PROJECT REPORT

TO: ENVIRONMENTAL EVALUATION COMMITTEE **AGENDA DATE: November 19, 2020**

FROM: PLANNING & DEVELOPMENT SERVICES **AGENDA TIME 1:30 PM / No.1**

PROJECT TYPE: Second Imperial Geothermal CUP 19-0017 SUPERVISOR DIST #2

LOCATION: 855 Dogwood Road , Imperial County, CA APN: 054-250-031-000

PARCEL SIZE: 39.99 acres

GENERAL PLAN (existing) Heber SPA AREA GENERAL PLAN (proposed) N/A

ZONE (existing) AG -2 G-SPA ZONE (proposed) N/A

GENERAL PLAN FINDINGS ☒ CONSISTENT ☐ INCONSISTENT ☐ MAY BE/FINDINGS

PLANNING COMMISSION DECISION: HEARING DATE: ____________

☐ APPROVED ☐ DENIED ☐ OTHER

PLANNING DIRECTORS DECISION: HEARING DATE: ____________

☐ APPROVED ☐ DENIED ☐ OTHER

ENVIROMENTAL EVALUATION COMMITTEE DECISION: HEARING DATE: 11-19-2020

INITIAL STUDY: 19-0020

☐ NEGATIVE DECLARATION ☒ MITIGATED NEG. DECLARATION ☐ EIR

DEPARTMENTAL REPORTS / APPROVALS:

PUBLIC WORKS	☐ NONE	☒ ATTACHED
AG	☒ NONE	☐ ATTACHED
APCD	☐ NONE	☒ ATTACHED
E.H.S.	☐ NONE	☐ ATTACHED
FIRE / OES	☒ NONE	☐ ATTACHED
SHERIFF	☒ NONE	☐ ATTACHED
OTHER		

REQUESTED ACTION:

(See Attached)

Planning & Development Services
801 MAIN STREET, EL CENTRO, CA, 92243 442-265-1736
(Jim Minnick, Director)

☐ **NEGATIVE DECLARATION**
☒ **MITIGATED NEGATIVE DECLARATION**

Initial Study & Environmental Analysis
For:

Heber 2 Geothermal Repower Project
CUP No. 19-0017
SCH # 2020069002

Prepared By:

COUNTY OF IMPERIAL
Planning & Development Services Department
801 Main Street
El Centro, CA 92243
(442) 265-1736
www.icpds.com

November 2020

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SECTION 1
INTRODUCTION

A. PURPOSE

This document is a ☐ policy-level, ☒ project level Initial Study for evaluation of potential environmental impacts resulting with the proposed installation of new geothermal energy converters and three isopentane storage tanks, located at the existing Heber 2 Geothermal Energy Complex located on APN 054-250-031 at 855 Dogwood Road, Heber, CA 92249 (see Exhibit "A" & "B").

B. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) REQUIREMENTS AND THE IMPERIAL COUNTY'S GUIDELINES FOR IMPLEMENTING CEQA

As defined by Section 15063 of the State California Environmental Quality Act (CEQA) Guidelines and Section 7 of the County's "CEQA Regulations Guidelines for the Implementation of CEQA, as amended", an **Initial Study** is prepared primarily to provide the Lead Agency with information to use as the basis for determining whether an Environmental Impact Report (EIR), Negative Declaration, or Mitigated Negative Declaration would be appropriate for providing the necessary environmental documentation and clearance for any proposed project.

☐ According to Section 15065, an **EIR** is deemed appropriate for a particular proposal if the following conditions occur:

- The proposal has the potential to substantially degrade quality of the environment.
- The proposal has the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals.
- The proposal has possible environmental effects that are individually limited but cumulatively considerable.
- The proposal could cause direct or indirect adverse effects on human beings.

☒ According to Section 15070(a), a **Negative Declaration** is deemed appropriate if the proposal would not result in any significant effect on the environment.

☐ According to Section 15070(b), a **Mitigated Negative Declaration** is deemed appropriate if it is determined that though a proposal could result in a significant effect, mitigation measures are available to reduce these significant effects to insignificant levels.

This Initial Study has determined that the proposed applications will not result in any potentially significant environmental impacts and therefore, a Negative Declaration is deemed as the appropriate document to provide necessary environmental evaluations and clearance as identified hereinafter.

This Initial Study and Negative Declaration are prepared in conformance with the California Environmental Quality Act of 1970, as amended (Public Resources Code, Section 21000 et. seq.); Section 15070 of the State & County of Imperial's Guidelines for Implementation of the California Environmental Quality Act of 1970 as amended (California Code of Regulations, Title 14, Chapter 3, Section 15000, et. seq.). applicable requirements of the County of Imperial; and the regulations, requirements, and procedures of any other responsible public agency or an agency with jurisdiction by law.

Pursuant to the County of Imperial Guidelines for Implementing CEQA, depending on the project scope, the County of Imperial Board of Supervisors, Planning Commission and/or Planning Director is designated the Lead Agency,

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in accordance with Section 15050 of the CEQA Guidelines. The Lead Agency is the public agency which has the principal responsibility for approving the necessary environmental clearances and analyses for any project in the County.

C. INTENDED USES OF INITIAL STUDY AND NEGATIVE DECLARATION

This Initial Study and Negative Declaration are informational documents which are intended to inform County of Imperial decision makers, other responsible or interested agencies, and the general public of potential environmental effects of the proposed applications. The environmental review process has been established to enable public agencies to evaluate environmental consequences and to examine and implement methods of eliminating or reducing any potentially adverse impacts. While CEQA requires that consideration be given to avoiding environmental damage, the Lead Agency and other responsible public agencies must balance adverse environmental effects against other public objectives, including economic and social goals.

The Initial Study and Negative Declaration, prepared for the project will be circulated for a period of 20 days (*30-days if submitted to the State Clearinghouse for a project of area-wide significance*) for public and agency review and comments. At the conclusion, if comments are received, the County Planning & Development Services Department will prepare a document entitled "Responses to Comments" which will be forwarded to any commenting entity and be made part of the record within 10-days of any project consideration.

D. CONTENTS OF INITIAL STUDY & NEGATIVE DECLARATION

This Initial Study is organized to facilitate a basic understanding of the existing setting and environmental implications of the proposed applications.

SECTION 1

I. **INTRODUCTION** presents an introduction to the entire report. This section discusses the environmental process, scope of environmental review, and incorporation by reference documents.

SECTION 2

II. ENVIRONMENTAL CHECKLIST FORM contains the County's Environmental Checklist Form. The checklist form presents results of the environmental evaluation for the proposed applications and those issue areas that would have either a significant impact, potentially significant impact, or no impact.

PROJECT SUMMARY, LOCATION AND EVIRONMENTAL SETTINGS describes the proposed project entitlements and required applications. A description of discretionary approvals and permits required for project implementation is also included. It also identifies the location of the project and a general description of the surrounding environmental settings.

ENVIRONMENTAL ANALYSIS evaluates each response provided in the environmental checklist form. Each response checked in the checklist form is discussed and supported with sufficient data and analysis as necessary. As appropriate, each response discussion describes and identifies specific impacts anticipated with project implementation.

SECTION 3

III. MANDATORY FINDINGS presents Mandatory Findings of Significance in accordance with Section 15065 of the CEQA Guidelines.

IV. PERSONS AND ORGANIZATIONS CONSULTED identifies those persons consulted and involved in

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preparation of this Initial Study and Negative Declaration.

V. REFERENCES lists bibliographical materials used in preparation of this document.

VI. NEGATIVE DECLARATION – COUNTY OF IMPERIAL

VII. FINDINGS

SECTION 4

VIII. RESPONSE TO COMMENTS (IF ANY)

IX. MITIGATION MONITORING & REPORTING PROGRAM (MMRP) (IF ANY)

E. SCOPE OF ENVIRONMENTAL ANALYSIS

For evaluation of environmental impacts, each question from the Environmental Checklist Form is summarized and responses are provided according to the analysis undertaken as part of the Initial Study. Impacts and effects will be evaluated and quantified, when appropriate. To each question, there are four possible responses, including:

1. **No Impact:** A "No Impact" response is adequately supported if the impact simply does not apply to the proposed applications.

2. **Less Than Significant Impact:** The proposed applications will have the potential to impact the environment. These impacts, however, will be less than significant; no additional analysis is required.

3. **Less Than Significant With Mitigation Incorporated:** This applies where incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact".

4. **Potentially Significant Impact:** The proposed applications could have impacts that are considered significant. Additional analyses and possibly an EIR could be required to identify mitigation measures that could reduce these impacts to less than significant levels.

F. POLICY-LEVEL or PROJECT LEVEL ENVIRONMENTAL ANALYSIS

This Initial Study and Negative Declaration will be conducted under a ☐ policy-level, ☒ project level analysis. Regarding mitigation measures, it is not the intent of this document to "overlap" or restate conditions of approval that are commonly established for future known projects or the proposed applications. Additionally, those other standard requirements and regulations that any development must comply with, that are outside the County's jurisdiction, are also not considered mitigation measures and therefore, will not be identified in this document.

G. TIERED DOCUMENTS AND INCORPORATION BY REFERENCE

Information, findings, and conclusions contained in this document are based on incorporation by reference of tiered documentation, which are discussed in the following section.

1. Tiered Documents

As permitted in Section 15152(a) of the CEQA Guidelines, information and discussions from other documents can be included into this document. Tiering is defined as follows:

"Tiering refers to using the analysis of general matters contained in a broader EIR (such as the one prepared

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for a general plan or policy statement) with later EIRs and negative declarations on narrower projects incorporating by reference the general discussions from the broader EIR; and concentrating the later EIR or negative declaration solely on the issues specific to the later project."

Tiering also allows this document to comply with Section 15152(b) of the CEQA Guidelines, which discourages redundant analyses, as follows:

"Agencies are encouraged to tier the environmental analyses which they prepare for separate but related projects including the general plans, zoning changes, and development projects. This approach can eliminate repetitive discussion of the same issues and focus the later EIR or negative declaration on the actual issues ripe for decision at each level of environmental review. Tiering is appropriate when the sequence of analysis is from an EIR prepared for a general plan, policy or program to an EIR or negative declaration for another plan, policy, or program of lesser scope, or to a site-specific EIR or negative declaration."

Further, Section 15152(d) of the CEQA Guidelines states:

"Where an EIR has been prepared and certified for a program, plan, policy, or ordinance consistent with the requirements of this section, any lead agency for a later project pursuant to or consistent with the program, plan, policy, or ordinance should limit the EIR or negative declaration on the later project to effects which:

(1) Were not examined as significant effects on the environment in the prior EIR; or

(2) Are susceptible to substantial reduction or avoidance by the choice of specific revisions in the project, by the imposition of conditions, or other means."

2. <u>Incorporation By Reference</u>

Incorporation by reference is a procedure for reducing the size of EIRs/MND and is most appropriate for including long, descriptive, or technical materials that provide general background information, but do not contribute directly to the specific analysis of the project itself. This procedure is particularly useful when an EIR or Negative Declaration relies on a broadly-drafted EIR for its evaluation of cumulative impacts of related projects (*Las Virgenes Homeowners Federation v. County of Los Angeles* [1986, 177 Ca.3d 300]). If an EIR or Negative Declaration relies on information from a supporting study that is available to the public, the EIR or Negative Declaration cannot be deemed unsupported by evidence or analysis (*San Francisco Ecology Center v. City and County of San Francisco* [1975, 48 Ca.3d 584, 595]). This document incorporates by reference appropriate information from the "Final Environmental Impact Report and Environmental Assessment for the "County of Imperial General Plan EIR" prepared by Brian F. Mooney Associates in 1993 and updates.

When an EIR or Negative Declaration incorporates a document by reference, the incorporation must comply with Section 15150 of the CEQA Guidelines as follows:

- The incorporated document must be available to the public or be a matter of public record (CEQA Guidelines Section 15150[a]). The General Plan EIR and updates are available, along with this document, at the County of Imperial Planning & Development Services Department, 801 Main Street, El Centro, CA 92243 Ph. (442) 265-1736.

- This document must be available for inspection by the public at an office of the lead agency (CEQA Guidelines Section 15150[b]). These documents are available at the County of Imperial Planning & Development Services Department, 801 Main Street, El Centro, CA 92243 Ph. (442) 265-1736.

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- These documents must summarize the portion of the document being incorporated by reference or briefly describe information that cannot be summarized. Furthermore, these documents must describe the relationship between the incorporated information and the analysis in the tiered documents (CEQA Guidelines Section 15150[c]). As discussed above, the tiered EIRs address the entire project site and provide background and inventory information and data which apply to the project site. Incorporated information and/or data will be cited in the appropriate sections.

- The material to be incorporated in this document will include general background information (CEQA Guidelines Section 15150[f]). This has been previously discussed in this document.

Appendices

Appendix A - Site Photographs
Appendix B - Biological Resources Clearance Memorandum
Appendix C - Cultural Resources Clearance Memorandum (CONFIDENTIAL)
Appendix D - Water Quality Management Plan
Appendix E - Geo-technical Site Conditions Memorandum and Technical Report
Appendix F - Air Emissions Memorandum
Appendix G - Isopentane Hazard Assessment
Appendix H - Imperial County Reclamation Plan Application
Appendix I- 2020 Heber 2 Mitigation
Appendix J- Attachment for Heber 2 responses
Appendix K- Heber 2 Isopentane tank
Appendix L - Heber 2 Hazard Assessment update
Appendix M - Heber 2 responses to comments

ATTACHMENTS

H2RP-1	HEBER CUP 06-0006
H2RP-2	PERMIT TO OPERATE
H2RP-4	BRYANT HART FAULT RUPTURE
H2RP-5	USGS SWELLING CLAY MAPS
H2RP-6	HEBER 2 IID WATER SUPPLY CONTACT
H2RP-7	PM 10 PM 2.5 PLANS
H2RP-8	ASTM
H2RP-9	CALIFORNIA AMBIENT AIR QUALITY
HPRP-10	CDFW DATA IMPERIAL, CNDDB MAPS IMPERIAL CO, CNDDB BIOS 10 & 5 MILE
H2PR-11	CA DIR SAFETY HEALTH PROTCOL
H2RP-12	CALRECYCLE INTEGRATED
H2RP-13	CAL DTSC
H2RP-14	CALTRANS TECHNICAL NOISE SUPPLE
H2RP-15	SCENIC HWY DATA
H2RP-16	CALIFORNIA GROUNDWATER
H2RP-17	OPR GENERAL PLAN GUID
H2RP-18	USEPA NAAQS CIRTERIA AIR POLL
H2RP-19	USGS SAN ANDRES FAULT
H2RP-20	HEBER 2 PROJECT INFO

RECORDS INDEX FOR HEBER 2 REPOWER PROJECT

Figures

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II. Environmental Checklist

1. **Project Title**: Heber 2 Geothermal Repower Project Initial Study IS 19-0020 SCH # 2020069002

2. **Lead Agency**: Imperial County Planning & Development Services Department

3. **Contact person and phone number**: David Black, Planner IV, (442)265-1736

4. **Address**: 801 Main Street, El Centro CA, 92243

5. **E-mail**: davidblack@co.imperial.ca.us

6. **Project location**: APN 054-250-031-000; 855 Dogwood Road, Heber, CA 92249. See Exhibit A and B.

7. **Project sponsor's name and address**: Second Imperial Geothermal Company; 6140 Plumas St., Reno, NV 89519

8. **General Plan designation**: Heber SPA area

9. **Zoning**: A-2-G-SPA, General Agriculture (A-2), Geothermal Overlay Zone (G), and in the Heber Specific Plan Area (SPA)

10. **Description of project**: Perform CUP amendment to allow for installation of two new water-cooled ORMAT Energy Converters (OECs) to replace six old units from 1992; three 10,000 gallon isopentane above ground storage tanks; and, additional pipes to connect the proposed facilities with the existing Heber 2 Geothermal Energy Complex. All proposed facilities would be developed within the existing Heber 2 Complex and fence line. The total project disturbance from developing the new facilities is approximately 4 acres. The CUP amendment application also proposes to renew the permitted life of the entire Heber 2 Complex (including the Goulds 2 and Heber South geothermal energy facilities) to 30 years (2019-2049).

The proposed facility upgrades would allow the Heber 2 Complex to run more efficiently and refurbish the Heber 2 Complex to the original nameplate capacity (33 megawatts) without expanding the existing facility beyond the current footprint, and produce clean renewable energy in the Imperial Valley for the next three decades.

11. **Surrounding land uses and setting**: Briefly describe the project's surroundings: Surrounding land uses include a solar energy facility to the west of the Project Site, a commercial aggregate/rock supplier to the south, and agriculture to the north and east. The primary use in the general surrounding area is agriculture. The closest residences to the Project Site are in the town of Heber, approximately 3,500 feet to the northeast of the Heber 2 Complex.

12. **Other public agencies whose approval is required** (e.g., permits, financing approval, or participation agreement.): None

13. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, is there a plan for consultation that includes, for example, the determination of significance of impacts to tribal cultural resources, procedures regarding confidentially, etc.?

Note: Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code, Section 21080.3.2). Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code, Section 5097.96 and the California Historical Resources Information System administered by the California Office of Historic Preservation. Please also note that Public Resources Code, Section 21082.3 (c) contains provisions specific to confidentiality.

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ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture and Forestry Resources	☐ Air Quality
☒ Biological Resources	☐ Cultural Resources	☐ Energy
☒ Geology /Soils	☐ Greenhouse Gas Emissions	☒ Hazards & Hazardous Materials
☐ Hydrology / Water Quality	☐ Land Use / Planning	☐ Mineral Resources
☐ Noise	☐ Population / Housing	☐ Public Services
☐ Recreation	☐ Transportation	☐ Tribal Cultural Resources
☐ Utilities/Service Systems	☐ Wildfire	☐ Mandatory Findings of Significance

ENVIRONMENTAL EVALUATION COMMITTEE (EEC) DETERMINATION

After Review of the Initial Study, the Environmental Evaluation Committee has:

☐ Found that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ Found that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ Found that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ Found that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ Found that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE DE MINIMIS IMPACT FINDING: ☐ Yes ☐ No

EEC VOTES	YES	NO	ABSENT
PUBLIC WORKS	☒	☐	☐
ENVIRONMENTAL HEALTH SVCS	☐	☐	☒
OFFICE EMERGENCY SERVICES	☐	☐	☒
APCD	☒	☐	☐
AG	☒	☐	☐
SHERIFF DEPARTMENT	☐	☐	☒
ICPDS	☒	☐	☐

Jim Minnick, Director of Planning/EEC Chairman

Date: 11-23-2020

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PROJECT SUMMARY

See attached Initial Study for additional information.

A. Project Location: The proposed development would occur entirely on the 39.99-acre Assessor's Parcel Number (APN) 054-250-031. This parcel also includes geothermal facilities for the Goulds 2 and Heber South projects. The address for the Heber 2 Complex is 855 Dogwood Road, Heber, CA. 92249. The legal description is Tract 44, Township 16 South, Range 14 East, SBB&M. See Exhibit A and B.

B. Project Summary: Install two new water-cooled ORMAT Energy Converters (OECs) to replace six old units from 1992; install three 10,000-gallon isopentane above ground storage tanks; and, additional pipes to connect the proposed facilities with the existing Heber 2 Geothermal Energy Complex. All proposed facilities will be developed within the existing Heber 2 Complex and fence line. The total project disturbance from developing the new facilities is approximately 4 acres. The CUP amendment application also proposes to renew the permitted life of the entire Heber 2 Complex (including the Goulds 2 and Heber South geothermal energy facilities) to 30 years (2019-2049). The proposed facility upgrades would allow the Heber 2 Complex to run more efficiently and refurbish the Heber 2 Complex to the original nameplate capacity **(33 megawatts)** without expanding the existing facility beyond the current footprint, and produce clean renewable energy in the Imperial Valley for the next three decades.

C. Environmental Setting:
Within the existing Heber 2 Complex, the Project Site is vacant of any vegetation or topographic features, consisting of exposed gravel and/or soil. No wetlands or jurisdictional waters are located on the Project Site. The closest jurisdictional water is the New River, located approximately 1.3 miles to the southwest of the Project Site, across Willoughby Road. The Project Site is not suitable habitat for any sensitive species.

D. Analysis: Taking into account the numerous voluntary environmental protection measures proposed by the Applicant, the Project is not expected to result in any significant effects. All impacts in the Initial Study were identified to be Less Than Significant or No Impact, primarily due to the fully developed nature of the Project Site as an existing geothermal energy complex. Therefore, no additional mitigation measures were prescribed.

E. General Plan Consistency: The proposed Project is consistent with the General Plan, located within the geothermal energy overlay zone allowing for major geothermal projects. All proposed developments would occur within the fence-line of the existing Heber 2 Geothermal Energy Complex and not increase the footprint on the energy facility. Construction activities and facility operations would be performed in line with the elements of the General Plan (Land Use; Housing; Circulation and Scenic Highways; Noise; Seismic and Public Safety; Conservation and Open Space; Agricultural; Geothermal and Transmission; Water).

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Exhibit "A"
Vicinity Map
Figure 1

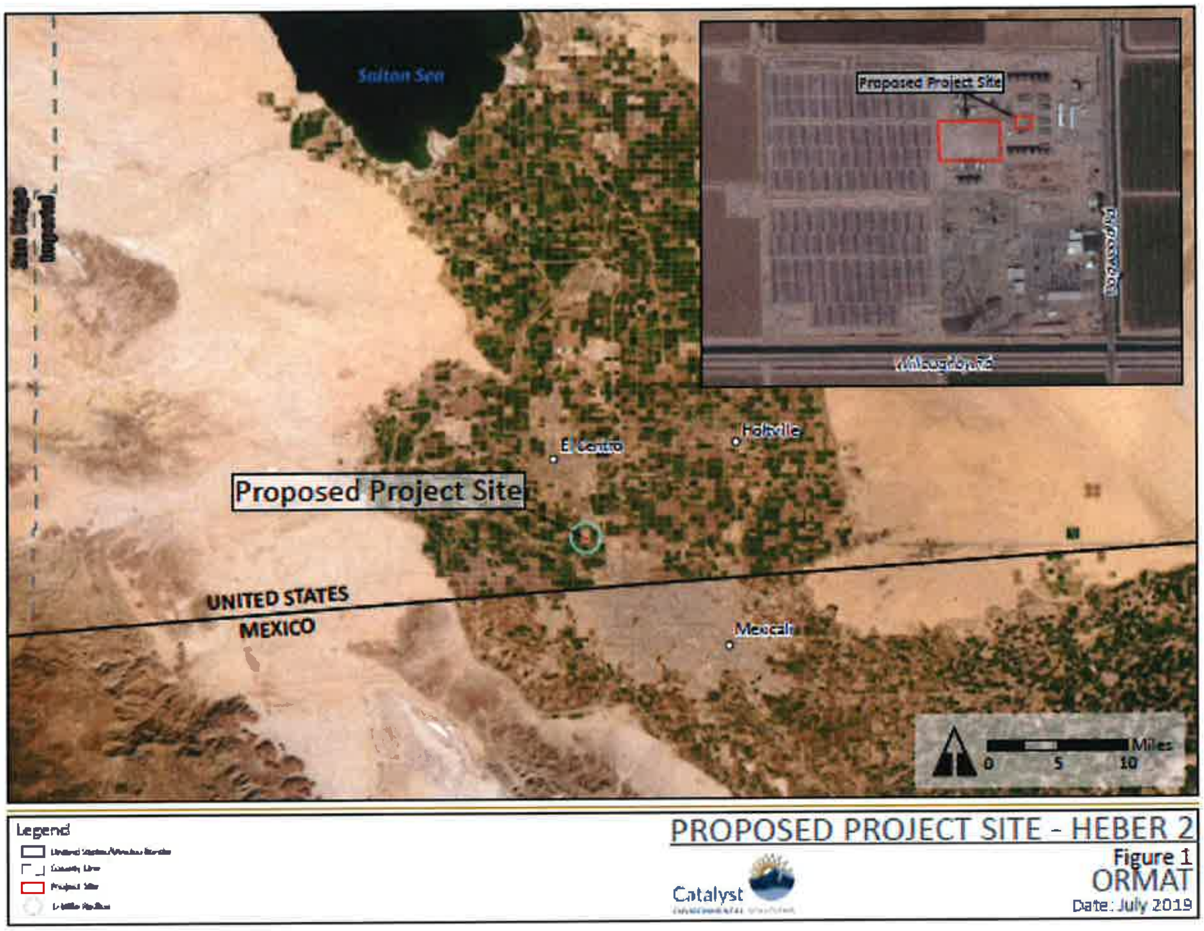

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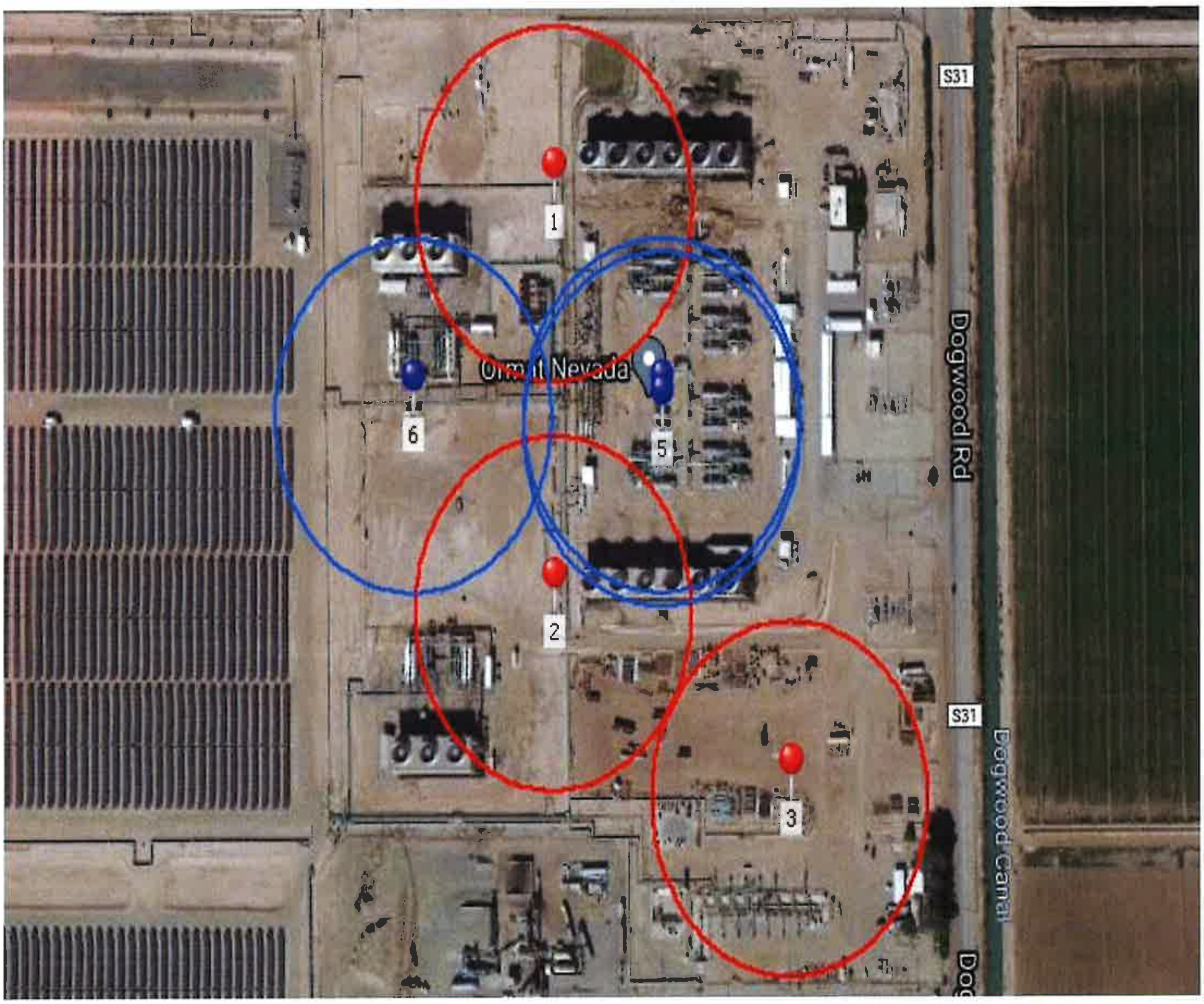
Exhibit "B"
Site Plan
Figure 2



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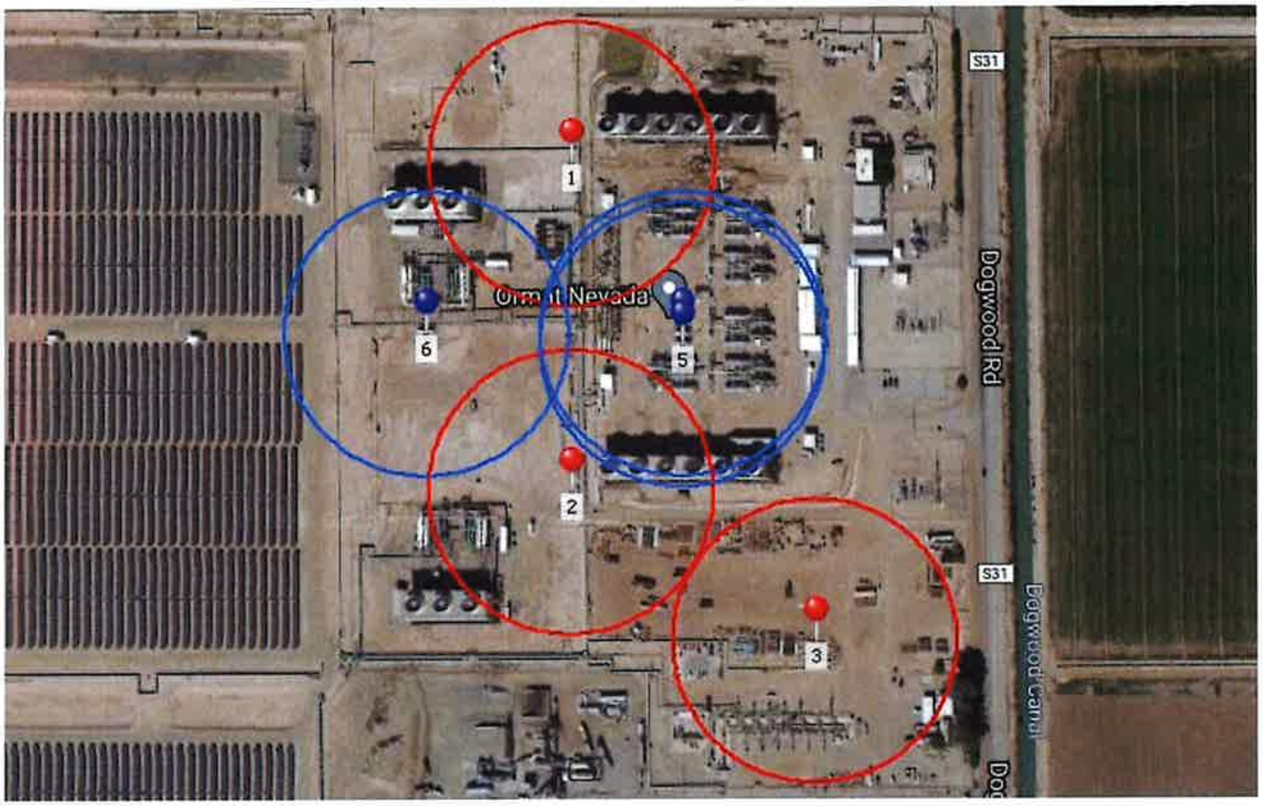

Figure 4- Example of Proposed ORMAT Energy Converters

Figure 5 Example of Proposed Above Ground Storage Tank (10,000 gallon)

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Figure 6- Photo of Project Site (June 13, 2019)

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should

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be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.
   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:

   a) The significance criteria or threshold, if any, used to evaluate each question; and
   b) The mitigation measure identified, if any, to reduce the impact to less than significance

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	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**

I. *AESTHETICS*

Except as provided in Public Resources Code Section 21099, would the project:

	PSI	PSUMI	LTSI	NI
a) Have a substantial adverse effect on a scenic vista or scenic highway?	☐	☐	☐	☒

a) No Impact. No scenic vistas or scenic highways are present on or in the vicinity of the Project Site; therefore, no impacts would occur to these aesthetic resources.

	PSI	PSUMI	LTSI	NI
b) Substantially damage scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒

b) No Impact. The Project would be developed within an existing power plant, on undeveloped lands with no scenic characteristics (i.e., site lacks vegetation, topography, or buildings), and no state scenic highways exist in the vicinity of the Project Site. Therefore, the Project would not impact any scenic resources.

	PSI	PSUMI	LTSI	NI
c) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surrounding? (Public views are those that are experienced from publicly accessible vantage point.) If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☒	☐

c) Less Than Significant. During the construction phase, a crane may be visible to travelers on Dogwood Road or in the vicinity of the Project Site. However, crane use is anticipated to be temporary (less than eight months) and would be removed from the Project Site after construction of the proposed facilities is complete.

The Project will be developed within an existing power plant, and the proposed facilities would blend in with the existing energy facilities. The proposed facilities would render no noticeable changes to the Heber 2 site/plant to travelers on Dogwood Road or in the vicinity of the Project Site. The Imperial County General/Zoning Plan allows for "Major Geothermal" projects on the Project Site and, taking into account the existing power plant, the Project would not impact the visual character of the site or its surroundings.

	PSI	PSUMI	LTSI	NI
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

d) No Impact. The Project would not introduce any new light sources to the Project Site or surrounding area. Lighting is present at the Heber 2 Complex, but no additional lighting is proposed as part of the Project.

II. *AGRICULTURE AND FOREST RESOURCES*

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:

	PSI	PSUMI	LTSI	NI
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒

a) No Impact. The Project Site is presently used for geothermal energy operations and is uncultivated. No Prime, Unique, or Important farmlands are present on the Project Site (DOC 2016). No land use or farmland conversion would occur as result of the

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	Potentially Significant Impact (PSI)	Potentially Significant Unless Mitigation Incorporated (PSUMI)	Less Than Significant Impact (LTSI)	No Impact (NI)

Project.

b) Conflict with existing zoning for agricultural use, or a Williamson Act Contract?	☐	☐	☐	☒

b) No Impact. The Project Site is zoned for agriculture and geothermal energy projects, and the Project does not conflict with Imperial County's General/Zoning Plan. The Project Site is not subject to a Williamson Act contract.

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?	☐	☐	☐	☒

c) No Impact. The Project site is not zoned for, nor does it contain, forest land or timber land. As such, the Project would not impact forest or timberlands.

d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒

d) No Impact. The Project site does not contain any forest land and would not convert any forest lands; therefore, the Project would not impact forest lands.

e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

e) No Impact. There is no farmland or forest land present on the Project Site, which is used for ongoing geothermal energy generation (DOC 2016). The proposed facilities would be constructed within the existing power plant site and no offsite disturbances would occur; therefore, no conversion of farmland or forest land would occur as result of the Project.

III. *AIR QUALITY*

Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to the following determinations. Would the Project:

a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐

a) Less Than Significant. The Project Site is located within the ICAPCD, and the Heber 2 Complex has an existing Permit to Operate (PTO) issued by ICAPCD. Emissions of criteria pollutants, which are limited to fugitive releases of isopentane, a volatile organic compound (VOC), are monitored at the Heber 2 Complex. Modeling was performed to forecast the amount of potential isopentane emissions (Appendix **F)** to evaluate a potential significant exceedance of the limits established in the Imperial County CEQA Air Quality Handbook.

Current isopentane emissions at the Heber 2 Complex are approximately 117.5 lbs/day, and the modeled future emissions with the new facilities are estimated to be 64.5 lbs/day (**Table 2**). Under the existing PTO, the Heber 2 Complex is authorized to emit between 137 and 218 lbs/day of isopentane (dependent on time of year). The expected change in isopentane emissions with the new facilities would decline by approximately 53 lbs/day or 3.1 tons/year, which is significantly less than the existing emissions profile of the Heber 2 Complex and well under the authorized release amount. SIGC is applying to ICAPCD for a new PTO with reduced emissions thresholds to 137 to 202 lbs/day. Therefore, considering the emissions reduction from the new facilities, the Project would not conflict with or obstruct the implementation of the ICAPCD air quality plan.

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	Potentially Significant Impact (PSI)	Potentially Significant Unless Mitigation Incorporated (PSUMI)	Less Than Significant Impact (LTSI)	No Impact (NI)

Table Existing and Modeled Future Isopentane Emissions

Heber 2 Complex Total Emissions

Isopentane Emissions	lbs / day	tons / year
Actual Emissions (2017 – 2018)	117.5	14.9
Estimated Potential Future Emissions	64.5	11.8
Emissions Increase	-52.9	-3.1
Permit Limit (varies)	137 - 218	

b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard? ☐ ☐ ☒ ☐

b) Less Than Significant. The Project would not violate any air quality standards or plan. The Heber 2

Complex has a PTO from the ICAPCD, which specifies the amount of isopentane, a VOC, authorized for release. The Heber 2 Complex is permitted to release between 137 and 218 lbs/day, depending on time of year. As noted in **Table 2** above, isopentane emissions with the new facilities are expected to decrease approximately 53 lbs/day, for a total of 64.5 lbs/day. SIGC is applying to ICAPCD for a new PTO with reduced emissions thresholds to 137 to 202 lbs/day. Therefore, considering the emissions reduction from the new facilities, the Project would not violate the existing PTO or contribute to an existing air quality violation.

Emissions from construction equipment would be temporary and not exceed any air quality thresholds or significantly contribute to an existing regional nonattainment condition (i.e. particulate matter, ozone). As described in Section 2.1.7, air quality measures would be implemented during construction of the proposed facilities to minimize the potential for fugitive dust and particulate matter releases. All air quality control measures would be in line with the Imperial County 2018 PM_{10} Plan and Imperial County 2018 $PM_{2.5}$ Plan. Through the application of these measures, the construction of the Project would limit visible dust emissions and particulate matter emissions to 20 percent opacity and/or 150 lbs/day, and therefore, be in compliance with Imperial County's approach to minimizing these construction-related emissions.

c) Expose sensitive receptors to substantial pollutants concentrations? ☐ ☐ ☒ ☐

c) Less Than Significant. Significant adverse cumulative air quality impacts could occur if the proposed Project resulted in a cumulatively considerable net increase of a criteria pollutant for which ICAPCD exceeds federal and state ambient air quality standards and has been designated as an area of non- attainment by the USEPA and/or CARB. The ICAPCD is a non-attainment area for ozone and fine particulate matter.

To determine whether air quality impacts from a proposed project are significant, the project's potential contribution to cumulative impacts would be assessed utilizing the same significance criteria as for project-specific impacts. Therefore, if an individual project generates construction or operational emissions that exceed the ICAPCD's recommended daily thresholds for project-specific impacts, that project would also cause a cumulatively considerable increase in emissions for those pollutants for which the ICAPCD is in nonattainment and therefore, would be considered to have significant adverse cumulative air quality impacts.

As discussed in Section 2.1.7, air quality measures would be implemented during construction of the proposed facilities to minimize the potential for fugitive dust and particulate matter releases. All air quality control measures would be in line with the Imperial County 2018 PM_{10} Plan and Imperial County 2018 $PM_{2.5}$ Plan. Through the application of these measures, the construction of the Project would limit visible dust emissions and particulate matter emissions to 20 percent opacity and/or 150 lbs/day, and therefore, be in compliance with Imperial County's approach to minimizing these construction-related emissions. Ozone, which is formed by a complex series of chemical reactions and the precursors of which stem from the use of fuel-combusting equipment (e.g., backhoes, trucks), would also be limited to the construction phase of the Project. To limit the amount ozone emissions from construction equipment, vehicles and equipment would be turned off when not in use and not left idling to minimize unnecessary

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	Potentially Significant Impact (PSI)	Potentially Significant Unless Mitigation Incorporated (PSUMI)	Less Than Significant Impact (LTSI)	No Impact (NI)

emissions. The temporary and relatively low amount of ozone emissions from the construction equipment would result in a less than significant cumulative effect to the existing nonattainment status of the ICAPCD.

	PSI	PSUMI	LTSI	NI
d) Result in other emissions (such as those leading to odors adversely affecting a substantial number of people?	☐	☐	☒	☐

d) Less Than Significant. Land uses that are considered more sensitive to changes in air quality than others are referred to as sensitive receptors. Land uses such as primary and secondary schools, hospitals, and convalescent homes are sensitive to poor air quality because the very young, the old, and the infirm are more susceptible to respiratory infections and other air quality-related health problems than the general public. Residential uses are considered sensitive because people in residential areas are often at home for extended periods of time, so they could be exposed to pollutants for extended periods. Recreational areas are considered moderately sensitive to poor air quality because vigorous exercise associated with recreation places a high demand on the human respiratory function.

The nearest sensitive receptors to the Project Site are the residences approximately 3,500 feet to the northeast of the Project Site. As discussed in **Appendix F**, air emissions from the Heber 2 Complex would be limited to isopentane, which is a VOC. The Heber 2 Complex is permitted to release between 137 and 218 lbs/day, depending on time of year. Isopentane emissions with the new facilities are estimated to decrease by approximately 53 lbs/day of isopentane, representing approximately a 54 percent decrease from current emissions and well below permitted limits (**Table 2**).The Project would not exceed the release limits established in the PTO, which are health-based; therefore, the Project would not expose any sensitive receptors to a significant exposure of pollutant concentrations.

Isopentane has a petroleum-like odor; however as noted previously, the Project would result in a decrease of approximately 53 lbs/day of isopentane, representing approximately a 54 percent decrease from current emissions and well below permitted limits (Table 2). Utilizing the existing Heber 2 power generation infrastructure, the additional facilities will not produce a significant odor. No odor complaints have ever been filed against the Heber 2 facilities and the existing facilities are not a significant source of odor. Further, the Project Site is located in an agrarian area that is not densely populated. The closest residences are located 3,500 feet to the northeast of the Project Site. During construction, diesel emissions from construction equipment may be sources of odor. These emissions would be temporary and minimal based on the small number of heavy vehicles that would be required for Project construction. Therefore, Project-related odors would be limited to the temporary construction phase and would not result in a significant source of odor to a substantial number of people.

IV. *BIOLOGICAL RESOURCES* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐

a) Potentially Significant Unless Mitigated:. The potential for sensitive species to occur on or in the vicinity of the Project Site was evaluated using information from the U.S. Fish and Wildlife (USFWS) Information, Planning, and Consultation System (IPaC System); California Natural Diversity Database (CNDDB); and California Native Plant Society (CNPS) Rare Plant Program.

No federally listed threatened or endangered plant species have the potential to occur on or near the project site (USFWS 2019a). Five plant species listed by the CNPS have the potential to occur in the Heber quadrangle (CNPS 2019):

1. Watson's amaranth (*Amaranthus watsonii*)
2. Abrams' spurge (*Euphorbia abramsiana*)
3. California satintail (*Imperata brevifolia*)
4. ribbed cryptantha (*Johnstonella costata*)
5. winged cryptantha (*Johnstonella holoptera*)

No federally listed threatened or endangered wildlife species have the potential to occur on the Project Site and no critical habitat exists on or near the Project Site (USFWS 2019a, b). No California special status species are known to occur on the Project Site (CDFW 2019).

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The following six migratory bird species are listed by IPaC as having the potential to occur in the vicinity of the Project Site:

6. Burrowing owl (*Athene cunicularia*)
7. Costa's hummingbird (*Calypte costae*)
8. Gila woodpecker (*Melanerpes uropygialis*)
9. Long-billed curlew (*Numenius americanus*)
10. Rufous hummingbird (*Selasphorus rufus*)
11. Whimbrel (*Numenius phaeopus*)

The Project Site appears to be devout of any vegetation or water resources; the proposed disturbance area is not suitable habitat for any of the sensitive species identified above. The Project Site is not designated by Imperial County for native habitat or conservation. However, the following mitigation will be required prior to construction to mitigate any possible occurrence prior to construction and operation of project upgrades.

Mitigation BR-1: Prior to any construction activities commencing on site, contractors shall attend a Worker Environmental Awareness Program (WEAP) regarding sensitive biological resources potentially occurring within the BSA. A person knowledgeable about the biology of the covered species shall present the program. At a minimum, the program shall cover the distribution of special-status species, general behavior and ecology of these species, their sensitivity to human activities, their legal protection, the penalties for violation of state and federal laws, reporting requirements, project mitigation measures, and measures to implement in the event that this species is found during construction. A fact sheet containing this information shall also be prepared and distributed. The program shall be presented to all members of the construction crew prior to the start of project construction activities. New employees shall receive formal, approved training prior to working onsite. Upon completion of the orientation, employees will sign a form stating that they attended the program and understand all protection measures. These forms shall be made available to CDFW upon request.

Mitigation BR-2: In accordance with the Staff Report on Burrowing Owl Mitigation (CDFW 2012), a preconstruction take avoidance survey shall be conducted (CDFW 2012). If the burrowing owl is absent, then no mitigation is required. If present, the following mitigation shall be implemented.
If burrowing owls and their habitat can be protected in place on or adjacent to a project site, then disturbance impacts shall be minimized through the use of buffer zones, visual screens, or other measures in accordance with CDFW (2012).

Occupied burrows shall be avoided during the breeding period from February 1 through August 31 (CDFW 2012). "Occupied" is defined as a burrow that shows sign of burrowing owl occupancy within the last 3 years. Occupied burrows shall also be avoided during the non-breeding season.

Burrow exclusion is a technique of installing one-way doors in burrow openings during the non-breeding season to temporarily exclude burrowing owls, or permanently exclude burrowing owls and close burrows after verifying burrows are empty by site monitoring and scoping (CDFW 2012).

Mitigation for permanent impacts to nesting, occupied, and satellite burrows and/or burrowing owl habitat is required such that the habitat acreage, number of burrows and burrowing owls impacted are replaced based on the burrowing owl life history information provided in Staff Report on Burrowing Owl Mitigation (CDFW 2012). Coordination with CDFW may be necessary for the development of site-specific avoidance and mitigation measures.

Mitigation BR-3: Protection of nesting birds would be required in compliance with the MBTA and to avoid impacts to nesting birds. To avoid impacts to nesting birds and to comply with the MBTA, clearing of vegetation should occur between non nesting (or non-breeding) season for birds (generally, September 1 to February 1). If this avoidance schedule is not feasible, the alternative is to carry out the clearing of vegetation associated with construction under the supervision of a qualified biologist. This shall entail a pre-construction nesting bird survey conducted by a qualified biologist within 14 days prior to initiating ground disturbance activities. The survey shall consist of full coverage of the proposed disturbance limits and a 500 foot buffer. The buffer shall be determined by the biologist and will take into account the species nesting in the area and the habitat present. If no active nests are found, no additional measures are required. If "occupied" nests are found, the nest locations shall be mapped by the biologist, utilizing GPS equipment. The nesting bird species shall be documented and, to the degree feasible, the nesting stage (e.g., incubation of eggs, feeding of young, near fledging). The biologist shall establish a no disturbance buffer around each active nest. The buffer will be determined by the biologist based on the species present and surrounding habitat. No construction or ground disturbance activities shall be conducted within the buffer until the biologist has determined the nest is no longer active and has informed the construction supervisor that activities may resume.

Mitigation BR-4 If pre-construction surveys determine either the presence of special status species or sensitive biological resources, a construction monitor may be needed during construction. If determined necessary, construction monitoring shall be conducted by a qualified biologist. The biologist shall be given authority to execute the following functions:
• Establish construction exclusion zones and make recommendations for implementing erosion control measures in temporary impact areas.

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- Ensure all construction activities stay within the staked construction zone and do not go beyond the limits of disturbance.
- Minimize trimming/removal of vegetation to within the Project impact area.
- Restrict non-essential equipment to the existing roadways and/or disturbed areas to avoid disturbance to existing adjacent native vegetation.
- Install and maintain appropriate erosion/sediment control measures, as needed, throughout the duration of work activities.

During construction, biological monitors shall inspect and verify field conditions, as needed, to ensure that wildlife and vegetation adjacent to the BSA are not harmed. The biological monitor shall coordinate with the construction supervisor and construction crew and shall have the authority to stop any activity that has the potential to affect special-status species or remove vegetation not specified in this report.

		PSI	PSUMI	LTSI	NI
b)	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐

b) Possible Significant Unless Mitigated. As discussed in Section 3.1.4, no water resources or sensitive communities are present on or near the Project Site (see Figure 6 above and Appendix A). Neither construction nor operation of the proposed facilities would create any substantially adverse offsite impacts. Therefore, no impacts to riparian habitat or sensitive natural communities would occur as a result of the Project. Additionally, as proposed as an Environmental Protection Measure**, SIGC will perform a pre-construction survey to verify the absence of any sensitive species (i.e. burrowing owl please see above mitigation BR-1- BR-4).**

		PSI	PSUMI	LTSI	NI
c)	Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒

c) No Impact. As discussed in Section 3.1.4, no wetlands or water resources are present on the Project Site; therefore, no impacts to wetland, riparian resources, or jurisdictional waters would occur as result of the Project.

		PSI	PSUMI	LTSI	NI
d)	Would the project interfere substantially with the movement of any resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☒	☐	☐

d) Possible Significant Unless Mitigated. The existing Heber 2 Complex site is entirely fenced for security purposes, precluding wildlife from using the site as habitat or for migration. Further, the Project Site is entirely devoid of vegetation or water features that could be used as suitable resident or migratory habitat. Therefore, it appears the development of the proposed facilities within the existing plant site would not remove suitable wildlife habitat or migratory corridor/connectivity, nor would the facilities impede the use of nursery sites. Additionally, as proposed as an Environmental Protection Measure, **SIGC will perform a pre-construction survey to verify the absence of any sensitive species (i.e. burrowing owl. Please see mitigation BR-1 – BR-4).**

		PSI	PSUMI	LTSI	NI
e)	Conflict with any local policies or ordinance protecting biological resource, such as a tree preservation policy or ordinance?	☐	☐	☐	☒

e) No Impact. No local policies or ordinances protecting biological resources, including the Fish and Game Natural Areas established in the Imperial County General Plan, pertain to the Project Site. Further, the Project Site is completely devoid of any vegetation or water resources that could serve as suitable habitat for trees or wildlife. Therefore, no impacts to any local policies/ordinances would be impacted by the Project.

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	Potentially Significant Impact (PSI)	Potentially Significant Unless Mitigation Incorporated (PSUMI)	Less Than Significant Impact (LTSI)	No Impact (NI)
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

f) No Impact. There are no HCPs or similar conservation areas/plans for the Project Site or its vicinity. Therefore, the Project would not impacted any HCPs or other conservation plans.

V. *CULTURAL RESOURCES* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?	☐	☐	☐	☒

a) No Impact. A records search of the California Historical Resources Information System (CHRIS), which is managed by the California Office of Historic Preservation (OHP), for previous cultural and historic resource surveys previously performed on/near the Project Site was performed did not identify any recorded historical resources on the Project Site or immediate vicinity (Appendix C). Further, there are no buildings or structures present on the Project Site. Therefore, the Project would not result in any impacts to historical resources.

	PSI	PSUMI	LTSI	NI
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒

b) No Impact. The CHRIS records search did not identify any recorded cultural or archaeological resources on the Project Site or immediate vicinity (Appendix C). Considering that the Project Site was completely disturbed when the Heber 2 Complex was constructed, the probability of encountering an unforeseen/buried resource is very low. As discussed in Section 2.1.8 above, Project construction personnel would monitor areas during surface disturbing activities and if any potential cultural or archaeological resources are encountered, all construction affecting the discovery site would be suspended immediately until a qualified archaeologist has reviewed the findings. An Unanticipated Discoveries Plan would be prepared prior to resuming construction. Therefore, the Project is anticipated to result in no significant effects to archaeological or cultural resources.

	PSI	PSUMI	LTSI	NI
c) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☒	☐

c) Less Than Significant. Considering that the Project Site was completely disturbed when the Heber 2 power plant was constructed, the probability of encountering unforeseen/buried human remains is very low. As discussed in Section 2.1.8 above, Project construction personnel would monitor areas during surface disturbing activities and if any potential cultural or archaeological resources are encountered, all construction affecting the discovery site would be suspended immediately until a qualified archaeologist has reviewed the findings. An Unanticipated Discoveries Plan would be prepared prior to resuming construction. Therefore, the Project is anticipated to result in no or less than significant effects to human remains.

VI. *ENERGY* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☐	☒

a) No Impact: The proposed facility upgrades would allow the Heber 2 Complex to run more efficiently and refurbish the Heber 2 Complex to the original nameplate capacity (33 megawatts) without expanding the existing facility beyond the current footprint, and produce clean renewable energy in the Imperial Valley for the next three decades.

	PSI	PSUMI	LTSI	NI
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	☒

b) No Impact: The Project would allow for the continued operation of a permitted major geothermal energy power plant that utilizes the geothermal energy zone established by Imperial County. The proposed facilities would not increase the use of the geothermal

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resource/reservoir, rather allow the existing Heber 2 Complex to operate more efficiently and return its nameplate energy generation capacity to 33 MW. The Heber 2 Complex has been producing renewable energy since 1992 and the proposed facilities would allow for that to be extended until 2049, assisting with meeting the state mandates for renewable energy and reducing greenhouse gas emissions.

VII. ***GEOLOGY AND SOILS Would the project:***

	PSI	PSUMI	LTSI	NI
a) Directly or indirectly cause potential substantial adverse effects, including risk of loss, injury, or death involving:	☐	☒	☐	☐

Potentially Significant Unless Mitigated. As discussed in Section 3.1.2, the Imperial Valley is seismically active and contains numerous active faults (ICPDS 2015). A formal geotechnical investigation of the Project Site's soil characteristics, seismic conditions, storm-water infiltration, site stability, and potential for liquefaction was conducted. A summary memorandum and full technical report are attached as **Appendix E.** A computer-aided search assessed known faults and seismic zones within 36 miles of the Project Site. The Imperial Fault located 9.4 miles southwest of the Project Site was the closest mapped Earthquake Fault Zone. The Project Site is not located in an established fault zone as identified by the Alquist-Priolo Earthquake Fault Zoning Maps (Bryant 2007). In the event of an earthquake, seismic ground-shaking could be experienced in the vicinity of the Project Site, as is typical throughout Southern California. The Project Site is not located in a landslide zone. The Project Site is not located in a potential seiche, tsunami, or mudflow zone.

No deep subsurface activities (i.e. deeper than 6 feet) are proposed as part of the Project; thus, no ruptures to faults or fissures would occur as a result of the Project. Seismic ground-shaking and seismically induced liquefaction could result in structural damage to power plant infrastructure and facilities. However, the Project does not involve any infrastructure or facilities that would include human occupancy, and the risk of injury at the Project Site associated with ground-shaking, landslides, tsunami/seiche or liquefaction is very low. However, the following mitigation will be required prior to issuance of a grading permit to help mitigate in the unlikely event of any of the above occurrences.

Mitigation GS-1: Prior to approval of a grading or a building permit, a California certified civil/geotechnical engineer shall prepare a geotechnical investigation of the Project site that includes appropriate subsurface exploration, laboratory testing, and evaluation of potential geotechnical constraints to critical Project structures, including liquefaction, corrosion, seismic shaking and shrink swell evaluations. The report shall include specific recommendations to address issues identified in the geotechnical investigation of the Project site to meet State and County seismic building code requirements. An ICPDS approved third party environmental monitor shall be on site during geotechnical investigations.

	PSI	PSUMI	LTSI	NI
1) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☒	☐	☐

1) Potentially Significant Unless Mitigated. As discussed in Section 3.1.2, the Imperial Valley is seismically active and contains numerous active faults (ICPDS 2015). A formal geotechnical investigation of the Project Site's soil characteristics, seismic conditions, storm-water infiltration, site stability, and potential for liquefaction was conducted. A summary memorandum and full technical report are attached as Appendix E. A computer-aided search assessed known faults and seismic zones within 36 miles of the Project Site. The Imperial Fault located 9.4 miles southwest of the Project Site was the closest mapped Earthquake Fault Zone. The Project Site is not located in an established fault zone as identified by the Alquist-Priolo Earthquake Fault Zoning Maps (Bryant 2007). In the event of an earthquake, seismic ground-shaking could be experienced in the vicinity of the Project Site, as is typical throughout Southern California. The Project Site is not located in a landslide zone. The Project Site is not located in a potential seiche, tsunami, or mudflow zone.

No deep subsurface activities (i.e. deeper than 6 feet) are proposed as part of the Project; thus, no ruptures to faults or fissures would occur as a result of the Project. Seismic ground-shaking and seismically induced liquefaction could result in structural damage to power plant infrastructure and facilities. However, the Project does not involve any infrastructure or facilities that would include human occupancy, and the risk of injury at the Project Site associated with ground-shaking, landslides, tsunami/seiche or liquefaction is very low. Therefore, impacts to people or structures from the Project

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	Potentially Significant Impact (PSI)	Potentially Significant Unless Mitigation Incorporated (PSUMI)	Less Than Significant Impact (LTSI)	No Impact (NI)

would be less than significant.

Mitigation Please see GS-1

	PSI	PSUMI	LTSI	NI
2) Strong Seismic ground shaking? **2) Potentially Significant Unless Mitigated** (see mitigation GS-1)	☐	☒	☐	☐
3) Seismic-related ground failure, including liquefaction and seiche/tsunami? **3) Potentially Significant Unless Mitigated** (see mitigation GS-1)	☐	☒	☐	☐
4) Landslides? **4) Less than Significant** (see above a)	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐

b) Less Than Significant. Minor excavation and compaction activities would occur to prepare the appropriate bases for the OEC units and the ABSTs. The Project Site is an active geothermal energy station and does not contain high-value topsoil. Any soils excavated for site preparation would be backfilled to the excavation areas, assuming that these soils are free of debris. No pervious surfaces would be created as part of the Project, and storm-water would be allowed to infiltrate on bare soils, which represent the current conditions. Therefore, less than significant soil impacts are anticipated to occur as result of the Project.

	PSI	PSUMI	LTSI	NI
c) Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project, and potentially result in on- or off-site landslides, lateral spreading, subsidence, liquefaction or collapse?	☐	☒	☐	☐

c) Potentially Significant Unless Mitigated. Development of the proposed facilities would not appear to result in the destabilization of any soils or geologic units that could cause a landslide, subsidence, or liquefaction. The primary soil unit present on the Project Site is dry silty clays, which are not expansive or unstable soils (Olive, 1989). However, **Mitigation GS-1** would appear to mitigate any significant impacts on the construction and operation of Project.

	PSI	PSUMI	LTSI	NI
d) Be located on expansive soil, as defined in the latest Uniform Building Code, creating substantial direct or indirect risk to life or property?	☐	☐	☐	☒

d) No Impact. Development of the proposed facilities would not result in the destabilization of any soils or geologic units that could cause a landslide, subsidence, or liquefaction. The primary soil unit present on the Project Site is dry silty clays, which are not expansive or unstable soils (Olive, 1989). Therefore, no impacts on unstable soils or geologic units would occur from the Project.

	PSI	PSUMI	LTSI	NI
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

e) No Impact. The Project does not include any septic tanks or wastewater disposal systems; thus, no impact to soils from wastewater systems/management would occur as a result of the Project.

	PSI	PSUMI	LTSI	NI
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒	☐

f) Less Than Significant. Considering that the Project Site was completely disturbed when the Heber 2 power plant was constructed, the probability of encountering an unforeseen/buried human remains is very low. As discussed in Section 2.1.8 above, Project construction personnel would monitor areas during surface disturbing activities and if any potential cultural or archaeological resources are encountered, all construction affecting the discovery site would be suspended immediately until a qualified archaeologist has reviewed the findings. An Unanticipated Discoveries Plan would be prepared prior to resuming construction.

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Therefore, the Project is anticipated to result in no or less than significant effects to human remains.

VIII. ***GREENHOUSE GAS EMISSION*** ***Would the project:***

	PSI	PSUMI	LTSI	NI
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐

a) Less Than Significant. The construction of the Project involves diesel- and gasoline-fueled equipment, such as trucks, excavators, and powered hand tools. These tools emit greenhouse gases, but these emissions would be minor, temporary (approximately eight months), and well under the 10,000 CO_2e lb/day threshold established by AB 32.

Greenhouse gas emissions from the Heber 2 Complex after the new facilities are developed would not increase. Therefore, greenhouse gas emissions as result of the Project would be less than significant.

	PSI	PSUMI	LTSI	NI
b) Conflict with an applicable plan or policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

b) Less Than Significant. The Project would not contribute a significant amount of greenhouse gases, with most being emitted during the temporary construction phase. Long-term emissions from the Heber 2 Complex would remain the same or very similar to the existing emissions profile. Therefore, less than significant impacts to any greenhouse gas reduction plans, policy, or regulations would be caused, and only during Project construction.

IX. ***HAZARDS AND HAZARDOUS MATERIALS*** ***Would the project:***

	PSI	PSUMI	LTSI	NI
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐

12. **Potentially Significant unless Mitigated.** The Project would utilize isopentane as the motive fluid to generate energy from the geothermal resource/fluids. The Project proposes to install three additional 10,000-gallon ABSTs for additional isopentane storage/use. Isopentane is a regulated substance by the USEPA. The Heber 2 Complex is classified as Prevention Program 3 and is regulated by USEPA's Risk Management Program for Chemical Accidental Release Prevention (40 CFR 68.20-68.42) because isopentane is stored on site in excess of 10,000 lbs. Isopentane would be delivered to the Project Site by a licensed commercial transport company, in accordance with US DOT regulations for the transport of dangerous goods.

An Updated Hazard Assessment (HA) was prepared to assess the potential effects and risks of the additional isopentane storage/use by the Project (**Appendix G**). The HA analyzed the isopentane storage/use by identifying the worst-case scenarios and endpoints of concern (as defined by EPA RMP and 40 CFR 68.22) including the following:

13. Explosion (an overpressure of 1 psi)
14. Radiant Heat/Exposure Time (a radiant heat of 5 kW/m^2 for 40 seconds)
15. Lower Flammability Limit (as provided by NFPA)

Using these criteria, the HA assessed the worst-case scenario of a catastrophic failure of one of the three new 10,000-gallon isopentane tanks. As modeled in the HA, the worst-case scenario event would have an impact up to 0.3 miles, or 1,584 feet. The closest potentially affected public are the residences approximately 3,500 feet to the northeast of the isopentane tanks. Therefore, the public or environment would not be exposed to a significant hazard through the Project's use/storage/transport of isopentane.

RMP has developed an updated worst-case modeling scenario for the isopentane currently and soon to be stored at the Heber 2 facility. According to the EPA Risk Management Plan regulations, the worst-case release is defined as "the release of the largest quantity of a regulated substance from a vessel failure that results in the greatest distance to a specified endpoint" (40 CFR § 68.3).

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To determine the worst case release quantity, the EPA regulations dictate "for substances in vessels, the greatest amount held in a single vessel, taking into account administrative controls that limit the maximum quantity" must be analyzed (40 CFR § 68.25). In compliance with these regulations, RMP modeled the worst-case scenario as the catastrophic failure of one 10,000-gallon isopentane storage vessel. With the incorporation of a concrete containment area as mitigation, the endpoint radius resulting from the release of one vessel was determined to stay within the property boundary and not to reach any new (#1, #2, and #3) or existing (#4, #5,) vessels. Please see attached Figure 7.

The only overlap of concern is in regard to vessel locations #4 and #5 where they reside in one another's areas of impact. However, plans to construct a blast wall between the two existing tanks will eliminate this concern. The EPA's Offsite of Consequences Analysis process, is recognized by process safety professionals as being highly conservative, rendering these scenarios very unlikely.

A certified fire protection engineer survey and analysis of current and proposed fire suppression and detection equipment will be performed to evaluate the current systems performance and coverage of protection prior to construction. This analysis will evaluate proposed fire suppression and detection equipment in conjunction with existing equipment and be reviewed and approved by the Fire Department and OES prior to building permits approval. Isopentane leak or fire will require a large scale evacuation area and create a large scale hazardous material incident with a large operational zone.

Mitigations: HZ

1. To minimize potential extremely dangerous condition to firefighters and hazardous material teams Imperial County Fire Department is requiring that a Drone be purchase for Imperial County Fire Department. The final cost, details, and equipment of the drone shall be determined prior the issuance of the building permit. Additionally, the following requirements will be conditioned in the proposed Conditional Use Permit. The drone usage will help reduce required monitoring and compliance impacts to a level of less than significant.
2. All isopentane storage tanks will be protected by approved automatic fire suppression equipment. All automatic fire suppression will be installed and maintained to the current adapted fire code and regulation.
3. An approved automatic fire detection system will be installed as per the California Fire Code. All fire detection systems will be installed and maintained to the current adapted fire code and regulations.
4. Fire department access roads and gates will be in accordance with the current adapted fire code and the facility will maintain a Knox Box for access on site.
5. Compliance with all required sections of the firecode.
6. Applicant will provide product containment areas(s) for both product and water run-off in case of fire applications and retained for removal.
7. Each tank will be equipped with an automated water suppression system.
8. Each tank will be equipped with two flame detectors and one gas detector (for a total of 6 flame detectors and 3 gas detectors for the three tanks).
9. In the case of an isopentane leak, the gas detector(s) will detect it immediately and send a notification to the operator at the control room (manned 24/7) in order to mobilize fixing the leak.
10. In case of a fire, the flame detector(s) will detect it and immediately start the automatic fire suppression system.
11. In case of a fire, there will also be a horn and strobe system that will turn on automatically to alert the plant employees.
12. Concrete containment areas for isopentene ,
13. vessels rarely filled to 90% capacity,
14. isopentane safety- control measures,
15. A blast wall between currently operational isopentene tanks #4 & #5.
16. To minimize the potential for a cascading failure event of the proposed isopentane tanks and to limit potential impacts within the existing Heber 2 Complex fence line, the three proposed isopentane tanks shall be located as set forth in the attached Figure 7.

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	Potentially Significant Impact (PSI)	Potentially Significant Unless Mitigation Incorporated (PSUMI)	Less Than Significant Impact (LTSI)	No Impact (NI)

17. Diking and impoundment of the proposed isopentane tanks shall be installed to minimize the magnitude and extent of a tank failure.

	PSI	PSUMI	LTSI	NI
b) Create a significant hazard to the public or the environment through reasonable foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐

a) Significant unless Mitigated see above (a) for Mitigations

	PSI	PSUMI	LTSI	NI
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒

c) No Impact. There are no schools or sensitive receptors within a quarter-mile of the Project Site (Appendix G). The closest potential sensitive receptors are located approximately 3,500 feet to the northeast of the Project Site. Therefore, no significant impacts to schools or sensitive receptors from nominal isopentane releases/emissions would occur due to the Project.

	PSI	PSUMI	LTSI	NI
d) Be located on a site, which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒

d) No Impact. The Project Site is not located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, therefore, would not create a significant hazard to the public or environment.

	PSI	PSUMI	LTSI	NI
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒

e) No Impact. The Project Site is not located in an airport land use plan or within two miles of an active airport. Therefore, the Project would have no impact on ongoing or planned airport activities or people/employees.

	PSI	PSUMI	LTSI	NI
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒

f) No Impact. The proposed facilities would be located within the existing Heber 2 Complex site and would not interfere with any emergency response or evacuation plans. Construction equipment delivering large components of the proposed facilities may temporarily block Dogwood Road to ensure safe delivery of the components, but these blockages are expected to be temporary (i.e., 5 minutes) and not significantly impede traffic flow. Therefore, no impacts to emergency response or evacuation plans would occur as result of the Project.

	PSI	PSUMI	LTSI	NI
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒

g) No Impact. The Project Site is not located in areas considered wildlands, as the vast majority of the surrounding area is cultivated farmlands. The Project Site does not lie within a fire hazard zone and is not subject to risk of wildland fires (CalFire, 2007). Therefore, there would be no impact associated with risk from wildlands fire.

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X. ***HYDROLOGY AND WATER QUALITY*** ***Would the project:***

	PSI	PSUMI	LTSI	NI
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☐	☒

a) No Impact. The proposed Project would not discharge any waste fluids or substances, nor violate any water quality standards; therefore, no impacts to water quality would occur as result of the Project.

	PSI	PSUMI	LTSI	NI
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☐	☒

b) No Impact. The proposed Project would not require additional groundwater/geothermal fluids. One production and two injection wells are present on the Heber 2 site and the quantity of injection fluid would remain the same under the Project. Therefore, no impacts to groundwater supplies would occur as result of the Project.

	PSI	PSUMI	LTSI	NI
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:	☐	☐	☒	☐

c) **No Impact.** The Project would not divert or alter any existing streams or canals on/near the Project Site. The Project would create less than 200 square feet of impervious surface to accommodate the proposed facilities. The remainder of the Project Site would be exposed dirt/gravel. Therefore, the Project would not increase storm-water runoff or result in on- or off-site flooding.

	PSI	PSUMI	LTSI	NI
(i) result in substantial erosion or siltation on- or off-site;	☐	☐	☒	☐

i) **Less Than Significant.** The Project would not divert or alter any existing streams or canals on/near the Project Site. The Project Site was graded during the original construction of the Heber 2 Complex in 1992 and site preparation activities would not significantly alter the existing grade of the Project Site. A Water Quality Management Plan (WQMP) prepared for the Project assesses potential effects to storm-water and provides recommendations and Best Management Practices (BMPs) to minimize potential erosion and siltation effects (**Appendix D**). Through the application of the WQMP, construction effects from site preparation would not result in a less than significant effect to existing drainage patterns.

	PSI	PSUMI	LTSI	NI
(ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	☐	☐	☒	☐

ii) **Less Than Significant.** The Project would not divert or alter any existing streams or canals on/near the Project Site. The Project Site was graded during the original construction of the Heber 2 Complex in 1992 and site preparation activities would not significantly alter the existing grade of the Project Site. A Water Quality Management Plan (WQMP) prepared for the Project assesses potential effects to stormwater and provides recommendations and Best Management Practices (BMPs) to minimize potential erosion and siltation effects (**Appendix D**). Through the application of the WQMP, construction effects from site preparation would not result in a less than significant effect to existing drainage patterns.

	PSI	PSUMI	LTSI	NI
(iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or;	☐	☐	☒	☐

iii) **Less than Significant.** The Project would not divert or alter any existing streams or canals on/near the Project Site. The

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Project Site was graded during the original construction of the Heber 2 Complex in 1992 and site preparation activities would not significantly alter the existing grade of the Project Site. A Water Quality Management Plan (WQMP) prepared for the Project assesses potential effects to storm water and provides recommendations and Best Management Practices (BMPs) to minimize potential erosion and siltation effects (**Appendix D**). Through the application of the WQMP, construction effects from site preparation would not result in a less than significant effect to existing drainage patterns

	PSI	PSUMI	LTSI	NI
(iv) impede or redirect flood flows?	☐	☐	☒	☐

iv) **Less Than Significant.** The Project would not divert or alter any existing streams or canals on/near the Project Site. The Project Site was graded during the original construction of the Heber 2 Complex in 1992 and site preparation activities would not significantly alter the existing grade of the Project Site. A Water Quality Management Plan (WQMP) prepared for the Project assesses potential effects to stormwater and provides recommendations and Best Management Practices (BMPs) to minimize potential erosion and siltation effects (**Appendix D**). Through the application of the WQMP, construction effects from site preparation would not result in a less than significant effect to existing drainage patterns.

	PSI	PSUMI	LTSI	NI
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☒

d) No Impact. The Project Site is not located in a potential seiche, tsunami, or mudflow zone. Additionally, the Geotechnical Analysis (Appendix E) concludes that liquefaction would not occur at the Project Site due to the cohesive nature of the subsurface soils. Therefore, the Project would not expose any people or structures to a significant risk of loss, injury, or death involving a seiche, tsunami, or mudflow.

	PSI	PSUMI	LTSI	NI
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☒	☐

e) Less Than Significant. Construction of the proposed facilities would not significantly alter the existing stormwater drainage pattern or grade. The existing site condition is exposed soils and gravel, and after site preparation, this area would be returned to a soil/gravel surface. The Project would create less than 200 square feet of impervious surface to accommodate the proposed facilities. The remainder of the Project Site would be exposed dirt/gravel that follows the existing grade of the Site. Stormwater would be allowed to infiltrate and would follow the existing drainage patterns to the existing Heber 2 stormwater facilities. With less than 200 square feet of impervious surfaces being developed as part of the Project, the amount of stormwater to the existing basins would not increase. Therefore, the Project would cause a less than significant addition of stormwater to the existing stormwater infrastructure and would create a less than significant amount of stormwater pollution. The proposed facilities would not discharge any fluids or substances to surface waters; therefore, construction of the Project is the only phase during which water quality may be impacted. Construction activities would have the potential to expose site soils to erosion and mobilize sediments in stormwater. However, with the application of the WQMP (**Appendix D**), on- and off-site erosion and siltation impacts to water quality related to construction of the Project would be less than significant.

XI. *LAND USE AND PLANNING* *Would the project:*

	PSI	PSUMI	LTSI	NI
a) Physically divide an established community?	☐	☐	☐	☒

a) No Impact. As discussed in Section 3.1, the Project Site is zoned for major geothermal energy projects by Imperial County, and the Project is consistent with the standards and objectives set forth in the Imperial County Renewable Energy Plan. Therefore, the Project is consistent with the land use designations established by Imperial County and will not result in an incompatible land use. Furthermore, the closest residents are approximately 3,500 feet to the northeast to the Heber 2 site and would not experience a physical effect from the construction or operation of the proposed facilities.

	PSI	PSUMI	LTSI	NI
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

b) No Impact. The Project Site is zoned as A-2-G-SPA, for General Agriculture (A-2), Geothermal Overlay Zone (G), and in the Heber Specific Plan Area (SPA). The Project site is entirely within the Imperial County Geothermal Overlay Zone. "Major Geothermal Projects" in the overlay zone are permitted through the CUP process, as was the original Heber 2 project. The Heber SPA is intended "to allow for commercial, residential, industrial, renewable energy and other employment oriented development in a mixed used orientation" (Land Use Element of the Imperial County General Plan, 2015). Therefore, the proposed Project conforms to the standards and goals

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set forth in the Imperial County General Plan and the Renewable Energy and Transmission Element of County of Imperial General Plan (2015) and would not result in an effect to land use/planning. No habitat conservation plans or natural community conservation plans are designate for the Project Site; therefore, the Project would not result in any impact to these plans or programs.

XII. ***MINERAL RESOURCES*** ***Would the project:***

	PSI	PSUMI	LTSI	NI
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒

a) No Impact. The Project would allow for the continued operation of a permitted major geothermal energy power plant that utilizes the geothermal energy zone established by Imperial County. The proposed facilities would not increase the use of the geothermal resource/reservoir, rather allow the existing Heber 2 Complex to operate more efficiently and return its nameplate energy generation capacity to 33 MW. The Heber 2 Complex has been producing renewable energy since 1992 and the proposed facilities would allow for that to be extended until 2049, assisting with meeting the state mandates for renewable energy and reducing greenhouse gas emissions. Therefore, the Project would result in no impacts to a known mineral resource.

	PSI	PSUMI	LTSI	NI
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

b) No Impact. The Project Site is zoned by Imperial County for major geothermal energy projects, and the Project is in conformance with this land use designation. The proposed facilities would not increase the use of the geothermal resource/reservoir, rather allow the existing Heber 2 Complex to operate more efficiently and return its nameplate energy generation capacity to 33 MW. The Project would not prohibit any additional development of geothermal energy facilities in Imperial County. Therefore, the Project would not result in the loss of availability of this unique local geothermal resource.

XIII. ***NOISE*** ***Would the project result in:***

	PSI	PSUMI	LTSI	NI
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒

a) No Impact. Per the Imperial County Noise Ordinance, the noise limit for the Project Site, which is considered an Industrial facility by the ordinance, is 75 decibels (one-hour average sound level) and allowed to operate 24 hours per day. The proposed facilities would not represent a significant new source of noise, as the OECs and storage tanks are fully contained units (see Figure 4 and Figure 5 above for pictures of the proposed facilities). Further, the new OEC units would replace dated equipment, and may result in a reduction in operational noise. Considering the Project is within the "normally acceptable" range established by Imperial County and the Project is not anticipated to increase noise emissions from the existing plant, the Project operation would result in a less than significant noise impact. Additionally, the closest receptors to facility noise are located approximately 3,500 feet to the northwest of the Project Site and well out of range from hearing the facility. The Heber 2 Complex has never received a noise complaint.

Construction activities would be limited to 7 a.m. to 7 p.m. Monday through Friday, and 9 a.m. to 5 p.m. on Saturday, per the Imperial County Noise Ordinance. During construction, noise emissions would be periodic and temporary, depending on the use of the heavy equipment (i.e., semi-truck trailers, flatbed trucks, excavators/bulldozers, and a crane). Smaller hand tools such as drills, compressors, and welding equipment would be used consistently during the construction phase (approximately eight months). Construction noise from the development of the proposed facilities would likely be drowned out from the existing noise conditions at the Heber 2 Complex, which is permitted to emit up to 75 decibels any time of the day (§90702.00 – Sound Level Limits). Further, there are no sensitive receptors in close proximity to the Heber 2 site, and the closest residence is over 3,500 feet away from the Project Site. Therefore, Project construction and operation would not expose of noise to people and would not exceed county noise ordinance levels.

	PSI	PSUMI	LTSI	NI
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐

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b) Less Than Significant: The only phase of the Project that would generate vibration or ground-borne noise is the site preparation activities, which include minor excavation and compaction. Site preparation activities would result in varying degrees of temporary ground vibration, depending on the specific construction equipment used and operations involved. All heavy, mobile construction equipment would be temporary.

		PSI	PSUMI	LTSI	NI
c)	For a project located within the vicinity of a private airstrip or an airport land use plan or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

c) No Impact The project site is not located within the vicinity of a private airstrip and or airport land use plan or within two miles of a public airport or public use airport.

XIV. *POPULATION AND HOUSING* ***Would the project:***

		PSI	PSUMI	LTSI	NI
a)	Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and business) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒

a) No Impact. The Project would require a temporary increase in labor force (15 workers) during the short-term construction period (approximately eight months). It is assumed that the workforce would be from southern California and would likely not require accommodations. The Project does not involve the construction of any new housing or commercial areas that would attract new residents to the area. The proposed project improvements are designed within the existing footprint to the current ongoing geothermal operation. The expansion would not appear to induce population growth in the area. The construction of work is temporary and any additional full time work would not appear to be substantial impact.

		PSI	PSUMI	LTSI	NI
b)	Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

b) No Impact. Construction of the proposed Project would not displace any existing people in the vicinity of the Project Site. Therefore, no impacts to residents would occur as result of the Project The project development within the existing geothermal facility will be to replace, repair and update is electrical generation site. There would not appear to be any displacement of full time workers. The construction is temporary.

XV. *PUBLIC SERVICES*

		PSI	PSUMI	LTSI	NI
a)	Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☒	☐
	1) Fire Protection?	☐	☐	☒	☐

1) Less Than Significant. Considering that the existing environment is an operating geothermal energy plant, the Project would not significantly increase the demand for public services. Additional fire response could be needed in the instance of a catastrophic event with an isopentane tank. A Hazard Assessment (**Appendix G & L**) was prepared for the Project and concluded that the likelihood of a catastrophic event is highly unlikely. Therefore, potential impacts to public services are less than significant. The applicant has agreed to supply a drone for project site which would be used by the Fire Department to inspect and insure the safety of personnel on site during operation and inspection of facility.

	PSI	PSUMI	LTSI	NI
2) Police Protection?	☐	☐	☐	☒

2) No Impact. This proposed project would not appear to impact police protection at the site or nearby neighborhoods. The construction is within the footprint of the existing facility. The Project would not result in any new security risks, nor an increase in

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	Potentially Significant Impact **(PSI)**	Potentially Significant Unless Mitigation Incorporated **(PSUMI)**	Less Than Significant Impact **(LTSI)**	No Impact **(NI)**

population or housing; therefore, the Project would not impact police protection services.

	PSI	PSUMI	LTSI	NI
3) Schools?	☐	☐	☐	☒

3) No Impact. The Project would not result in an increase in population or housing and would not require additional school services.

	PSI	PSUMI	LTSI	NI
4) Parks?	☐	☐	☐	☒

4) No Impact. The Project would not result in an increase in population or housing and would not increase demand/use for local parks.

	PSI	PSUMI	LTSI	NI
5) Other Public Facilities?	☐	☐	☐	☒

5) No Impact. The Project would not put an increased burden on off-site public services, including existing fire, police, school and other governmental services. Therefore, no impact would occur.

XVI. *RECREATION*

	PSI	PSUMI	LTSI	NI
a) Would the project increase the use of the existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒

a) No Impact. The Project would require a temporary increase in labor force during the short-term construction period (approximately eight months). It is assumed that the workforce would be local and not require accommodations. Therefore, the Project would not result in an increase in population that would increase use of existing neighborhood or regional recreational facilities. Therefore, no impact would occur as result of developing the Project.

	PSI	PSUMI	LTSI	NI
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse effect on the environment?	☐	☐	☐	☒

b) No Impact. Development of the proposed facilities would not restrict or preclude access to any recreational opportunities or assets/parks in the area. The Project would require a temporary increase in labor force during the short-term construction period (approximately eight months). It is assumed that the workforce would be local and not require accommodations. Therefore, the Project would have no impact on the in demand/use of recreational facilities that would have an adverse physical effect on the environment.

XVII. *TRANSPORTATION* ***Would the project:***

	PSI	PSUMI	LTSI	NI
a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☐	☒	☐

1) Less Than Significant. Lone site access is provided via Dogwood Road, which is classified as a Regional Arterial in the Imperial County Long Range Transportation Plan (2013). Dogwood Road's Average Daily Traffic (ADT) is approximately 15,000 vehicles per day and its level of service (LOS) is E. LOS E indicates that this arterial is operating at capacity and traffic flow can be irregular.

Construction of the proposed facilities may result in nominal and short-term increases in vehicle trips by construction workers and construction vehicles on area roadways. These trips would include construction workers commuting to and from the Project Site, haul truck trips associated with the transfer and disposal of materials, and material and equipment deliveries. The number of construction-related trips would vary each day, depending on construction phase, planned activity, and material needs.

Construction traffic on roadways in the immediate vicinity of the Project site and along haul routes could result in nominal and short-term increases in traffic volumes. The presence of construction trucks, with their slower speeds and larger turning radii, may temporarily reduce roadway capacities in the immediate vicinity of the Project Site. These nominal impacts of construction traffic would be most noticeable in the immediate vicinity of the Project site and less noticeable farther away and on regional roadways. Considering that no

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new employees would be hired to support the new facilities, all traffic-related impacts would be temporary and only occur during the construction phase (eight months).

Therefore, Project construction would cause incremental, short-term increases in traffic but construction-related trips are expected to be approximately 25-40 per day and well under the thresholds for developing a transportation management plan (i.e. 800 commercial/industrial trips). Therefore, Project construction would not conflict with any applicable transportation plans (i.e., Imperial County State Transportation Improvement Program/Plan, 2016) or contribute to a long-term decrease in LOS.

	PSI	PSUMI	LTSI	NI
b) Would the project conflict or be inconsistent with the CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☒	☐

b) Less Than Significant. Please see **(a)**

	PSI	PSUMI	LTSI	NI
c) Substantially increases hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒

c) No Impact. The Project does not include any aviation-related use and would have no impact on airports. The Project would also not require any modification of flight paths for existing airports. Therefore, no impact to air traffic patterns would occur as result of the Project.

	PSI	PSUMI	LTSI	NI
d) Result in inadequate emergency access?	☐	☐	☐	☒

d) No Impact. All proposed facilities would be constructed within the existing Heber 2 Complex site and not introduce any transportation hazards, design features, or incompatible uses with surrounding roadways. Therefore, there would be no increase to hazards due to the Project design. Emergency vehicle access is identified and designated at the Heber 2 site, and these areas would not be changed as result of the proposed developments. Therefore, no impacts to emergency access to the plant site or surrounding area would occur under the Project.

XVIII. *TRIBAL CULTURAL RESOURCES*

	PSI	PSUMI	LTSI	NI
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place or object with cultural value to a California Native American tribe, and that is:	☐	☐	☐	☒
(i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as define in Public Resources Code Section 5020.1(k), or	☐	☐	☐	☒

(i) No Impact. There are no known tribal cultural resources present on the Project Site. The Project Site is completely devoid of any vegetation, water, or natural features that could be defined as a tribal cultural resource or traditional use area. Further, considering the Project Site was entirely disturbed when the Heber 2 power plant was developed, the probability of encountering an unforeseen/buried tribal cultural resource is very low. As described in Section 2.1.8 above, Project construction personnel would monitor areas during surface disturbing activities and if any potential tribal cultural resources are encountered, all construction affecting the discovery site would be suspended immediately until a qualified archaeologist has reviewed the findings. An Unanticipated Discoveries Plan would be prepared prior to resuming construction. Therefore, the Project is anticipated to result in no impacts to tribal cultural resources.

	PSI	PSUMI	LTSI	NI
(ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth is subdivision (c) of Public Resource Code Section	☐	☐	☐	☒

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5024.1, the lead agency shall consider the significance of the resource to a California Native American Tribe.

(ii) No Impact please see(i)

XIX. ***UTILITIES AND SERVICE SYSTEMS*** ***Would the project:***

	PSI	PSUMI	LTSI	NI
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒

a) No Impact. Construction of the proposed facilities would not generate/discharge any wastewater. Portable toilets would be brought on-site per California Code of Regulations, Title 8, Section 1526, Subchapter 4, Construction Safety Orders Article 3, General §1526, Toilets at Construction Jobsites and disposed of at the appropriate wastewater facility, resulting in no impact to RWQCB requirements. Heber 2 Complex employees have permanent bathrooms in the existing facilities, and no new wastewater would be generated from the operation of the proposed facilities. Therefore, no impacts to wastewater would occur as a result of the Project.

	PSI	PSUMI	LTSI	NI
b) Have sufficient water supplies available to serve the project from existing and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☐	☒

b) No Impact. The Project would not require any additional water supplies and no new water rights would be required. Therefore, no impacts to any water entitlements or resources would occur as a result of the Project.

	PSI	PSUMI	LTSI	NI
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒

c) No Impact. Project construction would not generate any wastewater, and Project operation would not increase the amount of wastewater generated at the existing Heber 2 Complex. Therefore, no impacts to the wastewater treatment utility's service capacity would occur under the Project.

	PSI	PSUMI	LTSI	NI
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☐	☒

d) No Impact: Project construction waste generation would likely be limited to packaging for equipment and supplies, and construction personnel waste (i.e., wrappers, food waste). There are two active waste disposal facilities/landfills in Imperial County that are accepting wastes and these facilities have the capacity to service to the Project. Operation of the proposed facilities would not generate any solid waste. Therefore, the Project would not result in an impact to the waste disposal facilities in Imperial County.

	PSI	PSUMI	LTSI	NI
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☐	☒

e) No Impact. Project construction waste generation would likely be limited to packaging for equipment and supplies, and construction personnel waste (i.e., wrappers, food waste). No hazardous wastes would be generated as result of Project construction or operation. Operation of the proposed facilities would not generate any solid wastes. All construction wastes would be disposed of at the appropriate receiving facility, and there are two active waste disposal facilities/landfills operating in Imperial County that can service the Project. Therefore, the Project would not violate any federal, state, or local solid wastes statutes or regulation.

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	Potentially Significant Impact (PSI)	Potentially Significant Unless Mitigation Incorporated (PSUMI)	Less Than Significant Impact (LTSI)	No Impact (NI)

XX. ***WILDFIRE***

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the Project:

	PSI	PSUMI	LTSI	NI
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒

a) No Impact: The Second Imperial Geothermal Co. site is not located or near state responsibility, areas or lands classified as very high, high or moderate hazard severity zones.

	PSI	PSUMI	LTSI	NI
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☐	☒

2) No Impact: The project site, Second Imperial Geothermal Co. project is not located or near state responsibility, areas or lands classified as very high, high or moderate hazard severity zones. The project appears to be surrounded by agricultural related land.

	PSI	PSUMI	LTSI	NI
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒

c) No Impact: The existing Heber 2 Emergency Response Plan addresses project construction and operations. The proposed work is within the existing footprint of ongoing geothermal activities in the Heber 2 plant site. There appears to be no impacts to existing roads, emergency water sources, power lines or other utilities in or near this work.

	PSI	PSUMI	LTSI	NI
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	☒

d) No Impact: The project is located on mostly flat terrain. The existing geothermal facility has been in operation for a number of years and there would appear to no impacts from landslides, runoff or drainage changes.

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Section 65088.4, Gov. Code; Sections 21080(c), 21080.1, 21080.3, 21083, 21083.05, 21083.3, 21093, 21094, 21095, and 21151, Public Resources Code; Sundstrom v. County of Mendocino,(1988) 202 Cal.App.3d 296; Leonoff v. Monterey Board of Supervisors, (1990) 222 Cal.App.3d 1337; Eureka Citizens for Responsible Govt. v. City of Eureka (2007) 147 Cal.App.4th 357; Protect the Historic Amador Waterways v. Amador Water Agency (2004) 116 Cal.App.4th at 1109; San Franciscans Upholding the Downtown Plan v. City and County of San Francisco (2002) 102 Cal.App.4th 656.

Revised 2009- CEQA
Revised 2011- ICPDS
Revised 2016 – ICPDS
Revised 2017 – ICPDS
Revised 2019 – ICPDS

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	Potentially Significant Impact (PSI)	Potentially Significant Unless Mitigation Incorporated (PSUMI)	Less Than Significant Impact (LTSI)	No Impact (NI)

SECTION 3
III. MANDATORY FINDINGS OF SIGNIFICANCE

The following are Mandatory Findings of Significance in accordance with Section 15065 of the CEQA Guidelines.

	PSI	PSUMI	LTSI	NI
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, eliminate tribal cultural resources or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☐	☐
c) Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☐

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IV. PERSONS AND ORGANIZATIONS CONSULTED

This section identifies those persons who prepared or contributed to preparation of this document. This section is prepared in accordance with Section 15129 of the CEQA Guidelines.

A. COUNTY OF IMPERIAL

- Jim Minnick, Director of Planning & Development Services
- Michael Abraham, AICP, Assistant Director of Planning & Development Services
- David Black, Project Planner
- Imperial County Air Pollution Control District
- Department of Public Works
- Fire Department
- Ag Commissioner
- Environmental Health Services
- Sheriff's Office

B. OTHER AGENCIES/ORGANIZATIONS

- **DTSC Imperial CUPA**

(Written or oral comments received on the checklist prior to circulation)

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VI. NEGATIVE DECLARATION – County of Imperial

The following Negative Declaration is being circulated for public review in accordance with the California Environmental Quality Act Section 21091 and 21092 of the Public Resources Code.

Project Name: Heber 2 Geothermal Repower Project

Project Applicant: Second Imperial Geothermal Company

Project Location: The proposed development would occur entirely on the 39.99-acre Assessor's Parcel Number (APN) 054-250-031. This parcel also includes geothermal facilities for the Goulds 2 and Heber South projects. The address for the Heber 2 Complex is 855 Dogwood Road, Heber, CA 92249. The legal description is Tract 44, Township 16 South, Range 14 East, SBB&M. See Exhibit A and B.

Description of Project: Perform CUP amendment to allow for installation of two new water-cooled ORMAT Energy Converters (OECs) to replace six old units from 1992; three 10,000 gallon isopentane ground storage tanks; and, additional pipes to connect the proposed facilities with the existing Heber 2 Geothermal Energy Complex. All proposed facilities would be developed within the existing Heber 2 Complex and fence line. The total project disturbance from developing the new facilities is approximately 4 acres. The CUP amendment application also proposes to renew the permitted life of the entire Heber 2 Complex (including the Goulds 2 and Heber South geothermal energy facilities) to 30 years (2019-2049). The proposed facility upgrades would allow the Heber 2 Complex to run more efficiently and refurbish the Heber 2 Complex to the original nameplate capacity (33 megawatts) without expanding the existing facility beyond the current footprint, and produce clean renewable energy in the Imperial Valley for the next three decades.

The proposed Project Site is within the existing Heber 2 power plant area, and all proposed facilities would be located within the existing fence line and permit area. As an active energy generation facility, the Project Site is devoid of any vegetation, streams/wetlands, or existing facilities (**Figure 6**). As observed in **Figure 2** (site plan), **Figure 6** (photo of Project Site), and **exhibits A & B** (site photos), the proposed facilities would be installed in the vacant, undeveloped areas of the Heber 2 site.

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The Project Site is entirely within APN 054-250-031, which is zoned as A-2-G-SPA, for General Agriculture (A-2), Geothermal Overlay Zone (G), and in the Heber Specific Plan Area (SPA). The Project Site is entirely within the Imperial County Geothermal Overlay Zone. "Major Geothermal Projects" in the overlay zone are permitted through the CUP process, as was the original Heber 2 project. The Heber SPA is intended "to allow for commercial, residential, industrial, renewable energy and other employment oriented development in a mixed used orientation" (Land Use Element of the Imperial County General Plan, 2015). Therefore, the proposed Project conforms to the standards and goals set forth in the Imperial County General Plan and the Renewable Energy and Transmission Element of County of Imperial General Plan (2015).

Surrounding land uses include a solar energy facility to the west of the Project Site, a commercial aggregate/rock supplier to the south, and agriculture to the north and east. The primary use in the general surrounding area is agriculture. The closest residences to the Project Site are in the town of Heber, approximately 3,500 feet to the northeast of the Project Site.

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VII. FINDINGS

This is to advise that the County of Imperial, acting as the lead agency, has conducted an Initial Study to determine if the project may have a significant effect on the environmental and is proposing this Negative Declaration based upon the following findings:

☐ The Initial Study shows that there is no substantial evidence that the project may have a significant effect on the environment and a NEGATIVE DECLARATION will be prepared.

☒ The Initial Study identifies potentially significant effects but:

(1) Proposals made or agreed to by the applicant before this proposed Mitigated Negative Declaration was released for public review would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur.

(2) There is no substantial evidence before the agency that the project may have a significant effect on the environment.

(3) Mitigation measures are required to ensure all potentially significant impacts are reduced to levels of insignificance.

A NEGATIVE DECLARATION will be prepared.

If adopted, the Negative Declaration means that an Environmental Impact Report will not be required. Reasons to support this finding are included in the attached Initial Study. The project file and all related documents are available for review at the County of Imperial, Planning & Development Services Department, 801 Main Street, El Centro, CA 92243 (442) 265-1736.

NOTICE

The public are invited to comment on the proposed Negative Declaration during the review period.

11-23-2020 — Sol [signature]

Date of Determination — Jim Minnick, Director of Planning & Development Services

The Applicant hereby acknowledges and accepts the results of the Environmental Evaluation Committee (EEC) and hereby agrees to implement all Mitigation Measures, if applicable, as outlined in the MMRP.

Applicant Signature — Date

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SECTION 4

VIII. RESPONSE TO COMMENTS

N/A

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Responses to Heber 2 IS/ND Comments and Recommended Clarifications and Supplements

Date:	9/28/20
To:	Imperial County Planning Department
From:	Ben Pogue (Catalyst) on Behalf of ORMAT/SIGC
RE:	CURE Comment Letter on Heber 2 IS/ND

Introduction and Purpose

The purpose of this memorandum is to provide clarifying information to the Imperial County Planning Department (ICPD) and its affiliate departments in response to comments submitted by Adams Broadwell Joseph & Cardoza (ABJC) on behalf of California Unions for Reliable Energy (CURE) on the Initial Study and Negative Declaration (IS/ND) for the Heber 2 Repower Project (Project). The two primary sections of this memorandum include a summary outline of the CURE letter and a comment summary matrix with responses.

As discussed below, in response to comments received from the Imperial County Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. See new Mitigation Measure HAZ-1, discussed below. CEQA contemplates the move from ND to Mitigated Negative Declaration (MND) based on comments on the IS/ND , and we support the County in revising the CEQA decision to a MND and recirculating the IS/MND for a 30 day public review period.

CURE Comment Letter Issues Outline

This outline provides the basis of issues raised in the CURE comment letter. Those headings in bold represent primary issues, with the sub-issues outlined below. The issues identified in this outline are summarized and responded to in the comment matrix in the following section.

I. **Statement of Interest**

II. **An EIR Must be Prepared**

III. **The IS/ND Fails to Adequately Describe the Project**
   a. The IS/ND's Description of the Project's <u>Construction Activities</u> is Inadequate and Flawed
   b. The IS/ND Fails to Describe <u>Emissions from Reclamation</u> Activities
   c. The IS/ND's <u>Numerous Errors</u> Prohibits the Public from Fully Evaluating the Project's Impacts

IV. **The IS/ND Fails to Accurately Describe the Project's Baseline Conditions**
   a. The IS/ND Fails to Accurately Describe the Project's <u>Baseline Generating Capacity</u> and Associated Impacts, As Well As Its Baseline Emissions
   b. The IS/ND Fails to Accurately Describe <u>Biological Conditions</u> at the Project Site

V. **The County Has Violated CEQA by <u>Piecemealing</u> Environmental Review and Permitting for the Expansion of the Heber Geothermal Facilities as Separate Projects**

VI. **Substantial Evidence Supports a Fair Argument that the Project May Have Significant Impacts Which Must be Analysed in an EIR**

a. There is a Fair Argument that Construction Emissions from the Project Could Have a Significant Impact on Public Health and the Environment
b. There is a Fair Argument that the Project Could Result in Significant Impacts to Public Health from Valley Fever
c. The IS/ND's Methods for Evaluating a Hazard Analysis and the Possibility of Accidents or Explosions at the Site Are Inadequate and Unsupported.
d. There is a Fair Argument that Extending the Life of the Project Could Result in Geologic Impacts
e. There is a Fair Argument that Special Status Species Could Occur in the Vicinity of the Project Site and Could be Adversely Affected by the Project
f. The IS/ND Fails to Disclose the Project's Construction or Operational GHG Emissions, and Relies on an Inapplicable Significance Threshold
g. There is a Fair Argument that the Project Will Have Significant Impacts on Water Supply

VII. The IS/ND Concedes that Mitigation is Required

a. The IS/ND Fails to Consider Feasible Mitigation to Reduce Potentially Significant Impacts to Less than Significant Levels for Construction and Operations

VIII. The IS/ND Fails to Properly Evaluate Potentially Significant Cumulative Impacts.

IX. The Project May Require a CEC License.

Comment Summaries and Responses

CURE Letter Section	Substantive Comment Summary	Response
I. Statement of Interest	ABJC discloses its representation of its client, the California Unions for Reliable Energy (CURE). The IS/ND fails to meet the basic requirements of CEQA. The County must prepare an EIR.	No substantive technical comment provided. Comment lauds renewable energy development and subsequently criticizes the Heber 2 Repower Project. The IS/ND was based on site specific and technically substantiated information on the baseline conditions of the Project site and potential impacts. In response to comments received from the Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. The following Mitigation Measure HAZ-1 is considered: HAZ-1: To minimize the potential for a cascading failure event of the new isopentane tanks and to limit any potential impacts within the existing Heber 2 Complex fence line, the three isopentane tanks shall be located as set forth in Attachment B. Further, diking and impoundment of the proposed isopentane tanks shall be installed consistent with the Hazard Memorandum (Attachment C) to minimize the magnitude and extent of a tank failure, and the detailed design of the project shall ensure that the Project's features satisfy the design criteria assumed in the Hazard Assessment (Attachment C). As observed in Figure 9 of the Hazard Assessment (Attachment C), the area of potential effect for each new isopentane tank would not overlap, thus preventing a consequential catastrophic event. CEQA contemplates the move from ND to MND based on comments on the IS/ND, and we support the County in revising the CEQA decision to a MND and recirculating the IS/MND for a 30-day public review period. See following comments explaining why a MND is appropriate, instead of the EIR CURE requests.
II. An EIR Must Be Prepared	CURE attempts to employ the "fair argument rule" under CEQA that an EIR must be prepared to address significant impacts, but does not site any specific IS/ND sections or analyses.	The proposed Project site is entirely within the existing and permitted plant boundary, and is entirely void of any vegetation, habitat, waterbodies, and existing facilities. The purpose of the Project is to repower the Heber 2 geothermal facilities by replacing old ORMAT Energy Converters (OECs) with state-of-the-art OECs that run more efficiently and emit less emissions, and install three new isopentane tanks to support operations. No facilities are

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		proposed outside of the existing facility's fence line. Due to the Project's limited nature, no significant environmental impacts were anticipated. The IS confirmed that the Heber 2 Project would not result in any significant impacts and no mitigation was required, thus the issuance of an ND. In response to comments received from the Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. See new Mitigation Measure HAZ-1, discussed below. CEQA contemplates the move from ND to MND based on comments on the IS/ND. This comment identifies air quality, cumulative air quality, public health, water supply, biological resources, and impacts form hazardous materials are not technically substantiated. See responses included in Issue VI below that elaborates on these specific resources and discussions on the information and methods used to reach significance conclusions in the MND.
III. The IS/ND Fails to Accurately Describe the Project	CURE sites that CEQA prohibits the "piecemealing" of a larger project into many smaller projects, resulting in numerous environmental reviews for a single project.	A subsidiary of ORMAT is proposing to upgrade and develop additional geothermal energy generation at the Heber 1 plant, approximately 1 mile to the east of the Heber 2 site. The Heber 1 and Heber 2 facilities are physically and electrically separate, as they do not share any facilities, including geothermal production wells, pipeline, OECs, isopentane tanks, or transmission facilities. These geothermal energy facilities were developed at separate times (not as a single project), have never shared any facilities or lands/leases, and are permitted under separate CUPs issued by Imperial County. Further, these projects are treated as separate projects by relevant utilities and regulatory agencies, including each facility has separate Power Purchase Agreements, Interconnection Agreements, Imperial County Air Pollution Control District (ICAPCD). ICAPCD implements state and federal laws that determine how projects are either treated as separate or grouped under an air quality "bubble." ICAPCD' s determination that Heber 1 and Heber 2 are separate facilities is substantial evidence that they facilities are in fact two separate projects. There are three principle tests under CEQA with respect to determine whether two projects are separate CEQA projects.

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		In the seminal CEQA test for piecemealing, *Laurel Heights Improvement Association v. Regents of the University of California ("Laurel Heights")*[1], the California Supreme Court set forth a two prong test for determining whether future phases of a project or other foreseeable consequences of an approved land use must be included as a part of a project for the purposes of environmental review. This important and often cited case provides the clearest guidance as to the standard that will be applied by courts in evaluating whether an agency improperly segmented environmental review of a project. The first prong set forth in *Laurel Heights* is that an agency must analyse the environmental effects of a project's future expansion or other action if it is a "reasonably foreseeable consequence of the initial project." In this case, neither Heber 1 nor Heber 2 is a reasonably foreseeable consequence of the other. The projects are separated physically by nearly a mile and share no common critical infrastructure. One project can run with or without the other. The second *Laurel Heights* prong is that an agency must analyse the environmental effects of a project's future expansion or other action if it "will likely change the scope or nature of the initial project or its environmental effects." Again, the projects' physical and operational separation provide that neither project will affect the nature or scope of the other project or its environmental effects. See below for more factual discussions demonstrating that consistent with the *Laurel Heights* case, Heber 1 and Heber 2 are separate and independent CEQA projects. The second important CEQA test is the "independent utility" test. In *Del Mar Conservancy, Inc. v. City Council of the City of San Diego*, 10 Cal. App. 4th 712 (1992), the courts examine whether a project has "independent utility" that warrants separate environmental review and approval, even if it is arguably

[1] *Laurel Heights Improvement Assn. v. Regents of University of California*, 47 Cal. 3d 376, 396 (Cal. 1988).

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		part of a larger project. This test is derived from federal case law regarding the National Environmental Policy Act ("NEPA"), and has traditionally been applied in the context of the segmentation of environmental review of road projects, but has been applied in other contexts as well.[2] Under this test, it is appropriate for an individual portion of a larger road construction project to be reviewed and approved separately from the larger project if the segment has independent utility, and will serve a purpose even if the larger project is not constructed.[3] In this case, Heber 1 and Heber 2 each have independent utility; that is, each project operates to provide a separate and distinct set of benefits to the project owners. Each is contracted separately. Each sells its own electrical output. The projects do not sell to the same offtakers and each has separate and wholly unrelated contractual obligations, as just some examples of the independent utility of each. Under this CEQA test, Heber 1 and Heber 2 have "independent utility". The third CEQA test is called the "Crucial Functional Element" test, a corollary to the independent utility test. Unlike the independent utility test, which outlines when a project that is arguably part of a larger one can be reviewed and approved separately, the crucial function element test determines when a smaller project must be reviewed as a part of the larger project. Under this test, if a project is a "'required' or 'crucial element' without which" another

[2] See *Planning and Conservation League v. Castaic Lake Water Agency*, 180 Cal. App. 4th 210, 237 (2009)(applying independent utility test in upholding adequacy of EIR in case regarding transfer of water entitlements).

[3] *Del Mar Conservancy, Inc. v. City Council of the City of San Diego*, 10 Cal. App. 4th 712, 734 (citing to *Daly v. Volpe,* 514 F.2d 1106, 1109-1110 (1975)). In the original NEPA cases, *Daly v. Volpe*, three other criteria were also considered: whether the segment (1) is of substantial length and between logical terminal points; (2) is long enough to ensure adequate opportunity for consideration of alternatives; (3) will fulfill important state and local needs. However, as the independent utility criteria has been broken out as a separate test under both NEPA and CEQA case law, only the independent utility criteria is discussed above.

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		project "could not go forward," environmental review of the two cannot be piecemealed, and both projects as a whole must be addressed in an environmental review document. In the case of Heber 1 and Heber 2, neither project is "required or a critical element" of the other. Each operates independently, without sharing critical infrastructure. Neither is necessary for the other to be able to function as neither provides the other with any critical functional element. Each function separately. These three cases are fact-specific analyses. Applying the facts in this case demonstrates that Heber 1 and Heber 2 are separate CEQA projects. The following are some additional facts demonstrating two separate projects. For example, the proposal to repower Heber 2 does not depend on the outcome of the Heber 1 proposal (and vice versa). The points below are guidance provided in the CEQA Deskbook (Figure 2-2: Evaluation of Related Activities in a CEQA Document; 2012) for when two actions should be addressed in a single CEQA review. A copy of this guidance is also enclosed as Attachment F. While Action A and Action B, in this case, could be either Heber 1 and Heber 2, regardless of order, since this response is based on the CURE letter received on Heber 2, Action A below is read as Heber 2 and Action B is Heber 1, as follows: 1. When "Action B" is reasonably foreseeable consequence of "Action A". 2. When "Action B" is a future expansion of "Action A" and will be significant because it will likely change the scope, nature, and impacts of "Action A". 3. When "Action A" cannot proceed without essential public services that would be provided by "Action B". 4. When "Action A" and "Action B" are integral parts of the same project. <u>Response to CEQA Deskbook Hypothetical 1</u>: While Heber 1 and Heber 2 are being proposed in close temporal proximity, the result of either project is not dependent on the outcome of the other project. In other words, for example, if Heber 1 is declined a permit, and Heber 2 is permitted, Heber 2 will still be developed regardless of the fact that Heber 1 was declined (and vice versa).

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		Response to CEQA Deskbook Hypothetical 2: Since Heber 1 and Heber 2 do not share any critical facilities or infrastructure and are separated by almost a mile, and neither proposal includes facilities that would be shared, these actions are not reflective of a connected or future expansion at either plant. Any future expansions at Heber 1 and Heber 2 would remain independent from one another, simply due to the fact that the plants were developed as independent facilities and are not designed to operate in conjunction with each other. Response to CEQA Deskbook Hypothetical 3: Heber 1 and Heber 2 operate independently from one another. For example, ORMAT could shut down operations entirely at either plant and the other would not be affected whatsoever. These facilities do not share any public services, whereas the Heber 2 Repower Project could not proceed without the approval of Heber 1 (and vice versa). Response to CEQA Deskbook Hypothetical 4: As discussed above, the outcome of either proposal is not dependent on the other. In other words, for example, if Heber 1 is declined a permit, and Heber 2 is permitted, Heber 2 will still be developed regardless that Heber 1 was declined (and vice versa). Further, Heber 1 and Heber 2 are located approximately one mile apart from each other and share no facilities. There are no facilities in either proposal that would connect Heber 1 and Heber 2, thereby remaining completely independent geothermal plants at both sites.
III.a. The IS/ND's Description of the Project's Construction Activities is Inadequate and Flawed	CURE claims that a description of the proposed construction activities is provided, and that construction emissions are not calculated.	The CUP application clearly states that construction is anticipated to last up to eight months and provides a list of the equipment to be use. Further, construction emissions were calculated and accounted for in the IS/ND, relying on the modelling done as part of the APCD. For purposes of responding to this comment, Attachment E (Air Emissions Memorandum) includes the results of the modelling of construction and operation emissions for both criterial pollutants and GHG. As observed, construction emissions for criteria pollutants and GHG emissions are significantly less than the regulatory thresholds.

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III.b. The IS/ND Fails to Describe Emissions from Reclamation Activities	Reclamation emissions are not calculated.	A Reclamation Plan was submitted as part of the Heber 2 CUP Amendment Application to demonstrate the process for site abandonment and returning the condition of the site to a natural state and comply with the County requirements. Per common practice, final site reclamation (in 30 years at the termination of the CUP) would be permitted in the run up to site closure. Emissions calculations for reclamation activities in 2050 would be submitted to ICAPCD for a Permit to Construct. The reason for not speculating at this time is because the ambient air conditions, including attainment and non-attainment zones, may be considerably different in 30 years. Moreover, future potential effects are necessarily speculative. In trying to determine if an impact may be significant, CEQA provides "Argument, speculation, unsubstantiated opinion or narrative, or evidence that is clearly inaccurate or erroneous, or evidence that is not credible, shall not constitute substantial evidence." (14 C.C.R. 15064(f)(5).) Further, CEQA also provides that, "If, after thorough investigation, a Lead Agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact." (14 C.C.R. 15145).
III.c. The IS/ND's Numerous Errors Prohibits the Public from Fully Evaluating the Project's Impacts	The IS/ND is rife with inconsistent, misleading, and confusing statements making it impossible for a reader to assess the conclusions. CURE sites: • CURE sites a missing appendix the cultural and historic resources records review. • Figure 6 does not provide substantive support. • That Heber 1 and Heber 2 are the same facility. • The IS misuses the term "complex" and fails to disclose baseline and future generation, and incorrectly identifies the units that would be modified.	• Pursuant to the National Historic Preservation Act, Appendix C contains confidential information pertaining to the location of identified sites/resources in the project vicinity, as recorded in prior surveys. This information is not for public release, and thus, held in confidence by Imperial County. • As noted, Figure 6 (as well as the multiple pictures in Appendix A of the IS/ND and the MND) shows a photograph of the Project site, which is a "dirt lot", as stated by CURE. The purpose of this photography is to provide the reader with a visual aid of the proposed development site and verify that the site is, in fact, void of any water resources and sensitive communities. • See the response to Issue III above for a discussion as to why Heber 1 and Heber 2 are entirely independent facilities. • The term "Heber 2 Complex", as used in the CUP Amendment Application, refers to Heber 2, Goulds 2, and Heber South geothermal facilities (not Heber 1). The term "Complex" was applied because these facilities are interdependent on each other for operations and the CUP Amendment Application is requesting the extension of the permit life all three facilities (collectively, the Heber 2 Complex) until 2050. The

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		figures in the CUP Amendment Application provide clarity on the relationship between the three geothermal units that comprise the Heber 2 Complex, and demonstrates the location of each unit's OECs. As provided in Attachment A, no modifications are proposed for Goulds 2 or Heber South, only the Heber 2 plant, and conditions would remain the same as present baseline conditions at Goulds 2 and Heber South. Attachment A also provides a breakdown of the current and proposed energy generation at the Heber 2 Complex, breaking down overall generation by each power station. As noted in Attachment A, the Heber 2 Repower Project would generate 27 MW. The CUP Amendment Application states that the Heber 2 Complex would generate 33 MW. To avoid confusion, we recommend adding a note to the CUP Amendment Application with the table in Attachment A to clarify the generation capacity for each Heber 2 Complex geothermal unit (Heber 2, Goulds 2, and Heber South).
IV. The IS/ND Fails to Accurately Describe the Project's Baseline Conditions	An EIR must include description of the physical environmental conditions in the Project vicinity.	The affected environment descriptions provided in the CEQA Checklist submitted in support of the CUP Amendment Application and the IS/ND are technically substantiated by numerous detailed resource reports. The site specific information collected for this Project reflects a detailed characterization of the baseline conditions to measure potential effects against, primarily quantitatively where feasible, and qualitatively where necessary.
IV.a. The IS/ND Fails to Accurately Describe the Project's Baseline Generating Capacity and Associated Impacts, as well as Its Baseline Emissions	CURE attempts to provide "correct" air emissions calculations, and that the project underestimates emissions by 2/3rds.	The ICAPCD makes a determination on whether to treat individual facilities as a single source for the purposes of determining compliance with state and federal air quality laws and regulation. Attachment A provides a breakdown of the baseline and proposed generation capacity. An Authority to Construct and Permit to Operate (ACPO) was submitted to the Imperial County Air Pollution Control District, and as noted in the application, the existing Air District Permit (No. 2217A-5) includes any emissions for the entire Heber 2 Complex, which includes the geothermal units of Heber 2, Heber South, and Goulds 2. Therefore, baseline emissions from all subject facilities has been accounted for and properly assessed in the ACPO application. For purposes of responding to this comment, the enclosed Air Emissions Memorandum provides the historic (baseline) and the proposed future emissions. As observed, the modelled emissions show a decrease in future isopentane emissions of -3.0 lb/day or -4.0

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		tons/year. Therefore, through the use of more efficient equipment (e.g., the new OECs) would lead to a decrease in emissions.
IV.b. The IS/ND Fails to Accurately Describe Biological Conditions at the Project Site	The County failed to make a reasonable effort to describe baseline biological conditions, and account for sensitive species on the site.	As noted by CURE, a comprehensive records search for biological resources, vegetation, and sensitive species was performed to identify species that could occupy the project site and surrounding area. All databases used in this research (e.g., IPac, CNDDB, etc.) are managed by public agencies and serve as the standard for determining the biological community present in/near a project site. After a review of the records, a wildlife biologist performed a reconnaissance-level survey of the Project Site, concurring that the site is completely void of any habitat and sensitive species. These efforts were recorded and provided as an Appendix B to the CUP. For a site that is a "dirt lot" by CURE's own admission, and confirmed with site photographs and supporting technical documentation, a reasonable effort was made to describe the baseline biological conditions and potentially occurring sensitive species. Further, as provided in the CUP Amendment Application, the Environmental Protection Measures section, "pre-construction surveys would occur to ensure the absence of any sensitive species". As provided in the CURE letter, a Google Earth snapshot of a common crow flying by the Project site does not constitute evidence that sensitive species are likely present (14 C.C.R. 15064(f).) As documented through verifiable database research and a site-specific survey (as provided in Appendix B of the CUP), the site does not contain suitable habitat and no sensitive species occur on the site. Further, due to the industrialized nature of the site, avian species are likely to avoid the site. Again, the Project site would be surveyed prior to construction to verify the absence of any special status species.
V. The County Has Violated CEQA by Piecemealing Environmental Review and Permitting for the Expansion of the Heber Geothermal Facilities as Separate Projects	CURE alleges that the IS/ND does not accurately reflect that Heber South and Goulds 2 are part of the Heber 2 Complex.	The CUP Amendment Application clearly states that the Heber 2 Complex include the generation units of Heber 2, Goulds 2, and Heber South, and the proposal seeks to extend the life of the overall complex by 30 years. The term "Complex" was applied because these facilities are interdependent on each other for operations and the CUP Amendment Application is requesting the extension of the permit life all three facilities until 2050. The enclosed Figure 1 provides clarity on the relationship between the three geothermal units that comprise the Heber 2 Complex, and demonstrates the location of each unit's OECs. As provided in Attachment A, no modifications are proposed for Goulds 2 or Heber South, only the Heber 2 unit, and conditions would remain the same as present baseline conditions at the Goulds 2 and Heber South portions of the

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		Heber 2 Complex. Attachment A also provides a breakdown of the current and proposed energy generation at the Heber 2 Complex, breaking down overall generation by each unit.
VI. Substantial Evidence Supports a Fair Argument that the Project May Have Significant Impacts Which Must be Analysed in an EIR	An EIR must be prepared under the "Fair Argument" standard.	See response to Issue II above.
VI.a. There is a Fair Argument that Construction Emissions from the Project Could Have a Significant Impact on Public Health and the Environment	Because the IS/ND fails to provide details on construction schedule and equipment, emissions calculations are insufficient. IS/ND does not describe the existing baseline thresholds.	The IS/ND directly responded to the questions and issues identified in the CEQA Checklist Section III (Air Quality). A detailed and sophisticated air emissions model was prepared for the Project to apply to the ICAPCD for a Permit to Construct and Operate (PCO). For clarification, the PCO application is enclosed to this memo. A detailed CEQA Checklist was enclosed as part of the CUP Amendment Application. The Checklist included a detailed description of the Affected Environment for air quality, including a table that identified attainment and non-attainment emissions in the Imperial Valley. This information allowed the County to accurately characterize the existing ambient air conditions and make an informed impact conclusion. Further, an Air Emissions Memorandum was attached to the CUP Amendment Application as Appendix F. That analysis remains valid, confirming no potentially significant effects. In addition, in response to comments received, the Air Emissions Memorandum (Attachment E) provides information to address the comments received on potential construction emissions, further confirming no potentially significant effects.
VI.b. There is a Fair Argument that the Project Could Result in Significant Impacts to Public Health from Valley Fever	The IS/ND does not adequately account for construction workers contracting Valley Fever.	The IS/ND includes Best Management Practices for dust control and worker safety, including: • The Project would comply with the Imperial County Air Pollution Control District (ICAPCD) Regulation VIII (Fugitive Dust Control), the Imperial County 2018 PM10 Plan, and the Imperial County 2018 PM2.5 Plan. • Project equipment and worker vehicles would be turned off when not in use and not left idling to minimize unnecessary emissions. • Water would be applied to the development site and during site preparation and construction to control fugitive dust.

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		• Earth moving work would be completed in phases (as necessary) to minimize the amount of disturbed area at one time. • Construction vehicles and heavy equipment that use non-surfaced facility roads/areas will be restricted to 10 mph to control fugitive dust. • During windy conditions, barriers would be constructed and/or additional watering is conducted to minimize wind-blown fugitive dust. • Vehicle access would be restricted to the disturbance area via signage/fencing. Collectively, these measures would mitigate for the potential contraction of Valley Fever. While not required to mitigate any potentially significant effects, these Applicant proposed Mitigation Measures and practices will be included in the Mitigation and Monitoring Plan for the project.
VI.c. The IS/ND's Methods for Evaluating a Hazard Analysis and the Possibility of Accidents or Explosions at the Site Are Inadequate and Unsupported	Hazard Analysis should be based on a worst-case scenario.	The Hazard Assessment (HA) prepared for the CUP Amendment Application (Appendix G of CUP Application) and IS/ND was developed to comply with the regulatory standard for assessing a catastrophic event. In response to comments received from the Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. CEQA contemplates the move from ND to MND based on comments on the IS/ND. Accordingly, new Mitigation Measure HAZ-1 requires the following: HAZ-1: To minimize the potential for a cascading failure event of the new isopentane tanks and to limit any potential impacts within the existing Heber 2 Complex fence line, the three isopentane tanks shall be located as set forth in Attachment B. Further, diking and impoundment of the proposed isopentane tanks shall be installed consistent with the Hazard Memorandum (Attachment C) to minimize the magnitude and extent of a tank failure, and the detailed design of the project shall ensure that the Project's features satisfy the design criteria assumed in the Hazard Assessment (Attachment C). As observed in Figure 9 of the Hazard Assessment (Attachment C), the area of potential effect for each new isopentane tank would not overlap, thus preventing a consequential catastrophic event.
VI.d. There is a Fair Argument that Extending the Life of the Project Could Result in Geologic Impacts	The IS/ND fails to analyze geologic impacts of extending the life of the facilities.	An extensive geotechnical investigation was performed in support of the CUP Amendment Application (Appendix G) and the IS/ND. This geologic characterization served as the basis for measuring impacts against. As observed in the project description, no new wells or alteration of the pressure regime and

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		geothermal utilization program at Heber 2 are proposed, only the replacement of the OECs and the addition of the isopentane tanks. Therefore, there would be no impacts to the baseline geologic conditions or increased potential for subsidence in the nearby area. Additionally, the California Department of Conservation (CDOC) reviewed the IS/ND and concluded that no potential significant impacts from the existing geothermal wells and utilization. The CDOC concurrence on no significant impacts is enclosed to supplement this conclusion.
VI.e. There is a Fair Argument that Special Status Species Could Occur in the Vicinity of the Project Site and Could be Adversely Affected by the Project	Avian fatality monitoring at nearby solar facilities show high levels of avian mortality.	See response above for Issue IV.b above. Additionally, as observed in the CUP project description, no new transmission lines (or solar facilities, as volunteered in the CURE comment) or changes to existing Heber 2 substation are proposed; therefore, baseline conditions would remain the same and the Project would not cause any significant impacts to avian species.
VI.f. The IS/ND Fails to Disclose the Project's Construction or Operational GHG Emissions, and Relies on an Inapplicable Significance Threshold	The IS/ND fails to meaningfully describe or analyse the Project's construction and operational GHG emissions.	The potential GHG emissions associated with project construction and operations are discussed in the IS/ND CEQA Checklist Section III (Air Quality) and the enclosed Air Quality Memorandum (Attachment E). As observed, construction emissions for criteria pollutants and GHG emissions are significantly less than the regulatory thresholds. The construction phase is expected to emit 982 CO2e tons per year. This figure represents the total construction emissions and are temporary as development is expected to take 8 months.
VI.g. There is a Fair Argument that the Project Will Have Significant Impacts on Water Supply	CURE claims that the Project will use more water and the Project should seek an alternative water supply per the Basin Plan.	As noted by CURE, the Project would not require any additional water to operate, and all water would be supplied via existing IID permits. Heber 2 will remain as a retail water customer with IID with no changes in water consumption to support the existing or proposed facilities. Therefore, no significant impacts to the existing baseline conditions would occur.
VII. The IS/ND Concedes that Mitigation is Required	The IS/ND defers the formulation of mitigation measures. An EIR must be prepared.	CURE's comments confuse Best Management Practices and Applicant Proposed Measures that were included in the project description of the CUP as voluntary measures, with mitigation measures. An Applicant Proposed Measure is volunteered by the Applicant and should be considered as part of the Project. A mitigation measure, conversely, is a condition of approval issued by the County to reduce the magnitude and/or duration of a significant impact. Therefore, the conditions of what qualifies as a mitigation measures cited in the CURE comment, does not apply. In response to comments received from the Fire

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		Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. See new Mitigation Measure HAZ-1, discussed above.
VII.a. The IS/ND Fails to Consider Feasible Mitigation to Reduce Potentially Significant Impacts to Less than Significant Levels	The County should consider and implement a mitigation plan as part of an EIR.	The IS/ND correctly concluded that no significant impacts would occur and that mitigation is not required because all potential impacts would be less than significant. In response to comments received from the Fire Department and CURE on the IS/ND, the County has decided to impose conditions related to the isopentane tanks. See new Mitigation Measure HAZ-1, discussed above in Issue I.
VII.a.1. Construction Mitigation	The IS/ND does not include mitigation for fugitive dust and it is assumed that ozone emissions are significant.	Contrary to CURE's comment, the IS/ND contains numerous voluntary measures to control fugitive dust, as provided in response to Issue VI.b above, and included in the CUP Amendment Application.
VII.a.2. Operational Mitigation	The Project should implement an extensive leak detection and repair program to mitigate for ROG emissions.	The project owner implements leak and repair programs, consistent with applicable laws, ordinances, regulations, and standards. The PCO issued by the ICAPCD will also address potential for leaks and related issues. There are no significant effects associated with project operations and thus no need for additional mitigation measures.
VIII. The IS/ND Fails to Properly Evaluate Potentially Significant Cumulative Impacts	An EIR must discuss significant cumulative impacts.	Under Section 3 of the IS/ND (Mandatory Findings of Significance), the IS/ND considers cumulative effects as less than significant. Cumulative effects for this Project would be limited to off-site Project impacts that coincide with effects from another past, present, or reasonably foreseeable future action. This area of overlap is referred to as the Area of Potential Effect. There are no other projects occurring or proposed in the Heber 2 Area of Potential Effect, and therefore, no significant cumulative effects would occur as result of the Project.
IX. The Project May Require a CEC License	CURE alleges that the Project will result in 92 MW and require a CEC license.	The comments on generating capacity and CEC jurisdiction are incorrect on the facts and the applicable law. With respect to the facts, the Heber 2 project will result in a ***net*** increase of only 16 MWs. See Attachment A. With respect to the law, Heber 2 will not result in a net increase of 50 MWs or greater and thus is not CEC jurisdictional. The CEC has exclusive jurisdiction over the certification of proposed thermal powerplants 50 MWs or greater. Specifically, the Public Resources Code vests the CEC with "the exclusive power to certify all sites and related facilities in the state." A site is defined as "any location on which a facility is constructed or is proposed to be constructed."

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		(Pub. Resources Code § 25119.) A facility is defined as "any thermal powerplant or electric transmission line." (Pub. Resources Code § 25110.) A "thermal powerplant" is defined to mean "any stationary or floating electrical generating facility using any source of thermal energy, with a generating capacity of 50 megawatts or more, and any facilities appurtenant thereto." (Pub. Resources Code § 25120.) Accordingly, the CEC has jurisdiction over new thermal projects 50 MWs or greater and "a change or addition to an existing facility" resulting in a net increase of 50 MWs or greater. ((Pub. Resources Code § 25500.) For existing facilities like Heber 2, the CEC's jurisdiction depends on the net increase in generating capacity. The requirement for a net increase of fifty MWs or more is set forth in the California Supreme Court's only ruling on CEC jurisdiction: "We hold that 'facility' in sections 25500 and 25123, as the term applies here, collectively refers to the entirety of the existing powerplants at the Harbor Generating Station. The plain, common sense meaning of sections 25500 and 25123 is that any alteration, replacement, or improvement of equipment *that results in a 50-megawatt net increase in an existing station's total generating capacity* is subject to the Energy Commission's certification jurisdiction. (*Department of Water and Power, City of Los Angeles V. Energy Resources Conservation And Development Commission*, 2 Cal.App.4th 206, 221; emphasis added.)" As set forth in Table 1, the Heber 2 project does not "result[] in a 50-megawatt net increase in an existing station's total generating capacity." Accordingly, the CEC has no jurisdiction over Heber 2. Further, without any citation to any authority, CURE claims there are "four factors" that determine CEC jurisdiction. No authority is cited because no such authority exists. The four factors cited by CURE do not exist in statute, regulation, or CEC practice. CEC jurisdiction does not attach to Heber because the project will not result in a net increase of generating capacity of 50 MWs or greater.
X. Conclusion	An EIR must be prepared for the Project.	The issues identified in this paragraph are discussed in detail above as to why there are no significant impacts and an IS/ND is therefore the appropriate level of CEQA compliance.

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Attachments

- Attachment A – Table of Present and Proposed Geothermal Energy Generation by Unit at the Heber 2 Complex
- Attachment B – Site Plan with Adjusted Isopentane Tank Locations
- Attachment C - Hazard Memorandum and Hazard Assessment
- Attachment D - California Department of Conservation Concurrence (Email from Curtis Welty on July 22, 2020)
- Attachment E - Air Quality Memorandum
- Attachment F - CEQA Deskbook Reference for the Evaluation of Related Activities in a CEQA Document

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IX. MITIGATION MONITORING & REPORTING PROGRAM (MMRP)

N/A

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MITIGATION, MONTORING AND REPORTING PROGRAM

MITIGATION MEASURES
PURSUANT TO THE ENVIRONMENTAL EVALUATION COMMITTEE
November 19, 2020
Second Imperial Geothermal Co. (Heber 2 Complex)
[Cup 19-0017]

(APN 054-250-031-000)

(CEQA – Mitigated Negative Declaration)

Pursuant to the review and recommendations of the Imperial County Environmental Evaluation Committee (EEC) on November 19, 2020, the following Mitigation Measures are hereby proposed for the project:

MM #	Mitigation Measure	Monitoring Responsibility	Timing	Verification (Date and Initials)
BIOLOGICAL RESOURCES				
BR-1	Prior to any construction activities commencing on site, contractors shall attend a Worker Environmental Awareness Program (WEAP) regarding sensitive biological resources potentially occurring within the BSA. The program shall be presented by a person knowledgeable about the biology of the covered species. At a minimum, the program shall cover the distribution of special-status species, general behavior and ecology of these species, their sensitivity to human activities, their legal protection, the penalties for violation of state and federal laws, reporting requirements, project mitigation measures, and measures to implement in the event that this species is found during construction. A fact sheet containing this information shall also be prepared and distributed. The program shall be presented to all members of the construction crew prior to the start of project construction activities. New employees shall receive formal, approved training prior to working onsite.	ICPDS	PRIOR TO CONSTUCTION	

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MM #	Mitigation Measure	Monitoring Responsibility	Timing	Verification (Date and Initials)
	Upon completion of the orientation, employees will sign a form stating that they attended the program and understand all protection measures. These forms shall be made available to CDFW upon request.			
BR-2	In accordance with the Staff Report on Burrowing Owl Mitigation (CDFW 2012), a preconstruction take avoidance survey shall be conducted (CDFW 2012). If the burrowing owl is absent, then no mitigation is required. If present, the following mitigation shall be implemented. If burrowing owls and their habitat can be protected in place on or adjacent to a project site, then disturbance impacts shall be minimized through the use of buffer zones, visual screens, or other measures in accordance with CDFW (2012). Occupied burrows shall be avoided during the breeding period from February 1 through August 31 (CDFW 2012). "Occupied" is defined as a burrow that shows sign of burrowing owl occupancy within the last 3 years. Occupied burrows shall also be avoided during the non-breeding season. Burrow exclusion is a technique of installing one-way doors in burrow openings during the non-breeding season to temporarily exclude burrowing owls, or permanently exclude burrowing owls and close burrows after verifying burrows are empty by site monitoring and scoping (CDFW 2012). Mitigation for permanent impacts to nesting, occupied, and satellite burrows and/or burrowing owl habitat is required such that the habitat acreage, number of burrows and burrowing owls impacted are replaced based on the burrowing owl life history information provided in Staff Report on Burrowing Owl Mitigation (CDFW 2012). Coordination with CDFW may be necessary for the development of site-specific avoidance and mitigation measures.	ICPDS	Survey prior to any construction activities. If species present, timing as indicated in mitigation measure and prior to any impact to the species	
BR-3	Protection of nesting birds would be required in compliance with the MBTA and to avoid impacts to nesting birds. To avoid impacts to nesting birds and to comply with the MBTA, clearing of vegetation should occur between non nesting (or non-breeding) season for birds (generally, September 1 to February 1). If this avoidance schedule is not feasible, the alternative is to carry out the clearing of vegetation associated with construction under the supervision of a qualified biologist. This shall entail a pre-construction nesting bird survey conducted by a qualified biologist within 14 days prior	.ICPDS	Survey prior to any construction activities. If species present, timing as	

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MM #	Mitigation Measure	Monitoring Responsibility	Timing	Verification (Date and Initials)
	to initiating ground disturbance activities. The survey shall consist of full coverage of the proposed disturbance limits and a 500 foot buffer. The buffer shall be determined by the biologist and will take into account the species nesting in the area and the habitat present. If no active nests are found, no additional measures are required. If "occupied" nests are found, the nest locations shall be mapped by the biologist, utilizing GPS equipment. The nesting bird species shall be documented and, to the degree feasible, the nesting stage (e.g., incubation of eggs, feeding of young, near fledging). The biologist shall establish a no disturbance buffer around each active nest. The buffer will be determined by the biologist based on the species present and surrounding habitat. No construction or ground disturbance activities shall be conducted within the buffer until the biologist has determined the nest is no longer active and has informed the construction supervisor that activities may resume.		indicated in mitigation measure and prior to any impact to the species	
BR-4	If pre-construction surveys determine either the presence of special status species or sensitive biological resources, a construction monitor may be needed during construction. If determined necessary, construction monitoring shall be conducted by a qualified biologist. The biologist shall be given authority to execute the following functions: • Establish construction exclusion zones and make recommendations for implementing erosion control measures in temporary impact areas. • Ensure all construction activities stay within the staked construction zone and do not go beyond the limits of disturbance. • Minimize trimming/removal of vegetation to within the Project impact area. • Restrict non-essential equipment to the existing roadways and/or disturbed areas to avoid disturbance to existing adjacent native vegetation. • Install and maintain appropriate erosion/sediment control measures, as needed, throughout the duration of work activities. During construction, biological monitors shall inspect and verify field conditions, as needed, to ensure that wildlife and vegetation adjacent to the BSA are not harmed. The biological monitor shall coordinate with the construction foreman and construction crew and shall have the authority to immediately stop any activity that has the potential to impact special-status species or remove vegetation not specified in this report.	ICPDS	Survey prior to any construction activities. If species present, timing as indicated in mitigation measure and prior to any impact to the species.	

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MM #	Mitigation Measure	Monitoring Responsibility	Timing	Verification (Date and Initials)
HAZARDS AND HAZARDOUS MATERIALS				
HZ-1-17	1. To minimize potential extremely dangerous condition to firefighters and hazardous material teams Imperial County Fire Department is requiring that a Drone be purchase for Imperial County Fire Department. The final cost, details, and equipment of the drone shall be determined prior the issuance of the building permit. Additionally, the following requirements will be conditioned in the proposed Conditional Use Permit. The drone usage will help reduce required monitoring and compliance impacts to a level of less than significant. 2. All isopentane storage tanks will be protected by approved automatic fire suppression equipment. All automatic fire suppression will be installed and maintained to the current adapted fire code and regulation. 3. An approved automatic fire detection system will be installed as per the California Fire Code. All fire detection systems will be installed and maintained to the current adapted fire code and regulations. 4. Fire department access roads and gates will be in accordance with the current adapted fire code and the facility will maintain a Knox Box for access on site. 5. Compliance with all required sections of the fire code. 6. Applicant will provide product containment areas(s) for both product and water run-off in case of fire applications and retained for removal. 7. Each tank will be equipped with an automated water suppression system. 8. Each tank will be equipped with two flame detectors and one gas detector (for a total of 6 flame detectors and 3 gas detectors for the three tanks). 9. In the case of an isopentane leak, the gas detector(s) will detect it immediately and send a notification to the operator at the control room (manned 24/7) in order to mobilize fixing the leak. 10. In case of a fire, the flame detector(s) will detect it and immediately start the automatic fire suppression system. 11. In case of a fire, there will also be a horn and strobe system that will turn on	ICPDS & FIRE DEPARTMENT & OES.	DURIING CONSTRUCTIO N PHASE OF PROJECT	

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MM #	Mitigation Measure	Monitoring Responsibility	Timing	Verification (Date and Initials)
	automatically to alert the plant employees. 12. Concrete containment areas for isopentene , 13. vessels rarely filled to 90% capacity, 14. isopentane safety- control measures, 15. A blast wall between currently operational isopentene tanks #4 & #5. 16. To minimize the potential for a cascading failure event of the proposed isopentane tanks and to limit potential impacts within the existing Heber 2 Complex fence line, the three proposed isopentane tanks shall be located as set forth in the attached figure 7. 17. Diking and impoundment of the proposed isopentane tanks shall be installed to minimize the magnitude and extent of a tank failure.			
Geology and Soils				
GS-1	Prior to approval of a grading or a building permit, a California certified civil/geotechnical engineer shall prepare a geotechnical investigation of the Project site that includes appropriate subsurface exploration, laboratory testing, and evaluation of potential geotechnical constraints to critical Project structures, including liquefaction, corrosion, seismic shaking and shrink swell evaluations. The report shall include specific recommendations to address issues identified in the geotechnical investigation of the Project site to meet State and County seismic building code requirements. An ICPDS approved third party environmental monitor shall be on site during geotechnical investigations.	ICPDS & Imperial County Department of Public Works	Prior to the issuance of grading/building permit	

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(Lead Monitoring Agency: Imperial County Planning & Development Services Department)

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COMMENTS

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August 31, 2020

VIA EMAIL AND OVERNIGHT MAIL

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Re: Comments on the Negative Declaration for the Heber 2 Geothermal Repower Project (SCH No. 2020069002; CUP No. 19-0017)

Dear Mr. Minnick and Mr. Black:

We are writing on behalf of California Unions for Reliable Energy ("CURE") to provide comments on the Negative Declaration ("IS/ND") prepared by Imperial County ("County"), pursuant to the California Environmental Quality Act ("CEQA"),[1] for the Heber 2 Geothermal Repower Project ("Project") proposed by Second Imperial Geothermal Company, a wholly owned subsidiary of ORMAT Nevada, Inc ("Applicant"). The Applicant seeks a Conditional Use Permit ("CUP") amendment for installation of two new water-cooled ORMAT Energy Converters ("OECs") to replace six old units, along with three 10,000-gallon isopentane above-ground storage tanks and additional pipes to connect the proposed facilities with the existing geothermal complex.[2] The CUP amendment application also proposes to extend the permitted life of the entire Heber 2 Complex (including the Goulds 2 and Heber South geothermal energy facilities) ("Complex") by 30 years, to 2049, and

[1] Pub. Resources Code §§ 21000 et seq.
[2] IS/ND, p. 8.

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states that the Project will refurbish the Complex's original nameplate capacity of 33 megawatts ("MW"). The Project is located on the 39.99-acre Assessor's Parcel Number 054-250-031 at 855 Dogwood Road in Heber. Project disturbance from developing the new facilities would occur on approximately 4 acres of the existing site.[3] The parcel also contains geothermal facilities for the Gould 2[4] and Heber South projects.

The Project site is located in unincorporated Imperial County in the community of Heber and zoned for General Agriculture, Geothermal Overlay Zone within the Heber Specific Plan Area, which is intended to allow for commercial, residential, industrial, renewable energy, and other mixed-use development.[5] The primary land use in the surrounding area is agriculture, with a solar energy facility to the west, a commercial aggregate/rock supplier to the south, and agriculture to the north and east of the site. The closest residences are in the town of Heber, approximately 3,500 feet to the northeast of the Project site.

Based on our review of the IS/ND, we conclude that it fails to meet the basic requirements of CEQA. The IS/ND fails to accurate describe the Project and fails to accurately describe the Project's existing baseline setting, thus significantly underestimating the Project's impacts. As a result, the IS/ND's conclusions regarding impacts on air quality, cumulative air quality, public health, water supply, biological resources, and impacts from hazardous materials are not supported by substantial evidence. Moreover, as explained in these comments, there is substantial evidence supporting a fair argument that the Project will result in potentially significant impacts on air quality, public health, hazardous materials, water supply, and biological resources which the IS/ND fails to disclose and mitigate. The Project is also inconsistent with inconsistent with the Imperial Integrated Regional Water Management Plan.

The County may not consider approving the Project until it prepares an Environmental Impact Report ("EIR") that adequately analyzes the Project's potentially significant impacts and incorporates all feasible mitigation measures to avoid or minimize these impacts to the greatest extent feasible.

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[3] *Id.*
[4] The IS/ND refers to this facility as the "Goulds 2" facility.
[5] Imperial County General Plan, October 2015, 18.

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We reviewed the IS/ND for the Project with the assistance of Phyllis Fox, Ph.D., PE and Shawn Smallwood, Ph.D.[6,7] Dr. Fox and Dr. Smallwood provide substantial evidence of potentially significant impacts that have not been adequately disclosed, analyzed, or mitigated. Their technical comments and curriculum vitae are attached hereto and are submitted to the County, in addition to the comments in this letter. Accordingly, the County must address and respond to their comments separately.[8]

I. STATEMENT OF INTEREST

CURE is a coalition of labor organizations with members who may be adversely affected by the potential public and worker health and safety hazards and environmental and public service impacts of the Project. The coalition includes Heber residents Jaime Cuevas, Delila and Efrain Guzman, Imperial County resident Eric Jones, and other members who live, recreate, work, and raise families in Imperial County and in communities near the Project site. Thus, CURE, its participating organizations, and their members stand to be directly affected by the Project's impacts.

Since its founding in 1997, CURE has been committed to building a strong economy and healthier environment and it works to construct, operate, and maintain conventional and renewable energy power plants and other industrial facilities throughout California. CURE supports the development of clean, renewable energy technology, including geothermal power generation, where properly analyzed and carefully planned to minimize impacts on public health and the environment. Geothermal projects should avoid adverse impacts to natural resources and public health, and should take all feasible steps to ensure that unavoidable impacts are mitigated to the maximum extent feasible. Only by maintaining the highest standards can energy development truly be sustainable.

The individual members of CURE, and the members of its affiliated labor organizations, would be directly affected by the Project and may also work constructing the Project itself. They would therefore be first in line to be exposed to

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[6] P. Fox, Comments on the Initial Study/Negative Declaration for the Heber 2 Geothermal Repower Project (August 31, 2020) (hereinafter, "Fox Comments"), **Exhibit A**.
[7] S. Smallwood, Comments RE: Heber 2 Geothermal Repower Project, **Exhibit B**.
[8] The Commenters reserve the right to supplement these comments at later hearings and proceedings related to this Project. Gov. Code § 65009(b); PRC § 21177(a); *Bakersfield Citizens for Local Control v. Bakersfield* (2004) 124 Cal. App. 4th 1184, 1199-1203; *see Galante Vineyards v. Monterey Water Dist*. (1997) 60 Cal. App. 4th 1109, 1121.

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any health and safety hazards that may be present on the Project site. They each have a personal stake in protecting the Project area from unnecessary, adverse environmental and public health and safety impacts.

CURE supports and encourages the sustainable development of California's energy and natural resources and has an interest in enforcing environmental laws that encourage sustainable development and a safe working environment. Environmentally detrimental projects can jeopardize future jobs by making it more difficult and more expensive for business and industry to expand in the region, and by making it less desirable for businesses to locate and people to live and recreate in the County. Continued degradation can, and has, caused construction moratoriums and other restrictions on growth that, in turn, reduces future employment opportunities.

Finally, the organizational members of CURE are concerned with projects that can result in serious environmental harm without providing countervailing economic benefits. CEQA provides a balancing process whereby economic benefits are weighed against significant impacts to the environment. It is in this spirit we offer these comments.

II. AN EIR MUST BE PREPARED

CEQA is designed to inform decision-makers and the public about the potential, significant environmental effects of a project.[9] "CEQA's fundamental goal [is] fostering informed decision-making."[10] "The purpose of CEQA is not to generate paper, but to compel government at all levels to make decisions with environmental consequences in mind."[11]

CEQA requires that an agency analyze the potential environmental impacts of its proposed actions in an EIR, except in certain limited circumstances.[12] The EIR is the very heart of CEQA.[13] The EIR acts as an "environmental 'alarm bell' whose purpose is to alert the public and its responsible officials to environmental changes before they have reached the ecological points of no return."[14] The EIR aids an agency in identifying, analyzing, disclosing, and, to the extent possible, avoiding

[9] 14 Cal. Code Regs. ("CEQA Guidelines") § 15002, subd. (a)(1).
[10] *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 402.
[11] *Bozung v. LAFCO* (1975) 13 Cal.3d 263, 283.
[12] See, e.g., Pub. Resources Code, § 21100.
[13] *Dunn-Edwards v. Bay Area Air Quality Management Dist.* (1992) 9 Cal.App.4th 644, 652.
[14] *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1220.

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a project's significant environmental effects through implementing feasible mitigation measures.[15] The EIR also serves "to demonstrate to an apprehensive citizenry that the [agency] has analyzed and considered the ecological implications of its action."[16] Thus, an EIR "protects not only the environment but also informed self-government."[17]

An EIR is required if "there is substantial evidence, in light of the whole record before the lead agency, that the project may have a significant effect on the environment."[18] The EIR aids an agency in identifying, analyzing, disclosing, and, to the extent possible, avoiding a project's significant environmental effects through implementing feasible mitigation measures.[19] In very limited circumstances, an agency may avoid preparing an EIR by issuing a negative declaration, a written statement briefly indicating that a project will have no significant impact. Because "[t]he adoption of a negative declaration . . . has a terminal effect on the environmental review process" by allowing the agency to dispense with the duty to prepare an EIR, negative declarations are allowed only in cases where there is not even a "fair argument" that the project will have a significant environmental effect.[20] Under the fair argument standard, a lead agency "shall" prepare an EIR whenever substantial evidence in the whole record before the agency supports a fair argument that a project may have a significant effect on the environment.[21] The phrase "significant effect on the environment" is defined as "a substantial, or potentially substantial, adverse change in the environment."[22]In certain circumstances, a project with potentially significant impacts can be modified by the adoption of mitigation measures to reduce the impacts to a level of insignificance. In such cases, an agency may satisfy its CEQA obligation by preparing a mitigated

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[15] Pub. Resources Code § 21002.1(a); CEQA Guidelines § 15002(a), (f).
[16] *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 86.
[17] *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 564.
[18] Pub. Resources Code, § 21080, subd. (d) (emphasis added); CEQA Guidelines, § 15064; see also *Pocket Protectors v. City of Sacramento* (2004) 124 Cal.App.4th 903, 927; *Mejia v. City of Los Angeles* (2005) 13 Cal.App.4th 322.
[19] Pub. Resources Code, § 21002.1, subd. (a); CEQA Guidelines, § 15002, subd. (a) & (f).
[20] *Citizens of Lake Murray v. San Diego* (1989) 129 Cal.App.3d 436, 440; Pub. Resources Code, §§ 21100, 21064.
[21] Pub. Res. Code §§21080(d), 21082.2(d); 14 Cal. Code Reg. §§ 15002(k)(3), 15064(f)(1), (h)(1); *Laurel Heights Improvement Assn. v. Regents of the Univ. of Cal.* (1993) 6 Cal.4th 1112, 1123; *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 75, 82; *Stanislaus Audubon Society, Inc. v. County of Stanislaus* (1995) 33 Cal.App.4th 144, 150-151; *Quail Botanical Gardens Found., Inc. v. City of Encinitas* (1994) 29 Cal.App.4th 1597, 1601-1602.
[22] Pub. Resources Code, § 21068.

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negative declaration.[23] A mitigated negative declaration, however, is also subject to the fair argument standard. Thus, an MND is also inadequate, and an EIR is required, whenever substantial evidence in the record supports a "fair argument" that significant impacts may occur even with the imposition of mitigation measures.

The "fair argument" standard is an exceptionally "low threshold" favoring environmental review in an EIR rather than a negative declaration.[24] The "fair argument" standard requires preparation of an EIR, if any substantial evidence in the record indicates that a project may have an adverse environmental effect.[25] As a matter of law, substantial evidence includes both expert and lay opinion.[26] Even if other substantial evidence supports the opposite conclusion, the agency nevertheless must prepare an EIR.[27] Under the "fair argument," CEQA always resolves the benefit of the doubt in favor of the public and the environment.

III. THE IS/ND FAILS TO ADEQUATELY DESCRIBE THE PROJECT

California courts have repeatedly held that "an accurate, stable and finite project description is the *sine qua non* of an informative and legally sufficient [CEQA document]."[28] CEQA requires that a project be described with enough particularity that its impacts can be assessed.[29] As articulated by the court in *County of Inyo v. City of Los Angeles*, "a curtailed, enigmatic or unstable project description draws a red herring across the path of public input."[30] Without a complete project description, the environmental analysis under CEQA is impermissibly limited, thus minimizing the project's impacts and undermining meaningful public review.[31]

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[23] Pub. Resources Code, § 21064.5; CEQA Guidelines, § 15064, subd. (f)(2).
[24] *Pocket Protectors v. City of Sacramento* (2004) 124 Cal.App.4th 903, 928.
[25] CEQA Guidelines, § 15064, subd. (f)(1); *Pocket Protectors v. City of Sacramento, supra*, 124 Cal.App.4th at 931.
[26] Pub. Resources Code, § 21080, subd. (e)(1); CEQA Guidelines, § 15064, subd. (f)(5).
[27] *Arviv Enterprises v. South Valley Area Planning Comm.* (2002) 101 Cal.App.4th 1333, 1346; *Stanislaus Audubon v. County of Stanislaus* (1995) 33 Cal.App.4th 144, 150-151; *Quail Botanical Gardens v. City of Encinitas* (1994) 29 Cal.App.4th 1597.
[28] *Stopthemillenniumhollywood.com v. City of Los Angeles* (2019) 39 Cal.App.5th 1, 17; *Communities for a Better Environment v. City of Richmond* ("*CBE v. Richmond*") (2010) 184 Cal.App.4th 70, 85–89; *County of Inyo v. City of Los Angeles* (1977) 71 Cal.App.3d 185, 193.
[29] *Id.* at 192.
[30] *Id.* at 197-198.
[31] *See, e.g., Laurel Heights Improvement Assn. v. Regents of the University of California* (1988) 47 Cal.3d 376.

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A public agency may not segment a large project into two or more smaller projects in order to mask serious environmental consequences. CEQA prohibits such a "piecemeal" approach and requires review of a Project's impacts as a whole.[32] "Project" is defined as "the whole of an action," which has the potential to result in a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment.[33] CEQA mandates "that environmental considerations do not become submerged by chopping a large project into many little ones — each with a minimal potential impact on the environment — which cumulatively may have disastrous consequences."[34] Before undertaking a project, the lead agency must assess the environmental impacts of all reasonably foreseeable phases of a project.[35]

a. The IS/ND's Description of the Project's Construction Activities is Inadequate and Flawed

The IS/ND lacks a detailed and complete description of construction activities to take place during the initial decommissioning of the facility's existing components and installation of the Project's new OECs, storage tanks, pipes, and any other additions to the facility. Crucial details, such as a detailed construction schedule, a list of all the construction equipment that would be used, and the horsepower rating and engine tier for each piece of construction equipment, are omitted. Without these specifics, it is impossible for the public to properly evaluate the potential environmental and public health impacts of the Project.

The Project requires a new Authority to Construct ("ATC") from the Imperial County Air Pollution Control District ("ICAPCD") pursuant to ICAPCD Rule 207 for a modification to the Complex's existing air permit, PTO #2217.[36] The Applicant submitted an ATC Application to ICAPCD in November 2019.[37] The ATC Application states that "The existing OECs will be deconstructed and removed from

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[32] 14 Cal. Code Reg. § 15378, subd. (a); *Burbank- Glendale-Pasadena Airport Authority v. Hensler* (1991) 233 Cal.App.3d 577, 592.
[33] 14 Cal. Code Reg., § 15378.
[34] *Bozung v. LAFCO* (1975) 13 Cal.3d 263, 283-84; *City of Santee v. County of San Diego*, (1989) 214 Cal.App.3d 1438, 1452.
[35] *Laurel Heights Improvement Assoc. v. Regents of the Univ. of Calif.* (1988) 47 Cal.3d 376, 396-97, 253 Cal.Rptr. 426) (EIR held inadequate for failure to assess impacts of second phase of pharmacy school's occupancy of a new medical research facility).
[36] See **Exhibit C**, Heber 2 Application for Authority to Construct, PROJECT No. 346-2-1, November 2019 ("ATC Application").
[37] *Id.*

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the Facility within 5 years per County of Imperial requirements."[38] However, the ATC Application is not part of the IS/ND, and nothing in the IS/ND provides a clear timeline or description of the activities required to decommission the existing six 1992 OECs and replacing them with the two new OECs. The IS/ND vaguely states that the construction phase would last "approximately eight months,"[39] but does not meaningfully describe the Project's construction equipment, schedule, or provide any information about the Project's construction-related emissions.

Construction emissions must be estimated and compared to significance thresholds to determine if the emissions are significant. It is standard practice to use the CalEEMod model to estimate a project's construction emissions. This requires a detailed construction schedule, a list of all the construction equipment that would be used, and the horsepower rating and engine tier for each piece of construction equipment, among other inputs.[40] None of this information is in the files produced by the County in support of the IS. The IS only mentions in passing that a crane, trucks, excavators, compactors, water truck, and powered hand tools would be used,[41] but otherwise is silent on the full construction fleet.[42] Information supplied in response to PRAs indicate that "semi-truck trailers, flatbed trucks, excavators/bulldozers, forklifts, roller, and cranes would be used to deliver and place the proposed facilities on the Heber 2 Project Site."[43] However, more equipment would be required than mentioned due to site soil conditions.[44] Further, this general information cannot be used to estimate emissions because critical operating parameters that determine emissions are missing, including equipment horsepower ratings, engine tiers, engine loads, hours of operation, etc.

An EIR must be prepared to fully describe and analyze the Project's construction phase and emissions.

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[38] ATC Application at pdf 12.
[39] IS/ND, pp. 23, 28, 29, 30.
[40] See User's Guide for CalEEMod Version 2016.3.2; http://www.caleemod.com/.
[41] IS, pdf 17, 333.
[42] IS, pdf 17, 24.
[43] Memorandum from Catalyst Environmental Solutions Inc., Re: Heber 2 Project Description Information, July 6, 2020. Exhibit --.
[44] See, e.g., IS, pdf 162 ("The soils are highly corrosive to metals and contain sufficient sulfates and chlorides to require special concrete mixes and protection of embedded steel building components when concrete is place in contact with native soil…").

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b. The IS/ND Fails to Describe Emissions from Reclamation Activities

The IS/ND includes a Reclamation Plan Application, which explains that "the entire Heber 2 site would be dismantled and removed" at the end of the 30-year CUP extension.[45] The Application states that all wells would be abandoned, that the Heber 2 Complex site will be revegetated and "likely" returned to a natural state, and that reclamation activities will use approximately 20,000 gallons of water.[46] However, neither the IS/ND nor the Reclamation Plan Application describe the timeline for reclamation activities,[47] and neither contain any description or analysis of the construction emissions associated with dismantling and removing Project structures, which will include all 6 OECs, pipelines, buildings, above-ground well facilities, fences, and other on-site physical Project structures.

Site reclamation, which will involve deconstructing a much larger area (40 acres[48] compared to 4 acres for Project construction) and require much of the same equipment (backhoes, excavators, heavy trucks, compactors, water trucks, crane)[49] will have impacts similar to construction. Reclamation of the entire Heber 2 Complex site may result in potentially significant construction emissions from both on-site and off-site construction equipment, dust, and may release Valley Fever spores, exposing reclamation construction workers and off-site receptors to potentially significant health risks. None of these reclamation impacts are discussed in the IS/ND or Reclamation Plan.

An EIR must be prepared to fully describe and analyze the Project's reclamation phase.

c. The IS/ND's Numerous Errors Prohibit the Public from Fully Evaluating the Project's Impacts

The IS/ND fails as an informational document because of its numerous errors and confusing statements. "A project description that gives conflicting signals to

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[45] See IS/ND, Reclamation Plan Application, p. 8.
[46] *Id.* at pp. 6-8.
[47] The Application states that revegetation will take approximately 6 months, but omits any timeline for deconstruction and dismantling activities associated with site closure. See Application, Revegetation Plan, p. 1.
-[48] IS/ND, pdf 54, 330, 343.
[49] IS/ND, pdf 33; Reclamation Plan Application, p. 5 ("Backhoes, excavators, heavy trucks, light vehicles, compactors, hand tools, welding equipment, water truck, crane.").

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decision makers and the public about the nature of the project is fundamentally inadequate and misleading."[50]

The IS/ND is rife with inconsistent, misleading, and confusing statements, making it impossible for the reader to assess the County's conclusions regarding the Project's environmental impacts. The IS/ND asserts, for example, that a records search for previous cultural and historic resource surveys was conducted and "did not identify any recorded historical resources on the Project site or immediate vicinity. (Appendix C)." Appendix C is listed as the Water Quality Management Plan and does not concern cultural resources.[51] There is no cultural resources study attached to the IS/ND.

In addition, the IS/ND draws several conclusions that are not supported by substantial evidence or ask the reader to ferret out information not provided in the document, including:

- The IS/ND states that "no water resources or sensitive communities are present on or near the Project Site." The reader is directed to see Figure 6 and Appendix A as evidence of this conclusion. Figure 6 is a photograph of the Project site showing a lot with geothermal facilities at the back of a dirt lot. It does not support any conclusion, other than that a facility of some kind exists at the place where the photo was taken. The dirt lot does not lead to the conclusion that no water resources or sensitive communities are present on or near the site. Appendix A, meanwhile, contains more photographs of the site, none of which serve as evidence of a lack of sensitive natural communities.[52]

- The IS/ND consistently refers to the "Heber 2 Geothermal Complex" as also including the Heber South and Gould 2 facilities. ORMAT also owns the Heber 1 complex, located east of the Project site on Assessor's Parcel No. 054-250-036-000. Some documents, including the SEC Form 10-K, refer to the "Heber complex," which in some cases appears to refer to both sites.[53]

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[50] *South of Market Community Action Network v. City and County of San Francisco* (2019) 33 Cal.App.5th 321, 332.
[51] IS/ND at PDF page 22.
[52] IS/ND at PDF pages 21; 15; 48-52.
[53] See, e.g., http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/21c08b55-9e75-424a-b5b0-d2831cafc0e4.pdf at 83.

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- The IS/ND misuses the term "complex," fails to disclose the baseline generation and future generation after the Project is completed, and incorrectly identifies the units that would be modified.[54]

IV. THE IS/ND FAILS TO ACCURATELY DESCRIBE THE PROJECT'S BASELINE CONDITIONS

Courts have repeatedly emphasized the importance of an adequate baseline description, "for without such a description, analysis of impacts, mitigation measures and project alternatives becomes impossible."[55] CEQA Guidelines section 15125, subdivision (a), provides:

> An EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant.

A. The IS/ND Fails to Accurately Describe the Project's Baseline Generating Capacity and Associated Impacts, as Well As Its Baseline Emissions

The IS/ND's description of the generating capacity of the Complex is misleading and inaccurate. As Dr. Fox explains, the Applicant's annual reports and filings with the SEC describe the Heber 2 Complex as consisting of six OECs at Heber 2 plus Goulds 2 and Heber South. Further, the asserted nameplate generation capacity of the "complex" in the IS of 33 MW appears to be wrong. The owner/operator of the Heber 2 Complex, for example, asserts that the generating capacity of the "Heber Complex" is 92 MW and "has been sustainably operating since 1985, consisting of Heber 1, Heber 2, Heber South, Gould 1, and Gould 2."[56] Elsewhere, the owner variously reports that the generating capacity of the "Heber Complex" is

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[54] Hazard Assessment, PDF page 297, describes the complex as having three facilities (H2, G2, and Heber South).

[55] *County of Amador v. El Dorado County Water Agency* (1999) 76 Cal.App.4th 931, 953–954.

[56] Fox Comments, pp. ____; Charlene Wardlow, Director of Business Development, Ormat, Ormat's Geothermal Projects in Imperial County, p. 14, Imperial Valley Renewable Energy Summit, March 11, 2016; http://ivres.ivedc.com/media/managed/031116_Ormat_presentation_at_IVRES.pdf.

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currently 81 MW[57,58] to 82 MW[59] and includes Heber 1 and 2 and the Goulds Project in the term "Heber Complex."[60]

Generation data from the CEC for the original Heber units show multiple years with electrical output around 320,000 MWh and a peak output of 326,153 MWh in 2003, the year after net capacity was restored to 44 MW (per Ormat's 2015 Application[61]). The 2019 output of 198,110 MWh suggests that the proposed action would increase generation by up to 128,043 MWh/year, or by 65%. Because the 2002 upgrade only increased capacity to 44/47 of the original capacity, Dr. Fox concludes that the current proposal would increase output by an addition 47/44 over 2003 output, or 65% x 47/44 = 69% over 2019 output. Thus, Dr, Fox explains that the proposed action would increase generation and associated impacts, e.g., water use and emissions, by approximately 2/3.[62] These increases are not disclosed in the IS/ND, which supplies misleading and inaccurate statements regarding the Project's baseline generating capacity.

Furthermore, the increase in emissions from this Project must be based on baseline emissions, typically the average emissions in the years immediately preceding the start of environmental review.[63] The IS/ND asserts that the change in isopentane emissions is based on actual baseline emissions for the 2017 to 2018 period.[64] However, the ATC Application indicates that the IS/ND calculated the increase in isopentane emissions using the maximum reported quarterly emissions over the period 2017–2018 based only on the third quarter of 2018 of 117.5 lb/day facility total,[65] not average emissions for 2017 to 2018 as claimed in the IS/ND.[66] Baseline emissions must be based on the average emissions over the baseline

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[57] ORMAT, 2019 Annual Report, pdf 19; http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_ORA_2019.pdf.
[58] SEC, Form 10-K, p. 11, pdf 10, 27, December 31, 2019.
[59] U.S. Securities and Exchange Commission, Form 10-Q, Ormat Technologies, Inc., March 31, 2020, p. 41, pdf 36-37; http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/bd1a8403-baa2-4834-9e2f-29ea970e033c.pdf.
[60] U.S. Securities and Exchange Commission, Form 10-K, Ormat Technologies, Inc., December 31, 2007, p. 9, 24-26; https://www.sec.gov/Archives/edgar/data/1296445/000095013608001172/file1.htm.
[61] Heber 1 CUP #04-0024—Request to Amend, pdf 7; http://www.icpds.com/CMS/Media/Heber-Geothermal-Company_Part2.pdf.
[62] Fox Comments, p. ___.
[63] See e.g. *Association of Irritated Residents v. Kern County Board of Supervisors* ("*AIR v. Kern County*") (2017) 17 Cal.App.5th 708, 728–729,
[64] IS, pdf 19 and Table 2, pdf 291.
[65] ATC Application, pdf 28.
[66] Compare ATC Application, pdf 28 with IS, pdf 291.

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period, not the maximum. The use of the maximum emissions spike from a single point in time two years ago is not an accurate or permissible measure of the facility's baseline emissions because it is not representative of existing conditions at the Project site. The IS/ND's reliance on an inflated baseline artificially reduces the air quality impacts that are measured against it, and is not supported by substantial evidence.

Finally, the IS/ND contains no estimate of baseline emissions or resulting increases in emissions from any supporting equipment. Dr. Fox's analysis of the CEC generation for the subject units indicates that the Project will increase generation by two-thirds or by a factor of 1.6.[67] Thus, emissions from all supporting equipment will nearly double emissions as compared to the actual baseline conditions at the site. The IS/ND fails to disclose this potentially significant impact due to its reliance on an improperly inflated baseline.

B. The IS/ND Fails to Accurately Describe Biological Conditions at the Project Site

The County failed to make a reasonable effort to describe baseline biological conditions at the Project site. As a result, the IS/ND contains inaccurate and unreliable baseline information about potential sensitive species to occur at the Project site. The IS/ND also overlooks critical aerial habitat for special status birds and bats, and lacks substantial evidence to support its "no impact" conclusion for biological resources.

The IS/ND relies on a single site visit made by a wildlife biologist on June 1st, 2019, at an unreported time of day and for an unreported time period.[68] The IS/ND does not describe the survey guidelines followed by the biologist, including whether they complied with applicable United States Fish and Wildlife Service ("USFWS") and California Department of Fish and Wildlife ("CDFW") guidelines for surveys of relevant species, such as burrowing owl or migratory birds. Based on this single survey, the biologist concluded that no wildlife, and no suitable habitat for any special-status wildlife, exists on site.[69]

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[67] Dr. Fox Comments, p. ___.
[68] See IS/ND, Biological Resources Clearance Memorandum ("Biological Memorandum") (June 3, 2019), p. 5.
[69] *Id.*

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The Biological Memorandum vaguely states that the consultants reviewed information from four other sources: Unites States Fish and Wildlife Service ("USFWS"); Information, Planning, and Consultation System ("IPaC System"); California Natural Diversity Database ("CNDDB"); and the California Native Plant Society ("CNPS").[70] However, as Dr. Smallwood explains, "no use was made of richly informative data sets on wildlife occurrences, such as eBird."[71] Dr. Smallwood explains that, when appropriate use of available information is made, and consideration given to the aerial portion of wildlife habitat, readily available evidence supports the conclusion that up to 45 special-status species of wildlife are likely occur at the Project site.[72] Dr. Smallwood further explained that 6 of the 45 species are special-status species – either threatened, endangered, or a candidate for listing.[73]

Dr. Smallwood also conducted his own visual research using Google Earth images of the Project site. His review of Project-site images showed four common ravens taking off from structures on the Project site.[74] As Dr. Smallwood explains, common ravens remove carcasses of collision victims faster than any other vertebrate scavenger; the fact that common ravens are readily detectable in Google Earth imagery demonstrates that the site is likely providing vertebrate scavengers with regular, reliable food resources, which means "the Project is likely already killing birds and bats."[75] The IS/ND does not provide any baseline information about collision mortality with existing Project structures at the Project site. Therefore, the IS/ND lacks substantial evidence to support the conclusion that no wildlife will be impacted by the Project.

Dr. Smallwood presents substantial evidence demonstrating that special-status wildlife are likely to be present at the Project site. While courts have upheld EIRs containing limited biological baseline surveys,[76] no such deference is afforded to agency's decision to dispense with an EIR and prepare a negative declaration.[77] In this case, substantial evidence supports a fair argument for the need to prepare

[70] *Id*. at p. 4.
[71] Smallwood Comments, p. 1.
[72] *Id*.
[73] *Id*. at pp. 1-2.
[74] Smallwood Comments, p. 6.
[75] *Id*. at pp. 5-6.
[76] *North Coast Rivers Alliance v. Marin Mun. Water Dist*. (2013) 216 Cal. App. 4th 614, 644; *Association of irritated Residents v. County of Madera ("AIR v. Madera*") (2003) 107 Cal. App. 4th 1383, 1396.
[77] Pub. Resources Code, § 21080, subd. (d); CEQA Guidelines, § 15064; see also *Pocket Protectors,* 124 Cal.App.4th at 927.

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an EIR to accurately describe the Project's baseline conditions for wildlife, and to accurately analyze the Project's impacts to wildlife from both direct mortality and interference with wildlife movement.

V. THE COUNTY HAS VIOLATED CEQA BY PIECEMEALING ENVIRONMENTAL REVIEW AND PERMITTING FOR THE EXPANSION OF THE HEBER GEOTHERMAL FACILITIES AS SEPARATE PROJECTS

A public agency may not segment a large project into two or more smaller projects in order to mask serious environmental consequences. CEQA prohibits such a "piecemeal" approach and requires review of a Project's impacts as a whole.[78] "Project" is defined as "the whole of an action," which has the potential to result in a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment.[79] CEQA mandates "that environmental considerations do not become submerged by chopping a large project into many little ones — each with a minimal potential impact on the environment — which cumulatively may have disastrous consequences."[80] Before undertaking a project, the lead agency must assess the environmental impacts of all reasonably foreseeable phases of a project.[81]

Courts have found improper piecemealing where a lead agency conducts separate CEQA reviews for related activities proposed by the same applicant in the same vicinity. In *Plan for Arcadia v. City Council of Arcadia*,[82] a developer submitted two applications for developments on a 400-acre property, first a 72-acre shopping center and then a parking lot to serve a racetrack on the property. A site plan showed that the owner had plans to redevelop the entire property.[83] Although both projects were exempt from CEQA because they predated CEQA's effective date, it was "clear" to the court that they were "related to each other and that in

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[78] 14 Cal. Code Reg. § 15378, subd. (a); *Burbank- Glendale-Pasadena Airport Authority v. Hensler* (1991) 233 Cal.App.3d 577, 592.
[79] 14 Cal. Code Reg., § 15378.
[80] *Bozung v. LAFCO* (1975) 13 Cal.3d 263, 283-84; *City of Santee v. County of San Diego*, (1989) 214 Cal.App.3d 1438, 1452.
[81] *Laurel Heights Improvement Assoc. v. Regents of the Univ. of Calif.* (1988) 47 Cal.3d 376, 396-97, 253 Cal.Rptr. 426) (EIR held inadequate for failure to assess impacts of second phase of pharmacy school's occupancy of a new medical research facility).
[82] (1974) 42 Cal.App.3d 712, 718, 721.
[83] *Id.* at 719.

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assessing their environmental impact they should be regarded as a single project under [CEQA]."[84]

In *Tuolumne,* the court articulated "general principles" for determining whether two actions are one CEQA project, including "how closely related the acts are to the overall objective of the project," and how closely related they are in *time*, *physical location*, and *the entity undertaking the action*.[85] The court rejected arguments that a shopping center and nearby road alignment were "separate and independent" projects, and held that (1) separate approvals do not sever the connections between two activities; (2) the broad definition of a CEQA "project" extends beyond situations where a future activity is "necessitated by" an earlier one (noting that when actions "actually will be taken," the appropriate inquiry is whether they are related to one another, i.e. they comprise the "whole of an action" or "coordinated endeavor"); and (3) the applicable standard is not always whether two actions "could be implemented independently of each other."[86]

The Project is one of a series of permitting actions undertaken by the County to authorize operation of the Heber 2 Complex. The IS/ND provides misleading information about the Heber facilities, describing the Project as a simple upgrade to the Complex and extension of existing 33 MW operations. However, the ATC Application, Security and Exchange Commission ("SEC") filings by the Applicant, and other publicly available information indicate that the Heber 2 Geothermal Complex consists of eight OECs that "…are operationally interconnected to each other as well as to Goulds 2 and Heber South" as follows:[87]

- Heber 2: 6 OECs
- Heber South: 1 OEC
- Goulds 2: 1 OEC

The six OECs at Heber 2 are not only operationally interconnected to each other as well as to Goulds 2 and Heber South, they also share facilities, including the vapor recovery unit, fire pump, emergency pump, cooling towers, a diesel generator, and storage tanks. There is also piping connecting the motive fluid

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[84] *Id.* at 723, 726.
[85] *Tuolumne County Citizens for Responsible Growth, Inc. v. City of Sonora* (2007) 155 Cal.App.4th 1214, 1226-1227 ("*Tuolumne*").
[86] *Id.* at 1228-1230 (citing 14 Cal. Code Reg. § 15378(c) and analyzing *Sierra Club v. W. Side Irr. Dist.* (2005) 128 Cal.App.4th 690, 698-700).
[87] ATC Application, Section 1.1, pdf 9 and Appendix B, pdf 28.

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between the units.[88,89] Thus, these units constitute a single facility, rather than three separate facilities, as described in the IS/ND. The total generating capacity of this "complex" has been reported over the years by their owner to be significantly higher than the 33 MW described in the IS[90] and the 58 MW described in the ATC Application.[91] The combined generating capacity of these eight units is variously reported in Applicant documents filed elsewhere as ranging from 58 MW[92] to 81 MW.[93] These eight units clearly constitute a single facility, the "Heber Complex," a term that is widely misused in the IS and supporting documents.

The IS/ND fails to analyze the impacts of the Project's proposed extension of permits for the Heber Complex as a whole. As a result, the IS/ND is fundamentally flawed, as it piecemeals operational changes to the facilities that have occurred over time, and which will be expanded with implementation of the Project. The County must prepare an EIR which analyzes the impacts of the entire Heber Complex.

VI. SUBSTANTIAL EVIDENCE SUPPORTS A FAIR ARGUMENT THAT THE PROJECT MAY HAVE SIGNIFICANT IMPACTS WHICH MUST BE ANALYZED IN AN EIR

CEQA contains a strong presumption in favor of requiring a lead agency to prepare an EIR. This presumption is reflected in the "fair argument" standard. Under that standard, a lead agency must prepare an EIR whenever substantial evidence in the whole record before the agency supports a fair argument that a project may have a significant effect on the environment, even if other substantial evidence supports the opposite conclusion.[94] CEQA requires a lead agency to assess a project's impacts on the environment.[95] Any significant impacts must be mitigated or avoided to the extent feasible.[96]

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88 ATC Application, Table 1, p. 5, pdf 13.
89 Heber 1 CUP #04-0024 – Request to Amend, May 7, 2015; http://www.icpds.com/CMS/Media/Heber-Geothermal-Company_Part2.pdf.
90 IS, pdf 9.
91 ATC Application, Table 1, p. 5, pdf 13: 10+1223.6+14.52 = pdf 9: 36 MW + 10 MW + 12 MW = 58 MW.
92 ATC Application, pdf 28, Air Emission Calculations, Gross Power Column.
93 ORMAT, 2019 Annual Report, pdf 9 (81 MW); http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/21c08b55-9e75-424a-b5b0-d2831cafc0e4.pdf.
94 Pub. Res. Code § 21082.2; *Laurel Heights Improvement Ass'n v. Regents of the University of California* (1993) ("Laurel Heights II") 6 Cal.4th 1112, 1123; *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 75, 82; Quail Botanical, supra, 29 Cal.App.4th 1597at 1602; Stanislaus, supra, 33 Cal.App.4th 144, 150-151.)
95 Pub. Res. Code § 21002.1(a), 21061; 14 Cal. Code Reg. § 15125, subd. (d).
96 Pub. Res. Code §§ 21002, 21002.1(b), 21081, 21080.5(d)(2)(i).

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To determine whether a project will have a significant impact, the lead agency must first identify the relevant "environment," and then determine whether the project will cause a "significant effect on the environment."[97] CEQA defines these terms as follows:

"Environment means the physical conditions which *exist* within the area which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, objects of historic or aesthetic significance."[98]

"Significant effect on the environment means a substantial, or potentially substantial, *adverse change* in the environment."[99]

Additional guidance is provided in section 15125 of the CEQA Guidelines, which provides that an environmental review document must describe the environment in the project's vicinity "as it exists before the commencement of the project . . . ."

A. There is a Fair Argument that Construction Emissions from the Project Could Have a Significant Impact on Public Health and the Environment

CEQA requires the County to analyze the Project's impacts by determining whether there would be an adverse impact as measured against the *existing* environment in the area. Because the description of construction activities was incomplete, any estimation of impacts from construction activities will necessarily be inaccurate.

According to Dr. Fox, it is standard practice to use the CalEEMod model to estimate a project's emissions from construction. This requires, however, a detailed construction schedule, a list of all the construction equipment that would be used, and the horsepower rating and engine tier for each piece of construction equipment, among other inputs.[100] As Dr. Fox points out, the IS/ND contains none of this information, nor does any of it appear to exist in any of the files provided by the County in support of its conclusions.[101]

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[97] Pub. Res. Code § 21002.1; 14 Cal. Code Reg. §§ 15063, 15064.
[98] Pub. Res. Code § 21060.5 (emphases added).
[99] Pub. Res. Code § 21068 (emphasis added).
[100] See User's Guide for CalEEMod Version 2016.3.2; http://www.caleemod.com/.
[101] Fox Comments, p. ___.

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Far from estimating imprecise impacts to air quality due to construction emissions, the IS/ND simply fails to estimate these impacts at all. Construction emissions are not calculated, air quality significance thresholds are not presented for them, existing ambient air quality data are not presented, and the impacts of construction emissions on ambient air quality are not disclosed. Instead of estimating construction emissions and comparing them to ICAPCD's significance thresholds, the IS/ND concludes, with no analysis at all, that all construction emissions are not significant: "Emissions from construction equipment would be temporary and not exceed any air quality thresholds or significantly contribute to an existing regional nonattainment condition…"[102]

Dr. Fox explains that impacts from "temporary" construction emissions are routinely found to be significant.[103] ICAPCD, in fact, states in its guidance on construction emissions that "[i]t is not uncommon for construction-related emissions, which are generally temporary in nature, to have a temporary adverse impact on air quality."[104] Construction activities like demolition, grading, excavation, cut-and-fill operations, trenching, soil compaction, land clearing and grubbing "can cause substantial increases in localized concentrations of [particulate matter.]"[105]

The IS/ND states, without evidentiary support, that any emissions from construction activities will be insignificant. As the document contains no estimate of such emissions, however, there is no basis for this conclusion. Dr. Fox, meanwhile, estimates that emissions of PM10 and NOx and their attendant impacts to health and the environment due to construction activity will indeed be significant.[106]

Imperial County is already in violation of ambient air quality standards for PM2.5, PM10, and ozone (federal 8-hour).[107] As Dr. Fox states, "Imperial County fails the American Lung Association's (ALA's) State of the Air annual rankings for Imperial County (grade F). The ALA concludes that 'If you live in Imperial County,

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[102] IS, pdf 19.
[103] Fox Comments, p. ___.
[104] Imperial County APCD, CEQA Air Quality Handbook, November 2007, Section 4.2, p. 11.
[105] *Id.*
[106] Dr. Fox comments, 16.
[107] U.S. EPA, California Nonattainment/Maintenance Status for Each County by Year for all Criteria Pollutants, May 31, 2020; https://www3.epa.gov/airquality/greenbook/anayo_ca.html.

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the air you breathe may put your health at risk.'"[108] Based on Dr. Fox's calculations of emissions from construction activity at the Project site, emissions will increase and "any increase in PM2.5, PM10, or ozone precursors (ROG, NOx) due to construction (and operation) of the Project is a per se significant air quality and public health impact as they contribute to an acknowledged significant health risk."[109] Because this impact would clearly be significant, mitigation measures are required. Because the IS/ND failed to even estimate emissions and their impacts, a Negative Declaration is inappropriate and an EIR must be prepared.

B. There is a Fair Argument that the Project Could Result in Significant Impacts to Public Health from Valley Fever

As pointed out by Dr. Fox in her comments, the Project site is located in an area that is endemic for Coccidioidomycosis (abbreviated as cocci), commonly known as Valley Fever. Coccidioidomycosis is an infectious disease caused by inhaling the spores of *Coccidioides ssp.*[110,111] Clinical manifestations range from influenza-like illness to progressive pulmonary disease and, in 1% of infections, potentially fatal disseminated disease.[112] When soil containing this fungus is disturbed by activities such as digging, vehicle use, construction, dust storms, or during earthquakes, the fungal spores become airborne.[113,114] Valley Fever outbreaks during construction in

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108 American Lung Association, State of the Air, California: Imperial County; http://www.stateoftheair.org/city-rankings/states/california/imperial.html.
109 Dr. Fox comments, 15.
110 Two species of *Coccidioides* are known to cause Valley Fever: *C. immitis*, which is typically found in California, and *C. posadasii*, which is typically found outside California. See Centers for Disease Control, Coccidioidomycosis (Valley Fever), Information for Health Professionals; https://www.cdc.gov/fungal/diseases/coccidioidomycosis/health-professionals.html.
111 D. R. Hospenthal, Coccidioidomycosis and Valley Fever, Medscape, Updated September 20, 2018; https://emedicine.medscape.com/article/215978-overview.
112 Cummings et al., Point-Source Outbreak of Coccidioidomycosis in Construction Workers, *Epidemiology and Infection*, v. 138, no. 4, 2010, pp. 507-511, 2010 (Exhibit --).
113 California Department of Public Health, Valley Fever Fact Sheet, January 2016; https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/ValleyFeverFactSheet.pdf. *See also* G. Sondermeyer Cooksey et al., Update on Coccidioidomycosis in California, pp. 20-21, Medical Board of California Newsletter, v. 141, Winter 2017; https://www.mbc.ca.gov/Download/Newsletters/newsletter-2017-01.pdf.
114 Cummings et al. 2010 (Exhibit 14).

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California have been widely reported.[115,116,117,118,119,120] Spores raised during construction and/or wind storms,[121] which are common in the area, can result in significant worker and public health impacts. Imperial County is endemic for Valley Fever.[122] Valley Fever cases have increased significantly since the Heber 2 facility was constructed[123,124] in 1992,[125] including in Imperial County, where 42% of the cases occurred in El Centro.[126]

"Workers disturbing soil in areas where Valley Fever is common are at highest risk," with construction workers topping the list.[127] As the proposed site has the potential to contain Coccidioidomycosis spores and it is well known that they

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[115] Jason A. Wilken et al., Coccidioidomycosis among Workers Constructing Solar Power Farms, California, USA, 2011–2014, *Emerging Infectious Diseases*, v. 21, no. 11, November 2015; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4622237/.
[116] The Associated Press, Valley Fever Hits 28 at Calif. Solar Plant Sites, *The San Diego Union-Tribune*, May 1, 2013; http://www.sandiegouniontribune.com/sdut-valley-fever-hits-28-at-calif-solar-plant-sites-2013may01-story.html.
[117] G. L. Sondermeyer Cooksey et al., Dust Exposure and Coccidioidomycosis Prevention Among Solar Power Farm Construction Workers in California, *American Journal of Public Health*, August 2017 (Exhibit --).
[118] Rupal Das et al., Occupational Coccidioidomycosis in California, Outbreak Investigation, Respirator Recommendations, and Surveillance Findings, *Journal of Occupational and Environmental Medicine*, May 2012, vol. 54, no. 5, pp. 564-571 (Exhibit --).
[119] D. Pappagianis and the Coccidioidomycosis Serology Laboratory, Coccidioidomycosis in California State Correctional Institutions, *Annals of the New York Academy of Sciences*, v. 1111, pp. 103-111, 2007 (Exhibit --).
[120] K. C. Cummings et al., Point-source Outbreak of Coccidioidomycosis in Construction Workers, *Epidemiology and Infection*, v. 138, 2010, pp. 507-511 (Exhibit --).
[121] P. L. Williams, D. L. Sable, P. Mendez, and L. T. Smyth, Symptomatic Coccidioidomycosis Following a Severe Natural Dust Storm: An Outbreak at the Naval Air Station, Lemoore, Calif, *Chest*, pp. 566-70, 1979; https://pubmed.ncbi.nlm.nih.gov/498830/.
[122] California Department of Public Health, Valley Fever Fact Sheet; https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Coccidioidomycosis.aspx#.
[123] Barbara Feder Ostrov and Harriet Blair Rowan, Valley Fever Cases Climb in California's Central Valley—and Beyond, December 17, 2019; https://khn.org/news/valley-fever-cases-climb-in-californias-central-valley-and-beyond/.
[124] CDC, Valley Fever (Coccidioidomycosis) Statistics; https://www.cdc.gov/fungal/diseases/coccidioidomycosis/statistics.html.
[125] IS, pdf 9, 11, 22, 27, 28, 40, 53, 73, etc. Other sources report 1985; https://en.wikipedia.org/wiki/List_of_power_stations_in_California.
[126] Stephen Munday, Imperial County Public Health, Overview of Coccidioidomycosis (Valley Fever), May 21, 2013, df 21, 24; http://imperial.granicus.com/MetaViewer.php?view_id=2&clip_id=455&meta_id=59137.
[127] Wilken 2015, pdf 19.

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can easily become airborne when soil is disturbed,[128] the Project construction site should be tested well in advance of construction to determine if spores are present. Accurate test methods have been developed and used in similar applications.[129,130] A study conducted in the Antelope Valley, slated for six solar ranches of varying sizes, concluded that soil analyses should be conducted before soil disturbance in endemic areas, noting: "Based on the findings of this study, we recommend that EIRs include soil analyses for *Coccidioides spp.* on land destined for construction of any type in endemic areas of the pathogen."[131] An Environmental Assessment for a solar project in a nearby area has required soil testing.[132]

Recommendations that go far beyond the conventional dust control measures included in the Applicant's CUP have been developed by the California Department of Public Health and other agencies. And on top of these, Dr. Fox recommends additional mitigation measures to protect construction worker health, including the following:

- Continuously wet the soil before and while digging or moving the earth. Landing zones for helicopters and areas where bulldozers, graders, or skid steers operate are examples where continuously wetting the soil is necessary.
- When digging a trench or fire line or performing other soil-disturbing tasks, position workers upwind when possible.
- Place overnight camps, especially sleeping quarters and dining halls, away from sources of dust such as roadways.

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[128] Colson et al. 2017, p. 451 ("A correlation between soil disturbances due to large-scale renewable energy construction projects, agricultural management practices and PM10 fugitive dust emission with increased incidence of coccidioidomycosis was clearly indicated by results of this study."), p. 456 ("One such danger is *Coccidioides spp.* arthroconidia becoming airborne when soil is disturbed and dust mitigation measures are inefficient or absent.").
[129] J. R. Bowers et al., Direct Detection of Coccidioides from Arizona Soils Using CocciENV, a Highly Sensitive and Specific Real-time PCR Assay, *Medical Mycology*, 2018 (Exhibit 18); and Proceedings of the 60th Annual Coccidioidomycosis Study Group Meeting, April 8–9, 2016, Fresno, CA; http://coccistudygroup.com/wp-content/uploads/2016/10/CSG-60th-Annual.pdf.
[130] Colson et al. 2017, pp. 439–458.
[131] Colson et al. 2017, p. 456.
[132] Final Environmental Assessment for Construction, Operation, and Decommissioning of a Solar Photovoltaic System at Marine Air Ground Task Force Training Command Marine Corps Air Ground Combat Center, Twentynine Palms, California, November 2015, Table ES-1, AQ-17; https://www.29palms.marines.mil/Portals/56/Docs/G4/NREA/Environmental%20Assessment%20Construction%20and%20Operation%20of%20Solar%20Photovoltaic%20System%20at%20MAGTFTC,%20MCAGCC%20(Final)%20November%202015.pdf.

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- Minimize the amount of digging by hand. Instead, use heavy equipment with the operator in an enclosed, air-conditioned, HEPA-filtered cab.

The IS/ND, however, is silent on this potentially significant impact. Further, the dust control measures included in the CUP are not adequate to control Valley Fever spores raised during Project construction. Indeed, Dr. Fox states, projects that have implemented similar conventional PM10 dust control measures have experienced fugitive dust issues and reported cases of Valley Fever.[133,134] The very existence of this potentially significant impact, as well as the mitigation measures that must be implemented to avoid it, requires the preparation of an EIR.

C. The IS/ND's Methods for Evaluating a Hazard Analysis and the Possibility of Accidents or Explosions at the Site Are Inadequate and Unsupported

Hazard analyses should be based on a worst-case scenario. While the IS/ND acknowledges that this the legal standard, it only evaluates hazards and potential accidents from the hypothetical scenario of a single tank accident, rather than considering an accident at an OEC, which contain more isopentane and would cause much more significant damage in an accident than one of the small tanks which the County included in the IS/ND's hazards assessment. As Dr. Fox points out, if one takes the IS/ND's analysis, given the new configuration of the tanks, an accident could cause worst-case hazard impacts that are up to five times higher than disclosed.[135]

Furthermore, the IS/ND failed to even evaluate the worst-case release scenario. The IS/ND acknowledges five possible release scenarios: flash fire, pool fire, boiling liquid expanding vapor explosion (BLEVE), vapor cloud explosion, and jet fire.[136] The IS selected a vapor cloud explosion as the "most appropriate consequence" with no explanation or justification whatsoever.[137] However, a

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[133] Herman K. Trabish, Green Tech Media, Construction Halted at First Solar's 230 MW Antelope Valley Site, April 22, 2013; http://www.greentechmedia.com/articles/read/Construction-Halted-At-First-Solars-230-MW-Antelope-Valley-Site.
[134] Julie Cart, 28 Solar Workers Sickened by Valley Fever in San Luis Obispo County, *Los Angeles Times*, May 1, 2013; http://articles.latimes.com/2013/may/01/local/la-me-ln-valley-fever-solar-sites-20130501.
[135] Dr. Fox comments, 47.
[136] IS, pdf 301: Hazard Assessment, p. 6.
[137] Ibid.

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BLEVE is the worst case release scenario for very flammable materials such as isopentane because it combines both the mechanical effects of an explosion and the thermal effects of a fire. Due to these dual effects, it is one of the most severe accidents that can happen and typically results in mortalities.[138] A BLEVE cannot be ruled out as a possible accident scenario, and would result in much greater impacts than the vapor cloud explosion evaluated in the IS/ND. An EIR is required to accurately evaluate and mitigate the Project's potentially significant hazardous materials impacts.

D. There is a Fair Argument that Extending the Life of the Project Could Result in Geologic Impacts

Though the IS/ND does not analyze or discuss geologic impacts of extending the life of the facilities at the site for 30 more years, it concludes that the "[d]evelopment of the proposed facilities would not result in the destabilization of any soils or geologic units that could cause a landslide, subsidence, or liquefaction."[139]

It is clear from the Geotechnical Report Update, however, that the Project site is located over a geothermal fluids reservoir where fluids extraction and reinjection are causing annual ground settlement of 1 to 2 inches.[140] These shifts can impact farming operations and other infrastructure at or near the surface, as stated in the 2019 SEC filing:

> Another aspect of geothermal operations is the management and stabilization of subsurface impacts caused by fluid injection pressures of production and injection fluids to mitigate subsidence. In the case of the geothermal resource supplying the Heber complex, pressure drawdown in the center of the well field has caused some localized ground subsidence, while pressure in the peripheral area has caused localized ground inflation. Inflation and subsidence, if not controlled, can adversely affect farming operations and other infrastructure at or near the land surface. Cost of failing to stabilize site pressures in the Heber Complex area include repair and modification of gravity-based farm irrigation systems and municipal sewer piping and repair or replacement of a local road bridge spanning an irrigation canal.[141]

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[138] See Dr. Fox comments, 45–47.
[139] IS, Section VII: Geology and Soils, Sections VII(c) and (d), pdf 24.
[140] Mariana Eneva and others, Surface Deformation at the Heber Geothermal Field in Southern California, Proceedings, 44th Workshop on Geothermal Reservoir Engineering, February 11-13, 2019, p. 9, pdf 9.
[141] SEC, Form 10-K, p. 11, pdf 41, December 31, 2019.

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The presence of highly explosive isopentane makes the impacts from structural damage and accidents much more concerning. Both on-site personnel and off-site receptors are at risk of health impacts and mortality. An EIR must be prepared to adequately evaluate these risks.

E. There is a Fair Argument that Special Status Species Could Occur in the Vicinity of the Project Site and Could be Adversely Affected by the Project

The IS/ND claims that there will be no significant impact to migratory bird species that are listed by the USFWS's IPaC to have the potential to occur in the vicinity of the Project site, based on its assertion that the site is devoid of vegetation or water resources and contains no suitable habitat.[142] Evidence of this assertion is allegedly found in Figure 6 and Appendix A, which show photographs of the site depicting geothermal facilities foregrounded by bare dirt lots.[143] These photos, however, do not support any conclusion other than that facilities of some kind exist at the place where the photos were taken. The bare ground does not lead to the conclusion that no water resources or sensitive communities are present on or near the site.

As pointed out in Mr. Smallwood's comment letter, birds "inhabit the lower atmosphere just as they necessarily inhabit terrestrial or aquatic environments."[144] The bare ground that the IS/ND's photos depict does not deter birds from flying over it. "Volant wildlife often fly over bare ground to migrate, disperse, forage, patrol home ranges, or to move from one habitat patch to another."[145]

Collisions with static structures such as those in the proposed Project, are known to be the cause of bird fatalities and wildlife fatality monitoring at several industrial solar projects, including some near the Project site, indicates an average collision and entrapment fatality rate of 17.4 birds per kilometer of security fencing.[146] By this measure, the Project's existing 1,615 meters of security fencing likely results in 28.1 birds killed per year. The Project's proposal to extend the life of the complex by 30 years is likely to result in 843 birds killed by the fence alone.[147]

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[142] IS/ND at PDF page 20–21.
[143] IS/ND at PDF pages 15, 48–52.
[144] Smallwood Comments, p. 4.
[145] *Id.*
[146] *Id.*
[147] *Id.*

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Using the collision fatality rate found at nearby solar projects of 91.4 birds per kilometer of generation tie-ins, Mr. Smallwood estimates that the Project's 1 kilometer of powerlines likely kills 91.4 birds per year, which would likely result in 2,742 birds over the proposed 30-year extension.[148] Acknowledging that it is more difficult to translate the solar projects' data on collisions with those sites' powerblocks to collisions with the proposed Project's energy converters and storage tanks, Mr. Smallwood adjusts his calculation of the collision rate using 65% of the volume of the solar powerblocks to accommodate for a potentially smaller volume at the Heber Complex. The according fatality rate predicts annual fatalities of 31 bats and 315 birds.[149] This is a potentially significant impact on biological resources, which could also result in illegal take of special status bird or bad species.

All told, if the life of the Project is extended 30 years, the existing and proposed structures could result in 13,050 birds and 930 bats. The IS/ND, however, concludes that the Project will have no impact on wildlife.

Mr. Smallwood's calculations provide substantial evidence demonstrating that there is a fair argument that the Project will result in significant impacts to wildlife, and that an EIR must be prepared to assess those potential impacts.

F. The IS/ND Fails to Disclose the Project's Construction or Operational GHG Emissions, and Relies on an Inapplicable Significance Threshold

The IS/ND fails to meaningfully describe or analyze the Project's construction and operational GHG emissions. With regard to construction emissions, the IS/ND simply states that the Project's construction equipment will "emit greenhouse gases," then concludes, with no analysis, that these emissions would be "minor," "temporary," and "well under the 10,000 C02e lb/day threshold established by AB 32."[150] With regard to operational emissions, the IS/ND states, with no supporting evidence, that long-term emissions from the Heber 2 Complex would "remain the same or very similar to the existing emissions profile."[151] The IS/ND makes no attempt to quantify or qualify the Project's GHG emissions in any manner authorized by the CEQA Guidelines.[152] The IS/ND therefore lacks any evidence to support its conclusion that the Project would have insignificant GHG impacts.

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[148] *Id.*
[149] *Id.*
[150] IS/ND, p. 23.
[151] IS/ND, p. 24.
[152] 14 Cal. Code Regs § 15064.4.

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The IS/ND also relies on an inapplicable GHG threshold to evaluate construction and operational GHG impacts. Under the CEQA Guidelines, a lead agency must analyze a project's impacts on GHG emissions.[153] The Guidelines allow for several approaches to this analysis, both qualitative and quantitative. The Guidelines explicitly mandate, however, that the "analysis should consider a timeframe that is appropriate for the project. The agency's analysis also must reasonably reflect evolving scientific knowledge and state regulatory schemes."[154]

The IS/ND relies on the AB 32 10,000 C02e lb/day threshold.[155] This significance threshold, however, is not applicable to the Project, because it was developed to comply with the state reduction target as it is embodied in AB 32,[156] which mandates that statewide greenhouse gas emissions be reduced to 1990 levels by the target year 2020.[157] In 2016, the state passed SB 32,[158] which codified a new statewide 2030 GHG emissions reduction target of 40% below 1990 levels. Following the new legislation, the California Air Resources Board ("CARB") adopted in December 2017 a new scoping plan to outline the strategy needed to achieve SB 32 GHG targets. These are the binding "state regulatory scheme" that the CEQA Guidelines require agencies to account for.

The AB 32 threshold applies only through 2020, and does not account for or include any numeric threshold for compliance with SB 32 or the scoping plan and are therefore not applicable to projects that will be built and operated beyond the AB 32 target year.[159] Because the Project's first fully operational year would be after 2020, and it would continue to operate many years beyond that, the County must analyze the Project for its compatibility with the state's mandated goals for, at the very least, the year 2030 and beyond.[160]

An EIR must be prepared to correct these substantial deficiencies in the County's analysis of the Project's GHG impacts.

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[153] 14 CCR §15064.4.
[154] 14 CCR §15064.4(b)
[155] IS/ND, p. 23.
[156] See, California Environmental Quality Act Air Quality Guidelines, Bay Area Air Quality Management District, May 2017, at p. D-27.
[157] California Air Resources Board, Assembly Bill 32 Overview; available at: https://www.arb.ca.gov/cc/ab32/ab32.htm, accessed April 3, 2019.
[158] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32
[159] See also *Cleveland National Forest Foundation v. San Diego Assn. of Governments* (2017) 3 Cal.5th 497.
[160] SWAPE Comments, p. 21.

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G. There is a Fair Argument that the Project Will Have Significant Impacts on Water Supply

The IS/ND asserts that "[n]o additional water will be required to support the proposed facilities … The existing Heber 2 facility will provide the water via existing permits."[161] As Dr. Fox explains, however, relative to baseline conditions, the Project will increase water use at the facility by 69% through use of its two new water-cooled energy converters.[162,163]

The Imperial Irrigation District ("IID"), which supplies Colorado River water for the Project, adopted the Imperial Integrated Regional Water Management Plan ("IRWMP") in 2012. The IRWMP finds that "[r]enewable energy projects that result in intensification of water use could have a negative effect on agricultural water supplies unless mitigated" and requires that "[t]o the extent that water is proposed for power plant cooling, the developer shall demonstrate that alternative water supply sources and alternative cooling technologies are unavailable, environmentally undesirable, or economically unsound."[164] The IS/ND contains no such demonstration and fails to even disclose that the Project will increase water use from the IID relative to baseline conditions.

Moreover, the Water Quality Control Plan (Basin Plan) for the Colorado River Basin Region[165] states that fresh inland waters should only be used for power plant cooling if other sources or other methods of cooling would be environmentally undesirable or economically unsound. This policy requires that power plant cooling water should come from, in order of priority: (1) wastewater being discharged to the ocean; (2) ocean water; (3) brackish water from natural sources or irrigation return

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[161] IS, Reclamation Plan Application, pdf 333.
[162] Dr. Fox explains in her comments at pages 8 and 59 that CEC generation data for selected years for the original Heber units shows that the proposed action would increase generation by up to 128,043 MWh/year, or 65%. An upgrade to the facility in 2002 increased capacity to 44/47 of the original capacity. The current proposal would increase the capacity to 47/44 over 2003 output, or 65% x 47/44 = 69% over 2019 output.
[163] Dr. Fox further explains that water-cooled geothermal binary power plants, such as the Heber units, have the highest water consumption rate per megawatt hour of any thermal power plant technology.
[164] Imperial Water Forum, Imperial Region Integrated Regional Water Management Plan, October 2012, Chapter 8, Reduce Water Demand – Increase Water Use Efficiency, p. 8-22; http://imperialirwmp.org/2013%20Updates/finalirwmp.html.
[165] Water Quality Control Plan for the Colorado River Basin Region, January 8, 2019; https://www.waterboards.ca.gov/coloradoriver/water_issues/programs/basin_planning/docs/bp032014/r7_bp2019fullbp.pdf.

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flow; (4) inland waste waters of low total dissolved solids; (5) other inland waters.[166] The IS is silent on this policy and its application to the Project's water use, thus failing as an informational document under CEQA. Irrigation return flows, for example, would be available from IID.

The existing CUP states that "If the amount of water available to Imperial County is reduced by the Central Arizona project, the right to the irrigation water for the five years granted herein may be terminated."[167] Ongoing drought conditions in the area supplying the IID water puts the Project's water supply at risk. Thus, the existing water supply is not only inadequate, it is also insecure. The IS/ND is silent on the availability and source of the increase in water required to operate the Project and alternative water supply sources in the event that IID water is inadequate.

The increase in water use will result in significant impacts not disclosed or mitigated in the IS/ND. This increase in water use is for cooling purposes, specifically for evaporation and blowdown in the Project's cooling towers.[168] Heber 1 is primarily a flash steam plant. The only significant water use is for cooling tower water makeup. The cooling system is an evaporative (wet) system, and all makeup water not supplied by condensate is provided by water from the IID canal. At Heber 2, the condensers are cooled by a closed-loop wet cooling tower system. Because all of the geothermal brine is returned to the resource aquifer, and none is used for steam production, there is no condensate to be recovered for other uses.[169] Thus, all of the cooling tower makeup water is supplied from the IID canal.[170]

The IID's Interim Water Supply Policy ("IWSP"), which provides a mechanism to address new water supply requests for proposed projects being developed within the IID service area, currently designates up to 25,000 AFY of IID's annual Colorado River water supply for non-agricultural projects within its service area.[171] The Project's proposed use of IID Colorado River water for power

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166 Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling, p. 4, Principle #1. Adopted June 19, 1975, Resolution No. 75-58; https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/1975/rs75_058.pdf.
167 Imperial County, Agreement for Conditional Use Permit #06-0006, ORCAL/Heber Field Company, April 25, 2006, Document 2006-020097, pdf 14. Exhibit 14.
168 Doering and Jordan, Heber KGRA, pdf 11-12.
169 Dr. Fox Comments, p. 61.
170 Ibid.
171 IID, IID's Interim Water Supply Policy for Non-Agricultural Projects, adopted September 29, 2009, fee schedule revised 2015, p. 1; http://www.iid.com/home/showdocument?id=9599.

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plant cooling is inconsistent with the IRWMP. The County must disclose this inconsistency in an EIR. The County must also require the applicant to demonstrate that alternative water supply sources and alternative cooling technologies are unavailable, environmentally undesirable, or economically unsound prior to allowing the use of Colorado River water for the proposed Project.[172]

VII. THE IS/ND CONCEDES THAT MITIGATION IS REQUIRED

The IS/ND makes several references to measures that will be implemented during construction to reduce impacts on the environment. Control measures, for example, will allegedly be taken "to minimize the potential for construction fugitive dust and particulate matter releases," consistent with Imperial County 2019 PM10 and PM2.5 Plans.[173] The IS/ND further claims that "[t]hrough the application of these [unidentified] measures, the construction of the Project would limit visible dust emissions and particulate matter emissions to 20 percent opacity and/or 150 lb/day, and therefore, be in compliance with Imperial County's approach to minimizing these construction related emissions."[174]

The implementation of mitigation measures indicates that an IS/ND is the incorrect environmental analysis document for the Project. If mitigation measures are required to avoid significant impacts to the environment, a Mitigated Negative Declaration or an EIR must be prepared.

Furthermore, it is improper to defer the formulation of mitigation measures under CEQA. Courts have imposed several parameters for the adequacy of mitigation measures. First, the lead agency may not defer the formulation of mitigation measures until a future time unless there are specific performance standards capable of mitigating the project's impacts to a less than significant level. Deferral is impermissible where an agency simply requires a project applicant to obtain a report and then comply with any recommendations that may be made in

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[172] Dr. Fox explains in her Comments at pages 63–64 that other technologies, which consume much less water, are widely available and in use by the Applicant. Dry cooling, for example, is technologically feasible as demonstrated by some of Ormat's other operational geothermal binary OEC plants in the United States and all over the world. Not only would dry cooling eliminate the plant's water demand, it would also eliminate particulate matter emissions in an airshed that is designated as nonattainment for PM10.
[173] IS, pdf 19. "Emissions from construction equipment would be temporary and not exceed any air quality thresholds or significantly contribute to an existing regional nonattainment condition…"
[174] IS, pdf 19.

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the report.[175] Second, a public agency may not rely on mitigation measures of uncertain efficacy or feasibility. Third, "[m]itigation measures must be fully enforceable through permit conditions, agreements, or other legally binding instruments."[176] Fourth, mitigation measures that are vague or so undefined that it is impossible to evaluate their effectiveness are legally inadequate.

With respect to this Project, the IS/ND fails to satisfy the basic purposes of CEQA. The IS/ND failed to adequately disclose, investigate, and analyze the Project's potentially significant impacts, and in some places states that mitigation measures will be implemented—making an EIR the appropriate environmental review document—while at other times requiring no mitigation to reduce potential impacts to less than significant levels. Because the IS/ND lacks basic information regarding the Project's potentially significant impacts, the IS/ND's conclusion that the Project will have no significant impact on the environment is unsupported.[177] The County failed to gather the relevant data to support its findings and repeatedly and impermissibly deferred analysis and formulation of mitigation measures to future reports. Finally, the County's own evidence and that of experts provide substantial evidence showing that the Project may result in potentially significant impacts. Therefore, a fair argument can be made that the Project may cause significant impacts requiring the County to prepare an EIR.

A. The IS/ND Fails to Consider Feasible Mitigation to Reduce Potentially Significant impacts to Less than Significant Levels

Dr. Fox describes numerous readily available, feasible mitigation measures to reduce many of the Project's significant impacts to less than significant levels. The County should consider and implement these measures in a binding mitigation plan as part of an EIR.

1. <u>Construction Mitigation</u>

As Dr. Fox points out, the IS/ND's conclusions rely on mitigation of air quality impacts but the document contains no such control measures. The IS/ND contains no mitigation for "potential fugitive dust and particulate releases,"[178]

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[175] *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359, 1393; *Quail Botanical Gardens Foundation v. City of Encinitas* (1994) 29 Cal.App.4th 1597, 1604, fn. 5.
[176] 14 Cal. Code Reg. § 15126.4(a)(2).
[177] Pub. Res. Code § 21064.5.
[178] Ibid.

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which would contribute to existing violations of ambient air quality standards, a potentially significant impact. Further, construction emits other pollutants, including the ozone precursors ROG and NOx. As the area where the Project will be located is in violation of ozone ambient air quality standards, increases in ROG and NOx from construction equipment could contribute to an existing violation of the ozone standard, which is a significant impact. Thus, mitigation is required and an EIR must be prepared.

Dr. Fox agrees that construction ozone emissions are likely significant because the area where the Project is located currently violates ozone ambient air quality standards and construction would increase ozone precursor emissions. She explains, however, that shutting off equipment that is not in use—a mitigation measure recommended by the Application to Amend CUP 06-0006—will not mitigate this impact because idling emissions are a very small fraction of ozone precursor emissions. Thus, assuming ozone emissions are significant, and the IS/ND contains no estimate of ozone-precursor emissions, this proposed mitigation would do nothing to mitigate the significant impact. These emissions can be significantly reduced by requiring high tier (Tier 3 or 4) construction equipment and/or tailpipe controls such as catalytic converters.[179]

2. Operational Mitigation

As the facility will emit isopentane, which is a reactive organic gas (ROG) as well as other criteria pollutants, mitigation is required to avoid significant impacts.

The major source of ROG emissions is fugitive sources, such as pumps, valves, flanges, and connectors.[180] The ROG emission calculations in the ATC, relied upon in the IS/ND, assumed the use of the U.S. EPA's leak detection and repair (LDAR) program[181] to estimate ROG emissions from fugitive sources. The ROG emissions from fugitive sources can be mitigated by implementing an enhanced LDAR program and the use of leakless and low-leak technology,

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[179] Dr. Fox Comments, p. 19.
[180] ATC, Table 4, pdf 18.
[181] U.S. Environmental Protection Agency, Leak Detection and Repair Compliance Assistance Guidance, A Best Practices Guide, October 2007; http://www2.epa.gov/sites/production/files/2014-02/documents/ldarguide.pdf.

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including:[182]

- Reduce the leak detection threshold from 10,000 ppmv to 500 ppmv for all components except pumps in the motive fluid system, where the threshold should be 2,000 ppmv.
- Leak minimization after detection must occur as soon as possible after detection and no later than 24 hours after leak discovery.
- Leak repair must occur as soon as possible after detection and no later than 7 days after leak discovery.
- All leak detection monitoring must be done with both a USEPA Method 21 portable analyzer and a new hand-held infrared camera.
- Leakless and low-leak technology must be used to prevent fugitive emissions of the motive fluid.
- Require monthly LDAR inspections.

Additional reduction of ROG emissions can be achieved by the following mitigation measures proposed by Ormat Nevada, Inc. for its Casa Diablo IV Geothermal Development Project in Mono County:[183]

a) Install vapor recovery devices estimated to return at least 99% of the motive fluid back to the system.

b) Use a maintenance vapor recovery unit during OEC unit maintenance activities to capture motive fluid that could otherwise be released.

c) Lower pressure of motive fluid system compared to motive fluid used at older existing plants, thus, less potential for fugitive leaks/emissions.

d) Place pentane-specific vapor sensors and flame detectors at strategic locations around the around the turbine, motive fluid pumps, and motive fluid storage tank and connection to power plant computer control system to quickly alert plant operators to any potentially hazardous situations, which would help to keep a check on significant leaks.

e) Perform leak checks, inspections, monitoring, and leak logging.

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[182] ESA, Casa Diablo IV Geothermal Power Plant Draft Supplemental Environmental Impact Report, August 2020, Chapter 3; https://files.ceqanet.opr.ca.gov/139190-6/attachment/uz9O5pnLE-zHa0ulN3BgkuisP8fXYGyhCgPux2Zx7m8nGPwgcghuwFJ4IZOvzQ67LT2cQOGEv1rTrdyV0.
[183] County of Imperial, East Brawley Geothermal, Final Environmental Impact Report, May 2012; ftp://ftp.co.imperial.ca.us/icpds/eir/east-brawley-geothermal/final/07minor-revisions-deir.pdf.

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Further, Dr. Fox explains, the ATC Application indicates VOC emissions would be offset, implying offsets are mitigation. The ATC Application therefore demonstrates that the Project's excess VOC emissions are significant and require mitigation. However, the IS/ND cannot rely on offsets to mitigate air quality impacts because they are not valid CEQA mitigation unless they reduce the emissions at the location where the impact occurs.[184] Emission reduction credits ("ERCs") are not an acceptable substitute for performing local air quality analyses and mitigating the local impacts themselves. A revised CEQA document should prohibit the use of offsets to mitigate air quality impacts, except those offsets that occur at the project site at the time of project startup. Instead, conventional mitigation is required to reduce the significant ROG emissions.

VIII. THE IS/ND FAILS TO PROPERLY EVALUATE POTENTIALLY SIGNIFICANT CUMULATIVE IMPACTS

An EIR must discuss significant "cumulative impacts."[185] This requirement flows from CEQA section 21083, which requires a finding that a project may have a significant effect on the environment if

> the possible effects of a project are individually limited but cumulatively considerable. . . . 'Cumulatively considerable' means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.[186]

Cumulative impacts are defined as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts."[187] "[I]ndividual effects may be changes resulting from a single project or a number of separate projects."[188]

"The cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively

[184] See Dr. Fox Comments, p. 32.
[185] CEQA Guidelines § 15130(a).
[186] Pub. Resources Code § 21083(b)(2).
[187] CEQA Guidelines § 15355(a).
[188] *Id.*

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significant projects taking place over a period of time."[189] A legally adequate "cumulative impacts analysis" views a particular project over time and in conjunction with other related past, present, and reasonably foreseeable probable future projects whose impacts might compound or interrelate with those of the project at hand. "Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time."[190]

As the court stated in *Communities for a Better Environment, supra,* 103 Cal.App.4th 98, 114:

> Cumulative impact analysis is necessary because the full environmental impact of a proposed project cannot be gauged in a vacuum. One of the most important environmental lessons that has been learned is that environmental damage often occurs incrementally from a variety of small sources. These sources appear insignificant when considered individually, but assume threatening dimensions when considered collectively with other sources with which they interact.

In this case, the IS/ND's cumulative impact analysis is inaccurate and not in accordance with CEQA for numerous reasons. Most troublesome is the IS/ND's failure to analyze the cumulative impacts of the Project when taken together with the other geothermal facilities at the Heber Complex.

V. THE PROJECT MAY REQUIRE A CEC LICENSE

Dr. Fox's comments illustrate why the Project may require a CEC license:[191]

The subject geothermal facility as described in its Application for an Authority to Construct permit consists of six ORMAT Energy Converters (OECs) at Heber 2 (36 MW) that are operationally interconnected to each other as well as to Goulds 2 (12 MW) and Heber South (12 MW) for a total generating capacity of 60 MW.[192] Other information discussed in [Fox Comment 1, pp. 1–3] indicates that the Heber 2 Complex has a generating capacity of 81-82 MW. The Project will restore generating capacity of the Heber 2 Complex to its original capacity of 92 MW, not 33 MW as asserted in the IS.

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[189] Communities for a Better Environment v. () 103 Cal.App.4th 98, 117.
[190] CEQA Guidelines § 15355(b).
[191] Dr. Fox Comments, pp. 67–70.
[192] Air Sciences Inc., Heber 2 Application for Authority to Construct, November 2019, Section 1.0, pdf 9, Exhibit 11.

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The CEC licenses all thermal power plants over 50 MW in California.[193] The CEC's listing of licensed facilities does not include the Heber Complex.[194] The discussion in Comment 1 indicates that the Heber Complex currently exceeds 50 MW. The Project will extend the life of the Heber Complex by 30 years, from 2019 to 2049.[195] Thus, the Project requires a license from the CEC.

The CEC may delegate siting authority over geothermal power plants and related facilities to county governments that have adopted geothermal elements into their general plan.[196] [Dr. Fox's] research identified a geothermal element in Imperial County's General Plan.[197] However, this element clearly states that all energy facilities are required to undergo review by the CEC as part of an Application for Certification. "The CEC and County of Imperial coordinate the permitting and siting of power plants and any necessary transmission lines."[198] Two tests are required to establish that the Heber Complex is a single facility.

First, the net generating capacity must equal or exceed 50 MW using the calculation method in California Code of Regulations, Title 20, Section 203. Under Section 203, the generating capacity of an electric generating facility is found by subtracting the minimum auxiliary load from the maximum gross rating of the plant's turbine generators. The IS and the record before the County does not contain the information required to make this determination. Thus, the IS fails as an informational document under CEQA.

However, the CEC lists the Heber Complex as a single plant, with four units that share the same identifier (T0033) and a capacity of 81.5 MW.[199] While the record does not contain the information required to make the Section 203 calculation, based on my experience, it is unlikely that the maximum gross rating

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[193] U.S. Department of Energy, California State Plant Commissioning Process—Application for Certification (7-CA-a); https://openei.org/wiki/RAPID/Roadmap/7-CA-a.
[194] California Energy Commission, Alphabetical List of Power Plant Projects; https://ww2.energy.ca.gov/sitingcases/alphabetical_cms.html.
[195] IS, pdf 9.
[196] U.S. Department of Energy, California State Plant Commissioning Process—Application for Certification (7-CA-a).
[197] Imperial County Planning and Development Services Department, Geothermal/Alternative Energy and Transmission: Element, County of Imperial General Plan, October 17, 2006, p. 29; http://www.icpds.com/CMS/Media/Geothermal-TransmissionElement-(2006).pdf.
[198] Ibid.
[199] CEC, Annual Generation – Plant Unit; https://ww2.energy.ca.gov/almanac/electricity_data/web_qfer/Annual_Generation-Plant_Unit_cms.php.

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minus the minimum auxiliary load would be less than 50 MW. Heber energy, for example, is purchased by SCPPA, who reports a net annual generation of 327 gwh and a 60% net capacity factor for the Heber Complex.[200] This corresponds to a net generating capacity of 62 MW, which exceeds 50 MW.

Second, one must establish the connectivity between the components of the Heber 2 Complex, which includes Gould 2 and Heber South.[201] This requires the consideration of four factors:

- sited on contiguous parcels,
- designed, installed, and operated by the same organization,
- have energy and environmental impacts greater than a jurisdictional 50 MW facility, and
- share utility services for water, electrical interconnection, natural gas lines, and/or road access.

All four of these tests are met by the Project.

First, the proposed development would occur entirely on a single 39.99-acre parcel, which also includes the other Heber Complex geothermal facilities, the Goulds 2 and Heber South projects.[202] The proposed Project site is within the existing Heber 2 power plant area. All proposed facilities would be located within the existing fence line and permit area.[203] Finally, the Project shares the same road

[200] Ormat Heber 1; http://scppa.org/page/Ormat-Heber-1.
[201] IS, pdf 9.Charlene Wardlow, Ormat's Geothermal Projects in Imperial County, Imperial Valley Renewable Energy Summit, March 11, 2016, Heber Facility Summary, p. 14; http://ivres.ivedc.com/media/managed/031116_Ormat_presentation_at_IVRES.pdf.
[202] IS, p. 10, 23 ("the proposed facilities would be located within the existing Heber 2 Complex site."), 39 ("The proposed development would occur entirely on the 39.99 Assessor's Parcel Number (APN) 054-250-031. This parcel also includes geothermal facilities for the Goulds 2 and Heber South projects.").
[203] IS, p. 39.

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access as the entire Heber 2 Complex on Dogwood Road,[204] the same fire and emergency access roads,[205] and shared pipelines.[206]

Second, Ormat will design, install, and operate the Heber Complex over the 30-year extension, from 2019 to 2049, as noted in numerous SEC filings and annual reported cited elsewhere in these comments.[207]

Third, the Project proposes to extend the life of the entire Heber 2 complex by an additional 30 years.[208] As demonstrated in [Dr. Fox's Comments], the environmental impacts of the operation of the entire Heber 2 Complex, a 92 MW facility,[209] are significant over the 30-year extension.

Fourth, the Heber Complex geothermal facilities all rely on the same support facilities: cooling towers, vapor recovery unit, emergency generator, fire pumps, and emergency pump.[210] Thus, the proposed 30-year extension of the lifetime of the Heber 2 Complex requires a license from the CEC.

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204 IS, p. 8 (project location and location of entire Heber 2 Complex is 855 Dogwood Road, Heber, CA 92249), p. 30 ("Lone site access is provided via Dogwood Road.").

205 IS, p. 24 (discussing fire department access roads and gates at Heber 2 Complex site); p. 31 (all proposed facilities would be constructed within the existing Heber 2 Complex site and not introduce any transportation hazards, design features, or incompatible uses with surrounding roadways); p. 33 ("The existing Heber 2 Emergency Response Plan addresses project construction and operations. The proposed work is within the existing footprint of ongoing geothermal activities in the Heber 2 plant site.").

206 IS, p. 8 (Project will add additional pipes to connect the proposed facilities with the existing Heber 2 Geothermal Energy Complex).

207 See, for example, https://www.ormat.com/en/projects/all/main/?Country=USA&Seg=0&Tech=6 and the Ormat May 2020 10-Q report cited in Comment 2.1, which states: "Heber Complex (California). We are currently in the process of repowering the Heber 1 and Heber 2 power plants. We are planning to replace steam turbine and old OEC units with new advanced technology equipment that will add a net capacity of 11 MW. Following these enhancements, we expect the capacity of the complex to reach 92 MW. Permitting, engineering and procurement are ongoing as well as manufacturing and site construction. We expect commercial operation in the second half of 2021."

208 IS, p. 8.

209 The current capacity of the complex is 81 MW with a planned expansion to add 11 MW; https://www.ormat.com/en/projects/all/main/?Country=USA&Seg=0&Tech=6.

210 ATC Application, p. 5, pdf 13, Table 1. Existing and Proposed Equipment at Heber 2, Heber South, and Goulds 2.

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IX. CONCLUSION

The IS/ND fails to meet the informational and public participation requirements of CEQA, because it improperly piecemeals environmental review, fails to analyze potentially significant impacts compared to the existing baseline, fails to evaluate the proposed Project and lacks evidence to support the County's environmental conclusions. CEQA requires that an EIR be prepared if there is substantial evidence supporting a fair argument that any aspect of a project may cause a significant effect on the environment, regardless of whether the overall effect of the project is adverse or beneficial.[211] As discussed in detail above, there is substantial evidence supporting a fair argument that the Project may result in significant adverse and unmitigated impacts that were not identified in the IS/ND. An EIR is required for the Project.

Thank you for your consideration of these comments. Please include them in the record of proceedings for the Project.

Sincerely,

Kendra D. Hartmann
Christina Caro

Attachments

KDH:acp

[211] CEQA Guidelines § 15063(b)(1).

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EXHIBIT A

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Comments

on the

Initial Study

for the

Heber 2 Geothermal Repower Project

Heber, California

August 31, 2020

By

Phyllis Fox, PhD, PE

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1. INTRODUCTION

Second Imperial Geothermal Company (the "Applicant") is requesting a Conditional Use Permit (CUP) amendment to modify its facilities at the existing Heber 2 Geothermal Energy Complex located at 855 Dogwood Road, Heber, California, in Imperial County. Imperial County, the CEQA lead agency, has prepared an Initial Study (IS)[1] for this facility.

The IS describes the Project as consisting of two new water-cooled ORMAT Energy Converters (OECs) to replace six old OEC units, three new 10,000 gallon isopentane aboveground storage tanks; and pipes to connect the proposed facilities with the existing Heber 2 Geothermal Energy Complex. The IS states that these modifications would "refurbish the Heber 2 Complex to its original nameplate capacity (33 megawatts) without expanding the existing facility beyond the current footprint…"[2] The IS further states that the permitted life of the entire Heber 2 Complex will be increased by 30 years, from 2019 to 2049.[3]

This description is incomplete, misleading, and inconsistent with information on the Project filed by the Applicant with other agencies. As discussed below, the Project will replace the six OEC units disclosed in the IS. These OEC units are part of the Heber 2 Complex, as stated in the IS. The Heber 2 Complex also includes the Goulds 2 and Heber South units in addition to the six existing OECs.[4] The Project will restore the total generation capacity of the Heber 2 Complex to its original capacity of 92 MW, not 33 MW as asserted in the IS. The owner/operator of the Heber 2 Complex, for example, asserts that the generating capacity of the "Heber Complex" is 92 MW,[5] close to the total generating capacity of 96 MW disclosed in the ATC.[6]

The capacity of the upgraded Complex is critical here because the CEQA lead agency for power generation facilities of 50 MW or greater is the California Energy

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[1] Imperial County, Initial Study & Environmental Analysis for Heber 2 Geothermal Repower Project (IS), Contained in Project Report, Heber 2 Geothermal CUP #19-0017, pdf 2, May 28, 2020; http://www.icpds.com/CMS/Media/2.-Heber-2-Geothermal-CUP19-0017-EEC-Pkg.pdf.

[2] IS, pdf 9.

[3] IS, pdf 9.

[4] IS, pdf 9: "The CUP amendment application also proposes to renew the permitted life of the entire Heber 2 Complex (including the Goulds 2 and Heber South geothermal energy facilities to 30 years (2019-2049)."

[5] Charlene Wardlow, Director of Business Development, Ormat, Ormat's Geothermal Projects in Imperial County, p. 14, Imperial Valley Renewable Energy Summit, March 11, 2016; http://ivres.ivedc.com/media/managed/031116_Ormat_presentation_at_IVRES.pdf.

[6] ATC, pdf 28, Air Emission Calculations, Gross Power Column.

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Commission (CEC), not Imperial County. The CEC has jurisdiction over all power generation facilities of 50 MW and larger, together with their supporting infrastructure. Imperial County is the wrong lead agency under CEQA for this Project.

The Project is described in an Application for an Authority to Construct (ATC)[7] Permit submitted to Imperial County Air Pollution Control District (ICAPCD) as replacing six existing two-level geothermal power generation units at Heber 2 with two new larger units.[8] The ATC Application asserts Heber 2 has a gross combined power output rating of 36 MW,[9] not 33 MW as claimed in the IS. The existing units will be deconstructed and removed from the Facility within five years per County of Imperial requirements.[10]

I reviewed the IS and supporting files supplied by the lead agency, Imperial County, as well as information submitted to other agencies. In my opinion, the IS is substantially deficient and does not fulfill its mandate as an informational document under CEQA to inform the public of potential impacts. My review and analysis of the IS indicate that:

- The Project description is fundamentally flawed.
- The IS and Conditional Use Permit Application recommend mitigation for construction impacts, requiring the preparation of an Environmental Impact Report (EIR).
- The IS fails as an informational document under CEQA for failing to evaluate impacts, including construction and air quality impacts, operational air quality impacts, cumulative air quality impacts, construction health risks, reclamation air quality impacts, and water use impacts, among others.
- Construction PM10 and NOx emissions are significant and unmitigated.
- Valley Fever impacts are significant and unmitigated.
- Operational ROG emissions are significant and unmitigated.
- Water use impacts are significant and unmitigated.
- The IS failed to disclose emissions relative to baseline operation of the entire facility, thus significantly underestimating emissions.
- Cumulative impacts were not evaluated.

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[7] ORMAT Nevada Inc., Application for Authority to Construction (ATC Application), November 2019 (Exhibit 3).

[8] Ibid, pdf 5, 8.

[9] ATC Application, p.1, pdf 9.

[10] ATC Application, Section 1.3, pdf 12.

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- Significant geologic impacts were not evaluated or disclosed.
- Risk of upset (hazards) impacts are significant and unmitigated.
- Imperial County is the wrong lead agency under CEQA. The facility requires a license from the California Energy Commission (CEC).

I have over 40 years of experience in the field of environmental engineering, including air emissions and air pollution control; greenhouse gas (GHG) emission inventory and control; water quality and water supply investigations; hazardous waste investigations; risk of upset modeling; environmental permitting; nuisance investigations (odor, noise); environmental impact reports (EIRs), including CEQA/NEPA documentation; risk assessments; and litigation support. I have MS and PhD degrees in environmental engineering from the University of California at Berkeley and am a licensed professional engineer in California. My resume is included in Exhibit 1 to these comments.

I have prepared comments, responses to comments and sections of CEQA and NEPA documents on air quality, greenhouse gas emissions, water supply, water quality, hazardous waste, public health, risk assessment, worker health and safety, odor, risk of upset, noise, land use, traffic, and other areas for well over 500 CEQA and NEPA documents. This work includes EIRs, EISs, Initial Studies (ISs), Negative Declarations (NDs), and Mitigated Negative Declarations (MNDs). My work has been specifically cited in two published CEQA opinions: *Berkeley Keep Jets Over the Bay Committee, City of San Leandro, and City of Alameda et al. v. Board of Port Commissioners* (2001) 111 Cal. Rptr. 2d 598, and *Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal. 4th 310; and has supported the record in many other CEQA and NEPA cases. I have also presented expert testimony in many California Energy Commission (CEC) cases and before the hearing boards of numerous air districts across the United States.

2. PROJECT DESCRIPTION IS INACCURATE

The Project description in the IS is inaccurate and incomplete. The Application for an Authority to Construct (ATC) permit for the Project, Security and Exchange Commission (SEC) filings, and other publicly available information discussed below indicate that the Heber 2 Geothermal Complex consists of six ORMAT Energy Converters (OECs) that "are operationally interconnected to each other as well as to Goulds 2 and Heber South" as follows:[11]

- Heber 2: 6 OECs
- Heber South: 1 OEC

[11] ATC Application, Section 1.1, pdf 9 and Appendix B, pdf 28.

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- Goulds 2: 1 OEC

The combined generating capacity of these eight units is variously reported in Applicant documents filed elsewhere as ranging from 58 MW[12] to 81 MW.[13] These eight units constitute a single facility, the "Heber Complex," a term that is widely misused in the IS and supporting documents.

The six OECs at Heber 2 are not only operationally interconnected to each other, as well as to Goulds 2 and Heber South, they also share facilities, including the vapor recovery unit, fire pump, emergency pump, cooling towers, a diesel generator, and storage tanks. There is also piping connecting the motive fluid between the units.[14,15] Thus, these units constitute a facility, rather than three separate facilities. The total generating capacity of this "complex" has been reported over the years by its owner to be significantly higher than the 33 MW disclosed in the IS[16] and the 58 MW disclosed in the ATC Application.[17]

Thus, the IS is fundamentally flawed for at least three major reasons. First, it piecemeals operational changes to the facility. The Project is just one part of an overall upgrade of these eight units. Second, the IS only addresses a subset of the changes at the facility. The Project, for example, also requires the repair and enhancement of existing wells and drilling of new wells.[18] Third, Imperial County is the wrong CEQA lead agency. Power generating facilities of 50 MW or greater fall under the jurisdiction of the CEC. Comment 11. My review of the CEC's database of licensed facilities[19] indicates this facility is not listed. Third, the Project description in the IS is incomplete, inconsistent with information filed elsewhere by the Applicant, and littered with errors, rendering an accurate environmental analysis based on the IS as impossible.

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[12] ATC Application, pdf 28, Air Emission Calculations, Gross Power Column.

[13] ORMAT, 2019 Annual Report, pdf 9 (81 MW); http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/21c08b55-9e75-424a-b5b0-d2831cafc0e4.pdf.

[14] ATC Application, Table 1, p. 5, pdf 13.

[15] Heber 1 CUP #04-0024 – Request to Amend, May 7, 2015; http://www.icpds.com/CMS/Media/Heber-Geothermal-Company_Part2.pdf.

[16] IS, pdf 9.

[17] ATC Application, Table 1, p. 5, pdf 13: 36 MW + 10 MW + 12 MW = 58 MW.

[18] SEC, U.S. Securities and Exchange Commission (SEC), Ormat Technologies, Inc., Form 10-K, pdf 46, p. 60, December 31, 2019; http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/21c08b55-9e75-424a-b5b0-d2831cafc0e4.pdf.

[19] California Energy Commission, Alphabetical List of Power Plant Projects; https://ww2.energy.ca.gov/sitingcases/alphabetical_cms.html.

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After considerable research, described in further detail below, I conclude that the Project is an 11 MW addition to the Heber Complex to restore its capacity to 92 MW. However, reaching this conclusion required significant research, including information filed by the Applicant elsewhere, information that should have been disclosed by the Applicant and included in the IS, ATC, CUP Application and other documents before the County. The following sections describe the information I reviewed to reach this conclusion.

2.1. Generating Capacity of the "Complex"

The IS misuses the term "complex," fails to disclose the baseline generation and future generation after the Project is completed, and incorrectly identifies the units that would be modified. This information is essential to estimate air quality and other impacts. The files I reviewed indicate that the information in the IS is misleading, incomplete, full of errors and omissions and inconsistent with information filed by the Applicant elsewhere. Impacts cannot be identified without a complete and accurate project description, which is missing from the IS. Thus, the IS fails as an informational document under CEQA.

The IS[20] states that the purpose of the Project is to allow the existing "Heber 2 Complex" to return to its nameplate energy generation capacity of 33 MW,[21] by replacing six old units dating from 1992.[22] The IS also states that the Heber 2 Complex currently generates less than 33 MW.[23] These two assertions are wrong.

The term "complex" is incorrectly used in the IS because, as discussed in Comment 2, "complex" refers to eight connected generating units (OECs), with a total generating capacity that ranges from 58 MW[24] to 81 MW,[25] not 33 MW as asserted in the IS.

The ATC, for example describes the facility as follows:[26] "The six OECs at Heber 2 are operationally interconnected to each other as well as to Goulds 2 and Heber South.

[20] IS, pdf 9.

[21] IS, pdf 22, 29, 53, 54, 362.

[22] IS, pdf 9.

[23] IS, pdf 53, 361.

[24] ATC Application, pdf 28 (Heber 2 = 36 MW; Gould 2 = 10 MW; Heber South = 12 MW).

[25] ORMAT Technologies, Inc. 2019 Annual Report, pdf 19; https://s1.q4cdn.com/231465352/files/doc_financials/2019/ar/Ormat-2019-Annual-Report.pdf.

[26] ATC, Section 1.1, pdf 9.

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The VRMU and MF storage tanks are shared by all the units and there is piping connecting the MF circuits between the units."

The Conditional Use Permit (CUP) application similarly describes the subject facilities as follows: "This application also proposes to extend the permitted life of the entire Heber 2 Complex (including the related Goulds 2 and Heber South geothermal energy facilities) to 30 years (2019-2049)."[27]

The Applicant's annual reports and filings with the SEC similarly describe the Heber 2 Complex as consisting of six OECs at Heber 2, plus Goulds 2 and Heber South. Further, the asserted nameplate generation capacity of the "complex" in the IS of 33 MW appears to be wrong. The owner/operator of the Heber 2 Complex, for example, asserts that the generating capacity of the "Heber Complex" is 92 MW and "has been sustainably operating since 1985, consisting of Heber 1, Heber 2, Heber South, Gould 1, and Gould 2".[28] Elsewhere, the owner variously reports that the generating capacity of the "Heber Complex" is currently 81 MW[29,30] to 82 MW[31] and includes Heber 1 and 2 and the Goulds Project in the term "Heber Complex".[32] See, for example:[33]

Project Name	Size(MW)	Technology	Resource Cooling	Customer	PPA Expiration
Heber Complex (3)	81	Geothermal dual flash and binary systems using a water cooled system	1°F per year	SCPPA	Heber 1 — 2025 Heber 2 — 2023 Heber South — 2031

[1] PPA = power purchase agreement

This applicant information is consistent with information on file with the CEC, which identifies the following units at Heber with a total output of 81.5 MW:[34]

[27] CUP, p. 2.

[28] Charlene Wardlow, Director of Business Development, Ormat, Ormat's Geothermal Projects in Imperial County, p. 14, Imperial Valley Renewable Energy Summit, March 11, 2016; http://ivres.ivedc.com/media/managed/031116_Ormat_presentation_at_IVRES.pdf.

[29] ORMAT, 2019 Annual Report, pdf 19; http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_ORA_2019.pdf.

[30] SEC, Form 10-K, p. 11, pdf 10, 27, December 31, 2019.

[31] U.S. Securities and Exchange Commission, Form 10-Q, Ormat Technologies, Inc., March 31, 2020, p. 41, pdf 36-37; http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/bd1a8403-baa2-4834-9e2f-29ea970e033c.pdf.

[32] U.S. Securities and Exchange Commission, Form 10-K, Ormat Technologies, Inc., December 31, 2007, p. 9, 24-26; https://www.sec.gov/Archives/edgar/data/1296445/000095013608001172/file1.htm.

[33] U.S. SEC, Form 10-K, December 31, 2019, p. 34, pdf 27.

[34] California Energy Commission (CEC), Annual Generation—Plant Unit, Facility ID # T0033; http://www.icpds.com/CMS/Media/Heber-Geothermal-Company_Part2.pdf.

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- Heber Geothermal Company 1, online 8/1/1985, 52 MW
- Heber Geothermal Company GEN2, online 6/11/2006, 3.5 MW
- Heber Geothermal Company GEN3, online 6/11/2006, 7 MW
- Heber Geothermal Company GEN4, online 3/8/2018, 19 MW

These units are referred to as the "Heber Complex" and currently have a combined generating capacity of 81.5 MW.[35]

The Ormat annual report indicates that the Project will add 11 MW to the Heber Complex, raising its total output to 92 MW.[36] Recent (e.g., September 30, 2019,[37] March 31, 2020[38]) Ormat SEC Form 10-Q filings[39] similarly state:

> *Heber Complex (California).* We are currently in the process of repowering the Heber 1 and Heber 2 power plants. We are planning to replace steam turbine and old equipment with new advanced technology equipment that will add a net capacity of 11 MW. Following these enhancements, we expect the capacity of the complex to reach 92 MW. Permitting, engineering and procurement are ongoing. Manufacturing of equipment is planned to commence in the fourth quarter 2019. We expect commercial operation in early 2021.

The addition of 11 MW to reach the original design capacity of 92 MW is consistent with the CEC position that the facility currently has 81.5 MW (81.5+11 MW = 92.5 MW).

Thus, it appears that the Project is an 11 MW addition to the Heber Complex to restore its capacity to 92 MW. If the 11 MW addition is designed to return the Complex to its design capacity, the 11 additional megawatts will increase all impacts relative to baseline conditions by at least a factor of 1.13 (92/81.5 = 1.13) and likely more, depending on the increase relative to "baseline" operational conditions in a representative two-year period prior to the start of environmental review. The record that I reviewed, supplied in response to PRAs, does not include the information required to establish baseline generation. Thus, the IS and supporting files supplied by Imperial County fail as information resources under CEQA.

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[35] See also CEC, Geothermal Electric Generation, Heber Geothermal Co. capacity = 81.5 MW; gross MWh = 441,041 MWh; https://ww2.energy.ca.gov/almanac/renewables_data/geothermal/index_cms.php.

[36] ORMAT Annual Report, pdf 46.

[37] Ormat Technologies, Inc., Form 10-Q, U.S. Securities & Exchange Commission, September 30, 2019, p. 52, pdf 53; http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/94e40060-5286-4b4f-bc1c-c6549e04d4cf.pdf.

[38] Ormat Technologies, Inc., Form 10-Q, U.S. Securities & Exchange Commission, March 31, 2020, pp. 40-41, pdf 36-37; http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/bd1a8403-baa2-4834-9e2f-29ea970e033c.pdf.

[39] Ormat Technologies, Inc., Form 10-Q, U.S. Securities & Exchange Commission, September 30, 2019, p. 52; http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/94e40060-5286-4b4f-bc1c-c6549e04d4cf.pdf.

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2.2. Baseline Heber Complex Generation

Due to the significant confusion in the Project description and the absence of any baseline data, I examined CEC operating data for the Heber units for the past five years.[40] The actual operating data indicate that if the facility is really only a 33-MW net facility, as asserted in the IS, then it has been operating at a capacity factor of more than 100% in most years, clearly not requiring an upgrade. However, it is more likely that the IS simply incorrectly referred to the units that would be upgraded as the "Heber Complex."

These multiple values for Project capacity make it impossible to reach any legally defensible conclusions about the nature of the proposed project. If (and **only** if) the proposed changes are only to the original 1986 project, and not to any other part of the Heber Complex, then it is possible to draw some conclusions about the proposed Project's impact on Heber generation.

The spreadsheet in Exhibit 2 shows CEC generation data for selected years for the original Heber units. Data before 2001 were not easily available. The spreadsheet shows multiple years with electrical output around 320,000 MWh and a peak output of 326,153 MWh in 2003, the year after net capacity was restored to 44 MW (per Ormat's 2015 Application[41]). The 2019 output of 198,110 MWh suggests that the proposed action would increase generation by up to 128,043 MWh/year, or by 65%.

Because the 2002 upgrade only increased capacity to 44/47 of the original capacity, the current proposal would increase output by an additional 47/44 over 2003 output, or 65% x 47/44 = 69% over 2019 output. Thus, the proposed action would increase generation and associated impacts (e.g., water use and emissions), by approximately 2/3. These increases are not disclosed in the IS. Comment 2.

In sum, it is evident that the term "complex" is incorrectly used in the IS, that the Project is piecemealed, and that the facility that is being modified should be licensed by the CEC, not evaluated in an IS issued by Imperial County.

[40] Heber Geothermal Company (T0033) data from CEC QFER reports, where xx = 19, 18, 17, 16, or 15, for the years, e.g., 2019, 2019, 2017, 2016, and 2015; https://ww2.energy.ca.gov/almanac/electricity_data/web_qfer/Annual_Generation-Plant_Unit_cms.php?goSort=plant_table.plantName&year=20xx.

[41] Heber 1 CUP #04-0024—Request to Amend, pdf 7; http://www.icpds.com/CMS/Media/Heber-Geothermal-Company_Part2.pdf.

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3. CONSTRUCTION

3.1. Construction Emissions Were Not Estimated

Construction emissions must be estimated and compared to significance thresholds to determine if the emissions are significant. It is standard practice to use the CalEEMod model to estimate a project's construction emissions. This requires a detailed construction schedule, a list of all the construction equipment that would be used, and the horsepower rating and engine tier for each piece of construction equipment, among other inputs.[42] None of this information is in the files produced by the County in support of the IS. The IS only mentions in passing that a crane, trucks, excavators, compactors, water truck, and powered hand tools would be used,[43] but otherwise is silent on the full construction fleet.[44] Information supplied in response to PRAs indicate that "semi-truck trailers, flatbed trucks, excavators/bulldozers, forklifts, roller, and cranes would be used to deliver and place the proposed facilities on the Heber 2 Project Site."[45] However, more equipment would be required than mentioned due to site soil conditions.[46] Further, this general information cannot be used to estimate emissions because critical operating parameters that determine emissions are missing, including equipment horsepower ratings, engine tiers, engine loads, hours of operation, etc. Thus, the IS fails as an informational document under CEQA.

In fact, the IS does not contain any analysis of the impact of Project construction emissions on air quality. Construction emissions are not estimated. Rather, they are only generally, incoherently, and very briefly discussed in two IS subsections.

They are first discussed in IS Section III(b)(b). This section addresses cumulative emissions ("Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment…"), not Project emissions. Second, they are discussed in Section III(b)(c), which addresses health impacts ("Expose sensitive receptors to substantial pollutants [*sic*] concentration.").[47] Neither of these IS sections

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[42] See User's Guide for CalEEMod Version 2016.3.2; http://www.caleemod.com/.

[43] IS, pdf 17, 333.

[44] IS, pdf 17, 24.

[45] Memorandum from Catalyst Environmental Solutions Inc., Re: Heber 2 Project Description Information, July 6, 2020 (Exhibit 4).

[46] See, e.g., IS, pdf 162 ("The soils are highly corrosive to metals and contain sufficient sulfates and chlorides to require special concrete mixes and protection of embedded steel building components when concrete is place in contact with native soil…").

[47] IS, pdf 19.

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directly addresses Project construction emissions, which are confusingly and briefly discussed in each of these sections in spite of the section heads.

Construction emissions are not calculated, air quality significance thresholds are not presented for them, existing ambient air quality data are not presented, and the impacts of construction emissions on ambient air quality are not disclosed. Instead of estimating construction emissions and comparing them to Imperial County Air Pollution Control District's (ICAPCD's) significance thresholds, the standard CEQA approach, the IS concludes with no analysis at all that all construction emissions are not significant: "Emissions from construction equipment would be temporary and not exceed any air quality thresholds or significantly contribute to an existing regional nonattainment condition…"[48]

This failure to evaluate construction impacts not only violates CEQA but also the ICAPCD guidance on construction emissions, which states:[49]

> It is not uncommon for construction related emissions, which are generally temporary in nature, to have a temporary adverse impact on air quality. Construction, by its very nature may produce a variety of emissions however particulate matter (PM_{10}) is the pollutant of greatest concern. Past experience has shown that the emissions from construction can cause substantial increases in localized concentrations of PM_{10}. The most common activities associated with construction involve site preparation, earthmoving activities and general construction. These activities include, but are not limited to: demolition, grading, excavation, cut and fill operations, trenching, soil compaction, land clearing, grubbing and the addition of improvements such as roadway surfaces, structures and facilities. These common construction activities generate emissions from:
>
> 1. Fuel combustion from mobile heavy-duty diesel and gasoline powered equipment.
> 2. Portable auxiliary equipment
> 3. Worker commuter trips
> 4. Fugitive dust from soil disturbance.

Site reclamation, which will involve a much larger area (40 acres[50] compared to 4 acres for Project construction) and require much of the same equipment (backhoes, excavators, heavy trucks, compactors, water trucks, crane)[51] will have impacts similar to construction. Reclamation impacts are not discussed in the IS. Thus, the IS fails as an informational document under CEQA. In addition to this failure, there are numerous problems with the IS's superficial treatment of construction impacts.

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48 IS, pdf 19.

49 Imperial County APCD, CEQA Air Quality Handbook, November 2007, Section 4.2, p. 11.

50 IS, pdf 54, 330, 343.

51 IS, pdf 33.

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3.2. Temporary Emissions Are Often Significant

The IS seeks to minimize the potential significance of construction emissions by asserting they are "temporary."[52] Construction, by its very nature, is "temporary." I have worked on hundreds of similar projects with "temporary" construction emissions that were estimated and found to be significant.[53] "Temporary" is not a valid basis for concluding that construction emissions are not significant because construction is always temporary. "Temporary" construction and other emissions are commonly estimated and often found to be significant in CEQA documents, as clearly explained in the local air district's CEQA guidelines.

3.3. Construction Impacts Are Not Analyzed

Construction impacts are typically analyzed in two ways. First, emissions are estimated and compared to CEQA significance thresholds. Second, if a threshold is exceeded, or the area where the Project is located is not in compliance with ambient air quality standards (i.e., nonattainment), the emissions are modeled to estimate ambient concentrations. The IS fails to include either analysis.

3.3.1. Construction Significance Thresholds

ICAPCD's guidance states that construction emissions must be estimated and compared to significance thresholds:[54]

> The emissions from construction activities, such as fugitive PM_{10} and exhaust emissions from construction equipment, must be quantified and identified in an EIR or a Comprehensive Air Quality Analysis Report. Table 4 below is intended to serve as a guide for project developers and interested parties in determining the recommended type of mitigation measures.

Table 4, Thresholds of Significance for Construction Activities

Pollutant	Thresholds
PM_{10}	150 lbs/day
ROG	75 lbs/day
NOx	100 lbs/day
CO	550 lbs/day

The IS does not recognize these thresholds or contain any estimate of construction emissions to compare to these thresholds. Instead, the IS confusingly asserts that "if an individual project generates construction or operational emissions

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52 IS, pdf 19.

53 See, for example, Digging Up Trouble: The Health Risks of Construction Pollution in California, 2006; https://www.ucsusa.org/sites/default/files/2019-10/digging-up-trouble.pdf.

54 Imperial County APCD, CEQA Air Quality Handbook, Table 4, pdf 19.

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that exceed the ICAPCD's recommended daily thresholds for project-specific impacts, that project would also cause a cumulatively considerable increase in emissions…."[55] However, the IS does not contain any project-specific construction emissions or significance thresholds for them.

Rather, IS Section 3(a) asserts that "[e]missions from construction equipment would be temporary and not exceed any air quality thresholds or significantly contribute to an existing regional nonattainment condition…"[56] However, as the IS contains no estimate of construction emissions, there is no basis for concluding that they do not exceed thresholds and thus are not significant. My analysis in Comment – indicates that construction PM10 and NOx emissions are significant.

3.3.2. Construction Emissions Contribute to Existing Violations of Ambient Air Quality Standards

The area where the Project is located is in violation of ambient air quality standards for PM2.5, PM10, and ozone (federal 8-hour).[57] Short-term exposure to particle pollution (PM2.5, PM10) can kill.[58] Ozone, often called "smog," is harmful to breathe because it aggressively attacks lung tissue.[59] Imperial County fails the American Lung Association's (ALA's) State of the Air annual rankings for Imperial County (grade F). The ALA concludes that "If you live in Imperial County, the air you breathe may put your health at risk."[60] See Figures 1 to 4.

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55 IS, pdf 19.

56 IS, pdf 19.

57 U.S. EPA, California Nonattainment/Maintenance Status for Each County by Year for all Criteria Pollutants, May 31, 2020; https://www3.epa.gov/airquality/greenbook/anayo_ca.html.

58 American Lung Association (ALA), What Can Particles Do to Your Health?, https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/particle-pollution.

59 American Lung Association, What is Ozone; https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/ozone.

60 American Lung Association, State of the Air, California: Imperial County; http://www.stateoftheair.org/city-rankings/states/california/imperial.html.

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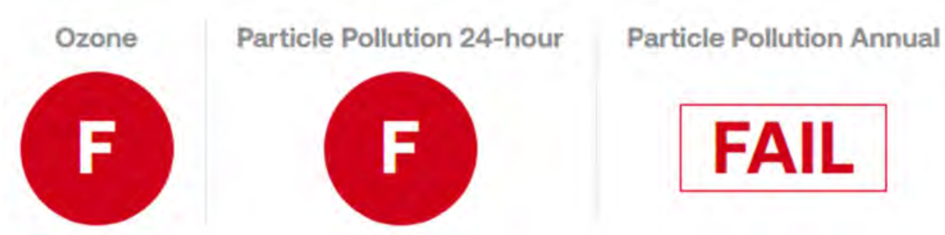
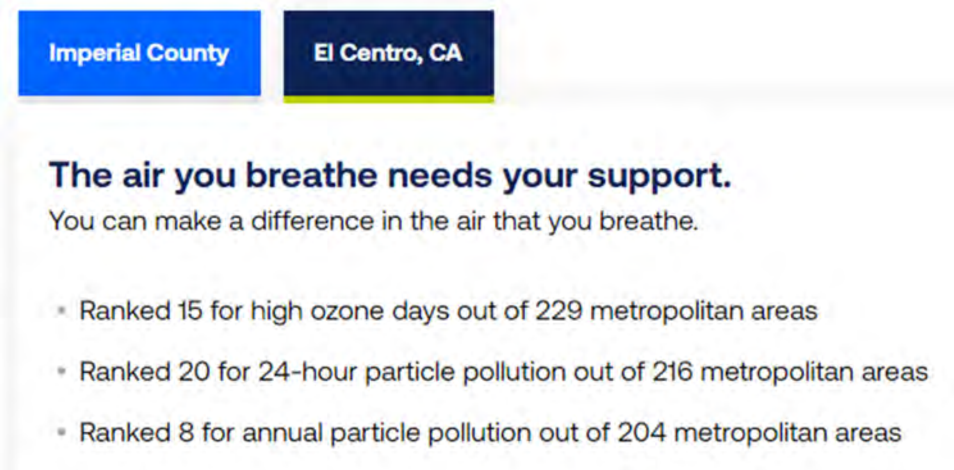
Figure 1: American Lung Association State of the Air Ranking, Imperial County[61]



El Centro, 6 miles north of the Project, ranks among the worst out of 229 metropolitan areas that were evaluated for ozone and particulate pollution:

Figure 2: El Centro, California, Ozone and Particulate Ranking[62]



Imperial County has large numbers of people at risk from elevated ozone and particulate pollution:

[61] Ibid.

[62] Ibid.

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Figure 3: Populations at Risk in El Centro[63]

Groups at Risk	El Centro, CA
Total Population:	181,827
Pediatric Asthma:	3,195
Adult Asthma:	11,043
COPD:	5,862
Lung Cancer:	70
Cardiovascular Disease:	8,440
Ever Smoker:	42,924
Children Under 18:	51,765
Adults 65 & Over:	23,580

Further, short-term (24-hour) particulate pollution, such as generated by construction, is on the rise in Imperial County:[64]

Figure 4: Number of Days That Exceed Annual and 24-hour PM10 Ambient Air Quality Standards in Imperial County[65]

For all of these reasons, any increase in PM2.5, PM10, or ozone precursors (ROG, NOx) due to construction (and operation) of the Project is a per se significant air quality and public health impact as they contribute to an acknowledged significant health risk.

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63 http://www.stateoftheair.org/city-rankings/compare-your-air.html?msa1=El%20Centro,%20CA&msa2=Los%20Angeles-Long%20Beach,%20CA.

64 Ibid.

65 Ibid.

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Particulate matter (PM2.5, PM10) and ozone precursors (ROG, NOx) are emitted in significant amounts during construction. ROG is also emitted during Project operation. The impact of construction and operational emissions on ambient air quality (PM2.5, PM10, ozone) can only be determined by estimating the emissions, comparing them to adopted significance thresholds and/or using air dispersion models to estimate ambient concentrations to determine if ambient air quality standards will be violated.

The files I reviewed do not contain any analysis at all of construction emissions. The IS and supporting files contain no information to demonstrate that construction emissions would not contribute significantly to an existing regional nonattainment condition, nor does it set forth any criteria for making this determination. The IS and supporting documents do not contain the information required to estimate emissions—neither construction emissions nor any air dispersion modeling. Instead, the IS concludes that construction impacts are not significant with no support whatsoever, despite the well-known air quality problems in the Project area, summarized in Figures 1 to 4. Thus, the IS fails as an informational document under CEQA.

Any increase in a pollutant that contributes to existing violations of ambient air quality standards or creates a new violation, for example, is a per se significant impact, absent a demonstration to the contrary. Construction will emit PM2.5, PM10, ROG, and NOx, which all contribute to existing violations of ambient air quality standards in the Project area. Thus, ambient air quality impacts of construction are significant unless analyses demonstrate the contrary and/or mitigation is imposed. The IS contains no analysis of construction air quality impacts or demonstration that they are not significant.

Construction equipment emits ROG and NOx, which are not mentioned in the IS construction discussion. These chemicals are ozone precursors and are converted into ozone in the atmosphere. The IS admits, and I agree, that Imperial County where the Project is located is in violation of ambient ozone standards (nonattainment).[66] This acknowledgement should have triggered an analysis to determine if construction emissions would contribute to violations of ambient ozone standards. It did not.

As to ozone construction impacts, the IS concludes with no analysis, buried in a section on "sensitive receptors," that "the temporary and relatively low amount of ozone emissions from the construction equipment would result in a less than significant cumulative effect to the existing nonattainment status of the ICAPCD."[67] The IS

[66] IS, pdf 19. See also footnote 56.

[67] IS, pdf 19.

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contains no support for this conclusion, which would require an estimate of construction ozone precursors (NOx, ROG) and/or air quality modeling.

The "sensitive receptor" section then states that construction equipment would be turned off when not in use to limit "ozone emissions" from idling construction equipment.[68] A requirement to turn construction equipment off to limit ozone emissions is a mitigation measure, which requires preparation of an EIR.

Regardless, idling emissions are a tiny fraction of ozone-precursor emissions from construction equipment and would do nothing to mitigate significant construction ozone precursor impacts. The major source of ozone precursor emissions is engine exhaust when construction equipment is operating, not idling.

In my opinion, the undisclosed ROG and/or NOx emissions are significant for two reasons. First, the area where the Project is located currently violates the federal 8-hour ozone standard. As noted above, the APA rated the area where the Project is located as an F for ozone. Increases in ozone precursors from both Project construction and operation would contribute to these violations. Second, as demonstrated below, ROG and NOx construction emissions could exceed the ICAPCD's significance thresholds of 75 lb/day for ROG and 100 lb/day for NOx without enforceable mitigation. No mitigation is proposed for ROG and NOx in the IS. Thus, in my opinion, an Initial Study is not appropriate for this Project. Because mitigation is required, an EIR must be prepared.

3.3.3. Construction Mitigation

The IS asserts that Section 2.1.7 lists air quality control measures that would be implemented during construction "to minimize the potential for construction fugitive dust and particulate matter releases," consistent with Imperial County 2019 PM10 and PM2.5 Plans.[69] The IS asserts that "control measures would be in line with the Imperial County 2018 PM10 Plan and Imperial County 2018 PM2.5 Plan …. and therefore, be in compliance with Imperial County's approach to minimizing these construction-related emissions."[70]

Elsewhere, the IS concludes, with no analysis whatsoever, that "[t]hrough the application of these [unidentified] measures, the construction of the Project would limit visible dust emissions and particulate matter emissions to 20 percent opacity and/or

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[68] IS, pdf 19.

[69] IS, pdf 19. "Emissions from construction equipment would be temporary and not exceed any air quality thresholds or significantly contribute to an existing regional nonattainment condition…"

[70] IS, pdf 19.

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150 lb/day, and therefore, be in compliance with Imperial County's approach to minimizing these construction related emissions."[71] This conclusion is unsupported and incorrect. There are major problems with these assertions as to impacts and mitigation.

First, if air quality control measures must be implemented during construction, as asserted in these cited sections of the IS, an Initial Study is the wrong CEQA document. An EIR must be prepared if a Project results in significant impacts.

Second, the cited mitigation in Section 2.1.7 is missing from the IS. Section 2.1.7 of the IS is captioned "Record Keeping and Internal Reporting." It does not contain any air quality control measures. Instead, it is a subsection of "Non-Structural BMPS" to minimize the probability of pollution from stormwater discharge.[72] It has nothing to do with air quality. Section 2.1.7 in the IS states as follows:[73]

> *2.1.7 Record Keeping and Internal Reporting*
>
> **All inspection, sampling, maintenance, corrective action records, and any other information that is a part of this plan are maintained at the facility office. All records are maintained for a period of at least three (3) years.**

These are not air quality control measures for construction PM10 and PM2.5 emissions. I did not find any air quality control measures anywhere in the IS, in any section, even though the IS's conclusions rely on mitigation. Thus, the IS contains no mitigation for "potential fugitive dust and particulate releases,"[74] which would contribute to existing violations of ambient air quality standards, a potentially significant impact. If mitigation is required, and my analyses below indicate that it is, an EIR must be prepared.

The Application to Amend CUP No. 06-0006 for the Project does contain construction mitigation for particulate matter, suggesting the Applicant expects construction PM10 and PM2.5 emissions to be significant, contrary to the IS's conclusions. The CUP Application proposes the following construction mitigation:[75]

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[71] IS, pdf 19.

[72] IS, Section 2.1, pdf 77.

[73] IS, pdf 79.

[74] Ibid.

[75] IS, Application to Amend Conditional Use Permit No. 06-0028, August 13, 2009, pdf 358. See pdf 364 for construction mitigation.

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- The Project would comply with the Imperial County Air Pollution Control District (ICAPCD) Regulation VIII (Fugitive Dust Control), the Imperial County 2018 PM10 Plan, and the Imperial County 2018 PM2.5 Plan.
- Project equipment and worker vehicles would be turned off when not in use and not left idling to minimize unnecessary emissions.
- Water would be applied to the development site and during site preparation and construction to control fugitive dust.
- Earth moving work would be completed in phases (as necessary) to minimize the amount of disturbed area at one time.
- Construction vehicles and heavy equipment that use non-surfaced facility roads/areas will be restricted to 5 mph to control fugitive dust.
- During windy conditions, barriers would be constructed and/or additional watering is conducted to minimize wind-blown fugitive dust.
- Vehicle access would be restricted to the disturbance area via signage/fencing.
- Equipment would be operated according to best practices and maintained according to design specifications.

The IS cannot rely on these measures to mitigate what are evidentially considered to be significant impacts because an IS by definition is prepared for projects that have no significant impacts and thus require no mitigation. The fact that the Applicant has proposed mitigation in the CUP Application for the Project evaluated in the IS indicates that there is an expectation that construction PM2.5 and PM10 emissions are significant. Thus, an IS is the wrong CEQA document. An EIR must be prepared and circulated for review.

Third, Section 3(a) of the IS asserts "As discussed in Section 2.1.7, air quality measures would be implemented during construction … to minimize the potential for fugitive dust and particulate matter releases."[76] The IS does not identify any air quality construction mitigation measures. As noted above, if mitigation is required, an IS is the wrong CEQA document. Further, as noted above, Section 2.1.7 does not exist. Finally, what does "minimize" mean in the referenced CEQA cumulative impact context? How can you conclude cumulative emissions are not significant, even if minimized, without estimating the emissions and either comparing them to a significance threshold or modeling them to determine if they violate ambient air quality standards? You cannot.

Fourth, the IS asserts that the applicable controls (which are never identified in the IS itself) "would be in line with the Imperial County 2018 PM10 Plan and the Imperial County 2018 PM2.5 Plan."[77] However, the IS fails to identify the applicable controls (which were mistakenly asserted to be in Section 2.1.7) or provide a specific citation to the PM10 and PM2.5 plans where these controls can be found. The PM10[78]

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[76] IS, pdf 19.

[77] IS, pdf 19.

[78] Imperial County APCD, Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less Than 10 Microns in Diameter, Adopted October 23, 2018, October 23, 2018; https://apcd.imperialcounty.org/wp-content/uploads/2020/01/2018PM10PlanBoardPacket.pdf.

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and PM2.5[79] plans submitted in response to a PRA only require controls at nonresidential construction sites greater than or equal to 5 acres.[80] The subject site is a nonresidential 4-acre site.[81] Thus, if construction PM10 and PM2.5 impacts are significant, these plans do not require a control plan for them.

Fifth, even if Section 2.1.7 did exist, the only control measures that the IS asserts it contains are for PM10 and PM2.5. Construction emits other pollutants, including the ozone precursors ROG and NOx. As the area where the Project will be located is in violation of ozone ambient air quality standards, increases in ROG and NOx from construction equipment could contribute to an existing violation of the ozone standard, which is a significant impact. See Comment 3.3.2. The IS does not discuss this issue, thus failing as an informational document under CEQA.

Sixth, the IS then wraps up the construction air quality discussion with an unsupported conclusion on ozone, asserting that the Project will:[82]

> be in compliance with Imperial County's approach to minimizing these construction-related emissions. Ozone, which is formed by a complex series of chemical reactions and the precursors of which stem from the use of fuel-combusting equipment (e.g., backhoes, trucks), would also be limited to the construction phase of the Project. To limit the amount ozone emissions from construction equipment, vehicles and equipment would be turned off when not in use and not left idling to minimize unnecessary emissions. The temporary and relatively low amount of ozone emissions from the construction equipment would result in a less than significant cumulative effect to the existing nonattainment statusof the ICAPCD.

By proposing mitigation, the IS is conceding that Project and cumulative ozone impacts are significant, requiring the preparation of an EIR. I agree that construction ozone emissions are likely significant because the area where the Project is located currently violates ozone ambient air quality standards and construction would increase ozone precursor emissions. Thus, mitigation is required for this impact and an EIR must be prepared. Regardless, shutting off equipment that is not in use will not mitigate this impact because idling emissions are a very small fraction of ozone precursor emissions. Thus, assuming ozone emissions are significant, and the IS contains no estimate of ozone-precursor emissions, this proposed mitigation would do nothing to mitigate the significant impact. These emissions can be significantly reduced by requiring high tier (Tier 3 or 4) construction equipment and/or tailpipe controls such as catalytic converters. Comment 3.4.

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[79] Imperial County APCD, Imperial County 2018 Annual Particulate Matter Less than 2.5 Microns in Diameter State Implementation Plan, April 2018; https://ww3.arb.ca.gov/planning/sip/planarea/imperial/final_2018_ic_pm25_sip.pdf.

[80] PM10 Plan, pdf 39 (dust control plan only required for construction sites greater than or equal to 5 acres for nonresidential projects), PM2.5 Plan, pdf 169.

[81] IS, pdf 40, 54, 74.

[82] IS, pdf 19.

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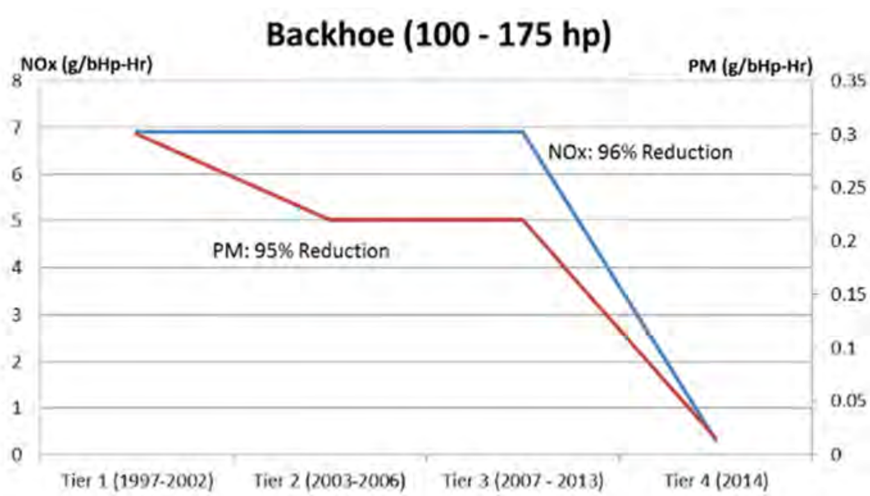
In sum, the IS failed to estimate construction emissions and failed to evaluate construction ambient air quality impacts, thus failing as an informational document under CEQA. Without estimating any emissions, the IS asserts mitigation is required, but it failed to disclose the mitigation, which is found in the CUP for the Project. In either case, requiring mitigation for an unquantified significant impact requires the preparation of an EIR. In the next section, I estimate that construction PM10 and NOx emissions are significant, confirming that mitigation is required. Thus, an EIR must be prepared for the Project.

3.4. Construction NOx Emissions Are Significant

The principal mitigation for NOx and ROG emissions from construction equipment is the design of the engine. The amount of pollution from construction equipment is categorized using a system of "engine tiers." The higher the tier, the lower the emissions.[83] For example, for a typical backhoe, the emissions of NOx and PM in grams per brake horsepower hour (g/bHp-Hr) as a function of engine tier are shown in Figure 5.[84]

Figure 5: PM and NOx Emission by Tier for a Backhoe[85]



This figure shows that NOx exhaust emissions would be about 35 (7/0.2) times higher if all Tier 1 construction equipment were used instead of Tier 4 equipment. Similarly, this figure shows that PM exhaust emissions would be about 15 (0.3/0.02) times higher if all Tier 1 equipment were used instead of Tier 4 equipment. It is

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[83] See, eg., DieselNet, Emission Standards: Nonroad Diesel Engines; https://dieselnet.com/standards/us/nonroad.php.

[84] See also EPA, Nonroad Compression-Ignition Engines: Exhaust Emission Standards.

[85] Ibid.

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standard practice to disclose the construction fleet (type/number of equipment) and construction equipment engine tier in CEQA documents. This IS fails to identify the specific pieces of construction equipment and their tier, thus failing as an informational document under CEQA.

The off-road construction equipment that would be required to build the Project and thus the engine tier of this equipment must be known to estimate construction emissions. The IS indicates that site preparation would include excavation and compaction, listing as examples of required equipment: semi-truck trailers, flatbed trucks, forklifts, excavators/bulldozers, a roller, and cranes.[86]

Without specific requirements for the engine "tier" of all construction equipment that will be used to build the Project, the applicant is free to use the cheapest, highest emitting, Tier 1 equipment to build the Project. Tier 1 construction equipment would emit over 7 times more NOx and 15 times more PM10 than the most efficient Tier 4 construction equipment. The applicant has a significant financial incentive to use lower tier, higher polluting equipment as it is much cheaper than the newer, better controlled construction equipment. Thus, unmitigated increases in NOx, ROG, and PM10 from construction equipment could exceed the ICAPCD's CEQA significance thresholds.

Construction NOx emissions could exceed 100 lb/day if Tier 1 equipment were used. For example, assuming four 300-hp pieces of construction equipment operating simultaneously (dump truck, excavator, bulldozer, crane), the NOx emissions would be 148 lb/day,[87] which exceeds the ICAPCD's significance threshold of 100 lb/day and is thus a significant construction air quality impact. There is nothing in the IS to prevent the applicant from selecting Tier 1 equipment.

The significant NOx and PM10 emissions from construction equipment can be controlled by requiring the use of Tier 3 to 4 construction equipment or by retrofitting older Tier 1 to 2 equipment with similarly effective emissions controls, such as exhaust selective catalytic reduction (SCR) and particulate traps. See also construction PM10 mitigation in Comment 3.6.

The significant NOx and diesel particulate matter (DPM) emissions from construction equipment can be mitigated using the same mitigation measures required

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[86] IS, pdf 29, 363.

[87] NOx emissions = 4(7 g/bhp-hr)(300 bhp)(8 hr/day)/(454 g/lb) = **148 lb/day.**

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by the County for the East Brawley Geothermal project[88] during all construction activities:

a) Use alternative-fueled or catalyst-equipped diesel construction equipment, including all off-road and portable diesel-powered equipment.

b) Minimize idling time either by shutting equipment off when not in use or reducing the time of idling.

c) Limit, to the extent feasible, the hours of operation of heavy-duty equipment and/or the amount of equipment in use.

d) Replace fossil-fueled equipment with electrically driven equivalents (provided they are not run via a portable generator set).

e) Utilize construction and well drilling equipment that meets or exceeds Tier 2 California Emission Standards for Off-Road Compression-Ignition Engines as specified in the California Code of Regulations.

f) Provide for on-site meals for construction workers by arranging a lunch wagon to visit the construction site.

g) Suspend construction activities when the Imperial County Air Pollution Control District issues a Health Advisory Alert pursuant to District Rule 608.

h) Require the construction contractor to ensure that construction equipment is properly maintained.

3.5. Construction PM10 Emissions Are Significant

The produced documents indicate that the Project would disturb 4 acres. Particulate matter emissions (PM10, PM2.5) can be estimated from the EPA emission factor for construction activity of 1.2 tons per acre per month of total suspended particulate (TSP) emissions per day (lb/day).[89] Studies indicate that on average, PM10 accounts for 34% to 52% of the TSP when watering is used for dust control.[90] Thus,

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[88] County of Imperial, East Brawley Geothermal, Final Environmental Impact Report, May 2012, pp. 4.0-20 and 4.0-21, See Board of Supervisors Agenda, Item #23; http://imperial.granicus.com/player/clip/356?view_id=2&meta_id=43881&redirect=true.

[89] AP-42, Section 13.2.3 Heavy Construction Operations, pdf 1; https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s02-3.pdf.

[90] Ingrid P.S. Araujo, Dayana B. Costa, and Rita J.B. de Moraes, Identification and Characterization of Particulate Matter Concentrations at Construction Job Sites, *Sustainability*, v. 6, pp. 7666-7688, 2014, Table 5, https://ideas.repec.org/a/gam/jsusta/v6y2014i11p7666-7688d41878.html.

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earthmoving activities could generate up to 166 lb/day of PM10,[91] exceeding the significance threshold of 150 lb/day.

In addition to PM10 from fugitive dust, PM10 would also be generated by construction equipment. Assuming that Tier 1 construction equipment would be used, PM10 exhaust emissions would be an additional 6 lb/day.[92]

Thus, total PM10 emissions would be 172 lb/day, which exceeds the significance threshold of 150 lb/day. Therefore, construction PM10 emissions are significant and unmitigated. Mitigation is thus required, requiring the preparation of an EIR for the Project.

The CUP identifies some proposed methods to control PM10 emissions. However, these controls are not required by the Negative Declaration as CEQA mitigation and are therefore not enforceable. The proposed controls are also not adequate to reduce the Project's significant PM10 impact to a less than significant level. There are numerous other feasible PM10 control methods that should be required for this Project.

The following summarizes frequently recommended measures to control emissions of DPM from construction that were not identified in the DEIR and that have been required in other CEQA documents and recommended by various air pollution control districts (e.g., BAAQMD[93]) and other public agencies. The following is a partial list:

- Maintain all construction equipment in proper tune according to manufacturer's specifications and use an ASE-certified mechanic to check the equipment and determine it to be running in proper condition before it is operated (CalAm IS/MND;[94] Chevron FEIR[95]).
- Diesel-powered equipment shall be replaced by gasoline-powered equipment whenever feasible (CalAm IS/MND, Chevron FEIR).

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91 Earthmoving TSP emissions = (1.2 ton TSP/acre-mo)(2000 lb/ton)(4 acres)/(30 day/mo) =**320 lb TSP/day.** Assuming 52% of the TSD is PM10, PM10 emissions = (320 lb/day)(0.52) = **166 lb/day.**

92 PM10 emissions = 4(0.3g/bhp-hr)(300 bhp)(8 hr/day)/(454 g/lb) = **6.3 lb/day.**

93 BAAQMD, CEQA Guidelines, Updated May 2017, Tables 8-2 and 8-2.

94 SWCA Environmental Consultants, Draft Initial Study and Mitigated Negative Declaration for the California American Water Slant Test Well Project, Prepared for City of Marina, May 2014 (CalAm IS/MND).

95 Chevron Refinery Modernization Project EIR, March 2014, Chapter 4.8, Greenhouse Gases, https://s3.amazonaws.com/chevron/Volume+1_DEIR_r1.pdf and Chapter 5, Mitigation Measure Monitoring and Reporting Program, https://s3.amazonaws.com/chevron/Final+EIR/5_MMRP.pdf.

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- The engine size of construction equipment shall be the minimum practical size (CalAm IS/MND).
- Catalytic converters shall be installed on gasoline-powered equipment (CalAm IS/MND).
- Signs shall be posted in designated queuing areas and job sites to remind drivers and operators of the idling limit (CalAm IS/MND, Chevron FEIR).
- Diesel equipment idling shall not be permitted within 1,000 feet of sensitive receptors (CalAm IS/MND).
- Engine size of construction equipment shall be the minimum practical size (CalAm IS/MND).
- Construction worker trips shall be minimized by providing options for carpooling and for lunch on site (CalAm IS/MND, Chevron FEIR).
- Use alternative diesel fuels, such as renewable diesel, Aquazole fuel, Clean Fuels Technology (water emulsified diesel fuel), or O2 diesel ethanol-diesel fuel (O2 Diesel) in existing engines (Monterey County General Plan EIR). [96]
- Modify engines with ARB verified retrofits.
- Repower engines with Tier 4 final diesel technology.[97]
- Convert part of the construction truck fleet to natural gas.[98]
- Use new or rebuilt equipment.
- Use diesel-electric and hybrid construction equipment.[99]

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[96] Monterey County General Plan EIR, Section 6.4.3.3, p. 6-14 ("The EIRs prepared for the desalination plants are expected to require that construction equipment use alternative fuels or other means to reduce their emissions of ozone precursors. Although, depending upon the intensity of construction, there is the potential for a significant impact on air quality from ozone precursors."); https://www.co.monterey.ca.us/home/showdocument?id=44010. See also Union of Concerned Scientists, Digging Up Trouble: The Health Risks of Construction Pollution in California, November 2006, pp. 23-24; https://www.ucsusa.org/sites/default/files/2019-10/digging-up-trouble.pdf.

[97] Union of Concerned Scientists, November 2009, p. 23.

[98] This is a mitigation measure used by PG&E to offset NOx emissions from its Otay Mesa Generating Project. See: GreenBiz, Natural Gas Trucks to Offset Power Plant Emissions, September 12, 2000, http://www.greenbiz.com/news/2000/09/12/natural-gas-trucks-offset-power-plant-emissions.

[99] Tom Jackson, How 3 Diesel-Electric and Hybrid Construction Machines are Waging War on Wasted Energy, *Equipment World*, June 1, 2014, http://www.equipmentworld.com/diesel-electric-and-other-hybrid-construction-equipment-are-waging-war-on-wasted-energy/; Kenneth J. Korane, Hybrid Drives for Construction Equipment, Machine Design, July 7, 2009, http://machinedesign.com/sustainable-engineering/hybrid-drives-construction-equipment; Caterpillar's D7E Electric Drive Redefines Dozer Productivity, http://www.constructionequipment.com/caterpillars-d7e-electric-drive-redefines-dozer-productivity.

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- Use low rolling resistance tires on long-haul class 8 tractor-trailers.[100]
- Use idle reduction technology, defined as a device that is installed on the vehicle that automatically reduces main engine idling and/or is designed to provide services (e.g., heat, air conditioning, and/or electricity) to the vehicle or equipment that would otherwise require the operation of the main drive engine while the vehicle or equipment is temporarily parked or is stationary.[101]
- Implement EPA's National Clean Diesel Program.[102,103,104]
- Require that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of PM (BAAQMD).

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100 EPA, Verified Technologies for SmartWay and Clean Diesel, Learn About Low Rolling Resistance (LRR) New and Retread Tire Technologies, https://www.epa.gov/verified-diesel-tech/learn-about-low-rolling-resistance-lrr-new-and-retread-tire-technologies; EPA, Verified Technologies for SmartWay and Clean Diesel, SmartWay Verified List for Low Rolling Resistance (LRR) New and Retread Tire Technologies, https://www.epa.gov/verified-diesel-tech/smartway-verified-list-low-rolling-resistance-lrr-new-and-retread-tire.

101 EPA Names Idle Reduction Systems Eligible for Federal Tax Exemptions, March 2009; http://www.greenfleetmagazine.com/channel/green-operations/article/story/2009/03/epa-names-idle-reduction-systems-eligible-for-federal-excise-tax-exemptions-grn.aspx. See also: Idle Reduction, Wikipedia, https://en.wikipedia.org/wiki/Idle_reduction and Diesel Emissions Reduction Program (DERA): Technologies, Fleets and Project Information, Working Draft Version 1.0; https://nepis.epa.gov/Exe/ZyNET.exe/P100CVIS.TXT?ZyActionD=ZyDocument&Client=EPA&Index=2011+Thru+2015&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C11thru15%5CTxt%5C00000003%5CP100CVIS.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL.

102 Northeast Diesel Collaborative, Best Practices for Clean Diesel Construction: Successful Implementation of Equipment Specifications to Minimize Diesel Pollution, August 2012; https://www.northeastdiesel.org/pdf/construction/BestPractices4CleanDieselConstructionAug2012.pdf.

103 U.S. EPA, Cleaner Diesels: Low-Cost Ways to Reduce Emissions from Construction Equipment, March 2007; https://nepis.epa.gov/Exe/ZyNET.exe/P1009QEO.TXT?ZyActionD=ZyDocument&Client=EPA&Index=2006+Thru+2010&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C06thru10%5CTxt%5C00000024%5CP1009QEO.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL.

104 NEDC Model Contract Specification, April 2008; https://www.epa.gov/sites/production/files/2015-09/documents/nedc-model-contract-sepcification.pdf.

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- Require that all contractors use equipment that meets CARB's most recent certification standard for off-road heavy-duty diesel engines.[105]
- Solicit bids that include these measures.

3.6. Well Drilling Emissions

Information filed by the Applicant in other fora indicate that new wells must be drilled to support the Project. The IS is silent on the need to drill new wells. Well drilling, flow testing, well venting, steam stacking, and fugitive sources such as valves and pumps can result in substantial emissions of air pollutants including diesel exhaust emissions from drill rigs and hydrogen sulfide ("H_2S").[106]

Hydrogen sulfide is an extremely hazardous gas with a "rotten egg" smell and pronounced health effects. Depending on the concentrations and length of exposure, health effects vary from irritation of eyes, nose, throat, or respiratory system to shock, convulsions, inability to breathe, and, in extreme cases, death.[107] Further, California has an ambient air quality standard on H_2S of 0.03 ppm for a one-hour average.[108] The IS failed to acknowledge this standard and failed to determine whether the Project's emissions would violate the standard.

The H_2S emissions, which typically result in significant odor and health impacts, can be controlled using liquid redox methods, reinjection, Selectox, Dow-Spec RT-2, BIOX, and other similar methods.[109]

3.7. Project Construction May Have Begun Without Required Permits

Under CEQA, environmental review must be completed before the start of construction. Documents filed by the Applicant with the SEC indicate that Project construction may have started in 2019 and is ongoing:[110]

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[105] BAAQMD, CEQA Guidelines, Updated May 2017, Table 8-3, Measure 13.

[106] See, for example, Acurex Corp., Assessment of H2S Control Technologies for Geothermal Power Plants, February 1980; https://www.osti.gov/servlets/purl/5226737.

[107] *See*, for example, Occupational Safety and Health Administration, OSHA Quick Card, Hydrogen Sulfide (H_2S); https://www.osha.gov/OshDoc/data_Hurricane_Facts/hydrogen_sulfide.pdf.

[108] CARB, Hydrogen Sulfide & Health; https://ww2.arb.ca.gov/resources/hydrogen-sulfide-and-health.

[109] Esteban Rodriguez, William Scott Harvey, and Einar Jon Abjornsson, Review of H_2S Abatement Methods in Geothermal Plants, Proceedings, Thirty-Eighth Workshop on Geothermal Reservoir Engineering, February 24-26, 2014; https://pangea.stanford.edu/ERE/pdf/IGAstandard/SGW/2014/Rodriguez.pdf.

[110] SEC, Form 10-K, Ormat Technologies, Inc., December 31, 2019, pdf 24.

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During fiscal year 2019, in the Electricity segment, we focused on the commencement of operations at Tungsten solar in Nevada and we began with construction of Heber Complex enhancement as well as with enhancement work in some of our operating power plants. During fiscal year 2018, we focused on

In the section of this SEC filing, in a subsection labeled "Projects Released for Construction", the summary table describes the work at the Heber Complex as: "Permitting, Engineering and procurement ongoing. Manufacturing and **construction commenced**."[111] See:

Project Name	Expected Size (MW)	Technology	Customer	Expected COD	Current Condition
Heber Complex	11	Geothermal air-cooled binary system	SCE and SCPPA	Early 2021	Permitting, Engineering and procurement ongoing. Manufacturing and construction commenced.

The SEC 10-Q filing similarly states "We are currently in the process of repowering the Heber 1 and Heber 2 power plants. We are planning to replace steam turbine and old OE units with new advanced technology equipment that will add a net capacity of 11 MW. Following these enhancements, we expect the capacity of the complex to reach 92 MW. Permitting, engineering and procurement are ongoing as well as manufacturing and site construction. We expect commercial operation in the second half of 2021."[112] The 92 MW is consistent with the original design capacity of the Heber Complex.

The Ormat 2019 annual report similarly reports that construction has commenced: "During fiscal year 2019, in the Electricity segment, we focused on the commencement of operations at Tungsten solar in Nevada and we began with construction of Heber Complex enhancement as well as with enhancement work in some of our operating power plants."[113] Elsewhere, the annual report states: "Permitting, Engineering and procurement ongoing. Manufacturing and construction commenced."[114]

If the Applicant's statements in its SEC filings are correct, then it appears the Applicant has begun prematurely constructing the Project without obtaining necessary land use permits.

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[111] SEC, Form 10-K, Ormat Technologies, Inc., December 31, 2019, pdf 30 (emphasis added);

[112] U.S. Securities and Exchange Commission, Form 10-Q, Ormat Technologies, Inc., March 31, 2020, p. 41, pdf 36-37; http://d18rn0p25nwr6d.cloudfront.net/CIK-0001296445/bd1a8403-baa2-4834-9e2f-29ea970e033c.pdf.

[113] ORMAT, 2019 Annual Report, p. 31, pdf 39.

[114] ORMAT, 2019 Annual Report, p. 38, pdf 46.

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4. OPERATIONAL AIR QUALITY IMPACTS

The facility will emit isopentane, which is a reactive organic gas (ROG) as well as other criteria pollutants, discussed below.

4.1. Isopentane Emissions

An accurate estimate of isopentane is very important because it is a reactive organic gas (ROG) and thus contributes to ozone in the atmosphere. As explained in Comment 3.3.2, the area where the Project is located violates ambient air quality standards for ozone. The Project will emit isopentane, a ROG precursor, from storage tanks during maintenance operations and from fugitive components. Fugitive emissions occur due to leaks from seals, flanges, pumps, valves, and other components.[115] The IS estimated 10.4 lbs/day of isopentane from maintenance and 54.1 lb/day from fugitive sources for a total of 64.5 lb/day.[116] The IS uses the ATC calculations to estimate the increase in ROG emissions from the Project, which are significant when correctly estimated.

The operational air quality analysis is presented in an appendix to the IS.[117] This appendix states that isopentane emissions are related to the size and complexity of the system. The new system would be smaller (111,000 gallons new vs. 120,000 gallons existing) and have decreased complexity with fewer seals, flanges, pumps, valves, etc. To account for the smaller size, the air quality analysis asserts that it scaled actual worst-case quarterly average daily emissions from 2017 to 2018 (111,000/120,000) to arrive at Project daily emissions. To account for the decreased complexity, the air quality analysis adjusted maintenance and fugitive emissions by 50%. Based on these assumptions, the IS finds a decrease in daily ROG (isopentane) emissions, and thus a less than significant impact.[118]

The IS does not include the supporting calculations for these emission estimates, which are complex. Thus, the IS fails as an informational document under CEQA. In my opinion, the emissions are underestimated and likely will increase, not decrease, for several reasons.

First, average daily emissions are calculated based on quarterly emission reports for maintenance, purging (minor), and fugitives. This is not a reasonable approach

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[115] ATC, pdf 15.

[116] ATC, Table 4, pdf 18.

[117] IS, pdf 287: Joel Firebaugh, Air Sciences Inc., Air Quality Analysis Summary for the Ormat Heber 2 Geothermal Repower Project, August 12, 2019 (Air Quality Appendix).

[118] IS, pdf 19 and 291.

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because maintenance emissions do not occur over an entire quarter, while fugitive emissions do. If the maintenance emissions occurred over a single day, for example, ROG emissions could exceed the daily ROG significance threshold of 55 lb/day.[119] The ATC, for example, explains:[120]

> Due to maintenance activities that occur during the 1st and 4th quarters annually, isopentane emissions have the potential to exceed 137 pounds per day on average for those quarters. ORMAT purchases VOC emissions offsets on an annual basis as required by ICAPCD Rule 207 C.2.a.

As the ROG significance threshold is 55 lb/day, 137 lb/day of ROG emissions are significant, requiring mitigation. The IS is silent as to this significant ROG impact.

Second, the IS assumes without any support that maintenance and fugitive emissions would be reduced by 50% compared to the existing facility emissions.[121] The IS and ATC do not identify any method(s) to assure that this reduction is enforceable and thus would be achieved in practice.

Third, the IS calculated a change in annual isopentane emissions of -3.1 ton/yr,[122] again asserting it is based on the period 2017 to 2018. However, the ATC Application indicates that the actual baseline emissions used in the IS are the maximum for 2017 of 14.9 tons/yr. The average 2017–2018 isopentane emissions are 11.4 ton/yr, resulting in an increase in annual ROG emissions of 0.4 ton/yr.

Fourth, the IS assumes without any support that maintenance and fugitive emissions would be reduced by 50% compared to the existing facility emissions.[123] The IS and ATC do not identify any method(s) to assure that this reduction is enforceable and thus would be achieved in practice. The IS therefore lacks substantial evidence to support this conclusion.

Fifth, the IS asserts that the change in isopentane emissions is based on actual baseline emissions for the 2017 to 2018 period.[124] However, the ATC Application, which was obtained through a PRA and was not part of the IS, indicates that the IS calculated the increase in isopentane emissions using the maximum reported quarterly emissions over the period 2017–2018 based only on the third quarter of 2018 of 117.5 lb/day

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[119] ICAPCD, CEQA Air Quality Handbook, November 2007, Table 1, p. 9.

[120] ATC, Section 2.0, p. 6, pdf 14.

[121] IS, pdf 290.

[122] IS, pdf 19. The ATC Application, Table 5, pdf 18 reports the change in permitted emissions:) [(202 lb/day – 218 lb/day)][(365 day/yr)/(2000 lb/ton)] = **-2.92 ton/yr**.

[123] IS, pdf 290.

[124] IS, pdf 19 and Table 2, pdf 291.

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facility total,[125] not average emissions for 2017 to 2018 as claimed in the IS.[126] Baseline emissions must be based on the average emissions over the baseline period, not the maximum. The use of the maximum artificially reduces the impact.

If the average quarterly emissions for 2017–2018 are used, 62.6 lb/day, the increase in isopentane would be 1.9 lb/day. Assuming arguendo that the IS is correct and instead of the maximum baseline emissions, the minimum quarterly baseline emissions are used, 0 lb/day in the first and second quarter of 2018, the increase would be 64.5 lb/day.[127] In fact, the ATC Application reports worst-case isopentane emissions after proposed changes of 64.5 lb/day.[128] Table 1. Thus, ROG emissions are significant.

Table 1: Estimated Worst-Case Isopentane Emissions After Proposed Changes

Emission Category	MF Volume After Changes (gallons)	Emission Factor (lbs/day/1,000 gal)	Emission Reduction Due to Reduced Complexity	Isopentane Emissions	
				(lbs/day)	(tons/year)
Maintenance	111,000	0.19	50%	10.4	1.9
Purging	111,000	2.8×10^{-5}	0%	0.0	0.0
Fugitive	171,000 (includes tanks)	0.63	50%	54.1	9.9
Facility Total				64.5	11.8

Finally, the ATC Application asserts that estimated uncontrolled ROG emissions would be 202 lbs/day:[129]

16. Estimated Emissions	Uncontrolled lbs/day	Controlled lbs/day
For largest single pollutant	VOC 202 lbs/day	

As the IS and the ATC do not include any controls for ROG emissions and the ICAPCD significance threshold for ROG[130] is 55 lb/day,[131] ROG emissions on any day that exceeds this threshold are significant because the ozone standard that the area violates is based on an 8-hour average. Thus, the Project has the potential to significantly increase ROG emissions on some days, requiring an EIR.

[125] ATC Application, pdf 28.

[126] Compare ATC Application, pdf 28 with IS, pdf 291.

[127] Increase in isopentane emissions = 62.6 + 1.9 = 64.5 lb/day.

[128] ATC Application, Table 4, p. 10, pdf 19.

[129] ATC Application, pdf 5.

[130] Isopentane is a reactive organic gas, or ROG.

[131] ICAPCD, Table 1, pdf 9.

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In sum, ROG emissions are significant and must be mitigated. The major source of ROG emissions is fugitive sources, such as pumps, valves, flanges, and connectors.[132] The ROG emission calculations in the ATC, relied upon in the IS, assumed the use of the U.S. EPA's leak detection and repair (LDAR) program[133] to estimate ROG emissions from fugitive sources. The ROG emissions from fugitive sources can be mitigated by implementing an enhanced LDAR program and the use of leakless and low-leak technology, including:[134]

- Reduce the leak detection threshold from 10,000 ppmv to 500 ppmv for all components except pumps in the motive fluid system, where the threshold should be 2,000 ppmv.
- Leak minimization after detection must occur as soon as possible after detection and no later than 24 hours after leak discovery.
- Leak repair must occur as soon as possible after detection and no later than 7 days after leak discovery.
- All leak detection monitoring must be done with both a USEPA Method 21 portable analyzer and a new hand-held infrared camera.
- Leakless and low-leak technology must be used to prevent fugitive emissions of the motive fluid.
- Require monthly LDAR inspections.

Additional reduction of ROG emissions can be achieved by the following mitigation measures proposed by Ormat Nevada, Inc. for its Casa Diablo IV Geothermal Development Project in Mono County:[135]

a) Install vapor recovery devices estimated to return at least 99% of the motive fluid back to the system.

b) Use a maintenance vapor recovery unit during OEC unit maintenance activities to capture motive fluid that could otherwise be released.

c) Lower pressure of motive fluid system compared to motive fluid used at older existing plants, thus, less potential for fugitive leaks/emissions.

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[132] ATC, Table 4, pdf 18.

[133] U.S. Environmental Protection Agency, Leak Detection and Repair Compliance Assistance Guidance, A Best Practices Guide, October 2007; http://www2.epa.gov/sites/production/files/2014-02/documents/ldarguide.pdf.

[134] ESA, Casa Diablo IV Geothermal Power Plant Draft Supplemental Environmental Impact Report, August 2020, Chapter 3; https://files.ceqanet.opr.ca.gov/139190-6/attachment/uz9O5pnLE-zHa0ulN3BgkuisP8fXYGyhCgPux2Zx7m8nGPwgcghuwFJ4IZOvzQ67LT2cQOGEv1rTrdyV0.

[135] County of Imperial, East Brawley Geothermal, Final Environmental Impact Report, May 2012; Exhibit 14.

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d) Place pentane-specific vapor sensors and flame detectors at strategic locations around the around the turbine, motive fluid pumps, and motive fluid storage tank and connection to power plant computer control system to quickly alert plant operators to any potentially hazardous situations, which would help to keep a check on significant leaks.

e) Perform leak checks, inspections, monitoring, and leak logging.

The ATC Application, cited *supra*, indicates VOC emissions would be offset, implying offsets are mitigation. The ATC Application therefore demonstrates that the Project's excess VOC emissions are significant and require mitigation. However, for several reasons the IS cannot rely on offsets to mitigate air quality impacts because they are not valid CEQA mitigation unless they reduce the emissions at the location where the impact occurs.

First, historically banked ERCs are part of the CEQA baseline. The emission reductions are already accounted for in the ambient air quality at the project site at the time of project proposal. Increases in emissions from the Project will increase emissions relative to the existing baseline. Thus, purchasing ERCs would not reduce, offset, or mitigate increases in Project emissions, as the reductions occurred historically, before the Project was conceived and are part of the baseline.

Second, historically banked ERCs are legally distinct from emission reductions required under CEQA to mitigate new increases in emissions. Thus, the ERC concept is not consistent with the CEQA mandate to mitigate actual impacts on local receptors. The emissions of VOCs will increase in the area where the new Project emissions are released. The impact of this increased pollution on local sensitive receptors must be evaluated under CEQA and mitigated at the time and place that it occurs.

On a common sense level, it is not logical to assume that ERCs, which frequently have been banked decades ago and at locations that are hundreds of miles from the project site, will do anything to mitigate impacts from local emission increases, especially in a region plagued with serious and ongoing air quality violations. Instead, this approach aggravates the exposure of residents to extraordinarily unhealthy ozone in the local area.

Therefore, the use of ERCs is not valid mitigation under CEQA. ERCs are not an acceptable substitute for performing local air quality analyses and mitigating the local impacts themselves. A revised CEQA document should prohibit the use of offsets to mitigate air quality impacts, except those offsets that occur at the project site at the time of project startup. Instead, conventional mitigation is required to reduce the significant ROG emissions.

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4.2. Emissions from Other Equipment and Units

The IS only estimates the change in ROG emissions for maintenance, purging, and fugitive components (valves, flanges, etc.) for the OEC units' emissions. The facility includes other equipment that emits pollutants, including four cooling towers, a vapor recovery unit, a diesel generator, and a fire pump.[136] These all variously emit ROG, NOx, PM10, PM2.5, and HAPs. Because the facility is at the end of its useful life and is being repowered, it is reasonable to assume that the Heber 2 facility and all of this supporting equipment has not been operating at its design capacity in the baseline.

The increase in emissions from this Project must be based on baseline emissions; typically, the average emissions in the two years preceding the start of environmental review. The IS contains no estimate of baseline emissions or resulting increases in emissions from any of this supporting equipment. Thus, it fails as an informational document under CEQA.

The baseline would depend on the amount of electricity generated by the units that are being retired or the baseline generation. In any given year, the actual power generation, and thus emissions from supporting equipment, may differ from the Project's design capacity, due to age, operational issues, or other factors. The IS and supporting files are silent on power generation from the units that are being retired, which would directly determine baseline emissions for supporting equipment. The Project is replacing six 36-MW units, for a total of 216 MW. Thus, the IS fails as an informational document under CEQA.

My analysis of the CEC generation for the subject units indicates that the Project will increase generation by two thirds or by a factor of 1.6. Thus, emissions from all supporting equipment will nearly double. The IS fails as an informational document under CEQA for failing to disclose the increase in generation and its impact on emissions from supporting equipment.

Additionally, neither the IS nor the ATC permit application discusses why the Project would require three new 10,000-gallon isopentane storage tanks even though the operating capacity of the new OECs is less than the operating capacity of the existing Heber 2 units, the units are more efficient, and the generating capacity only increases by about 2 MW gross. These tanks would in part be required to accommodate the significant increase in generation.

Another explanation would be that the Project may debottleneck production at the Goulds and Heber South facilities. The six OECs at Heber 2 are operationally

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[136] IS, pdf 289; ATC Application, Table 1, pdf 13.

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interconnected to each other, as well as to Gould 2 and Heber South.[137] This would increase emissions. This explanation cannot be ruled out due to the inadequate Project description. In fact, the hazard assessment characterizes the Project as "part of the facility's expansion project…"[138] Thus, the IS fails as an informational document under CEQA.

5. CUMULATIVE AIR QUALITY IMPACTS

The IS concluded that all cumulative impacts were less than significant, without identifying any cumulative projects or conducting any analyses.[139] "Cumulatively considerable" under CEQA means that "the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects."[140] When the incremental effect of a project is cumulatively considerable, the lead agency must evaluate cumulative impacts in an EIR.[141]

The plain language of this section of CEQA (i.e., "the effects of past projects, the effects of other current projects, and the effects of probable future projects") requires the identification of other projects that will be constructed and/or operating over the same time period as the subject project and the analysis of these projects together with the Project being reviewed. Thus, cumulative impacts can be determined by identifying past projects, other current projects, and probable future projects and their impacts. The IS concluded that all cumulative impacts were less than significant without identifying any cumulative projects or conducting any cumulative impact analyses. Thus, the IS fails as an informational document under CEQA.

The IS includes a section captioned "Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard."[142] However, this section does not present any cumulative emissions or even discuss cumulative impacts.

First, the IS asserts that the Project would reduce VOC emissions (VOC = ROG). However, as discussed in Comments 2.2 and 4.1, this is incorrect due to the use of an invalid baseline assumption. The Project will increase VOC emissions.

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137 ATC Application, pdf 9.

138 IS, pdf 299, 314 (Heber 2 expansion project).

139 IS, pdf 19.

140 CEQA Guidelines §15064(h)(1).

141 CEQA Guidelines §15064.

142 IS, pdf 19.

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Second, the IS asserts that because VOC emissions will be reduced, the "Project would not … contribute to an existing air quality violation." This is incorrect because, even assuming it would not contribute to a ROG violation, the Project will also emit NOx, PM10, PM2.5 and other criteria pollutants from increases in the operation of support equipment. Comment 4.2.

Third, the IS asserts that "emissions from construction equipment would be temporary and not exceed any air quality thresholds or significantly contribute to an existing regional nonattainment condition…"[143] However, the IS contains no estimate of construction emissions, so there is no basis for concluding they are not cumulatively significant. My analysis in Comment – indicates that construction PM10 emissions are significant. Thus, under the IS's reasoning, cumulative construction PM10 emissions are also significant.

Fourth, the IS next asserts that air quality control measures "would be in line with the Imperial County 2018 PM10 Plan and Imperial County 2018 PM2.5 Plan …. and therefore, be in compliance with Imperial County's approach to minimizing these construction-related emissions."[144] However, the IS itself fails to identify a single PM control measure and fails to provide a specific citation to the PM10[145] and PM2.5 plans[146] where these controls can be found. The PM10[147] and PM2.5 plans[148] that I found only require controls at nonresidential construction sites greater than or equal to 5 acres. The subject site is a nonresidential 4-acre site. Thus, these plans do not apply. Regardless, compliance with control plans has nothing to do with cumulative impacts.

In sum, the IS fails to identify any cumulative projects and fails to estimate cumulative emissions and impacts. There are projects in the general area that would cumulatively contribute to air quality impacts, including the Valencia Solar Project and

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143 IS, pdf 19.

144 IS, pdf 19.

145 Imperial County APCD, Board Agenda Fact Sheet, 2018 PM10 Plan, October 23, 2018; https://apcd.imperialcounty.org/wp-content/uploads/2020/01/2018PM10PlanBoardPacket.pdf.

146 Imperial County APCD, Imperial County 2018 Annual Particulate Matter Less than 2.5 Microns in Diameter State Implementation Plan, April 2018, Rule 801 encompassed in this Plan only requires a dust control plan for nonresidential sites of 5 acres or greater. The subject site is 4 acres; https://ww3.arb.ca.gov/planning/sip/planarea/imperial/final_2018_ic_pm25_sip.pdf.

147 Ibid., pdf 39 (dust control plan only required for construction sites greater than or equal to 5 acres for nonresidential projects), 169.

148 Rule 801, Sec. E.1.c.

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Le Conte Battery Energy Storage facility, among others.[149] Thus, the IS fails as an informational document under CEQA.

6. HEALTH IMPACTS

The IS contains a subsection under air quality captioned "Expose sensitive receptors to substantial pollutants concentrations."[150] Normally, a section with this title in a CEQA document would discuss construction and operational health risks (cancer, acute and chronic impacts), not ambient air quality, which is a separate impact area.

6.1. The IS Did Not Evaluate Construction Health Risks

A health risk assessment is commonly conducted to determine if a Project's construction and/or operational hazardous air pollutant (HAP) emissions would cause a significant health impact.[151] The health risk assessment is based on pollutants other than conventional air quality pollutants, e.g., ROG, NOx, PM10, PM2.5, CO, and SO_2.

Construction equipment emits diesel particulate matter (DPM), which is a HAP.[152] If Tier 1 equipment is used (Comment 3.5), DPM emissions could be very high. Nothing in the IS would prevent the use of Tier 1 equipment. Construction workers, workers at the existing Heber facility, and nearby residents will be exposed to DPM during construction.

However, despite its caption, this section does not discuss health impacts to these sensitive receptors from HAP emissions. Instead, it discusses cumulative air quality impacts without ever estimating Project air quality impacts, the starting point for a cumulative analysis. The IS contains no analysis whatsoever of health impacts or cumulative air quality impacts, thus failing as an informational document under CEQA.

Instead of discussing health impacts to sensitive receptors, this section asserts with no support that "if an individual project generates construction or operational emissions that exceed the ICAPCD's recommended daily thresholds for project-specific impacts, that project would also cause a cumulatively considerable increase in emissions…."[153] However, these thresholds are for Project air quality impacts, not

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[149] See: http://www.icpds.com/?pid=2854.

[150] IS, pdf 19.

[151] Office of Environmental Health Hazard Assessment (OEHHA), Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessment, February 2015; https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf.

[152] Cal/EPA OEHHA and American Lung Association of California, Health Effects of Diesel Exhaust; https://oehha.ca.gov/media/downloads/calenviroscreen/indicators/diesel4-02.pdf.

[153] IS, pdf 19.

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public health impacts or even cumulative impacts. The thresholds for public health impacts are cancer risk in cases per million exposed and acute and chronic hazard indices, metrics that are not reported in the IS.[154]

This mislabeled section continues: "As discussed in Section 2.1.7, air quality measures would be implemented during construction … to minimize the potential for fugitive dust and particulate matter releases."[155] However, as noted in Comment 3.3.3, Section 2.1.7 does not exist. Further, if an impact requires mitigation, an IS is the wrong CEQA document. Mitigation to minimize an impact requires the preparation of an EIR.

Further, what does "minimize" mean in the CEQA cumulative impact context? How can you conclude cumulative emissions, regardless of whether they are HAPs or conventional air pollutants (e.g., ROG, NOx), are not significant without estimating the Project and cumulative project emissions and either comparing them to a significance threshold or modeling them to determine if they violate ambient air quality standards? You cannot.

The IS then concludes, again with no analysis whatsoever, that "through the application of these [unidentified] measures, the construction of the Project would limit visible dust emissions and particulate matter emissions to 20 percent opacity and/or 150 lb/day, and therefore, be in compliance with Imperial County's approach to minimizing these construction related emissions."[156]

This conclusion is unsupported and incorrect. Further, it has nothing to do with the caption of this subsection, "expose sensitive receptors to substantial pollutants concentrations." The IS failed to estimate "visible dust emissions" and thus has no basis for concluding that these emissions would be less than 150 lb/day or meet any opacity limit.

The IS then wraps up this section with an unsupported conclusion on ozone, asserting that the Project will "be in compliance with Imperial County's approach to minimizing these construction-related emissions…. To limit the amount of ozone emissions from construction equipment, vehicles and equipment would be turned off when not in use and not left idling…. The temporary and relatively low amount of

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[154] Office of Environmental Health Hazard Assessment (OEHHA), Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessment, February 2015; https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf.

[155] IS, pdf 19.

[156] IS, pdf 19.

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ozone emissions from the construction equipment would result in a less than significant cumulative impact."[157]

In my opinion, construction ozone emissions are likely significant because the area where the Project is located currently violates ozone ambient air quality standards and construction would increase ozone precursor emissions. Thus, by proposing mitigation, the IS is conceding that cumulative ozone impacts are significant, requiring the preparation of an EIR.

In sum, this section is a jumbled mess that has nothing to do with the section title. Despite the caption, this section and the entire IS fails to estimate construction HAPs, primarily DPM (typically measured as PM2.5) and does not contain a health risk assessment. Instead, the "expose sensitive receptor" section discusses unrelated issues, which are not supported. Thus, the IS fails as an informational document under CEQA.

6.2. Hydrogen Sulfide

The entire plan area overlays a geothermal fluids reservoir. Geothermal fluids extraction and reinjection has caused annual ground surface settlement that is not uniform.[158] Geothermal fluids contain high concentrations of hydrogen sulfide (H_2S),[159] which is an extremely hazardous gas with pronounced health effects. Depending on the concentrations and length of exposure, health effects vary from irritation of eyes, nose, throat, or respiratory system to shock, convulsions, inability to breathe, and, in extreme cases, death.[160]

If construction occurs in an area where surface settlement has occurred, construction workers could experience significant adverse health impacts from escaping H_2S.

Further, workers performing routine duties can be exposed to significant levels of H_2S. Occupational health and safety issues during construction and decommissioning of geothermal power generation projects are common but were not addressed in the IS. Environmental, Health, and Safety Guidelines note as follows:[161]

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[157] IS, pdf 19.

[158] IS, Geotechnical Report Update, pdf 96.

[159] See, for example, ATC Application, pdf 14.

[160] See, for example, Occupational Safety and Health Administration, OSHA Quick Card, Hydrogen Sulfide (H_2S); https://www.osha.gov/Publications/hydrogen_sulfide.html.

[161] International Finance Corporation and World Bank Group, Environmental, Health, and Safety Guidelines: Geothermal Power Generation, April 30, 2007; https://www.ifc.org/wps/wcm/connect/

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Geothermal Gases

Occupational exposure to geothermal gases, mainly hydrogen sulfide gas, may occur during non-routine release of geothermal fluids (for example, pipeline failures) and maintenance work in confined spaces such as pipelines, turbines, and condensers.

Where there is a potential for exposure to hazardous levels of hydrogen sulfide, geothermal power facilities should consider the following management measures:

- Installation of hydrogen sulfide monitoring and warning systems. The number and location of monitors should be determined based on an assessment of plant locations prone to hydrogen sulfide emission and occupational exposure;[8]
- Development of a contingency plan for hydrogen sulfide release events, including all necessary aspects from evacuation to resumption of normal operations;
- Provision of facility emergency response teams, and workers in locations with high risk of exposure, with personal hydrogen sulfide monitors, self-contained breathing apparatus and emergency oxygen supplies, and training in their safe and effective use;
- Provision of adequate ventilation of occupied buildings to avoid accumulation of hydrogen sulfide gas;
- Development and implementation of a confined space entry program for areas designated as 'Confined Spaces' (see below);
- Providing workers with a fact sheet or other readily available information about the chemical composition of liquid and gaseous phases with an explanation of potential implications for human health and safety.

afad6488-c478-45d8-bd2e-dc2f86b7e18a/Final%2B-%2BGeothermal%2BPower%2BGeneration.pdf?MOD=AJPERES&CVID=jkD2Ay-&id=1323161975166.

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None of these measures is incorporated into the Project, potentially exposing workers to dangerous conditions.

Further, the facility itself emits H_2S, reported as 0.5 lb/hr in the ATC Application.[162] Thus, workers at the facility, as well as others in the vicinity, including nearby workers or motorist on adjacent roadways, could be exposed to H_2S, resulting in both odor impacts and health impacts. The IS is silent on this issue, failing as an informational document under CEQA.

Hydrogen sulfide has well-established eye irritation, respiratory, neurological, and reproductive and development effects. It also can result in death at high exposure, such as may occur during accidental releases. The health effects of H_2S increase sharply with dose, ranging from a rotten egg smell (0.13–0.15 ppm), to respiratory, eye, and throat irritation (100 ppm), to olfactory nerve paralysis (150 ppm), and coma (1000 ppm). Exposure to high concentrations can be extremely hazardous and lead to immediate collapse or death. Most deaths have occurred in industrial settings.[163,164]

California has an ambient air quality standard for H_2S of 0.03 ppm (30 ppb or 42 $\mu g/m^3$) for one hour, which was adopted in 1969.[165] This standard is not adequate to protect exposed parties from chronic health effects because OEHHA's chronic Reference Exposure Level (REL) is 8 ppb, or a factor of nearly four lower.[166] The IS failed to identify this standard or determine if Project construction would cause or contribute to violations of the standard or result in chronic health impacts among the construction work force.

Further, H_2S is highly odiferous and can be detected at subparts per billion levels. Guidelines recommend installation of an H_2S gas monitoring network and

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[162] ATC Application, Section 2.0, pdf 14.

[163] E. Lim and others, Effect of Environmental Exposure to Hydrogen Sulfide on Central Nervous System and Respiratory Function: A Systematic Review of Human Studies, *International Journal of Occupational and Environmental Health*, v. 22, no. 1, January 2016, pp. 80–90; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4894269/.

[164] Health Canada, Draft Screening Assessment Hydrogen Sulfide (H_2S), Sodium Sulfide (Na(SH)) and Sodium Sulfide (Na_2S), September 2017; http://www.ec.gc.ca/ese-ees/default.asp?lang=En&n=2C9C9061-1.

[165] James Collins and David Lewis, Hydrogen Sulfide: Evaluation of Current California Air Quality Standards with Respect to Protection of Children, September 1, 2000; https://ww3.arb.ca.gov/ch/ceh/aqstandards/oehhah2scontractorreport091200.pdf.

[166] *Id.*, p. 18.

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emergency planning involving community input to allow for effective response to monitoring system warnings.[167]

The IS is silent on H_2S health effects and odor impacts, thus failing as an informational document under CEQA.

7. VALLEY FEVER

The Project site is located in an area that is endemic for Coccidioidomycosis (abbreviated as cocci), commonly known as Valley Fever. Coccidioidomycosis is an infectious disease caused by inhaling the spores of *Coccidioides ssp*.[168,169] Clinical manifestations range from influenza-like illness to progressive pulmonary disease and, in 1% of infections, potentially fatal disseminated disease.[170] When soil containing this fungus is disturbed by activities such as digging, vehicle use, construction, dust storms, or during earthquakes, the fungal spores become airborne.[171,172] Valley Fever outbreaks

[167] International Finance Corporation and World Bank Group, 2007, pp. 6-7.

[168] Two species of *Coccidioides* are known to cause Valley Fever: *C. immitis*, which is typically found in California, and *C. posadasii*, which is typically found outside California. See Centers for Disease Control, Coccidioidomycosis (Valley Fever), Information for Health Professionals; https://www.cdc.gov/fungal/diseases/coccidioidomycosis/health-professionals.html.

[169] D. R. Hospenthal, Coccidioidomycosis and Valley Fever, Medscape, Updated September 20, 2018; https://emedicine.medscape.com/article/215978-overview.

[170] Cummings et al., Point-Source Outbreak of Coccidioidomycosis in Construction Workers, *Epidemiology and Infection*, v. 138, no. 4, 2010, pp. 507-511, 2010 (Exhibit 5).

[171] California Department of Public Health, Valley Fever Fact Sheet, January 2016; https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/ValleyFeverFactSheet.pdf. *See also* G. Sondermeyer Cooksey et al., Update on Coccidioidomycosis in California, pp. 20-21, Medical Board of California Newsletter, v. 141, Winter 2017; https://www.mbc.ca.gov/Download/Newsletters/newsletter-2017-01.pdf.

[172] Cummings et al. 2010 (Exhibit 5).

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during construction in California have been widely reported.[173,174,175,176,177,178] Spores raised during construction and/or wind storms,[179] which are common in the area, can result in significant worker and public health impacts. Imperial County is endemic for Valley Fever.[180] Valley Fever cases have increased significantly since the Heber 2 facility was constructed[181,182] in 1992,[183] including in Imperial County, where 42% of the cases occurred in El Centro.[184]

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173 Jason A. Wilken et al., Coccidioidomycosis among Workers Constructing Solar Power Farms, California, USA, 2011–2014, *Emerging Infectious Diseases*, v. 21, no. 11, November 2015; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4622237/.

174 The Associated Press, Valley Fever Hits 28 at Calif. Solar Plant Sites, *The San Diego Union-Tribune*, May 1, 2013; http://www.sandiegouniontribune.com/sdut-valley-fever-hits-28-at-calif-solar-plant-sites-2013may01-story.html.

175 G. L. Sondermeyer Cooksey et al., Dust Exposure and Coccidioidomycosis Prevention Among Solar Power Farm Construction Workers in California, *American Journal of Public Health*, August 2017 (Exhibit 6).

176 Rupal Das et al., Occupational Coccidioidomycosis in California, Outbreak Investigation, Respirator Recommendations, and Surveillance Findings, *Journal of Occupational and Environmental Medicine*, May 2012, vol. 54, no. 5, pp. 564-571 (Exhibit 7).

177 D. Pappagianis and the Coccidioidomycosis Serology Laboratory, Coccidioidomycosis in California State Correctional Institutions, *Annals of the New York Academy of Sciences*, v. 1111, pp. 103-111, 2007 (Exhibit 8).

178 K. C. Cummings et al., Point-source Outbreak of Coccidioidomycosis in Construction Workers, *Epidemiology and Infection*, v. 138, 2010, pp. 507-511 (Exhibit 5).

179 P. L. Williams, D. L. Sable, P. Mendez, and L. T. Smyth, Symptomatic Coccidioidomycosis Following a Severe Natural Dust Storm: An Outbreak at the Naval Air Station, Lemoore, Calif, *Chest*, pp. 566-70, 1979; https://pubmed.ncbi.nlm.nih.gov/498830/.

180 California Department of Public Health, Valley Fever Fact Sheet; https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Coccidioidomycosis.aspx#.

181 Barbara Feder Ostrov and Harriet Blair Rowan, Valley Fever Cases Climb in California's Central Valley—and Beyond, December 17, 2019; https://khn.org/news/valley-fever-cases-climb-in-californias-central-valley-and-beyond/.

182 CDC, Valley Fever (Coccidioidomycosis) Statistics; https://www.cdc.gov/fungal/diseases/coccidioidomycosis/statistics.html.

183 IS, pdf 9, 11, 22, 27, 28, 40, 53, 73, etc. Other sources report 1985; https://en.wikipedia.org/wiki/List_of_power_stations_in_California.

184 Stephen Munday, Imperial County Public Health, Overview of Coccidioidomycosis (Valley Fever), May 21, 2013; pdf 21, 24; http://imperial.granicus.com/MetaViewer.php?view_id=2&clip_id=455&meta_id=59137.

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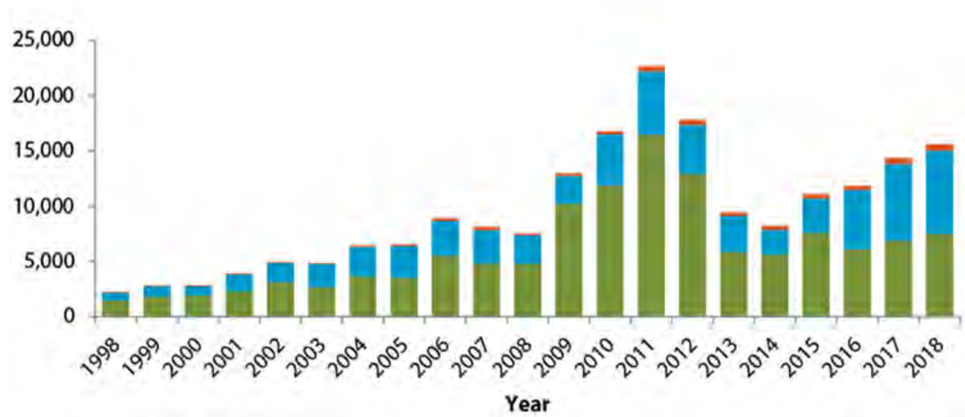
Figure 6: Number of Reported Valley Fever Cases[185]



The IS is silent on this significant impact, thus failing as an informational document under CEQA. Further, the existence of this potentially significant impact requires the preparation of an EIR.

"Workers disturbing soil in areas where Valley Fever is common are at highest risk," with construction workers topping the list.[186] As the proposed site has the potential to contain Coccidioidomycosis spores and it is well known that they can easily become airborne when soil is disturbed,[187] the Project construction site should be tested well in advance of construction to determine if spores are present. Accurate test methods have been developed and used in similar applications.[188,189] A study conducted in the Antelope Valley, slated for six solar ranches of varying sizes, concluded that soil analyses should be conducted before soil disturbance in endemic areas, noting: "Based on the findings of this study, we recommend that EIRs include soil analyses for *Coccidioides spp.* on land destined for construction of any type in

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185 Ibid.

186 Wilken et al. 2015, pdf 19.

187 Colson et al. 2017, p. 451 ("A correlation between soil disturbances due to large-scale renewable energy construction projects, agricultural management practices and PM10 fugitive dust emission with increased incidence of coccidioidomycosis was clearly indicated by results of this study."), p. 456 ("One such danger is *Coccidioides spp.* arthroconidia becoming airborne when soil is disturbed and dust mitigation measures are inefficient or absent.").

188 J. R. Bowers et al., Direct Detection of Coccidioides from Arizona Soils Using CocciENV, a Highly Sensitive and Specific Real-time PCR Assay, *Medical Mycology*, 2018 (Exhibit 9); and Proceedings of the 60th Annual Coccidioidomycosis Study Group Meeting, April 8–9, 2016, Fresno, CA; http://coccistudygroup.com/wp-content/uploads/2016/10/CSG-60th-Annual.pdf.

189 Colson et al. 2017, pp. 439–458.

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endemic areas of the pathogen."[190] An Environmental Assessment for a solar project in a nearby area has required soil testing.[191]

In response to an outbreak of Valley Fever in construction workers in 2007 at a construction site for a solar facility within San Luis Obispo County, its Public Health Department, in conjunction with the California Department of Public Health,[192] developed recommendations to limit exposure to Valley Fever based on scientific information from the published literature. The recommended measures go far beyond the conventional dust control measures included in the CUP.[193] They include the following measures that are not required by the IS's mitigation measures:

1. Train all employees on the following issues:
   - The soils in Imperial County may contain cocci spores;
   - Inhaling cocci spores may cause Valley Fever;
   - How to recognize symptoms of Valley Fever; these symptoms resemble common viral infections, and may include fatigue, cough, chest pain, fever, rash, headache, and body and joint ache;
   - Work with a medical professional with expertise in cocci as you develop your training program and consult information on public health department websites;
   - Workers must promptly report suspected symptoms of work-related Valley Fever to a supervisor;
   - Workers are entitled to receive prompt medical care if they suspect symptoms of work-related Valley Fever. Workers should inform the health care provider that they may have been exposed to cocci;
   - To protect themselves, workers should use control measures as outlined here.

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[190] Colson et al. 2017, p. 456.

[191] Final Environmental Assessment for Construction, Operation, and Decommissioning of a Solar Photovoltaic System at Marine Air Ground Task Force Training Command Marine Corps Air Ground Combat Center, Twentynine Palms, California, November 2015, Table ES-1, AQ-17; https://www.29palms.marines.mil/Portals/56/Docs/G4/NREA/Environmental%20Assessment%20Construction%20and%20Operation%20of%20Solar%20Photovoltaic%20System%20at%20MAGTFTC,%20MCAGCC%20(Final)%20November%202015.pdf.

[192] CDPH June 2013, pp. 4-6. See also Wilken et al., 2015, and Sondermeyer Cooksey et al. (Exhibit 6).

[193] IS, pdf 364 in the attached CUP lists construction mitigation.

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2. Control dust exposure:

   – Consult with local Air Pollution Control District Compliance Assistance programs and with California Occupational Safety and Health Administration ("Cal/OSHA") compliance program regarding meeting the requirements of dust control plans and for specific methods of dust control. These methods may include wetting the soil continuously while working it and ensuring that the wetting process does not raise dust or adversely affect the construction process.

   – Provide high-efficiency particulate ("HEP")-filtered, air-conditioned enclosed cabs on heavy equipment. Train workers on proper use of cabs, such as turning on air conditioning prior to using the equipment and keeping windows closed.

   – Provide communication methods, such as 2-way radios, for use in enclosed cabs.

   – Employees should be medically evaluated, fit-tested, and properly trained on the use of the respirators, and a full respiratory protection program in accordance with the applicable Cal/OSHA Respiratory Protection Standard (8 CCR 5144) should be in place.

   – Provide National Institute for Occupational Safety and Health (NIOSH)-approved respirators for workers with a prior history of Valley Fever.

   – Half-face respirators equipped with N-100 or P-100 filters should be used during digging. Employees should wear respirators when working near earth moving machinery.

   – Prohibit eating and smoking at the worksite, and provide separate, clean eating areas with handwashing facilities.

   – Avoid outdoor construction operations during unusually windy conditions or in dust storms.

   – Consider limiting outdoor construction during the Fall to essential jobs only, as the risk of cocci infection is higher during this season.

3. Prevent transport of cocci outside endemic areas:

   – Thoroughly clean equipment, vehicles, and other items before they are moved off-site to other work locations.

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- Provide workers with coveralls daily, lockers (or other systems for keeping work and street clothing and shoes separate), daily changing and showering facilities.
- Clothing should be changed after work every day, preferably at the work site.
- Train workers to recognize that cocci may be transported offsite on contaminated equipment, clothing, and shoes; alternatively, consider installing boot-washing facilities.
- Post warnings onsite and consider limiting access to visitors, especially those without adequate training and respiratory protection.

4. Improve medical surveillance for employees:

   - Employees should have prompt access to medical care, including suspected work-related illnesses and injuries.
   - Work with a medical professional to develop a protocol to medically evaluate employees who have symptoms of Valley Fever.
   - Consider preferentially contracting with 1-2 clinics in the area and communicate with the health care providers in those clinics to ensure that providers are aware that Valley Fever has been reported in the area. This will increase the likelihood that ill workers will receive prompt, proper and consistent medical care.
   - Respirator clearance should include medical evaluation for all new employees, annual reevaluation for changes in medical status, and annual training, and fit-testing.
   - Skin testing is not recommended for evaluation of Valley Fever. [194]
   - If an employee is diagnosed with Valley Fever, a physician must determine if the employee should be taken off work, when they may return to work, and what type of work activities they may perform.

In a more recent Valley Fever outbreak among solar plant construction workers in Monterey County, public health officials conducted a site visit to the solar farm to observe and interview workers and employers about work practices, dust control, and

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[194] Short-term skin tests that produce results within 48 hours are now available. See Kerry Klein, NPR for Central California, New Valley Fever Skin Test Shows Promise, But Obstacles Remain, November 21, 2016; http://kvpr.org/post/new-valley-fever-skin-test-shows-promise-obstacles-remain.

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use of protective equipment; review training materials; and discuss prevention strategies. The visit confirmed dust control issues, serious lapses in use of respiratory protection, insufficient Coccidioidomycosis employee training, and no system for tracking or reporting illness. Thus, in November 2017, the CDPH issued prevention recommendations before the start of the second construction phase, which was scheduled to continue through the end of 2018. Recommendations for employers included:[195]

(1) reducing dust exposure by ensuring ample and efficient water truck capacity to wet soil;

(2) using only heavy equipment with enclosed cabs and temperature-controlled, high efficiency particulate air–filtered air;

(3) providing clean coveralls daily to employees who disturb soil;

(4) implementing a mandatory respiratory protection program (8 CCR §5144, Respiratory Protection: https://www.dir.ca.gov/title8/5144.html) that specifically requires National Institute for Occupational Safety and Health–approved respirators be worn while performing or in the near vicinity of job activities that create airborne dust;

(5) developing effective Valley Fever training for all employees, including ways to reduce exposure, how to recognize symptoms, and where to seek care; and

(6) tracking and reporting of all suspected Valley Fever illnesses that occur at the worksite to the Imperial County Public Health Department.

The study concluded that prevention methods need to be better incorporated into the planning and monitoring of construction projects in areas with endemic *Coccidioides* (e.g., by involving public health practitioners in pre-project reviews). Specifically, the following was recommended: "Outdoor workers in these areas should be trained by employers about the potential for infection, how to limit dust exposure, how to recognize symptoms, where to seek care, and how to ask a health care provider to assess them for coccidioidomycosis. Clinicians should inquire about occupational history and should suspect coccidioidomycosis in patients who are outdoor workers in areas with endemic *Coccidioides* and who have a clinically compatible illness."[196]

Similarly, the California Department of Public Health (CDPH) recently summarized recommendations to control Valley Fever, including:[197]

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[195] Law et al., 2018.

[196] *Ibid.*

[197] See, *e.g.*, 8/21/18 CDPH; Wilken 2015.

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- Minimize soil disturbance through job design (e.g., avoid digging, reduce grading, maintain vegetation, install wiring in aboveground trays instead of belowground trenches);
- Limit dust generation and exposure;
- Protect operators with enclosed cabs (air conditioned with HEPA air filtration, windows closed & 2-way radio for communication, wet-clean inside cabs);
- Maintain effective cab pressurization and filtration (positive pressure, tight door seals, gaskets, holes sealed up, replace clogged filters, provide cooling & heating);
- Get employees respirator-ready;
- Use respirators with N95 or P100 (HEPA) filters;
- Develop respiratory protection program (program coordinator, medical clearance, fit testing, training, written policy on when to use respirators);
- Plan to take action when dust cannot be controlled (rules for work stoppage, monitor conditions, move indoors or into HEPA-filtered A/C, don respirators quickly);
- Valley Fever prevention training (train all supervisors, employees, & subcontractors);
- Training content to include Valley Fever awareness, symptoms, groups at greater risk, how to prevent exposure, what to do if you have symptoms;
- Preventing "take-home" dust (provide clean area to wash up, require change of clothing, provide boot cleaning stations, wet-clean tools and equipment); and
- Train workers on what to do if they're sick (inform supervisors, get medical evaluation, file workers' compensation claim).

In addition to the above-discussed measures, I recommend the following mitigation measures to protect construction workers, on-site workers at the existing geothermal facilities, and off-site sensitive receptors:

- Continuously wet the soil before and while digging or moving the earth. Landing zones for helicopters and areas where bulldozers, graders, or skid steers operate are examples where continuously wetting the soil is necessary.
- When digging a trench or fire line or performing other soil-disturbing tasks, position workers upwind when possible.

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- Place overnight camps, especially sleeping quarters and dining halls, away from sources of dust such as roadways.
- Minimize the amount of digging by hand. Instead, use heavy equipment with the operator in an enclosed, air-conditioned, HEPA-filtered cab.

In sum, construction mitigation measures in the IS (included in the attached CUP) are not adequate to control Valley Fever spores raised during Project construction. Projects that have implemented similar conventional PM10 dust control measures have experienced fugitive dust issues and reported cases of Valley Fever.[198,199]

All of the above health-protective measures recommended by the San Luis Obispo County Public Health Department, Monterey County Health Department, and the California Department of Public Health are feasible for the Project and must be required in a dust control plan included in an EIR that evaluates and mitigates the risk to construction workers, on-site workers, nearby residents, and passengers on public roads from contacting Valley Fever. Many of these measures have been required by the County of Monterey in other EIRs.[200] They are also required in the EIR for the California High-Speed Train.[201] Even if all of the above measures are adopted, CEQA review is required to analyze whether these measures are adequate to reduce this significant impact to a level below significance.

8. HAZARDS

The IS contains an asserted "worst-case analysis" for the failure of one isopentane storage tank (vapor cloud explosion) with an endpoint distance of 0.3 miles for an overpressure of 1 psi. The IS also contains an alternative release scenario for a truck transfer hose uncoupling from the isopentane storage tank during loading operations with an endpoint distance of 0.1 miles for an overpressure of 1 psi.[202]

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198 Herman K. Trabish, Green Tech Media, Construction Halted at First Solar's 230 MW Antelope Valley Site, April 22, 2013; http://www.greentechmedia.com/articles/read/Construction-Halted-At-First-Solars-230-MW-Antelope-Valley-Site.

199 Julie Cart, 28 Solar Workers Sickened by Valley Fever in San Luis Obispo County, *Los Angeles Times*, May 1, 2013; http://articles.latimes.com/2013/may/01/local/la-me-ln-valley-fever-solar-sites-20130501.

200 County of Monterey, California Flats Solar Project Final Environmental Impact Report, December 2014; https://www.co.monterey.ca.us/home/showdocument?id=48244.

201 California High-Speed Rail Authority and U.S. Department of Transportation, California High-Speed Train Project Environmental Impact Report/Environmental Impact Statement, Fresno to Bakersfield, Mitigation Monitoring and Enforcement Program Amendments, September 2015.

202 IS, Hazard Assessment for Heber 2 Expansion Project, pdf 293.

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The chemical released from the tank and transfer hose is isopentane (also called methyl butane or 2-methylbutane), which is an extremely volatile and highly flammable liquid at room temperature and pressure. The normal boiling point is just a few degrees above room temperature.[203] It will readily boil and evaporate on a warm day. Isopentane is used to drive turbines in geothermal power production, including the Project.

The IS concludes that impacts from accidents involving isopentane use and storage are not significant because the nearest sensitive receptors to the Project site are residences about 3,500 feet (0.66 mi) to the northeast.[204] The scenarios evaluated in the IS are not worst-case scenarios, as demonstrated below.

8.1. The Wrong Release Scenario Was Selected

Under applicable regulations,[205] a hazard analysis should be based on a worst-case scenario. The IS Hazard Assessment acknowledges this but failed to evaluate a worst-case scenario. Instead, it asserts:[206]

> *Normally, to develop the worst-case scenario, the covered process is reviewed, and a suitable worst-case release analysis is identified through a review of vessels and storage tanks to determine the single vessel with the largest quantity of the regulated substance. However, in this particular Hazard Assessment, the worst-case scenario instead analyzes a release from one of the three new 10,000 gallon isopentane storage vessels. This updated Hazard Assessment was performed to account for the modifications made to Heber 2 as part of the facility's expansion project, thus an exclusive examination of the new 10,000 gallon storage vessels was performed rather than a review of the entire facility.*

However, this is not a reasonable worst-case scenario under existing regulations for this Project. The new facilities are linked to existing facilities and are not standalone. Thus, the entire facility must be considered. The worst-case scenario is a single scenario (for toxics or flammables) that results in the maximum potential distance from the facility where people or the environment may be adversely impacted. This assessment requires that the entire isopentane inventory be taken into account when determining the maximum potential distance, not just the inventory from one of the three new tanks picked out of thin air. Thus, the IS fails as an informational document under CEQA.

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[203] Wikipedia, Isopentane; https://en.wikipedia.org/wiki/Isopentane.

[204] IS, pdf 20, 26, 29, 363.

[205] Federal EPA regulations at 40 CFR §68.20 to §68.42 and California EPA regulations at 19 CCR §2750.1 to §2750.9.

[206] IS, Hazard Assessment, pp. 3-4, pdf 298-299.

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Isopentane is present in two sources, the Ormat Energy Converters and storage tanks.[207] The Project will increase OEC isopentane from 150,000 gallons to 171,000 gallons or by 21,000 gallons[208] and tank OEC storage from 20,000 gallons to 50,000 gallons, increasing on-site isopentane from 171,000 gallons to 221,000 gallons. Thus, at a minimum, the IS should have evaluated a release of 51,000 gallons of isopentane, rather than a release of 10,000 gallons from a single tank.

The IS only evaluates a tank accident but failed to evaluate an accident at an OEC. The Project will reduce the total number of geothermal power units from eight to four.[209] Thus, an accident involving an OEC after the Project is complete will result in much more significant impacts than an accident involving one of the smaller units because each individual OEC will contain more isopentane. The IS is silent on these issues, failing as an informational document under CEQA.

Further, as the three new tanks will be sited side by side and adjacent to two existing 10,000-gallon isopentane tanks,[210] an accident involving any one of these tanks would very likely trigger a similar accident at adjacent tanks. Thus, assuming the IS's analysis, the worst-case hazard impacts are up to five times higher (5 tanks/1 tank = 5) than disclosed. In other words, rather than extending just 0.66 miles from the tanks, the impact would extend 5 x 0.66 = 3.3 miles from the site, which would encompass all of the city of Heber and portions of El Centro.

Further, the IS failed to evaluate the worst-case release scenario. The IS acknowledges five possible release scenarios: flash fire, pool fire, boiling liquid expanding vapor explosion (BLEVE), vapor cloud explosion, and jet fire.[211] The IS selected a vapor cloud explosion as the "most appropriate consequence" with no explanation or justification whatsoever.[212] However, a BLEVE is the worst case release scenario for very flammable materials such as isopentane because it combines both the mechanical effects of an explosion and the thermal effects of a fire. Due to these dual effects, it is one of the most severe accidents that can happen and typically results in mortalities. See for example, the summary in Table 2.

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[207] ATC Application, pdf 16.

[208] IS, pdf 289-290.

[209] ATC Application, pdf 17.

[210] IS, pdf 54 and 79 (3 new and 2 existing 10,000 gal tanks); Air Sciences Inc., Heber 2 Application for Authority to Construct (ATC Application), November 2019, Figure 2, pdf 11 (Exhibit 10).

[211] IS, pdf 301: Hazard Assessment, p. 6.

[212] Ibid.

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Table 2: BLEVE Accidents Occurring Between 1980 and 2004[213]

Date	Place	Material	Cause	Fatalities
1980	Los Angeles, USA	Gasoline	Tanker, road accident	2
1980	Rotterdam, The Netherlands	LPG	External fire in a bus station	-
1981	Montonas, México	Chlorine	Derailment, impact, fire	29
1982	Spencer, USA	Water	Overheating	7
1982	Louisiana, USA	Vinyl chloride	Derailment, impact, fire	0
1982	Taft, USA	Acroleine	Runaway reaction	0
1982	Tyne and Wear, UK	LPG	Tank, external fire	-
1983	Reserve, USA	Chlorobutadiene	Runaway reaction	3
1983	Houston, USA	Methyl bromide	Overfilling	2
1983	Murdock, USA	Propane	Derailment, impact, fire	0
1984	Romeoville, USA	Propane	Weld failure	15
1984	Cleveland, USA	LPG	External fire on vessel	0
1984	Mexico City	LPG	Leak and fire in storage park	500
1985	Priolo, Italy	Ethylene	Leak, jet fire on tanks	0
1985	Pine Bluff, USA	Ethylene, ethylene oxide	Derailment, impact, fire	0
1986	Kennedy S C, USA	Hydrogen	Fire	7
1987	Cairns, Australia	LPG	Human error (hose disconnected), fire	0
1988	Philadelphia, USA	Gasoline	Tanker, road accident	0
1988	Kings Ripton, UK	LPG	Human error (hose): leak while filling vessel, fire	0
1989	Alma Ata, Mongolia	LPG?	Train collision, fire	5
1990	St. Peters, Australia	LPG	Tank, external fire	-
1991	Lyon, France	Propane	External fire on small vessel	-
1995	La Plata, Argentina	Propane	Overfilling (human error)	2
1996	Paese, Italy	Propane	Human error while unloading a tanker, release, fire	0
1998	Albert City, USA	Propane	Car breakes pipes, fire	2
1998	Xian, China	LPG	Leak, fire on storage park	11
1999	Dortyol, Turkey	LPG	Human error	-
1999	KamenaVourla, Greece	LPG	Road accident, leak, fire	4
2000	Downey, USA	Propane	Leak, fire	-

A BLEVE is an explosion caused by the rupture of a vessel containing a pressurized liquid that has reached a temperature above its boiling point. As the normal boiling point of isopentane is just a few degrees above room temperature, this condition can be reasonably expected to occur. It can occur, for example, when a sudden drop in pressure inside a vessel causes violent boiling of the liquid, which rapidly releases large amounts of vapor. The pressure of this vapor can be extremely high, causing a significant wave of overpressure (explosion) that may completely destroy the tank and eject fragments over the surrounding areas, resulting in injury

[213] Joaquim Casal (Ed.), Evaluation of the Effects and Consequences of Major Accidents in Industrial Plants, Industrial Safety Series, Vol. 8, Table 5-1 (Exhibit 11).

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from shrapnel, explosion, and fire radiation. If the vessel's integrity is compromised, the loss of pressure and dropping boiling point can cause the liquid to quickly convert to gas and expand extremely rapidly. If the gas is also combustible, as is isopentane, further damage can be caused by fire.

The IS should have evaluated a BLEVE, which cannot be ruled out as a possible accident scenario. A BLEVE would result in much greater impacts than the vapor cloud explosion evaluated in the IS. The IS is silent on BLEVE impacts—a fatal omission, rendering the IS invalid under CEQA. I did not have the time or resources to redo the IS's work. However, the results of a similar study in which various release scenarios for a butane storage facility (63 million pounds of butane[214]) were evaluated shows that the impact radius for the BLEVE cases are substantially higher (up to 68 times) than the impact radius for the vapor cloud explosion cases evaluated in the IS.[215] Table 3.

Table 3: Summary of Release Scenarios, Amerigas Storage Facility[216]

Release Description	Wind Speed (m/s)	Air Temperature (°F)	Release Rate (lb/min.)	Impact Radius (miles)
Vapor Cloud Explosion	3.0	77.0	7,790	<0.1
Vapor Cloud Explosion	3.0	77.0	1,000	<0.1
Pool Fire	3.0	77.0	500	0.4
Pool Fire	3.0	77.0	7,790	1.7
Vapor Cloud Explosion	1.5	77.0	Instantaneous	3.2
Vapor Cloud Explosion	1.5	77.0	Instantaneous	4.0
BLEVE	3.0	77.0	Instantaneous	5.2
BLEVE	3.0	77.0	Instantaneous	6.8

Assuming a 68 times higher impact radius, an explosion at the Project's storage tank facility could extend 20 miles from the tanks,[217] impacting all of the city of Heber and much of the cities of El Centro and Calexico. The literature, for example, reports an accident that occurred in a 15,000-barrel spherical tank containing 500,000 gallons of mixed pentane and hexane that caught fire at a Texas refinery. Over an hour after the original fire started, the top of the tank ruptured violently and the storage tank BLEVEd and ignited two adjacent tanks 450 and 550 feet from the BLEVEd tank. Nineteen

214 Isobutane is an isomer of butane.

215 Worst-case BLEVE/Vapor Cloud Explosion = 6.8 mi/0.1 mi = 68.

216 Cornerstone Technologies, Inc., Quantitative Risk Analysis for Amerigas Butane Storage Facility, September 2010, Section 7.0, p. 12, pdf 18; http://nwsanpedro.org/wp-content/uploads/2012/10/RISK-ANALYSIS-ON-TANKS-PDF2.pdf.

217 Revised impact radius = (0.3 mi)(68) = 20 mi. Project impact radius of 0.3 miles from IS, pdf 311, Table 6.

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firefighters were killed and 31 injured. These are highly significant impacts.[218] The IS failed to address impacts to on-site workers.

If the new and/or existing isopentane tanks were engulfed in a fire, for example, a BLEVE could result.[219] The most common cause of a BLEVE is a fire near tanks containing volatile chemicals, caused by external high temperatures surrounding the tank that increase the temperatures inside of the tank, potentially to the breaking point. The result is a BLEVE, a rapid phase transition in which a liquid contained above its atmospheric boiling point is rapidly depressurized, causing nearly instantaneous transition from liquid to vapor with a corresponding energy release.

When a tank experiences a BLEVE, the vessel fully opens, releasing contained energy. As explained by Birk et al.:[220]

> When a tank suffers a BLEVE the vessel opens fully to release the contained energy. The release is strongly directional since the tank wall does not move away instantaneously. The piston effect of the expanding vapour generates a shock at some distance away from the tank. This shock then propagates into the surroundings. Behind this shock is an additional blast wind caused by liquid flashing. This may also produce a shock. When the tank opens fully and is flattened on the ground this produces a large impulse load. Long range projectiles are also possible.

As there are six tanks in close proximity, this could involve all tanks in a catastrophic accident, far worse than the accident evaluated in the IS.

8.2. Impact of Future Plans on Release Scenario

The Hazard Analysis failed to consider Imperial County's recently adopted "specific plan area" that covers the Heber Known Geothermal Resource Area (KGRA). The Heber Specific Plan allows commercial, residential, industrial, and other employment-oriented development in a mixed-use orientation, which currently

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218 Anton Riecher and Davis White, Sunray, Texas: July 29, 1956, Industrial Fire World, November 1, 2006; https://www.industrialfireworld.com/536610/sunray-refinery-blast.

219 Joaquim Casal (ed.), Chapter 5, Evaluation of the Effects and Consequences of Major Accidents in Industrial Plants, Industrial Safety Series, v. 8, 2000.

220 A. M. Birk et al., Near Field Blast Effects from BLEVE, *Chemical Engineering Transactions*, v. 48, 2016; https://www.aidic.it/cet/16/48/048.pdf#:~:text=A%20BLEVE%20takes%20place%20when,et%20al.%2C%202013).&text=This%20work%20presents%20some%20preliminary,blast%20effects%20from%20a%20BLEVE.

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includes geothermal uses. This plan could place many sensitive receptors close to the Project.[221] Heber's annual report discloses:[222]

> geothermal uses. Several of the landowners from whom we hold geothermal leases have expressed an interest in developing their land for residential, commercial, industrial or other surface uses in accordance with the parameters of the Heber Specific Plan Area. Currently, Imperial County's Heber Specific Plan Area is coordinated with the cities of El Centro and Calexico. There has been ongoing underlying interest since the early 1990s to incorporate the community of Heber. While any incorporation process would likely take several years, if Heber were to be incorporated, the City of Heber could replace Imperial County as the governing land use authority, which, depending on its policies, could have a significant effect on land use and availability of geothermal resources.

8.3. On-Site Receptors Excluded

The hazard analysis only considered "offsite sensitive receptors." However, one of the most at-risk populations are on-site workers, emergency responders, the Applicant's office/control room/shop building at the power plant, and agricultural workers in the surrounding fields. The impact to on-site workers would be highly significant. The Imperial County Fire Department, for example, reviewed the CUP. In their comments, they pointed out that isopentane is a hazardous substance with the following impacts:[223]

> Isopentane is highly flammable liquid that fire behavior can be highly volatile and vapors may explode when mixed with air. The amount of propose storage and the location rises concerns for Imperial County Fire Department and the surrounding community of Heber. The Emergency

The Fire Department specifically requested the following mitigation measures to protect the Imperial County Fire Department staff, facility staff, and citizens of Heber and Imperial County:

> - A certified fire protection engineer survey and analysis of current and proposed fire suppression and detection equipment be performed to evaluate the current systems performance and coverage of protection. Evaluate propose fire suppression and detection equipment in conjunction with existing equipment. A full report of findings must be provided to Imperial County Fire Department for review
> - Isopentane leak or fire will require a large scale evacuation area and create a large scale hazardous material incident with a large operational zone. To minimize potential extremely dangerous condition to firefighters and hazardous material teams Imperial County Fire Department is requiring that a Drone be purchase for Imperial County Fire Department. The final cost, details, and equipment of the drone shall be determined prior the issuance of the building permit.

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[221] U.S. Securities and Exchange Commission, Form 10-K, Ormat Technologies, Inc., Fiscal Year Ended December 31, 2019; https://sec.report/Document/0001437749-20-004072/. See also: Ormat Technologies, Inc., 2019 Annual Report, pdf 77; http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_ORA_2019.pdf.

[222] See, e.g. Ormat Technologies, Inc., 2019 Annual Report, pdf 77; http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_ORA_2019.pdf.

[223] IS, Letter from Andrew Loper, Fire Protection Bureau, to Imperial County Planning & Development Services, Re: Conditional Use Permit #19-0017, September 18, 2019, pdf 351-354.

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- All isopentane above ground storage tanks shall be protected by approved automatic fire suppression equipment. All automatic fire suppression shall be installed and maintained to the current adapted fire code and regulation.
- An approved automatic fire detection system shall be installed as per the California Fire Code. All fire detection systems shall be installed and maintained to the current adapted fire code and regulations.
- Fire department access roads and gates will be in accordance with the current adapted fire code and the facility will maintain a Knox Box for access on site.
- Compliance with all required sections of the fire code.
- Applicant shall provide product containment areas(s) for both product and water run-off in case of fire applications and retained for removal.

The IS fails as an informational document under CEQA for failing to identify the fire risk and for failing to require mitigation.

8.4. Mitigation for Hazard Impacts

To address potential hazards associated with use, storage, and disposal of the highly flammable motive fluid isopentane requires, at a minimum, the following mitigation measures based on commitments by Ormat and required by the County for the East Brawley Geothermal project:[224,225]

a) Disclose the potential project and cumulative risk of an isopentane vapor cloud explosion and fire to potentially affected residents and offer to relocate the residence.
b) Prepare a Hazard and Operability Review for the final geothermal plant design containing a structured and systematic examination of the planned operation for the power plant in order to identify and evaluate problems that may represent risks to personnel or equipment, or prevent efficient operation. Incorporate control valves, pump kill switches, and motor-operated valves into the final design. Monitoring and enforcement shall be the responsibility of the Imperial County Planning and Development Services Department, Imperial County Fire Department, and the California Department of Toxic Substances Control ("DTSC") as the Certified Unified Program Agency ("CUPA") for Imperial County.

Further, as required by the County for the East Brawley Geothermal project, implement at Heber Complex or expand to include the following plans:[226]

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[224] County of Imperial, East Brawley Geothermal, Final Environmental Impact Report, May 2012, p. 4.0-27 and 4.0-28, Item #23 on the Board of Supervisors agenda at: http://imperial.granicus.com/player/clip/356?view_id=2&meta_id=43881&redirect=true.

[225] County of Imperial, East Brawley Geothermal, Draft Environmental Impact Report, March 2011, p. 4.7-18.

[226] *Ibid*.

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c) Prior to issuance of a conditional use permit, prepare a comprehensive Hazardous Materials Business Plan for the Project in accordance with the California Accidental Release Prevention Program. The Hazardous Materials Management Plan ("HMMP") shall include (1) an Inventory and Site Map, (2) an Emergency Response Plan ("ERP") and Owner/Operator Identification, and (3) employee training.

   The HMMP will be prepared and submitted to the California Department of Toxic Substances Control ("DTSC"), as the Certified Unified Program Agency ("CUPA") for Imperial County, and shall be maintained and revised as necessary.

   The Project shall comply with all federal, state, Imperial County, and fire district requirements for temporary storage of flammable/combustible materials at construction sites. The proposed Project shall include staging areas where materials shall be stored during construction. Monitoring and enforcement shall be the responsibility of Imperial County Planning and Development Services Department, Imperial County Fire Department, and DTSC).

d) Prepare a comprehensive Emergency Response Plan ("ERP"). Consult with local emergency response providers. Require approval of this ERP by the Imperial County Sheriff's Office, Imperial County Office of Emergency Services, Imperial County Fire Department, Imperial County Department of Public Health, California Highway Patrol, and Caltrans prior to the commencement of site operations. The ERP shall address potential safety hazards associated with the project and identify public safety hazards that can be reduced or eliminated through specific protocols. The ERP also shall provide an overview of general procedures required to protect people and property during an emergency or disaster situation. The intent of the ERP is to establish a clear understanding of responsibilities for first responders, sheriff and police, local fire departments, emergency medical service agencies, and management of staff during an emergency situation.

   The ERP shall identify and assign personnel to various emergency tasks and responsibilities, thus creating a site emergency team. The ERP shall describe the emergency management procedures to cover possible emergencies (i.e., well blowouts, major fluid spills, earthquakes, etc.). There shall be at least one employee on call at all times (*i.e.*, available to respond to an emergency by reaching the facility within a short period of time) with the responsibility of coordinating all emergency response

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measures. The on-call emergency coordinator would be familiar with the ERP and would have the authority to commit the resources needed to carry out the contingency plan. Additionally, the ERP shall include designated assignments for on-site personnel, details of each position's responsibilities, procedures for coordination with outside resources, and establishment of a chain of command to take precedence in emergencies.

The Emergency Response Plan shall be updated annually in coordination with the Imperial County Fire Department, the Imperial County Public Health Department, the Imperial County Certified Unified Program Agency, and the Imperial County Office of Emergency Services. Enforcement/Monitoring shall be the responsibility of the Imperial County Department of Planning and Development Services.

9. GEOLOGIC IMPACTS

The IS does not discuss geologic impacts of extending the life of the Heber facilities for 30 more years, from 2019 to 2049.[227] Instead, the IS asserts with no analysis and contrary to supporting geotechnical reports, that "[d]evelopment of the proposed facilities would not result in the destabilization of any soils or geologic units that could cause a landslide, subsidence, or liquefaction."[228]

However, the Geotechnical Report Update indicates in bold that "**The entire plan area overlays a geothermal fluids reservoir that geothermal fluids extraction and reinjection is causing annual ground settlement of 1 to 2 inches per year. The settlement is not uniform**."[229]

Scientific studies confirm the surface deformation caused by the Heber geothermal field:[230]

> Using data from two satellites, Envisat and Sentinel, we observe changes in surface deformation at the Heber geothermal field, corresponding to changes in production and injection. Subsidence at the center of the field is observed in both study periods, August 2005 – August 2010 and April 2015 – April 2018, while a significant uplift is observed to the northwest of the subsidence bowl during the earlier period, but not in the later period. This is also confirmed by data from leveling surveys. Based on the apparent capability of InSAR to capture the dynamics of surface deformation, we suggest that it would be very beneficial to integrate such satellite measurements in the geothermal operation strategies.

The applicant itself has disclosed the resulting impacts in its annual report, admitting that withdrawing geothermal fluid creates localized ground subsidence,

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227 IS, pdf 331, 345, 361.

228 IS, Section VII: Geology and Soils, Sections VII(c) and (d), pdf 24.

229 IS, pdf 96, 97.

230 Mariana Eneva and others, Surface Deformation at the Heber Geothermal Field in Southern California, Proceedings, 44th Workshop on Geothermal Reservoir Engineering, February 11-13, 2019, p. 9, pdf 9; https://pangea.stanford.edu/ERE/pdf/IGAstandard/SGW/2019/Eneva2.pdf.

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while pressure in peripheral areas has caused localized ground inflation. Inflation and subsidence, if not controlled, can adversely affect farming operations and other infrastructure at or near the land surface. This could result in damage to gravity-based farm irrigation systems and municipal sewer piping, local roads, and bridges.[231] The 2019 SEC filing further indicates:[232]

> Another aspect of geothermal operations is the management and stabilization of subsurface impacts caused by fluid injection pressures of production and injection fluids to mitigate subsidence. In the case of the geothermal resource supplying the Heber complex, pressure drawdown in the center of the well field has caused some localized ground subsidence, while pressure in the peripheral areas has caused localized ground inflation. Inflation and subsidence, if not controlled, can adversely affect farming operations and other infrastructure at or near the land surface. Costs of failing to stabilize site pressures in the Heber Complex area include repair and modification of gravity-based farm irrigation systems and municipal sewer piping and repair or replacement of a local road bridge spanning an irrigation canal.

The IS is silent on this significant impact, failing as an informational document under CEQA.

Finally, the Project is located in a seismically active area. Significant nearby earthquake activity has been recently experienced.[233] The IS admits that in the event of an earthquake, "[s]eismic ground-shaking could be experienced in the vicinity of the Project Site … Seismic ground-shaking and seismically induced liquefaction could result in structural damage to power plant infrastructure and facilities." The IS then incorrectly concludes that "However, the Project does not involve any infrastructure or facilities that would include human occupancy … Therefore, impacts to people or structure from the Project would be less than significant."[234]

However, as discussed in Comment 4.1, the OEC units and storage tanks contain isopentane, which is highly explosive. Structural damage could result in accidents, resulting in mortality and significant health impacts to off-site receptors and response personnel. Comment 8. This is a significant impact that was not disclosed in the IS, which thus fails as an informational document under CEQA.

10. WATER USE

The IS concludes with no analysis at all that "[t]he Project would not require any additional water supplies … Therefore, no impacts to any water entitlements or resources would occur as a result of the Project."[235] Elsewhere, the IS asserts that "[n]o additional water will be required to support the proposed facilities … The existing

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[231] See, e.g., Ormat Technologies, Inc., 2019 Annual Report, pdf 61.

[232] SEC 2019, p. 53, pdf 41.

[233] Rong-Gong Lin II, Swarm of Salton Sea Earthquakes Sparks Worry About the San Andreas Fault, Los Angeles Times, August 10, 2020; https://www.latimes.com/california/story/2020-08-10/swarm-of-earthquakes-shakes-salton-sea-area-raising-worry-about-the-san-andreas.

[234] IS, pdf 23.

[235] IS, Section XIX, p. 32, pdf 33.

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Heber 2 facility will provide the water via existing permits."[236] The IS and supporting files do not contain any support for this assertion, which is incorrect as demonstrated below.

The Project includes two new "water-cooled ORMAT Energy Converters,"[237] that will restore output from 81 MW to 92 MW (Comment 1) and will use existing cooling towers[238] to cool heated water from these new OECs. The existing cooling towers cool heated water from the OECs by evaporating water. Thus, the cooling towers are a net water user. In fact, wet-cooled geothermal binary power plants, such as the subject Heber units, have the highest water consumption rate per megawatt hour of any thermal power plant technology (over 1,600 gallons per megawatt hour).[239] Relative to the baseline, the period prior to the start of environmental review, the Project will increase water use at the facility by 69% relative to 2019 conditions. Comment 2.2. Thus, the proposed action would increase water use by approximately 2/3. This increase was not disclosed in the IS.

The average water use for the period 2004 to 2009 was 1,017 acre-feet per year (AFY) for Heber 1 and 3,978 AFY for Heber 2,[240] or a total of 4,995 AFY. Thus, the Project will increase the amount of water required to operate the facility from 4,995 AFY to 8,325 AFY.[241] The Applicant currently has a Water Supply Agreement with Imperial Irrigation District ("IID") for up to 5,000 AFY of water.[242] Further, the existing Conditional Use Permit (CUP) between Imperial County and ORCAL/Heber Field Company limits water usage to 5,000 AFY of irrigation water for up to five years from the date of commencement of water usage.

The existing CUP further states that "If the amount of water available to Imperial County is reduced by the Central Arizona project, the right to the irrigation water for

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236 IS, Reclamation Plan Application, pdf 333.

237 IS, Section VI, p. 39, pdf 40.

238 IS, Integration of Heber II Facilities, pdf 46.

239 California Energy Commission (CEC) et al, Best Management Practices and Guidance Manual, Desert Renewable Energy Projects, November 2010, pdf 88; https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.432.1193&rep=rep1&type=pdf.

240 Brandon Doering and Eddie Jordan, Integrated Engineers & Contractors Corporation, Memorandum to GEI Consultants, Inc., Re: Imperial Irrigation District Power Plant Water Use Evaluation, September 15, 2009; Reported in: Imperial Irrigation District, IID Power Plant Water Use Evaluation, October 2012, Table 4, p. 7; https://www.iid.com/home/showdocument?id=9550.

241 Water use after the Project is operational = (4,995 AFY)(0.69) + 4,995 = 8,442 AFY.

242 Water Supply Agreement, October 27, 1992 (Exhibit 12).

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the five years granted herein may be terminated."[243] Ongoing drought conditions in the area supplying the IID water puts the Project's water supply at risk. Thus, the existing water supply is not only inadequate, it is also insecure. The IS is silent on the availability and source of the increase in water required to operate the Project and alternative water supply sources in the event that IID water is inadequate.

Thus, the Project will require an increase in water from IID that was not disclosed in the IS. This increase will result in significant impacts not disclosed or mitigated in the IS. This increase in water use is for cooling purposes, specifically for evaporation and blowdown in the Project's cooling towers.[244] Heber 1 is primarily a flash steam plant. The only significant water use is for cooling tower water makeup. The cooling system is an evaporative (wet) system, and all makeup water not supplied by condensate is provided by water from the IID canal. At Heber 2, the condensers are cooled by a closed-loop wet cooling tower system. Because all of the geothermal brine is returned to the resource aquifer, and none is used for steam production, there is no condensate to be recovered for other uses. Thus, all of the cooling tower makeup water is supplied from the IID canal.[245]

The only water available to the IID originates from the Colorado River via the All-American Canal, which diverts the river's flow away from Mexico and the Gulf of California and toward Imperial Valley in southeastern California.[246] Record drought conditions and overuse of water in the American Southwest have put tremendous strain on the lower part of the Colorado River. Tree-ring reconstructions of stream flow suggest the past decades rank among the lowest stream-flow periods in 1,200 years.[247]

The IID's Interim Water Supply Policy ("IWSP"), which provides a mechanism to address new water supply requests for proposed projects being developed within the IID service area, currently designates up to 25,000 AFY of IID's annual Colorado River water supply for non-agricultural projects within its service area.[248] The Imperial Integrated Regional Water Management Plan ("IRWMP"), adopted by IID's Board of

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[243] Imperial County, Agreement for Conditional Use Permit #06-0006, ORCAL/Heber Field Company, April 25, 2006, Document 2006-020097, pdf 14 (Exhibit 13).

[244] Doering and Jordan, Heber KGRA, pdf 11-12.

[245] Ibid.

[246] Jeff Berndt, The Coming Water Crisis in America, last updated October 17, 2013; http://hubpages.com/hub/The-Coming-Water-Crisis-in-America.

[247] National Geographic, Daily News, Feds Slash Colorado River Release to Historic Lows, August 16, 2013; http://news.nationalgeographic.com/news/2013/08/130816-colorado-river-drought-lake-powell-mead-water-scarcity/.

[248] IID, IID's Interim Water Supply Policy for Non-Agricultural Projects, adopted September 29, 2009, fee schedule revised 2015, p. 1; http://www.iid.com/home/showdocument?id=9599.

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Directors in December 2012, finds that "[r]enewable energy projects that result in intensification of water use could have a negative effect on agricultural water supplies unless mitigated" and requires that "to the extent that water is proposed for power plant cooling, the developer shall demonstrate that alternative water supply sources and alternative cooling technologies are unavailable, environmentally undesirable, or economically unsound."[249] The IS contains no such demonstration and fails to even disclose that the Project will increase water use from the IID relative to baseline conditions. Thus, the IS fails as an informational document under CEQA.

Further, the Water Quality Control Plan (Basin Plan) for the Colorado River Basin Region[250] states that fresh inland waters should only be used for power plant cooling if other sources or other methods of cooling would be environmentally undesirable or economically unsound. This policy requires that power plant cooling water should come from, in order of priority: (1) wastewater being discharged to the ocean; (2) ocean water; (3) brackish water from natural sources or irrigation return flow; (4) inland waste waters of low total dissolved solids; (5) other inland waters.[251] The IS is silent on this policy and its application to the Project's water use, thus failing as an informational document under CEQA. Irrigation return flows, for example, would be available from IID.

Thus, the Project's increase in the generation capacity of the Heber units, relative to baseline generation, would increase the facility's water consumption by a factor of 1.6. Any increase in water use in this area is significant as the water supply must be imported from distant and overtapped sources and violates the Basin Plan and underlying Principle #1 of the "Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling." This increase could be mitigated by replacing one or more of the facility's wet cooling towers with a dry/hybrid cooling system and by treating the cooling water.

This is consistent with best management practices recommended by the CEC for desert renewable energy projects, which only approves the use of fresh water for cooling by power plants where alternative water supply sources and alternative cooling

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[249] Imperial Water Forum, Imperial Region Integrated Regional Water Management Plan, October 2012, Chapter 8, Reduce Water Demand—Increase Water Use Efficiency, p. 8-22; http://imperialirwmp.org/2013%20Updates/finalirwmp.html.

[250] Water Quality Control Plan for the Colorado River Basin Region, January 8, 2019; https://www.waterboards.ca.gov/coloradoriver/water_issues/programs/basin_planning/docs/bp032014/r7_bp2019fullbp.pdf.

[251] Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling, p. 4, Principle #1. Adopted June 19, 1975, Resolution No. 75-58; https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/1975/rs75_058.pdf.

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technologies are shown to be "environmentally undesirable" or "economically unsound."[252] Specifically, the CEC recommends the following for geothermal power plants:[253]

> Consistent with the Board policy and the Warren-Alquist Act, the Energy Commission will approve the use of fresh water for cooling purposes by power plants which it licenses only where alternative water supply sources and alternative cooling technologies are shown to be 'environmentally undesirable' or 'economically unsound.' Additionally, as a way to reduce the use of fresh water and to avoid discharges in keeping with the Board's policy, the Energy Commission will require zero-liquid discharge technologies unless such technologies are shown to be 'environmentally undesirable' or 'economically unsound.' The Energy Commission interprets 'environmentally undesirable' to mean the same as having a 'significant adverse environmental impact' and 'economically unsound' to mean the same as 'economically or otherwise infeasible.'"

These methods are in use at other Ormat facilities as well as elsewhere and thus are clearly feasible for this Project.

10.1. Dry or Wet/Dry Hybrid Cooling

Dry cooling, also called air cooling, is technologically feasible as demonstrated by some of Ormat's other operational geothermal binary OEC plants in the United States and all over the world. These include, for example, the 86-MW Steamboat Hills Complex and the 30-MW McGinness plant in Nevada; the 0.2-MW CRADA in Wyoming; the 20-MW Amatitlan and 24-MW Zunil plants in Guatemala; the 7.4-MW Dora I and 17-MW IREM plants in Turkey; the 88-MW Olkaria III Complex in Kenya; and the 26.6-MW TeHuka Complex in New Zealand.[254] In addition, all of Ormat's recent binary OEC geothermal plants in the Casa Diablo and Mammoth Pacific complex in northern California are air-cooled.[255]

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[252] IID, October 2012, pdf 21; CEC et al., Best Management Practices and Guidance Manual: Desert Renewable Energy Projects, pdf 76; https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.432.1193&rep=rep1&type=pdf.

[253] CEC et al., pdf 76.

[254] *See* Ormat, Global Projects; https://www.ormat.com/en/projects/all/main/.

[255] *See*, for example, United States Department of the Interior, Bureau of Land Management, United States Department of Agriculture Forest Service, and Great Basin Unified Air Pollution Control District, Casa Diablo IV Geothermal Development Project, Public Draft Joint Environmental Impact Statement and Environmental Impact Report, DOI Control #: DES 12-21, Publication Index #: BLM/CA-ES-2013-002+1793, SCH No. 2011041008, November 2012; https://openei.org/wiki/DOI-BLM-CA-ES-2013-002%2B1793-EIS and Charlene Wardlow, Ormat, Update on Mammoth Pacific, LP Operations, CGEC Summit—Mammoth Mountain, May 26, 2011; https://cgec.ucdavis.edu/wp-content/uploads/lessonslearned-ormat-2011.pdf.

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Ormat, for example, explains that its proprietary technology is capable of using air cooling processes: [256]

> Ormat's geothermal power plants implement either air or water cooling, depending on the availability and cost of suitable water resources. Air cooling systems feature low operating costs and an exceptionally low environmental profile. They operate in a closed loop, do not require chemical additives and involve no waste disposal. In addition, air cooled power plants do not produce a visible plume and have a lower impact on the landscape.

Clearly, there is no question as to the technological feasibility of dry cooling for geothermal binary OEC plants.

Further, dry or wet/dry hybrid cooling systems have been built and are in operation all over the world in all, including the most extreme, climates. For example, the Shell Pearl gas-to-liquids integrated gasification combined-cycle project in Qatar, one of the most extreme climates with respect to temperature and low water supply, relies on dry cooling for its cooling demands.[257]

Not only would dry cooling eliminate the plant's water demand, it would also eliminate particulate matter emissions in an airshed that is designated as nonattainment for PM10.[258]

With respect to cost-effectiveness and plant performance for geothermal and other power plants in the Imperial Valley, a study conducted for the IID in 2009 summarizes:

> The design change from wet to dry cooling is still undeniably more expensive, but in some cases is becoming more of a viable alternative. Using the Binary geothermal plant model previously discussed, the per-megawatt-hour cost of wet cooling is $69, while dry cooling is $81 per MWh, and hybrid cooling is somewhat less expensive at $76 per MWh. This premium of approximately 17% for dry cooling would likely be a serious drawback from an economic standpoint. Additionally, dry-cooled plants are also less efficient than wet-cooled plants in desert areas like Imperial Valley. Dry cooling technologies are capable of handling the entire cooling load up to an ambient temperature of 85-90ºF. However, beyond that point the air temperature becomes too high for effective cooling and the plant performance suffers dramatically as a result. For

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[256] Ormat Technologies, Inc., Air and Water Cooling; https://www.energy-xprt.com/services/ormat-added-values-187202.

[257] Shell, Pearl GTL; http://www.shell.com/global/aboutshell/major-projects-2/pearl.html; *see* Google view of facility: Linde—Gama Construction site (SPX Cooling Tech) ACC Plant; http://wikimapia.org/7535982/Linde-Gama-Construction-site-SPX-Cooling-Tech-ACC-Plant.

[258] IS, pdf 19.

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example, on an 110ºF day, a dry cooled plant will have an energy production penalty of approximately 5-10% as compared to a wet cooled plant. Therefore, the plant will be producing less power during peak demand periods of the day which is when it is needed most. *However, as the costs of water supplies, water-related environmental studies, and compliance with water regulations continue to rise, some are still finding dry cooling an increasingly attractive option. The performance losses and increase in capital costs will also become less of an issue as electricity prices rise.…*

…

*The recommendation that can be derived from this general overview is that consideration should be given to alternative cooling technologies for new power plant design, although it would initially appear undesirable from a production and economic standpoin*t. For larger plants (greater than 50 MW), the inclusion of dry cooling in the design study is already required, and this may be required for smaller plants in the future. As water costs and related impacts continue to increase, the alternative cooling technologies will become more feasible.[259]

10.2. Cooling Water Makeup Water Pretreatment

The Project could also reduce its water demand by pretreating the cooling tower makeup water, as recognized by the IID's IRWMP:

> Cooling water demands are in part based on water quality. Pre-treatment, whether on-site or off-site of the power plant or by a public agency or the power plant developer, would allow for more cooling cycles as compared to use of water of lesser quality.[260]

Pretreatment of water is technologically feasible, commercially available, and used at other power plants[261] and should be evaluated for the Project's cooling

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[259] Doering and Jordan 2009, pp. 17-18.

[260] IRWMP, Chapter 8. Reduce Water Demand—Increase Water Use Efficiency, 8.2.3.2 Treat Cooling Water to Improve Quality, October 2012, p. 8-31; https://imperialirwmp.org/wp-content/uploads/2013/07/CH08-Reduce-Water-Demand-20121010_Proof2.pdf.

[261] *See*, for example, Siemens, Cooling Tower Water Treatment Systems; https://web.archive.org/web/20130425134436/http://www.water.siemens.com/en/applications/industrial_process_water/cooling_tower_makeup/Pages/default.aspx. ("Cooling Towers with electric generators installed at power generation facilities require a consistent, reliable source of water that is cost-effective and sustainable. In many cases, cooling tower water must be treated to soften, remove solids, and deal with organics. With properly treated water, the potential for scaling in the cooling tower is significantly reduced which also lowers cooling circuit cleaning requirements, extends the life of the cooling equipment and reduces the cooling tower blowdown flow to the environment.")

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demands. Potential options include, for example, reverse osmosis treatment of the cooling water blowdown to increase the cycles of concentration and reduce overall water consumption and collection and treatment of relatively pure condensed water from air handlers.[262]

10.3. Best Management Practices

The IID's IRWMP sets forth the following best management practices for geothermal/renewable water sources, cooling alternatives, and other uses:

- *State policy supports the use of dry or hybrid cooling to conserve water in desert environments*.
- Dry cooling technology has limits and is not presently cost-effective in the Imperial Region.
- *Hybrid cooling should be encouraged if Colorado River water is used in order to demonstrate reasonable beneficial use of Colorado River entitlements*.
- The feasibility of changing wet cooled plants to dry or hybrid cooled plants may be cost prohibitive for the remaining life of the plant.
- A critical factor for conserving water used for cooling and other uses is the water quality. *The higher the incoming water quality, the more cooling cycles can occur*, resulting in both less use and reduced wastewater discharge.
- Use of recycled municipal water or desalination of brackish water for cooling and other uses in lieu of Colorado River water would mitigate for potential impacts to current agricultural water users, and would demonstrate reasonable beneficial use of Colorado River entitlements.
- Storage of Colorado River water in a groundwater bank would provide a supply for renewable/geothermal energy water use and could serve to mitigate or eliminate impacts to existing agricultural water users.
- *Use of recycled municipal water or desalination of brackish water for cooling purposes could provide multiple regional benefits*. Project, program, and policy recommendations should be developed through the Imperial IRWMP process.
- Encouraging use of recycled municipal water for cooling and other uses could support local communities by providing a source of revenue to upgrade treatment plants so as to improve water quality.

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[262] DoE, Energy Efficiency and Renewable Energy, Federal Energy Management Program, Cooling Towers: Understanding Key Components of Cooling Towers and How to Improve Water Efficiency, February 2011; https://www.energy.gov/sites/prod/files/2013/10/f3/waterfs_coolingtowers.pdf.

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- *Recycled municipal water or desalinated brackish water maybe cost-effective* when compared to the price of water from voluntary fallowing, and would serve to mitigate third party impacts to agriculture.
- Industrial customers shall be required by IID to follow appropriate water use efficiency BMPs, including but not limited to those established by the California Urban Water Conservation Council and California Energy Commission, as well as other water use efficiency standards, adopted by the District or local government agencies. (Interim Water Supply Policy (IWSP No. 11). IID may prescribe additional or different Best management practices for certain categories of Municipal and Industrial Water Users (IWSP No. 12).[263]

These best management practices are equally applicable to the Project and should be required.

11. THE PROJECT MAY NEED A CEC LICENSE

The subject geothermal facility as described in its Application for an Authority to Construct permit consists of six ORMAT Energy Converters (OECs) at Heber 2 (36 MW) that are operationally interconnected to each other as well as to Goulds 2 (12 MW) and Heber South (12 MW) for a total generating capacity of 60 MW.[264] Other information discussed in Comment 1 indicates that the Heber 2 Complex has a generating capacity of 81-82 MW. The Project will restore generating capacity of the Heber 2 Complex to its original capacity of 92 MW, not 33 MW as asserted in the IS.

The CEC licenses all thermal power plants over 50 MW in California.[265] The CEC's listing of licensed facilities does not include the Heber Complex.[266] The discussion in Comment 1 indicates that the Heber Complex currently exceeds 50 MW. The Project will extend the life of the Heber Complex by 30 years, from 2019 to 2049.[267] Thus, the Project requires a license from the CEC.

The CEC may delegate siting authority over geothermal power plants and related facilities to county governments that have adopted geothermal elements into

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263 IRWMP, Chapter 8, pp. 8-22 and 8-23.

264 Air Sciences Inc., Heber 2 Application for Authority to Construct, November 2019, Section 1.0, pdf 9 (Exhibit 10).

265 U.S. Department of Energy, California State Plant Commissioning Process—Application for Certification (7-CA-a); https://openei.org/wiki/RAPID/Roadmap/7-CA-a.

266 California Energy Commission, Alphabetical List of Power Plant Projects; https://ww2.energy.ca.gov/sitingcases/alphabetical_cms.html.

267 IS, pdf 9.

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their general plan.[268] My research identified a geothermal element in Imperial County's General Plan.[269] However, this element clearly states that all energy facilities are required to undergo review by the CEC as part of an Application for Certification. "The CEC and County of Imperial coordinate the permitting and siting of power plants and any necessary transmission lines."[270] Two tests are required to establish that the Heber Complex is a single facility.

First, the net generating capacity must equal or exceed 50 MW using the calculation method in California Code of Regulations, Title 20, Section 203. The generating capacity of an electric generating facility is found by subtracting the minimum auxiliary load from the maximum gross rating of the plant's turbine generators. The IS and the record before the County does not contain the information required to make this determination. Thus, the IS fails as an informational document under CEQA.

The 2018 FERC Form 19-K[271] and 2019 FERC Form 10-K[272] reports indicate that the Heber Complex has a generating capacity, reported as gross net of auxiliary loads of 81 MW, which exceeds the CEC jurisdictional 50 MW limit. The generating capacity reported as gross of net auxiliary loads is the metric required under CCR Title 20, Section 203 to determine if the facility is subject to CEC licensing. Thus, the Heber Complex meets this requirement.

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[268] U.S. Department of Energy, California State Plant Commissioning Process—Application for Certification (7-CA-a).

[269] Imperial County Planning and Development Services Department, Geothermal/Alternative Energy and Transmission: Element, County of Imperial General Plan, October 17, 2006, p. 29; http://www.icpds.com/CMS/Media/Geothermal-TransmissionElement-(2006).pdf.

[270] Ibid.

[271] SEC, Form 10-K, Annual Report for the Fiscal Year Ended December 31, 2018, p.13, footnote 2, p. 14 ("References to generating capacity generally refer to the gross generating capacity less auxiliary power in the case of all of our existing power plants, except the Zunil power plant. We determine the generating capacity figures in these power plants by taking into account resource and power plant capabilities…."); https://www.sec.gov/Archives/edgar/data/1296445/000143774919003760/ora20181231_10k.htm.

[272] SEC, Form 10-K, December 31, 2019, pp. 11-12, footnote 2 ("References to generating capacity generally refer to the gross generating capacity less auxiliary power. We determine the generating capacity of these power plants by taking into account resource and power plant capabilities….").

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Second, one must establish the connectivity between the components of the Heber 2 Complex, which includes Gould 2 and Heber South.[273] This requires the consideration of four factors:

- sited on contiguous parcels,
- designed, installed, and operated by the same organization,
- have energy and environmental impacts greater than a jurisdictional 50 MW facility, and
- share utility services for water, electrical interconnection, natural gas lines, and/or road access.

All four of these tests are met by the Project.

First, the proposed development would occur entirely on a single 39.99-acre parcel, which also includes the other Heber Complex geothermal facilities, the Goulds 2 and Heber South projects.[274] The proposed Project site is within the existing Heber 2 power plant area. All proposed facilities would be located within the existing fence line and permit area.[275] Finally, the Project shares the same road access as the entire Heber 2 Complex on Dogwood Road,[276] the same fire and emergency access roads,[277] and shared pipelines.[278]

Second, Ormat will design, install, and operate the proposed modifications to the Heber Complex over the 30-year extension, from 2019 to 2049, as noted in numerous SEC filings and annual reported cited elsewhere in these comments.[279]

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[273] IS, pdf 9. Charlene Wardlow, Ormat's Geothermal Projects in Imperial County, Imperial Valley Renewable Energy Summit, March 11, 2016, Heber Facility Summary, p. 14; http://ivres.ivedc.com/media/managed/031116_Ormat_presentation_at_IVRES.pdf.

[274] IS, p. 10, 23 ("the proposed facilities would be located within the existing Heber 2 Complex site."), 39 ("The proposed development would occur entirely on the 39.99 Assessor's Parcel Number (APN) 054-250-031. This parcel also includes geothermal facilities for the Goulds 2 and Heber South projects.").

[275] IS, p. 39.

[276] IS, p. 8 (project location and location of entire Heber 2 Complex is 855 Dogwood Road, Heber, CA 92249), p. 30 ("Lone site access is provided via Dogwood Road.").

[277] IS, p. 24 (discussing fire department access roads and gates at Heber 2 Complex site); p. 31 (all proposed facilities would be constructed within the existing Heber 2 Complex site and not introduce any transportation hazards, design features, or incompatible uses with surrounding roadways); p. 33 ("The existing Heber 2 Emergency Response Plan addresses project construction and operations. The proposed work is within the existing footprint of ongoing geothermal activities in the Heber 2 plant site.").

[278] IS, p. 8 (Project will add additional pipes to connect the proposed facilities with the existing Heber 2 Geothermal Energy Complex).

[279] See, for example, https://www.ormat.com/en/projects/all/main/?Country=USA&Seg=0&Tech=6 and the Ormat May 2020 10-Q report cited in Comment 2.1, which states: "Heber Complex (California).

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Third, the Project proposes to extend the life of the entire Heber 2 complex by an additional 30 years.[280] As demonstrated in Comments 3 to 10, the environmental impacts of the operation of the entire Heber 2 Complex, a 92 MW facility,[281] will be significant over the 30 year extension, requiring mitigation.

Fourth, the Heber Complex geothermal facilities all rely on the same support facilities: cooling towers, vapor recovery unit, emergency generator, fire pumps, and emergency pump.[282] Thus, the proposed 30-year extension of the lifetime of the Heber 2 Complex requires a license from the CEC.

12. EXTENDED LIFETIME

The Project would extend the lifetime of the entire Heber 2 Complex for 30 years, from 2019 to 2049. The impacts beyond 2019 were not considered in the IS. These include GHG emission increases. Thus, the IS fails as an informational document under CEQA.

We are currently in the process of repowering the Heber 1 and Heber 2 power plants. We are planning to replace steam turbine and old OEC units with new advanced technology equipment that will add a net capacity of 11 MW. Following these enhancements, we expect the capacity of the complex to reach 92 MW. Permitting, engineering and procurement are ongoing as well as manufacturing and site construction. We expect commercial operation in the second half of 2021."

[280] IS, p. 8.

[281] The current capacity of the complex is 81 MW with a planned expansion to add 11 MW; https://www.ormat.com/en/projects/all/main/?Country=USA&Seg=0&Tech=6.

[282] ATC Application, p. 5, pdf 13, Table 1. Existing and Proposed Equipment at Heber 2, Heber South, and Goulds 2.

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Phyllis Fox, Ph.D, PE
Environmental Management
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Dr. Fox has over 40 years of experience in the field of environmental engineering, including air pollution control (BACT, BART, MACT, LAER, RACT), greenhouse gas emissions and control, cost effectiveness analyses, water quality and water supply investigations, hydrology, hazardous waste investigations, environmental permitting, nuisance investigations (odor, noise), environmental impact reports, CEQA/NEPA documentation, risk assessments, and litigation support.

EDUCATION

Ph.D. Environmental/Civil Engineering, University of California, Berkeley, 1980.
M.S. Environmental/Civil Engineering, University of California, Berkeley, 1975.
B.S. Physics (with high honors), University of Florida, Gainesville, 1971.

REGISTRATION

Registered Professional Engineer: Arizona (2001-2014: #36701; retired), California (2002-present; CH 6058), Florida (2001-2016; #57886; retired), Georgia (2002-2014; #PE027643; retired), Washington (2002-2014; #38692; retired), Wisconsin (2005-2014; #37595-006; retired)
Board Certified Environmental Engineer, American Academy of Environmental Engineers, Certified in Air Pollution Control (DEE #01-20014), 2002-2014; retired)
Qualified Environmental Professional (QEP), Institute of Professional Environmental Practice (QEP #02-010007, 2001-2015: retired).

PROFESSIONAL HISTORY

Environmental Management, Principal, 1981-present
Lawrence Berkeley National Laboratory, Principal Investigator, 1977-1981
University of California, Berkeley, Program Manager, 1976-1977
Bechtel, Inc., Engineer, 1971-1976, 1964-1966

PROFESSIONAL AFFILIATIONS

American Chemical Society (1981-2010)
Phi Beta Kappa (1970-present)
Sigma Pi Sigma (1970-present)

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Who's Who Environmental Registry, PH Publishing, Fort Collins, CO, 1992.
Who's Who in the World, Marquis Who's Who, Inc., Chicago, IL, 11th Ed., p. 371, 1993-present.
Who's Who of American Women, Marquis Who's Who, Inc., Chicago, IL, 13th Ed., p. 264, 1984-present.
Who's Who in Science and Engineering, Marquis Who's Who, Inc., New Providence, NJ, 5th Ed., p. 414, 1999-present.
Who's Who in America, Marquis Who's Who, Inc., 59th Ed., 2005.
Guide to Specialists on Toxic Substances, World Environment Center, New York, NY, p. 80, 1980.
National Research Council Committee on Irrigation-Induced Water Quality Problems (Selenium), Subcommittee on Quality Control/Quality Assurance (1985-1990).
National Research Council Committee on Surface Mining and Reclamation, Subcommittee on Oil Shale (1978-80)

REPRESENTATIVE EXPERIENCE

Performed environmental and engineering investigations, as outlined below, for a wide range of industrial and commercial facilities including: petroleum refineries and upgrades thereto; reformulated fuels projects; refinery upgrades to process heavy sour crudes, including tar sands and light sweet crudes from the Eagle Ford and Bakken Formations; petroleum, gasoline and ethanol distribution terminals; coal, coke, and ore/mineral export terminals; LNG export, import, and storage terminals; crude-by-rail projects; shale oil plants; crude oil/condensate marine and rail terminals; coal gasification and liquefaction plants; oil and gas production, including conventional, thermally enhanced, hydraulic fracking, and acid stimulation techniques; underground storage tanks; pipelines; compressor stations; gasoline stations; landfills; railyards; hazardous waste treatment facilities; nuclear, hydroelectric, geothermal, wood, biomass, waste, tire-derived fuel, gas, oil, coke and coal-fired power plants; wind farms; solar energy facilities; battery storage facilities; transmission lines; airports; hydrogen plants; petroleum coke calcining plants; coke plants; activated carbon manufacturing facilities; asphalt plants; cement plants; incinerators; flares; manufacturing facilities (e.g., semiconductors, electronic assembly, aerospace components, printed circuit boards, amusement park rides); lanthanide processing plants; ammonia plants; nitric acid plants; urea plants; food processing plants; wineries; almond hulling facilities; composting facilities; grain processing facilities; grain elevators; ethanol production facilities; soy bean oil extraction plants; biodiesel plants; paint formulation plants; wastewater treatment plants; marine terminals and ports; gas processing plants; steel mills; iron nugget production facilities; pig iron plant, based on blast furnace technology; direct reduced iron plant; acid regeneration facilities; railcar refinishing facility; battery manufacturing plants; pesticide manufacturing and repackaging facilities; pulp

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and paper mills; olefin plants; methanol plants; ethylene crackers; alumina plants, desalination plants; battery storage facilities; data centers; covered lagoon anaerobic digesters with biogas generators and upgrading equipment to produce renewable natural gas and electricity; selective catalytic reduction (SCR) systems; selective noncatalytic reduction (SNCR) systems; halogen acid furnaces; contaminated property redevelopment projects (e.g., Mission Bay, Southern Pacific Railyards, Moscone Center expansion, San Diego Padres Ballpark); residential developments; commercial office parks, campuses, and shopping centers; server farms; transportation plans; and a wide range of mines including sand and gravel, hard rock, limestone, nacholite, coal, molybdenum, gold, zinc, and oil shale.

EXPERT WITNESS/LITIGATION SUPPORT

- For plaintiffs-intervenors (Sierra Club), in civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications at Rush Island Units 1 and 2 and Labadie Energy Center, assist counsel in evaluating best available control technology (BACT) to reduce SO2 emissions, including wet and dry scrubbing, sorbent injection, and offsets. Case settled. *U.S. and Sierra Club vs. Ameren Missouri*, Case No. 4-11 CV 77 RWS, U.S. District Court, Eastern District of Missouri, Eastern Division, September 30, 2019.
- For the California Attorney General, assist in determining compliance with probation terms in the matter of People v. Chevron USA.
- For plaintiffs, assist in developing Petitioners' proof brief for National Parks Conservation Association et al v. U.S. EPA, Petition for Review of Final Administrative Action of the U.S. EPA, In the U.S. Court of Appeals for the Third Circuit, Docket No. 14-3147.
- For plaintiffs, expert witness in civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications (1997-2000) at the Cemex cement plant in Lyons, Colorado. Reviewed produced documents, prepared expert and rebuttal reports on PSD applicability based on NOx emission calculations for a collection of changes considered both individually and collectively. Deposed August 2011. *United States v. Cemex, Inc.*, In U.S. District Court for the District of Colorado (Civil Action No. 09-cv-00019-MSK-MEH). Case settled June 13, 2013.
- For plaintiffs, in civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications (1988 – 2000) at James De Young Units 3, 4, and 5. Reviewed produced documents, analyzed CEMS and EIA data, and prepared netting and BACT analyses for NOx, SO2, and PM10 (PSD case). Expert report February 24, 2010 and affidavit February 20, 2010. *Sierra Club v. City of Holland, et al.*, U.S. District Court, Western District of Michigan (Civil Action 1:08-cv-1183). Case settled. Consent Decree 1/19/14.

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- For plaintiffs, in civil action alleging failure to obtain MACT permit, expert on potential to emit hydrogen chloride (HCl) from a new coal-fired boiler. Reviewed record, estimated HCl emissions, wrote expert report June 2010 and March 2013 (Cost to Install a Scrubber at the Lamar Repowering Project Pursuant to Case-by-Case MACT), deposed August 2010 and March 2013. *Wildearth Guardian et al. v. Lamar Utilities Board*, Civil Action No. 09-cv-02974, U.S. District Court, District of Colorado. Case settled August 2013.
- For plaintiffs, expert witness on permitting, emission calculations, and wastewater treatment for coal-to-gasoline plant. Reviewed produced documents. Assisted in preparation of comments on draft minor source permit. Wrote two affidavits on key issues in case. Presented direct and rebuttal testimony 10/27 - 10/28/10 on permit enforceability and failure to properly calculate potential to emit, including underestimate of flaring emissions and omission of VOC and CO emissions from wastewater treatment, cooling tower, tank roof landings, and malfunctions. *Sierra Club, Ohio Valley Environmental Coalition, Coal River Mountain Watch, West Virginia Highlands Conservancy v. John Benedict, Director, Division of Air Quality, West Virginia Department of Environmental Protection and TransGas Development System, LLC*, Appeal No. 10-01-AQB. Virginia Air Quality Board remanded the permit on March 28, 2011 ordering reconsideration of potential to emit calculations, including: (1) support for assumed flare efficiency; (2) inclusion of startup, shutdown and malfunction emissions; and (3) inclusion of wastewater treatment emissions in potential to emit calculations.
- For plaintiffs, expert on BACT emission limits for gas-fired combined cycle power plant. Prepared declaration in support of CBE's Opposition to the United States' Motion for Entry of Proposed Amended Consent Decree. Assisted in settlement discussions. *U.S. EPA, Plaintiff, Communities for a Better Environment, Intervenor Plaintiff, v. Pacific Gas & Electric Company, et al.*, U.S. District Court, Northern District of California, San Francisco Division, Case No. C-09-4503 SI.
- Technical expert in confidential settlement discussions with large coal-fired utility on BACT control technology and emission limits for NOx, SO2, PM, PM2.5, and CO for new natural gas fired combined cycle and simple cycle turbines with oil backup. (July 2010). Case settled.
- For plaintiffs, expert witness in remedy phase of civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications (1998-99) at Gallagher Units 1 and 3. Reviewed produced documents, prepared expert and rebuttal reports on historic and current-day BACT for SO2, control costs, and excess emissions of SO2. Deposed 11/18/09. *United States et al. v. Cinergy, et al.*, In U.S. District Court for the Southern District of Indiana, Indianapolis Division, Civil Action No. IP99-1693 C-M/S. Settled 12/22/09.

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- For plaintiffs, expert witness on MACT, BACT for NOx, and enforceability in an administrative appeal of draft state air permit issued for four 300-MW pet-coke-fired CFBs. Reviewed produced documents and prepared prefiled testimony. Deposed 10/8/09 and 11/9/09. Testified 11/10/09. *Application of Las Brisas Energy Center, LLC for State Air Quality Permit*; before the State Office of Administrative Hearings, Texas. Permit remanded 3/29/10 as LBEC failed to meet burden of proof on a number of issues including MACT. Texas Court of Appeals dismissed an appeal to reinstate the permit. The Texas Commission on Environmental Quality and Las Brisas Energy Center, LLC sought to overturn the Court of Appeals decision but moved to have their appeal dismissed in August 2013.
- For defense, expert witness in unlawful detainer case involving a gasoline station, minimart, and residential property with contamination from leaking underground storage tanks. Reviewed agency files and inspected site. Presented expert testimony on July 6, 2009, on causes of, nature and extent of subsurface contamination. *A. Singh v. S. Assaedi,* in Contra Costa County Superior Court, CA. Settled August 2009.
- For plaintiffs, expert witness on netting and enforceability for refinery being upgraded to process tar sands crude. Reviewed produced documents. Prepared expert and rebuttal reports addressing use of emission factors for baseline, omitted sources including coker, flares, tank landings and cleaning, and enforceability. Deposed. *In the Matter of Objection to the Issuance of Significant Source Modification Permit No. 089-25484-00453 to BP Products North America Inc., Whiting Business Unit, Save the Dunes Council, Inc., Sierra Club., Inc., Hoosier Environmental Council et al., Petitioners, B. P. Products North American, Respondents/Permittee,* before the Indiana Office of Environmental Adjudication. Case settled.
- For plaintiffs, expert witness on BACT, MACT, and enforceability in appeal of Title V permit issued to 600 MW coal-fired power plant burning Powder River Basin coal. Prepared technical comments on draft air permit. Reviewed record on appeal, drafted BACT, MACT, and enforceability pre-filed testimony. Drafted MACT and enforceability pre-filed rebuttal testimony. Deposed March 24, 2009. Testified June 10, 2009. *In Re: Southwestern Electric Power Company*, Arkansas Pollution Control and Ecology Commission, Consolidated Docket No. 08-006-P. Recommended Decision issued December 9, 2009 upholding issued permit. Commission adopted Recommended Decision January 22, 2010.
- For plaintiffs, expert witness in remedy phase of civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications (1989-1992) at Wabash Units 2, 3 and 5. Reviewed produced documents, prepared expert and rebuttal report on historic and current-day BACT for NOx and SO2, control costs, and excess emissions of NOx, SO2, and mercury. Deposed 10/21/08. *United States et al. v.*

Cinergy, et al., In U.S. District Court for the Southern District of Indiana, Indianapolis Division, Civil Action No. IP99-1693 C-M/S. Testified 2/3/09. Memorandum Opinion & Order 5-29-09 requiring shutdown of Wabash River Units 2, 3, 5 by September 30, 2009, run at baseline until shutdown, and permanently surrender SO2 emission allowances.

- For plaintiffs, expert witness in liability phase of civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for three historic modifications (1997-2001) at two portland cement plants involving three cement kilns. Reviewed produced documents, analyzed CEMS data covering subject period, prepared netting analysis for NOx, SO_2 and CO, and prepared expert and rebuttal reports. *United States v. Cemex California Cement,* In U.S. District Court for the Central District of California, Eastern Division, Case No. ED CV 07-00223-GW (JCRx). Settled 1/15/09.
- For intervenors Clean Wisconsin and Citizens Utility Board, prepared data requests, reviewed discovery and expert report. Prepared prefiled direct, rebuttal and surrebuttal testimony on cost to extend life of existing Oak Creek Units 5-8 and cost to address future regulatory requirements to determine whether to control or shutdown one or more of the units. Oral testimony 2/5/08. Application for a Certificate of Authority to Install Wet Flue Gas Desulfurization and Selective Catalytic Reduction Facilities and Associated Equipment for Control of Sulfur Dioxide and Nitrogen Oxide Emissions at Oak Creek Power Plant Units 5, 6, 7 and 8, WPSC Docket No. 6630-CE-299.
- For plaintiffs, expert witness on alternatives analysis and BACT for NOx, SO2, total PM10, and sulfuric acid mist in appeal of PSD permit issued to 1200 MW coal fired power plant burning Powder River Basin and/or Central Appalachian coal (Longleaf). Assisted in drafting technical comments on NOx on draft permit. Prepared expert disclosure. Presented 8+ days of direct and rebuttal expert testimony. Attended all 21 days of evidentiary hearing from 9/5/07 – 10/30/07 assisting in all aspects of hearing. *Friends of the Chatahooche and Sierra Club v. Dr. Carol Couch, Director, Environmental Protection Division of Natural Resources Department, Respondent, and Longleaf Energy Associates, Intervener*. ALJ Final Decision 1/11/08 denying petition. ALJ Order vacated & remanded for further proceedings, Fulton County Superior Court, 6/30/08. Court of Appeals of GA remanded the case with directions that the ALJ's final decision be vacated to consider the evidence under the correct standard of review, July 9, 2009. The ALJ issued an opinion April 2, 2010 in favor of the applicant. Final permit issued April 2010.
- For plaintiffs, expert witness on diesel exhaust in inverse condemnation case in which Port expanded maritime operations into residential neighborhoods, subjecting plaintiffs to noise, light, and diesel fumes. Measured real-time diesel particulate concentrations from marine vessels and tug boats on plaintiffs' property. Reviewed documents, depositions, DVDs, and photographs provided by counsel. Deposed. Testified October 24, 2006. *Ann Chargin, Richard Hackett, Carolyn Hackett, et al. v. Stockton Port District*, Superior Court

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of California, County of San Joaquin, Stockton Branch, No. CV021015. Judge ruled for plaintiffs.

- For plaintiffs, expert witness on NOx emissions and BACT in case alleging failure to obtain necessary permits and install controls on gas-fired combined-cycle turbines. Prepared and reviewed (applicant analyses) of NOx emissions, BACT analyses (water injection, SCR, ultra low NOx burners), and cost-effectiveness analyses based on site visit, plant operating records, stack tests, CEMS data, and turbine and catalyst vendor design information. Participated in negotiations to scope out consent order. *United States v. Nevada Power.* Case settled June 2007, resulting in installation of dry low NOx burners (5 ppm NOx averaged over 1 hr) on four units and a separate solar array at a local business.
- For plaintiffs, expert witness in appeal of PSD permit issued to 850 MW coal fired boiler burning Powder River Basin coal (Iatan Unit 2) on BACT for particulate matter, sulfuric acid mist and opacity and emission calculations for alleged historic violations of PSD. Assisted in drafting technical comments, petition for review, discovery requests, and responses to discovery requests. Reviewed produced documents. Prepared expert report on BACT for particulate matter. Assisted with expert depositions. Deposed February 7, 8, 27, and 28, 2007. *In Re PSD Construction Permit Issued to Great Plains Energy, Kansas City Power & Light – Iatan Generating Station, Sierra Club v. Missouri Department of Natural Resources, Great Plains Energy, and Kansas City Power & Light.* Case settled March 27, 2007, providing offsets for over 6 million ton/yr of CO2 and lower NOx and SO_2 emission limits.
- For plaintiffs, expert witness in remedy phase of civil action relating to alleged violations of the Clean Air Act, Prevention of Significant Deterioration, for historic modifications of coal-fired boilers and associated equipment. Reviewed produced documents, prepared expert report on cost to retrofit 24 coal-fired power plants with scrubbers designed to remove 99% of the sulfur dioxide from flue gases. Prepared supplemental and expert report on cost estimates and BACT for SO2 for these 24 complaint units. Deposed 1/30/07 and 3/14/07. *United States and State of New York et al. v. American Electric Power*, In U.S. District Court for the Southern District of Ohio, Eastern Division, Consolidated Civil Action Nos. C2-99-1182 and C2-99-1250. Settlement announced 10/9/07.
- For plaintiffs, expert witness on BACT, enforceability, and alternatives analysis in appeal of PSD permit issued for a 270-MW pulverized coal fired boiler burning Powder River Basin coal (City Utilities Springfield Unit 2). Reviewed permitting file and assisted counsel draft petition and prepare and respond to interrogatories and document requests. Reviewed interrogatory responses and produced documents. Assisted with expert depositions. Deposed August 2005. Evidentiary hearings October 2005. *In the Matter of Linda Chipperfield and Sierra Club v. Missouri Department of Natural Resources.* Missouri Supreme Court denied review of adverse lower court rulings August 2007.

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- For plaintiffs, expert witness in civil action relating to plume touchdowns at AEP's Gavin coal-fired power plant. Assisted counsel draft interrogatories and document requests. Reviewed responses to interrogatories and produced documents. Prepared expert report "Releases of Sulfuric Acid Mist from the Gavin Power Station." The report evaluates sulfuric acid mist releases to determine if AEP complied with the requirements of CERCLA Section 103(a) and EPCRA Section 304. This report also discusses the formation, chemistry, release characteristics, and abatement of sulfuric acid mist in support of the claim that these releases present an imminent and substantial endangerment to public health under Section 7002(a)(1)(B) of the Resource Conservation and Recovery Act ("RCRA"). *Citizens Against Pollution v. Ohio Power Company*, In the U.S. District Court for the Southern District of Ohio, Eastern Division, Civil Action No. 2-04-cv-371. Case settled 12-8-06.

- For petitioners, expert witness in contested case hearing on BACT, enforceability, and emission estimates for an air permit issued to a 500-MW supercritical Power River Basin coal-fired boiler (Weston Unit 4). Assisted counsel prepare comments on draft air permit and respond to and draft discovery. Reviewed produced file, deposed (7/05), and prepared expert report on BACT and enforceability. Evidentiary hearings September 2005. *In the Matter of an Air Pollution Control Construction Permit Issued to Wisconsin Public Service Corporation for the Construction and Operation of a 500 MW Pulverized Coal-fired Power Plant Known as Weston Unit 4 in Marathon County, Wisconsin*, Case No. IH-04-21. The Final Order, issued 2/10/06, lowered the NOx BACT limit from 0.07 lb/MMBtu to 0.06 lb/MMBtu based on a 30-day average, added a BACT SO2 control efficiency, and required a 0.0005% high efficiency drift eliminator as BACT for the cooling tower. The modified permit, including these provisions, was issued 3/28/07. Additional appeals in progress.

- For plaintiffs, adviser on technical issues related to Citizen Suit against U.S. EPA regarding failure to update New Source Performance Standards for petroleum refineries, 40 CFR 60, Subparts J, VV, and GGG. *Our Children's Earth Foundation and Sierra Club v. U.S. EPA et al.* Case settled July 2005. CD No. C 05-00094 CW, U.S. District Court, Northern District of California – Oakland Division. Proposed revisions to standards of performance for petroleum refineries published 72 FR 27178 (5/14/07).

- For interveners, reviewed proposed Consent Decree settling Clean Air Act violations due to historic modifications of boilers and associated equipment at two coal-fired power plants. In response to stay order, reviewed the record, selected one representative activity at each of seven generating units, and analyzed to identify CAA violations. Identified NSPS and NSR violations for NOx, SO_2, PM/PM10, and sulfuric acid mist. Summarized results in an expert report. *United States of America, and Michael A. Cox, Attorney General of the State of Michigan, ex rel. Michigan Department of Environmental Quality, Plaintiffs, and Clean Wisconsin, Sierra Club, and Citizens' Utility Board, Intervenors, v. Wisconsin*

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Electric Power Company, Defendant, U.S. District Court for the Eastern District of Wisconsin, Civil Action No. 2:03-CV-00371-CNC. Order issued 10-1-07 denying petition.

- For a coalition of Nevada labor organizations (ACE), reviewed preliminary determination to issue a Class I Air Quality Operating Permit to Construct and supporting files for a 250-MW pulverized coal-fired boiler (Newmont). Prepared about 100 pages of technical analyses and comments on BACT, MACT, emission calculations, and enforceability. Assisted counsel draft petition and reply brief appealing PSD permit to U.S. EPA Environmental Appeals Board (EAB). Order denying review issued 12/21/05. *In re Newmont Nevada Energy Investment, LLC, TS Power Plant*, PSD Appeal No. 05-04 (EAB 2005).
- For petitioners and plaintiffs, reviewed and prepared comments on air quality and hazardous waste based on negative declaration for refinery ultra low sulfur diesel project located in SCAQMD. Reviewed responses to comments and prepared responses. Prepared declaration and presented oral testimony before SCAQMD Hearing Board on exempt sources (cooling towers) and calculation of potential to emit under NSR. Petition for writ of mandate filed March 2005. Case remanded by Court of Appeals to trial court to direct SCAQMD to re-evaluate the potential environmental significance of NOx emissions resulting from the project in accordance with court's opinion. California Court of Appeals, Second Appellate Division, on December 18, 2007, affirmed in part (as to baseline) and denied in part. *Communities for a Better Environment v. South Coast Air Quality Management District and ConocoPhillips and Carlos Valdez et al v. South Coast Air Quality Management District and ConocoPhillips.* Certified for partial publication 1/16/08. Appellate Court opinion upheld by CA Supreme Court 3/15/10. *(2010) 48 Cal.4th 310*.
- For amici seeking to amend a proposed Consent Decree to settle alleged NSR violations at Chevron refineries, reviewed proposed settlement, related files, subject modifications, and emission calculations. Prepared declaration on emission reductions, identification of NSR and NSPS violations, and BACT/LAER for FCCUs, heaters and boilers, flares, and sulfur recovery plants. *U.S. et al. v. Chevron U.S.A.*, Northern District of California, Case No. C 03-04650. Memorandum and Order Entering Consent Decree issued June 2005. Case No. C 03-4650 CRB.
- For petitioners, prepared declaration on enforceability of periodic monitoring requirements, in response to EPA's revised interpretation of 40 CFR 70.6(c)(1). This revision limited additional monitoring required in Title V permits. 69 FR 3203 (Jan. 22, 2004). *Environmental Integrity Project et al. v. EPA* (U.S. Court of Appeals for the District of Columbia). Court ruled the Act requires all Title V permits to contain monitoring requirements to assure compliance. *Sierra Club v. EPA*, 536 F.3d 673 (D.C. Cir. 2008).
- For interveners in application for authority to construct a 500 MW supercritical coal-fired generating unit before the Wisconsin Public Service Commission, prepared pre-filed

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written direct and rebuttal testimony with oral cross examination and rebuttal on BACT and MACT (Weston 4). Prepared written comments on BACT, MACT, and enforceability on draft air permit for same facility.

- For property owners in Nevada, evaluated the environmental impacts of a 1,450-MW coal-fired power plant proposed in a rural area adjacent to the Black Rock Desert and Granite Range, including emission calculations, air quality modeling, comments on proposed use permit to collect preconstruction monitoring data, and coordination with agencies and other interested parties. Project cancelled.
- For environmental organizations, reviewed draft PSD permit for a 600-MW coal-fired power plant in West Virginia (Longview). Prepared comments on permit enforceability; coal washing; BACT for SO_2 and PM10; Hg MACT; and MACT for HCl, HF, non-Hg metallic HAPs, and enforceability. Assist plaintiffs draft petition appealing air permit. Retained as expert to develop testimony on MACT, BACT, offsets, enforceability. Participate in settlement discussions. Case settled July 2004.
- For petitioners, reviewed record produced in discovery and prepared affidavit on emissions of carbon monoxide and volatile organic compounds during startup of GE 7FA combustion turbines to successfully establish plaintiff standing. *Sierra Club et al. v. Georgia Power Company* (Northern District of Georgia).
- For building trades, reviewed air quality permitting action for 1500-MW coal-fired power plant before the Kentucky Department for Environmental Protection (Thoroughbred).
- For petitioners, expert witness in administrative appeal of the PSD/Title V permit issued to a 1500-MW coal-fired power plant. Reviewed over 60,000 pages of produced documents, prepared discovery index, identified and assembled plaintiff exhibits. Deposed. Assisted counsel in drafting discovery requests, with over 30 depositions, witness cross examination, and brief drafting. Presented over 20 days of direct testimony, rebuttal and sur-rebuttal, with cross examination on BACT for NOx, SO_2, and PM/PM10; MACT for Hg and non-Hg metallic HAPs; emission estimates for purposes of Class I and II air modeling; risk assessment; and enforceability of permit limits. Evidentiary hearings from November 2003 to June 2004. *Sierra Club et al. v. Natural Resources & Environmental Protection Cabinet, Division of Air Quality and Thoroughbred Generating Company et al.* Hearing Officer Decision issued August 9, 2005 finding in favor of plaintiffs on counts as to risk, BACT (IGCC/CFB, NOx, SO_2, Hg, Be), single source, enforceability, and errors and omissions. Assist counsel draft exceptions. Cabinet Secretary issued Order April 11, 2006 denying Hearing Offer's report, except as to NOx BACT, Hg, 99% SO2 control and certain errors and omissions.
- For citizens group in Massachusetts, reviewed, commented on, and participated in permitting of pollution control retrofits of coal-fired power plant (Salem Harbor).

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- Assisted citizens group and labor union challenge issuance of conditional use permit for a 317,000 ft^2 discount store in Honolulu without any environmental review. In support of a motion for preliminary injunction, prepared 7-page declaration addressing public health impacts of diesel exhaust from vehicles serving the Project. In preparation for trial, prepared 20-page preliminary expert report summarizing results of diesel exhaust and noise measurements at two big box retail stores in Honolulu, estimated diesel PM10 concentrations for Project using ISCST, prepared a cancer health risk assessment based on these analyses, and evaluated noise impacts.
- Assisted environmental organizations to challenge the DOE Finding of No Significant Impact (FONSI) for the Baja California Power and Sempra Energy Resources Cross-Border Transmissions Lines in the U.S. and four associated power plants located in Mexico (DOE EA-1391). Prepared 20-page declaration in support of motion for summary judgment addressing emissions, including CO_2 and NH_3, offsets, BACT, cumulative air quality impacts, alternative cooling systems, and water use and water quality impacts. Plaintiff's motion for summary judgment granted in part. U.S. District Court, Southern District decision concluded that the Environmental Assessment and FONSI violated NEPA and the APA due to their inadequate analysis of the potential controversy surrounding the project, water impacts, impacts from NH_3 and CO_2, alternatives, and cumulative impacts. *Border Power Plant Working Group v. Department of Energy and Bureau of Land Management*, Case No. 02-CV-513-IEG (POR) (May 2, 2003).
- For Sacramento school, reviewed draft air permit issued for diesel generator located across from playfield. Prepared comments on emission estimates, enforceability, BACT, and health impacts of diesel exhaust. Case settled. BUG trap installed on the diesel generator.
- Assisted unions in appeal of Title V permit issued by BAAQMD to carbon plant that manufactured coke. Reviewed District files, identified historic modifications that should have triggered PSD review, and prepared technical comments on Title V permit. Reviewed responses to comments and assisted counsel draft appeal to BAAQMD hearing board, opening brief, motion to strike, and rebuttal brief. Case settled.
- Assisted California Central Coast city obtain controls on a proposed new city that would straddle the Ventura-Los Angeles County boundary. Reviewed several environmental impact reports, prepared an air quality analysis, a diesel exhaust health risk assessment, and detailed review comments. Governor intervened and State dedicated the land for conservation purposes April 2004.
- Assisted Central California city to obtain controls on large alluvial sand quarry and asphalt plant proposing a modernization. Prepared comments on Negative Declaration on air quality, public health, noise, and traffic. Evaluated process flow diagrams and engineering reports to determine whether proposed changes increased plant capacity or substantially modified plant operations. Prepared comments on application for categorical exemption from CEQA. Presented testimony to County Board of Supervisors. Developed controls to

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mitigate impacts. Assisted counsel draft Petition for Writ. Case settled June 2002. Substantial improvements in plant operations were obtained including cap on throughput, dust control measures, asphalt plant loadout enclosure, and restrictions on truck routes.

- Assisted oil companies on the California Central Coast in defending class action citizen's lawsuit alleging health effects due to emissions from gas processing plant and leaking underground storage tanks. Reviewed regulatory and other files and advised counsel on merits of case. Case settled November 2001.
- Assisted oil company on the California Central Coast in defending property damage claims arising out of a historic oil spill. Reviewed site investigation reports, pump tests, leachability studies, and health risk assessments, participated in design of additional site characterization studies to assess health impacts, and advised counsel on merits of case. Prepare health risk assessment.
- Assisted unions in appeal of Initial Study/Negative Declaration ("IS/ND") for an MTBE phaseout project at a Bay Area refinery. Reviewed IS/ND and supporting agency permitting files and prepared technical comments on air quality, groundwater, and public health impacts. Reviewed responses to comments and final IS/ND and ATC permits and assisted counsel to draft petitions and briefs appealing decision to Air District Hearing Board. Presented sworn direct and rebuttal testimony with cross examination on groundwater impacts of ethanol spills on hydrocarbon contamination at refinery. Hearing Board ruled 5 to 0 in favor of appellants, remanding ATC to district to prepare an EIR.
- Assisted Florida cities in challenging the use of diesel and proposed BACT determinations in prevention of significant deterioration (PSD) permits issued to two 510-MW simple cycle peaking electric generating facilities and one 1,080-MW simple cycle/combined cycle facility. Reviewed permit applications, draft permits, and FDEP engineering evaluations, assisted counsel in drafting petitions and responding to discovery. Participated in settlement discussions. Cases settled or applications withdrawn.
- Assisted large California city in federal lawsuit alleging peaker power plant was violating its federal permit. Reviewed permit file and applicant's engineering and cost feasibility study to reduce emissions through retrofit controls. Advised counsel on feasible and cost-effective NOx, SOx, and PM10 controls for several 1960s diesel-fired Pratt and Whitney peaker turbines. Case settled.
- Assisted coalition of Georgia environmental groups in evaluating BACT determinations and permit conditions in PSD permits issued to several large natural gas-fired simple cycle and combined-cycle power plants. Prepared technical comments on draft PSD permits on BACT, enforceability of limits, and toxic emissions. Reviewed responses to comments, advised counsel on merits of cases, participated in settlement discussions, presented oral

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and written testimony in adjudicatory hearings, and provided technical assistance as required. Cases settled or won at trial.

- Assisted construction unions in review of air quality permitting actions before the Indiana Department of Environmental Management ("IDEM") for several natural gas-fired simple cycle peaker and combined cycle power plants.
- Assisted coalition of towns and environmental groups in challenging air permits issued to 523 MW dual fuel (natural gas and distillate) combined-cycle power plant in Connecticut. Prepared technical comments on draft permits and 60 pages of written testimony addressing emission estimates, startup/shutdown issues, BACT/LAER analyses, and toxic air emissions. Presented testimony in adjudicatory administrative hearings before the Connecticut Department of Environmental Protection in June 2001 and December 2001.
- Assisted various coalitions of unions, citizens groups, cities, public agencies, and developers in licensing and permitting of over 110 coal, gas, oil, biomass, and pet coke-fired power plants generating over 75,000 MW of electricity. These included base-load, combined cycle, simple cycle, and peaker power plants in Alaska, Arizona, Arkansas, California, Colorado, Georgia, Florida, Illinois, Indiana, Kentucky, Michigan, Missouri, Ohio, Oklahoma, Oregon, Texas, West Virginia, Wisconsin, and elsewhere. Prepared analyses of and comments on applications for certification, preliminary and final staff assessments, and various air, water, wastewater, and solid waste permits issued by local agencies. Presented written and oral testimony before various administrative bodies on hazards of ammonia use and transportation, health effects of air emissions, contaminated property issues, BACT/LAER issues related to SCR and SCONOx, criteria and toxic pollutant emission estimates, MACT analyses, air quality modeling, water supply and water quality issues, and methods to reduce water use, including dry cooling, parallel dry-wet cooling, hybrid cooling, and zero liquid discharge systems.
- Assisted unions, cities, and neighborhood associations in challenging an EIR issued for the proposed expansion of the Oakland Airport. Reviewed two draft EIRs and prepared a health risk assessment and extensive technical comments on air quality and public health impacts. The California Court of Appeals, First Appellate District, ruled in favor of appellants and plaintiffs, concluding that the EIR "2) erred in using outdated information in assessing the emission of toxic air contaminants (TACs) from jet aircraft; 3) failed to support its decision not to evaluate the health risks associated with the emission of TACs with meaningful analysis," thus accepting my technical arguments and requiring the Port to prepare a new EIR. See *Berkeley Keep Jets Over the Bay Committee, City of San Leandro, and City of Alameda et al. v. Board of Port Commissioners* (August 30, 2001) 111 Cal.Rptr.2d 598.
- Assisted lessor of former gas station with leaking underground storage tanks and TCE contamination from adjacent property. Lessor held option to purchase, which was forfeited

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based on misrepresentation by remediation contractor as to nature and extent of contamination. Remediation contractor purchased property. Reviewed regulatory agency files and advised counsel on merits of case. Case not filed.

- Advised counsel on merits of several pending actions, including a Proposition 65 case involving groundwater contamination at an explosives manufacturing firm and two former gas stations with leaking underground storage tanks.
- Assisted defendant foundry in Oakland in a lawsuit brought by neighbors alleging property contamination, nuisance, trespass, smoke, and health effects from foundry operation. Inspected and sampled plaintiff's property. Advised counsel on merits of case. Case settled.
- Assisted business owner facing eminent domain eviction. Prepared technical comments on a negative declaration for soil contamination and public health risks from air emissions from a proposed redevelopment project in San Francisco in support of a CEQA lawsuit. Case settled.
- Assisted neighborhood association representing residents living downwind of a Berkeley asphalt plant in separate nuisance and CEQA lawsuits. Prepared technical comments on air quality, odor, and noise impacts, presented testimony at commission and council meetings, participated in community workshops, and participated in settlement discussions. Cases settled. Asphalt plant was upgraded to include air emission and noise controls, including vapor collection system at truck loading station, enclosures for noisy equipment, and improved housekeeping.
- Assisted a Fortune 500 residential home builder in claims alleging health effects from faulty installation of gas appliances. Conducted indoor air quality study, advised counsel on merits of case, and participated in discussions with plaintiffs. Case settled.
- Assisted property owners in Silicon Valley in lawsuit to recover remediation costs from insurer for large TCE plume originating from a manufacturing facility. Conducted investigations to demonstrate sudden and accidental release of TCE, including groundwater modeling, development of method to date spill, preparation of chemical inventory, investigation of historical waste disposal practices and standards, and on-site sewer and storm drainage inspections and sampling. Prepared declaration in opposition to motion for summary judgment. Case settled.
- Assisted residents in east Oakland downwind of a former battery plant in class action lawsuit alleging property contamination from lead emissions. Conducted historical research and dry deposition modeling that substantiated claim. Participated in mediation at JAMS. Case settled.
- Assisted property owners in West Oakland who purchased a former gas station that had leaking underground storage tanks and groundwater contamination. Reviewed agency files

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and advised counsel on merits of case. Prepared declaration in opposition to summary judgment. Prepared cost estimate to remediate site. Participated in settlement discussions. Case settled.

- Consultant to counsel representing plaintiffs in two Clean Water Act lawsuits involving selenium discharges into San Francisco Bay from refineries. Reviewed files and advised counsel on merits of case. Prepared interrogatory and discovery questions, assisted in deposing opposing experts, and reviewed and interpreted treatability and other technical studies. Judge ruled in favor of plaintiffs.
- Assisted oil company in a complaint filed by a resident of a small California beach community alleging that discharges of tank farm rinse water into the sanitary sewer system caused hydrogen sulfide gas to infiltrate residence, sending occupants to hospital. Inspected accident site, interviewed parties to the event, and reviewed extensive agency files related to incident. Used chemical analysis, field simulations, mass balance calculations, sewer hydraulic simulations with SWMM44, atmospheric dispersion modeling with SCREEN3, odor analyses, and risk assessment calculations to demonstrate that the incident was caused by a faulty drain trap and inadequate slope of sewer lateral on resident's property. Prepared a detailed technical report summarizing these studies. Case settled.
- Assisted large West Coast city in suit alleging that leaking underground storage tanks on city property had damaged the waterproofing on downgradient building, causing leaks in an underground parking structure. Reviewed subsurface hydrogeologic investigations and evaluated studies conducted by others documenting leakage from underground diesel and gasoline tanks. Inspected, tested, and evaluated waterproofing on subsurface parking structure. Waterproofing was substandard. Case settled.
- Assisted residents downwind of gravel mine and asphalt plant in Siskiyou County, California, in suit to obtain CEQA review of air permitting action. Prepared two declarations analyzing air quality and public health impacts. Judge ruled in favor of plaintiffs, closing mine and asphalt plant.
- Assisted defendant oil company on the California Central Coast in class action lawsuit alleging property damage and health effects from subsurface petroleum contamination. Reviewed documents, prepared risk calculations, and advised counsel on merits of case. Participated in settlement discussions. Case settled.
- Assisted defendant oil company in class action lawsuit alleging health impacts from remediation of petroleum contaminated site on California Central Coast. Reviewed documents, designed and conducted monitoring program, and participated in settlement discussions. Case settled.

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- Consultant to attorneys representing irrigation districts and municipal water districts to evaluate a potential challenge of USFWS actions under CVPIA section 3406(b)(2). Reviewed agency files and collected and analyzed hydrology, water quality, and fishery data. Advised counsel on merits of case. Case not filed.
- Assisted residents downwind of a Carson refinery in class action lawsuit involving soil and groundwater contamination, nuisance, property damage, and health effects from air emissions. Reviewed files and provided advice on contaminated soil and groundwater, toxic emissions, and health risks. Prepared declaration on refinery fugitive emissions. Prepared deposition questions and reviewed deposition transcripts on air quality, soil contamination, odors, and health impacts. Case settled.
- Assisted residents downwind of a Contra Costa refinery who were affected by an accidental release of naphtha. Characterized spilled naphtha, estimated emissions, and modeled ambient concentrations of hydrocarbons and sulfur compounds. Deposed. Presented testimony in binding arbitration at JAMS. Judge found in favor of plaintiffs.
- Assisted residents downwind of Contra Costa County refinery in class action lawsuit alleging property damage, nuisance, and health effects from several large accidents as well as routine operations. Reviewed files and prepared analyses of environmental impacts. Prepared declarations, deposed, and presented testimony before jury in one trial and judge in second. Case settled.
- Assisted business owner claiming damages from dust, noise, and vibration during a sewer construction project in San Francisco. Reviewed agency files and PM10 monitoring data and advised counsel on merits of case. Case settled.
- Assisted residents downwind of Contra Costa County refinery in class action lawsuit alleging property damage, nuisance, and health effects. Prepared declaration in opposition to summary judgment, deposed, and presented expert testimony on accidental releases, odor, and nuisance before jury. Case thrown out by judge, but reversed on appeal and not retried.
- Presented testimony in small claims court on behalf of residents claiming health effects from hydrogen sulfide from flaring emissions triggered by a power outage at a Contra Costa County refinery. Analyzed meteorological and air quality data and evaluated potential health risks of exposure to low concentrations of hydrogen sulfide. Judge awarded damages to plaintiffs.
- Assisted construction unions in challenging PSD permit for an Indiana steel mill. Prepared technical comments on draft PSD permit, drafted 70-page appeal of agency permit action to the Environmental Appeals Board challenging permit based on faulty BACT analysis for electric arc furnace and reheat furnace and faulty permit conditions, among others, and drafted briefs responding to four parties. EPA Region V and the EPA General Counsel

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intervened as amici, supporting petitioners. EAB ruled in favor of petitioners, remanding permit to IDEM on three key issues, including BACT for the reheat furnace and lead emissions from the EAF. Drafted motion to reconsider three issues. Prepared 69 pages of technical comments on revised draft PSD permit. Drafted second EAB appeal addressing lead emissions from the EAF and BACT for reheat furnace based on European experience with SCR/SNCR. Case settled. Permit was substantially improved. See *In re: Steel Dynamics, Inc.*, PSD Appeal Nos. 99-4 & 99-5 (EAB June 22, 2000).

- Assisted defendant urea manufacturer in Alaska in negotiations with USEPA to seek relief from penalties for alleged violations of the Clean Air Act. Reviewed and evaluated regulatory files and monitoring data, prepared technical analysis demonstrating that permit limits were not violated, and participated in negotiations with EPA to dismiss action. Fines were substantially reduced and case closed.
- Assisted construction unions in challenging PSD permitting action for an Indiana grain mill. Prepared technical comments on draft PSD permit and assisted counsel draft appeal of agency permit action to the Environmental Appeals Board challenging permit based on faulty BACT analyses for heaters and boilers and faulty permit conditions, among others. Case settled.
- As part of a consent decree settling a CEQA lawsuit, assisted neighbors of a large west coast port in negotiations with port authority to secure mitigation for air quality impacts. Prepared technical comments on mobile source air quality impacts and mitigation and negotiated a $9 million CEQA mitigation package. Represented neighbors on technical advisory committee established by port to implement the air quality mitigation program. Program successfully implemented.
- Assisted construction unions in challenging permitting action for a California hazardous waste incinerator. Prepared technical comments on draft permit, assisted counsel prepare appeal of EPA permit to the Environmental Appeals Board. Participated in settlement discussions on technical issues with applicant and EPA Region 9. Case settled.
- Assisted environmental group in challenging DTSC Negative Declaration on a hazardous waste treatment facility. Prepared technical comments on risk of upset, water, and health risks. Writ of mandamus issued.
- Assisted several neighborhood associations and cities impacted by quarries, asphalt plants, and cement plants in Alameda, Shasta, Sonoma, and Mendocino counties in obtaining mitigations for dust, air quality, public health, traffic, and noise impacts from facility operations and proposed expansions.
- For over 100 industrial facilities, commercial/campus, and redevelopment projects, developed the record in preparation for CEQA and NEPA lawsuits. Prepared technical comments on hazardous materials, solid wastes, public utilities, noise, worker safety, air

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quality, public health, water resources, water quality, traffic, and risk of upset sections of EIRs, EISs, FONSIs, initial studies, and negative declarations. Assisted counsel in drafting petitions and briefs and prepared declarations.

- For several large commercial development projects and airports, assisted applicant and counsel prepare defensible CEQA documents, respond to comments, and identify and evaluate "all feasible" mitigation to avoid CEQA challenges. This work included developing mitigation programs to reduce traffic-related air quality impacts based on energy conservation programs, solar, low-emission vehicles, alternative fuels, exhaust treatments, and transportation management associations.

SITE INVESTIGATION/REMEDIATION/CLOSURE

- Technical manager and principal engineer for characterization, remediation, and closure of waste management units at former Colorado oil shale plant. Constituents of concern included BTEX, As, 1,1,1-TCA, and TPH. Completed groundwater monitoring programs, site assessments, work plans, and closure plans for seven process water holding ponds, a refinery sewer system, and processed shale disposal area. Managed design and construction of groundwater treatment system and removal actions and obtained clean closure.
- Principal engineer for characterization, remediation, and closure of process water ponds at a former lanthanide processing plant in Colorado. Designed and implemented groundwater monitoring program and site assessments and prepared closure plan.
- Advised the city of Sacramento on redevelopment of two former railyards. Reviewed work plans, site investigations, risk assessment, RAPS, RI/FSs, and CEQA documents. Participated in the development of mitigation strategies to protect construction and utility workers and the public during remediation, redevelopment, and use of the site, including buffer zones, subslab venting, rail berm containment structure, and an environmental oversight plan.
- Provided technical support for the investigation of a former sanitary landfill that was redeveloped as single family homes. Reviewed and/or prepared portions of numerous documents, including health risk assessments, preliminary endangerment assessments, site investigation reports, work plans, and RI/FSs. Historical research to identify historic waste disposal practices to prepare a preliminary endangerment assessment. Acquired, reviewed, and analyzed the files of 18 federal, state, and local agencies, three sets of construction field notes, analyzed 21 aerial photographs and interviewed 14 individuals associated with operation of former landfill. Assisted counsel in defending lawsuit brought by residents

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alleging health impacts and diminution of property value due to residual contamination. Prepared summary reports.

- Technical oversight of characterization and remediation of a nitrate plume at an explosives manufacturing facility in Lincoln, CA. Provided interface between owners and consultants. Reviewed site assessments, work plans, closure plans, and RI/FSs.
- Consultant to owner of large western molybdenum mine proposed for NPL listing. Participated in negotiations to scope out consent order and develop scope of work. Participated in studies to determine premining groundwater background to evaluate applicability of water quality standards. Served on technical committees to develop alternatives to mitigate impacts and close the facility, including resloping and grading, various thickness and types of covers, and reclamation. This work included developing and evaluating methods to control surface runoff and erosion, mitigate impacts of acid rock drainage on surface and ground waters, and stabilize nine waste rock piles containing 328 million tons of pyrite-rich, mixed volcanic waste rock (andesites, rhyolite, tuff) Evaluated stability of waste rock piles. Represented client in hearings and meetings with state and federal oversight agencies.

REGULATORY (PARTIAL LIST)

- In September 2019, reviewed City of Sunnyvale's file on Google's proposed Central Utility Plant and researched and wrote 34 pages of comments on construction and operational air quality impacts, cumulative impacts, and battery fire and explosion impacts.
- In August 2019, researched and wrote 25 pages of comments on IS/MND for the Hanford-Lakeside Dairy digester Project, Kings County, on project description (piecemealing), cumulative impacts, construction impacts, air quality impacts, valley fever and risk of upset.
- In July 2019, researched and wrote 48 pages of comments on IS/MND for the Five Points Pipeline Dairy Digester Cluster Project, including on air quality, cumulative impacts, worker and public health impacts (including on pesticide-contaminated soils), Valley Fever, construction air quality impacts, and risk of upset.
- In June 2019, researched and wrote 15 pages of responses to comments on IS/MND for SV1 Data Center, including operational NOx emissions, air quality analyses, construction emissions, battery hazards, and mitigation plans for noise, vibration, risk management, storm water pollution, and emergency response and evacuation plans.

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- In June 2019, researched and wrote 30 pages of comments on DEIR for the Humboldt Wind Energy Project on fire and aesthetic impacts of transmission line, construction air quality impacts and mitigation, and greenhouse gas emissions.
- In May 2019, researched and wrote 25 pages of comments on the DEIR for the ExxonMobil Interim Trucking for Santa Ynez Phased Restart Project on project description, baseline, and mitigation.
- In April 2019, researched and wrote a 16 page letter critiquing the adequacy of the FEIR for CalAm Desalination Project to support a Monterey County Combined Development Permit, consisting of a Use Permit, an Administrative Permit, and Design Approval for the Desalination Plant and Carmel Valley Pump Station.
- In April 2019, researched and wrote 22 pages of comments on DEIR for the Eco-Energy Liquid Bulk Terminal at the Port of Stockton on emissions, air quality impact mitigation, and health risk assessment.
- In March 2019, researched and wrote 43 pages of comments on DEIR for Contanda Renewable Diesel Bulk Liquid Terminal at the Port of Stockton on operational emissions, air quality impacts and mitigation and health risks.
- In February 2019, researched and wrote 36 pages of comments on general cumulative impacts, air quality, accidents, and valley fever for IS/MND for biogas cluster project in Kings County.
- In January 2019, researched and wrote 30 pages of comments on air quality and valley fever for IS/MND for energy storage facility in Kings County.
- In December 2018, researched and wrote 11 pages of comments on air quality for IS/MND for biomass gasification facility in Madera County.
- In December 2018, researched and wrote 10 pages of responses to comments on IS/MND for a wind energy project in Riverside County.
- In December 2018, researched and wrote 12 pages of responses to comments on IS/MND for a large Safeway fueling station in Petaluma. The Planning Commission voted unanimously to require an EIR.
- In November 2018, researched and wrote 30 pages of comments on IS/MND on wind energy project in Riverside County on construction health risks, odor impacts, waste disposal, transportation, construction emissions and mitigation and Valley Fever.
- In November 2018, researched and wrote 32 pages of comments on the DEIR for a solar energy generation and storage project in San Bernardino County on hazards, health risks, odor, construction emissions and mitigation, and Valley Fever.

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- In September 2018, researched and wrote 36 pages of comments on the FEIR for the Newland Sierra Project including on greenhouse gas emissions, construction emissions, and cumulative impacts.
- In August 2018, researched and wrote 20 pages of comments on the health risk assessment in the IS/MND for a large Safeway fueling station in Petaluma.
- In August 2018, researched and wrote responses to comments on DEIR for the Newland Sierra Project, San Diego County on greenhouse gas emissions, construction emissions, odor, and Valley Fever.
- In July/August 2018, researched and wrote 12 pages of comments on DEIR for proposed Doheny Desal Project, on GHG, criteria pollutant, and TAC emissions and public health impacts during construction and indirect emissions during operation.
- In June 2018, researched and wrote 12 pages of technical comments rebutting NDDH responses to comments on Meridian Davis Refinery.
- In April 2018, researched and wrote 26 pages of comments on greenhouse gas emissions and mitigation as proposed in the San Diego County Climate Action Plan.
- In April 2018, researched and wrote 24 pages of comments on the FEIR for Monterey County water supply project, including GHG mitigation, air quality impacts and mitigation, and Valley Fever.
- In March-June 2018, researched and wrote 37 pages of comments on the IS/MND for the 2305 Mission College Boulevard Data Center, Santa Clara, California and responded to responses to comments.
- In March 2018, researched and wrote 40 pages of comments on the IS/MND for the Diablo Energy Storage Facility in Pittsburg, California.
- In March 2018, researched and wrote 19 pages of comments on Infill Checklist/Mitigated Negative Declaration for the Legacy@Livermore Project on CalEEMod emission calculations, including NOx and PM10 and construction health risk assessment, including Valley Fever.
- In January 2018, researched and wrote 28 pages of comments on draft Permit to Construct for the Davis Refinery Project, North Dakota, as a minor source of criteria pollutants and HAPs.
- In December 2017, researched and wrote 19 pages of comments on DEIR for the Rialto Bioenergy Facility, Rialto, California.
- In November and December 2017, researched and wrote 6 pages of comments on the Ventura County Air Pollution Control District's Preliminary Determination if Compliance (PDOC) for Mission Rock Energy Center.

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- In November 2017, researched and wrote 11 pages of comments on control technology evaluation for the National Emission Standards for Hazardous Air Pollutants from the Portland Cement Manufacturing Industry Residual Risk and Technology Review.
- In September and November 2017, prepared comments on revised Negative Declaration for Delicato Winery in San Joaquin County, California.
- In October and November 2017, researched and wrote comments on North City Project Pure Water San Diego Program DEIR/DEIS to reclaim wastewater for municipal use.
- In August 2017, reviewed DEIR on a new residential community in eastern San Diego County (Newland Sierra) and research and wrote 60 pages of comments on air quality, greenhouse gas emissions and health impacts, including Valley Fever.
- In August 2017, reviewed responses to comments on Part 70 operating permit for IGP Methanol's Gulf Coast Methanol Complex, near Myrtle Grove, Louisiana, and researched and wrote comments on metallic HAP issues.
- In July 2017, reviewed the FEIS for an expansion of the Port of Gulfport and researched and wrote 10 pages of comments on air quality and public health.
- In June 2017, reviewed and prepared technical report on an Application for a synthetic minor source construction permit for a new Refinery in North Dakota.
- In June 2017, reviewed responses to NPCA and other comments on the BP Cherry Point Refinery modifications and assisted counsel in evaluating issues to appeal, including GHG BACT, coker heater SCR cost effectiveness analysis, and SO_2 BACT.
- In June 2017, reviewed Part 70 Operating Permit Renewal/Modification for the Noranda Alumina LC/Gramercy Holdings I, LLC alumina processing plant, St. James, Louisiana, and prepared comments on HAP emissions from bauxite feedstock.
- In May and June 2017, reviewed FEIR on Tesoro Integration Project and prepared responses to comments on the DEIR.
- In May 2017, prepared comments on tank VOC and HAP emissions from Tesoro Integration Project, based on real time monitoring at the Tesoro and other refineries in the SCAQMD.
- In April 2017, prepared comments on Negative Declaration for Delicato Winery in San Joaquin County, California.
- In March 2017, reviewed Negative Declaration for Ellmore geothermal facility in Imperial County, California and prepared summary of issues.

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- In March 2017, prepared response to Phillips 66 Company's Appeal of the San Luis Obispo County Planning Commission's Decision Denying the Rail Spur Extension Project Proposed for the Santa Maria Refinery.
- In February 2017, researched and wrote comments on Kalama draft Title V permit for 10,000 MT/day methanol production and marine export facility in Kalama, Washington.
- In January 2017, researched and wrote 51 pages of comments on proposed Title V and PSD permits for the St. James Methanol Plant, St. James Louisiana, on BACT and enforceability of permit conditions.
- In December 2016, researched and wrote comments on draft Title V Permit for Yuhuang Chemical Inc. Methanol Plant, St. James, Louisiana, responding to EPA Order addressing enforceability issues.
- In November 2016, researched and wrote comments on Initial Study/Mitigated Negative Declaration for the AES Battery Energy Storage Facility, Long Beach, CA.
- In November 2016, researched and wrote comments on Campo Verde Battery Energy Storage System Draft Environmental Impact Report.
- In October 2016, researched and wrote comments on Title V Permit for NuStar Terminal Operations Partnership L.P, Stockton, CA.
- In October 2016, prepared expert report, Technical Assessment of Achieving the 40 CFR Part 423 Zero Discharge Standard for Bottom Ash Transport Water at the Belle River Power Plant, East China, Michigan. Reported resulted in a 2 year reduction in compliance date for elimination of bottom ash transport water. 1/30/17 DEQ Letter.
- In September 2016, researched and wrote comments on Proposed Title V Permit and Environmental Assessment Statement, Yuhuang Chemical Inc. Methanol Plant, St. James, Louisiana.
- In September 2016, researched and wrote response to ''Further Rebuttal in Support of Appeal of Planning Commission Resolution No. 16-1, Denying Use Permit Application 12PLN-00063 and Declining to Certify Final Environmental Impact Report for the Valero Benicia Crude-by-Rail Project.
- In August 2016, reviewed and prepared comments on manuscript: Hutton et al., Freshwater Flows to the San Francisco Bay-Delta Estuary over Nine Decades: Trends Evaluation.
- In August/September 2016, researched and wrote comments on Mitigated Negative Declaration for the Chevron Long Wharf Maintenance and Efficiency Project.

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- In July 2016, researched and wrote comments on the Ventura County APCD Preliminary Determination of Compliance and the California Energy Commission Revised Preliminary Staff Assessment for the Puente Power Project.
- In June 2016, researched and wrote comments on an Ordinance (1) Amending the Oakland Municipal Code to Prohibit the Storage and Handling of Coal and Coke at Bulk Material Facilities or Terminals Throughout the City of Oakland and (2) Adopting CEQA Exemption Findings and supporting technical reports. Council approved Ordinance on an 8 to 0 vote on June 27, 2016.
- In May 2016, researched and wrote comments on Draft Title V Permit and Draft Environmental Impact Report for the Tesoro Los Angeles Refinery Integration and Compliance Project.
- In March 2016, researched and wrote comments on Valero's Appeal of Planning Commission's Denial of Valero Crude-by-Rail Project.
- In February 2016, researched and wrote comments on Final Environmental Impact Report, Santa Maria Rail Spur Project.
- In February 2016, researched and wrote comments on Final Environmental Impact Report, Valero Benicia Crude by Rail Project.
- In January 2016, researched and wrote comments on Draft Programmatic Environmental Impact Report for the Southern California Association of Government's (SCAG) 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy.
- In November 2015, researched and wrote comments on Final Environmental Impact Report for Revisions to the Kern County Zoning Ordinance – 2015(C) (Focused on Oil and Gas Local Permitting), November 2015.
- In October 2015, researched and wrote comments on Revised Draft Environmental Report, Valero Benicia Crude by Rail Project.
- In September 2015, prepared report, ''Environmental, Health and Safety Impacts of the Proposed Oakland Bulk and Oversized Terminal, and presented oral testimony on September 21, 2015 before Oakland City Council on behalf of the Sierra Club.
- In September 2015, researched and wrote comments on revisions to two chapters of EPA's Air Pollution Control Cost Manual: Docket ID No. EPA-HQ-OAR-2015-0341.
- In June 2015, researched and wrote comments on DEIR for the CalAm Monterey Peninsula Water Supply Project.
- In April 2015, researched and wrote comments on proposed Title V Operating Permit Revision and Prevention of Significant Deterioration Permit for Arizona Public Service's

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Ocotillo Power Plant Modernization Project (5 GE LMS100 105-MW simple cycle turbines operated as peakers), in Tempe, Arizona; Final permit appealed to EAB.

- In March 2015, researched and wrote ''Comments on Proposed Title V Air Permit, Yuhuang Chemical Inc. Methanol Plant, St. James, Louisiana''. Client filed petition objecting to the permit. EPA granted majority of issues. In the Matter of Yuhuang Chemical Inc. Methanol Plant, St. James Parish, Louisiana, Permit No. 2560-00295-V0, Issued by the Louisiana Department of Environmental Quality, Petition No. VI-2015-03, Order Responding to the Petitioners' Request for Objection to the Issuance of a Title V Operating Permit, September 1, 2016.
- In February 2015, prepared compilation of BACT cost effectiveness values in support of comments on draft PSD Permit for Bonanza Power Project.
- In January 2015, prepared cost effectiveness analysis for SCR for a 500-MW coal fire power plant, to address unpermitted upgrades in 2000.
- In January 2015, researched and wrote comments on Revised Final Environmental Impact Report for the Phillips 66 Propane Recovery Project. *Communities for a Better Environment et al. v. Contra Costa County et al. Contra Costa County (Superior Court, Contra Costa County, Case No. MSN15-0301, December 1, 2016).*
- In December 2014, researched and wrote ''Report on Bakersfield Crude Terminal Permits to Operate.'' In response, the U.S. EPA cited the Terminal for 10 violations of the Clean Air Act. The Fifth Appellate District Court upheld the finding in this report in CBE et al v. San Joaquin Valley Unified Air Pollution Control District and Bakersfield Crude Terminal LLC et al, Super. Ct. No. 284013, June 23, 2017.
- In December 2014, researched and wrote comments on Revised Draft Environmental Impact Report for the Phillips 66 Propane Recovery Project.
- In November 2014, researched and wrote comments on Revised Draft Environmental Impact Report for Phillips 66 Rail Spur Extension Project and Crude Unloading Project, Santa Maria, CA to allow the import of tar sands crudes.
- In November 2014, researched and wrote comments on Draft Environmental Impact Report for Phillips 66 Ultra Low Sulfur Diesel Project, responding to the California Supreme Court Decision, *Communities for a Better Environment v. South Coast Air Quality Management Dist. (2010) 48 Cal.4th 310.*
- In November 2014, researched and wrote comments on Draft Environmental Impact Report for the Tesoro Avon Marine Oil Terminal Lease Consideration.
- In October 2014, prepared: ''Report on Hydrogen Cyanide Emissions from Fluid Catalytic Cracking Units'', pursuant to the Petroleum Refinery Sector Risk and Technology Review and New Source Performance Standards, 79 FR 36880.

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- In October 2014, researched and wrote technical comments on Final Environmental Impact Reports for Alon Bakersfield Crude Flexibility Project to build a rail terminal to allow the import/export of tar sands and Bakken crude oils and to upgrade an existing refinery to allow it to process a wide range of crudes.
- In October 2014, researched and wrote technical comments on the Title V Permit Renewal and three De Minimus Significant Revisions for the Tesoro Logistics Marine Terminal in the SCAQMD.
- In September 2014, researched and wrote technical comments on the Draft Environmental Impact Report for the Valero Crude by Rail Project.
- In August 2014, for EPA Region 6, prepared technical report on costing methods for upgrades to existing scrubbers at coal-fired power plants.
- In July 2014, researched and wrote technical comments on Draft Final Environmental Impact Reports for Alon Bakersfield Crude Flexibility Project to build a rail terminal to allow the import/export of tar sands and Bakken crude oils and to upgrade an existing refinery to allow it to process a wide range of crudes.
- In June 2014, researched and wrote technical report on Initial Study and Draft Negative Declaration for the Tesoro Logistics Storage Tank Replacement and Modification Project.
- In May 2014, researched and wrote technical comments on Intent to Approve a new refinery and petroleum transloading operation in Utah.
- In March and April 2014, prepared declarations on air permits issued for two crude-by-rail terminals in California, modified to switch from importing ethanol to importing Bakken crude oils by rail and transferring to tanker cars. Permits were issued without undergoing CEQA review. One permit was upheld by the San Francisco Superior Court as statute of limitations had run. The Sacramento Air Quality Management District withdrew the second one due to failure to require BACT and conduct CEQA review.
- In March 2014, researched and wrote technical report on Negative Declaration for a proposed modification of the air permit for a bulk petroleum and storage terminal to the allow the import of tar sands and Bakken crude oil by rail and its export by barge, under the New York State Environmental Quality Review Act (SEQRA).
- In February 2014, researched and wrote technical report on proposed modification of air permit for midwest refinery upgrade/expansion to process tar sands crudes.
- In January 2014, prepared cost estimates to capture, transport, and use CO2 in enhanced oil recovery, from the Freeport LNG project based on both Selexol and Amine systems.
- In January 2014, researched and wrote technical report on Draft Environmental Impact Report for Phillips 66 Rail Spur Extension Project, Santa Maria, CA. Comments

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addressed project description (piecemealing, crude slate), risk of upset analyses, mitigation measures, alternative analyses and cumulative impacts.

- In November 2013, researched and wrote technical report on the Phillips 66 Propane Recovery Project, Rodeo, CA. Comments addressed project description (piecemealing, crude slate) and air quality impacts.
- In September 2013, researched and wrote technical report on the Draft Authority to Construct Permit for the Casa Diablo IV Geothermal Development Project Environmental Impact Report and Declaration in Support of Appeal and Petition for Stay, U.S. Department of the Interior, Board of Land Appeals, Appeal of Decision Record for the Casa Diablo IV Geothermal Development Project.
- In September 2013, researched and wrote technical report on Effluent Limitation Guidelines for Best Available Technology Economically Available (BAT) for Bottom Ash Transport Waters from Coal-Fired Power Plants in the Steam Electric Power Generating Point Source Category.
- In July 2013, researched and wrote technical report on Initial Study/Mitigated Negative Declaration for the Valero Crude by Rail Project, Benicia, California, Use Permit Application 12PLN-00063.
- In July 2013, researched and wrote technical report on fugitive particulate matter emissions from coal train staging at the proposed Coyote Island Terminal, Oregon, for draft Permit No. 25-0015-ST-01.
- In July 2013, researched and wrote technical comments on air quality impacts of the Finger Lakes LPG Storage Facility as reported in various Environmental Impact Statements.
- In July 2013, researched and wrote technical comments on proposed Greenhouse Gas PSD Permit for the Celanese Clear Lake Plant, including cost analysis of CO2 capture, transport, and sequestration.
- In June/July 2013, researched and wrote technical comments on proposed Draft PSD Preconstruction Permit for Greenhouse Gas Emission for the ExxonMobil Chemical Company Baytown Olefins Plant, including cost analysis of CO2 capture, transport, and sequestration.
- In June 2013, researched and wrote technical report on a Mitigated Negative Declaration for a new rail terminal at the Valero Benicia Refinery to import increased amounts of "North American" crudes. Comments addressed air quality impacts of refining increased amounts of tar sands crudes.
- In June 2013, researched and wrote technical report on Draft Environmental Impact Report for the California Ethanol and Power Imperial Valley 1 Project.

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- In May 2013, researched and wrote comments on draft PSD permit for major expansion of midwest refinery to process 100% tar sands crudes, including a complex netting analysis involving debottlenecking, piecemealing, and BACT analyses.
- In April 2013, researched and wrote technical report on the Draft Supplemental Environmental Impact Statement (DSEIS) for the Keystone XL Pipeline on air quality impacts from refining increased amount of tar sands crudes at Refineries in PADD 3.
- In October 2012, researched and wrote technical report on the Environmental Review for the Coyote Island Terminal Dock at the Port of Morrow on fugitive particulate matter emissions.
- In October 2012-October 2014, review and evaluate Flint Hills West Application for an expansion/modification for increased (Texas, Eagle Ford Shale) crude processing and related modification, including netting and BACT analysis. Assist in settlement discussions.
- In February 2012, researched and wrote comments on BART analysis in PA Regional Haze SIP, 77 FR 3984 (Jan. 26, 2012). On Sept. 29, 2015, a federal appeals court overturned the U.S. EPA's approval of this plan, based in part on my comments, concluding ''..we will vacate the 2014 Final Rule to the extent it approved Pennsylvania's source-specific BART analysis and remand to the EPA for further proceedings consistent with this Opinion.'' Nat'l Parks Conservation Assoc. v. EPA, 3d Cir., No. 14-3147, 9/19/15.
- Prepared cost analyses and comments on New York's proposed BART determinations for NOx, SO2, and PM and EPA's proposed approval of BART determinations for Danskammer Generating Station under New York Regional Haze State Implementation Plan and Federal Implementation Plan, 77 FR 51915 (August 28, 2012).
- Prepared cost analyses and comments on NOx BART determinations for Regional Haze State Implementation Plan for State of Nevada, 77 FR 23191 (April 18, 2012) and 77 FR 25660 (May 1, 2012).
- Prepared analyses of and comments on New Source Performance Standards for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, 77 FR 22392 (April 13, 2012).
- Researched and wrote comments on CASPR-BART emission equivalency and NOx and PM BART determinations in EPA proposed approval of State Implementation Plan for Pennsylvania Regional Haze Implementation Plan, 77 FR 3984 (January 26, 2012).
- Researched and wrote comments and statistical analyses on hazardous air pollutants (HAPs) emission controls, monitoring, compliance methods, and the use of surrogates for acid gases, organic HAPs, and metallic HAPs for proposed National Emission Standards for

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Hazardous Air Pollutants from Coal- and Oil-Fired Electric Utility Steam Generating Units, 76 FR 24976 (May 3, 2011).

- Prepared cost analyses and comments on NOx BART determinations and emission reductions for proposed Federal Implementation Plan for Four Corners Power Plant, 75 FR 64221 (October 19, 2010).
- Prepared cost analyses and comments on NOx BART determinations for Colstrip Units 1- 4 for Montana State Implementation Plan and Regional Haze Federal Implementation Plan, 77 FR 23988 (April 20, 2010).
- For EPA Region 8, prepared report: Revised BART Cost Effectiveness Analysis for Tail-End Selective Catalytic Reduction at the Basin Electric Power Cooperative Leland Olds Station Unit 2 Final Report, March 2011, in support of 76 FR 58570 (Sept. 21, 2011).
- For EPA Region 6, prepared report: Revised BART Cost-Effectiveness Analysis for Selective Catalytic Reduction at the Public Service Company of New Mexico San Juan Generating Station, November 2010, in support of 76 FR 52388 (Aug. 22, 2011).
- For EPA Region 6, prepared report: Revised BART Cost-Effectiveness Analysis for Flue Gas Desulfurization at Coal-Fired Electric Generating Units in Oklahoma: Sooner Units 1 & 2, Muskogee Units 4 & 5, Northeastern Units 3 &4, October 2010, in support of 76 FR 16168 (March 26, 2011). My work was upheld in: *State of Oklahoma v. EPA*, App. Case 12-9526 (10th Cri. July 19, 2013).
- Identified errors in N_2O emission factors in the Mandatory Greenhouse Gas Reporting Rule, 40 CFR 98, and prepared technical analysis to support Petition for Rulemaking to Correct Emissions Factors in the Mandatory Greenhouse Gas Reporting Rule, filed with EPA on 10/28/10.
- Assisted interested parties develop input for and prepare comments on the Information Collection Request for Petroleum Refinery Sector NSPS and NESHAP Residual Risk and Technology Review, 75 FR 60107 (9/29/10).
- Technical reviewer of EPA's "Emission Estimation Protocol for Petroleum Refineries," posted for public comments on CHIEF on 12/23/09, prepared in response to the City of Houston's petition under the Data Quality Act (March 2010).
- Researched and wrote comments on SCR cost effectiveness for EPA's Advanced Notice of Proposed Rulemaking, Assessment of Anticipated Visibility Improvements at Surrounding Class I Areas and Cost Effectiveness of Best Available Retrofit Technology for Four Corners Power Plant and Navajo Generating Station, 74 FR 44313 (August 28, 2009).
- Researched and wrote comments on Proposed Rule for Standards of Performance for Coal Preparation and Processing Plants, 74 FR 25304 (May 27, 2009).

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- Prepared comments on draft PSD permit for major expansion of midwest refinery to process up to 100% tar sands crudes. Participated in development of monitoring and controls to mitigate impacts and in negotiating a Consent Decree to settle claims in 2008.
- Reviewed and assisted interested parties prepare comments on proposed Kentucky air toxic regulations at 401 KAR 64:005, 64:010, 64:020, and 64:030 (June 2007).
- Prepared comments on proposed Standards of Performance for Electric Utility Steam Generating Units and Small Industrial-Commercial-Industrial Steam Generating Units, 70 FR 9706 (February 28, 2005).
- Prepared comments on Louisville Air Pollution Control District proposed Strategic Toxic Air Reduction regulations.
- Prepared comments and analysis of BAAQMD Regulation, Rule 11, Flare Monitoring at Petroleum Refineries.
- Prepared comments on Proposed National Emission Standards for Hazardous Air Pollutants; and, in the Alternative, Proposed Standards of Performance for New and Existing Stationary Sources: Electricity Utility Steam Generating Units (MACT standards for coal-fired power plants).
- Prepared Authority to Construct Permit for remediation of a large petroleum-contaminated site on the California Central Coast. Negotiated conditions with agencies and secured permits.
- Prepared Authority to Construct Permit for remediation of a former oil field on the California Central Coast. Participated in negotiations with agencies and secured permits.
- Prepared and/or reviewed hundreds of environmental permits, including NPDES, UIC, Stormwater, Authority to Construct, Prevention of Significant Deterioration, Nonattainment New Source Review, Title V, and RCRA, among others.
- Participated in the development of the CARB document, *Guidance for Power Plant Siting and Best Available Control Technology*, including attending public workshops and filing technical comments.
- Performed data analyses in support of adoption of emergency power restoration standards by the California Public Utilities Commission for ''major'' power outages, where major is an outage that simultaneously affects 10% of the customer base.
- Drafted portions of the Good Neighbor Ordinance to grant Contra Costa County greater authority over safety of local industry, particularly chemical plants and refineries.
- Participated in drafting BAAQMD Regulation 8, Rule 28, Pressure Relief Devices, including participation in public workshops, review of staff reports, draft rules and other

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technical materials, preparation of technical comments on staff proposals, research on availability and costs of methods to control PRV releases, and negotiations with staff.

- Participated in amending BAAQMD Regulation 8, Rule 18, Valves and Connectors, including participation in public workshops, review of staff reports, proposed rules and other supporting technical material, preparation of technical comments on staff proposals, research on availability and cost of low-leak technology, and negotiations with staff.
- Participated in amending BAAQMD Regulation 8, Rule 25, Pumps and Compressors, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of low-leak and seal-less technology, and negotiations with staff.
- Participated in amending BAAQMD Regulation 8, Rule 5, Storage of Organic Liquids, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of controlling tank emissions, and presentation of testimony before the Board.
- Participated in amending BAAQMD Regulation 8, Rule 18, Valves and Connectors at Petroleum Refinery Complexes, including participation in public workshops, review of staff reports, proposed rules and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of low-leak technology, and presentation of testimony before the Board.
- Participated in amending BAAQMD Regulation 8, Rule 22, Valves and Flanges at Chemical Plants, etc, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability and costs of low-leak technology, and presentation of testimony before the Board.
- Participated in amending BAAQMD Regulation 8, Rule 25, Pump and Compressor Seals, including participation in public workshops, review of staff reports, proposed rules, and other supporting technical material, preparation of technical comments on staff proposals, research on availability of low-leak technology, and presentation of testimony before the Board.
- Participated in the development of the BAAQMD Regulation 2, Rule 5, Toxics, including participation in public workshops, review of staff proposals, and preparation of technical comments.
- Participated in the development of SCAQMD Rule 1402, Control of Toxic Air Contaminants from Existing Sources, and proposed amendments to Rule 1401, New Source

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Review of Toxic Air Contaminants, in 1993, including review of staff proposals and preparation of technical comments on same.

- Participated in the development of the Sunnyvale Ordinance to Regulate the Storage, Use and Handling of Toxic Gas, which was designed to provide engineering controls for gases that are not otherwise regulated by the Uniform Fire Code.
- Participated in the drafting of the Statewide Water Quality Control Plans for Inland Surface Waters and Enclosed Bays and Estuaries, including participation in workshops, review of draft plans, preparation of technical comments on draft plans, and presentation of testimony before the SWRCB.
- Participated in developing Se permit effluent limitations for the five Bay Area refineries, including review of staff proposals, statistical analyses of Se effluent data, review of literature on aquatic toxicity of Se, preparation of technical comments on several staff proposals, and presentation of testimony before the Bay Area RWQCB.
- Represented the California Department of Water Resources in the 1991 Bay-Delta Hearings before the State Water Resources Control Board, presenting sworn expert testimony with cross examination and rebuttal on a striped bass model developed by the California Department of Fish and Game.
- Represented the State Water Contractors in the 1987 Bay-Delta Hearings before the State Water Resources Control Board, presenting sworn expert testimony with cross examination and rebuttal on natural flows, historical salinity trends in San Francisco Bay, Delta outflow, and hydrodynamics of the South Bay.
- Represented interveners in the licensing of over 20 natural-gas-fired power plants and one coal gasification plant at the California Energy Commission and elsewhere. Reviewed and prepared technical comments on applications for certification, preliminary staff assessments, final staff assessments, preliminary determinations of compliance, final determinations of compliance, and prevention of significant deterioration permits in the areas of air quality, water supply, water quality, biology, public health, worker safety, transportation, site contamination, cooling systems, and hazardous materials. Presented written and oral testimony in evidentiary hearings with cross examination and rebuttal. Participated in technical workshops.
- Represented several parties in the proposed merger of San Diego Gas & Electric and Southern California Edison. Prepared independent technical analyses on health risks, air quality, and water quality. Presented written and oral testimony before the Public Utilities Commission administrative law judge with cross examination and rebuttal.
- Represented a PRP in negotiations with local health and other agencies to establish impact of subsurface contamination on overlying residential properties. Reviewed health studies

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prepared by agency consultants and worked with agencies and their consultants to evaluate health risks.

WATER QUALITY/RESOURCES

- Directed and participated in research on environmental impacts of energy development in the Colorado River Basin, including contamination of surface and subsurface waters and modeling of flow and chemical transport through fractured aquifers.
- Played a major role in Northern California water resource planning studies since the early 1970s. Prepared portions of the Basin Plans for the Sacramento, San Joaquin, and Delta basins including sections on water supply, water quality, beneficial uses, waste load allocation, and agricultural drainage. Developed water quality models for the Sacramento and San Joaquin Rivers.
- Conducted hundreds of studies over the past 40 years on Delta water supplies and the impacts of exports from the Delta on water quality and biological resources of the Central Valley, Sacramento-San Joaquin Delta, and San Francisco Bay. Typical examples include:
    1. Evaluate historical trends in salinity, temperature, and flow in San Francisco Bay and upstream rivers to determine impacts of water exports on the estuary;
    2. Evaluate the role of exports and natural factors on the food web by exploring the relationship between salinity and primary productivity in San Francisco Bay, upstream rivers, and ocean;
    3. Evaluate the effects of exports, other in-Delta, and upstream factors on the abundance of salmon and striped bass;
    4. Review and critique agency fishery models that link water exports with the abundance of striped bass and salmon;
    5. Develop a model based on GLMs to estimate the relative impact of exports, water facility operating variables, tidal phase, salinity, temperature, and other variables on the survival of salmon smolts as they migrate through the Delta;
    6. Reconstruct the natural hydrology of the Central Valley using water balances, vegetation mapping, reservoir operation models to simulate flood basins, precipitation records, tree ring research, and historical research;
    7. Evaluate the relationship between biological indicators of estuary health and down-estuary position of a salinity surrogate (X2);
    8. Use real-time fisheries monitoring data to quantify impact of exports on fish migration;

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9. Refine/develop statistical theory of autocorrelation and use to assess strength of relationships between biological and flow variables;
10. Collect, compile, and analyze water quality and toxicity data for surface waters in the Central Valley to assess the role of water quality in fishery declines;
11. Assess mitigation measures, including habitat restoration and changes in water project operation, to minimize fishery impacts;
12. Evaluate the impact of unscreened agricultural water diversions on abundance of larval fish;
13. Prepare and present testimony on the impacts of water resources development on Bay hydrodynamics, salinity, and temperature in water rights hearings;
14. Evaluate the impact of boat wakes on shallow water habitat, including interpretation of historical aerial photographs;
15. Evaluate the hydrodynamic and water quality impacts of converting Delta islands into reservoirs;
16. Use a hydrodynamic model to simulate the distribution of larval fish in a tidally influenced estuary;
17. Identify and evaluate non-export factors that may have contributed to fishery declines, including predation, shifts in oceanic conditions, aquatic toxicity from pesticides and mining wastes, salinity intrusion from channel dredging, loss of riparian and marsh habitat, sedimentation from upstream land alternations, and changes in dissolved oxygen, flow, and temperature below dams.

- Developed, directed, and participated in a broad-based research program on environmental issues and control technology for energy industries including petroleum, oil shale, coal mining, and coal slurry transport. Research included evaluation of air and water pollution, development of novel, low-cost technology to treat and dispose of wastes, and development and application of geohydrologic models to evaluate subsurface contamination from in-situ retorting. The program consisted of government and industry contracts and employed 45 technical and administrative personnel.
- Coordinated an industry task force established to investigate the occurrence, causes, and solutions for corrosion/erosion and mechanical/engineering failures in the waterside systems (e.g., condensers, steam generation equipment) of power plants. Corrosion/erosion failures caused by water and steam contamination that were investigated included waterside corrosion caused by poor microbiological treatment of cooling water, steam-side corrosion caused by ammonia-oxygen attack of copper alloys, stress-corrosion

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cracking of copper alloys in the air cooling sections of condensers, tube sheet leaks, oxygen in-leakage through condensers, volatilization of silica in boilers and carry over and deposition on turbine blades, and iron corrosion on boiler tube walls. Mechanical/engineering failures investigated included: steam impingement attack on the steam side of condenser tubes, tube-to-tube-sheet joint leakage, flow-induced vibration, structural design problems, and mechanical failures due to stresses induced by shutdown, startup and cycling duty, among others. Worked with electric utility plant owners/operators, condenser and boiler vendors, and architect/engineers to collect data to document the occurrence of and causes for these problems, prepared reports summarizing the investigations, and presented the results and participated on a committee of industry experts tasked with identifying solutions to prevent condenser failures.

- Evaluated the cost effectiveness and technical feasibility of using dry cooling and parallel dry-wet cooling to reduce water demands of several large natural-gas fired power plants in California and Arizona.
- Designed and prepared cost estimates for several dry cooling systems (e.g., fin fan heat exchangers) used in chemical plants and refineries.
- Designed, evaluated, and costed several zero liquid discharge systems for power plants.
- Evaluated the impact of agricultural and mining practices on surface water quality of Central Valley steams. Represented municipal water agencies on several federal and state advisory committees tasked with gathering and assessing relevant technical information, developing work plans, and providing oversight of technical work to investigate toxicity issues in the watershed.

AIR QUALITY/PUBLIC HEALTH

- Prepared or reviewed the air quality and public health sections of hundreds of EIRs and EISs on a wide range of industrial, commercial and residential projects.
- Prepared or reviewed hundreds of NSR and PSD permits for a wide range of industrial facilities.
- Designed, implemented, and directed a 2-year-long community air quality monitoring program to assure that residents downwind of a petroleum-contaminated site were not impacted during remediation of petroleum-contaminated soils. The program included real-time monitoring of particulates, diesel exhaust, and BTEX and time integrated monitoring for over 100 chemicals.
- Designed, implemented, and directed a 5-year long source, industrial hygiene, and ambient monitoring program to characterize air emissions, employee exposure, and downwind environmental impacts of a first-generation shale oil plant. The program included stack monitoring of heaters, boilers, incinerators, sulfur recovery units, rock crushers, API

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separator vents, and wastewater pond fugitives for arsenic, cadmium, chlorine, chromium, mercury, 15 organic indicators (e.g., quinoline, pyrrole, benzo(a)pyrene, thiophene, benzene), sulfur gases, hydrogen cyanide, and ammonia. In many cases, new methods had to be developed or existing methods modified to accommodate the complex matrices of shale plant gases.

- Conducted investigations on the impact of diesel exhaust from truck traffic from a wide range of facilities including mines, large retail centers, light industrial uses, and sports facilities. Conducted traffic surveys, continuously monitored diesel exhaust using an aethalometer, and prepared health risk assessments using resulting data.
- Conducted indoor air quality investigations to assess exposure to natural gas leaks, pesticides, molds and fungi, soil gas from subsurface contamination, and outgasing of carpets, drapes, furniture and construction materials. Prepared health risk assessments using collected data.
- Prepared health risk assessments, emission inventories, air quality analyses, and assisted in the permitting of over 70 1 to 2 MW emergency diesel generators.
- Prepare over 100 health risk assessments, endangerment assessments, and other health-based studies for a wide range of industrial facilities.
- Developed methods to monitor trace elements in gas streams, including a continuous real-time monitor based on the Zeeman atomic absorption spectrometer, to continuously measure mercury and other elements.
- Performed nuisance investigations (odor, noise, dust, smoke, indoor air quality, soil contamination) for businesses, industrial facilities, and residences located proximate to and downwind of pollution sources.

PUBLICATIONS AND PRESENTATIONS (Partial List - Representative Publications)

J.P. Fox, P.H. Hutton, D.J. Howes, A.J. Draper, and L. Sears, Reconstructing the Natural Hydrology of the San Francisco Bay-Delta Watershed, Hydrology and Earth System Sciences, Special Issue: Predictions under Change: Water, Earth, and Biota in the Anthropocene, v. 19, pp. 4257-4274, 2015. http://www.hydrol-earth-syst-sci.net/19/4257/2015/hess-19-4257-2015.pdf. See also: Estimates of Natural and Unimpaired Flows for the Central Valley of California: Water Years 1922-2014 at: https://msb.water.ca.gov/documents/86728/a702a57f-ae7a-41a3-8bff-722e144059d6.

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Phyllis Fox and Elaine Archibald, *Aquatic Toxicity and Pesticides in Surface Waters of the Central Valley*, California Urban Water Agencies (CUWA) Report, September 1997.

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(Partial)

S-Plus Data Analysis, MathSoft, 6/94.
Air Pollutant Emission Calculations, UC Berkeley Extension, 6-7/94
Assessment, Control and Remediation of LNAPL Contaminated Sites, API and USEPA, 9/94
Pesticides in the TIE Process, SETAC, 6/96
Sulfate Minerals: Geochemistry, Crystallography, and Environmental Significance, Mineralogical Society of America/Geochemical Society, 11/00.
Design of Gas Turbine Combined Cycle and Cogeneration Systems, Thermoflow, 12/00
Air-Cooled Steam Condensers and Dry- and Hybrid-Cooling Towers, Power-Gen, 12/01
Combustion Turbine Power Augmentation with Inlet Cooling and Wet Compression, Power-Gen, 12/01
CEQA Update, UC Berkeley Extension, 3/02
The Health Effects of Chemicals, Drugs, and Pollutants, UC Berkeley Extension, 4-5/02
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Noise Exposure Measurement Instruments and Techniques, AIHA PDC 302, 6/02
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Optimizing Generation and Air Emissions, Power-Gen, 12/02
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McIlvaine Hot Topic Hour, WE Energies Hg Control Update, 1/12/07
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Coal-to-Liquids – A Timely Revival, 9th Electric Power, 4/30/07
Advances in Multi-Pollutant and CO_2 Control Technologies, 9th Electric Power, 4/30/07
McIlvaine Hot Topic Hour, Measurement & Control of PM2.5, 5/17/07
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EXHIBIT B

EXHIBIT B

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Shawn Smallwood, PhD
3108 Finch Street
Davis, CA 95616

Attn: David Black, Planner IV
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243 1 July 2020

RE: Heber 2 Geothermal Repower Project

Dear Mr. Black,

I write to comment on the Initial Study and Mitigated Negative Declaration (IS/MND) prepared for the proposed Heber 2 Geothermal Repower Project (County of Imperial 2020), which I understand would modify the existing facilities and repower the project for another 30 years of operations.

My qualifications for preparing expert comments are the following. I hold a Ph.D. degree in Ecology from University of California at Davis, where I subsequently worked for four years as a post-graduate researcher in the Department of Agronomy and Range Sciences. My research has been on animal density and distribution, habitat selection, habitat restoration, interactions between wildlife and human infrastructure and activities, conservation of rare and endangered species, and on the ecology of invading species. I performed research on wildlife mortality caused by wind turbines, electric distribution lines, agricultural practices, and road traffic. I authored numerous papers on special-status species issues. I served as Chair of the Conservation Affairs Committee for The Wildlife Society – Western Section. I am a member of The Wildlife Society and the Raptor Research Foundation, and I've been a part-time lecturer at California State University, Sacramento. I was Associate Editor of wildlife biology's premier scientific journal, The Journal of Wildlife Management, as well as of Biological Conservation, and I was on the Editorial Board of Environmental Management. I have performed wildlife surveys in California for thirty-three years, including at many proposed project sites. My CV is attached.

IMPACTS TO BIOLOGICAL RESOURCES

Insufficient survey effort has been committed to the potential impacts to wildlife from the proposed project. A single visit was made by a wildlife biologist, who on June 1, 2019, visited at an unreported time of day and for an unreported time period. No use was made of richly informative data sets on wildlife occurrences, such as eBird. Had appropriate use of the available information been made, and had consideration been given to the aerial portion of wildlife habitat, the list of special-status species likely affected by the project would look more like that in Table 1. Available evidence supports the conclusion that up to 45 special-status species of wildlife likely occur at the project site at one time or another, most of them flying across the site for various reasons. Six of the species in Table 1 are threatened or endangered, or a candidate for listing.

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Table 1. *Occurrence likelihoods of wildlife species at the project site according to County of Imperial (2020) ("Imperial") and myself. eBird records are those occurring on or near the project site, and represent my conclusion that the species probably occurs at the site at various times. The right column identifies those species with documented collision fatalities along fences or powerlines or powerblocks of industrial solar projects that were monitored for fatalities.*

Common name, *Species name*	Status[1]	Occurrence likelihood		Known collisions
		Imperial	Smallwood	
Marbled godwit, *Limosa fedua*	BCC		eBird nearby	
Mountain plover, *Charadrius montanus*	BCC, SSC2		eBird nearby	
Long-billed curlew, *Numenius americanus*	BCC, TWL	Possible	eBird nearby	
Whimbrel, *Numenius phaeopus*	BCC	Possible	eBird nearby	
Swainson's hawk, *Buteo swainsoni*	CT, BCC, FGC 3503.5		eBird nearby	
Ferruginous hawk, Buteo regalis	TWL, FGC 3503.5		eBird nearby	
Red-tailed hawk, *Buteo jamaicensis*	FGC 3503.5		eBird nearby	Yes
Red-shouldered hawk, *Buteo lineatus*	FGC 3503.5		eBird nearby	
Osprey, *Pandion haliaetus*	FGC 3503.5		eBird nearby	
Sharp-shinned hawk, *Accipiter striatus*	FGC 3503.5		eBird nearby	
Cooper's hawk, *Accipiter cooperi*	FGC 3503.5, TWL		eBird nearby	Yes
Northern harrier, *Circus cyaneus*	SSC3, FGC 3503.5		eBird nearby	Yes
White-tailed kite, *Elanus leucurus*	CFP, FGC 3503.5		eBird nearby	
American kestrel, *Falco sparverius*	FGC 3503.5		eBird nearby	Yes
Merlin, *Falco columbarius*	FGC 3503.5, TWL		eBird nearby	
Prairie falcon, *Falco mexicanus*	BCC, FGC 3503.5, TWL		eBird nearby	
Peregrine falcon, *Falco peregrinus*	CE, CFP, BCC		eBird nearby	
Barn owl, *Tyto alba*	FGC 3503.5		eBird nearby	Yes
Burrowing owl, *Athene cunicularia*	BCC, SSC2, FGC 3503.5	Possible	eBird nearby	Yes
Yellow-billed cuckoo, *Coccyzus americanus*	FT, CE, BCC		eBird nearby	Yes
Gila woodpecker, *Melanerpes uropygialis*	CE, BCC	Possible	eBird nearby	
California gull, *Larus californicus*	TWL		eBird nearby	
Costa's hummingbird, *Calypte costae*	BCC	Possible	eBird nearby	
California horned lark, *Eremophila alpestris actia*	TWL		eBird nearby	Yes
Vermilion flycatcher, *Pyrocephalus rubinus*	SSC2		eBird nearby	
Loggerhead shrike, *Lanius ludovicianus*	FSC, SSC2		eBird nearby	Yes
Bank swallow, *Riparia riparia*	CT		eBird nearby	Yes

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Common name, *Species name*	**Status[1]**	**Occurrence likelihood**		**Known collisions**
		Imperial	**Smallwood**	
Cactus wren, *Campylorhychus brunneicapillus*	BCC		In region	
Yellow warbler, *Setophaga petechia*	BCC, SSC2		eBird nearby	Yes
Yellow-breasted chat, *Icteria virens*	SSC3		eBird nearby	Yes
Summer tanager, *Piranga rubra*	SSC1		eBird nearby	
Large-billed savannah sparrow, *Passerculus s. rostratus*	SSC2		eBird nearby	Yes
Yellow-headed blackbird, *X. xanthocephalus*	SSC3		eBird nearby	Yes
Pallid bat, *Antrozous pallidus*	SSC		iNaturalist nearby	Yes (fence)
Townsend's western big-eared bat, *Plecotus t. townsendii*	SSC		In range	
Western red bat, *Lasiurus blossevillii*	SSC		In range	
Western yellow bat, *Lasiurus xanthinus*	SSC		In range	
Small-footed myotis, *Myotis cililabrum*	WBWG		In range	
Long-eared myotis, *Myotis evotis*	WBWG		In range	
Fringed myotis, *Myotis thysanodes*	WBWG		In range	
Long-legged myotis, *Myotis volans*	WBWG		In range	
Yuma myotis, *Myotis yumanensis*	WBWG		In range	
Pocketed free-tailed bat, *Nyctinomops femorosaccus*	SSC		In range	
Big free-tailed bat, *Nyctinomops macrotis*	SSC		In range	
Flat-tailed horned lizard, *Phrynosoma mcallii*	SSC		iNaturalist nearby	

[1] Listed as FE or FT = federal endangered or threatened, BCC = U.S. Fish and Wildlife Service Bird of Conservation Concern, CE or CT = California endangered or threatened, CFP = California Fully Protected (CDFG Code 3511), SSC = California species of special concern (not threatened with extinction, but rare, very restricted in range, declining throughout range, peripheral portion of species' range, associated with habitat that is declining in extent) with priorities 1, 2 and 3, respectively (Shuford and Gardali 2008), FGC 3503.5 = California Fish and Game Code 3503.5 (Birds of prey), TWL = Taxa to Watch List (Shuford and Gardali 2008), WBWG = Western Bat Working Group listing with level of priority.

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County of Imperial (2020) gave no consideration to collision fatalities of volant wildlife attempting to fly across the existing or proposed future project. Furthermore, no collision, electrocution or entrapment fatality monitoring appears to have been performed at the project site. If there exists any form of volunteer reporting of wildlife fatalities found at the site, some summary of what has been found needs to be shared in the environmental review. If no such monitoring and reporting exists, the County of Imperial should rectify the situation by requiring both.

County of Imperial (2020:20) concludes that because "*the Project Site is completely devoid of any vegetation or water resources, the proposed disturbance area is not suitable habitat for any of the sensitive species…*" However, many volant species, including those with special status, inhabit the lower atmosphere just as they necessarily inhabit terrestrial or aquatic environments. Volant wildlife often fly over bare ground to migrate, disperse, forage, patrol home ranges, or to move from one habitat patch to another. This use of the lower atmosphere is the subject of study referred to as Aeroecology (Kunz et al. 2007). Aeroecology is a field of study I have been involved with for 21 years, because I study collisions of volant wildlife with anthropogenic structures inserted into the airspaces used by wildlife.

Anthropogenic structures known to cause fatal collisions of volant wildlife already occur on the project site, and with project approval these structures would continue to pose hazards to wildlife for another 30 years. These structures include at least 1,615 m of security fence and 1,000 m of electric distribution lines. The proposed project would replace some existing structures with 2 ORMAT energy converters and 3 above-ground, 10,000-gallon, isopentane storage tanks. Due to wildlife fatality monitoring at multiple industrial solar projects, where anthropogenic structures are just as static as those in the existing and proposed projects, empirical evidence is available to estimate ongoing and likely future wildlife collision mortality at the project.

Based on an average collision and entrapment (Photo 1) fatality rate of 17.4 birds/km of security fence surrounding 5 industrial solar projects (Campo Verde near the proposed project site, Desert Sunlight, McCoy, Blythe, and Genesis), the project's fencing likely kills 28.1 birds per year (17.4 bird fatalities/km × 1.615 km of fence at the project site). After 30 more years of this level of mortality, the project's fence will have killed another 843 birds.

Based on an average collision fatality rate of 91.4 birds/km of generation tie-ins of 8 industrial solar projects (Campo Verde and Centinela near the proposed project site, California Valley, Desert Sunlight, McCoy, Blythe, Stateline, and Genesis), the project's powerlines likely kill 91.4 birds per year (91.4 bird fatalities/km × 1 km of powerlines at the project site). After 30 more years of this level of mortality, the project's powerlines will have killed another 2,742 birds.

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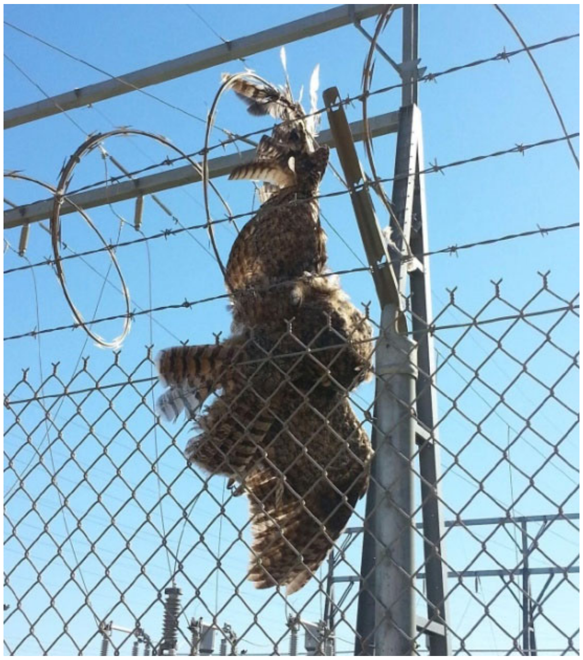

Photo 1. *A great-horned owl died after becoming entangled on the razor wire placed on top of this cyclone fence surrounding a substation in Alameda County. Photo by Joanne Mount.*

The basis is more limited for predicting the level of collision mortality that would result from 30 years of operations of 2 ORMAT energy converters and 3 above-ground, 10,000-gallon, isopentane storage tanks. Collision fatality monitoring was performed at 2 powerblocks at the Genesis Solar Energy Project, where 94 bats and 968 birds were killed annually. Assuming the combined volume of the proposed 2 ORMAT energy converters and 3 above-ground, 10,000-gallon, isopentane storage tanks would compose about 65% of the volume of one of the powerblocks at Genesis, I can project the Genesis powerblock fatality rates to the proposed project to predict annual fatalities of about 31 bats and 315 birds.

Together, the existing structures and proposed new structures would result in annual collision fatalities of 435 birds and 31 bats. After 30 years of operations, this level of mortality would have accumulated 13,050 birds and 930 bats. These fatality totals might seem incredible by those inexperienced with wildlife fatality monitoring, so I will explain why these estimates are credible even though few fatalities are actually ever seen. Many collision fatalities happen at night. Those that happen during daylight often escape witness by human eyes because facility personnel do not spend much time staring at fences, powerlines or other structures. Once the fatalities occur, vertebrate scavengers remove carcasses shortly after the victims fall to the ground (Smallwood et al. 2018). Vertebrate scavengers entrain on facilities that produce dead birds and bats. Carcasses are typically removed within a few days, and removal rates increase as ground cover diminishes. There is no ground cover at the project site, so vertebrate scavengers quickly detect newly killed birds and bats, and they quickly remove them.

That vertebrate scavengers occur on the site is indisputable, as they are visible in Google Earth imagery (Photo 2). Google Earth imagery shows 4 common ravens taking off from structures on the project site. In my experience, common ravens remove carcasses of collision victims faster than any other vertebrate scavengers, sometimes removing

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carcasses within a minute of deposition (Smallwood et al. 2010). That common ravens are readily detectable in Google Earth imagery suggests to me that the site is providing vertebrate scavengers with regular, reliable food resources, which means the project is likely already killing birds and bats. A fair argument can be made for the need to prepare an EIR to assess the project's impacts to wildlife in terms of direct mortality and interference with the ability of wildlife to move within the region.

Photo 2. *Four common ravens leaving the project site. Photo by Google Earth StreetView.*

The fatalities I predicted above need to be assessed for their contribution to cumulative impacts caused by existing and future projects that cause collision fatalities. For example, the California Energy Commission estimates 1,488.5 MW of industrial solar have been installed in Imperial County (https://ww2.energy.ca.gov/almanac/renewables_data/solar/index_cms.php). Applying the MW-weighted average of the number of bird collision fatalities/MW from nearby solar projects (Campo Verde, Centinela, Imperial, Calipatria, and Midway [Smallwood, unpublished data]) to the CEC's estimated 1,488.5 MW of installed capacity, I estimate a cumulative annual mortality of 29,268 (95% CI: 24,803-47,476) birds. This is a substantial number of birds – a number that easily qualifies as a significant cumulative impact which the proposed project would worsen. A fair argument can be made for the need to prepare an EIR to assess the project's contribution to cumulative impacts to wildlife.

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MITIGATION

According to County of Imperial (2020:20), "*…SIGG will perform a pre-construction survey to verify the absence of any sensitive species (i.e. burrowing owl).*" However, preconstruction surveys cannot verify the absence of any species, as verification of absence is not what preconstruction surveys are designed to achieve. Preconstruction surveys are surveys intended to detect and salvage readily detectable individuals before they are destroyed by heavy machinery. The only type of survey that can verify absence is a 'detection survey.' Detection surveys are intended for providing the best means of detecting a particular species and for supporting determinations of absence when the species has not been detected despite implementation of detection surveys. Detection surveys are also intended to inform preconstruction surveys and to inform mitigation planning. The protocols for detection surveys have been developed by experts on the species, usually in coordination with natural resource agencies. The protocol for detection surveys applied to burrowing owl can be found in CDFW (2012). Detection surveys need to be performed according to available guidelines, and prior to preconstruction surveys.

Both a preconstruction survey for wildlife and an on-site speed-limit should be implemented as mitigation to minimize project impacts. However, much more is needed, including appropriate detection surveys, as discussed above, as well as compensatory mitigation for those impacts that could not be avoided. Compensatory mitigation should be provided in the form of off-site habitat protections and donations to wildlife rehabilitation facilities. With the ongoing collision-injuries of the current project and the collision-injuries at 1,488.5 MW of installed industrial solar facilities in Imperial County, local wildlife rehabilitation facilities probably need considerable support to treat and release the animals they receive. A fair argument can be made for the need to prepare an EIR to appropriately formulate mitigation measures to further minimize and to compensate for project impacts to wildlife.

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Curriculum Vitae

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Born May 3, 1963 in
Sacramento, California.
Married, father of two.

Ecologist

Expertise

- Finding solutions to controversial problems related to wildlife interactions with human industry, infrastructure, and activities;
- Wildlife monitoring and field study using GPS, thermal imaging, behavior surveys;
- Using systems analysis and experimental design principles to identify meaningful ecological patterns that inform management decisions.

Education

Ph.D. Ecology, University of California, Davis. September 1990.
M.S. Ecology, University of California, Davis. June 1987.
B.S. Anthropology, University of California, Davis. June 1985.
Corcoran High School, Corcoran, California. June 1981.

Experience

- 480 professional publications, including:
- 83 peer reviewed publications
- 24 in non-reviewed proceedings
- 371 reports, declarations, posters and book reviews
- 8 in mass media outlets
- 87 public presentations of research results

Editing for scientific journals: Guest Editor, *Wildlife Society Bulletin*, 2012-2013, of invited papers representing international views on the impacts of wind energy on wildlife and how to mitigate the impacts. Associate Editor, *Journal of Wildlife Management*, March 2004 to 30 June 2007. Editorial Board Member, *Environmental Management*, 10/1999 to 8/2004. Associate Editor, *Biological Conservation*, 9/1994 to 9/1995.

Member, Alameda County Scientific Review Committee (SRC), August 2006 to April 2011. The five-member committee investigated causes of bird and bat collisions in the Altamont Pass Wind Resource Area, and recommended mitigation and monitoring measures. The SRC

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reviewed the science underlying the Alameda County Avian Protection Program, and advised the County on how to reduce wildlife fatalities.

Consulting Ecologist, 2004-2007, California Energy Commission (CEC). Provided consulting services as needed to the CEC on renewable energy impacts, monitoring and research, and produced several reports. Also collaborated with Lawrence-Livermore National Lab on research to understand and reduce wind turbine impacts on wildlife.

Consulting Ecologist, 1999-2013, U.S. Navy. Performed endangered species surveys, hazardous waste site monitoring, and habitat restoration for the endangered San Joaquin kangaroo rat, California tiger salamander, California red-legged frog, California clapper rail, western burrowing owl, salt marsh harvest mouse, and other species at Naval Air Station Lemoore; Naval Weapons Station, Seal Beach, Detachment Concord; Naval Security Group Activity, Skaggs Island; National Radio Transmitter Facility, Dixon; and, Naval Outlying Landing Field Imperial Beach.

Part-time Lecturer, 1998-2005, California State University, Sacramento. Instructed Mammalogy, Behavioral Ecology, and Ornithology Lab, Contemporary Environmental Issues, Natural Resources Conservation.

Senior Ecologist, 1999-2005, BioResource Consultants. Designed and implemented research and monitoring studies related to avian fatalities at wind turbines, avian electrocutions on electric distribution poles across California, and avian fatalities at transmission lines.

Chairman, Conservation Affairs Committee, The Wildlife Society--Western Section, 1999-2001. Prepared position statements and led efforts directed toward conservation issues, including travel to Washington, D.C. to lobby Congress for more wildlife conservation funding.

Systems Ecologist, 1995-2000, Institute for Sustainable Development. Headed ISD's program on integrated resources management. Developed indicators of ecological integrity for large areas, using remotely sensed data, local community involvement and GIS.

Associate, 1997-1998, Department of Agronomy and Range Science, University of California, Davis. Worked with Shu Geng and Mingua Zhang on several studies related to wildlife interactions with agriculture and patterns of fertilizer and pesticide residues in groundwater across a large landscape.

Lead Scientist, 1996-1999, National Endangered Species Network. Informed academic scientists and environmental activists about emerging issues regarding the Endangered Species Act and other environmental laws. Testified at public hearings on endangered species issues.

Ecologist, 1997-1998, Western Foundation of Vertebrate Zoology. Conducted field research to determine the impact of past mercury mining on the status of California red-legged frogs in Santa Clara County, California.

Senior Systems Ecologist, 1994-1995, EIP Associates, Sacramento, California. Provided consulting services in environmental planning, and quantitative assessment of land units for their

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conservation and restoration opportunities basedon ecological resource requirements of 29 special-status species. Developed ecological indicators for prioritizing areas within Yolo County to receive mitigation funds for habitat easements and restoration.

Post-Graduate Researcher, 1990-1994, Department of Agronomy and Range Science, *U.C. Davis*. Under Dr. Shu Geng's mentorship, studied landscape and management effects on temporal and spatial patterns of abundance among pocket gophers and species of Falconiformes and Carnivora in the Sacramento Valley. Managed and analyzed a data base of energy use in California agriculture. Assisted with landscape (GIS) study of groundwater contamination across Tulare County, California.

Work experience in graduate school: Co-taught Conservation Biology with Dr. Christine Schonewald, 1991 & 1993, UC Davis Graduate Group in Ecology; Reader for Dr. Richard Coss's course on Psychobiology in 1990, UC Davis Department of Psychology; Research Assistant to Dr. Walter E. Howard, 1988-1990, UC Davis Department of Wildlife and Fisheries Biology, testing durable baits for pocket gopher management in forest clearcuts; Research Assistant to Dr. Terrell P. Salmon, 1987-1988, UC Wildlife Extension, Department of Wildlife and Fisheries Biology, developing empirical models of mammal and bird invasions in North America, and a rating system for priority research and control of exotic species based on economic, environmental and human health hazards in California. Student Assistant to Dr. E. Lee Fitzhugh, 1985-1987, UC Cooperative Extension, Department of Wildlife and Fisheries Biology, developing and implementing statewide mountain lion track count for long-term monitoring.

Fulbright Research Fellow, Indonesia, 1988. Tested use of new sampling methods for numerical monitoring of Sumatran tiger and six other species of endemic felids, and evaluated methods used by other researchers.

Projects

<u>Repowering wind energy projects</u> through careful siting of new wind turbines using map-based collision hazard models to minimize impacts to volant wildlife. Funded by wind companies (principally NextEra Renewable Energy, Inc.), California Energy Commission and East Bay Regional Park District, I have collaborated with a GIS analyst and managed a crew of five field biologists performing golden eagle behavior surveys and nocturnal surveys on bats and owls. The goal is to quantify flight patterns for development of predictive models to more carefully site new wind turbines in repowering projects. Focused behavior surveys began May 2012 and continue. Collision hazard models have been prepared for seven wind projects, three of which were built. Planning for additional repowering projects is underway.

<u>Test avian safety of new mixer-ejector wind turbine (MEWT)</u>. Designed and implemented a before-after, control-impact experimental design to test the avian safety of a new, shrouded wind turbine developed by Ogin Inc. (formerly known as FloDesign Wind Turbine Corporation). Supported by a $718,000 grant from the California Energy Commission's Public Interest Energy Research program and a 20% match share contribution from Ogin, I managed a crew of seven field biologists who performed periodic fatality searches and behavior surveys, carcass detection trials, nocturnal behavior surveys using a thermal camera, and spatial analyses with the collaboration of a GIS

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analyst. Field work began 1 April 2012 and ended 30 March 2015 without Ogin installing its MEWTs, but we still achieved multiple important scientific advances.

Reduce avian mortality due to wind turbines at Altamont Pass. Studied wildlife impacts caused by 5,400 wind turbines at the world's most notorious wind resource area. Studied how impacts are perceived by monitoring and how they are affected by terrain, wind patterns, food resources, range management practices, wind turbine operations, seasonal patterns, population cycles, infrastructure management such as electric distribution, animal behavior and social interactions.

Reduce avian mortality on electric distribution poles. Directed research toward reducing bird electrocutions on electric distribution poles, 2000-2007. Oversaw 5 founds of fatality searches at 10,000 poles from Orange County to Glenn County, California, and produced two large reports.

Cook *et al*. v. Rockwell International *et al*., No. 90-K-181 (D. Colorado). Provided expert testimony on the role of burrowing animals in affecting the fate of buried and surface-deposited radioactive and hazardous chemical wastes at the Rocky Flats Plant, Colorado. Provided expert reports based on four site visits and an extensive document review of burrowing animals. Conducted transect surveys for evidence of burrowing animals and other wildlife on and around waste facilities. Discovered substantial intrusion of waste structures by burrowing animals. I testified in federal court in November 2005, and my clients were subsequently awarded a $553,000,000 judgment by a jury. After appeals the award was increased to two billion dollars.

Hanford Nuclear Reservation Litigation. Provided expert testimony on the role of burrowing animals in affecting the fate of buried radioactive wastes at the Hanford Nuclear Reservation, Washington. Provided three expert reports based on three site visits and extensive document review. Predicted and verified a certain population density of pocket gophers on buried waste structures, as well as incidence of radionuclide contamination in body tissue. Conducted transect surveys for evidence of burrowing animals and other wildlife on and around waste facilities. Discovered substantial intrusion of waste structures by burrowing animals.

Expert testimony and declarations on proposed residential and commercial developments, gas-fired power plants, wind, solar and geothermal projects, water transfers and water transfer delivery systems, endangered species recovery plans, Habitat Conservation Plans and Natural Communities Conservation Programs. Testified before multiple government agencies, Tribunals, Boards of Supervisors and City Councils, and participated with press conferences and depositions. Prepared expert witness reports and court declarations, which are summarized under Reports (below).

Protocol-level surveys for special-status species. Used California Department of Fish and Wildlife and US Fish and Wildlife Service protocols to search for California red-legged frog, California tiger salamander, arroyo southwestern toad, blunt-nosed leopard lizard, western pond turtle, giant kangaroo rat, San Joaquin kangaroo rat, San Joaquin kit fox, western burrowing owl, Swainson's hawk, Valley elderberry longhorn beetle and other special-status species.

Conservation of San Joaquin kangaroo rat. Performed research to identify factors responsible for the decline of this endangered species at Lemoore Naval Air Station, 2000-2013, and implemented habitat enhancements designed to reverse the trend and expand the population.

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Impact of West Nile Virus on yellow-billed magpies. Funded by Sacramento-Yolo Mosquito and Vector Control District, 2005-2008, compared survey results pre- and post-West Nile Virus epidemic for multiple bird species in the Sacramento Valley, particularly on yellow-billed magpie and American crow due to susceptibility to WNV.

Workshops on HCPs. Assisted Dr. Michael Morrison with organizing and conducting a 2-day workshop on Habitat Conservation Plans, sponsored by Southern California Edison, and another 1-day workshop sponsored by PG&E. These Workshops were attended by academics, attorneys, and consultants with HCP experience. We guest-edited a Proceedings published in Environmental Management.

Mapping of biological resources along Highways 101, 46 and 41. Used GPS and GIS to delineate vegetation complexes and locations of special-status species along 26 miles of highway in San Luis Obispo County, 14 miles of highway and roadway in Monterey County, and in a large area north of Fresno, including within reclaimed gravel mining pits.

GPS mapping and monitoring at restoration sites and at Caltrans mitigation sites. Monitored the success of elderberry shrubs at one location, the success of willows at another location, and the response of wildlife to the succession of vegetation at both sites. Also used GPS to monitor the response of fossorial animals to yellow star-thistle eradication and natural grassland restoration efforts at Bear Valley in Colusa County and at the decommissioned Mather Air Force Base in Sacramento County.

Mercury effects on Red-legged Frog. Assisted Dr. Michael Morrison and US Fish and Wildlife Service in assessing the possible impacts of historical mercury mining on the federally listed California red-legged frog in Santa Clara County. Also measured habitat variables in streams.

Opposition to proposed No Surprises rule. Wrote a white paper and summary letter explaining scientific grounds for opposing the incidental take permit (ITP) rules providing ITP applicants and holders with general assurances they will be free of compliance with the Endangered Species Act once they adhere to the terms of a "properly functioning HCP." Submitted 188 signatures of scientists and environmental professionals concerned about No Surprises rule US Fish and Wildlife Service, National Marine Fisheries Service, all US Senators.

Natomas Basin Habitat Conservation Plan alternative. Designed narrow channel marsh to increase the likelihood of survival and recovery in the wild of giant garter snake, Swainson's hawk and Valley Elderberry Longhorn Beetle. The design included replication and interspersion of treatments for experimental testing of critical habitat elements. I provided a report to Northern Territories, Inc.

Assessments of agricultural production system and environmental technology transfer to China. Twice visited China and interviewed scientists, industrialists, agriculturalists, and the Directors of the Chinese Environmental Protection Agency and the Department of Agriculture to assess the need and possible pathways for environmental clean-up technologies and trade opportunities between the US and China.

Yolo County Habitat Conservation Plan. Conducted landscape ecology study of Yolo County to spatially prioritize allocation of mitigation efforts to improve ecosystem functionality within the

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County from the perspective of 29 special-status species of wildlife and plants. Used a hierarchically structured indicators approach to apply principles of landscape and ecosystem ecology, conservation biology, and local values in rating land units. Derived GIS maps to help guide the conservation area design, and then developed implementation strategies.

Mountain lion track count. Developed and conducted a carnivore monitoring program throughout California since 1985. Species counted include mountain lion, bobcat, black bear, coyote, red and gray fox, raccoon, striped skunk, badger, and black-tailed deer. Vegetation and land use are also monitored. Track survey transect was established on dusty, dirt roads within randomly selected quadrats.

Sumatran tiger and other felids. Upon award of Fulbright Research Fellowship, I designed and initiated track counts for seven species of wild cats in Sumatra, including Sumatran tiger, fishing cat, and golden cat. Spent four months on Sumatra and Java in 1988, and learned Bahasa Indonesia, the official Indonesian language.

Wildlife in agriculture. Beginning as post-graduate research, I studied pocket gophers and other wildlife in 40 alfalfa fields throughout the Sacramento Valley, and I surveyed for wildlife along a 200 mile road transect since 1989 with a hiatus of 1996-2004. The data are analyzed using GIS and methods from landscape ecology, and the results published and presented orally to farming groups in California and elsewhere. I also conducted the first study of wildlife in cover crops used on vineyards and orchards.

Agricultural energy use and Tulare County groundwater study. Developed and analyzed a data base of energy use in California agriculture, and collaborated on a landscape (GIS) study of groundwater contamination across Tulare County, California.

Pocket gopher damage in forest clear-cuts. Developed gopher sampling methods and tested various poison baits and baiting regimes in the largest-ever field study of pocket gopher management in forest plantations, involving 68 research plots in 55 clear-cuts among 6 National Forests in northern California.

Risk assessment of exotic species in North America. Developed empirical models of mammal and bird species invasions in North America, as well as a rating system for assigning priority research and control to exotic species in California, based on economic, environmental, and human health hazards.

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Smallwood, K. S. 2000. Comments on the Preliminary Staff Assessment of the Contra Costa Power Plant Unit 8 Project. Submitted to California Energy Commission on November 30 on behalf of Californians for Renewable Energy (CaRE). 4 pp.

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Smallwood, K. S. 2000. Comments on the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP). Submitted to California Energy Commission on October 29 on behalf of Californians for Renewable Energy (CaRE). 9 pp.

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Smallwood, K. S. 2000. Preliminary report of reconnaissance surveys near the TRW plant south of Phoenix, Arizona, March 27-29. Report prepared for Hagens, Berman & Mitchell, Attorneys at Law, Phoenix, AZ. 6 pp.

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Smallwood, K.S. 1998. Draft report of a visit to a paint sludge dump site near Ridgewood, New Jersey, February 26th, 1998. Unpublished report to Consulting in the Public Interest.

Smallwood, K.S. 1997. Science missing in the "no surprises" policy. Commissioned by National Endangered Species Network and Spirit of the Sage Council, Pasadena, California.

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Smallwood, K.S. and S. Geng. 1995. Analysis of the 1987 California Farm Cost Survey and recommendations for future survey. Program on Workable Energy Regulation, University-wide Energy Research Group, University of California.

Smallwood, K.S., S. Geng, and W. Idzerda. 1992. Final report to PG&E: Analysis of the 1987 California Farm Cost Survey and recommendations for future survey. Pacific Gas & Electric Company, San Ramon, California. 24 pp.

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Fitzhugh, E.L., K.S. Smallwood, and R. Gross. 1985. Mountain lion track count, Marin County, 1985. Report on file at Wildlife Extension, University of California, Davis.

Comments on Environmental Documents

I was retained or commissioned to comment on environmental planning and review documents, including:

- The Villages of Lakeview EIR (2017; 28 pp);
- Notes on Proposed Study Options for Trail Impacts on Northern Spotted Owl (2017; 4 pp);
- San Gorgonio Crossings EIR (2017; 22 pp);
- Replies to responses on Jupiter Project IS and MND (2017; 12 pp);
- MacArthur Transit Village Project Modified 2016 CEQA Analysis (2017; 12 pp);
- Central SoMa Plan DEIR (2017; 14 pp);
- Colony Commerce Center Specific Plan DEIR (2016; 16 pp);
- Fairway Trails Improvements MND (2016; 13 pp);
- Review of Avian-Solar Science Plan (2016; 28 pp);
- Replies to responses on Initial Study for Pyramid Asphalt (2016; 5 pp);
- Initial Study for Pyramid Asphalt (2016; 4 pp);
- Agua Mansa Distribution Warehouse Project Initial Study (2016; 14 pp);
- Santa Anita Warehouse IS and MND (2016; 12 pp);
- CapRock Distribution Center III DEIR (2016: 12 pp);
- Orange Show Logistics Center Initial Study and MND (2016; 9 pp);
- City of Palmdale Oasis Medical Village Project IS and MND (2016; 7 pp);
- Comments on proposed rule for incidental eagle take (2016, 49 pp);
- Grapevine Specific and Community Plan FEIR (2016; 25 pp);
- Grapevine Specific and Community Plan DEIR (2016; 15 pp);
- Clinton County Zoning Ordinance for Wind Turbine siting (2016);
- Hallmark at Shenandoah Warehouse Project Initial Study (2016; 6 pp);
- Tri-City Industrial Complex Initial Study (2016; 5 pp);
- Hidden Canyon Industrial Park Plot Plan 16-PP-02 (2016; 12 pp);
- Kimball Business Park DEIR (2016; 10 pp);
- Jupiter Project IS and MND (2016; 9 pp);
- Revised Draft Giant Garter Snake Recovery Plan of 2015 (2016, 18 pp);
- Palo Verde Mesa Solar Project Draft Environmental Impact Report (2016; 27 pp);

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- Reply Witness Statement on Fairview Wind Project, Ontario, Canada (2016; 14 pp);
- Fairview Wind Project, Ontario, Canada (2016; 41 pp);
- Supplementary Reply Witness Statement Amherst Island Wind Farm, Ontario (2015, 38 pp);
- Witness Statement on Amherst Island Wind Farm, Ontario (2015, 31 pp);
- Second Reply Witness Statement on White Pines Wind Farm, Ontario (2015, 6 pp);
- Reply Witness Statement on White Pines Wind Farm, Ontario (2015, 10 pp);
- Witness Statement on White Pines Wind Farm, Ontario (2015, 9 pp);
- Proposed Section 24 Specific Plan Agua Caliente Band of Cahuilla Indians DEIS (2015, 9 pp);
- Replies to comments 24 Specific Plan Agua Caliente Band of Cahuilla Indians FEIS (2015, 6 pp);
- Willow Springs Solar Photovoltaic Project DEIR (2015; 28 pp);
- Sierra Lakes Commerce Center Project DEIR (2015, 9 pp);
- Columbia Business Center MND (2015; 8 pp);
- West Valley Logistics Center Specific Plan DEIR (2015, 10 pp);
- World Logistic Center Specific Plan FEIR (2015, 12 pp);
- Bay Delta Conservation Plan EIR/EIS (2014, 21 pp);
- Addison Wind Energy Project DEIR (2014, 32 pp);
- Response to Comments on the Addison Wind Energy Project DEIR (2014, 15 pp);
- Addison and Rising Tree Wind Energy Project FEIR (2014, 12 pp);
- Alta East Wind Energy Project FEIS (2013, 23 pp);
- Blythe Solar Power Project Staff Assessment, California Energy Commission (2013, 16 pp);
- Clearwater and Yakima Solar Projects DEIR (2013, 9 pp);
- Cuyama Solar Project DEIR (2014, 19 pp);
- Draft Desert Renewable Energy Conservation Plan (DRECP) EIR/EIS (2015, 49 pp);
- Kingbird Solar Photovoltaic Project EIR (2013, 19 pp);
- Lucerne Valley Solar Project Initial Study & Mitigated Negative Declaration (2013, 12 pp);
- Palen Solar Electric Generating System Final Staff Assessment of California Energy Commission, (2014, 20 pp);
- Rebuttal testimony on Palen Solar Energy Generating System (2014, 9 pp);
- Rising Tree Wind Energy Project DEIR (2014, 32 pp);
- Response to Comments on the Rising Tree Wind Energy Project DEIR (2014, 15 pp);
- Soitec Solar Development Project Draft PEIR (2014, 18 pp);
- Comment on the Biological Opinion (08ESMF-00-2012-F-0387) of Oakland Zoo expansion on Alameda whipsnake and California red-legged frog (2014; 3 pp);
- West Antelope Solar Energy Project Initial Study and Negative Declaration (2013, 18 pp);
- Willow Springs Solar Photovoltaic Project DEIR (2015, 28 pp);
- Alameda Creek Bridge Replacement Project DEIR (2015, 10 pp);
- Declaration on Tule Wind project FEIR/FEIS (2013; 24 pp);
- Sunlight Partners LANDPRO Solar Project Mitigated Negative Declaration (2013; 11 pp);
- Declaration in opposition to BLM fracking (2013; 5 pp);
- Rosamond Solar Project Addendum EIR (2013; 13 pp);
- Pioneer Green Solar Project EIR (2013; 13 pp);
- Reply to Staff Responses to Comments on Soccer Center Solar Project Mitigated Negative

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Declaration (2013; 6 pp);
- Soccer Center Solar Project Mitigated Negative Declaration (2013; 10 pp);
- Plainview Solar Works Mitigated Negative Declaration (2013; 10 pp);
- Reply to the County Staff's Responses on comments to Imperial Valley Solar Company 2 Project (2013; 10 pp);
- Imperial Valley Solar Company 2 Project (2013; 13 pp);
- FRV Orion Solar Project DEIR (PP12232) (2013; 9 pp);
- Casa Diablo IV Geothermal Development Project (3013; 6 pp);
- Reply to Staff Responses to Comments on Casa Diablo IV Geothermal Development Project (2013; 8 pp);
- FEIS prepared for Alta East Wind Project (2013; 23 pp);
- Metropolitan Air Park DEIR, City of San Diego (2013;);
- Davidon Homes Tentative Subdivision Map and Rezoning Project DEIR (2013; 9 pp);
- Analysis of Biological Assessment of Oakland Zoo Expansion Impacts on Alameda Whipsnake (2013; 10 pp);
- Declaration on Campo Verde Solar project FEIR (2013; 11pp);
- Neg Dec comments on Davis Sewer Trunk Rehabilitation (2013; 8 pp);
- Declaration on North Steens Transmission Line FEIS (2012; 62 pp);
- City of Lancaster Revised Initial Study for Conditional Use Permits 12-08 and 12-09, Summer Solar and Springtime Solar Projects (2012; 8 pp);
- J&J Ranch, 24 Adobe Lane Environmental Review (2012; 14 pp);
- Reply to the County Staff's Responses on comments to Hudson Ranch Power II Geothermal Project and the Simbol Calipatria Plant II (2012; 8 pp);
- Hudson Ranch Power II Geothermal Project and the Simbol Calipatria Plant II (2012; 9 pp);
- Desert Harvest Solar Project EIS (2012; 15 pp);
- Solar Gen 2 Array Project DEIR (2012; 16 pp);
- Ocotillo Sol Project EIS (2012; 4 pp);
- Beacon Photovoltaic Project DEIR (2012; 5 pp);
- Declaration on Initial Study and Proposed Negative Declaration for the Butte Water District 2012 Water Transfer Program (2012; 11 pp);
- Mount Signal and Calexico Solar Farm Projects DEIR (2011; 16 pp);
- City of Elk Grove Sphere of Influence EIR (2011; 28 pp);
- Comment on Sutter Landing Park Solar Photovoltaic Project MND (2011; 9 pp);
- Statement of Shawn Smallwood, Ph.D. Regarding Proposed Rabik/Gudath Project, 22611 Coleman Valley Road, Bodega Bay (CPN 10-0002) (2011; 4 pp);
- Declaration of K. Shawn Smallwood on Biological Impacts of the Ivanpah Solar Electric Generating System (ISEGS) (2011; 9 pp);
- Comments on Draft Eagle Conservation Plan Guidance (2011; 13 pp);
- Comments on Draft EIR/EA for Niles Canyon Safety Improvement Project (2011; 16 pp);
- Declaration of K. Shawn Smallwood, Ph.D., on Biological Impacts of the Route 84 Safety Improvement Project (2011; 7 pp);
- Rebuttal Testimony of Witness #22, K. Shawn Smallwood, Ph.D, on Behalf of Intervenors Friends of The Columbia Gorge & Save Our Scenic Area (2010; 6 pp);
- Prefiled Direct Testimony of Witness #22, K. Shawn Smallwood, Ph.D, on Behalf of

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Intervenors Friends of the Columbia Gorge & Save Our Scenic Area. Comments on Whistling Ridge Wind Energy Power Project DEIS, Skamania County, Washington (2010; 41 pp);

- Evaluation of Klickitat County's Decisions on the Windy Flats West Wind Energy Project (2010; 17 pp);
- St. John's Church Project Draft Environmental Impact Report (2010; 14 pp.);
- Initial Study/Mitigated Negative Declaration for Results Radio Zone File #2009-001 (2010; 20 pp);
- Rio del Oro Specific Plan Project Final Environmental Impact Report (2010;12 pp);
- Answers to Questions on 33% RPS Implementation Analysis Preliminary Results Report (2009: 9 pp);
- SEPA Determination of Non-significance regarding zoning adjustments for Skamania County, Washington. Second Declaration to Friends of the Columbia Gorge, Inc. and Save Our Scenic Area (Dec 2008; 17 pp);
- Comments on Draft 1A Summary Report to CAISO (2008; 10 pp);
- County of Placer's Categorical Exemption of Hilton Manor Project (2009; 9 pp);
- Protest of CARE to Amendment to the Power Purchase and Sale Agreement for Procurement of Eligible Renewable Energy Resources Between Hatchet Ridge Wind LLC and PG&E (2009; 3 pp);
- Tehachapi Renewable Transmission Project EIR/EIS (2009; 142 pp);
- Delta Shores Project EIR, south Sacramento (2009; 11 pp + addendum 2 pp);
- Declaration of Shawn Smallwood in Support of Care's Petition to Modify D.07-09-040 (2008; 3 pp);
- The Public Utility Commission's Implementation Analysis December 16 Workshop for the Governor's Executive Order S-14-08 to implement a 33% Renewable Portfolio Standard by 2020 (2008; 9 pp);
- The Public Utility Commission's Implementation Analysis Draft Work Plan for the Governor's Executive Order S-14-08 to implement a 33% Renewable Portfolio Standard by 2020 (2008; 11 pp);
- Draft 1A Summary Report to California Independent System Operator for Planning Reserve Margins (PRM) Study (2008; 7 pp.);
- SEPA Determination of Non-significance regarding zoning adjustments for Skamania County, Washington. Declaration to Friends of the Columbia Gorge, Inc. and Save Our Scenic Area (Sep 2008; 16 pp);
- California Energy Commission's Preliminary Staff Assessment of the Colusa Generating Station (2007; 24 pp);
- Rio del Oro Specific Plan Project Recirculated Draft Environmental Impact Report (2008: 66 pp);
- Replies to Response to Comments Re: Regional University Specific Plan Environmental Impact Report (2008; 20 pp);
- Regional University Specific Plan Environmental Impact Report (2008: 33 pp.);
- Clark Precast, LLC's "Sugarland" project, Negative Declaration (2008: 15 pp.);
- Cape Wind Project Draft Environmental Impact Statement (2008; 157 pp.);
- Yuba Highlands Specific Plan (or Area Plan) Environmental Impact Report (2006; 37 pp.);
- Replies to responses to comments on Mitigated Negative Declaration of the proposed

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Mining Permit (MIN 04-01) and Modification of Use Permit 96-02 at North Table Mountain (2006; 5 pp);

- Mitigated Negative Declaration of the proposed Mining Permit (MIN 04-01) and Modification of Use Permit 96-02 at North Table Mountain (2006; 15 pp);
- Windy Point Wind Farm Environmental Review and EIS (2006; 14 pp and 36 Powerpoint slides in reply to responses to comments);
- Shiloh I Wind Power Project EIR (2005; 18 pp);
- Buena Vista Wind Energy Project Notice of Preparation of EIR (2004; 15 pp);
- Negative Declaration of the proposed Callahan Estates Subdivision (2004; 11 pp);
- Negative Declaration of the proposed Winters Highlands Subdivision (2004; 9 pp);
- Negative Declaration of the proposed Winters Highlands Subdivision (2004; 13 pp);
- Negative Declaration of the proposed Creekside Highlands Project, Tract 7270 (2004; 21 pp);
- On the petition California Fish and Game Commission to list the Burrowing Owl as threatened or endangered (2003; 10 pp);
- Conditional Use Permit renewals from Alameda County for wind turbine operations in the Altamont Pass Wind Resource Area (2003; 41 pp);
- UC Davis Long Range Development Plan of 2003, particularly with regard to the Neighborhood Master Plan (2003; 23 pp);
- Anderson Marketplace Draft Environmental Impact Report (2003: 18 pp + 3 plates of photos);
- Negative Declaration of the proposed expansion of Temple B'nai Tikyah (2003: 6 pp);
- Antonio Mountain Ranch Specific Plan Public Draft EIR (2002: 23 pp);
- Response to testimony of experts at the East Altamont Energy Center evidentiary hearing on biological resources (2002: 9 pp);
- Revised Draft Environmental Impact Report, The Promenade (2002: 7 pp);
- Recirculated Initial Study for Calpine's proposed Pajaro Valley Energy Center (2002: 3 pp);
- UC Merced -- Declaration of Dr. Shawn Smallwood in support of petitioner's application for temporary restraining order and preliminary injunction (2002: 5 pp);
- Replies to response to comments in Final Environmental Impact Report, Atwood Ranch Unit III Subdivision (2003: 22 pp);
- Draft Environmental Impact Report, Atwood Ranch Unit III Subdivision (2002: 19 pp + 8 photos on 4 plates);
- California Energy Commission Staff Report on GWF Tracy Peaker Project (2002: 17 pp + 3 photos; follow-up report of 3 pp);
- Initial Study and Negative Declaration, Silver Bend Apartments, Placer County (2002: 13 pp);
- UC Merced Long-range Development Plan DEIR and UC Merced Community Plan DEIR (2001: 26 pp);
- Initial Study, Colusa County Power Plant (2001: 6 pp);
- Comments on Proposed Dog Park at Catlin Park, Folsom, California (2001: 5 pp + 4 photos);
- Pacific Lumber Co. (Headwaters) Habitat Conservation Plan and Environmental Impact Report (1998: 28 pp);
- Final Environmental Impact Report/Statement for Issuance of Take authorization for listed

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species within the MSCP planning area in San Diego County, California (Fed. Reg. 62 (60): 14938, San Diego Multi-Species Conservation Program) (1997: 10 pp);

- Permit (PRT-823773) Amendment for the Natomas Basin Habitat Conservation Plan, Sacramento, CA (Fed. Reg. 63 (101): 29020-29021) (1998);
- Draft Recovery Plan for the Giant Garter Snake (*Thamnophis gigas*). (Fed. Reg. 64(176): 49497-49498) (1999: 8 pp);
- Review of the Draft Recovery Plan for the Arroyo Southwestern Toad (*Bufo microscaphus californicus*) (1998);
- Ballona West Bluffs Project Environmental Impact Report (1999: oral presentation);
- California Board of Forestry's proposed amended Forest Practices Rules (1999);
- Negative Declaration for the Sunset Skyranch Airport Use Permit (1999);
- Calpine and Bechtel Corporations' Biological Resources Implementation and Monitoring Program (BRMIMP) for the Metcalf Energy Center (2000: 10 pp);
- California Energy Commission's Final Staff Assessment of the proposed Metcalf Energy Center (2000);
- US Fish and Wildlife Service Section 7 consultation with the California Energy Commission regarding Calpine and Bechtel Corporations' Metcalf Energy Center (2000: 4 pp);
- California Energy Commission's Preliminary Staff Assessment of the proposed Metcalf Energy Center (2000: 11 pp);
- Site-specific management plans for the Natomas Basin Conservancy's mitigation lands, prepared by Wildlands, Inc. (2000: 7 pp);
- Affidavit of K. Shawn Smallwood in Spirit of the Sage Council, et al. (Plaintiffs) vs. Bruce Babbitt, Secretary, U.S. Department of the Interior, et al. (Defendants), Injuries caused by the No Surprises policy and final rule which codifies that policy (1999: 9 pp).

Comments on other Environmental Review Documents:

- Proposed Regulation for California Fish and Game Code Section 3503.5 (2015: 12 pp);
- Statement of Overriding Considerations related to extending Altamont Winds, Inc.'s Conditional Use Permit PLN2014-00028 (2015; 8 pp);
- Draft Program Level EIR for Covell Village (2005; 19 pp);
- Bureau of Land Management Wind Energy Programmatic EIS Scoping document (2003: 7 pp.);
- NEPA Environmental Analysis for Biosafety Level 4 National Biocontainment Laboratory (NBL) at UC Davis (2003: 7 pp);
- Notice of Preparation of UC Merced Community and Area Plan EIR, on behalf of The Wildlife Society—Western Section (2001: 8 pp.);
- Preliminary Draft Yolo County Habitat Conservation Plan (2001; 2 letters totaling 35 pp.);
- Merced County General Plan Revision, notice of Negative Declaration (2001: 2 pp.);
- Notice of Preparation of Campus Parkway EIR/EIS (2001: 7 pp.);
- Draft Recovery Plan for the bighorn sheep in the Peninsular Range (*Ovis candensis*) (2000);
- Draft Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*), on behalf of The Wildlife Society—Western Section (2000: 10 pp.);
- Sierra Nevada Forest Plan Amendment Draft Environmental Impact Statement, on behalf of The Wildlife Society—Western Section (2000: 7 pp.);

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- State Water Project Supplemental Water Purchase Program, Draft Program EIR (1997);
- Davis General Plan Update EIR (2000);
- Turn of the Century EIR (1999: 10 pp);
- Proposed termination of Critical Habitat Designation under the Endangered Species Act (Fed. Reg. 64(113): 31871-31874) (1999);
- NOA Draft Addendum to the Final Handbook for Habitat Conservation Planning and Incidental Take Permitting Process, termed the HCP 5-Point Policy Plan (Fed. Reg. 64(45): 11485 - 11490) (1999; 2 pp + attachments);
- Covell Center Project EIR and EIR Supplement (1997).

Position Statements I prepared the following position statements for the Western Section of The Wildlife Society, and one for nearly 200 scientists:

- Recommended that the California Department of Fish and Game prioritize the extermination of the introduced southern water snake in northern California. The Wildlife Society--Western Section (2001);
- Recommended that The Wildlife Society—Western Section appoint or recommend members of the independent scientific review panel for the UC Merced environmental review process (2001);
- Opposed the siting of the University of California's 10th campus on a sensitive vernal pool/grassland complex east of Merced. The Wildlife Society--Western Section (2000);
- Opposed the legalization of ferret ownership in California. The Wildlife Society--Western Section (2000);
- Opposed the Proposed "No Surprises," "Safe Harbor," and "Candidate Conservation Agreement" rules, including permit-shield protection provisions (Fed. Reg. Vol. 62, No. 103, pp. 29091-29098 and No. 113, pp. 32189-32194). This statement was signed by 188 scientists and went to the responsible federal agencies, as well as to the U.S. Senate and House of Representatives.

Posters at Professional Meetings

Leyvas, E. and K. S. Smallwood. 2015. Rehabilitating injured animals to offset and rectify wind project impacts. Conference on Wind Energy and Wildlife Impacts, Berlin, Germany, 9-12 March 2015.

Smallwood, K. S., J. Mount, S. Standish, E. Leyvas, D. Bell, E. Walther, B. Karas. 2015. Integrated detection trials to improve the accuracy of fatality rate estimates at wind projects. Conference on Wind Energy and Wildlife Impacts, Berlin, Germany, 9-12 March 2015.

Smallwood, K. S. and C. G. Thelander. 2005. Lessons learned from five years of avian mortality research in the Altamont Pass WRA. AWEA conference, Denver, May 2005.

Neher, L., L. Wilder, J. Woo, L. Spiegel, D. Yen-Nakafugi, and K.S. Smallwood. 2005. Bird's eye view on California wind. AWEA conference, Denver, May 2005.

Smallwood, K. S., C. G. Thelander and L. Spiegel. 2003. Toward a predictive model of avian

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fatalities in the Altamont Pass Wind Resource Area. Windpower 2003 Conference and Convention, Austin, Texas.

Smallwood, K.S. and Eva Butler. 2002. Pocket Gopher Response to Yellow Star-thistle Eradication as part of Grassland Restoration at Decommissioned Mather Air Force Base, Sacramento County, California. White Mountain Research Station Open House, Barcroft Station.

Smallwood, K.S. and Michael L. Morrison. 2002. Fresno kangaroo rat (*Dipodomys nitratoides*) Conservation Research at Resources Management Area 5, Lemoore Naval Air Station. White Mountain Research Station Open House, Barcroft Station.

Smallwood, K.S. and E.L. Fitzhugh. 1989. Differentiating mountain lion and dog tracks. Third Mountain Lion Workshop, Prescott, AZ.

Smith, T. R. and K. S. Smallwood. 2000. Effects of study area size, location, season, and allometry on reported *Sorex* shrew densities. Annual Meeting of the Western Section of The Wildlife Society.

Presentations at Professional Meetings and Seminars

Repowering the Altamont Pass. Altamont Symposium, The Wildlife Society – Western Section, 5 February 2017.

Developing methods to reduce bird mortality in the Altamont Pass Wind Resource Area, 1999-2007. Altamont Symposium, The Wildlife Society – Western Section, 5 February 2017.

Conservation and recovery of burrowing owls in Santa Clara Valley. Santa Clara Valley Habitat Agency, Newark, California, 3 February 2017.

Mitigation of Raptor Fatalities in the Altamont Pass Wind Resource Area. Raptor Research Foundation Meeting, Sacramento, California, 6 November 2015.

From burrows to behavior: Research and management for burrowing owls in a diverse landscape. California Burrowing Owl Consortium meeting, 24 October 2015, San Jose, California.

The Challenges of repowering. Keynote presentation at Conference on Wind Energy and Wildlife Impacts, Berlin, Germany, 10 March 2015.

Research Highlights Altamont Pass 2011-2015. Scientific Review Committee, Oakland, California, 8 July 2015.

Siting wind turbines to minimize raptor collisions: Altamont Pass Wind Resource Area. US Fish and Wildlife Service Golden Eagle Working Group, Sacramento, California, 8 January 2015.

Evaluation of nest boxes as a burrowing owl conservation strategy. Sacramento Chapter of the Western Section, The Wildlife Society. Sacramento, California, 26 August 2013.

Predicting collision hazard zones to guide repowering of the Altamont Pass. Conference on wind

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power and environmental impacts. Stockholm, Sweden, 5-7 February 2013.

Impacts of Wind Turbines on Wildlife. California Council for Wildlife Rehabilitators, Yosemite, California, 12 November 2012.

Impacts of Wind Turbines on Birds and Bats. Madrone Audubon Society, Santa Rosa, California, 20 February 2012.

Comparing Wind Turbine Impacts across North America. California Energy Commission Staff Workshop: Reducing the Impacts of Energy Infrastructure on Wildlife, 20 July 2011.

Siting Repowered Wind Turbines to Minimize Raptor Collisions. California Energy Commission Staff Workshop: Reducing the Impacts of Energy Infrastructure on Wildlife, 20 July 2011.

Siting Repowered Wind Turbines to Minimize Raptor Collisions. Alameda County Scientific Review Committee meeting, 17 February 2011

Comparing Wind Turbine Impacts across North America. Conference on Wind energy and Wildlife impacts, Trondheim, Norway, 3 May 2011.

Update on Wildlife Impacts in the Altamont Pass Wind Resource Area. Raptor Symposium, The Wildlife Society—Western Section, Riverside, California, February 2011.

Siting Repowered Wind Turbines to Minimize Raptor Collisions. Raptor Symposium, The Wildlife Society - Western Section, Riverside, California, February 2011.

Wildlife mortality caused by wind turbine collisions. Ecological Society of America, Pittsburgh, Pennsylvania, 6 August 2010.

Map-based repowering and reorganization of a wind farm to minimize burrowing owl fatalities. California burrowing Owl Consortium Meeting, Livermore, California, 6 February 2010.

Environmental barriers to wind power. Getting Real About Renewables: Economic and Environmental Barriers to Biofuels and Wind Energy. A symposium sponsored by the Environmental & Energy Law & Policy Journal, University of Houston Law Center, Houston, 23 February 2007.

Lessons learned about bird collisions with wind turbines in the Altamont Pass and other US wind farms. Meeting with Japan Ministry of the Environment and Japan Ministry of the Economy, Wild Bird Society of Japan, and other NGOs Tokyo, Japan, 9 November 2006.

Lessons learned about bird collisions with wind turbines in the Altamont Pass and other US wind farms. Symposium on bird collisions with wind turbines. Wild Bird Society of Japan, Tokyo, Japan, 4 November 2006.

Responses of Fresno kangaroo rats to habitat improvements in an adaptive management framework. California Society for Ecological Restoration (SERCAL) 13th Annual Conference, UC Santa

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Barbara, 27 October 2006.

Fatality associations as the basis for predictive models of fatalities in the Altamont Pass Wind Resource Area. EEI/APLIC/PIER Workshop, 2006 Biologist Task Force and Avian Interaction with Electric Facilities Meeting, Pleasanton, California, 28 April 2006.

Burrowing owl burrows and wind turbine collisions in the Altamont Pass Wind Resource Area. The Wildlife Society - Western Section Annual Meeting, Sacramento, California, February 8, 2006.

Mitigation at wind farms. Workshop: Understanding and resolving bird and bat impacts. American Wind Energy Association and Audubon Society. Los Angeles, CA. January 10 and 11, 2006.

Incorporating data from the California Wildlife Habitat Relationships (CWHR) system into an impact assessment tool for birds near wind farms. Shawn Smallwood, Kevin Hunting, Marcus Yee, Linda Spiegel, Monica Parisi. Workshop: Understanding and resolving bird and bat impacts. American Wind Energy Association and Audubon Society. Los Angeles, CA. January 10 and 11, 2006.

Toward indicating threats to birds by California's new wind farms. California Energy Commission, Sacramento, May 26, 2005.

Avian collisions in the Altamont Pass. California Energy Commission, Sacramento, May 26, 2005.

Ecological solutions for avian collisions with wind turbines in the Altamont Pass Wind Resource Area. EPRI Environmental Sector Council, Monterey, California, February 17, 2005.

Ecological solutions for avian collisions with wind turbines in the Altamont Pass Wind Resource Area. The Wildlife Society—Western Section Annual Meeting, Sacramento, California, January 19, 2005.

Associations between avian fatalities and attributes of electric distribution poles in California. The Wildlife Society - Western Section Annual Meeting, Sacramento, California, January 19, 2005.

Minimizing avian mortality in the Altamont Pass Wind Resources Area. UC Davis Wind Energy Collaborative Forum, Palm Springs, California, December 14, 2004.

Selecting electric distribution poles for priority retrofitting to reduce raptor mortality. Raptor Research Foundation Meeting, Bakersfield, California, November 10, 2004.

Responses of Fresno kangaroo rats to habitat improvements in an adaptive management framework. Annual Meeting of the Society for Ecological Restoration, South Lake Tahoe, California, October 16, 2004.

Lessons learned from five years of avian mortality research at the Altamont Pass Wind Resources Area in California. The Wildlife Society Annual Meeting, Calgary, Canada, September 2004.

The ecology and impacts of power generation at Altamont Pass. Sacramento Petroleum Association,

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Sacramento, California, August 18, 2004.

Burrowing owl mortality in the Altamont Pass Wind Resource Area. California Burrowing Owl Consortium meeting, Hayward, California, February 7, 2004.

Burrowing owl mortality in the Altamont Pass Wind Resource Area. California Burrowing Owl Symposium, Sacramento, November 2, 2003.

Raptor Mortality at the Altamont Pass Wind Resource Area. National Wind Coordinating Committee, Washington, D.C., November 17, 2003.

Raptor Behavior at the Altamont Pass Wind Resource Area. Annual Meeting of the Raptor Research Foundation, Anchorage, Alaska, September, 2003.

Raptor Mortality at the Altamont Pass Wind Resource Area. Annual Meeting of the Raptor Research Foundation, Anchorage, Alaska, September, 2003.

California mountain lions. Ecological & Environmental Issues Seminar, Department of Biology, California State University, Sacramento, November, 2000.

Intra- and inter-turbine string comparison of fatalities to animal burrow densities at Altamont Pass. National Wind Coordinating Committee, Carmel, California, May, 2000.

Using a Geographic Positioning System (GPS) to map wildlife and habitat. Annual Meeting of the Western Section of The Wildlife Society, Riverside, CA, January, 2000.

Suggested standards for science applied to conservation issues. Annual Meeting of the Western Section of The Wildlife Society, Riverside, CA, January, 2000.

The indicators framework applied to ecological restoration in Yolo County, California. Society for Ecological Restoration, September 25, 1999.

Ecological restoration in the context of animal social units and their habitat areas. Society for Ecological Restoration, September 24, 1999.

Relating Indicators of Ecological Health and Integrity to Assess Risks to Sustainable Agriculture and Native Biota. International Conference on Ecosystem Health, August 16, 1999.

A crosswalk from the Endangered Species Act to the HCP Handbook and real HCPs. Southern California Edison, Co. and California Energy Commission, March 4-5, 1999.

Mountain lion track counts in California: Implications for Management. Ecological & Environmental Issues Seminar, Department of Biological Sciences, California State University, Sacramento, November 4, 1998.

“No Surprises” -- Lack of science in the HCP process. California Native Plant Society Annual Conservation Conference, The Presidio, San Francisco, September 7, 1997.

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In Your Interest. A half hour weekly show aired on Channel 10 Television, Sacramento. In this episode, I served on a panel of experts discussing problems with the implementation of the Endangered Species Act. Aired August 31, 1997.

Spatial scaling of pocket gopher (*Geomyidae*) density. Southwestern Association of Naturalists 44th Meeting, Fayetteville, Arkansas, April 10, 1997.

Estimating prairie dog and pocket gopher burrow volume. Southwestern Association of Naturalists 44th Meeting, Fayetteville, Arkansas, April 10, 1997.

Ten years of mountain lion track survey. Fifth Mountain Lion Workshop, San Diego, February 27, 1996.

Study and interpretive design effects on mountain lion density estimates. Fifth Mountain Lion Workshop, San Diego, February 27, 1996.

Small animal control. Session moderator and speaker at the California Farm Conference, Sacramento, California, Feb. 28, 1995.

Small animal control. Ecological Farming Conference, Asylomar, California, Jan. 28, 1995.

Habitat associations of the Swainson's Hawk in the Sacramento Valley's agricultural landscape. 1994 Raptor Research Foundation Meeting, Flagstaff, Arizona.

Alfalfa as wildlife habitat. Seed Industry Conference, Woodland, California, May 4, 1994.

Habitats and vertebrate pests: impacts and management. Managing Farmland to Bring Back Game Birds and Wildlife to the Central Valley. Yolo County Resource Conservation District, U.C. Davis, February 19, 1994.

Management of gophers and alfalfa as wildlife habitat. Orland Alfalfa Production Meeting and Sacramento Valley Alfalfa Production Meeting, February 1 and 2, 1994.

Patterns of wildlife movement in a farming landscape. Wildlife and Fisheries Biology Seminar Series: Recent Advances in Wildlife, Fish, and Conservation Biology, U.C. Davis, Dec. 6, 1993.

Alfalfa as wildlife habitat. California Alfalfa Symposium, Fresno, California, Dec. 9, 1993.

Management of pocket gophers in Sacramento Valley alfalfa. California Alfalfa Symposium, Fresno, California, Dec. 8, 1993.

Association analysis of raptors in a farming landscape. Plenary speaker at Raptor Research Foundation Meeting, Charlotte, North Carolina, Nov. 6, 1993.

Landscape strategies for biological control and IPM. Plenary speaker, International Conference on Integrated Resource Management and Sustainable Agriculture, Beijing, China, Sept. 11, 1993.

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Landscape Ecology Study of Pocket Gophers in Alfalfa. Alfalfa Field Day, U.C. Davis, July 1993.

Patterns of wildlife movement in a farming landscape. Spatial Data Analysis Colloquium, U.C. Davis, August 6, 1993.

Sound stewardship of wildlife. Veterinary Medicine Seminar: Ethics of Animal Use, U.C. Davis. May 1993.

Landscape ecology study of pocket gophers in alfalfa. Five County Grower's Meeting, Tracy, California. February 1993.

Turbulence and the community organizers: The role of invading species in ordering a turbulent system, and the factors for invasion success. Ecology Graduate Student Association Colloquium, U.C. Davis. May 1990.

Evaluation of exotic vertebrate pests. Fourteenth Vertebrate Pest Conference, Sacramento, California. March 1990.

Analytical methods for predicting success of mammal introductions to North America. The Western Section of the Wildlife Society, Hilo, Hawaii. February 1988.

A state-wide mountain lion track survey. Sacramento County Dept Parks and Recreation. April 1986.

The mountain lion in California. Davis Chapter of the Audubon Society. October 1985.

Ecology Graduate Student Seminars, U.C. Davis, 1985-1990: Social behavior of the mountain lion; Mountain lion control; Political status of the mountain lion in California.

Other forms of Participation at Professional Meetings

- Scientific Committee, Conference on Wind energy and Wildlife impacts, Berlin, Germany, March 2015.
- Scientific Committee, Conference on Wind energy and Wildlife impacts, Stockholm, Sweden, February 2013.
- Workshop co-presenter at Birds & Wind Energy Specialist Group (BAWESG) Information sharing week, Bird specialist studies for proposed wind energy facilities in South Africa, Endangered Wildlife Trust, Darling, South Africa, 3-7 October 2011.
- Scientific Committee, Conference on Wind energy and Wildlife impacts, Trondheim, Norway, 2-5 May 2011.
- Chair of Animal Damage Management Session, The Wildlife Society, Annual Meeting, Reno, Nevada, September 26, 2001.

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- Chair of Technical Session: Human communities and ecosystem health: Comparing perspectives and making connection. Managing for Ecosystem Health, International Congress on Ecosystem Health, Sacramento, CA August 15-20, 1999.

- Student Awards Committee, Annual Meeting of the Western Section of The Wildlife Society, Riverside, CA, January, 2000.

- Student Mentor, Annual Meeting of the Western Section of The Wildlife Society, Riverside, CA, January, 2000.

Printed Mass Media

Smallwood, K.S., D. Mooney, and M. McGuinness. 2003. We must stop the UCD biolab now. Op-Ed to the Davis Enterprise.

Smallwood, K.S. 2002. Spring Lake threatens Davis. Op-Ed to the Davis Enterprise.

Smallwood, K.S. Summer, 2001. Mitigation of habitation. The Flatlander, Davis, California.

Entrikan, R.K. and K.S. Smallwood. 2000. Measure O: Flawed law would lock in new taxes. Op-Ed to the Davis Enterprise.

Smallwood, K.S. 2000. Davis delegation lobbies Congress for Wildlife conservation. Op-Ed to the Davis Enterprise.

Smallwood, K.S. 1998. Davis Visions. The Flatlander, Davis, California.

Smallwood, K.S. 1997. Last grab for Yolo's land and water. The Flatlander, Davis, California.

Smallwood, K.S. 1997. The Yolo County HCP. Op-Ed to the Davis Enterprise.

Radio/Television

PBS News Hour,

FOX News, Energy in America: Dead Birds Unintended Consequence of Wind Power Development, August 2011.

KXJZ Capital Public Radio -- Insight (Host Jeffrey Callison). Mountain lion attacks (with guest Professor Richard Coss). 23 April 2009;

KXJZ Capital Public Radio -- Insight (Host Jeffrey Callison). Wind farm Rio Vista Renewable Power. 4 September 2008;

KQED QUEST Episode #111. Bird collisions with wind turbines. 2007;

EEC ORIGINAL PKG

KDVS Speaking in Tongues (host Ron Glick), Yolo County HCP: 1 hour. December 27, 2001;

KDVS Speaking in Tongues (host Ron Glick), Yolo County HCP: 1 hour. May 3, 2001;

KDVS Speaking in Tongues (host Ron Glick), Yolo County HCP: 1 hour. February 8, 2001;

KDVS Speaking in Tongues (host Ron Glick & Shawn Smallwood), California Energy Crisis: 1 hour. Jan. 25, 2001;

KDVS Speaking in Tongues (host Ron Glick), Headwaters Forest HCP: 1 hour. 1998;

Davis Cable Channel (host Gerald Heffernon), Burrowing owls in Davis: half hour. June, 2000;

Davis Cable Channel (hosted by Davis League of Women Voters), Measure O debate: 1 hour. October, 2000;

KXTV 10, In Your Interest, The Endangered Species Act: half hour. 1997.

Reviews of Journal Papers (Scientific journals for whom I've provided peer review)

Journal	**Journal**
American Naturalist	Journal of Animal Ecology
Journal of Wildlife Management	Western North American Naturalist
Auk	Journal of Raptor Research
Biological Conservation	National Renewable Energy Lab reports
Canadian Journal of Zoology	Oikos
Ecosystem Health	The Prairie Naturalist
Environmental Conservation	Restoration Ecology
Environmental Management	Southwestern Naturalist
Functional Ecology	The Wildlife Society--Western Section Trans.
Journal of Zoology (London)	Proc. Int. Congress on Managing for Ecosystem Health
Journal of Applied Ecology	Transactions in GIS
Ecology	Tropical Ecology
Wildlife Society Bulletin	Peer J
Biological Control	The Condor

Committees

- Scientific Review Committee, Alameda County, Altamont Pass Wind Resource Area
- Ph.D. Thesis Committee, Steve Anderson, University of California, Davis
- MS Thesis Committee, Marcus Yee, California State University, Sacramento

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Other Professional Activities or Products

Testified in Federal Court in Denver during 2005 over the fate of radio-nuclides in the soil at Rocky Flats Plant after exposure to burrowing animals. My clients won a judgment of $553,000,000. I have also testified in many other cases of litigation under CEQA, NEPA, the Warren-Alquist Act, and other environmental laws. My clients won most of the cases for which I testified.

Testified before Environmental Review Tribunals in Ontario, Canada regarding proposed White Pines, Amherst Island, and Fairview Wind Energy projects.

Testified in Skamania County Hearing in 2009 on the potential impacts of zoning the County for development of wind farms and hazardous waste facilities.

Testified in deposition in 2007 in the case of O'Dell et al. vs. FPL Energy in Houston, Texas.

Testified in Klickitat County Hearing in 2006 on the potential impacts of the Windy Point Wind Farm.

Memberships in Professional Societies

The Wildlife Society
Raptor Research Foundation

Honors and Awards

Fulbright Research Fellowship to Indonesia, 1987
J.G. Boswell Full Academic Scholarship, 1981 college of choice
Certificate of Appreciation, The Wildlife Society—Western Section, 2000, 2001
Northern California Athletic Association Most Valuable Cross Country Runner, 1984
American Legion Award, Corcoran High School, 1981, and John Muir Junior High, 1977
CIF Section Champion, Cross Country in 1978
CIF Section Champion, Track & Field 2 mile run in 1981
National Junior Record, 20 kilometer run, 1982
National Age Group Record, 1500 meter run, 1978

Community Activities

District 64 Little League Umpire, 2003-2007
Dixon Little League Umpire, 2006-07
Davis Little League Chief Umpire and Board member, 2004-2005
Davis Little League Safety Officer, 2004-2005
Davis Little League Certified Umpire, 2002-2004
Davis Little League Scorekeeper, 2002
Davis Visioning Group member
Petitioner for Writ of Mandate under the California Environmental Quality Act against City of Woodland decision to approve the Spring Lake Specific Plan, 2002
Served on campaign committees for City Council candidates

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Representative Clients/Funders

Law Offices of Stephan C. Volker
Blum Collins, LLP
Eric K. Gillespie Professional Corporation
Law Offices of Berger & Montague
Lozeau | Drury LLP
Law Offices of Roy Haber
Law Offices of Edward MacDonald
Law Office of John Gabrielli
Law Office of Bill Kopper
Law Office of Donald B. Mooney
Law Office of Veneruso & Moncharsh
Law Office of Steven Thompson
Law Office of Brian Gaffney
California Wildlife Federation
Defenders of Wildlife
Sierra Club
National Endangered Species Network
Spirit of the Sage Council
The Humane Society
Hagens Berman LLP
Environmental Protection Information Center
Goldberg, Kamin & Garvin, Attorneys at Law
Californians for Renewable Energy (CARE)
Seatuck Environmental Association
Friends of the Columbia Gorge, Inc.
Save Our Scenic Area
Alliance to Protect Nantucket Sound
Friends of the Swainson's Hawk
Alameda Creek Alliance
Center for Biological Diversity
California Native Plant Society
Endangered Wildlife Trust
and BirdLife South Africa
AquAlliance
Oregon Natural Desert Association
Save Our Sound
G3 Energy and Pattern Energy
Emerald Farms
Pacific Gas & Electric Co.
Southern California Edison Co.
Georgia-Pacific Timber Co.
Northern Territories Inc.
David Magney Environmental Consulting
Wildlife History Foundation
NextEra Energy Resources, LLC
Ogin, Inc.
EDF Renewables
National Renewable Energy Lab
Altamont Winds LLC
Salka Energy
Comstocks Business (magazine)
BioResource Consultants
Tierra Data
Black and Veatch
Terry Preston, Wildlife Ecology Research Center
EcoStat, Inc.
US Navy
US Department of Agriculture
US Forest Service
US Fish & Wildlife Service
US Department of Justice
California Energy Commission
California Office of the Attorney General
California Department of Fish & Wildlife
California Department of Transportation
California Department of Forestry
California Department of Food & Agriculture
Ventura County Counsel
County of Yolo
Tahoe Regional Planning Agency
Sustainable Agriculture Research & Education Program
Sacramento-Yolo Mosquito and Vector Control District
East Bay Regional Park District
County of Alameda
Don & LaNelle Silverstien
Seventh Day Adventist Church
Escuela de la Raza Unida
Susan Pelican and Howard Beeman
Residents Against Inconsistent Development, Inc.
Bob Sarvey
Mike Boyd
Hillcroft Neighborhood Fund
Joint Labor Management Committee, Retail Food Industry
Lisa Rocca
Kevin Jackson
Dawn Stover and Jay Letto
Nancy Havassy
Catherine Portman (for Brenda Cedarblade)
Ventus Environmental Solutions, Inc.
Panorama Environmental, Inc.
Adams Broadwell Professional Corporation

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Representative special-status species experience

Common name	**Species name**	**Description**
Field experience		
California red-legged frog	*Rana aurora draytonii*	Protocol searches; Many detections
Foothill yellow-legged frog	*Rana boylii*	Presence surveys; Many detections
Western spadefoot	*Spea hammondii*	Presence surveys; Few detections
California tiger salamander	*Ambystoma californiense*	Protocol searches; Many detections
Coast range newt	*Taricha torosa torosa*	Searches and multiple detections
Blunt-nosed leopard lizard	*Gambelia sila*	Detected in San Luis Obispo County
California horned lizard	*Phrynosoma coronatum frontale*	Searches; Many detections
Western pond turtle	*Clemmys marmorata*	Searches; Many detections
San Joaquin kit fox	*Vulpes macrotis mutica*	Protocol searches; detections
Sumatran tiger	*Panthera tigris*	Track surveys in Sumatra
Mountain lion	*Puma concolor californicus*	Research and publications
Point Arena mountain beaver	*Aplodontia rufa nigra*	Remote camera operation
Giant kangaroo rat	*Dipodomys ingens*	Detected in Cholame Valley
San Joaquin kangaroo rat	*Dipodomys nitratoides*	Monitoring & habitat restoration
Monterey dusky-footed woodrat	*Neotoma fuscipes luciana*	Non-target captures and mapping of dens
Salt marsh harvest mouse	*Reithrodontomys raviventris*	Habitat assessment, monitoring
Salinas harvest mouse	*Reithrodontomys megalotus distichlus*	Captures; habitat assessment
Bats		Thermal imaging surveys
California clapper rail	*Rallus longirostris*	Surveys and detections
Golden eagle	*Aquila chrysaetos*	Numerical & behavioral surveys
Swainson's hawk	*Buteo swainsoni*	Numerical & behavioral surveys
Northern harrier	*Circus cyaeneus*	Numerical & behavioral surveys
White-tailed kite	*Elanus leucurus*	Numerical & behavioral surveys
Loggerhead shrike	*Lanius ludovicianus*	Large area surveys
Least Bell's vireo	*Vireo bellii pusillus*	Detected in Monterey County
Willow flycatcher	*Empidonax traillii extimus*	Research at Sierra Nevada breeding sites
Burrowing owl	*Athene cunicularia hypugia*	Numerical & behavioral surveys
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	Monitored success of relocation and habitat restoration
Analytical		
Arroyo southwestern toad	*Bufo microscaphus californicus*	Research and report.
Giant garter snake	*Thamnophis gigas*	Research and publication
Northern goshawk	*Accipiter gentilis*	Research and publication
Northern spotted owl	*Strix occidentalis*	Research and reports
Alameda whipsnake	*Masticophis lateralis euryxanthus*	Expert testimony

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AIR SCIENCES INC.

DENVER • PORTLAND • LOS ANGELES

Heber 2 Application for Authority to Construct

PREPARED FOR:
ORMAT NEVADA INC.

PROJECT NO. 346-2-1
NOVEMBER 2019

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EXHIBIT C

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EXECUTIVE SUMMARY

ORMAT Nevada Inc. proposes to conduct a Re-Power Project which will replace six existing two-level geothermal power generation units at its Heber 2 facility in Imperial County, CA with two new units. The six units to be replaced are approaching the end of their useful lives while the two new units are expected to be more efficient, have lower maintenance requirements, and produce similar net combined power output. The Re-Power Project will affect volatile organic compound (VOC) air emissions at the facility and are not expected to affect emission rates of other regulated pollutants. Actual emission rates for all pollutants are expected to either remain unchanged or decrease. Therefore, ORMAT is confident and proposes to reduce the existing permitted emission levels.

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1.0 PROJECT DESCRIPTION

Second Imperial Geothermal Company, a subsidiary of ORMAT Nevada, Inc. (ORMAT), owns and operates the Heber 2 geothermal electric generation facility in the town of Heber in Imperial County, CA. Heber 2 operates under Authority to Construct (ATC) and Permit to Operate (PTO) #2217A-4 issued by Imperial County Air Pollution Control District (ICAPCD). Heber 2's PTO #2217A-4 includes the emission units at two adjacent, connected facilities known as Heber South and Goulds 2 which are also owned and operated by ORMAT. In this document, the terms Heber 2, Heber South, and Goulds 2 refer to the emission sources at each individual facility, while the general term Facility refers to all the sources at the combined facilities regulated under PTO #2217A-4. The Facility location is shown in Figure 1.

1.1 Existing Facility

Heber 2 currently consists of six ORMAT Energy Converters (OECs). They are integrated two-level units (ITLUs) and have a gross combined power output rating of 36 megawatts (MW). Goulds 2 and Heber South each consist of one OEC with gross outputs of 10 and 12 MW, respectively. Operation of the OECs is described below. Ancillary equipment for the Facility includes cooling towers, an evacuation skid/vapor recovery maintenance unit (VRMU), motive fluid (MF) above ground storage tanks, and diesel engines for emergency use.

The six OECs at Heber 2 are operationally interconnected to each other as well as to Goulds 2 and Heber South. The VRMU and MF storage tanks are shared by all the units and there is piping connecting the MF circuits between the units.

The existing OECs and storage tanks are shown in Figure 2 along with the locations for two proposed new OECs and storage tanks. All existing and proposed permitted emission units at the Facility are listed in Table 1.

1.2 Power Generation Process

All of the OECs at the Facility are binary units, meaning they use two separate fluid circuits to generate power. These units produce power by pumping geothermal fluid from the ground and use the heat from that fluid to vaporize liquid isopentane. This is done using heat exchangers; the two fluids remain isolated in separate circuits. The isopentane is the motive fluid, that is, the vaporized isopentane flows through and provides the motive force to the turbines. The turbines are connected to electric generators. The geothermal fluid, after transferring heat to the isopentane, is pumped back underground into the geological formation. The isopentane is cooled and condensed and begins the cycle again. The cooling is accomplished with a third fluid, cooling water, which cycles between the hot isopentane and cooling towers.

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Figure 1. Facility Location Map

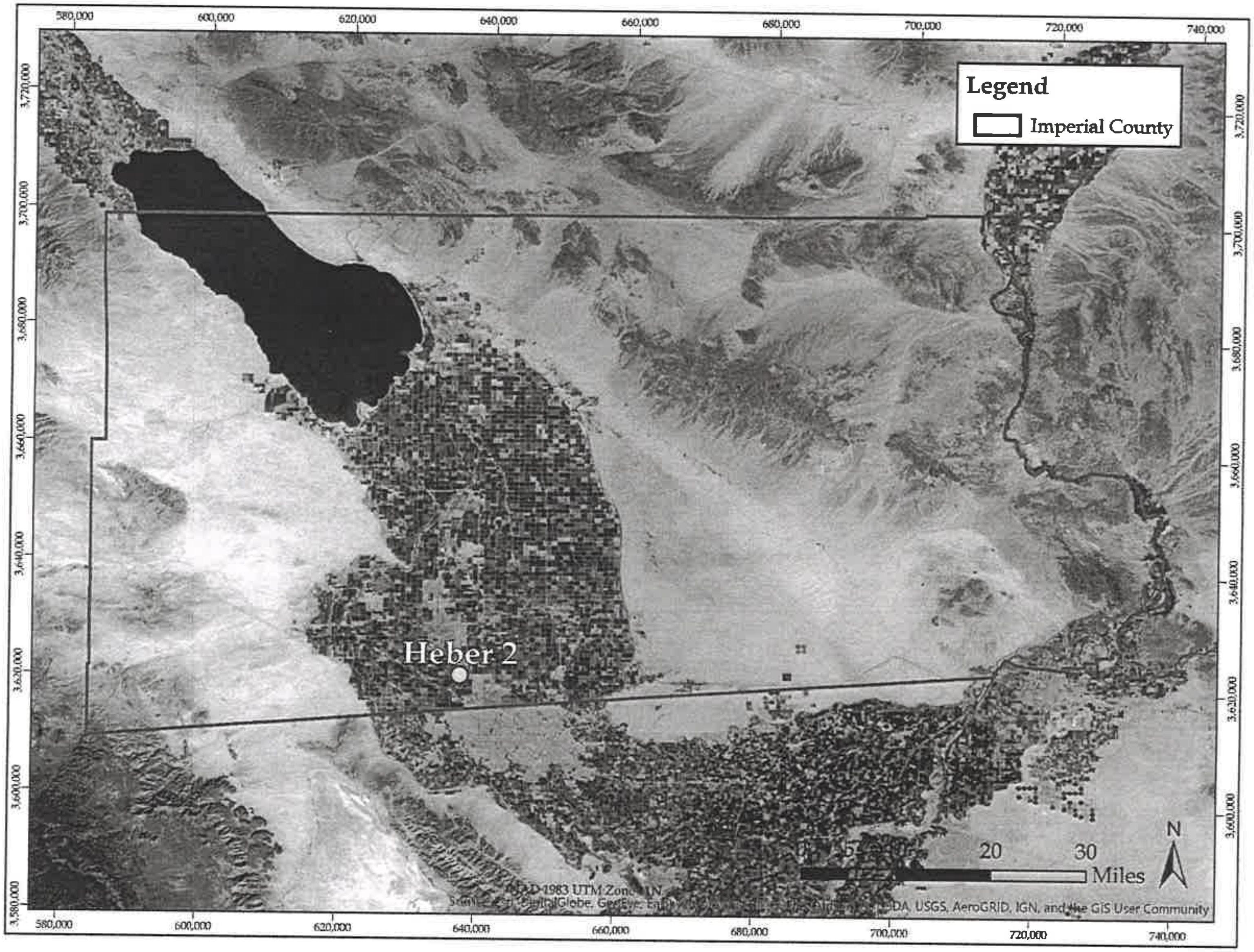

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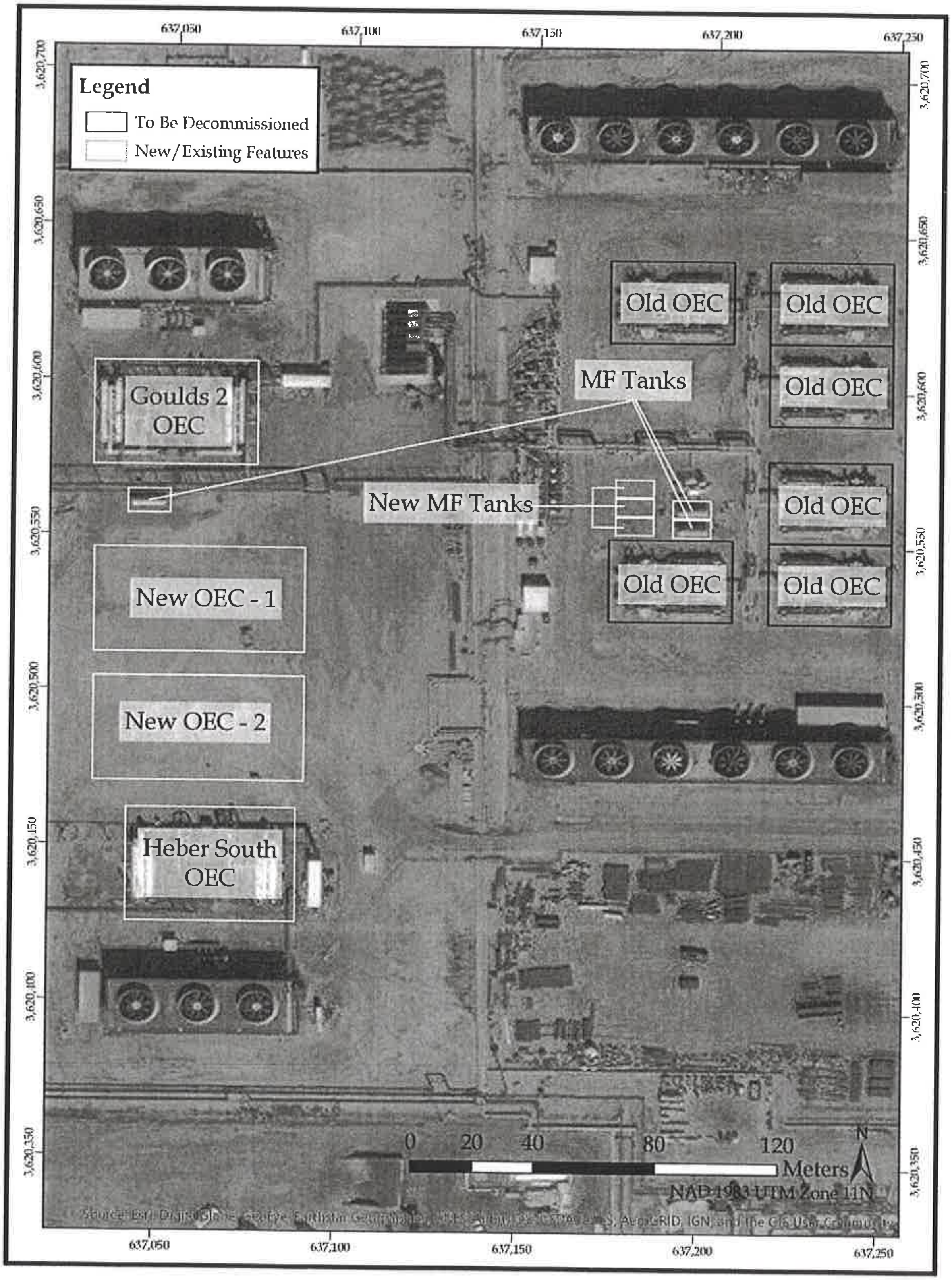
Figure 2. Facility Layout Showing Existing and Proposed Equipment



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1.3 Proposed Development

Development of the proposed Re-Power Project includes the installation of two new OEC units, manufactured by ORMAT, to replace all six existing OECs at Heber 2. The existing OECs will be deconstructed and removed from the Facility within 5 years per County of Imperial requirements.

The total disturbance will be approximately 2.5 acres, entirely within the existing Facility. The development site is completely devoid of vegetation and is actively disturbed as part of ongoing energy generation operations at the Facility. Considering its current condition, site preparation for the installation of the proposed facilities will be limited to light excavation and soil compaction. The locations of the new OECs and storage tanks are shown in Figure 2. Process flow diagrams for the new OECs are included in Appendix A.

ORMAT Energy Converter-1 (OEC-1)

The proposed OEC-1 is a two-turbine combined cycle binary unit, operating on a subcritical Rankine cycle, with isopentane as the motive fluid for the system. This system also consists of a generator, vaporizer, water-cooled condensers, preheaters, and recuperators, with the OEC served by the existing portable VRMU for purging and maintenance events. The design capacity for the unit is 23.6 MW gross output.

ORMAT Energy Converter-2 (OEC-2)

The proposed OEC-2 is a two-turbine, two-cycle binary unit, operating on a subcritical Rankine cycle, with isopentane as the motive fluid for the system. This system also consists of a generator, vaporizers, water-cooled condensers, and preheaters, with the OEC served by the existing portable VRMU for purging and maintenance events. The design capacity for the unit is 14.52 MW gross output.

Three Additional Isopentane Above Ground Storage Tanks

To support the new OEC units, three new above ground tanks for additional isopentane storage will be installed. There are two existing storage tanks at Heber 2 and one at Goulds 2. The new tanks will be sited adjacent to the existing Heber 2 tanks. Each tank has a capacity of 10,000 gallons.

The new OECs will utilize the two existing 6-cell Harmon cooling towers that are currently used by the six old OECs that will be decommissioned. No changes to the cooling tower operation or cooling water is anticipated, and therefore no change in emissions is expected.

The existing John Zink VRMU will continue to be used at the Facility and will service the new and existing equipment.

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Table 1. Existing and Proposed Equipment at Heber 2, Heber South, and Goulds 2

Equipment Description	Air Permitting Status
(6) 6 MW (each) ORMAT Energy Converters	Existing – To be shut down
10 MW ORMAT Energy Converter	Existing – No change
12 MW ORMAT Energy Converter	Existing – No change
(2) 6-cell Harmon cooling towers	Existing – No change
(2) 3-cell Marley Model F499A-5.91-3 cooling towers	Existing – No change
23.6 MW ORMAT Energy Converter	New
14.52 MW ORMAT Energy Converter	New
John Zink Series 2000 Vapor Recovery Unit	Existing – No change
Emergency Generator – Cummins (685 hp)	Existing – No change
Fire Pump – Clarke (443 hp)	Existing – No change
Emergency Pump – John Deere (350 hp)	Existing – No change
Fire Pump – Clarke (300 hp)	Existing – No change
(3) 10,000-gallon Motive Fluid Tanks	Existing – No change
(3) 10,000-gallon Motive Fluid Tanks	New

Re-Power Project Construction

Construction for the Heber 2 Re-Power Project will commence as soon as possible after issuance of all required pre-construction permits. Most construction activities will occur on an area approximately 2.5 acres in size. The active construction area will be watered on a regular basis as necessary to minimize dust emissions. Minor excavation will be conducted for equipment foundations as well as placement of underground pipes.

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2.0 AIR EMISSIONS

The Facility is a minor source of air pollution. The main pollutant of concern is isopentane, which is a VOC. Isopentane is the motive fluid used in the power generation process, as described above.

The Facility also has the potential to emit fugitive H_2S from geothermal fluid, particulates from cooling towers, and combustion emissions from emergency diesel engines. Emission calculations are provided in Appendix B.

2.1 Existing Air Emission Limits

Current facility-wide emission limits specified in PTO #2217A-4 are listed in Table 2.

Table 2. Facility-Wide Emission Limits

Pollutant	Emission Limit
Isopentane – 1st Quarter	185 lbs / day
Isopentane – 2nd Quarter	137 lbs / day
Isopentane – 3rd Quarter	137 lbs / day
Isopentane – 4th Quarter	218 lbs / day
H_2S	0.5 lbs / hour

In addition to the facility-wide limits, the Cummins diesel-fired emergency generator has emission limits of 14.32 pounds of NO_X per hour and 1.54 pounds per of CO per hour.

Due to maintenance activities that occur during the 1st and 4th quarters annually, isopentane emissions have the potential to exceed 137 pounds per day on average for those quarters. ORMAT purchases VOC emissions offsets on an annual basis as required by ICAPCD Rule 207 C.2.a.

2.2 Isopentane Emissions

Isopentane emissions at the Facility come from equipment maintenance, purging of non-condensable gases, and fugitive leaks.

Maintenance

Occasionally, the MF must be evacuated from a portion of an OEC for maintenance or repair. The OECs are divided into zones that can be isolated and evacuated for maintenance while MF remains in the rest of the system.

To evacuate MF from a zone for maintenance, the isopentane liquid and vapor are removed using the VRMU and held in the storage tanks. Any remaining vapors are purged from the zone

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using nitrogen and passed through the VRMU. The unit is not opened to the atmosphere until the vapor concentration is less than 20% of the lower explosion limit for isopentane.

Despite efforts to minimize isopentane release during maintenance operations, some small portion of the MF will be emitted to the atmosphere when an OEC zone is opened. Maintenance isopentane emissions occur due to:

- dilute vapors that remain in the evacuation zone.
- liquid pooling that can occur in low points or adjoining pipes that cannot be drained.
- emissions from the VRMU that are not captured by the 99%+ efficient emission controls.

Purging of Non-Condensable Gases

Over time impurities build up in the MF. These impurities include non-condensable gases (NCGs) which decrease the operating efficiency of the units. NCGs are purged from the system using the VRMU.

During purging, vapors from the OECs pass through a knock-out drum and chiller to separate the condensable gases from NCGs. The remaining gases are passed through an activated carbon bed to collect hydrocarbons before being vented to the atmosphere. The Facility's current air permit requires the VRMU to achieve 95% hydrocarbon capture efficiency. Annual testing indicates the VRMU at the Facility achieves greater than 99% capture and recovery.

Fugitive Leaks

Fugitive isopentane emissions occur due to leaks from seals, flanges, pumps, valves, and other components. The MF is pressurized above atmospheric pressure, and the MF will leak out of the system due to the pressure differential at any location that is not completely sealed. Operators check for leaks and other signs of damage or equipment failure every shift. Isopentane is a volatile, flammable fluid and sensors are located throughout the Facility to detect flammable gases for safety reasons.

The isopentane storage tanks are a source of potential fugitive emissions, however they are typically only used to store fluid that needs to be evacuated from the OECs during maintenance. Most of the time they remain empty.

It is not feasible to measure fugitive emissions directly, but fugitive leaks can be quantified based on the addition of isopentane to the system to make up for the lost fluid. ORMAT tracks fluid additions, and the fluid additions that are not attributable to known non-fugitive cause are counted as fugitive emissions.

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Quarterly actual MF make-up additions during 2017 and 2018 range from zero to approximately 1,700 gallons per quarter. The reported quarterly emission rates vary from zero to 95 pounds per day. This variability is not necessarily reflective of actual changes in fugitive emission rates, rather that additions of MF to make up for fugitive losses occur irregularly, and don't occur every calendar quarter. Actual fugitive emission rates are more consistent than the quarterly MF additions data imply.

Effect of Proposed Changes on Isopentane Emission Rates

The proposed changes will replace six old OECs with two new units. This will reduce the number of total geothermal power units at the Facility from eight to four, which also reduces the number of potential locations for leaks and equipment failures (e.g. the number of seals, flanges, pumps, valves, etc.). The new, simpler setup is likely to reduce isopentane emissions from fugitive leaks and the occurrence of failures requiring maintenance.

The proposed OECs have a more advanced design than the units that are being replaced. They have been designed with the knowledge that ORMAT has gained over the nearly three decades since the old OECs were designed. The design improvements include methods to decrease fugitive losses of MF such as redundant seals on pumps, minimizing joints in the system, better construction materials, and reducing low points in the system that cannot be drained prior to evacuation for maintenance.

The combined MF volume for the existing OECs is 120,000 gallons. The MF storage tanks add another 30,000 gallons for a total of 150,000 gallons. After the proposed changes, the OEC volume will decrease to 111,000 gallons; and the total volume including tanks will increase to 171,000 gallons. The reduced system capacity (excluding tanks) will reduce maintenance and purging emissions, while the increase in total capacity (including tanks) has the potential to increase fugitive emissions of isopentane. Including the storage tanks in fugitive emissions estimate is a conservative assumption since the tanks remain empty most of the time.

2.3 Method for Estimating Emissions for Proposed Development

The proposed modifications to the Facility will only affect emissions of isopentane. No changes are proposed for the sources of particulate, combustion, and H_2S emissions at the Facility.

Potential isopentane emissions for the proposed changes to Heber 2 were estimated based on site-specific emission factors derived from previous actual emissions data. No known publicly available emission factors exist for the proposed OECs or similar processes. However, ORMAT has isopentane emissions data for the existing Facility. ORMAT reports isopentane emissions from the Facility to ICAPCD on a quarterly basis. This data was used to derive site-specific emission factors which can be applied to the proposed changes with a higher degree of confidence than if more general emission factors were located and applied.

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Two years of previous emissions data (2017 & 2018) were used to determine appropriate emission factors and estimate emissions from the proposed OECs. Reported isopentane emissions are categorized based on their cause: maintenance, purging of NCGs, and fugitive leaks. The site-specific emission factors for each category of isopentane emissions are listed in Table 3.

Table 3. Site-Specific Isopentane Emission Factors

Emission Category	Emission Factor Basis	Actual Isopentane Emissions (lbs / day)	Existing System Volume (gallons)	Site-Specific Emission Factor (lbs / day / 1,000 gal)
Maintenance	Worst-case quarter	22.5	120,000 (OECs)	0.19
Purging	Worst-case quarter	0.0034	120,000 (OECs)	2.8×10^{-5}
Fugitive	Worst-case quarter	95.0	150,000 (OECs & storage tanks)	0.63

Isopentane emission factors were estimated based on the worst-case quarterly emissions from the previous two years for each emission category (maintenance, purging, and fugitive). These emission rates were divided by the system MF volume so estimated emissions could be scaled to account for changes to the size of the system. For maintenance and purging emissions, the existing combined volume for the OECs (120,000 gallons) was used. For fugitive emissions the existing MF tanks volume (30,000 gallons) was included as well.

An emission reduction factor, shown in Table 4, was applied to the isopentane emission estimates for the proposed changes to account for the reduced complexity of the system. The reduction in total number of geothermal power units from eight to four results in a corresponding reduction in the number of turbines, seals, valves, flanges, pumps, etc., which are the locations for potential leaks and equipment failures. Having a few large units rather than several small units means less potential for equipment leaks and failures. This in turn reduces fugitive and maintenance emission rates. As a reasonable approximation, an emission reduction factor was applied, equal to the ratio of existing units to proposed units (8 units: 4 units) equating to a 50% reduction. This factor was not applied to purging emissions.

Note that the emission estimates for the proposed development remain conservatively high. This is a result of using the worst-case quarterly emissions for each category (maintenance, purging, and fugitive) when deriving the emission factors, plus the significant design improvements (better seals, design for ease of maintenance, etc.) which will reduce emissions but are not accounted for in the emission estimates.

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2.4 Estimated Emissions for Proposed Development

Isopentane emissions for the proposed changes to the Facility were estimated using the site-specific emission factors described above and are listed below in Table 4. Emissions of other pollutants are not expected to be affected by the proposed changes. More detailed emission calculations can be found in Appendix B.

Table 4. Estimated Worst-Case Isopentane Emissions After Proposed Changes

Emission Category	MF Volume After Changes (gallons)	Emission Factor (lbs / day / 1,000 gal)	Emission Reduction Due to Reduced Complexity	Isopentane Emissions (lbs / day)	Isopentane Emissions (tons / year)
Maintenance	111,000	0.19	50%	10.4	1.9
Purging	111,000	2.8×10^{-5}	0%	0.0	0.0
Fugitive	171,000 (includes tanks)	0.63	50%	54.1	9.9
Facility Total				64.5	11.8

The total estimated isopentane emission rate is 64.5 pounds per day, which is well below currently permitted emission rates, listed in Table 5. Although emissions are expected to decrease, ORMAT is proposing permitted emission rates slightly below the currently permitted levels to account for the variability in emissions.

Table 5. Current and Proposed Isopentane Emission Limits

Calendar Quarter	Permitted Isopentane Emissions (lbs / day) Current	Permitted Isopentane Emissions (lbs / day) Proposed
1st Quarter (Jan – Mar)	185	171
2nd Quarter (Apr – Jun)	137	137
3rd Quarter (Jul – Sep)	137	137
4th Quarter (Oct – Dec)	218	202

ORMAT is proposing a small reduction in the permitted emission rates for isopentane during the 1st and 4th calendar quarters. Emission rates during those two quarters tend to be higher because there is more planned maintenance activity during that half of the year. The two new OECs have a smaller total volume than the six old OECs they will replace; reducing total facility isopentane volume from 120,000 gallons to 111,000 gallons (excluding tanks). This is a 7.5% reduction in the total volume for the OECs at the facility. The smaller system volume will result in lower isopentane emissions for maintenance. ORMAT is requesting a reduction in the permitted emission rates, as shown in Table 5, for the two quarters with the highest maintenance activity of approximately 7.5% for each of those quarters.

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3.0 REGULATORY ANALYSIS AND PERMITTING

The Facility is a minor source for air pollution currently operating under PTO #2217A-4 issued by ICAPCD. This request for modification is being submitted as required under ICAPCD Rule 207. The facility is located in a nonattainment area for PM_{10}, $PM_{2.5}$, and ozone.

3.1 Rule Applicability

The following list summarizes the ICAPCD rules applicable to the requested changes to the Facility.

Rule 111 Equipment Breakdown
The Facility is required to comply with the notification and corrective action requirement described in Rule 111.

Rule 201 Permits Required
ORMAT is requesting to modify its existing Facility by decommission several pieces of existing, permitted equipment and upgrading with new units. These units have the potential to emit air pollutants and require an ATC and a PTO.

Rule 204 Applications
The Facility must submit an application to modify the current permit and provide the information required in the rule and requested by ICAPCD.

Rule 207 New and Modified Stationary Source Review
207(B) Definitions – Modification or Reconstructed Stationary Source
"A Reconstructed Stationary Source shall be treated as a new Stationary Source and not as a Modification." An analysis provided in Section 3.2 of this document demonstrates that the proposed changes to the Facility constitute a Modification rather than a Reconstructed Stationary Source.

207(C).1 Best Available Control Technology (BACT)
Application of BACT is required for new emission units that have the potential to emit 25 pounds per day or more of any non-attainment pollutant or its precursors. A BACT review for the new OEC units at the Facility is provided in Section 3.3.

207(C).2 Offsets
The Facility has the potential to emit more than 137 pounds per day of isopentane during the 1st and 4th quarters of the year and will continue to be required to purchase emission offsets.

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Rule 208 Permit to Operate
The ICAPCD may inspect the new equipment to confirm compliance with all requirements prior to issuing a PTO.

Rule 401 Opacity of Emissions
All emission sources at the Facility are subject to the opacity requirements in Rule 401.B.

Rule 403 General Limitations on the Discharge of Air Contaminants
Rule 403 establishes general emission standards for particulates and other pollutants that are applicable to emission sources at the Facility.

Rule 414 Storage of Reactive Organic Compound Liquids
The MF tanks store a reactive organic compound (ROC) with a vapor pressure greater than 0.5 pounds per square inch absolute (psia) and are therefore subject to the requirements of Rule 414. The existing and new tanks at the Facility satisfy the conditions of Rule 414 by utilizing a Vapor Recovery System with greater than 95% vapor loss control efficiency. Vapor pressure and other physical and chemical properties of isopentane are provided in the material safety data sheet in Appendix C.

Rule 417 Organic Solvents
Rule 417 applies to equipment that discharge organic solvents. The Facility uses isopentane as a process fluid and not as a solvent, although other applications for isopentane include use as an organic solvent. The applicant proposes that Rule 417 does not apply in this case because the facility does not "discharge" an organic solvent, such as by spraying onto a surface, but does have the potential for isopentane emissions as discussed above. Regardless of rule applicability, the proposed emission sources at the facility will utilize emission controls with greater than 85% capture and control efficiency and therefore satisfy the requirements of the rule.

3.2 Modification or Reconstruction Determination

The Re-Power Project will result in the replacement of several large pieces of equipment at the Facility. ICAPCD Rule 207 defines a Reconstructed Stationary Sources as "any Stationary Source undergoing physical Modification where the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost of a comparable entirely new Stationary Source."

The new equipment at the Facility include:

- Two (2) ORMAT Energy Converters
- Three (3) 10,000-gallon Motive Fluid Storage Tanks

Existing equipment that will not be modified or replaced include:

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- Two ORMAT Energy Converters
- Two (2) Six-Cell Cooling Towers
- Two (2) Three-Cell Cooling Towers
- John Zink Series 2000 Vapor Recovery Unit
- Three (3) 10,000-gallon Motive Fluid Storage Tanks
- Four (4) Diesel Emergency Engines
- Existing process infrastructure including underground and above ground isopentane and coolant piping, flanges, valves, pumps, etc.
- Existing electrical equipment to condition power and connect to the power grid

The cost of the new equipment will be less than 50% of the cost of a comparable entirely new stationary source.

3.3 BACT Review

ICAPCD Rule 207(C) requires the implementation of BACT emission controls for any new source that has the potential to emit 25 pounds or more of any nonattainment pollutant or its precursors. The new OEC units are subject to this requirement because they have the potential to emit more than 25 pounds per day of VOC, which is an ozone precursor. The Facility is in an area classified nonattainment for ozone.

The BACT review process requires the determination of BACT on a case-by-case basis. The required review and BACT determination for the Facility follows the guidelines from Chapter B of the U.S. Environmental Protection Agency (EPA) guidance document, *New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting, Draft.* The review was conducted using the following five steps:

1. Identification of all possible control technologies
2. Elimination of technologically infeasible technologies
3. Ranking of the technologies by control effectiveness
4. Evaluation of the most effective control technology with consideration of economic, energy, and environmental impacts
5. Selection of BACT

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The review process above is consistent with the South Coast Air Quality Management District's *Best Available Control Technology Guidelines*.

Two databases were searched for possible control technologies that could be used at the Facility: the California Air Resources Board Statewide BACT Clearinghouse (CARB SBC) and the EPA RACT/BACT/LAER Clearinghouse (RBLC). Search results are summarized below.

The RBLC does not contain any determinations for the past ten years under process type 99.019 "Geothermal Power". The CARB SBC does not have a process category for geothermal power. In the absence of BACT determinations for geothermal power sources, a search was performed for other sources with VOC emissions from hydrocarbon fluid processes using pipes, flanges, valves, pumps, etc.

The RBLC was searched for determinations in the last ten years under process type code 50 "Petroleum/Natural Gas Production and Refining" for VOC emission sources. These results were filtered to include processes with similarities to the Heber 2 facility. The "Process Name" field from the RBLC results was filtered to include only sources with the words "leak", "fugitive", "vent", "tank", or "maintenance". After filtering the results, 61 determinations remained. An additional determination was found by searching the CARB SBC for "Oil and Gas: Fugitive Components". The results are summarized in Table 6.

Table 6. VOC Control Options for Hydrocarbon Handling Processes

Control Technology	Number of Determinations	Maximum Reported Control Efficiency
Thermal oxidizer	7	99.9%
Wet scrubber	1	99%
Vapor recovery	1	99%*
LDAR	26	97%
Good equipment design	5	Not listed
Compliance with applicable federal or state rules	12	Not listed
Good operation practices	6	Not listed
No control specified or No add-on control	4	Not listed

*ORMAT operates vapor recovery units at Heber 2 and other facilities and routinely achieves isopentane recovery efficiencies of 99%or higher. No control efficiency was listed for the vapor recovery determination found in the databases.

Additional possible controls for VOC emissions are vapor condensers and carbon adsorption filters.

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Of the possible VOC control options, a thermal oxidizer, such as a flare, is not feasible for the Heber 2 facility. While it effectively controls VOC emissions, it generates NO_X emissions, which is also an ozone precursor, along with other pollutants from combustion. Thermal oxidation often requires additional fuel for complete combustion of the pollutant, which increases operating costs and emissions. Additionally, ORMAT desires to capture, condense and reuse the isopentane vapors rather than destroy them through oxidation.

Another technically infeasible control method is a wet scrubber. The only RBLC determination for a wet scrubber was to control methanol emissions. Methanol is highly water soluble, whereas isopentane is not. A wet scrubber cannot effectively control isopentane emissions.

Of the remaining options, leak detection and repair (LDAR) and vapor recovery are the most effective controls. ORMAT has selected to use both of these control methods for the isopentane emission sources at Heber 2. Operators will continue to check for leaks during each shift and leaks will be repaired as quickly as possible and in accordance with its current LDAR procedures. ORMAT currently operates a John Zink VRMU that is considered BACT and will use it to control emissions from the new units associated with the Re-Power Project. The VRMU is a vapor recovery device which includes a condenser to recover isopentane fluid and activated carbon filter to remove any remaining organic compounds before release to the atmosphere. The VRMU at Heber 2 as well as similar units ORMAT operates at its other facilities are tested regularly and show total recovery of isopentane exceeding 99% efficiency during purging and maintenance operations.

3.4 Air Toxics Health Risk Assessment

The Facility was evaluated to determine if there are health risks associated with the proposed changes to operations. The Air Toxics "Hot Spots" Information and Assessment Act (AB 2588) requires stationary sources of toxic air contaminants to estimate the potential cancer and non-cancer risks due to toxic air emissions. The proposed changes to the Facility will affect emissions of isopentane, which is a VOC.

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments, Appendix A lists all substances for which emissions must be quantified in a risk assessment. Isopentane has no known health risks and is not included in the list. Additionally, n-pentane and other similar substances, or larger groups of substances that include isopentane such as VOCs, are also not included in the list. Therefore, there are no quantifiable cancer or non-cancer public health risks associated with toxic air contaminant emissions from this project.

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Appendix A – Process Flow Diagram

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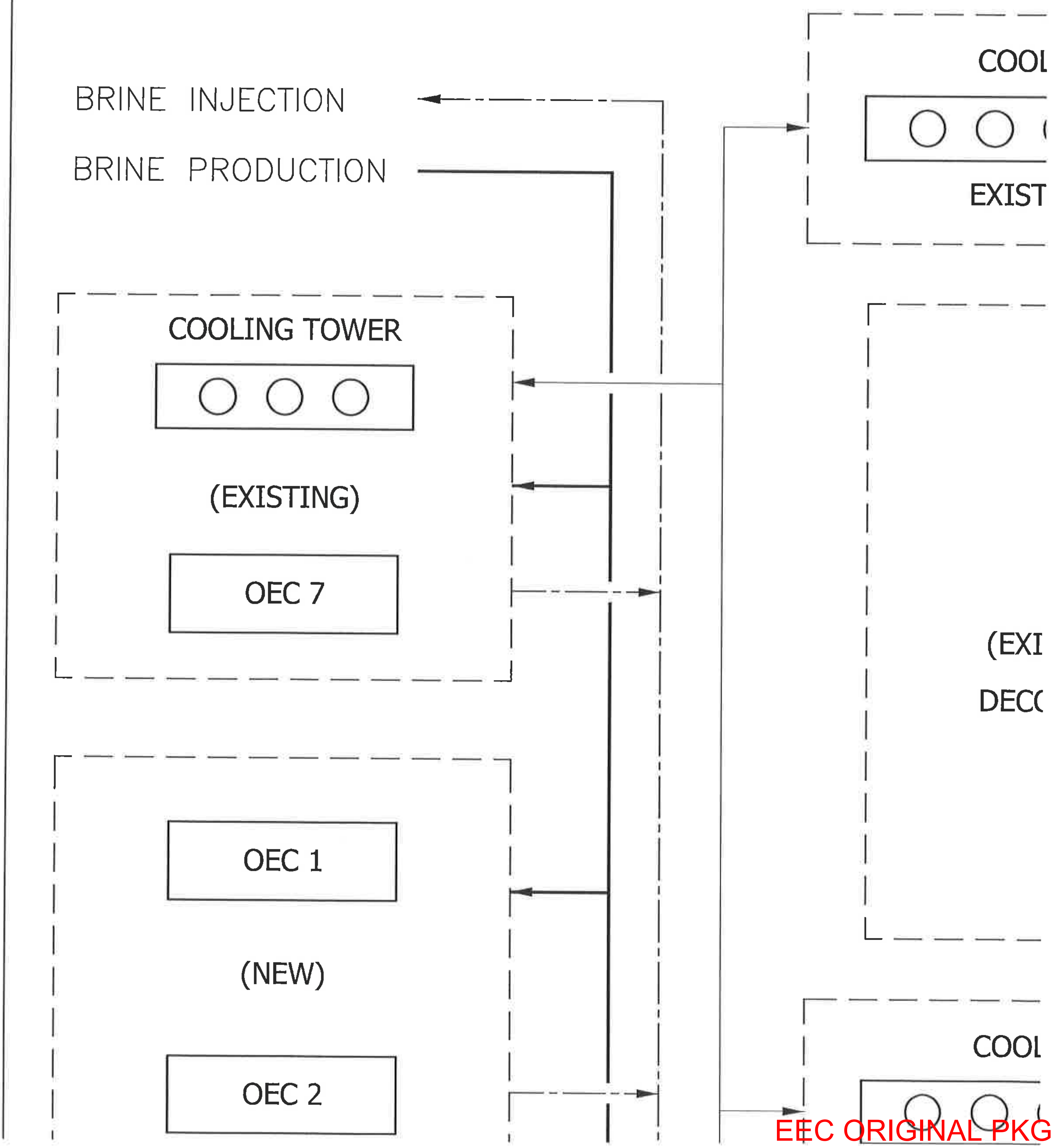
INTEGRATION OF HEBER II FACILITIES



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Appendix B – Emission Calculations

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Air Sciences Inc.	PROJECT TITLE: Ormat Heber 2	BY: J. Firebaugh
	PROJECT NO: 346-2	PAGE: 1 OF: 4 SHEET: Emis_Calcs
AIR EMISSION CALCULATIONS	SUBJECT: 2019 Re-Power Emissions	DATE: November 12, 2019

Ormat Heber 2: 2019 Re-Power Project - Facility-Wide Air Emissions Summary

Facility-wide Daily Emissions Estimate (lbs/day)

Emission Source	PM	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC[1]	Isopentane[1]
OECs + Motive Fluid Tanks							64.5	64.5
Cooling Towers	76.9	9.2	9.2					
Diesel Engines[2]	1.3	1.3	1.3	29.0	5.6	0.016	3.7	
Facility Total Emissions	78	10.5	10.5	29.0	5.6	0.016	68.2	64.5

[1]Isopentane emissions are reported separately, but they are also included in the VOC emission estimate.
[2]Daily diesel engine emissions are based on one hour per day for maintenance and testing.

Facility-wide Annual Emissions Estimate (tons/year)

Emission Source	PM	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC*	Isopentane*
OECs + Motive Fluid Tanks							11.8	11.8
Cooling Towers	14.0	1.7	1.7					
Diesel Engines	0.027	0.027	0.027	0.63	0.11	3.6E-4	0.068	
Facility Total Emissions	14.1	1.7	1.7	0.63	0.11	3.6E-4	11.8	11.8

*Isopentane emissions are reported separately, but they are also included in the VOC emission estimate.

Emissions Increase - Isopentane

	Facility Total Isopentane Emissions	
	lbs/day	*tons/year*
Previous Actual Emissions (worst-case, 2017-2018)	117.5	1.7
Projected Actual Emissions	64.5	11.8
Increase	-52.9	10.1

Isopentane Permitted Emission Limits - (Maintenance, Purging and Fugitive)

	Current Permit	Proposed Limits
	lbs/day	*lbs/day*
1st Quarter	185	171
2nd Quarter	137	137
3rd Quarter	137	137
4th Quarter	218	202

EEC ORIGINAL PKG

Air Sciences Inc. AIR EMISSION CALCULATIONS	PROJECT TITLE: Ormat Heber 2	BY: J. Firebaugh
	PROJECT NO: 346-2	PAGE: 2 OF: 4 SHEET: Emis_Calcs
	SUBJECT: 2019 Re-Power Emissions	DATE: November 12, 2019

Isopentane Emission Calculations

Emission Units

OEC / ITLU	Rating (MW, each)	# of Units	Gross Power MW (total)	MF Volume* gallons (total)	GF Flow Rate* gal/hr	Permitting Status
Heber 2	6	6	36.0	72,000		Will be shut down and replaced by new OEC-1 and OEC-2
Goulds 2	10	1	10.0	22,500		Existing - no change
Heber South	12	1	12.0	25,500		Existing - no change
OEC-1	23.6	1	23.6	35,000	12,200	New unit
OEC-2	14.5	1	14.5	28,000	12,200	New unit
MF Tanks	Size (gal, each)			gallons (total)		
Existing	10,000	3		30,000		Existing - no change
New	10,000	3		30,000		New tanks

* *MF is motive fluid (isopentane) and GF is geothermal fluid (brine)*

Actual Isopentane Emissions (Previous 2 Years)

		Maintenance		Purging		Fugitive		Facility Total	
	# of days	gallons	lbs/day	gallons	lbs/day	gallons	lbs/day	lbs/day	tons/year
2017 - 1st Qtr	90	300	17.2	0.02	0.001	1,636	94.1	111.3	
2017 - 2nd Qtr	91	240	13.6	0.04	0.002	123	7.0	20.7	
2017 - 3rd Qtr	92	400	22.5	0.05	0.003	1,616	90.9	113.4	
2017 - 4th Qtr	92	100	5.6	0.02	0.001	1,337	75.2	80.8	14.9
2018 - 1st Qtr	90	0	0.0	0	0.000	0	0.0	0.0	
2018 - 2nd Qtr	91	0	0.0	0	0.000	0	0.0	0.0	
2018 - 3rd Qtr	92	400	22.5	0.06	0.003	1,688	95.0	117.5	
2018 - 4th Qtr	92	250	14.1	0.02	0.001	770	43.3	57.4	8.0

Isopentane Density
620 mg/ml
0.00835 (lb/gal)/(mg/ml)
5.17 lb/gal

Site-Specific Isopentane Emission Factor Calculation

Previous 2 Years Emissions	Basis	Isopentane Emissions lbs/day	tons/year	Existing Isopentane Volume gallons	Units Included	Calculated Site-Specific Emission Factor
Maintenance	worst-case quarter	22.5	1.7	120,000	OECs	0.19 *(lb/day)/1,000 gal MF*
Purging	worst-case quarter	0.0034	0.0002	120,000	OECs	2.8E-5 *(lb/day)/1,000 gal MF*
Fugitive	worst-case quarter	95.0	0.0	150,000	OECs + MF tanks	0.63 *(lb/day)/1,000 gal MF*
Total		117.5	1.7			

Heber 2 Re-Power Isopentane Emission Estimate - After proposed changes

OEC Units & MF Tanks	MF Volume (new) gallons	Emission Factor (lb/day)/1,000 gal	Expected Reduction Due to Fewer Emission Units	Isopentane Emissions lbs/day	tons/year	Change in Emissions lbs/day	tons/year
Maintenance	111,000	0.19	50%	10.4	1.9	-12.1	0.2
Purging	111,000	2.8E-5	0%	0.0	0.0	0.0	0.0
Fugitive	171,000	0.63	50%	54.1	9.9	-40.8	9.9
Total				64.5	11.8	-52.9	10.1

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Air Sciences Inc.	PROJECT TITLE: Ormat Heber 2	BY: J. Firebaugh
	PROJECT NO: 346-2	PAGE: 3 OF: 4 SHEET: Emis_Calcs
AIR EMISSION CALCULATIONS	SUBJECT: 2019 Re-Power Emissions	DATE: November 12, 2019

Cooling Towers Emission Calculations (Existing - no change)

Site Data		Reference
Total solids in recirculating water	3,950 ppm	Heber 1 OEC-14 ATC Application
Water Density at 84.9 F	8.31 lb/gal	
Droplets larger than 10 µm	88%	Heber 1 OEC-14 ATC Application
Droplets larger than 2.5 µm	88%	Heber 1 OEC-14 ATC Application

Cooling Tower Emissions

	Water Flow		PM		PM_{10}		$PM_{2.5}$	
Description	*gal/min*	Drift Rate	*lb/day*	*ton/yr*	*lb/day*	*ton/yr*	*lb/day*	*ton/yr*
3-Cell Cooling Tower	41,250	0.0010%	19.50	3.56	2.340	0.43	2.340	0.43
3-Cell Cooling Tower	41,250	0.0005%	9.75	1.78	1.170	0.21	1.170	0.21
6-Cell Cooling Tower	63,000	0.0008%	23.82	4.35	2.859	0.52	2.859	0.52
6-Cell Cooling Tower	63,000	0.0008%	23.82	4.35	2.859	0.52	2.859	0.52
Total			76.9	14.0	9.23	1.7	9.23	1.7

EEC ORIGINAL PKG

Air Sciences Inc.	PROJECT TITLE: Ormat Heber 2	BY: J. Firebaugh
AIR EMISSION CALCULATIONS	PROJECT NO: 346-2	PAGE: 4 OF: 4 SHEET: Emis_Calcs
	SUBJECT: 2019 Re-Power Emissions	DATE: November 12, 2019

Diesel Engines Emission Calculations (Existing - no change)

Diesel Engines

Type	Engine Make & Model	Engine Power	Operating Hours	Emission Factors
Emergency Generator	Cummins KTA19G2	685 hp	50 hrs/yr	AP-42 Table 3.4-1, Existing Permit Limits
Fire Pump	Detroit Diesel DDFP-L6AT-7017V	305 hp	35 hrs/yr	AP-42 Table 3.3-1
Emergency Pump	John Deere 6090HF485	350 hp	50 hrs/yr	EPA Certification Data
Fire Pump	Clarke JW6H-UF40 (John Deere 6081HF001)	300 hp	35 hrs/yr	CA Tier 2, Fire Pumps

Emission Factors

Reference	PM	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC	Units
PTO #2217A-4 Emission Limits - Cummins KTA19G2				14.3	1.5			*lb/hr*
AP-42 Table 3.4-1 (Diesel engines >600hp)	7.0E-4	7.0E-4	7.0E-4	0.024	0.0055	1.1E-5	7.1E-4	*lb/hp-hr*
AP-42 Table 3.3-1 (Diesel engines <600hp)	0.0022	0.0022	0.0022	0.031	0.0067	1.1E-5	0.0025	*lb/hp-hr*
EPA Cert. Data for JD Family 6JDXL09.0102	0.10	0.10	0.100	3.5	0.50	0.0049	0.10	*g/kW-hr*
CA Tier 2, Fire Pumps (300 ≤ hp < 600)	0.15	0.15	0.15	4.8	2.6	0.0049	4.8	*g/hp-hr*

SO_2 Emission Factor Calculation (mass balance):

$$\frac{7{,}000\ \text{Btu}}{1\ \text{hp-hr}} \Bigg| \frac{1\ \text{lb diesel}}{19{,}300\ \text{Btu}} \Bigg| \frac{15\ \text{lb S}}{1{,}000{,}000\ \text{lb diesel}} \Bigg| \frac{1.998\ \text{lb SO2}}{1\ \text{lb S}} = \quad 1.09\text{E-05 lb } SO_2/\text{hp-hr}$$

Diesel Properties	Typical CI Engine BSFC (AP-42)	Units Conversions
15 ppm S (ULSD)	7,000 Btu/hp-hr	1.341 hp/kW
7.1 lb/gal (AP-42)		453.592 g/lb
19,300 Btu/lb (AP-42)		1.998 g SO_2/g S

Diesel Engine Emissions - Daily (lbs/day)

Type	Engine Make & Model	PM	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC
Emergency Generator	Cummins KTA19G2	0.5	0.5	0.5	14.3	1.5	0.0074	0.48
Fire Pump	Detroit Diesel DDFP-L6AT-7017V	0.7	0.7	0.7	9.5	2.0	0.0033	0.77
Emergency Generator	John Deere 6090H	0.1	0.1	0.1	2.0	0.29	0.0028	0.058
Emergency Pump	Clarke JW6H-UF40	0.1	0.1	0.1	3.2	1.7	0.0024	2.4
Total		1.3	1.3	1.3	29.0	5.6	0.016	3.7

*Daily diesel engine emissions are based on one hour per day for maintenance and testing.

Diesel Engine Emissions - Annual (tons/year)

Type	Engine Make & Model	PM	PM_{10}	$PM_{2.5}$	NO_X	CO	SO_2	VOC
Emergency Generator	Cummins KTA19G2	0.012	0.012	0.012	0.36	0.039	1.9E-4	0.012
Fire Pump	Detroit Diesel DDFP-L6AT-7017V	0.012	0.012	0.012	0.17	0.036	5.8E-5	0.013
Emergency Generator	John Deere 6090H	0.0014	0.0014	0.0014	0.050	0.0072	7.1E-5	0.0014
Emergency Pump	Clarke JW6H-UF40	0.0017	0.0017	0.0017	0.056	0.030	4.3E-5	0.041
Total		0.027	0.027	0.027	0.63	0.11	3.6E-4	0.068

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Appendix C – Material Safety Data Sheet for Isopentane

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South Hampton Resources

Isopentane

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

Revision Date: 4/05/2019 Date of Issue: 3/10/2019 Version: 4.0

Section 1. Substance name and company identification

1.1 Product identifier

Common name	Isopentane
Synonyms	2-Methylbutane
Chemical class	Alkane
REACH registration	This substance is derived from natural gas condensate and meets the criteria for exemption from REACH registration under Annex V.

1.2 Relevant identified uses of the substances or mixture and of the company/undertaking

Gasoline additive, solvent, blowing agent for polystyrene, chemical intermediate

1.3 Details of the supplier of the safety data sheet

Manufacturer

South Hampton Resources, Inc.
7752 FM 418 West
Silsbee, Texas 77656
USA
Tel: + 1 409-385-8300
E mail: customerservice@southhamptonr.com

EU Only Representative

TSGE
Concordia House, St James Business Park,
Grimbald Crag Court, Knaresborough,
North Yorkshire, HG5 8QB,
United Kingdom
Tel: +44 (0) 1423 799 633
Fax: +44 (0) 1423 797 804

1.4 Emergency telephone number

In case of emergency Tel. +1 703 527 3887 (CHEMTREC)

Section 2. Hazards Identification

2.1 GHS Classification

Flammable liquids, Category 1
Eye irritation, Category 2B
Specific target organ systematic toxicity-single exposure, Category 3
Aspiration hazard, Category 1
Chronic toxicity -- Category 2

2.2 GHS Label elements

Pictograms:

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Signal Word: Danger

Hazard Statements

H224 Highly flammable liquid and vapour
H304 May be fatal if swallowed and enters airways
H320 Causes eye irritation
H336 May cause drowsiness or dizziness.
H411 Hazardous to the aquatic environment, chronic toxicity -- Category 2
Toxic to aquatic life with long lasting effects.

Precautionary statements

P210 Keep away from heat/ sparks/open flames/hot surfaces. — No smoking.
P243+P240 Take precautionary measures against static discharge. Ground/bond container and receiving equipment.
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection
P301+P310+P331 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do NOT induce vomiting.
P403+P235 Store in a well-ventilated place. Keep cool. Keep container tightly closed
P370+P378 In case of fire: Use foam, carbon dioxide or dry powder for extinction.
P501 Dispose of product/container in accordance with all applicable regulations.

Section 3. Composition

Name	EC No	CAS No	Concentration
n-Pentane	203-692-4	109-66-0	1 w% min
Isopentane	201-142-8	78-78-4	99 w% max

Section 4. First Aid Measures

4.1 Description of first aid measures

Inhalation
If breathing difficulties, dizziness, or light-headedness occur when working in areas with high vapor concentrations, remove victim to fresh air. If victim experiences continued breathing difficulties, keep patient warm and at rest, and seek medical attention. If breathing stops, begin artificial respiration and seek immediate medical attention.

Skin contact
If this product comes into contact with the skin, wash with soap and water. Seek medical attention if irritation persists. Remove and wash contaminated clothing before re-use.

Accidental eye contact

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If this product comes into contact with the eyes, flush with large quantities of water for several minutes, while gently holding the eyelids open. Seek medical attention if irritation persists.

Ingestion
If this product is swallowed, DO NOT INDUCE VOMITING. Give small quantities (<250 ml) of water to drink. Never give anything by mouth to an unconscious person. Seek immediate medical attention

Notes to doctor/physician
Aspiration of solvent may cause chemical pneumonitis.

4.2 Most important symptoms and effects, both acute and delayed

Inhalation: isopentane may cause dizziness and drowsiness if inhaled, and high concentrations may result in central nervous system depression, and loss of consciousness.

Ingestion: Symptoms of ingestion may include nausea, vomiting, as well as symptoms of dizziness, drowsiness and central nervous system depression. If vomiting occurs, isopentane may be aspirated into the lungs, with a risk of chemical pneumonitis.

4.3 Indication of any immediate attention and special treatment needed

If ingested or inhaled seek medical attention immediately.

Section 5. Firefighting Measures

5.1 Extinguishing media

Small fires: Use foam, carbon dioxide or dry powder extinguisher.

Large fires: Use foam to extinguish fires. Water spray should not be used, as n-pentane is lighter than water and may form pools of burning liquid on top of water. Keep adjacent containers cool using water spray.

5.2 Special hazards arising from the substance or mixture

Isopentane is extremely flammable. Remove all sources of ignition. Vapors are heavier than air and may travel considerable distances to a source of ignition and flash back. Vapor/air mixtures may be explosive. Electrostatic discharges may cause fire and/or explosion.

5.3 Advice for fire-fighters

Wear positive pressure Self-Contained Breathing Apparatus.

5.4 Evacuation

If tank, rail car, or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions, also, consider initial evacuation for 300 meters (1/2 mile) in all directions.

Section 6. Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Remove all ignition sources and evacuate unnecessary personnel from the area. Ventilate the area if possible. Wear suitable protective clothing including solvent resistant gloves and coveralls. If vapor concentrations are high, respiratory protective equipment may be required. See section 8 for more information.

6.2 Environmental precautions

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Prevent entry into sewers and watercourses. If product enters sewers or watercourses, inform the appropriate environmental authorities.

6.3 Method for cleaning up

Small spills: Remove all ignition sources. Use non-sparking hand tools. Take precautions to avoid electrostatic discharge. Absorb spillage in a non-combustible absorbent, e.g. sand or vermiculite, and place in a suitable container for disposal.

Large spills: Remove all ignition sources. Use non-sparking hand tools. Contain spill and cover if possible to reduce evaporation. Transfer to a suitable container by mechanical means. Take precautions to avoid static discharge, e.g. by grounding containers, etc. Consider initial downwind evacuation for at least 300 meters (1,000 feet).

6.4 Reference to other sections

Refer to section 8 of SDS for personal protection details.

Section 7. Handling and Storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Use only in well ventilated areas. isopentane is extremely flammable. Avoid contact with all ignition sources, including hot surfaces. Take precautions to avoid electrostatic discharges, such as grounding of containers and equipment, and restricting flow rates. Vapors are heavier than air and may accumulate in low lying areas and below ground areas such as ducts and sewers.

7.2 Condition for safe storage, including any incompatibilities

Store in a well ventilated area, away from all ignition sources. If stored in drums, keep out of direct sunlight.

Section 8. Exposure Controls/Personal Protection

8.1 Control parameters

Substance	TWA	Source, Type
n-Pentane	1000 ppm,3000 mg/m^3	OSHA
n-Pentane	600 ppm,1800 mg/m^3	ACGIH
Isopentane	600 ppm,1800 mg/m3	ACGIH

8.2 Exposure controls

Ensure there is sufficient ventilation of the area. The floor of the storage room must be impermeable to prevent the escape of liquids. General mechanical ventilation may be sufficient to keep product vapor concentrations within specified time-weighted TLV ranges. If general ventilation proves inadequate to maintain safe vapor concentrations, supplemental local exhaust may be required. Other special precautions such as respiratory masks or environmental containment devices may be required in extreme cases.

Respiratory protection
Use only in well ventilated area. If high exposure levels are likely, then suitable respiratory protection will be required. Very high vapor concentrations may result in oxygen displacement and self-contained breathing apparatus or airline may be required.

Hand Protection

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Wear suitable chemical resistant gloves recommended for use with hydrocarbon solvent. Nitrile gloves may be suitable, but glove manufacturers' specifications should always be checked first. Natural rubber gloves are not suitable. Change gloves in accordance with manufacturer recommendations. If gloves are damaged during use, remove immediately and wash hands before replacing with new gloves.

Eye protection
Wear suitable eye protection, safety glasses or goggles, when handling this product.

Skin protection
Aprons or coveralls made of fire retardant material are recommended. These should be changed after use or if contaminated. Wash before re-use.

Section 9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance:	Colorless Liquid
Odor:	Gasoline-like odor
Molecular weight:	72
pH:	not applicable
Melting point/freezing point:	-256°F/-160°C
Approximate boiling range :	80-100°F/27-38°C
Flash point:	-70°F/-57°C
Evaporation rate:	not available
Flammability limits in air	
Lower:	1.4 v%
Upper:	8.3 v%
Reid vapor pressure at 100°F:	20.7 psia
Relative vapor density (Air=1.0)	2.6
Density at 60°F:	0.624 kg/l
Solubility in water:	negligible
Partition Coefficient: n-octanol/water:	2.72
Auto-ignition temperature:	788°F/402°C
Viscosity:	not available
Oxidizing properties:	none

Sources of Information:

1. Company product testing
2. Hawley's Condensed Chemical Dictionary revised by N. Irving Sax and Richard J. Lewis, and
3. CHRIS directory

Section 10. Stability and Reactivity

10.1 Reactivity

Stable under normal conditions.

10.2 Chemical stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

Hazardous polymerisation will not occur.

10.4 Conditions to avoid

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Keep away from sources of ignition.

10.5 Incompatible materials

This product is incompatible with strong oxidizing agents, strong acids and bases, and selected amines.

10.6 Hazardous decomposition products

None

Section 11. Toxicological Information

11.1 Information on toxicological effects

Acute Toxicity:
LC_{50} (Mouse) 450 mg/l/2 hour
Harmful when inhaled in high concentrations or ingested. n-pentane may cause dizziness and drowsiness if inhaled, and high concentrations may result in central nervous system depression, and loss of consciousness. Symptoms of ingestion may include nausea, vomiting, as well as symptoms of dizziness, drowsiness and central nervous system depression. If vomiting occurs, isopentane may be aspirated into the lungs, with a risk of chemical pneumonitis.
Irritation: isopentane can be irritating to the eye, may cause redness.
Corrosivity: Not corrosive
Sensitisation: Not known to be a sensitizer
Repeated dose toxicity:
NOAEL (90 day) 2250 ppm
Prolonged or repeated contact of this product will result in defatting of the skin, causing dryness and cracking.
Carcinogenicity: Not expected to be carcinogenic.
Mutagenicity: Not expected to be mutagenic
Toxicity for reproduction: Not expected to be toxic to reproduction.

Route of exposure: Inhalation and ingestion

Symptoms related to the physical, chemical and toxicological characteristics: isopentane may cause dizziness and drowsiness if inhaled, and high concentrations may result in central nervous system depression, and loss of consciousness. Symptoms of ingestion may include nausea, vomiting, as well as symptoms of dizziness, drowsiness and central nervous system depression. If vomiting occurs, isopentane may be aspirated into the lungs, with a risk of chemical pneumonitis.

Section 12. Ecological Information

GHS Classification:
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2
Toxic to aquatic life with long lasting effects.

12.1 Toxicity

EC50 (*Oncorhynchus mykiss,* rainbow trout) 3.1 mg/l (96 hour)
EC50 (*Daphnia magna*) 2.3 mg/l (48 hour)

Isopentane is classified as toxic to aquatic organisms and likely to cause long term effects in the environment.

Acute aquatic toxicity studies on samples of Isopentane show acute toxicity values greater than 1 mg/L and mostly in the range 1-10 mg/L. Isopentane will readily evaporate from the surface and would not be expected to have significant adverse effects in the aquatic environment.

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12.2 Persistence and degradability

Isopentane is readily biodegradable in aquatic systems, however, in view of its high evaporation rate, Isopentane is expected to volatilize rapidly from water sources into the atmosphere, where it will be degraded by photochemical reaction.

12.3 Bioaccumulative potential

The Log Kow value measured for Isopentane is 2.7 and it is expected to have a low potential for bioaccumulation.

12.4 Mobility in soil

Due to Isopentanes extreme volatility, air is the only environmental compartment in which this hydrocarbon will be found. In air, Isopentane can readily undergo photo degradation by reaction with hydroxyl radicals. The chemical half-life is approximately 4 days.

12.5 Results of PBT and vPvB assessment

No information available

12.6 Other adverse effects

No further details

Section 13. Disposal Considerations

13.1 Waste treatment methods

Recover and recycle product if possible. If recovery and recycling are not possible, isopentane may be disposed of by incineration.

Please follow all local, regional, national and international laws.

Section 14. Transport Information

14.1 UN number

1265

14.2 USDOT (United States Department of Transportation)(Domestic)

USDOT Proper Shipping Name: Pentanes
Hazard Classification: 3, Packing Group: 1
Label: Flammable Liquid
Placard: Flammable Liquid

14.3 IMO/IMDG (International Maritime Dangerous Goods)(Water)

IMO Proper Shipping Name: Pentanes
Hazard Classification: 3, Packing Group: 1
Label: Flammable Liquid

Special precautions for user: Container(s) greater than 5 liters (liquids) or 5 kilograms (solids), shipped by water mode and ALL bulk shipments may require the shipping description to contain the "Marine Pollutant" notation [49 CFR 172.203(l)] and the container(s) to display the [Marine Pollutant Mark] [49 CFR 172.322].

14.4 IATA (International Air Transport Association)

Proper Shipping Name: Pentanes
Hazard Classification: 3, Packing Group: 1
Label: Flammable Liquid

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14.5 ADR (Agreement on Dangerous Goods by Road (Europe))

Proper Shipping Name: Pentanes

Hazard Classification: 3, Packing Group: 1, Environmentally Hazardous

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

Section 15. Regulatory Information

15.1 Clean Air Act

- This product neither contains nor was it manufactured with any class 1 or class 2 ozone depleting substances.
- Under Section 112 (r), 40 CFR Part 68, the threshold quantity for both n-pentane and isopentane is 10,000 lbs.

15.2 Emergency Planning and Community Tight-To –Know Act (EPCRA)

- Section 302 - This product does not contain any constituents that are classified as an extremely hazardous substance.
- Section 311/312 (Tier II) - This product is considered a fire hazard and an acute health hazard.
- Section 313 - This product contains no toxic chemicals.

15.3 California Office of Environmental Health Hazard Assessment

- Proposition 65 - This product contains none of the chemicals which may cause cancer or birth defects as listed in this legislation.

15.4 Coalition of Northeast Governors (CONEG)

- This product contains no lead, mercury, cadmium, or hexavalent chromium.

15.5 New Jersey Right-to-Know

- Normal pentane and isopentane both appear on this state's hazardous substance list.

15.6 Pennsylvania Right-to-Know

- Normal pentane and isopentane both appear on this state's hazardous substance list.

15.7 Toxic Substance Control Act (TSCA)

- All constituents of this product are listed in TSCA.

15.8 Other Inventories

- The constituents of this product are known to be listed on the following country inventories:
  - **Canada (DSL)**
  - **Japan (ENCS)**
  - **Australia (AICS)**
  - **Phillipines (PICCS)**
  - **China (IECSC)**
  - **Korea (KECI)**

Section 16. Other Information

Hazard Ratings:

GHS:		NFPA:		HMIS:	
Health:	4	Health:	1	Health:	1
Flammability:	1	Fire:	4	Flammability:	4
Reactivity:	5	Reactivity:	0	Reactivity:	0

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Specific Hazard: None

The above information is believed to be correct as of the date hereof. However no warranty of merchantability fitness for any use or any other warranty is expressed or is to be implied regarding the accuracy of this data, the results to be obtained from the use of the material, or the hazards connected with such use. Since the information contained herein may be applied under conditions beyond our control and with which we may be unfamiliar, and since data made available subsequent to the data hereof may suggest modification of the information, we do not assume responsibility for the results of its use. This information is furnished on the condition that the person receiving it shall make his own determination as to the suitability of the material for his particular purpose and on the condition that he assume the risk of his use thereof.

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RECEIVED

NOV 18 2019

AIR POLLUTION CONTROL DISTRICT

ORMAT

November 15, 2019

VIA FedEx and Electronic Mail

Imperial County Air Pollution Control District
Attn: Israel Hernandez (israelhernandez@co.imperial.ca.us)
150 S. 9th Street
El Centro, CA 92243

RE: Heber 2 Repower Project
Application for Amendment to Authority to Construct Permit No. 2217A-4

Dear Mr. Hernandez,

Second Imperial Geothermal Co., a subsidiary of Ormat Nevada Inc., respectfully submits this application to amend ATC Permit No. 2217A-4 to support the repower activities at the Heber 2 facility. The repower involves replacing old equipment with new fewer units and better technology to increase the efficiency of the geothermal plant. We appreciate the APCD starting the review of this application while we proceed through the County Conditional Use Permit process.

If the Air Pollution Control District requires more information or has any questions regarding this application please feel free to contact me at 775.336.9029 Ext. 32288 or mwendt@ormat.com.

Best regards,

Mel R Wendt

Melissa R. Wendt
Director, Project Development
Ormat Nevada Inc.

EEC ORIGINAL PKG

150 SOUTH NINTH STREET
EL CENTRO, CA 92243-2850

TELEPHONE: (442) 265-1800
FAX: (442) 265-1799

IMPERIAL COUNTY CALIFORNIA 1907

AIR POLLUTION CONTROL DISTRICT

September 25, 2019

RECEIVED
SEP 25 2019
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

Mr. Jim Minnick
Planning & Development Services Director
801 Main St.
El Centro, CA 92243

SUBJECT: Condition Use Permit 19-0017—Second Imperial Geothermal Company (Ormat)

Dear Mr. Minnick:

The Imperial County Air Pollution Control District ("Air District") would like to thank you for the opportunity to review Conditional Use Permit (CUP) 19-0017 that would allow for the installation of two new water-cooled ORMAT Energy Converters; three 10,000 gallon isopentane above ground storage tanks; and, additional pipes to connect the proposed facilities with the existing Heber 2 Geothermal Energy complex ("Project"). The new energy converters will replace the existing six converters while the three new isopentane storage tanks will complement the existing two storage tanks. The Project location is located at 855 Dogwood Road in Heber (APN 054-250-031-000).

Upon review, the Air District reminds the applicant that it will need to submit an application for a Modification of a Permit to Operate to the Engineering & Permitting Division of the Air District. During this process the applicant can discuss the emissions from the equipment to be used in the construction and installation of the energy converters and storage tanks. The applicant must adhere to the Air District's Regulation VIII which is designed to mitigate PM10 emissions during construction. Additionally, the applicant needs to submit a Construction Dust Control Plan and notify the Air District 10 days prior to the start of any construction activities.

Finally, the Air District requests a copy of the Draft CUP prior to recording.

The Air District's rule book can be accessed via the internet at http://www.co.imperial.ca.us/AirPollution. Click on "Rules & Regulations" under "Resources" on the left side of the page. Should you have questions, please call our office at (442) 265-1800.

AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER

EEC ORIGINAL PKG

Sincerely,

Curtis Blondell

Curtis Blondell
APC Environmental Coordinator

Reviewed by Monica Soucier
APC Division Manager

EEC ORIGINAL PKG

150 SOUTH NINTH STREET
EL CENTRO, CA 92243-2850

TELEPHONE: (442) 265-1800
FAX: (442) 265-1799

IMPERIAL COUNTY CALIFORNIA 1907

AIR POLLUTION CONTROL DISTRICT

June 18, 2020

RECEIVED
JUN 15 2020
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

Mr. Jim Minnick
Planning & Development Services Director
801 Main St.
El Centro, CA 92243

SUBJECT: Notice of Intent for a Negative Declaration of Initial Study 19-0020 for Condition Use Permit 19-0017—Heber 2 Geothermal Energy Complex (Ormat)

Dear Mr. Minnick:

The Imperial County Air Pollution Control District ("Air District") would like to thank you for the opportunity to review Initial Study 19-0020 regarding Conditional Use Permit (CUP) 19-0017 (collectively called "Project"). The Project would install two new Ormat Energy Converters (OECs) to replace the six existing Integrated Two-Level Units (ITLU) which would be demolished or abandoned in place. Additionally, three 10,000-gallon isopentane above ground storage tanks will be installed, along with additional pipes to connect the proposed facilities with the existing Heber 2 Geothermal Energy Complex. An amendment to the existing CUP will renew the permitted life of the Heber 2 Geothermal Energy Complex (including the Goulds 2 and Heber South geothermal energy facilities) to 30 years (2019-2049). The Project is located at 855 Dogwood Road in Heber, California, also identified as APN 054-250-031-000.

Upon review, the Air District has no comments, but politely requests a copy of the Draft CUP prior to recording.

The Air District's rule book can be accessed via the internet at https://apcd.imperialcounty.org. Click on "Rules & Regulations" at the top of the page. Please contact the Air District offices at (442) 265-1800 if you have any questions.

AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER

EEC ORIGINAL PKG

Sincerely,

Curtis Blondell

Curtis Blondell
APC Environmental Coordinator

Reviewed by,
Monica Soucier

EEC ORIGINAL PKG

Gabriela Robb

From: Krug, Robert@DTSC <Robert.Krug@dtsc.ca.gov>
Sent: Friday, May 15, 2020 3:27 PM
To: Gabriela Robb
Subject: RE: 05 28 20 EEC Meeting

CAUTION: This email originated outside our organization; please use caution.

Hi Gabriela,
Please forward my comments to David Black, Planner IV on these two projects:

Assessment #19-0018: Applicant: (CED) Con Edison Clean Energy Businesses
We request that prior to the start of business operations that the facility informs the DTSC Imperial CUPA of their operations and whether they will have hazardous materials, hazardous waste, underground storage tanks, aboveground storage tanks, or be a CalARP facility. If so, they are not allowed to operate without a permit.

Assessment # 19-0020: Applicant: Second Imperial Geothermal
We require the facility to update their CERS account information with the modifications made at their facility. This must be done within 30 days of the modification.

Robert Krug
Supervisor / Senior Environmental Scientist
DTSC Imperial CUPA
627 Wake Avenue
El Centro, CA 92243
Robert.Krug@dtsc.ca.gov
(760) 336-8919 Work
(760) 457-7376 Cell

RECEIVED
MAY 15 2020
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

Subject: 05 28 20 EEC Meeting

Good morning,

Please see attached agenda for the May 28, 2020 EEC meeting.
In an effort to increase the efficiency at which information is distributed and reduce paper usage, the EEC Hearing Package is available by clicking on the following link:
http://www.icpds.com/?pid=7530

Thank you,

EEC ORIGINAL PKG

Gabriela Robb

From: Krug, Robert@DTSC <Robert.Krug@dtsc.ca.gov>
Sent: Tuesday, August 27, 2019 3:23 PM
To: Gabriela Robb
Subject: RE: Request for Review and Comments for Ormat CUP19-0017

CAUTION: This email originated outside our organization; please use caution.

Hi Gabriela,
Regarding Heber 2 Geothermal Repower Project – Amendment to Conditional Use Permit No. 06-0006:
The DTSC Imperial CUPA requests that if Second Imperial Geothermal Company (SIGC) is currently regulated by the DTSC Imperial CUPA, that they update their California Environmental Reporting System (CERS) information when their activities and Haz Mat inventory changes. If they are just starting their business, then they need to evaluate their inventory for any Hazardous Materials (HM), if they will have any Hazardous Wastes (HW), if there will be any petroleum Aboveground Storage Tanks (ASTs) or Underground Storage Tanks (USTs), and lastly if they exceed the thresholds for the California Accidental Release Program (CalARP). If they determine they do have HM or HW as part of their business operation, then they need to notify the DTSC Imperial CUPA and we will evaluate and assist them in what they need to do, which will include creating a CERS account and the payment of annual CUPA fees. Any determination on their part is subject to validation by the DTSC Imperial CUPA, which may consist of an inspection of the facility and sampling wastes for HW criteria.
Bob

Robert Krug
Supervisor / Senior Environmental Scientist
DTSC Imperial CUPA
627 Wake Avenue
El Centro, CA 92243
Robert.Krug@dtsc.ca.gov
(760) 336-8919 Work
(760) 457-7376 Cell

RECEIVED
AUG 27 2019
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

From: Gabriela Robb <GabrielaRobb@co.imperial.ca.us>
Sent: Tuesday, August 27, 2019 2:58 PM
Subject: Request for Review and Comments for Ormat CUP19-0017

Good afternoon commenting agencies,

Please see attached Request for Review and Comments regarding CUP19-0017 as submitted by Second Imperial Geothermal Company/Ormat.
Comments are due by Thursday, September 26, 2019.

Should you have further questions, feel free to contact assigned planner, David Black at (442) 265-1736 Ext. 1746.

Thank you,

Gabriela Robb
Office Assistant III

EEC ORIGINAL PKG

ADMINISTRATION / TRAINING
1078 Dogwood Road
Heber, CA 92249

Administration
Phone: (442) 265-6000
Fax: (760) 482-2427

Training
Phone: (442) 265-6011

IMPERIAL COUNTY CRASH RESCUE FIRE

OPERATIONS/PREVENTION
2514 La Brucherie Road
Imperial, CA 92251

Operations
Phone: (442) 265-3000
Fax: (760) 355-1482

Prevention
Phone: (442) 265-3020

RECEIVED
SEP 19 2019
IMPERIAL COUNTY
PLANNING & DEVELOPMENT SERVICES

September 18, 2019

RE: Conditional Use Permit #19-0017
Ormat, 855 Dogwood Road, Heber CA 92249 APN: 054-250-031

Imperial County Fire Department would like to thank you for the chance to review and comment on CUP #19-0017 for Ormat Facility Refurbishment, equipment installation, removal of existing facilities.

Imperial County Fire Department has the following comments and/or requirements for the Ormat Geothermal facility.

Comment received is requesting 3 additional 10,000 gallon isopentane above ground storage tanks will be installed adjacent to the existing 2 10,000 gallon isopentane above ground storage tanks.
Isopentane is highly flammable liquid that fire behavior can be highly volatile and vapors may explode when mixed with air. The amount of propose storage and the location rises concerns for Imperial County Fire Department and the surrounding community of Heber. The Emergency Response Guide:
Excerpt from <u>ERG Guide 128</u> [Flammable Liquids (Water-Immiscible):
As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions.
LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet).
FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2016)
Firefighting
Fire Extinguishing Agents Not to Be Used: Water may be ineffective
Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide (USCG, 1999)
These precautions are required to be followed for all incidents including fire involving hazardous materials. To adequately protect the Imperial County Fire Department staff, facility staff, and citizens of the community of Heber and Imperial County ICFD is requesting the following mitigations measures:

- A certified fire protection engineer survey and analysis of current and proposed fire suppression and detection equipment be performed to evaluate the current systems performance and coverage of protection. Evaluate propose fire suppression and detection equipment in conjunction with existing equipment. A full report of findings must be provided to Imperial County Fire Department for review
- Isopentane leak or fire will require a large scale evacuation area and create a large scale hazardous material incident with a large operational zone. To minimize potential extremely dangerous condition to firefighters and hazardous material teams Imperial County Fire Department is requiring that a Drone be purchase for Imperial County Fire

Department. The final cost, details, and equipment of the drone shall be determined prior the issuance of the building permit.

- Isopentane fire will require a large amount of dry chemical, foam or carbon dioxide to be effective in firefighting as water may be ineffective. For Imperial County Fire Department to be effective in our firefighting effort for the amount of storage Imperial County Fire Department is requiring a foam unit sized and equipment for the storage of isopentane be purchase for Imperial County Fire Department. The final cost, details, and equipment of the foam unit shall be determined prior the issuance of the building permits.
- All isopentane above ground storage tanks shall be protected by approved automatic fire suppression equipment. All automatic fire suppression shall be installed and maintained to the current adapted fire code and regulation.
- An approved automatic fire detection system shall be installed as per the California Fire Code. All fire detection systems shall be installed and maintained to the current adapted fire code and regulations.
- Fire department access roads and gates will be in accordance with the current adapted fire code and the facility will maintain a Knox Box for access on site.
- Compliance with all required sections of the fire code.
- Applicant shall provide product containment areas(s) for both product and water run-off in case of fire applications and retained for removal.

Imperial County Fire Department reserves the right to comment at a later time as we feel necessary.

If you have any questions, please contact the Imperial County Fire Prevention Bureau at 442-265-3020 or 442-265-3021.

Sincerely
Andrew Loper
Lieutenant/Fire Prevention Specialist
Imperial County Fire Department
Fire Prevention Bureau

Robert Malek
Deputy Chief
Imperial County Fire Department

EEC ORIGINAL PKG

Kimberly Noriega

From:	Ben Pogue <bpogue@ce.solutions>
Sent:	Saturday, June 6, 2020 9:53 AM
To:	Andrew Loper
Cc:	David Black; Melissa Wendt; Sergio Cabanas; Shlomi Huberman
Subject:	Heber 2 Geothermal Repower Project - Hazard Assessment

CAUTION: This email originated outside our organization; please use caution.

Good morning Lieutenant Loper,

I am following up on behalf of the Second Imperial Geothermal Co. (ORMAT) on your question regarding the analysis area for the Heber 2 Hazard Assessment (HA). As we understood, your question was why the HA used a 0.33 mile analysis area, as opposed to a 0.5 mile analysis area. I reached out to the consultant (Risk Mgt. Professionals) who performed the HA, and they provided the response below. We wanted to close the loop with you on this issue and I'd be glad to coordinate an online meeting or conference call to discuss if you have further questions. Thank you Lt. Loper, please let us know if this information resolves the issue and, if not, how you would like to proceed and I'll coordinate on this end.

Best regards, Ben

From HA Consultant:
For the alternative release scenario, the CalARP and EPA RMP regulations do not assign a radius for the alternative release scenario – the regulations only state the following regarding the alternative release scenario:

- CalARP Regulations (19 CCR § 2750.4) / EPA RMP Regulations (40 CFR §68.28):
  - (a) The owner or operator shall identify and analyze at least one alternative release scenario for each regulated toxic substance held in a covered process(es) and at least one alternative release scenario to represent all flammable substances held in covered processes.
  - (1) For each scenario required under section (a), the owner or operator shall select a scenario:
    - (A) That is more likely to occur than the worst-case release scenario under Section 2750.3;
    - (B) That will reach an endpoint offsite, unless no such scenario exists; and
    - (C) That will reach a public receptor, unless no such scenario exists.

There is not a prescribed distance the regulations assign. If you are a county within LEPC Region I (Los Angeles, Orange, San Luis Obispo, Santa Barbara, and Ventura Counties), there is a requirement that if the alternative release scenario radius is less than 0.5 miles, a map displaying a 0.5 mile radius with a list of sensitive receptors outlined on the map with the name, address and telephone number of each sensitive receptor is required. However, the Heber 2 facility is within Imperial County, which is part of LEPC Region VI. If the CUPA would like us to prepare a map in accordance with these LEPC Region I requirements, we will be happy to do so for you. Please let me know.

Ben Pogue, PMP, AICP
Director of Environmental Planning & Natural Resource Management
CELL (503) 477-2792 EMAIL bpogue@ce.solutions
WEBSITE www.ce.solutions

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Heber Public Utility District

1078 Dogwood Rd. Suite 103 • PO Box H
Heber CA 92249
Tel:(760)482-2440 • Fax (760)353-9951
www.heber.ca.gov

Mr. David Black, Planner IV
Imperial County Planning and Development Services
801 Main Street
El Centro, CA 92243

RE: COMMENT LETTER REGARDING CONDITIONAL USE PERMIT (CUP) #19-0017 HEBER II PROJECT

Dear Mr. Black:

Thank you for allowing us the opportunity to provide comments regarding the above-referenced project. The District understands the proposed amendment for the existing CUP #06-0006 to allow the installation of two (2) new water-cooled ORMAT Energy Converters and three (3) additional Isopentane above ground Storage Tanks. The proposed project is located within Heber Public Utility District's Sphere of Influence. The following comments are offered:

1. **Hazard Assessment:** The project description on the Request for Review and Comment Letter identifies the installation of three (3) additional isopentane storage tanks to be located adjacent to the existing two (2) isopentane storage tanks at 10,000 gallons each. The Hazard Assessment in the Mitigated Declaration is based on the release of a single 10,000-gallon isopentane tank. This same report states that the potential catastrophic failure of one of three 10,000-gallon isopentane tanks would have an impact of 0.3 miles, or 1,584 feet. There are residential units located within 3,500 feet to the northeast of the isopentane tanks. Please clarify how the release of three (3) additional isopentane tanks would affect the other adjacent tanks causing additional release and the impact that would occur.

2. **Miscellaneous:** ORMAT's internal pipelines are located within close proximity to Heber Public Utility District's (HPUD) domestic water pipeline along Dogwood Road, directly east of the project site. It is important to note that hot water running through ORMAT's pipeline has caused one of our pipelines, located on Pitzer Road, to burst. We encourage measures to be implemented for the proposed project to ensure protection for HPUD's domestic water pipeline.

3. **Annexation:** HPUD encourages and recommends the annexation of said property to be incorporated in HPUD's Boundary.

Once again, we thank you for the opportunity to comment. Should you have any questions, please feel free to contact me at (760)482-2440 or via email at lfischer@heber.ca.gov.

Sincerely,

Laura Fischer

Laura Fischer
General Manager

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COUNTY OF IMPERIAL
DEPARTMENT OF PUBLIC WORKS
155 S. 11th Street
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ICDPW

September 18, 2019

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PLANNING & DEVELOPMENT SERVICES

Mr. Jim Minnick, Director
Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Attention: David Black, Planner IV

SUBJECT: **CUP 19-0017 for Second Imperial Geothermal Company / Ormat;** Located on 855 Dogwood Road, Heber, CA. APN 054-250-031-000

Dear Mr. Minnick:

This letter is in response to your submittal received by this department on August 27, 2019 for the above mentioned project. The applicant is requesting a facility refurbishment, equipment installation and removal of existing facilities.

Department staff has reviewed the package information and the following comments shall be Conditions of Approval:

1. Prior to the issuance of grading, building, and encroachment permits, corner record is required to be filed with the county surveyor for monuments:

   8771. (b) When monuments exist that control the location of subdivisions, tracts, boundaries, roads, streets, or highways, or provide horizontal or vertical survey control, the monuments shall be located and referenced by or under the direction of a licensed land surveyor or licensed civil engineer legally authorized to practice land surveying, prior to the time when any streets, highways, other rights-of-way, or easements are improved, constructed, reconstructed, maintained, resurfaced, or relocated, and a corner record or record of survey of the references shall be filed with the county surveyor.

2. Prior to Certificate of Occupancy, a second corner record is required to be filed with the county surveyor for monuments:

   8771. (c) A permanent monument shall be reset in the surface of the new construction or a witness monument or monuments set to perpetuate the location if any monument could be destroyed, damaged, covered, disturbed, or otherwise obliterated, and a corner record or record of survey shall be filed with the county surveyor prior to the recording of a certificate of completion for the project. Sufficient controlling monuments shall be retained or replaced in their original positions to enable property, right-of-way and easement lines, property corners, and subdivision and tract boundaries to be reestablished without devious surveys necessarily originating on monuments differing from those that currently control the area.

3. An encroachment permit shall be secured from the Department of Public Works for any and all new, altered or unauthorized existing driveway(s) to access the property through surrounding County Roads.

4. The applicant shall provide a drainage letter that takes into account the prevention of storm event run-off and sedimentation of damage to off-site properties and county road right-of-way(s).

5. Dogwood Road is classified as Prime Arterial - Six (6) lanes divided, requiring one hundred sixty four feet (164) of right of way, being eighty two (82) feet from existing centerline. It is required that sufficient right of way be provided to meet this road classification. **As directed by Imperial County Board of Supervisors per Minute Order #6 dated 11/22/1994 per the Imperial County Circulation Element Plan of the General Plan).**

INFORMATIVE:

The following items are for informational purposes only. The Developer is responsible to determine if the enclosed items affect the subject project.

- All solid and hazardous waste shall be disposed of in approved solid waste disposal sites in accordance with existing County, State and Federal regulations (Per Imperial County Code of Ordinances, Chapter 8.72).

- All on-site traffic areas shall be hard surfaced to provide all weather access for emergency vehicles.

- The project may require a National Pollutant Discharge Elimination System (NPDES) permit and Notice of Intent (NOI) from the Regional Water Quality Control Board (RWQCB) prior to County approval of onsite grading plan (40 CFR 122.28).

- As this project proceeds through the planning and the approval process, additional comments and/or requirements may apply as more information is received.

- A Transportation Permit may be required from road agency(s) having jurisdiction over the haul route(s) for any hauls of heavy equipment and/or large vehicles which impose greater than legal loads on riding surfaces, including bridges. (Per Imperial County Code of Ordinances, Chapter 10.12 – Overweight Vehicles and Loads).

Should you have any questions, please do not hesitate to contact this office. Thank you for the opportunity to review and comment on this project.

Respectfully,

By:

John A. Gay, PE
Director of Public Works

CY/dm

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P:\PRIVATE PROJECTS ADMIN\2) PRIVATE PROJECTS\CUP\19-0017 Second Imperial Geothermal Company - Ormat (facility refurbishment)\CUP 19-0017 (draft).doc

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Of Counsel

**Not admitted in California. Licensed in Colorado.*

SACRAMENTO OFFICE

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November 18, 2020

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PLANNING & DEVELOPMENT SERVICES

Via Email Submission

Chairman Jim Minnick and Committee Members
Environmental Evaluation Committee
Imperial County
801 Main Street
El Centro, CA 92243
Email: JimMinnick@co.imperial.ca.us; icpdscommentletters@co.imperial.ca.us

David Black, Planner IV
Email: DavidBlack@co.imperial.ca.us

Re: **Assessment #19-0020: Second Imperial Geothermal; Negative Declaration for the Heber 2 Geothermal Repower Project (SCH No. 2020069002; CUP No. 19-0017)**

Dear Chairman Minnick and Committee Members, Mr. Black:

On behalf of California Unions for Reliable Energy ("CURE"), we submit these comments regarding Environmental Evaluation Committee ("EEC") Assessment #19-0020: Second Imperial Geothermal, including the Initial Study/Negative Declaration ("IS/ND") for the Heber 2 Geothermal Repower Project ("Project"). We urge the EEC to revise the IS/ND and recirculate it as an Environmental Impact Report ("EIR") to give the public and the County an opportunity to accurately assess the Project's significant environmental impacts.

The Staff Report submitted to the EEC recommends that the IS/ND be recirculated as a Mitigated Negative Declaration ("MND") to account for several impacts that are potentially significant unless mitigated, including impacts to biological resources, geology and soils, and health risks related to the Project's three new 10,000-gallon above-ground isopentane storage tanks. We concur that the Project poses potentially significant hazardous materials and public health risks from the proposed storage of isopentane, an extremely volatile and highly flammable liquid, as well as potentially significant impacts to biological resources and geology and soils, and that the IS/ND must be recirculated as a new CEQA document for further public assessment and comment. However, an MND is inadequate to address all of Project's potentially significant impacts, many of which were not analyzed at all, or were inadequately analyzed, in the IS/ND. The IS/ND also failed to include supporting evidence for many of its conclusions about the Project's air quality, valley fever, geologic and biological resources impacts. An EIR must be prepared and circulated for additional public comment to address these remaining inadequacies in the IS/ND. The EIR must include a detailed analysis which fully discloses the scope and severity of the Project's potential impacts to public health and the environment and must incorporate feasible and enforceable mitigation measures to minimize these risks to the greatest extent feasible.

On August 31, 2020, we submitted written comments on the IS/ND, supported by the technical comments of air quality and hazardous materials expert Phyllis Fox, Ph.D., PE and biological resources expert Shawn Smallwood, Ph.D.[1] Dr. Fox and Dr. Smallwood provided substantial evidence supporting a fair argument that the Project was likely to have numerous potentially significant impacts that were not adequately disclosed, analyzed, or mitigated in the IS/ND. The Staff Report did not directly respond to any of our comments. The Responses from the Applicant ("Responses"), address some of our comments, though not in any meaningful level of detail. Furthermore, both of the comment letters from Dr. Fox and Dr. Smallwood, went unanswered. Dr. Fox and Dr. Smallwood have provided letters indicating that the Staff Report and Responses lack evidence for their conclusions and calling for preparation of an EIR. We request that the County provide responses to all of our comments in an EIR.[2]

The Responses that do purport to address our comments lack any substantial evidence that the Project will not result in significant impacts, and fail to address the substantial evidence submitted by our experts. The Responses are largely non-responsive, and fail to provide the missing information, analysis, and mitigation called for in the entirety of our comment letter. Furthermore, the Responses are inconsistent with the revised MND that Staff recommends be adopted by the County. The revised MND, for instance, found that the Project will have potentially significant impacts on biological resources and geology and soils, and recommends

[1] CURE's August 1, 2020 *Comments on the Negative Declaration for the Heber 2 Geothermal Repower Project (SCH No. 2020069002; CUP No. 19-0017)* are included in the Staff Report at Part 1, beginning at pdf. 71.
[2] Both Dr. Fox's and Dr. Smallwood's replies to the Staff Report and Responses are attached as **Attachment A** and **Attachment B**.

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mitigation measures to minimize these impacts. The Responses, however, state that the Project will result in no significant impacts in these areas. This is indicative of the lack of evidence for the conclusions made in both the Responses and the proposed MND, and underscores the necessity of an EIR to fully evaluate the Project's impacts.

Among the issues itemized in our comment letter that have not been addressed by the Responses are:

- Construction emissions estimations are based upon incomplete baseline information and are therefore inaccurate. The ATC application indicates that the increase in isopentane emissions was calculated using only emissions from the third quarter of 2018. Baseline emissions must be based on an average over a period.
- Our expert, Dr. Fox, found that emissions from construction would be significant, while the IS/ND does not support the conclusion that construction emissions would not contribute significantly to regional violations of ambient air quality standards.
- An updated inventory of air quality emissions containing new figures and a memorandum summarizing these calculations was included in the Staff Report. Any new analysis must be circulated as part of an EIR, not simply attached to the Staff Report.
- The Project may result in significant impacts to public health through valley fever. The IS/ND acknowledges that measures must be taken to avoid risks to worker safety and public health, but disguises these measures as "voluntary" practices undertaken by the applicant, thus failing to acknowledge a potentially significant risk that requires mitigation and the circulation of an EIR.
- The Project may result in significant impacts to biological resources, including six migratory bird species. The Staff Report acknowledges this, and includes several new mitigation measures in an attempt to minimize the potential impacts, but the Responses fail to disclose the impact as significant. Both the mitigation measures, and an updated analysis which discloses the severity of the impact, should be included in an EIR that is recirculated for public review to allow for meaningful consideration of their adequacy.
- The Responses fail to acknowledge that the Project may result in potentially significant impacts to geology and soils. The IS/ND

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explained that withdrawing geothermal fluid creates localized ground subsidence. Dr. Fox's comments explained that inflation and subsidence, if not controlled, can have adverse geologic impacts on farming operations, irrigation systems, roads, bridges and municipal sewer piping. The Responses are inconsistent with the revised MND, which recommends the preparation of a geotechnical investigation of the Project site prior to approval of a grading or building permit to minimize the potentially adverse effects due to the Project's location in a seismically active valley. As these adverse effects have the potential to be catastrophic, an EIR is required to properly assess mitigation.

- The Staff Report acknowledges that risks to public health and the environment involving the transport, use, and disposal of hazardous materials, as well as the risk of upset or accident involving these materials are potentially significant unless mitigated. Staff recommends incorporating mitigation measures that include protecting isopentane tanks with fire suppression equipment; installation of an automatic fire detection system; equipping tanks with water-suppression systems and flame and gas detectors; constructing a blast wall between isopentane tanks #4 and #5; and more. Due to the catastrophic nature of any adverse effects resulting from upset or accident involving hazardous materials, an EIR assessing these mitigation measures should be circulated.

While we agree with Staff that the IS/ND must be recirculated for additional public comment and to include mitigation measures to address impacts from several potentially significant impacts, we urge the Committee to require the County to prepare an EIR to sufficiently consider these impacts. We reserve the right to file comments on any revised CEQA document.

Sincerely,

Kendra Hartmann
Christina Caro

KDH:ljl
4847-015j

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ATTACHMENT A

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Phyllis Fox, Ph.D., PE
745 White Pine Ave.
Rockledge, FL 32955

November 18, 2020

Dear Ms. Hartmann,

I have reviewed the Staff Report and Responses to Comments ("Responses") on the Initial Study/Negative Declaration ("IS/ND") for the Heber 2 Geothermal Repower Project. While I agree that the IS/ND must be recirculated for further public review and comment, it must be revised as an environmental impact report ("EIR"), not a mitigated negative declaration ("MND").

Though Staff did not respond directly to my comment letter, some of the recommended revisions in the IS/ND, as well as some of the responses submitted by the Applicant, peripherally address issues raised in my letter.

Hazard Assessment

First, the Staff Report contains a revised Hazard Assessment.[1] However, it fails to address my comments. However, this revised analysis fails to address the majority of the issues that I raised in my comments on this issue.[2] A hazard analysis must be based on the worst-case scenario. The revised analysis selected a vapor cloud explosion as the most appropriate type of accident. However, a BLEVE is the worst case release scenario for very flammable materials such as isopentane because it combines both the mechanical effects of an explosion and the thermal effects of a fire. Due to these dual effects, it is one of the most severe accidents that can happen and typically results in mortalities.

The revised Hazard Assessment failed to evaluate a worst-case scenario, a BLEVE. It incorrectly asserts, with no support, that "BLEVEs are generally considered unlikely events and were therefore not considered a probable event for the Offsite Consequence Analysis."

[1] ORMAT, Heber 2 Geothermal Power Generation Facilities, Heber, California, Hazard Assessment, October 16, 2020, Prepared by Risk Management Professionals, Inc.
[2] Fox Comments, Comment 8: Hazards.

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However, my comments documented many BLEVE accidents at similar facilities. My comments also demonstrated that the impact radius for BLEVEs is substantially higher (up to 68 times) than the impact radius for the vapor cloud explosion cases evaluated in the IS[3] and the revised Hazard Assessment in the Staff Report. Assuming a 68 times higher impact radius, an explosion at the Project's storage tank facility based on the revised analysis could extend 3.5 miles (0.052x68=3.5 miles) from the tanks,[4] impacting numerous sensitive receptors.[5]

Further, the revised Hazard Analysis failed to consider Imperial County's recently adopted "specific plan area" that covers the Heber Known Geothermal Resource Area (KGRA). The Heber Specific Plan allows commercial, residential, industrial, and other employment-oriented development in a mixed-use orientation, which currently includes geothermal uses. This plan could place many sensitive receptors close to the Project.[6] Heber's annual report discloses:[7]

> geothermal uses. Several of the landowners from whom we hold geothermal leases have expressed an interest in developing their land for residential, commercial, industrial or other surface uses in accordance with the parameters of the Heber Specific Plan Area. Currently, Imperial County's Heber Specific Plan Area is coordinated with the cities of El Centro and Calexico. There has been ongoing underlying interest since the early 1990s to incorporate the community of Heber. While any incorporation process would likely take several years, if Heber were to be incorporated, the City of Heber could replace Imperial County as the governing land use authority, which, depending on its policies, could have a significant effect on land use and availability of geothermal resources.

Finally, the revised hazard analysis only considered "offsite sensitive receptors." However, one of the most at-risk populations is on-site workers, emergency responders, the Applicant's office/control room/shop building at the power plant, and agricultural workers in the surrounding fields. The impacts to these workers are significant and unmitigated.

The Imperial County Fire Department had similar concerns and requested specific mitigation measures. The Staff Report asserts mitigation HAZ-1 addresses these concerns. However, HAZ-1 is silent on the Fire Department's concerns.[8]

While I concur that it is necessary to include measures to minimize the potential harm from an accident involving the storage of isopentane, which is an extremely volatile and highly flammable liquid, these mitigation measures are not sufficient to prevent such harm. My comment letter discussed the problems with considering the worst-case scenario from the hypothetical catastrophic failure of only one of the 10,0000-gallon isopentane tanks. The Project proposes to install three of these tanks. The Staff Report attaches a new Hazard Assessment. This is a new study which presents new information and analysis that must be presented in an EIR, not merely attached to the Staff Report. Moreover, my

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[3] Worst-case BLEVE/Vapor Cloud Explosion = 6.8 mi/0.1 mi = 68.

[4] Revised impact radius = (0.3 mi)(68) = 20 mi. Project impact radius of 0.3 miles from IS, pdf 311, Table 6.

[5] Fox Comments, p. 49 (The nearest sensitive receptors are about 0.66 miles to the northeast.)

[6] U.S. Securities and Exchange Commission, Form 10-K, Ormat Technologies, Inc., Fiscal Year Ended December 31, 2019; https://sec.report/Document/0001437749-20-004072/. See also: Ormat Technologies, Inc., 2019 Annual Report, pdf 77; http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_ORA_2019.pdf.

[7] See, e.g. Ormat Technologies, Inc., 2019 Annual Report, pdf 77; http://www.annualreports.com/HostedData/AnnualReports/PDF/NYSE_ORA_2019.pdf.

[8] Staff Report, pdf184

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preliminary review of the Hazard Assessment concludes that it remains inadequate because it fails to analyzes the impacts from all three tanks and continues to rely on the IS/ND's deficient worst-case release scenario. Due to the high risk to public health from these potential accidents, an EIR must be prepared and circulated to allow the public to review these impacts and mitigation measures.

Many more were not responded to at all, or provide inaccurate and cursory responses, including:

- Emissions of criteria pollutants such as NOx would be significantly higher depending on the equipment used during construction. Though the Applicant's responses state that the IS/ND checklist adequately describes the construction activities and equipment, neither the IS/ND nor its supporting Air Quality Report contain any information about which equipment will be used.
- The IS/ND did not include any supporting calculations for isopentane emissions estimates. Based on my calculations, as explained extensively in my comments on the IS/ND, these emissions are underestimated and will likely increase, not decrease, potentially resulting in a significant impact. The Responses do not provide evidence to support the County's conclusions.
- Operational air quality impacts from emissions of isopentane and other criteria pollutants will be significant. The IS/ND did not include supporting calculations for emissions estimates, and neither do the Responses.
- The IS/ND only estimates the change in ROG emissions for maintenance, purging, and fugitive components (valves, flanges, etc.) for the OEC units' emissions. The facility includes other equipment that emits pollutants, including four cooling towers, a vapor recovery unit, a diesel generator, and a fire pump. These all variously emit ROG, NOx, PM10, PM2.5, and HAPs. Because the facility is at the end of its useful life and is being repowered, it is reasonable to assume that the Heber 2 facility and all of this supporting equipment has not been operating at its design capacity in the baseline.
- The Project may result in significant impacts to public health, including increased incidence of valley fever, exposure to geothermal gases, increased emissions of hazardous air pollutants, and worsening air quality. The mitigation proposed in the Staff Report does not address Valley Fever spores, which are substantially smaller than the PM2.5 and PM10 emissions they were designed to control. My coments identify mitigation measures for Valley Fever developed by San Luis Obispo County specifically to control Valley Fever spores. The responses failed to acknowledge these important and essential mitigation measures.

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- Staff has recommended including in a mitigation measure in an MND to minimize the potential risks posed by upset and accident of hazardous materials related to the Project's three new 10,000-gallon above-ground isopentane storage tanks. The measure includes diking and impoundment of the isopentane tanks to minimize the magnitude and extent of a tank failure and relocating the tanks to prevent a catastrophic event.

Sincerely,

Phyllis Fox, Ph.D., PE

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ATTACHMENT B

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Shawn Smallwood, PhD
3108 Finch Street
Davis, CA 95616

Attn: David Black, Planner IV
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

18 November 2020

RE: Heber 2 Geothermal Repower Project

Dear Mr. Black,

I write to reply to responses to my comments on the Initial Study and Mitigated Negative Declaration (IS/MND) prepared for the proposed Heber 2 Geothermal Repower Project. I note that whereas the County responded directly to comments provided by CURE, those comments were summaries of my comments. My qualifications for providing expert comments were provided with my letter of 1 July 2020.

Comment IV.b. The IS/ND Fails to Accurately Describe Biological Conditions at the Project Site — the County failed to make a reasonable effort to describe baseline biological conditions, and account for sensitive species on the site.

County Response: As noted by CURE, a comprehensive records search for biological resources, vegetation, and sensitive species was performed to identify species that could occupy the project site and surrounding area. All databases used in this research (e.g., IPac, CNDDB, etc.) are managed by public agencies and serve as the standard for determining the biological community present in/near a project site. After a review of the records, a wildlife biologist performed a reconnaissance-level survey of the Project Site, concurring that the site is completely void of any habitat and sensitive species. These efforts were recorded and provided as an Appendix B to the CUP. For a site that is a "dirt lot" by CURE's own admission, and confirmed with site photographs and supporting technical documentation, a reasonable effort was made to describe the baseline biological conditions and potentially occurring sensitive species. Further, as provided in the CUP Amendment Application, the Environmental Protection Measures section, "pre-construction surveys would occur to ensure the absence of any sensitive species".

As provided in the CURE letter, a Google Earth snapshot of a common crow flying by the Project site does not constitute evidence that sensitive species are likely present (14 C.C.R. 15064(f).) As documented through verifiable database research and a site-specific survey (as provided in Appendix B of the CUP), the site does not contain suitable habitat and no sensitive species occur on the site. Further, due to the industrialized nature of the site, avian species are likely to avoid the site. Again, the Project site would be surveyed prior to construction to verify the absence of any special status species.

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Reply: In dismissing species occurrence data that are available on eBird, the response implies that use of data managed by public agencies — specifically iPac and CNDDB — "serve as the standard for determining the biological community present in/near a project site." However, CNDDB was never intended to determine the biological community at or near a project site. CNDDB appropriately posts the following disclaimer: "We work very hard to keep the CNDDB and the Spotted Owl Database as current and up-to-date as possible given our capabilities and resources. However, we cannot and do not portray the CNDDB as an exhaustive and comprehensive inventory of all rare species and natural communities statewide. Field verification for the presence or absence of sensitive species will always be an important obligation of our customers. Likewise, your contribution of data to the CNDDB is equally important to the maintenance of the CNDDB. ..." Similarly, iPac makes no claim of perfect knowledge of species occurrences at or near a site.

CEQA does not include such an exclusionary standard over which data sources ought to be used to inform decision-makers and the public of potential project impacts to biological resources. An important CEQA objective is to publicly disclose potential environmental impacts of a proposed project so that decision-makers and the public can make more informed decisions over whether and how to proceed with a proposed project. To meet this objective, CEQA does not require use of CNDDB and iPac as the sole data bases upon which to inform the public. Nor do detection survey guidelines for any particular species suggest relying solely on CNDDB or iPac for determining habitat suitability at a site. The response asserts exclusionary use of CNDDB and iPac as a false standard.

Public participation with decision-making over proposed projects is another important CEQA objective, and one to which the public can contribute via their observations of special-status species on or near a project site. Members of the public have eyes, too. Observations of the public can be just as informative — and more so — as those of professional biologists, especially when biologists commit very little time and effort toward detecting special-status species at a site. eBird is a compilation of observations of the public. It is administered competently by Cornell University Laboratory of Ornithology — the most respected ornithological organization in North America and a leading authority in the world. Hundreds of scientific papers based on eBird records have been peer-reviewed and published (https://ebird.org/science/publications). eBird not only serves as a highly useful source of information for predicting the occurrence likelihoods of special-status species, but it helps to meet CEQA's objective of public participation.

The response repeats the IS/ND's claim that the lack of vegetation on site prevents the occurrence of any special-status species. But the response also repeats the IS/ND's neglect of airspace as a critical habitat component of volant species. Species that fly do so in the airspace above ground regardless of whether the ground is covered in grass, scrub or a suppressed "dirt lot." Many of these species fly at night, and thus pay little attention to groundcover. However, some special-status species happen to prefer bare ground, such as California horned lark (Photos 1 and 2).

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Photos 1 and 2. *A pair of California horned larks at their breeding site on bare ground in April 2020, in an agricultural field where safflower and wheat were cultivated to either side. Photos by K. Shawn Smallwood.*

The response goes on to claim, "…as provided in the CUP Amendment Application, the Environmental Protection Measures section, "pre-construction surveys would occur to ensure the absence of any sensitive species." This claim falsely characterizes the purpose and capability of preconstruction surveys. As I explained in my comment letter of 1 July 2020, "…preconstruction surveys cannot verify the absence of any species, as verification of absence is not what preconstruction surveys are designed to achieve. Preconstruction surveys are surveys intended to detect and salvage readily detectable individuals before they are destroyed by heavy machinery. The only type of survey that can verify absence is a 'detection survey.' Detection surveys are intended for providing the best means of detecting a particular species and for supporting determinations of absence when the species has not been detected despite implementation of detection surveys. Detection surveys are also intended to inform preconstruction surveys and to inform mitigation planning. The protocols for detection surveys have been developed by experts on the species, usually in coordination with natural resource agencies."

The response mischaracterizes information I provided in my comment letter. According to the County, "…a Google Earth snapshot of a common crow flying by the Project site does not constitute evidence that sensitive species are likely present (14 C.C.R. 15064(f).)." The crow was not a crow, but rather 4 common ravens. Nor were the common ravens just flying by, but the series of images available on Google Earth revealed they had been perched on project buildings before taking off. These distinctions are important because, as was explained in my comment letter, common ravens are the most prolific removers of bird and bat carcasses from places where collision fatalities are deposited. Common ravens occur where they have learned food

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can be reliably found. Birds and bats that collide with powerblocks and fences and powerlines become reliable food sources for common ravens.

Comment VI.e. There is a Fair Argument that Special Status Species Could Occur in the Vicinity of the Project Site and Could be Adversely Affected by the Project – Avian fatality monitoring at nearby solar facilities show high levels of avian mortality.

County Response: See response above for Issue IV.b above. Additionally, as observed in the CUP project description, no new transmission lines (or solar facilities, as volunteered in the CURE comment) or changes to existing Heber 2 substation are proposed; therefore, baseline conditions would remain the same and the Project would not cause any significant impacts to avian species.

Reply: The proposed project would cause significant impacts to avian species, as amply demonstrated by fatality monitoring data collected in both Imperial County and neighboring counties (Smallwood 2020). In my comment letter of 1 July 2020, I predicted that after 30 years of operations of the existing structures and proposed new structures, the accumulated collision fatalities would total about 13,050 birds and 930 bats. In its response, the County does not dispute my predictions. Instead, the response characterizes the ongoing collision and entanglement mortality as baseline conditions that would remain unchanged for 30 more years. Whereas in 1992 little was known of the impacts to wildlife caused by powerblocks, fences and powerlines, the proliferation of solar energy projects and the wildlife fatality monitoring performed at those projects have provided the bases for predicting wildlife fatalities at the project that would be modified as proposed and operated for another 30 years. The project's impacts would be substantial, and significant.

Shawn Smallwood

Shawn Smallwood, Ph.D.

REFERENCES CITED

Smallwood, K. S. 2020. Comparison of bird and bat fatality rates among utility-scale solar projects in California. Report to undisclosed client.

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HEBER 2
DOCUMENTS & DATA

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Recorded in Official Records, Imperial County
Dolores Provencio
County Clerk / Recorder
P Public
4/25/2006
11:04 AM
IV
Doc#: 2006 – 020097
Titles: 1 Pages: 17
Fees 54.00
Taxes 0.00
Other 0.00
PAID $54.00

Please return to:

Imperial County Planning & Dev. Services Department
801 Main Street
El Centro, California 92243

AGREEMENT FOR CONDITIONAL USE PERMIT #06-0006 ORCAL/HEBER FIELD COMPANY

This Agreement is made and entered into on this 12th day of April 2006, by and between ORCAL/Heber Field Company, hereinafter referred to as Permittee, and the COUNTY OF IMPERIAL, a political subdivision of the State of California, (hereinafter referred to as "COUNTY").

RECITALS

WHEREAS, Permittee is the owner, lessee or successor-in-interest in certain land in Imperial County located south of State Highway 86, east of Dogwood Road, north of Willoughby Road, and southeast of the townsite of Heber, California, described as a portion of the East half of Tract 45, APN 054-250-036-000, 20 acres, Township 16 South, Range 14 East, SBB&M; and,

WHEREAS, Permittee has applied to the County of Imperial for a Conditional Use Permit #06-0006 ("Project") for the following expansion project which supercedes the previous CUP #04-0026);

GENERALCONDITIONS:

The "GENERAL CONDITIONS" are shown by the letter "G". These conditions are conditions that are either routinely and commonly included in all Conditional Use Permits as "standardized conditions and/or are conditions that the Imperial County Planning Commission has established as a requirement on all CUP's for consistent application and enforcement. The Permittee is hereby advised that the General Conditions are as applicable as the SITE SPECIFIC conditions.

G-1 GENERAL LAW:

The Permittee shall comply with all local, state and/or federal laws, rules, regulations, ordinances, and/or standards as they may pertain to the Project whether specified herein or not.

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G-2 PERMITS/LICENSES:

The Permittee shall obtain any and all local, state and/or federal permits, licenses, and/or other approvals for the construction and/or operation of the Project. This shall include, but not be limited to, local requirements for Health, Building, Sanitation, ICAPCD, Public Works, County Sheriff, Fire/Office of Emergency Services, Regional Water Quality Control Board, California Division of Oil, Gas and Geothermal Resources (CDOGGR), among others. Permittee shall likewise comply with all such permit requirements and shall submit a copy of such additional permit and/or licenses to the Planning & Development Services Department within 30 days of receipt, as deemed necessary.

G-3 RECORDATION:

This permit shall not be effective until it is recorded at the Imperial County Recorders Office and payment of the recordation fee shall be the responsibility of the Permittee. If the Permittee fails to pay the recordation fee within six (6) months from the date of approval, this permit shall be deemed null and void. The Planning & Development Services Department will submit the executed CUP to the County Recorder's office for recordation purposes.

G-4 CONDITION PRIORITY:

The Project shall be constructed and operated as described in the Conditional Use Permit application, and as specified in these conditions.

G-5 INDEMNIFICATION:

As a condition of this permit, Permittee agrees to defend, indemnify, hold harmless, and release the County, its agents, officers, attorneys, and employees from any claim, action, or proceeding brought against any of them, the purpose of which is to attack, set aside, void, or annul the permit or adoption of the environmental document which accompanies it. This indemnification obligation shall include, but not be limited to, damages, costs, expenses, attorneys fees, or expert witness fees that may be asserted by any person or entity, including the Permittee, arising out of or in connection with the approval of this permit, whether there is concurrent, passive or active negligence on the part of the County, its agents, officers, attorneys, or employees. This indemnification shall include Permittee's actions involved in construction, operation or abandonment of the permitted activities.

G-6 INSURANCE:

The Permittee shall secure and maintain liability in tort and property damage, insurance at a minimum of $1,000,000 or proof of financial responsibility to protect persons or property from injury or damage caused in any way by construction and/or operation of the permitted facilities. The Permittee shall require that proper Workers' Compensation insurance cover all laborers working on such facilities, e.g. during construction and maintenance, as required by the State of California. The Permittee shall also secure liability insurance and such other insurance as may be

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required by the State and/or Federal Law. Evidence of such insurance shall be provided to the County prior to commencement of any activities authorized by this permit, e.g. a Certificate of Insurance is to be provided to the Planning & Development Services Department by the insurance carrier and said insurance and certificate shall be kept current for the life of the permitted project. Certificate(s) of insurance shall be sent directly to the Planning & Development Services Department by the insurance carrier and shall name the Department as a recipient of both renewal and cancellation notices.

G-7 INSPECTION AND RIGHT OF ENTRY:

The County reserves the right to enter the premises to make appropriate inspection(s) and to determine if the condition(s) of this permit are complied with. The owner or operator shall allow authorized County representative(s) access upon the presentation of credentials and other documents as may be required by law to:

(a) Enter at reasonable times upon the owner's or operator's premises where the permitted facilities are is located, or where records must be kept under the conditions of the permit;

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit;

(c) Inspect at reasonable times any facilities, equipment, or operations regulated or required under the permit, and,

G-8 SEVERABILITY:

Should any condition(s) of this permit be determined by a Court or other agency with proper jurisdiction to be invalid for any reason, such determination shall not invalidate the remaining provision(s) of this permit.

G-9 PROVISION TO RUN WITH THE LAND/PROJECT:

The provisions of this project are to run with the land/project and shall bind the current and future owner(s), successor(s) of interest, assignee(s) and/or transferee(s) of said project. Permittee shall not without prior notification to the Planning & Development Services Department assign, sell or transfer, or grant control of project or any right or privilege therein. The Permittee shall provide a minimum of sixty (60) days written notice prior to such proposed transfer becoming effective. The permitted use identified herein is limited for use upon the permitted properties described herein and may not be transferred.

G-10 TIME LIMIT:

Unless otherwise specified within the specific conditions, this permit shall be limited to a maximum of three (3) years from the recordation of the CUP. The CUP may be extended for successive three (3) year period(s) by the Planning Director upon a finding by the Planning & Development Services Department that the project is in

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compliance with all conditions of the CUP as stated herein and any applicable Land Use regulation of the County of Imperial. Unless otherwise specified herein, no Conditional Use Permit(s) shall be extended for more than four (4) consecutive periods by the Planning & Development Services Department. If an extension is necessary, or is requested beyond fifteen (15) years, the Permittee shall file a written extension request at least sixty (60) days prior to the expiration of the Permit. Such an extension request shall include the appropriate extension fee, pursuant to the Land Use Ordinance, Title 9, Division 9, Section 90901.03 et. seq., General Planning fees. If the original approval was granted by the Planning Commission and/or the Board of Supervisors, such an extension shall only be considered by the approving body, after a noticed public hearing. Nothing stated or implied within this permit shall constitute a guarantee that an extension will be granted. An extension may not be granted if the project is in violation of any one or all of the conditions or if there is a history of non-compliance with the permit conditions.

G-11 COST:

The Permittee shall pay any and all amounts determined by the County Planning & Development Services Department to defray any and all cost(s) for the review of reports, field investigations, monitoring, and other activities directly related to the enforcement/monitoring for compliance of this Conditional Use Permit, County Ordinance or any other applicable law as provided in the Land Use Ordinance, Section 90901.03 et. seq, General Planning fees. All County Departments, directly involved in the monitoring/enforcement of this project may bill Permittee under this provision, however said billing shall only be through and with the approval of the Planning & Development Services Department.

G-12 REPORTS/INFORMATION:

If requested by the Planning Director, Permittee shall provide any such documentation/report as necessary to ascertain compliance with the Conditional Use Permit. The format, content and supporting documentation shall be as required by the Planning Director.

G-13 DEFINITIONS:

In the event of a dispute the meaning(s) or the intent of any word(s), phrase(s) and/or conditions or sections herein shall be determined by the Planning Commission of the County of Imperial. Their determination shall be final unless an appeal is made to the Board of Supervisors within the required time, i.e. ten (10) calendar days, pursuant to the Land Use Ordinance, Title 9, Division 1, Chapter 4, Section 90104.05, Appeal from Decision.

G-14 MINOR AMENDMENTS:

The Planning Director may approve minor modifications to the Permit to accommodate minor changes or modifications to the design, construction, and/or operation of the Project provided said changes are necessary for the project to meet

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other laws, regulations, codes, or conditions of the CUP and provided further, that such changes will not result in any additional environmental impacts.

G-15 SPECIFICITY:

The issuance of this permit does not authorizes the Permittee to construct or operate the Project in violation of any state, federal, local law nor beyond the specified boundaries of the project as shown the application/project description/permit, nor shall this permit allow any accessory or ancillary use not specified herein. This permit does not provide any prescriptive right or use to the Permittee for future addition and or modifications to the Project.

G-16 NON-COMPLIANCE (ENFORCEMENT & TERMINATION):

Should the Permittee violate any condition herein, the County shall give notice of such violation. If Permittee does not act to correct the identified violation, and after having given reasonable notice and opportunity, e.g. typically at least thirty (30) days, the County may revoke the permit.

(a) If the Planning Commission finds and determines that the Permittee or successor-in-interest has not complied with the terms and conditions of the CUP, or cannot comply with the terms and conditions of the CUP, or the Planning Commission determines that the permitted activities constitute a public nuisance, the Planning Director shall provide Permittee with notice and a reasonable opportunity to comply with the enforcement or abatement order.

(b) If after receipt of the order (1) Permittee fails to comply, and/or (2) Permittee cannot comply with the conditions set forth in the CUP, then the matter shall be referred to the Planning Commission for permit modification suspension, or termination, or to the appropriate prosecuting authority.

G-17 GENERAL WELFARE:

All construction, drilling, testing, and operations shall be conducted with consistency with all laws, conditions, adopted County policies, plans and the application so that the project will be in harmony with the area and not conflict with the public health, safety, comfort, convenience, and general welfare.

G-18 PERMITS OF OTHER AGENCIES INCORPORATED:

Permits granted by other governmental agencies in connection with the Project are incorporated herein by reference. The County reserves the right to apply conditions of those permits, as the County deems appropriate; provided however, that enforcement of a permit granted by another governmental agency shall require concurrence by the respective agency. Permittee shall provide to the County, on request, copies and amendments of all such permits.

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G-19 HEALTH HAZARD:

If the County Health Officer determines that a significant health hazard exists to the public, the Health Officer may require appropriate measures and the Permittee shall implement such measures to mitigate the health hazard. If the hazard to the public is determined to be imminent, such measures may be imposed immediately and may include temporary suspension of permitted activities, the measures imposed by the County Health Officer shall not prohibit the Permittee from requesting a special Planning Commission meeting, provided Permittee bears all related costs.

G-20 EMPLOYMENT:

The Permittee shall use to the maximum extent possible local labor from Imperial County for both construction and operation of said project. Permittee shall give priority to the extent allowed by law to applicants from Imperial County. This provision shall apply to all levels of employment at the site from Senior Management, Technical to Laborer (collectively the work force). At a minimum, Permittee shall seek to secure 50% of the work force from Imperial County residents (County residents being defined as anyone who has resided within the County for at least 120 days). In the event Permittee is unable to meet this requirement due to lack of qualified applicants, a comprehensive report shall be provided to the Planning & Development Services Department. Said report shall include the description of position(s), the number and origin of all applicants, the reasons that Permittee cannot comply. In the event compliance cannot be attained, this matter shall be brought to the Planning Commission for direction and/or modification.

G-21 APPROVALS AND CONDITIONS SUBSEQUENT TO GRANTING PERMIT:

Permittee acceptance of this permit shall be deemed to constitute agreement with the terms and conditions contained herein. Where a requirement is imposed in this permit that Permittee conduct a monitoring program, and where the County has reserved the right to impose or modify conditions with which the Permittee must comply based on data obtained therefrom, or where Permittee is required to prepare specific plans for County approval and disagreement arises, the Permittee, operator and/or agent, the Planning Director or other affected party, to be determined by the Planning Director, may request that a hearing be conducted before the Planning Commission whereby they may state the requirements which will implement the applicable conditions as intended herein. Upon receipt of a request, the Planning Commission shall conduct a hearing and make a written determination. The Planning Commission may request support and advice from a technical advisory committee. Failure to take any action shall constitute endorsement of staff's determination.

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SITE SPECIFIC CONDITIONS:

S-1 AUTHORIZED SCOPE OF ACTIVITIES:

The Permittee has constructed and operated the following facilities in compliance with the County's General Plan, Geothermal/Transmission Element, Land Use Ordinance, and former CUP #04-0026, and all other applicable local, state, and federal laws, ordinances, regulations and standards:

(a) A production island containing eleven (11) wells;

(b) Piping from the wells to the power plant and from the plant to the injection islands;

(c) An injection island containing eight (8) wells and additional injection island containing two (2) wells;

(d) Pumps, tanks, valves, controls, flow monitoring, and other necessary appurtenances to the above wells and pipelines;

(e) Construct and maintain the proposed injection pipeline from Heber Geothermal Company (Heber 1) geothermal power plant to the Second Imperial Geothermal Company (Heber 2) injection facilities;

(f) Operation of pumps, valves, and other control mechanisms, associated with
the pipeline, flow monitoring and other necessary appurtenances to the above.

The proposed project will be constructed, operated and maintained as follows:

(a) Drill an injection well on the HGC production island, drill a blowdown well, and construct a one and one-half mile (1 1/2 mile) long 6" below-ground pipeline to transport brine from the HGC power plant to the Second Imperial Geothermal Company area;

(b) Except as specifically authorized in this permit to complete the above activities, supplemental activities which require additional major equipment or facilities will require separate permits. The County, in issuing this permit, in no way assures or otherwise vests any right, with respect to the issuance of a permit(s) for any supplemental activities and Permittee shall also comply with all applicable geothermal standards in the Land Use Ordinance.

S-2 AIR QUALITY AND DUST EMISSIONS:

The Permittee shall comply with the Imperial County Air Pollution Control District's (ICAPCD) air-monitoring criteria for PM-10 to control dust or other emissions by implementing the APCD Fugitive Dust Control conditions (Rule 800) and obtain an Authority to Construct and Amendment Permit to Operate prior to any

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construction/operation of any new or modified equipment or operation for the expansion project.

S-3 ARCHAEOLOGICAL, CULTURAL & PALEONTOLOGICAL RESOURCES:

The Permittee shall monitor the construction of expansion equipment and if any unusual specimens of bone, stone, or ceramic are discovered during construction of the permitted facilities, all construction affecting the discovery site, shall cease until a qualified archaeologist retained by the Permittee and approved by the County, reviews the specimens. The recommendations of the archaeologist shall be complied with prior to resuming construction.

S-4 BRINE CHEMISTRY:

Permittee shall conduct brine chemistry tests which shall include but not be limited to analysis for hydrogen sulfide, mercury, arsenic, fluoride, boron, ammonia, strontium, iron, zinc, barium, lithium, lead, copper, and chromium. The results of such tests shall be provided by the County upon request. To the extent information contained in test results are proprietary, such information shall not be released to the public

S-5 CONFORMITY:

The expansion project shall be designed, constructed, and operated in substantial conformance with the application.

S-6 CONSTRUCTION STANDARDS:

The expansion facilities shall be built in accordance with the County Building Code requirement applicable to "Seismic Zone 4". All structures and facilities shall be designed in accordance with the publication entitled "Recommended Lateral Force Requirements and Commentary by the Structural Engineers Association of California". The structural components of the permitted facilities shall be reviewed by the Building Official/Planning Director. Building permits shall be procured for the Project from the County prior to commencement of any construction.

S-7 EMERGENCY RESPONSE PLAN:

The existing Emergency Response Plan shall be maintained covering possible emergencies, e.g. blow-outs, major fluid spills, impacts due to earthquakes, and other emergencies. At all times, there shall be at least one employee "on call", i.e., available to respond to an emergency by reaching the facility within a short period of time, with the responsibility of coordinating all emergency response measures. The Emergency Coordinator shall be thoroughly familiar with all aspects of the Emergency Response Plan and have the authority to commit the resources needed to carry out the contingency plan. Adequate personnel and equipment shall be available to respond to emergencies and to insure compliance with the conditions of the permit, to include appropriate first aid provisions during project construction and operation with appropriate first aid training for project employees. The existing Hazardous Materials Business Plan submitted to the County Environmental Health

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Services Division, Health Department, shall be maintained by the Permittee and any applicable amendments provided as deemed necessary for this project.

S-8 GEOTECHNICAL:

Geotechnical investigations of soil characteristics affecting the expanded facilities shall be conducted by qualified people at the applicant's expense. The report therefrom shall be made available to the County on request.

S-9 GEOLOGIC HAZARDS:

No structure meant to be, or which actually is, regularly, habitually, or primarily, occupied by humans shall be placed across the trace of an active fault. Further, no such structure shall be placed within fifty (50) feet of the trace of an active fault, nor anywhere within a seismic special studies zone, unless a geologic report, satisfactory to the State Geologist, is prepared and shows that no undue hazard would be created by construction or placement of the structure.

S-10 NOISE:

Control measures shall include, but are not limited to, the following:

(a) Diesel equipment used for drilling within 1,000 feet of any residence shall have hospital-type mufflers. Well venting and testing at these wells shall be accompanied by the use of an effective muffling device or "silencer".

(b) Heavy truck traffic, well site preparation, and pipe stacking shall be limited to the hours of 7:00 a.m. and 7:00 p.m. for any wells within 1,000 feet of any residence.

(c) Hydroblasters used in descaling operations when used within 1,000 feet of a residence shall be limited to the hours of 7:00 a.m. to 7:00 p.m.

(d) The Permittee may propose and the Planning Director may approve modification of the above measures.

S-11 PROJECT DESIGN:

The following shall be followed in project design:

(a) All expansion loops in fluid lines shall be horizontal except where requested in writing by the owners of surface rights within five hundred (500) feet of a proposed expansion loop, or where design constraints require otherwise.

(b) Marking and lighting of drill rigs and permanent facilities shall be maintained in accordance with Federal Aviation Administration regulations.

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(c) On-site parking shall be provided for all employees, customers, clients, and visitors. All facility roads and parking areas shall be constructed and surfaced to County standards.

(d) Shrubs, trees and ground cover shall be planted and maintained to compliment the appearance of the project, in accordance with a landscaping plan approved by the Planning Director.

(e) Permittee shall submit architectural and landscaping plans, as required herein, for all facilities to be constructed as part of the project to the Planning Director, and shall receive the approval of said Director prior to the commencement of construction. The Director shall not unreasonably withhold approval of said plans.

(f) All lights shall be directed or shield to confine any direct rays to the site, and shall be muted to the maximum extent consistent with safety and operational necessity.

(g) The location of power pole lines adjacent to County roads shall be reviewed and approved by the Public Works Department prior to construction/installation of the power poles.

(h) The Planning Director may authorize minor relocation of the well sites, lines, and other minor adjustments to insure that the final facilities comply with the conditions of this permit and those required by other governmental agencies.

S-12 PROTECTION OF WILDLIFE:

Measures approved by the Planning Director shall be employed to discourage or prevent wildlife and avian entry into brine ponds. Well cellars shall be designed to prevent wildlife entry and entrapment. Pipelines shall be constructed so as not to become a barrier to wildlife movement.

S-13 REPORTING:

The Permittee shall furnish to the County, within a reasonable time, any relevant reports/information which the County requires for monitoring purposes to determine whether cause exists for revoking this permit, or to determine compliance with this permit, i.e. relevant reports are those defined within this Permit or requested by the County. The Permittee shall submit all required reports to the Planning Director, County Planning & Development Services Department, 801 Main Street, El Centro, CA 92243.

S-14 SUBSIDENCE:

Permittee shall participate in the County's subsidence detection program and, in connection therewith, submit a plan for Department of Public Works (ICPWD) approval, showing the proposed locations of benchmarks. Monuments shall connect with the County's geothermal subsidence detection network. Benchmarks installed

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shall conform to County standards. Surveying shall be performed to National Geodetic Survey (NGS) standards and all field surveying shall conform to such standards.

Permittee shall evaluate whether or not the recent abnormally high annual subsidence measurements may be continuing, or whether they may be the result of some mechanism not associated with geothermal operations and shall:

(a) Review the results of the precision level survey of the Heber subsidence monitoring network;

(b) Install and level as part of this new survey, a few additional subsidence monuments in the areas of greatest subsidence (near the intersection of Dogwood Road and Willoughby Road) at locations selected in consultation with ICPWD and CDOGGR.

(c) Within approximately six (6) months of this survey, a follow-up with another survey of the entire Heber subsidence monitoring network, including these new monuments;

(d) Prepare and submit to ICPBD, ICPWD, and CDOGGR, a specific plan for additional monitoring and the development of potential measures to mitigate (if determined necessary), the subsidence to uplift in the Heber geothermal field area which may be attributable to Project operations to include:

- Re-surveying at least the core sections of the Heber subsidence monitoring network every six (6) months;
- Continuing to re-survey the entire Heber subsidence monitoring network annually;
- Implementing a program to monitor selected key land surface features (such as major bridges and canal structures) for evidence of changes due to subsidence or uplift; and,
- Conducting geothermal reservoir modeling to evaluate what specific changes in the operation of the geothermal wellfield could be undertaken to alter the geothermal reservoir pressure distribution with the objective of reducing the rate of geothermal subsidence and/or uplift in the areas of greatest challenge.

(e) Monitor results of future surveys as per item (d) and, based on those results, develop a long term plan for submittal to ICPBD, ICDPW, and CDOGGR to reduce, or reverse if possible, any uplift in the Heber injection areas or any subsidence in the Heber production areas;

(f) Construct and operate, as soon as all the required permits and approvals have been obtained, the proposed expansion project.

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S-15 INDUCED SEISMICITY:

Permittee shall participate in the County's seismic monitoring program, and in connection therewith, submit a plan for Public Works Department approval, and shall implement the plan as approved. If evidence of detrimental seismicity induced by project operations is indicated, changes in operations, including possible cessation of operations, may be ordered by the Department of Public Works after consultation with the California Department of Oil, Gas and Geothermal Resources (CDOGGR) and Permittee.

S-16 SYSTEM SHUT DOWN AND SITE ABANDONMENT:

The Permittee shall prepare and implement a plan for when the operation of the permitted facilities herein authorized has ceased, that all HGC facilities shall be dismantled, and the land involved be made compatible with the surrounding uses, or as requested by the landowner and as agreed to by the County Planning Director. A Bond, or other acceptable surety, or other forms of security acceptable to Imperial County, in the amount of $500,000, in addition to any amount set by the California Division of Oil, Gas and Geothermal Resources, shall be filed with the County that guarantees restoration of the land to its condition prior to the injection pipeline development. Upon completion of such site restoration, the Bond or other surety shall be released by the County.

S-17 REINJECTION:

Fluids equivalent to 86% of produced fluids by mass, and on an annual basis, shall be injected back into the reservoir subject to the requirements of CDOGGR and information obtained from any monitoring programs and other sources.

If significant subsidence, loss of reservoir pressure, or other detriments attributable to this project occur, or substantial evidence of other undesirable changes in operations is revealed, corrective measures or changes may be ordered by the County. Corrective measures may be included, but are not limited to, a modified injection rate or altered injection depth, re-leveling of affected areas, or reduction or total cessation of geothermal activities.

S-18 SPILLS AND RUNOFF:

The expanded plant site shall be designed and constructed to prevent spills from endangering adjacent properties and waterways, and to prevent runoff from any source being channeled or directed in an unnatural way so as to cause erosion, siltation, or other detriments. A system of pressure and flow sensing devices and regular inspection of all lines, capable of detecting leaks and spills, shall be instituted and maintained. Blowout prevention equipment shall be used in accordance with the requirements of CDOGGR.

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S-19 MAINTENANCE OF WATER QUALITY:

A water quality monitoring program, acceptable to the Regional Water Quality Control Board (RWQCB) shall be instituted and maintained. If injection fluids intrude on shallow ground waters, a modification of the injection program may be ordered by the County in consultation with RWQCB and the Permittee. Any needed sumps and holding ponds shall be constructed and maintained so that permeability does not exceed 1 X 10-6 cm/sec.

S-20 TRAFFIC SAFETY:

The Permittee shall obtain all encroachment permits and consider traffic safety in transporting equipment and materials to the permitted facilities to include temporary signs warning motorists on adjacent roadways and flagmen shall be used when equipment is being brought to and from the Project site.

(a) The Permittee shall coordinate the movement of any required oversize loads on County roads with the DPW, on State Highways with CALTRANS as well as the El Centro CHP office and such transportation of oversized equipment should be minimized as much as possible.

(b) The Permittee shall be required to obtain any necessary rights-of-way on property under the lease and control of the Permittee and to provide any necessary road work as deemed necessary by the DPW.

(c) The Permittee shall coordinate with DPW for their requested dedication of rights-of-way needed for Pitzer Road for the consideration of existing and any future road needs.

(d) The Permittee shall file for an encroachment permit for any work or proposed work in the affected County road rights-of-way.

(e) The Permittee shall coordinate the maintenance of unpaved roads used for construction activities and obtain approvals from the County Department of Public Works.

S-21 WATER COURSE CROSSINGS:

The Permittee shall provide one or more of the following techniques to decrease the potential for spills on or near Imperial Irrigation District water courses, e.g. surface water canals and/or drains, as follows:

(a) Pipes shall be constructed of industrial standard designation of "extra heavy" with a thickness of at least 50% greater than that used for other sections of pipe.

(b) An automatic injection pump shut off and check valve system to immediately stop fluid flow shall be installed on the injection pipeline.

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(c) Design of facilities shall protect surface and groundwater, e.g. handling of on-site drainage shall not adversely affect adjacent properties.

(d) Other spill prevention measures approved by the County shall be implemented.

S-22 WASTE DISPOSAL:

The Permittee shall insure that any discharged wastes, liquid or solid, shall be disposed of in compliance with all appropriate local, state, and federal regulations, in effect or subsequently duly-enacted, i.e. discharge of wastes into surface water shall meet all requirements of the Regional Water Quality Control Board, e.g. National Pollution Discharge Elimination System permit restrictions, and solid wastes shall be disposed of in an approved solid waste disposal site in accordance with County regulations.

S-23 ODORS:

All harmful or noxious emissions and odors shall be controlled to insure that quantities of air contaminants released as a result of the facility operations do not exceed State standards, or constitute a public nuisance.

S-24 WATER USAGE:

The Permittee may use up to a total of 5,000 acre feet of irrigation water per year for up to five years from date of commencement of water usage. Any extension beyond the five-year period must be agreed to in writing by the Imperial Irrigation District. If the amount of water available to Imperial County is reduced by the Central Arizona project, the right to the irrigation water for the five years granted herein may be terminated. Permittee shall diligently pursue the development of alternate sources to replace the use of irrigation water.

S-25 PARTICIPATION IN GEOTHERMAL COMMITTEE:

Permittee shall participate in the "Geothermal Industrial Committee" formed by the County.

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S-26 ACCEPTANCE:

Acceptance of this permit shall be deemed to constitute agreement by Permittee with all terms and conditions herein contained.

NOW THEREFORE, County hereby issues the Conditional Use Permit #06-0006 and Permittee hereby accepts such upon the terms and conditions set forth herein.

IN WITNESS THEREOF, the parties hereto have executed this Agreement the day and year first written.

PERMITTEE

______________________________	______________________________
Gregory Griffith, Plant Manager ORCAL/Heber Field Company	Date

COUNTY OF IMPERIAL, a political subdivision of the STATE OF CALIFORNIA

______________________________	______________________________
Jurg Heuberger, AICP, CEP, CBO Planning Director	Date

EEC ORIGINAL PKG

S-26 ACCEPTANCE:

Acceptance of this permit shall be deemed to constitute agreement by Permittee with all terms and conditions herein contained.

NOW THEREFORE, County hereby issues the Conditional Use Permit #06-0006 and Permittee hereby accepts such upon the terms and conditions set forth herein.

IN WITNESS THEREOF, the parties hereto have executed this Agreement the day and year first written.

PERMITTEE

_______________________ 4/12/06

Gregory Griffith, Plant Manager — Date
ORCAL/Heber Field Company

COUNTY OF IMPERIAL, a political subdivision of the STATE OF CALIFORNIA

_______________________ _______________________

Jurg Heuberger, AICP, CEP, CBO — Date
Planning Director

EEC ORIGINAL PKG

PERMITTEE NOTARIZATION

Dated April 12, 2006

STATE OF CALIFORNIA

COUNTY OF Imperial } S.S.

On April 12, 2006 before me, Monica M. Leon a Notary Public in and for said County and State, personally appeared Gregory Griffith, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal

MONICA M. LEON
COMM. #1612967
Notary Public-California
IMPERIAL COUNTY
My Comm. Exp. Nov 12, 2009
ESI1

Signature [signature]

ATTENTION NOTARY: Although the information requested below is OPTIONAL, it could prevent fraudulent attachment of this certificate to unauthorized document.

Title or Type of Document Conditional Use Permit #06-0006
Number of Pages 17 Date of Document 4/12/06
Signer(s) Other Than Named Above ______

Dated ______

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RECEIPT

ORIGINAL COPY

RECEIPT NUMBER: R0600336

APD #: CUP06-0006 TYPE: CONDITIONAL USE PERMIT
SITE ADDRESS: 895 PITZER RD CNTY
PARCEL: 054-250-036-001
RECEIPT NOTATION:

TRANSACTION DATE: 02/13/2006

TOTAL PAYMENT:	5,500.00
TOTAL PAID FROM TRUST:	.00
TOTAL PAID FROM CURRENCY:	5,500.00

TRANSACTION LIST:

Type	Method	Description	Amount
Payment	Check	028528	5,500.00
		TOTAL:	5,500.00

ACCOUNT ITEM LIST:

Description	Account Code	Current Pmts
GENERAL PLAN TRUST T/M	7086000-301000	500.00
TIME & MATERIAL PLANNING	7004000-301000	5,000.00
	TOTAL:	5,500.00

RECEIPT ISSUED BY: IRISD INITIALS: ID
ENTERED DATE: 02/13/2006 TIME: 03:02 PM

This is your original copy of the receipt for funds received by the Imperial County Planning and Development Services Department for the above identified *PERMIT*.

Please make sure this receipt is accurate and reflects the payment amount and the permit information referenced.

If you request cancellation of your permit and/or a refund, please understand that we can only refund a maximum of 70% of the total minus all costs already incurred to date.

If you have questions please direct them to this office at (760) 482-4236.

Thank you for your cooperation!

Jurg Heuberger, AICP, CEP
Building Official / Director of Planning & Development Services

CC: Auditor/Controller
Permit File

Permitrc.doc

EEC ORIGINAL PKG

150 SOUTH NINTH STREET
EL CENTRO, CA 92243-2850

TELEPHONE: (442) 265-1800
FAX: (442) 265-1799

AIR POLLUTION CONTROL DISTRICT

May 25, 2016

Second Imperial Geothermal Co.
947 Dogwood Road
Heber, CA 92249

Dear Mr. Paolo Alvarado:

Enclosed please find amended conditions, authority to construct along with permit to operate **#2217A-4** for a geothermal power plant located at 855 Dogwood Rd., Heber, CA.

Please sign and date both copies of the permits and return our copies to our office.

If you have any questions regarding this permit, please do not hesitate to contact **Linda Cedillo at 442-265-1800.**

Sincerely,

Norma A. Amavizca

Norma A. Amavizca
Office Technician

R

EEC ORIGINAL PKG

150 SOUTH NINTH STREET
EL CENTRO, CA 92243-2850

TELEPHONE: (442) 265-1800
FAX: (442) 265-1799

AIR POLLUTION CONTROL DISTRICT

CONDITIONS FOR AUTHORITY TO CONSTRUCT AND PERMIT TO OPERATE #2217A-4

SECOND IMPERIAL GEOTHERMAL COMPANY
947 DOGWOOD ROAD
HEBER, CA 92249

LOCATIION: 855 DOGWOOD RD., HEBER, CA

A. General Conditions

A.1 Operation of this equipment shall be in compliance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.
(General Conditions)

A.2 Operation of this equipment shall be in compliance with all applicable APCD Rules and Regulations.
(General Conditions)

A.3 This Permit does not authorize the emissions of air contaminants in excess of those allowed by USEPA (Title 40 of the Code of Federal Regulation), the State of California Division 26, Part 4, Chapter 3 of the Health and Safety Code, or the APCD (Rules and Regulations).
(General Conditions)

A.4 This permit cannot be considered permission to violate applicable existing laws, regulations, rules or statutes of other governmental agencies.
(General Conditions)

B. Facility H2S Emission Limitation

B.1 The facility shall not discharge into the atmosphere in excess of 0.5 lbs/hr of hydrogen sulfide.
(ICAPCD Rule 207)

AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER

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C. Isopentane Emissions

C.1 Under all normal operating conditions (maintenance, VRU purging, and fugitive daily emissions), the total isopentane emissions shall not exceed 185 lbs/day during the first quarter (January thru March), and 137 lbs/day second (April thru June) quarter and 137 lbs/day third (July thru September) quarter; from the entire facility, as determined by normal inventory and mass balance procedures.
(ICAPCD Rule 207)

C.2 Fourth quarter (October thru December) isopentane emissions shall not exceed 218 lbs/day.
(Permit Application; ICAPCD Rule 207)

C.3 Purging Emissions

C.3.a All non-condensable gas purging of any ORMAT Energy Converter (OEC) and/or Integrated Two-Level Unit (ITLU) shall be conducted through the Vapor Recovery Unit (VRU). The purging of gases through the VRU to the atmosphere shall be conducted only after the separation process of non-condensable gases and isopentane gases is completed. Purging of non-condensable gases to the atmosphere shall be conducted in a manner to minimize entrainment of isopentane gases with non-condensable gases.
(ICAPCD Rule 207; Permit Application)

C.3.b Isopentane emissions occurring during normal purging events shall be considered part of the daily average isopentane emissions for the total isopentane loss for the reporting quarter.
(ICAPCD Rule 207)

C.4 Maintenance Emissions

C.4.a The APCD shall be notified by telephone or fax at least 48 hours prior to the time which an OEC and/or ITLU containing isopentane will be opened to the ambient air for scheduled maintenance.
(ICAPCD Rule 207; Permit Application)

C.4.b Unscheduled maintenance and repairs of an OEC and/or ITLU containing isopentane may be conducted without prior APCD notification.
(ICAPCD Rule 207; Permit Application)

C.4.c Prior to conducting any scheduled or unscheduled maintenance or repairs to any OEC and/or ITLU where the isopentane may be exposed to the atmosphere, the isopentane in that portion of the unit shall be first

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transferred to the storage tank or any type of vessel that serves as a storage tank, and any residual isopentane evacuated through the VRU. The OEC and/or ITLU shall be evacuated of isopentane in a manner that results in the minimum practical amount of isopentane being emitted to the atmosphere.
(ICAPCD Rule 207; Permit Application)

C.4.d Venting isopentane from an OEC and/or ITLU to the atmosphere for the sole purpose of evacuation is prohibited. All isopentane shall be transferred to the storage tank through the VRU.
(ICAPCD Rule 207; Permit Application)

C.4.e Isopentane emissions occurring during normal repair and maintenance shall not be considered a breakdown and shall be considered part of the daily average isopentane emissions for the total isopentane loss for the reporting quarter.
(ICAPCD Rule 207)

C.5 Breakdown Emissions

C.5.a Any breakdown, malfunction, or upset occurrence which constitutes a breakdown condition resulting in the emission of any air pollutant to the atmosphere, shall be reported to the ICAPCD as soon as reasonably possible but no later than two (2) hours after its detection, and should identify the time, specific location, equipment involved, and to the extent known the cause of the occurrence, and immediate remedial measures shall be undertaken to correct the problem and prevent further emissions into the atmosphere. The completion of corrective measures or the shutdown of emitting equipment is required within (24) hours of occurrence of a breakdown condition.
(ICAPCD Rule 111)

C.5.b If the breakdown condition will require more than (24) hours to correct, the Permittee, in lieu of shutdown, shall submit a variance application to the Air Pollution Control Officer (APCO) requesting to commence the emergency variance procedure set forth in the ICAPCD Hearing Board Procedures.
(ICAPCD Rule 111)

C.5.c Within 10 days after a breakdown occurrence has been corrected, the owner or operator shall submit a written report to the APCO which includes:

C.5.c.1 A statement that the occurrence has been corrected, together with the date of correction and proof of compliance;

EEC ORIGINAL PKG

C.5.c.2 A specific statement of the reason(s) or cause(s) from the occurrence sufficient to enable the APCO to determine whether the occurrence was a breakdown condition;

C.5.c.3. A description of the corrective measures undertaken and/or to be undertaken to avoid such an occurrence in the future;

C.5.c.4 An estimate of the emissions caused by the occurrence;

C.5.c.5 And pictures of the equipment or controls which failed, if available.
(ICAPCD Rule 111)

C.5.d Failure to comply, or comply in a timely manner, with the reporting requirements established in paragraph C.5.a shall constitute cause for enforcement action.
(ICAPCD Rule 111)

C.5.e Isopentane breakdown emissions and losses shall be deducted from the total isopentane loss for the reporting quarter before calculating the daily average emissions.
(ICAPCD Rule 111; ICAPCD Rule 207)

D. Isopentane Mitigation

D.1 The Permittee shall offset all isopentane excess emissions above 137 lbs/day, determined on a quarterly basis.
(ICAPCD Rule 207)

D.2 The Permittee shall secure Emission Reduction Credits (ERCs) of Total Organic Compounds (TOC), on an annual basis, from the Agricultural ERC Bank in the amount of 7.05 tons per year to offset first and fourth quarter excess emissions, or the Permittee can opt to secure Emission Reduction Credits (ERCs) of Reactive Organic Gases (ROG) from the Stationary ERC Bank, on a one time basis, in the amount of current calculations to offset yearly first and fourth quarter excess emissions.
(ICAPCD Rule 207)

D.3 The Emission Reduction Credits shall be secured and shall be submitted before January 31 of each operating year along with the corresponding yearly permit operating fees.
(ICAPCD Rule 207)

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E. Vapor Recovery Unit (VRU)

E.1 The VRU shall be maintained in good working order at all times and shall achieve a minimum 95% isopentane vapor recovery efficiency during the purging process of an OEC and/or ITLU.
(ICAPCD Rule 207)

E.2 The VRU shall be source tested at least once, on a yearly basis, to verify the isopentane vapor recovery efficiency. The source test method shall receive prior approval by the Air Pollution Control District (APCD). The VRU source test shall be witnessed by the APCD.
(ICAPCD Rule 109)

E.3 Any breakdown, malfunction, or maintenance of the VRU resulting in the emission of isopentane to the atmosphere, shall be reported to the ICAPCD as soon as reasonably possible but no later than two (2) hours after its detection, and immediate remedial measures shall be undertaken to correct the problem and prevent further emissions into the atmosphere. The completion of corrective measures or the shutdown of emitting equipment is required within (24) hours of occurrence of a breakdown condition.
(ICAPCD Rule 111)

E.4 If the breakdown condition will require more than (24) hours to correct, the Permittee, in lieu of shutdown, shall submit a variance application to the Air Pollution Control Officer (APCO) requesting to commence the emergency variance procedure set forth in the ICAPCD Hearing Board Procedures.
(ICAPCD Rule 111)

E.5 The Permittee shall install and maintain in good working order an in-line flow meter (cfm) at the inlet of the VRU. The flow meter shall be equipped with a totalizer.
(Permit Application)

E.6 A log shall be maintained on the premises showing the VRU hours of operation and/or purging events, and routine repairs. This log shall be made available for inspection by the ICAPCD.
(Permit Application; ICAPCD Rule 207)

F. Emergency Standby Equipment

F.1 The diesel-fueled emergency equipment shall be restricted to the following maintenance operating hours:

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- Emergency Electric Power Generator, Model DMT-500C2, 500 KW, powered by a Cummins diesel-fueled engine model KTA19G2, rated 685 hp shall be restricted to operate 50 hours per year.
- John Deere model 6090H diesel pump (emergency stand-by), 350 hp shall be restricted to operate 50 hours per year.

(ATCM 93115)

F.2 The listed Clarke Detroit Diesel-Allison emergency Fire Pump, powered by a Detroit Diesel engine model DDFP-LGAT-7017V, rated 443hp, and the Clarke model JW6H-UF40 diesel pump (emergency stand-by) 300 hp shall be restricted to operate a total of 35 (thirty-five) hours per year for maintenance and testing purposes each, and to comply with the requirements of the National Fire Protection Association (NFPA) 25.

F3. Operation of the emergency power generator for other than testing and maintenance purposes, shall be limited to provide backup power, in each instance, be documented to the satisfaction of the ICAPCD.

F4. All internal combustion engines shall not discharge into the atmosphere any visible air contaminant other than uncombined water vapor, for a period or periods aggregating more than three minutes in any one hour, which is 20% opacity or greater.

F5. Each unit, with an internal combustion engine rated greater than 50 horsepower, shall have installed a non-resettable hour meter. The device shall be kept in proper working condition at all times.

F6. The permittee shall maintain an operation engine log onsite for each listed unit with an internal combustion engine rated greater than 50 horsepower. The Permittee shall maintain all required records for a minimum of two (2) calendar years and make them available to the ICAPCD upon request. The log(s) shall include the following for each unit:

a. Engine manufacturer name, model number, brake horsepower output rating, and type of fuel combusted;

b. A manual of recommended maintenance as provided by the engine manufacturer or other maintenance procedure as approved in writing by the APCO;

c. Record of routine engine maintenance, including date(s) and type of maintenance performed;

e. For each emergency unit, the total daily recorded hours of operation for maintenance and testing purposes.

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f. For each emergency unit, the total daily recorded hours of operation for emergency events.

F7. The listed Cummins Model KTA19G2 diesel emergency generator, with engine rated 685hp, shall be limited to the following emission limits:

a. 14.32 lbs/hr of NOx.
b. 1.54 lb/hr of CO.

F8. The Permittee shall conduct a source test for the Cummins Model KTA19G2 emergency generator to demonstrate compliance with the emission limits once every 60 months thereafter.

F9. The Cummins Model KTA19G2 generator shall each be source tested at least at 80% of the total horse power rating to determine compliance with the emission limits. If the permittee demonstrates to the satisfaction to the APCO that a listed unit cannot operate at 80% capacity, then the source test shall be performed at the highest achievable continuous power rating. Compliance with the NOx emission limits shall be determined by using CARB Method 100 or US EPA Method 7E. Oxygen Content shall be determined by using CARB Method 100 or US EPA Method 3A. Compliance with the CO emission limits shall be determined by using CARB Method 100 or US EPA Method 10, or other approved method.

F10. The source test protocol for each required test shall be submitted to the ICAPCD for approval 30 days prior to commencing testing. The source test results shall be submitted to the ICAPCD within 60 days of the test being completed.

F11. Permittee shall maintain all records required by this Permit for a minimum of two (2) calendar years. These records shall be maintained with the units or at the company's office, and shall be made available to the District upon request. **ICAPCD Rule 400.3**

G. Monitoring

G.1 The ICAPCD may, at any time, monitor emissions from any source within the facility.
(ICAPCD Rule 108; ICAPCD Rule 109)

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G.2 The ICAPCD may, at any time, but no more often than once per year, authorize third-party emissions testing and/or inventory of the facility. The cost of the emissions testing shall be borne by the Permittee. The ICAPCD shall give advance notification to the Permittee prior to any emissions testing or inventory required.
(ICAPCD Rule 108; ICAPCD Rule 109)

H. Reports

At the end of each calendar quarter, and not more than thirty (30) days thereafter, the facility shall submit a report to the ICAPCD which contains the following information:

H.1 The total amount of isopentane renewals brought to the facility during the reporting quarter and the previous quarters of that year. The facility shall include the isopentane supplier's name and address.

H.2 The total amount of isopentane present at the facility before renewals.

H.3 The number of VRU non-condensable gas purges that occurred during the reporting quarter.

H.4 The number of isopentane withdrawals and total amount of isopentane withdrawn from OECs and/or ITLU for hardware maintenance and repairs during the reporting quarter.

H.5 The combined daily total quantity of isopentane fugitive, purging and maintenance emissions from all OEC and ITLU units.

H.6 The number of rotating seals replaced or installed or any other OEC and/or ITLU seal or gasket failure that occurred during the reporting quarter.

H.7 The number of pressure relief rupture discs removed and replaced during the reporting quarter.

H.8 The total flow, in cubic feet, through the VRU during the reporting quarter.

H.9 The facility shall report to the APCD by telephone all non-normal (upset and breakdown) releases of isopentane or geothermal gases to the atmosphere as established on operating condition C.5.

At the end of February of each calendar year, and not more than 30 days thereafter, the Permittee shall submit to the APCD an annual report of the previous calendar year, consisting of the following:

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H.10 The monthly fuel consumption and hours operated per month of the emergency standby water pump, emergency electric power generator, and emergency fire pump.
(ICAPCD Rule 207)

Equipment Listed at the Facility:

6- ORMAT Integrated Two Level Units, 6 MW approx. each, for a total of 12 modular power generating units.

1- ORMAT Integrated Two Level Unit, 12 MW approx. each, for a total of 2 modular power generating units.

1- ORMAT Integrated Two Level Unit, 10 MW, 2 modular power generating units.

2- 6-cell Harmon mechanical draft counter flow cooling towers, 63,000 gpm/tower, framework and fan deck made of treated Douglas fir, fiberglass fan stacks and PVC drift eliminators, with a drift rate of 0.0008% of circulating water flow.

1- 3-cell Marley Model F499A-5.91-3, mechanical draft counter flow tower, 41,250 gpm, made of industrial fiberglass, with fire retardant pultruded reinforced polyester framing and polyvinyl chloride cellular drift eliminators, with a drift rate of 0.0010% of circulating water flow.

1- 3-cell Marley Model F499A-5.91-3, mechanical draft counter flow tower, 41,250 gpm, made of industrial fiberglass, with fire retardant pultruded reinforced polyester framing and polyvinyl chloride cellular drift eliminators, with a drift rate of 0.0005% of circulating water flow.

1- John Zink Series 2000 AC-400-4-10-4 Carbon Adsorption-Condensation (ADCON) Hydrocarbon Vapor Recovery Unit (VRU), 90 scfm, equipped with a 27 HP electric motor.

1- Emergency Electric Power Generator, Model DMT-500C2, 500 KW, powered by a Cummins diesel-fueled engine model KTA19G2, rated 685 hp.

1- Clarke Detroit Diesel-Allison Fire Pump, powered by a Detroit Diesel engine model DDFP-LGAT-7017V, rated 443hp.

1- John Deere model 6090H diesel generator (emergency stand-by), 350 hp

1- Clarke model JW6H-UF40 diesel pump (emergency stand-by) 300 hp

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IMPERIAL COUNTY

AIR POLLUTION CONTROL DISTRICT
2016 APCD PERMIT

Facility name and mailing address:

SECOND IMPERIAL GEOTHERMAL COMPANY SIGC
947 DOGWOOD ROAD
HEBER, CA 92249

FEE FOR THE YEAR	$180.50
LATE FEE / PENALTY	$0.00
ADJUSTMENTS	$180.50
TOTAL PAID	$0.00
BALANCE DUE	$0.00

Permit Number:	**2217 ATC**
PAID	**Active**
Permit Type	GEOTHERMAL
Location Address	855 DOGWOOD ROAD HEBER, CA 92249
Resp. Agent	PAOLO ALVARADO
Phone	760-353-8200
Issued:	**5/25/2016**
Expires:	**5/25/2016**

CERTIFICATION BY AUTHORIZED AGENT

The permit presented here is correct. The authorizations, certifications, and information from the application and permit being renewed, remain valid and will be kept with this ANNUAL PERMIT RENEWAL.

DATE ______________________________ SIGNATURE ____

CERTIFICATION BY APC DIVISION MANAGER

This permit becomes valid when signed by authorized agent.

This permit, or an approved facsimile, shall be mounted so as to be clearly visible in an accessible place within 25 feet of the article, machine, equipment, or other contrivance, or maintained readily available at all times on the operating premises. (Rule 201D)

Return this copy with payment fees to Imperial County Air Pollution Control District

150 South 9th Street, El Centro, CA 92243-2801

EEC ORIGINAL PKG

IMPERIAL COUNTY

AIR POLLUTION CONTROL DISTRICT
2016 APCD PERMIT

Facility name and mailing address:

SECOND IMPERIAL GEOTHERMAL COMPANY SIGC
947 DOGWOOD ROAD
HEBER, CA 92249

FEE FOR THE YEAR	$17,458.00
LATE FEE / PENALTY	$0.00
ADJUSTMENTS	$17,458.00
TOTAL PAID	$0.00
BALANCE DUE	$0.00

Permit Number:	**2217 PTO**
PAID	**Active**
Permit Type	GEOTHERMAL
Location Address	855 DOGWOOD ROAD HEBER, CA 92249
Resp. Agent	PAOLO ALVARADO
Phone	760-353-8200
Issued:	**5/25/2016**
Expires:	**12/31/2016**

CERTIFICATION BY AUTHORIZED AGENT

The permit presented here is correct. The authorizations, certifications, and information from the application and permit being renewed, remain valid and will be kept with this ANNUAL PERMIT RENEWAL.

DATE ____________________ SIGNATURE ______________________________

CERTIFICATION BY APC DIVISION MANAGER

This permit becomes valid when signed by authorized agent.

This permit, or an approved facsimile, shall be mounted so as to be clearly visible in an accessible place within 25 feet of the article, machine, equipment, or other contrivance, or maintained readily available at all times on the operating premises. (Rule 201D)

Return this copy with payment fees to Imperial County Air Pollution Control District

150 South 9th Street, El Centro, CA 92243-2801

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SPECIAL PUBLICATION 42
Interim Revision 2007

FAULT-RUPTURE HAZARD ZONES IN CALIFORNIA

Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones[1] Maps

[1] Name changed from Special Studies Zones January 1, 1994

DEPARTMENT OF CONSERVATION
California Geological Survey

STATE OF CALIFORNIA
ARNOLD SCHWARZENEGGER
GOVERNOR

THE RESOURCES AGENCY
MIKE CHRISMAN
SECRETARY FOR RESOURCES

DEPARTMENT OF CONSERVATION
BRIDGETT LUTHER
DIRECTOR

CALIFORNIA GEOLOGICAL SURVEY
JOHN G. PARRISH, *PH.D.*
STATE GEOLOGIST

EEC ORIGINAL PKG

SPECIAL PUBLICATION 42

FAULT-RUPTURE HAZARD ZONES IN CALIFORNIA

Alquist-Priolo Earthquake Fault Zoning Act
With Index to Earthquake Fault Zones Maps

by

WILLIAM A. BRYANT and EARL W. HART

Geologists

Interim Revision 2007

California Department of Conservation
California Geological Survey
801 K Street, MS 12-31
Sacramento, California 95814

EEC ORIGINAL PKG

PREFACE

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to regulate development near active faults so as to mitigate the hazard of surface fault rupture.

This report summarizes the various responsibilities under the Act and details the actions taken by the State Geologist and his staff to implement the Act.

This is the eleventh revision of Special Publication 42, which was first issued in December 1973 as an "Index to Maps of Special Studies Zones." A text was added in 1975 and subsequent revisions were made in 1976, 1977, 1980, 1985, 1988, 1990, 1992, 1994, and 1997. The 2007 revision is an interim version, available in electronic format only, that has been updated to reflect changes in the index map and listing of additional affected cities. In response to requests from various users of Alquist-Priolo maps and reports, several digital products are now available, including digital raster graphic (pdf) and Geographic Information System (GIS) files of the Earthquake Fault Zones maps, and digital files of Fault Evaluation Reports and site reports submitted to the California Geological Survey in compliance with the Alquist-Priolo Act (see Appendix E).

On January 1, 1994, the name of the Alquist-Priolo Special Studies Zones Act was changed to the Alquist-Priolo Earthquake Fault Zoning Act, and the name Special Studies Zones was changed to Earthquake Fault Zones as a result of a July 25, 1993 amendment.

Information on new and revised Earthquake Fault Zones maps will be provided as supplements until the next revision of this report.

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CALIFORNIA DEPARTMENT OF CONSERVATION
CALIFORNIA GEOLOGICAL SURVEY
801 K Street, MS 12-31
Sacramento, CA 95814-3531
www.conservation.ca.gov/cgs

PUBLIC INFORMATION OFFICES:

SACRAMENTO AREA
Publications and Information
801 K Street, MS 14-33
Sacramento, CA 95814-3532
(916) 445-5716

SAN FRANCISCO AREA
345 Middlefield Road, MS 520
Menlo Park, CA 94025
(650) 688-6327

LOS ANGELES AREA
888 South Figueroa, Suite 475
Los Angeles, CA 90017
(213) 239-0878

SUPPLEMENT NO. 1 TO SPECIAL PUBLICATION 42 (2007 Interim Edition)

NEW AND REVISED OFFICIAL MAPS OF EARTHQUAKE FAULT ZONES OF SEPTEMBER 21, 2012

Official Maps of new and revised Earthquake Fault Zones, indexed hereon, are issued pursuant to the Alquist-Priolo Earthquake Fault Zoning Act. Revised maps supersede earlier Official Maps.

Copies of these maps may be examined at the offices of affected cities and counties, at the Public Information offices of the California Geological Survey (CGS), and on the CGS website (**http://www.quake.ca.gov/gmaps/ap/ap_maps.htm).** Both GIS and pdf files can be downloaded from this website. Printed maps may be purchased from ARC-Bryant (formerly BPS Reprographic Services), 945 Bryant Street, San Francisco, California 94103, telephone (415) 495-8700.

For information on Official Maps of Earthquake Fault Zones previously issued, and for provisions of the Alquist-Priolo Earthquake Fault Zoning Act, the reader should consult the 2007 edition of Special Publication 42, "Fault-rupture Hazard Zones in California." This publication is available online only from the California Geological Survey at **ftp://ftp.consrv.ca.gov/pub/dmg/pubs/sp/Sp42.pdf**.

Official Maps issued September 21, 2012 (Map numbers keyed to index map):

1. Hayward.*
2. Piru
3. Mecca*
4. Mortmar*
5. Orocopia Canyon*
6. Salton*
7. Durmid*
8. Carrizo Mtn.*
9. Painted Gorge
10. Plaster City
11. Coyote Wells
12. Yuha Basin
13. Mount Signal

* Revised zone map

Cities and counties affected by new or revised Earthquake Fault Zones shown on Official Maps of September 19, 2012:

Cities	**Counties**
Hayward	Alameda
Oakland	Imperial
San Leandro	Riverside
	San Diego
	Ventura

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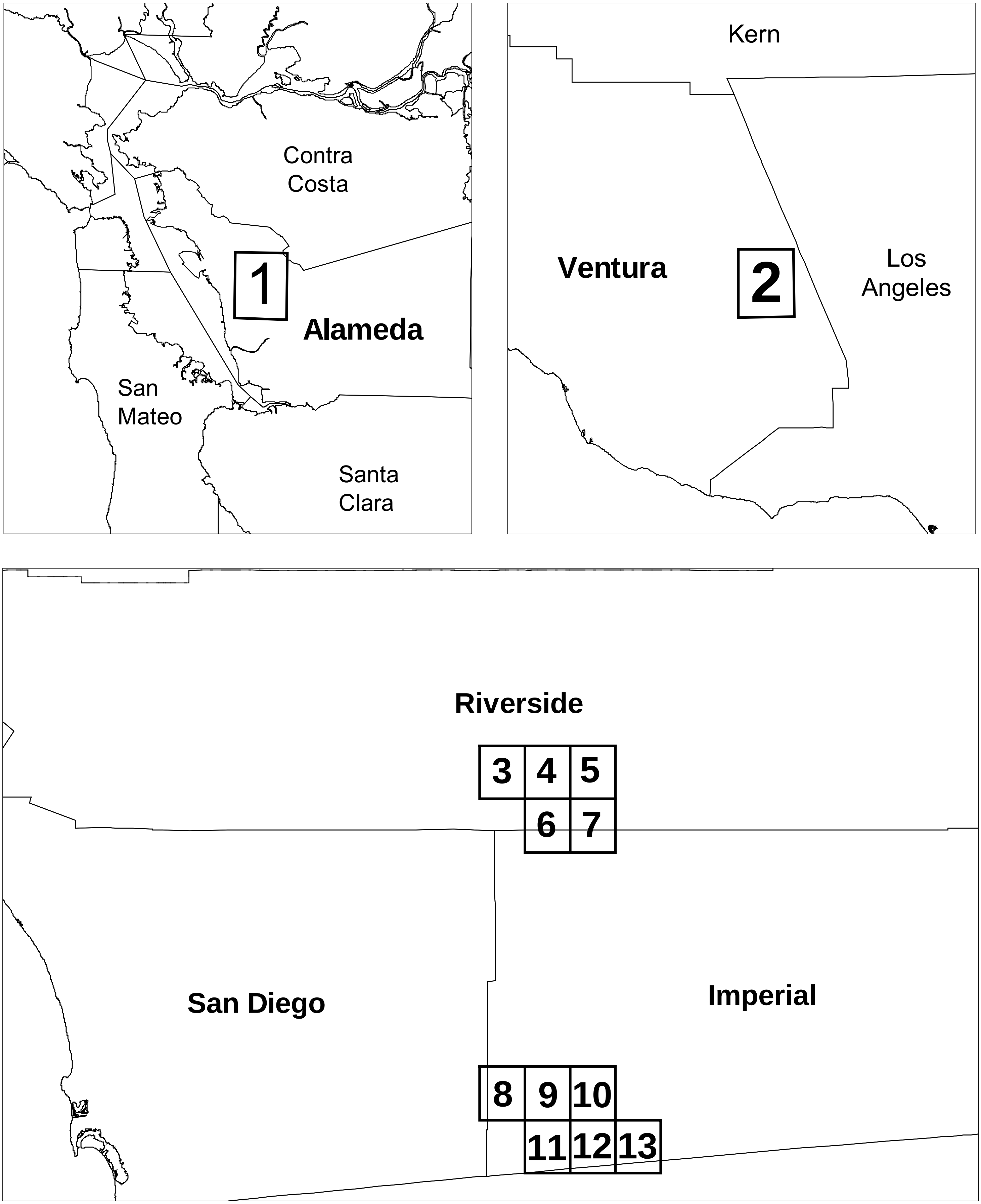

SUPPLEMENT NO. 1 INDEX MAP
NEW AND REVISED OFFICIAL MAPS OF EARTHQUAKE FAULT ZONES OF SEPTEMBER 21, 2012
(See List for Names of Maps)

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CALIFORNIA GEOLOGICAL SURVEY
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SUPPLEMENT NO. 2 TO SPECIAL PUBLICATION 42 (2007 Interim Edition)

NEW AND REVISED OFFICIAL MAPS OF EARTHQUAKE FAULT ZONES OF NOVEMBER 6, 2014

Official Maps of new and revised Earthquake Fault Zones, indexed hereon, are issued pursuant to the Alquist-Priolo Earthquake Fault Zoning Act. Revised maps supersede earlier Official Maps.

Copies of these maps may be examined at the offices of affected cities and counties, at the Public Information offices of the California Geological Survey (CGS), and on the CGS website (**http://www.conservation.ca.gov/CGS/Pages/Index.aspx).** Both GIS and pdf files can be downloaded from this website.

For information on Official Maps of Earthquake Fault Zones previously issued, and for provisions of the Alquist-Priolo Earthquake Fault Zoning Act, the reader should consult the 2007 edition of Special Publication 42, “Fault-rupture Hazard Zones in California.” This publication is available online only from the California Geological Survey at **ftp://ftp.consrv.ca.gov/pub/dmg/pubs/sp/Sp42.pdf**.

Official Maps issued November 6, 2014 (Map numbers keyed to index map):

1. Hollywood.*
2. Azusa

---

* Revised zone map

Cities and counties affected by new or revised Earthquake Fault Zones shown on Official Maps of November 6, 2014:

Cities	**Counties**
Azusa	Los Angeles
Bradbury	
Duarte	
Glendora	
Irwindale	
Los Angeles	
Monrovia	
West Hollywood	

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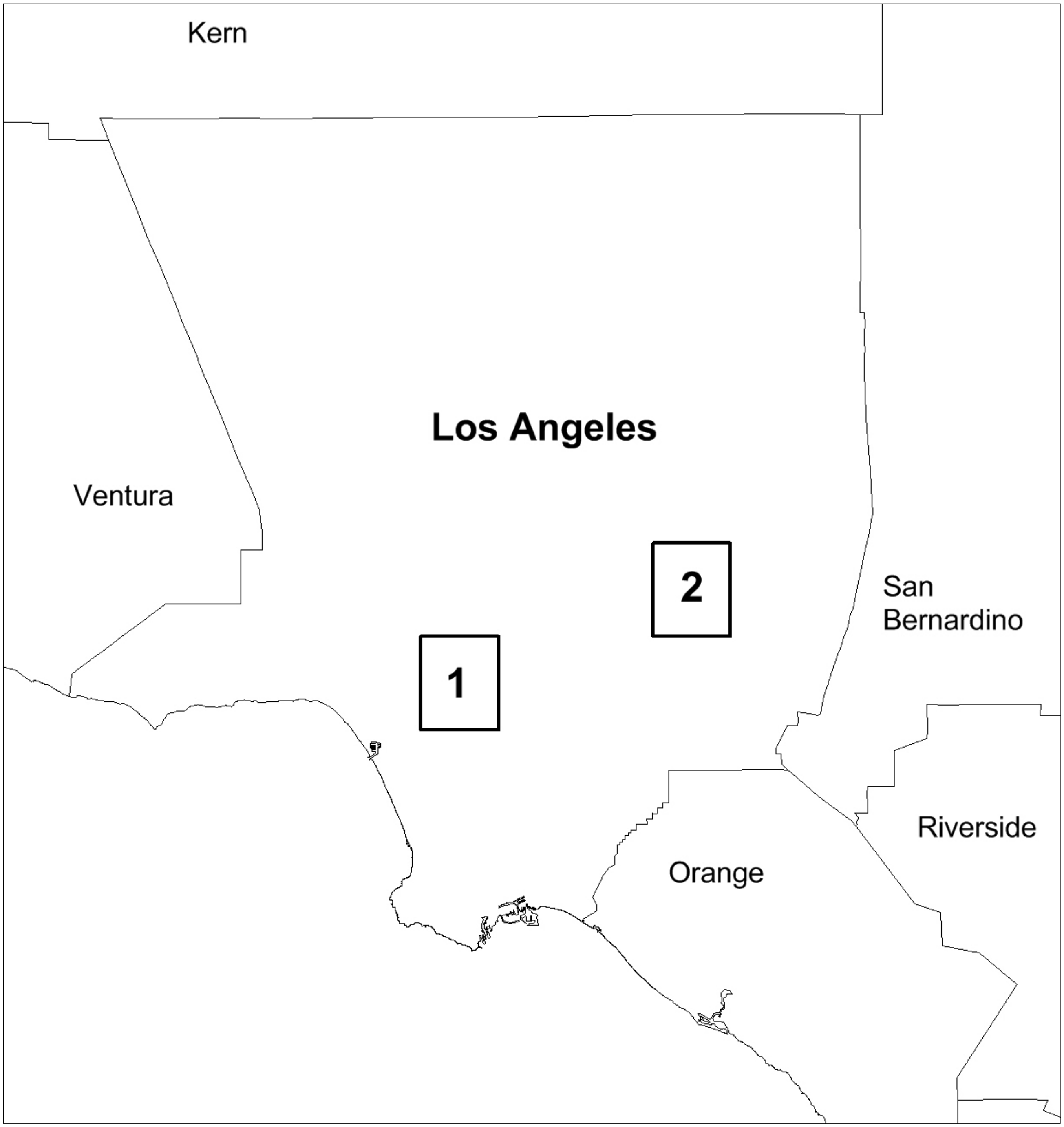

SUPPLEMENT NO.2 INDEX MAP

NEW AND REVISED OFFICIAL MAPS OF EARTHQUAKE FAULT ZONES OF NOVEMBER 6, 2014

(See List for Names of Maps)

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CONTENTS

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FAULT-RUPTURE HAZARD ZONES IN CALIFORNIA

By

William A. Bryant and Earl W. Hart

INTRODUCTION

The Alquist-Priolo Earthquake Fault Zoning Act was signed into law December 22, 1972, and went into effect March 7, 1973. The Act, codified in the Public Resources Code as Division 2, Chapter 7.5, has been amended ten times. A complete text of the Act is provided in Appendix A. The purpose of this Act is to prohibit the location of most structures for human occupancy across the traces of active faults and to thereby mitigate the hazard of fault rupture (Section 2621.5).

This law initially was designated as the Alquist-Priolo Geologic Hazard Zones Act. The Act was renamed the Alquist-Priolo Special Studies Zones Act effective May 4, 1975 and the Alquist-Priolo Earthquake Fault Zoning Act effective January 1, 1994. The original designation "Special Studies Zones" was changed to "Earthquake Fault Zones" when the Act was last renamed.

Under the Act, the State Geologist (Chief of the California Geological Survey [CGS]) is required to delineate "Earthquake Fault Zones" (EFZs) along known active faults in California. Cities and counties affected by the zones must regulate certain development "projects" within the zones. They must withhold development permits for sites within the zones until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting. The State Mining and Geology Board provides additional regulations (Policies and Criteria) to guide cities and counties in their implementation of the law (California Code of Regulations, Title 14, Div. 2). A summary of principal responsibilities and functions required by the Alquist-Priolo Act is given in Table 1. The Policies and Criteria are summarized in Table 2, and the complete text is provided in Appendix B.

This publication identifies and describes (1) actions taken by the State Geologist to delineate Earthquake Fault Zones, (2) policies used to make zoning decisions, and (3) Official Maps of Earthquake Fault Zones issued to date. A continuing program to evaluate faults for future zoning or zone revision also is summarized. Other aspects of the Alquist-Priolo Earthquake Fault Zoning Act and its implementation are discussed by Hart (1978 and 1986). The effectiveness of the AP Act and program was evaluated by Reitherman and Leeds (1990). The program is implementing many of the recommendations in that report.

Information presented here is based on various in-house documents and publications of the authors and others of the CGS (see Appendix E).

Table 1. Summary of responsibilities and functions under the Alquist-Priolo Earthquake Fault Zoning Act (see Appendix A for full text of Act).

State Mining and Geology Board

1. Formulates policies and criteria to guide cities and counties (Sec. 2621.5 and 2623). (See Appendix B.)
2. Serves as Appeals Board (Sec. 673).

State Geologist

1. Delineates Earthquake Fault Zones; compiles and issues maps to cities, counties, and state agencies (Sec. 2622).
   a. Preliminary Review Maps.
   b. Official Maps.
2. Reviews new data (Sec. 2622).
   a. Revises existing maps.
   b. Compiles new maps.
3. Approves requests for waivers initiated by cities and counties (Sec. 2623).

Cities and Counties

1. Must adopt zoning laws, ordinances, rules, and regulations; primary responsibility for implementing Act (Sec. 2621.5).
2. Must post notices of new Earthquake Fault Zones Maps (Sec. 2621.9 and 2622).
3. Regulates specified "projects" within Earthquake Fault Zones (Sec. 2623).
   a. Determines need for geologic reports prior to project development.
   b. Approves geologic reports prior to issuing development permits.
   c. May initiate waiver procedures. (See Appendix F.)

Other

1. *Seismic Safety Commission* - advises State Geologist and State Mining and Geology Board (Sec. 2630).
2. *State Agencies* - prohibited from siting structures for human occupancy across active fault traces (Sec. 2621.5).
3. *Disclosure* - prospective buyers of any real property located within an Earthquake Fault Zone must be notified of that fact (Sec. 2621.9).

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Table 2. Summary of policies and criteria adopted by the State Mining and Geology Board and codified in California Code of Regulations (see Appendix B for full text).

Policies

1. Defines active fault (equals potential hazard) as a fault that has had surface displacement during Holocene time (last 11,000 years) (Sec. 3601).
2. Defines "structure for human occupancy" and other terms (Sec. 3601).
3. Requires cities and counties to notify property owners within proposed new and revised Earthquake Fault Zones (Sec. 3602).
4. Provides opportunity for public to comment on Preliminary Review Maps of Earthquake Fault Zones (Sec. 3602).
5. Provides for comments and recommendations to State Geologist regarding Preliminary Review Maps (Sec. 3602).

Specific Criteria for Lead Agencies (Sec. 3603)

1. No structure for human occupancy defined as a "project" is permitted on the trace of an active fault. Unless proven otherwise, the area within 50 feet of an active fault is presumed to be underlain by active branches of the fault.
2. Requires disclosure of Earthquake Fault Zones to the public.
3. Requires that buildings converted to structures for human occupancy comply with provisions of the Act.
4. Requires geologic reports directed at the problem of potential surface faulting for all projects defined by the Act.
5. Requires cities and counties to review geologic reports for adequacy.
6. Requires that geologic reports be submitted to the State Geologist for open-file.

PROGRAM FOR ZONING AND EVALUATING FAULTS

Requirements of the Act

Section 2622 of the Alquist-Priolo Earthquake Fault Zoning Act (Appendix A) requires the State Geologist to:

1. "Delineate ... appropriately wide earthquake fault zones to encompass all potentially and recently active traces of the San Andreas, Calaveras, Hayward, and San Jacinto faults, and such other faults, or segments thereof, as the State Geologist determines to be sufficiently active and well-defined as to constitute a potential hazard to structures from surface faulting or fault creep."

2. Compile maps of Earthquake Fault Zones and submit such maps to affected cities, counties, and state agencies for their review and comment. Following appropriate reviews, the State Geologist must provide Official Maps to the affected cities, counties, and state agencies.

3. Continually review new geologic and seismic data to revise the Earthquake Fault Zones or delineate additional zones.

These requirements constitute the basis for the State Geologist's fault-zoning program and for many of the policies devised to implement the program.

Initial Program for Zoning Faults

As required under the Act, the State Geologist initiated a program early in 1973 to delineate Earthquake Fault Zones to encompass potentially and recently active traces of the San Andreas, Calaveras, Hayward, and San Jacinto faults, and to compile and distribute maps of these zones. A project team was established within the CGS to develop and conduct a program for delineation of the zones.

Initially, 175 maps of Earthquake Fault Zones were delineated for the four named faults. These zone maps, issued as Preliminary Review Maps, were distributed for review by local and state government agencies on December 31, 1973. Following prescribed 90-day review and revision periods, Official Maps were issued on July 1, 1974. At that time, the Earthquake Fault Zones became effective and the affected cities and counties were required to implement programs to regulate development within the mapped zones. A second set of Official Maps -- 81 maps of new zones and five maps of revised zones -- was issued on January 1, 1976 to delineate new and revised zones. Additional Official Maps of new and revised zones were issued in succeeding years, as summarized in Table 3.

Table 3. Official Maps of Earthquake Fault Zones issued 1974 through August 2007.

DATE OF ISSUE	NEW MAPS	REVISED MAPS	WITHDRAWN MAPS
July 1, 1974	175	-	-
January 1, 1976	81	5	-
January 1, 1977	4	3	-
January 1, 1978	1	-	-
July 26, 1978	2	-	-
January 1, 1979	4	7	-
January 1, 1980	21	9	-
January 1, 1982	13	27	2
July 1, 1983	18	12	-
January 1, 1985	33	10	-
July 1, 1986	18	14	-
March 1, 1988	58	4	-
January 1, 1990	60	25	-
November 1, 1991	46	8	-
July 1, 1993	1	10	2
June 1, 1995	8	13	-
May 1, 1998	2	1	-
May 1, 1999	3	1	-
May 1, 2003	3	11	-
August 16, 2007	-	1	-
Totals	551	161	4

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As of August 16, 2007, 551 Official Maps of Earthquake Fault Zones have been issued. Of these, 161 have been revised since their initial issue and four have been withdrawn. The maps are identified by quadrangle map name and the date of issue or revision on the Index to Maps of Earthquake Fault Zones (Figure 4).

The maps delineate regulatory zones for the faults generally identified in Figure 1. Additional faults will be zoned in the future, and some zones will be revised. Thirty-six counties and 104 cities are affected by the existing Earthquake Fault Zones. These jurisdictions are listed in Table 4.

Definitions, Policies, Rationale

For the State Geologist to carry out the mandate to establish regulatory zones, certain terms identified in Section 2622 of the Act had to be defined and policies had to be developed to provide a consistent and reasonable approach to zoning. After the zoning program was underway and the surface fault-rupture process was better understood, other terms were defined and some zoning policies were modified.

Fault and Fault Zone

A *fault* is defined as a fracture or zone of closely associated fractures along which rocks on one side have been displaced with respect to those on the other side. Most faults are the result of repeated displacement that may have taken place suddenly and/or by slow creep. A fault is distinguished from those fractures or shears caused by landsliding or other gravity-induced surficial failures. A *fault zone* is a zone of related faults that commonly are braided and subparallel, but may be branching and divergent. A fault zone has significant width (with respect to the scale at which the fault is being considered, portrayed, or investigated), ranging from a few feet to several miles.

*Table 4. Cities and counties affected by Earthquake Fault Zones as of August 16, 2007**

CITIES (104)**			COUNTIES (36)	
American Canyon	Hayward	Rosemead	Alameda	Stanislaus
Arcadia	Hemet	San Bernardino	Alpine	Ventura
Arcata	Highland	San Bruno	Butte	Yolo
Arvin	Hollister	San Diego	Contra Costa	
Bakersfield	Huntington Beach	San Fernando	Fresno	
Banning	Indio	San Jacinto	Humboldt	
Barstow	Inglewood	San Jose	Imperial	
Beaumont	La Habra	San Juan Bautista	Inyo	
Benicia	La Habra Heights	San Leandro	Kern	
Berkeley	Lake Elsinore	San Luis Obispo	Lake	
Bishop	Livermore	San Marino	Lassen	
Brea	Loma Linda	San Pablo	Los Angeles	
Calimesa	Long Beach	San Ramon	Marin	
Camarillo	Los Angeles	Santa Clarita	Mendocino	
Carson	Malibu	Santa Rosa	Merced	
Cathedral City	Mammoth Lakes	Seal Beach	Modoc	
Chino Hills	Milpitas	Signal Hill	Mono	
Coachella	Monrovia	Simi Valley	Monterey	
Colton	Moorpark	South Pasadena	Napa	
Compton	Moreno Valley	South San Francisco	Orange	
Concord	Morgan Hill	Temecula	Riverside	
Corona	Murrieta	Trinidad	San Benito	
Coronado	Oakland	Twentynine Palms	San Bernardino	
Culver City	Pacifica	Union City	San Diego	
Daly City	Palmdale	Upland	San Luis Obispo	
Danville	Palm Springs	Ventura (San Buenaventura)	San Mateo	
Desert Hot Springs	Palo Alto	Walnut Creek	Santa Barbara	
Dublin	Pasadena	Whittier	Santa Clara	
El Cerrito	Pleasanton	Willits	Santa Cruz	
Fairfield	Portola Valley	Windsor	Shasta	
Fontana	Rancho Cucamonga	Woodside	Siskiyou	
Fortuna	Redlands	Yorba Linda	Solano	
Fremont	Rialto	Yucaipa	Sonoma	
Gardena	Richmond	Yucca Valley		
Glendale	Ridgecrest			

* To inquire about local government policies and regulations or to consult (obtain) copies of specific Earthquake Fault Zones maps, address the Planning Director of each county or city. Some jurisdictions have replotted the EFZ boundaries on large-scale parcel maps.

** Additional cities may be affected by the zones as new cities are created, city boundaries are expanded, or new zones are established

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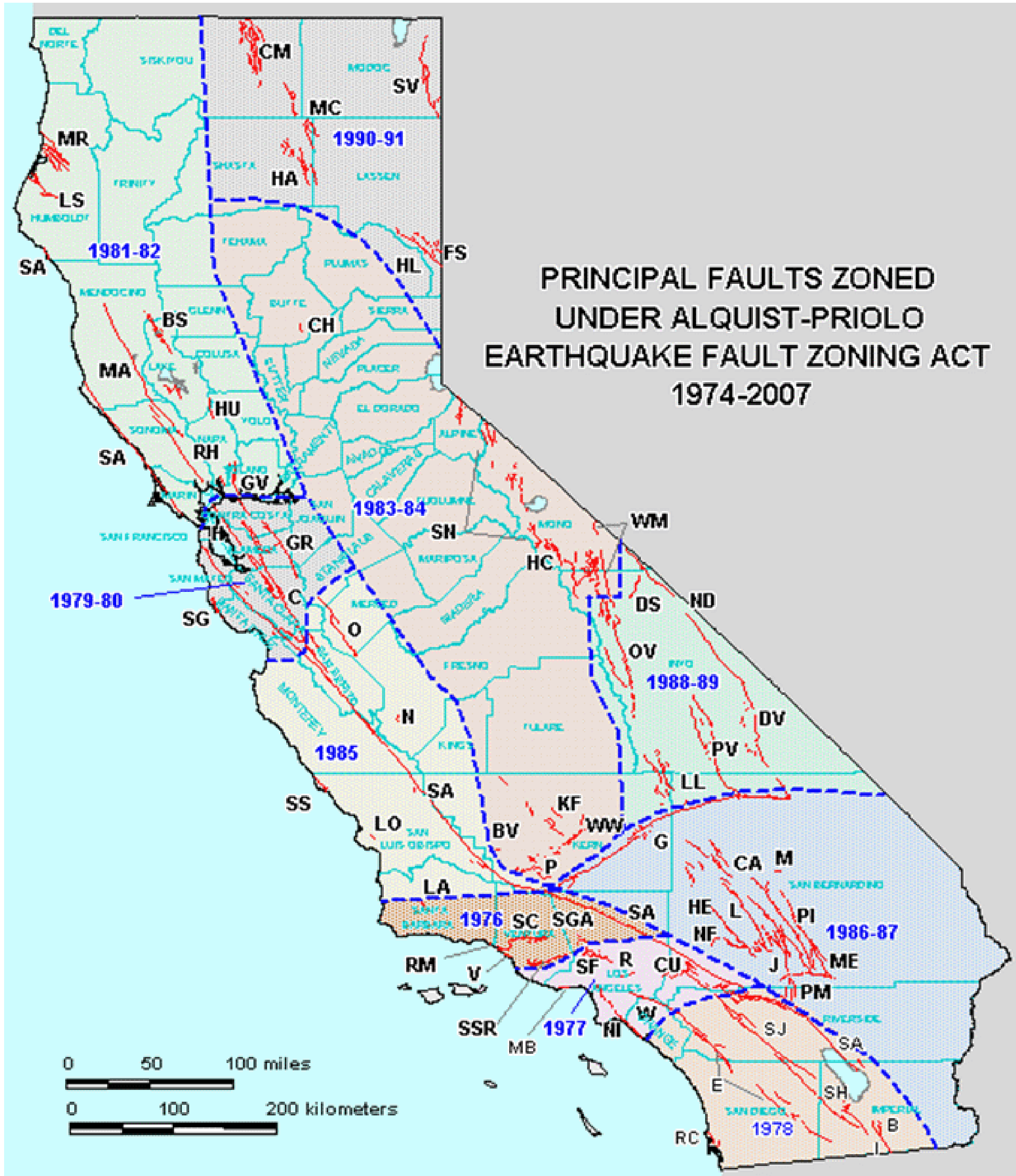
MAP SYMBOL	NAME OF PRINCIPAL FAULT
B	*Brawley
BS	Bartlett Springs
BV	*Buena Vista
C	*Calaveras
CA	Calico
CH	*Cleveland Hill
CM	Cedar Mtn.
CU	Cucamonga
DS	Deep Springs
DV	Death Valley
E	Elsinore
FS	*Fort Sage
G	*Garlock
GR	*Greenville
GV	*Green Valley and Concord
H	*Hayward
HA	Hat Creek
HC	*Hilton Creek & related
HE	Helendale
HL	Honey Lake
HU	Hunting Creek
I	*Imperial
J	*Johnson Valley & related
KF	*Kern Front & related
L	Lenwood
LA	Los Alamos
LL	*Little Lake
LO	Los Osos
LS	Little Salmon
M	*Manix
MA	*Maacama
MB	Malibu
MC	McArthur
ME	Mesquite Lake
MR	Mad River
N	*Nunez
ND	Northern Death Valley
NF	North Frontal
NI	*Newport-Inglewood
O	Ortigalita
OV	*Owens Valley
P	Pleito & Wheeler Ridge
PI	*Pisgah-Bullion
PM	Pinto Mountain
PV	Panamint Valley
R	Raymond Hill
RC	Rose Canyon
RH	Rodgers Creek-Healdsburg
RM	Red Mountain
SA	*San Andreas
SC	San Cayetano
SF	*San Fernando
SG	San Gregorio
SGA	San Gabriel
SH	*Superstition Hills
SJ	*San Jacinto
SN	Sierra Nevada (zone)
SS	San Simeon
SSR	Simi-Santa Rosa
SV	Surprise Valley
W	Whittier
WM	*White Mtns
WW	*White Wolf
V	Ventura



Faults zoned through August 2007

Approximate boundaries of work-plan regions and year studied

Note: Other faults may be zoned in the future and existing zones may be revised when warranted by new fault data

Figure 1. Principal active faults in California zoned under the Alquist-Priolo Earthquake Fault Zoning Act. Asterisk indicates faults with historic surface rupture.

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Fault Trace

A *fault trace* is the line formed by the intersection of a fault and the earth's surface. It is the representation of a fault as depicted on a map, including maps of the Earthquake Fault Zones.

Active Fault

For the purposes of this Act, an *active fault* is defined by the State Mining and Geology Board as one which has "had surface displacement within Holocene time (about the last 11,000 years)" (see Appendix B, Section 3601). This definition does not, of course, mean that faults lacking evidence for surface displacement within Holocene time are necessarily inactive. A fault may be presumed to be inactive based on satisfactory geologic evidence; however, the evidence necessary to prove inactivity sometimes is difficult to obtain and locally may not exist.

Potentially Active Fault

Because the Alquist-Priolo Act requires the State Geologist to establish Earthquake Fault Zones to encompass all "potentially and recently active" traces of the San Andreas, Calaveras, Hayward, and San Jacinto faults, additional definitions were needed (Section 2622). Initially, faults were defined as *potentially active*, and were zoned, if they showed evidence of surface displacement during Quaternary time (last 1.6 million years, Figure 2). Exceptions were made for certain Quaternary (i.e., Pleistocene) faults that were presumed to be inactive based on direct geologic evidence of inactivity during all of Holocene time or longer. The term "recently active" was not defined, as it was considered to be covered by the term "potentially active." Beginning in 1977, evidence of Quaternary surface displacement was no longer used as a criterion for zoning. However, the term "potentially active" continued to be used as a descriptive term on map explanations on EFZ maps until 1988.

Sufficiently Active and Well-defined

A major objective of the CGS's continuing Fault Evaluation and Zoning Program is to evaluate the hundreds of remaining potentially active faults in California for zoning consideration. However, it became apparent as the program progressed that there are so many potentially active (i.e., Quaternary) faults in the state (Jennings, 1975) that it would be meaningless to zone all of them. In late 1975, the State Geologist made a policy decision to zone only those potentially active faults that have a relatively high potential for ground rupture. To facilitate this, the terms "sufficiently active" and "well-defined," from Section 2622 of the Act, were defined for application in zoning faults other than the four named in the Act. These two terms constitute the present criteria used by the State Geologist in determining if a given fault should be zoned under the Alquist-Priolo Act.

Sufficiently active. A fault is deemed sufficiently active if there is evidence of Holocene surface displacement along one or more of its segments or branches. Holocene surface displacement may be directly observable or inferred; it need not be present everywhere along a fault to qualify that fault for zoning.

Well-defined. A fault is considered well-defined if its trace is clearly detectable by a trained geologist as a physical feature at or just below the ground surface. The fault may be identified by direct observation or by indirect methods (e.g., geomorphic evidence; Appendix C). The critical consideration is that the fault, or some part of it, can be located in the field with sufficient precision and confidence to indicate that the required site-specific investigations would meet with some success.

Determining if a fault is sufficiently active and well-defined is a matter of judgment. However, these definitions provide standard, workable guidelines for establishing Earthquake Fault Zones under the Act.

The evaluation of faults for zoning purposes is done with the realization that not all active faults can be identified. Furthermore, certain faults considered to be active at depth, because of known seismic activity, are so poorly defined at the surface that zoning is impractical. Although the map explanation indicates that "potentially active" (i.e., Quaternary) faults are identified and zoned (with exceptions) on the Official Maps of Earthquake Fault Zones until 1988, this is basically true only for those maps issued July 1, 1974 and January 1, 1976. Even so, all of the principal faults zoned in 1974 and 1976 were active during Holocene time, if not historically. Beginning with the maps of January 1, 1977, all faults zoned meet the criteria of "sufficiently active and well-defined."

GEOLOGIC AGE			YEARS BEFORE PRESENT (estimated)
	Period	Epoch	
CENOZOIC	QUATERNARY	Historic	200
		Holocene	11,000
		Pleistocene	1,600,000
	TERTIARY	Pliocene	5,000,000
		pre-Pliocene	66,000,000
pre-CENOZOIC time Beginning of geologic time			4,600,000,000

Faults along which movement has occurred during this interval and defined as *active* by Policies and Criteria of the State Mining and Geology Board.

Faults defined as *potentially active* for the purpose of evaluation for possible zonation.

Figure 2. Geologic time scale.

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Delineating the Earthquake Fault Zones

Earthquake Fault Zones are delineated on U.S. Geological Survey topographic base maps at a scale of 1:24,000 (1 inch equals 2,000 feet). The zone boundaries are straight-line segments defined by turning points (Figure 3). Most of the turning points are intended to coincide with locatable features on the ground (e.g., bench marks, roads, streams). Neither the turning points nor the connecting zone boundaries have been surveyed to verify their mapped locations.

Locations of Earthquake Fault Zone boundaries are controlled by the position of fault traces shown on the Official Maps of Earthquake Fault Zones. With few exceptions, the faults shown on the 1974 and 1976 Earthquake Fault Zones maps were not field-checked during the compilation of these maps. However, nearly all faults zoned since January 1, 1977 have been evaluated in the field or on aerial photographs to verify that they do meet the criteria of being sufficiently active and well-defined.

Zone boundaries on early maps were positioned about 660 feet (200 meters) away from the fault traces to accommodate imprecise locations of the faults and possible existence of active branches. The policy since 1977 is to position the EFZ boundary about 500 feet (150 meters) away from major active faults and about 200 to 300 feet (60 to 90 meters) away from well-defined, minor faults. Exceptions to this policy exist where faults are locally complex or where faults are not vertical.

Fault Evaluation and Zoning Program

The Fault Evaluation and Zoning Program was initiated in early 1976 for the purpose of evaluating those “other faults” identified in the Act as “sufficiently active and well-defined” (see definition above) after it was recognized that effective future zoning could not rely solely on the limited fault data of others. Justification of this program is discussed in more detail in Special Publication 47 of the Division of Mines and Geology (1976; also see Hart, 1978).

The program was originally scheduled over a 10-year period. The state was divided into 10 regions or work areas (Figure 1), with one region scheduled for evaluation each year. However, the work in some regions was extended due to heavy workloads. Fault evaluation work includes interpretation of aerial photographs and limited field mapping, as well as the use of other geologists’ work. A list of faults to be evaluated in a target region was prepared and priorities assigned. The list included potentially active faults not yet zoned, as well as previously zoned faults or fault-segments that warranted zone revisions (change or deletion). Faults also were evaluated in areas outside of scheduled regions, as the need arose (e.g., to map fault rupture immediately after an earthquake). The fault evaluation work was completed in early 1991. The work is summarized for each region in Open-File Reports (OFR) 77-8, 78-10, 79-10, 81-3, 83-10, 84-52, 86-3, 88-1, 89-16, and 91-9 (see Appendix E). Appendix E is a complete list of publications and products of the Fault Evaluation and Zoning Program.

For each fault evaluated, a Fault Evaluation Report (FER) was prepared, summarizing data on the location, recency of activity, and sense and magnitude of displacement. Each FER contains recommendations for or against zoning. These in-house reports are filed at the CGS Sacramento Regional Office at 801 K Street, MS 12-31, Sacramento, 95814, where they are available for reference. Reference copies of the FERs are filed in the CGS’s Los Angeles and San Francisco Bay regional offices. An index to FERs prepared 1976 to April 1989 is available as OFR 90-9 (see Appendix E). This list and an index map identify the faults that have been evaluated. Digital files of all FER’s are available in pdf format (CGS CD 2002-01; CD 2002-02; CD 2002-03) (see Appendix E).

Under the AP Act (Sec. 2622), the State Geologist has an on-going responsibility to review “new geologic and seismic data” in order to revise the Earthquake Fault Zones and to delineate new zones “when warranted by new information.”

As a result of the fault evaluations made since 1976, 295 new and 155 revised Earthquake Fault Zones Maps have been issued and four maps have been withdrawn (Table 3). The faults zoned since 1976 are considered to meet the criteria of “sufficiently active and well-defined” (see Definitions above). Many other faults did not appear to meet the criteria and were not zoned. It is important to note that it is sometimes difficult to distinguish between slightly active faults and inactive ones, because the surface features formed as a result of minor, infrequent rupture are easily obliterated by geologic processes (erosion, sedimentation, mass wasting) or people’s activities. Even large scale fault-rupture can be obscured in complex geologic terranes or high-energy environments. Recent fault-rupture also is difficult to detect where it is distributed as numerous breaks or warps in broad zones of deformation. As a consequence of these problems, it is not possible to identify and zone all active faults in California. For the most part, rupture on faults not identified as active is expected to be minor.

Since zones were first established in 1974, there have been 25 earthquakes or earthquake sequences associated with surface faulting in various parts of California (Table 5). This is an average of 0.75 fault-rupture events per year. Most of the recent surface faulting has been relatively minor; either in terms of amount of displacement or length of surface rupture (Table 5). However, one foot (30 cm) or more displacement occurred during seven events. Earlier records (incomplete) suggest that displacements of 3 feet (one meter) or more occur at least once every 15 to 20 years in California (Bonilla, 1970; Grantz and Bartow, 1977). Many of the recent coseismic events occurred on faults that were not yet zoned, and a few were on faults not considered to be potentially active or not even mapped. However, coseismic rupture also occurred on faults mostly or entirely within the Earthquake Fault Zones in nine of the rupture events (Table 5). A sequence of four rupture events occurred in the Lompoc diatomite quarry and presumably was triggered by quarrying (see event #10, Table 5). In addition, aseismic fault creep has occurred on many zoned faults in the last 30 years (see footnote, Table 5). Most fault creep is tectonically induced, although some is induced by people (mainly by fluid withdrawal).

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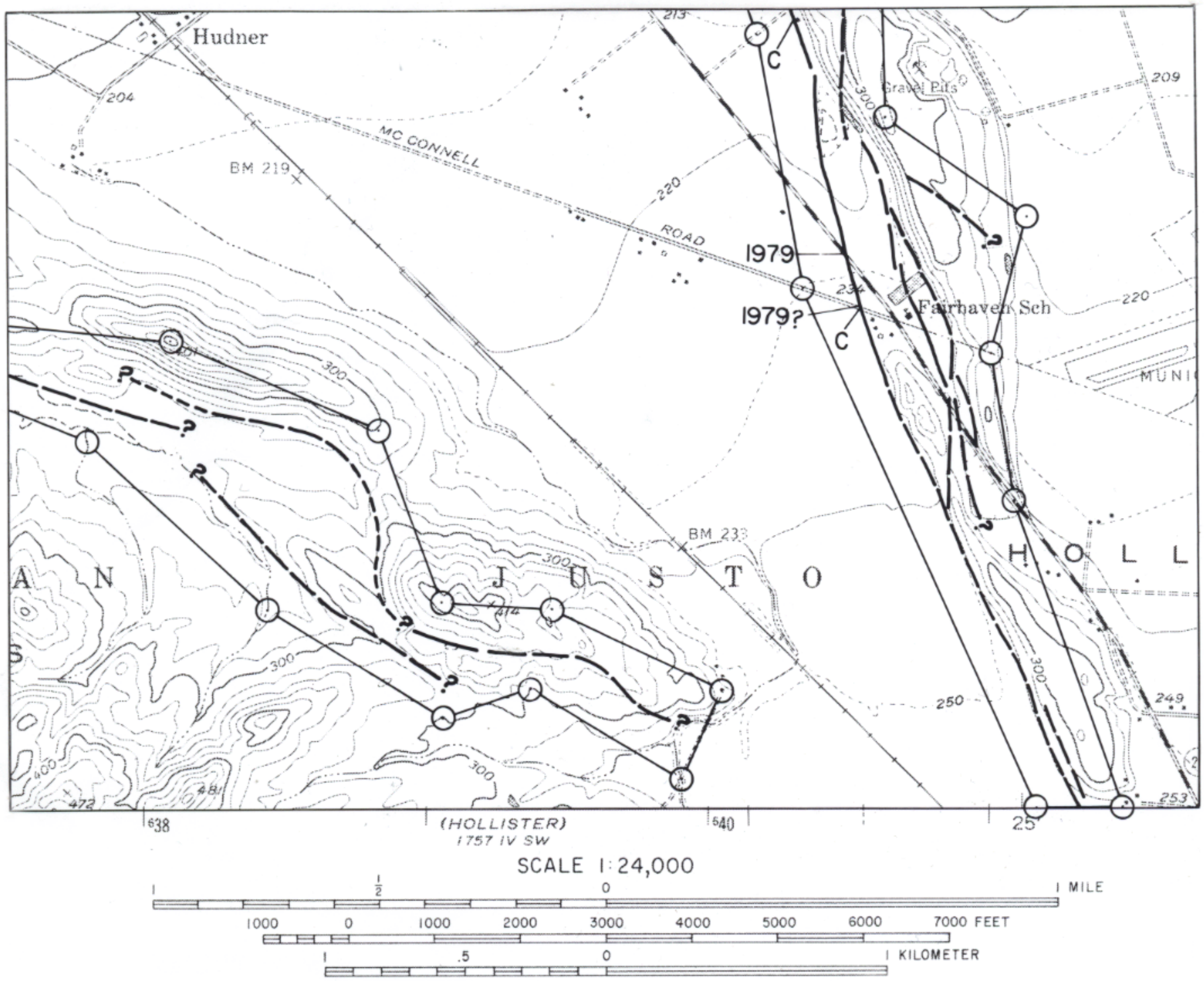

MAP EXPLANATION

Active Faults

1906 C

Faults considered to have been active during Holocene time and to have a relatively high potential for surface rupture; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainity. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Earthquake Fault Zone Boundaries

These are delineated as straight-line segments that connect encircled turning points so as to define earthquake fault zone segments.

Seaward projection of zone boundary.

Figure 3. Example of Earthquake Fault Zones map and explanation of map symbols.

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Table 5. Surface faulting associated with earthquakes in California, 1974-June 2007. List excludes fault creep and faulting triggered by shaking or movement on a different fault[1]. See Bonilla (1970), Jennings (1985), and Grantz and Bartow (1977) for earlier faulting events.

Fault (County where located)	Year of rupture	Magnitude of associated earthquake	Surface rupture[2] Max. displacement (cm)	Total length[2] (km)	Main sense of displacement[3]	Comments
1. Brawley (Imperial)	1975	4.7	20	10.4	N	Also ruptured in 1940 and 1979, fault creep in part.
2. Galway Lake (San Bernardino)	1975	5.3	1.5	6.8	RL	Fault previously unknown.
3. Cleveland Hill (Butte)	1975	5.7	5	5.7	N	Fault not previously known to be Holocene-active.
4. Stephens Pass (Siskiyou)	1978	4.3	30	2+	N	Fault previously unknown.
5. Homestead Valley (San Bernardino)	1979	5.2	8	3.3	RL	Also minor rupture on Johnson Valley fault.
6. *Calaveras (San Benito, Santa Clara)	1979	5.9	1	39 (?)	RL	Minor, discontinuous rupture mostly in creep-active segment.
7. *Imperial *Brawley (Imperial) Rico	1979	6.6	55 15 10	30 13 1	RL N N	Creep triggered on San Andreas and Superstition Hills faults; also ruptured in 1940. Rico fault not previously known.
8. Greenville (Alameda)	1980	5.6	3	6.5	RL	Minor left-lateral slip also occurred on Las Positas fault.
9 . Hilton Creek-Mammoth Lakes (Mono)	1980	6.0-6.5	30	20	N	Rupture on many minor faults, may relate to volcanic activity. Minor ruptures also in 1981.
10. "Lompoc quarry" (Santa Barbara)	1981	2.5	25	0.6	R	Flexural slip on flank of syncline triggered by quarrying; do not plan to zone. Similar earthquake-associated ruptures occurred in 1985, 1988, and 1995.
11. Little Lake (Kern)	1982	5.2	0+	10	RL/N	Fracture zones on monoclines.
12. "Coalinga Nose" (Fresno)	1983	6.7	5	.005	R	Secondary fault (?) associated with 43 cm of anticlinal uplift; too minor to zone.
13. Nunez (Fresno)	1983	5.2-5.9	60	3.3	R	Aftershocks associated with event (12) above.
14. *Calaveras (Santa Clara)	1984	6.1	20 (?)	1.2	RL	Questionable faulting; triggered afterslip in 15-km long creep-zone to south.
15. *Banning (Riverside)	1986	5.9	7	9	RL	Minor slip also triggered locally on Garnet Hill and Desert Hot Springs (?) faults as well as more distant faults.
16. *White Mountains (Mono, Inyo)	1986	6.4	11	13	RL/N	Also extensional cracks on faults in Volcanic Tableland in 40km x 12km area.
17. Elmore Ranch (Imperial)	1987	6.2	12	12	LL	Also lesser left-lateral rupture on nearby faults.
18. *Superstition Hills (Imperial)	1987	6.6	90	28	RL	Much of rupture occurred as afterslip; associated with event 17.
19. *San Andreas (Santa Cruz)	1989	7.1	2.5	1?	RL	Surface rupture possibly triggered slip; slip also triggered on nearby Calaveras and San Andreas faults outside of aftershock zone. Secondary faulting may have occurred with ridgetop spreading fissures.
20. *Johnson Valley *Homestead Valley *Emerson (San Bernardino) *Camp Rock	1992	7.3	460-600	85	RL	Most significant fault rupture since 1906; ruptures connected several separate faults; triggered slip also occurred on at least 10 other faults.
21. "Eureka Valley" (Inyo)	1993	6.1	2	5+	RL/N	Two zones of left-stepping fractures along pre-existing fault scarps; incompletely mapped; remote area, not zoned.
22. "Stevenson Ranch" (Los Angeles)	1994	6.7	19	0.6	R	Flexural slip faults on limb of fold near Newhall; related to blind thrust faulting. Minor slip also triggered on Mission Wells fault, which ruptured in 1971.
23. Airport Lake (Kern and Inyo)	1995	5.4-5.8	1	2.5	RL/N	Discontinuous cracks along pre-existing scarp.
24. Lavic Lake *Bullion *Mesquite Lake (San Bernardino)	1999	7.1	525	45	RL	Bullion and Mesquite Lake faults previously zoned; Lavic Lake had not ruptured in Holocene.
25. *San Andreas (Monterey, San Luis Obispo)	2004	6.0	15	32	RL	Parkfield section of San Andreas fault zone; also ruptured in 1966. Much of rupture occurred as afterslip.

[1] Tectonic (aseismic) fault-creep and triggered slip have occurred along various segments of the San Andreas, Hayward, Calaveras, Concord, Green Valley, Imperial, Superstition Hills, Maacama, Garlock, and more than 10 other faults. People-induced fault-creep has been reported on at least 12 other faults due to withdrawal of groundwater or oilfield fluids. See Jennings (1994) for map locations.

[2] Includes some afterslip. Rupture length measured from distal ends of rupture, which often is discontinuous.

[3] N=normal displacement; R=reverse displacement; RL=right-lateral displacement; LL=left-lateral displacement.

* Coseismic surface faulting occurred mostly or entirely within existing Earthquake Fault Zones during eight events

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In addition to evaluating and zoning faults, program staff also perform other functions necessary to the implementation of the APEFZ Act. Regulations (Section 3603, Appendix B) require that cities and counties file geologic reports for "project" sites in Earthquake Fault Zones with the State Geologist. By the middle of 2006, over 4000 site-specific geologic reports investigating the hazard of surface-fault rupture had been filed for public reference. Site reports on file with CGS through 2000 are available as digital images in pdf format (CGS CD 2003-01; CD 2003-02). Reports filed after 2000 are available for reference at the Geologic Information and Publications Office in Sacramento (see Appendix E).

In order to improve the quality of site investigations and reports, guidelines were prepared in 1975 to assist others in evaluating faults. These guidelines have been revised and appear as Appendix C.

General guidelines for reviewing geologic reports for adequacy, required by Section 3603 of the regulations, are provided in Appendix D.

If a city or county considers that a geologic investigation of a proposed "project" is unnecessary, it may request a waiver from the State Geologist (Section 2623, Appendix A). A waiver form detailing the procedures used is provided in Appendix F. Through 2006, 84 waiver requests have been processed by program staff.

Another important activity is to provide information on the APEFZ Act, the Division's Fault Evaluation and Zoning Program, and fault-rupture hazards to both the public and private sectors. Program staff responds to about 1,500 inquiries each year from geologists, planners, building officials, developers, realtors, financial institutions, and others.

Uses and Limitations of Earthquake Fault Zones Maps

The Earthquake Fault Zones are delineated to define those areas within which fault-rupture hazard investigations are required prior to building structures for human occupancy. Traces of faults are shown on the maps mainly to justify the locations of zone boundaries. These fault traces are plotted as accurately as the sources of data permit; yet the plots are not sufficiently accurate to be used as the basis for building set-back requirements, and they should not be so used.

The fault information shown on the maps is not sufficient to meet the requirement for fault-rupture hazard investigations. Local governmental units must require developers to have project sites within the Earthquake Fault Zones evaluated to determine if a potential hazard from any fault, whether heretofore recognized or not, exists with regard to proposed structures and their occupants.

The surface fault-ruptures associated with historic earthquake and creep events are identified where known. However, no degree of relative potential for future surface displacement or degree of hazard is implied for the faults shown. Surface ruptures resulting from the secondary effects of seismic shaking (e.g., landsliding, differential settlement, liquefaction) are omitted from the map and do not serve as a basis for zoning.

Active faults may exist outside the Earthquake Fault Zones on any zone map. Therefore, fault investigations are recommended for all critical and important developments proposed outside the Earthquake Fault Zones.

INDEX TO MAPS OF EARTHQUAKE FAULT ZONES

The following pages (Figures 4A to 4J) indicate the names and locations of the Official Maps of Earthquake Fault Zones delineated by the California Geological Survey under the Alquist-Priolo Earthquake Fault Zoning Act (Appendix A). These index pages identify all Official Maps of Earthquake Fault Zones released by the State Geologist through August 2007. The official maps are compiled on U.S. Geological Survey 7.5-minute topographic quadrangle maps at a scale of 1 inch equals 2,000 feet (Figure 3). Cities and counties affected by these maps are listed in Table 4.

Because Earthquake Fault Zones maps are issued every year or two to delineate revised and additional zones, users of these maps should check with the California Geological Survey for up-to-date information on new and revised Earthquake Fault Zones maps. A change in zones also may affect different local governments. This index to Official Maps of Earthquake Fault Zones (Figures 4A to 4J) will be revised in future years as new maps are issued.

The Earthquake Fault Zones maps are available for purchase as indicated under Availability of Earthquake Fault Zones Maps. Also, they may be consulted at any office of the California Geological Survey and at the planning departments of all cities and counties affected locally by Earthquake Fault Zones (Table 4).

Availability of Earthquake Fault Zones Maps

Reproducible masters, from which copies of local Earthquake Fault Zones maps (scale 1:24,000) can be made, have been provided to each of the cities and counties affected by the zones. Requests for copies of

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particular Earthquake Fault Zones maps of local areas should be directed to the Planning Director of the appropriate city or county. Refer to the index of Earthquake Fault Zones maps for the quadrangle names of the maps needed.

Arrangements also have been made with ARC-Bryant (formerly BPS Reprographic Services), San Francisco, to provide paper copies of the Earthquake Fault Zones maps to those who cannot get them conveniently from the cities and counties.

ARC-Bryant
945 Bryant Street
San Francisco, CA 94103
Telephone: (415) 495-8700

Each map must be ordered by quadrangle name as shown on the index map. The cost of the maps is nominal; handling and C.O.D. charges are extra. These maps are not sold by the California Geological Survey.

Digital files of the maps can be obtained from the California Geological Survey in both digital raster (pdf) and Geographic Information System (GIS) format. Refer to Appendix E for more information on obtaining digital files of the maps.

REFERENCES

(See Appendix E for Complete List of AP Products)

Bonilla, M.G., 1970, Surface faulting and related effects, *in* Wiegel, R.L, editor, Earthquake Engineering: Prentice-Hall, Inc., Englewood Cliffs, New Jersey, p. 47-74.

California Division of Mines and Geology, 1976, Active fault mapping and evaluation program -- 10-year program to implement Alquist-Priolo Special Studies Zones Act: California Division of Mines and Geology Special Publication 47, 42 p.

Grantz, A. and Bartow, A., 1977, Active faults of California: U.S. Geological Survey pamphlet, 15 p.

Hart, E.W., 1978, Zoning for the hazard of surface fault rupture in California: International Conference on Microzonation, 2nd, San Francisco, 1978, Proceedings, v. 2, p. 635-646.

Hart, E.W., 1986, Zoning for the hazard of surface faulting in California, *in* Proceedings Conference XXXII -- Workshop on future directions in evaluating earthquake hazards in southern California, November 12-13, 1985: U.S. Geological Survey Open-File Report 86-401, p. 74-83.

Jennings, C.W., 1975, Fault map of California with locations of volcanoes, thermal springs, and thermal wells: California Division of Mines and Geology Data Map No. 1, scale 1:750,000.

Jennings, C.W., 1985, An explanatory text to accompany the 1:750,000 scale Fault and Geologic Maps of California: Division of Mines and Geology Bulletin 201, 197 p., 2 plates.

Jennings, C.W., 1994, Fault activity map of California and adjacent areas: California Department of Conservation, Division of Mines and Geology Geologic Data Map No. 6, scale 1:750,000 (appendices).

Reitherman, R. and Leeds, D.J., 1990, A study of the effectiveness of the Alquist-Priolo program: California Division of Mines and Geology Open-File Report 90-18, 131 p.

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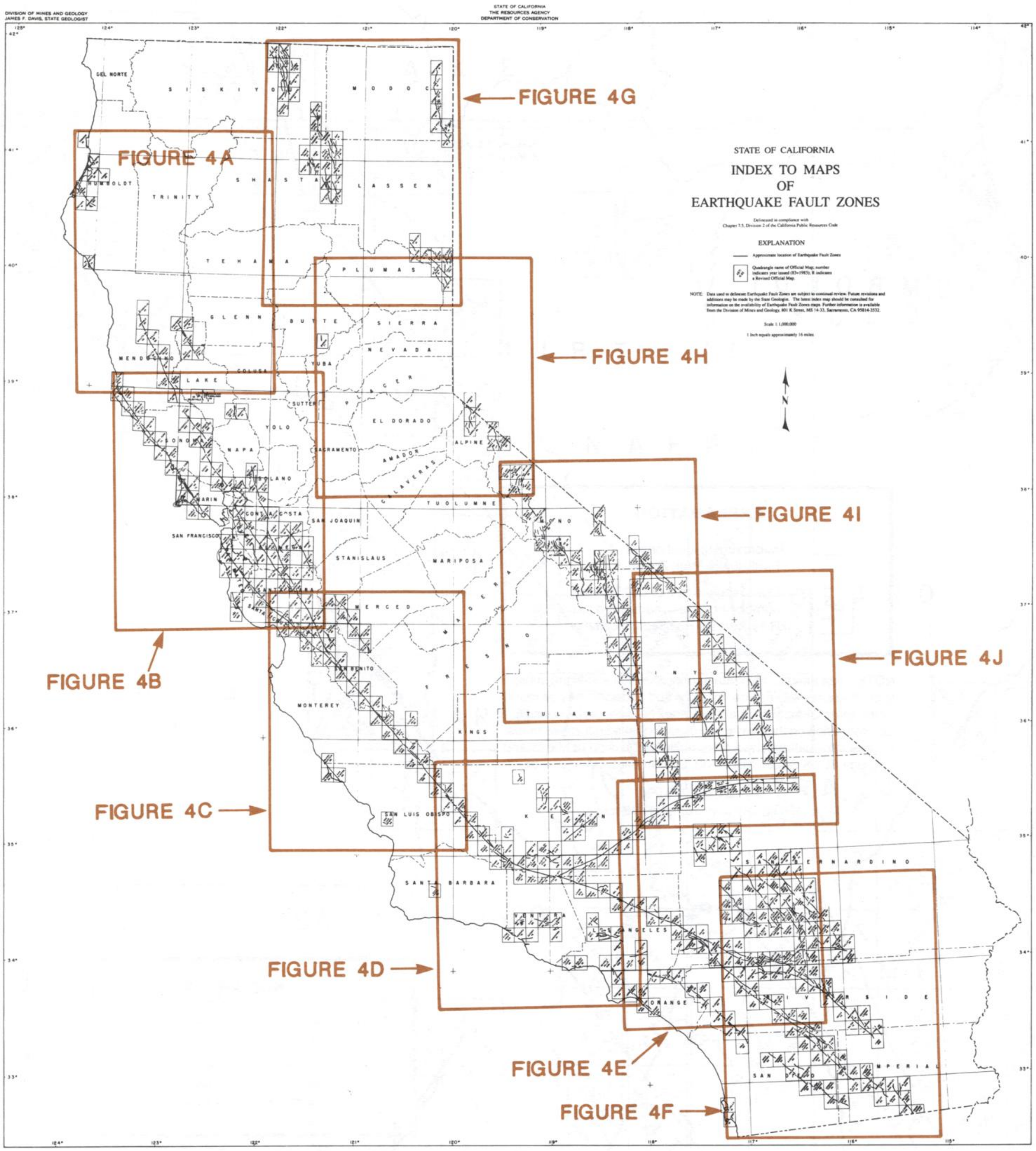

Data used to delineate Earthquake Fault Zones are subject to continual review. Future revisions and additions may be made by the State Geologist. Future supplements to this report should be consulted for information on the availability of Earthquake Fault Zones maps.
These Earthquake Fault Zones maps are delineated in compliance with Chapter 7.5, Division 2 of the California Public Resources Code.

Figure 4. Index to Official Maps of Earthquake Fault Zones.

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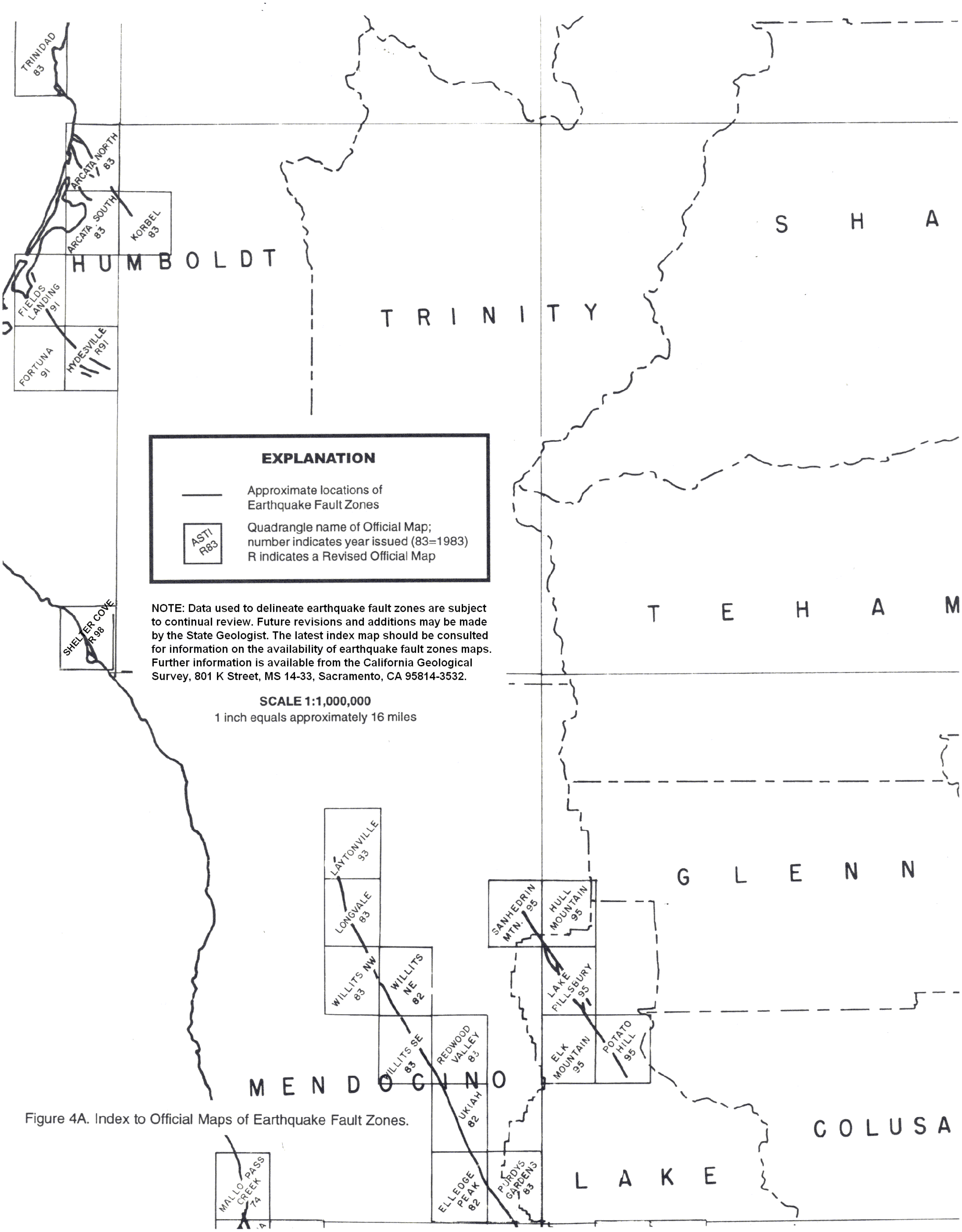

Figure 4A. Index to Official Maps of Earthquake Fault Zones.

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NOTE: Data used to delineate earthquake fault zones are subject to continual review. Future revisions and additions may be made by the State Geologist. The latest index map should be consulted for information on the availability of earthquake fault zones maps. Further information is available from the California Geological Survey, 801 K Street, MS 14-33, Sacramento, CA 95814-3532.

SCALE 1:1,000,000
1 inch equals approximately 16 miles

Figure 4B. Index to Official Maps of Earthquake Fault Zones.

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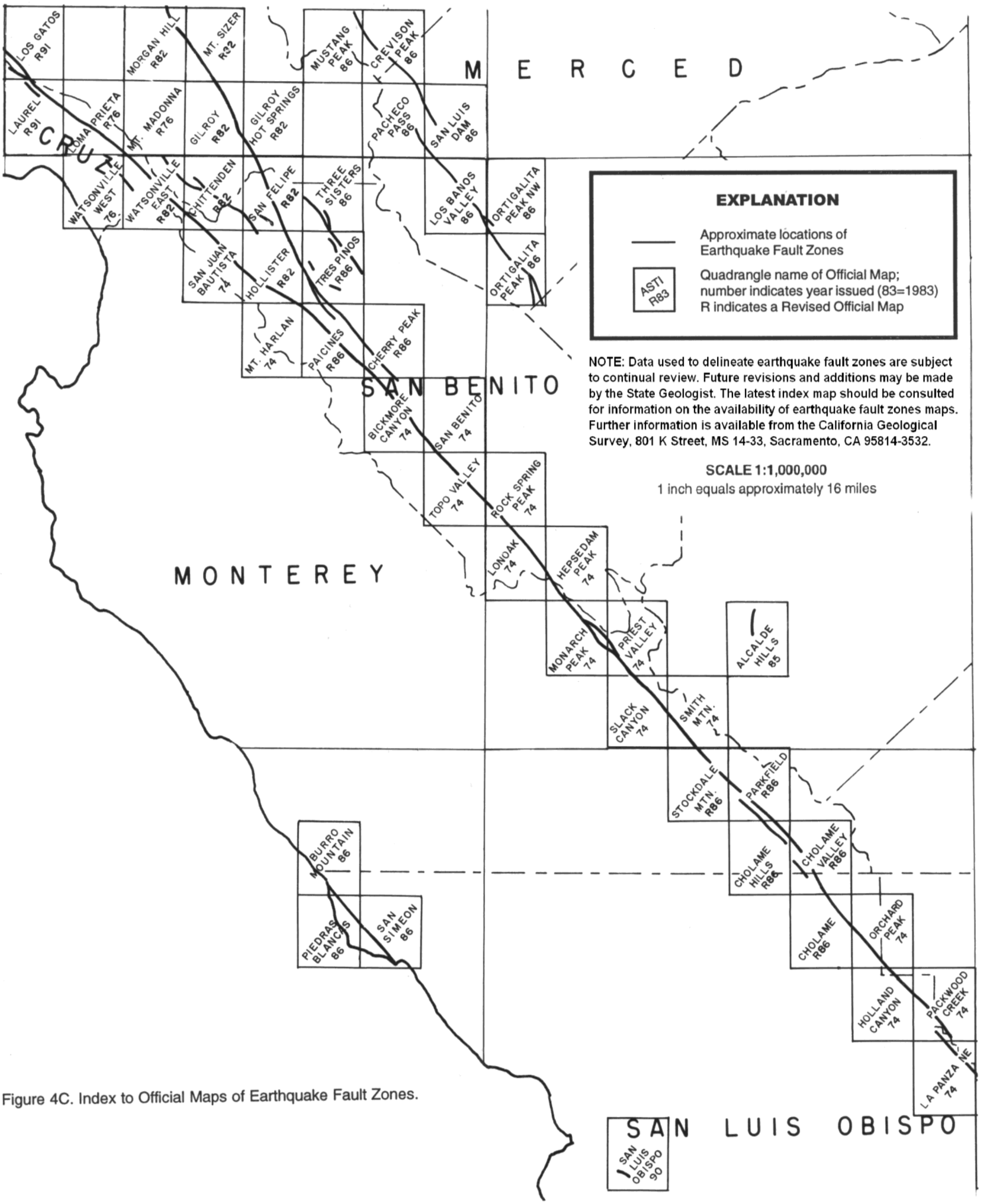

Figure 4C. Index to Official Maps of Earthquake Fault Zones.

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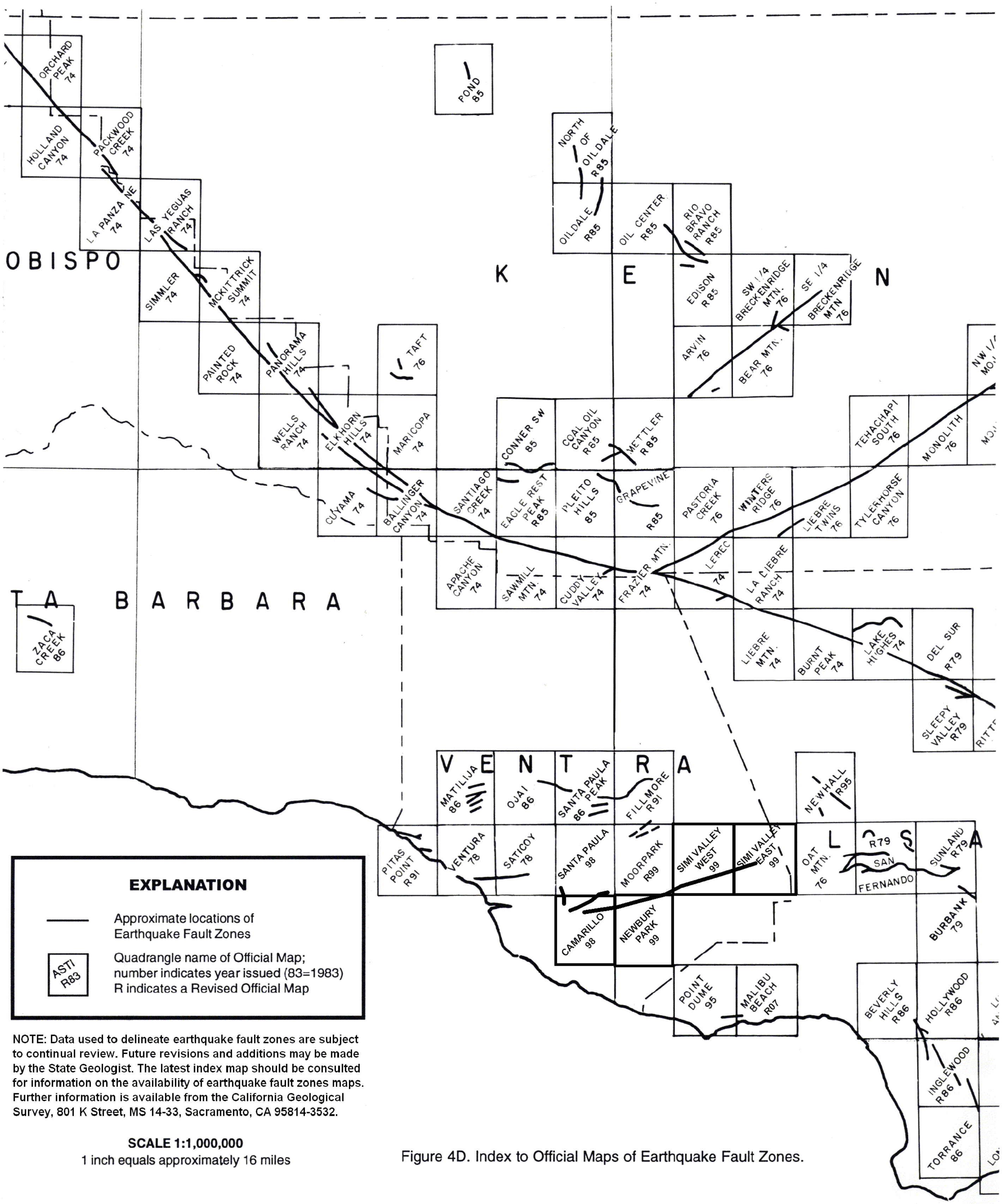

NOTE: Data used to delineate earthquake fault zones are subject to continual review. Future revisions and additions may be made by the State Geologist. The latest index map should be consulted for information on the availability of earthquake fault zones maps. Further information is available from the California Geological Survey, 801 K Street, MS 14-33, Sacramento, CA 95814-3532.

SCALE 1:1,000,000
1 inch equals approximately 16 miles

Figure 4D. Index to Official Maps of Earthquake Fault Zones.

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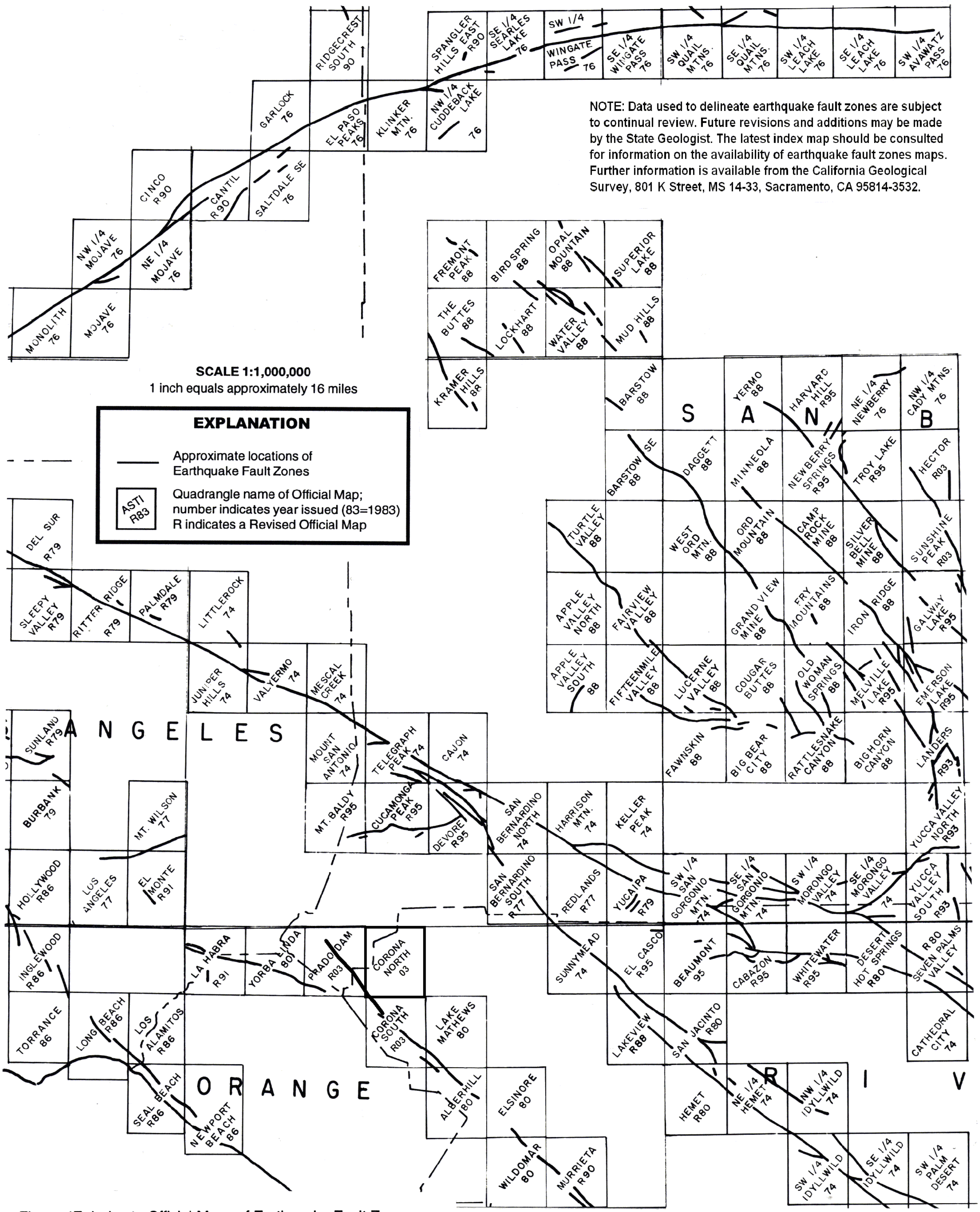

Figure 4E. Index to Official Maps of Earthquake Fault Zones.

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NOTE: Data used to delineate earthquake fault zones are subject to continual review. Future revisions and additions may be made by the State Geologist. The latest index map should be consulted for information on the availability of earthquake fault zones maps. Further information is available from the California Geological Survey, 801 K Street, MS 14-33, Sacramento, CA 95814-3532.

SCALE 1:1,000,000
1 inch equals approximately 16 miles

EXPLANATION

Approximate locations of Earthquake Fault Zones

ASTI R83 — Quadrangle name of Official Map; number indicates year issued (83=1983) R indicates a Revised Official Map

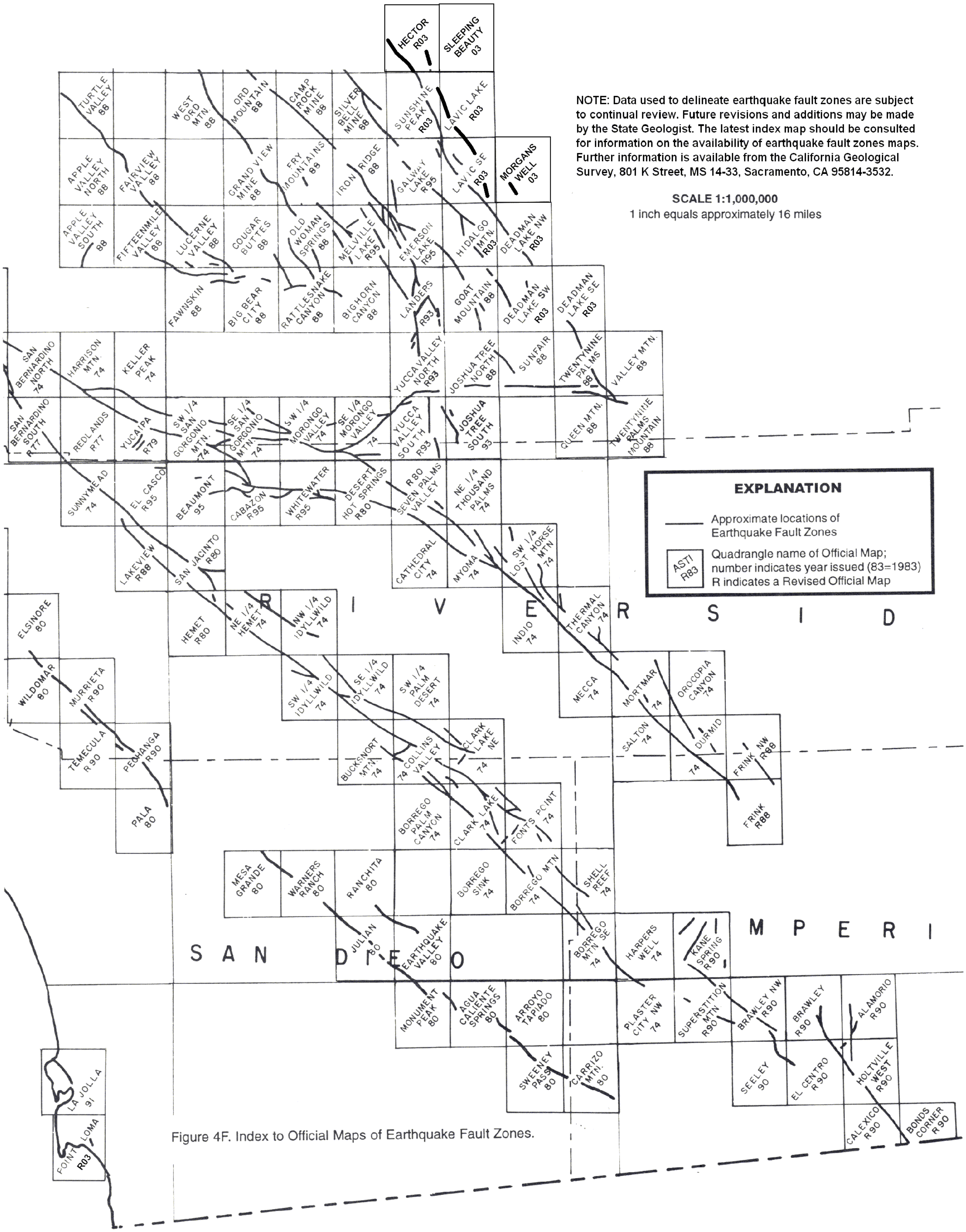

Figure 4F. Index to Official Maps of Earthquake Fault Zones.

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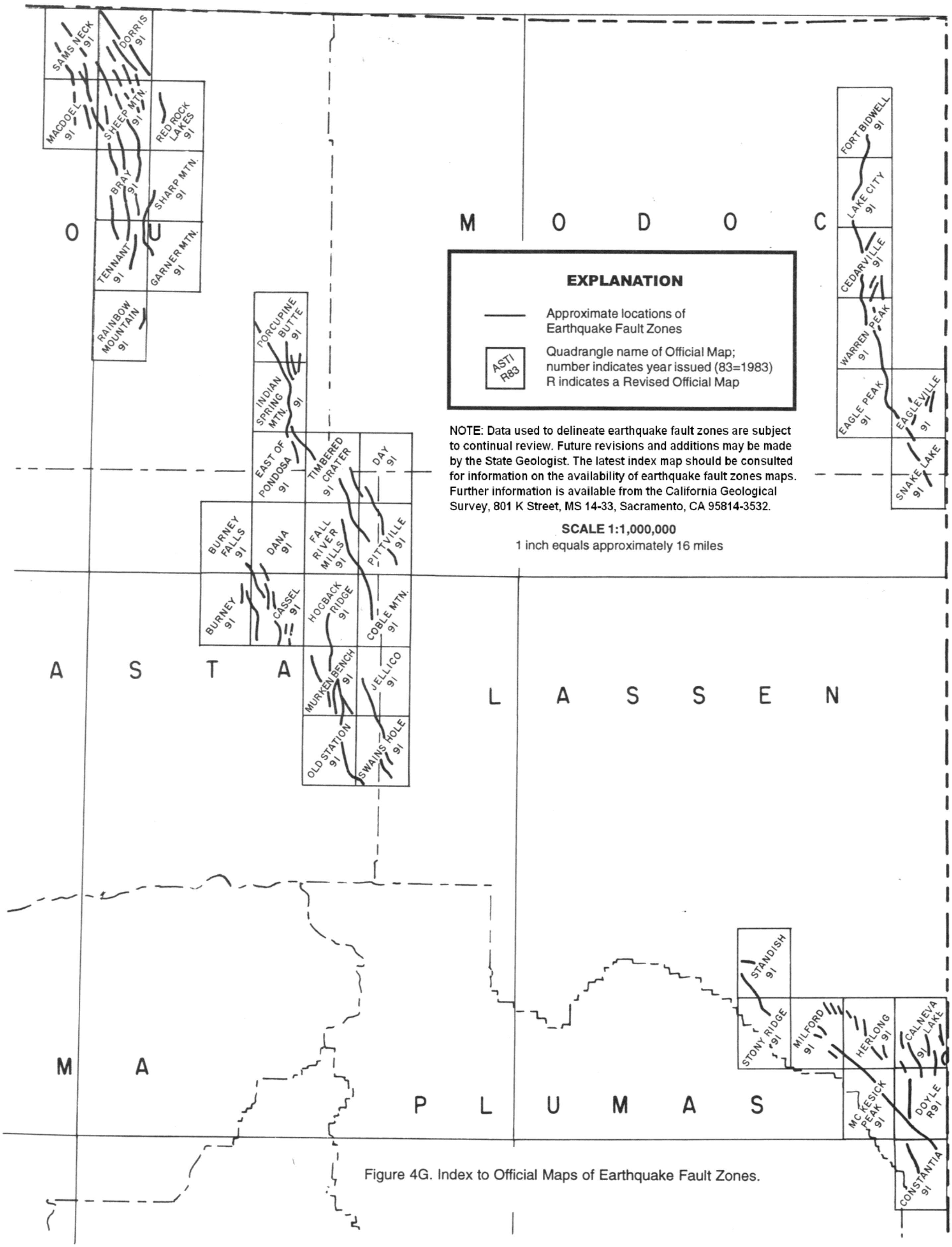

Figure 4G. Index to Official Maps of Earthquake Fault Zones.

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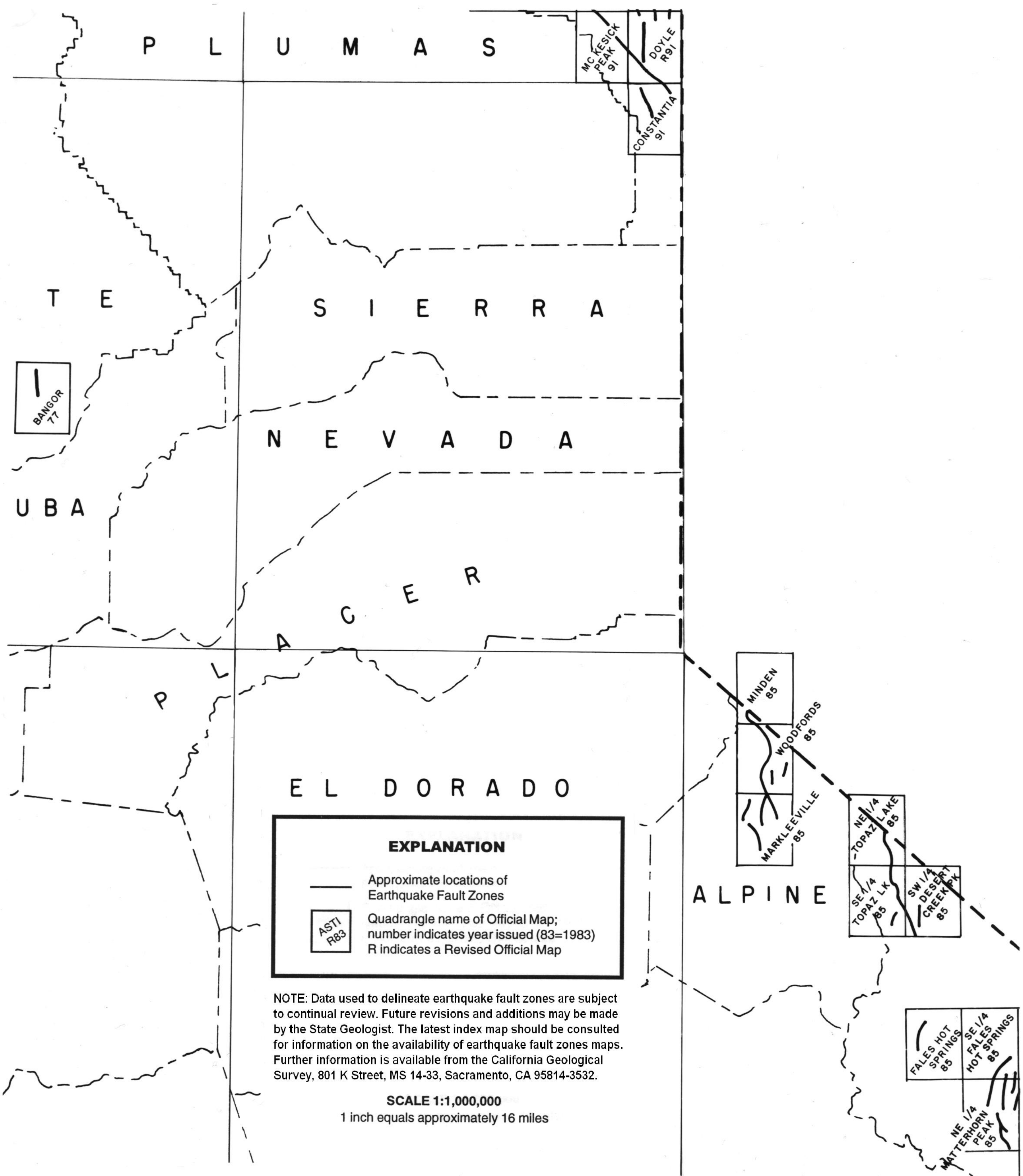

Figure 4H. Index to Official Maps of Earthquake Fault Zones.

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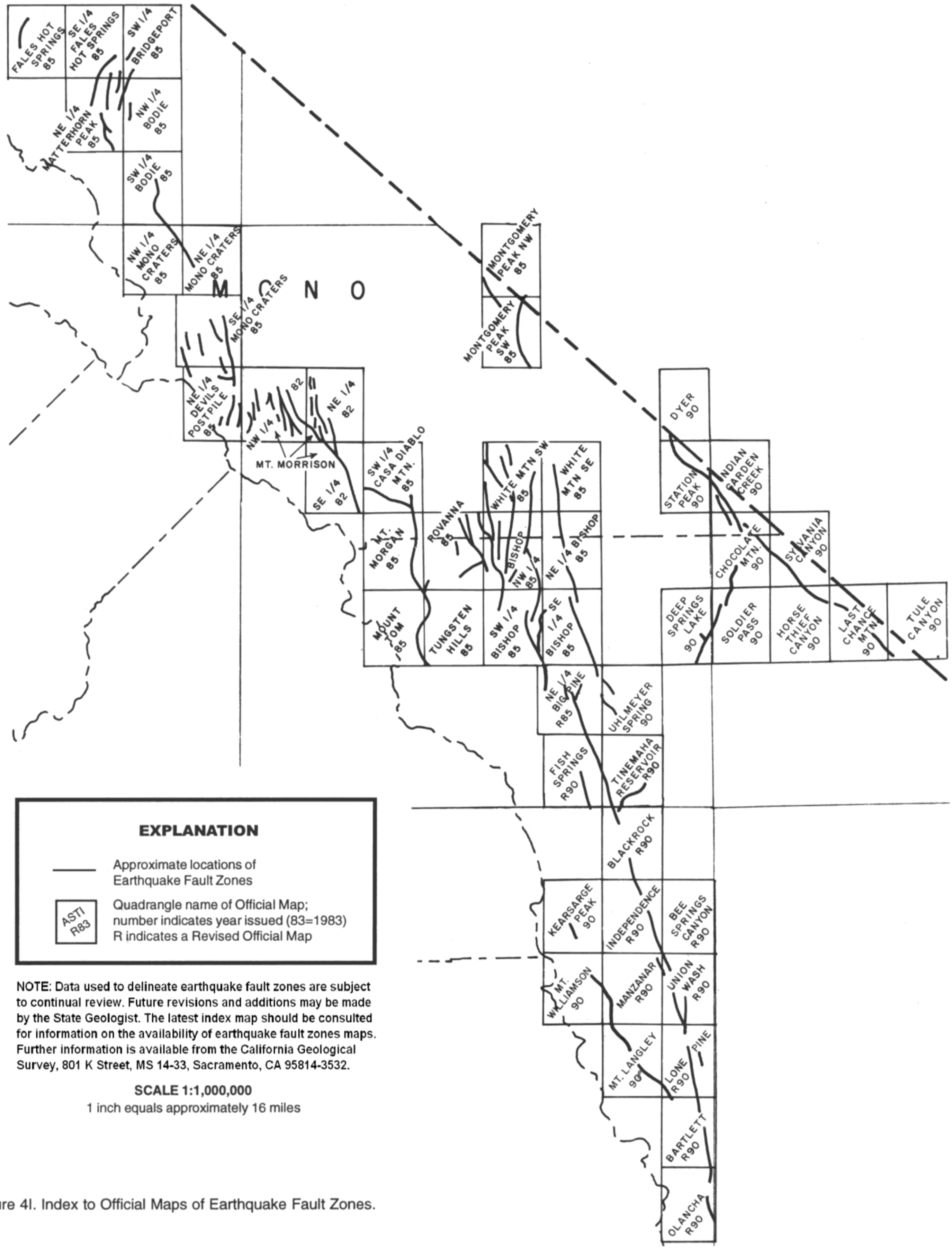

NOTE: Data used to delineate earthquake fault zones are subject to continual review. Future revisions and additions may be made by the State Geologist. The latest index map should be consulted for information on the availability of earthquake fault zones maps. Further information is available from the California Geological Survey, 801 K Street, MS 14-33, Sacramento, CA 95814-3532.

SCALE 1:1,000,000

1 inch equals approximately 16 miles

Figure 4I. Index to Official Maps of Earthquake Fault Zones.

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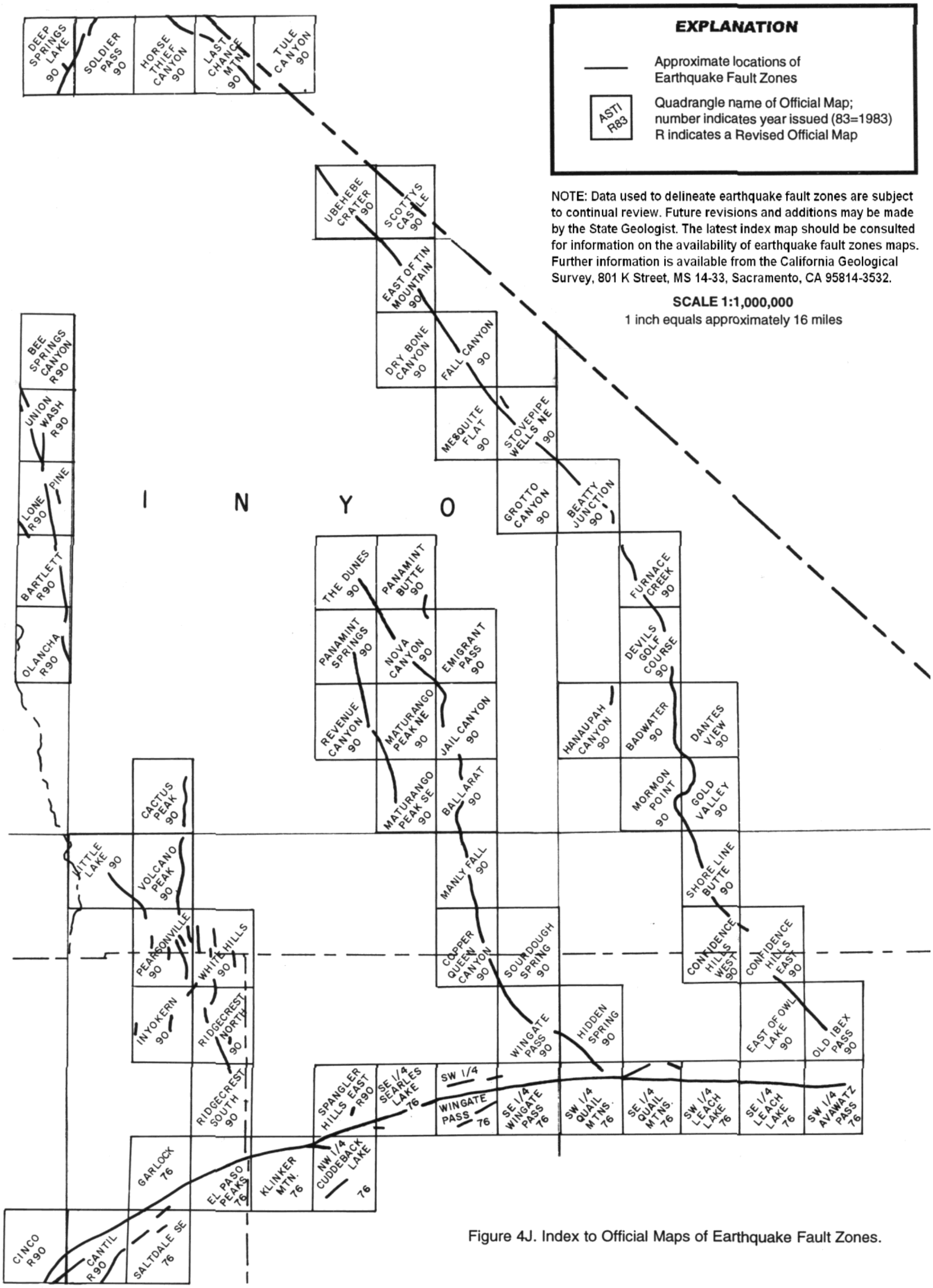

Figure 4J. Index to Official Maps of Earthquake Fault Zones.

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APPENDICES

Data are presented herein to provide city and county officials, property owners, developers, geologists, and others with specific information they may need to effectuate the Act.

Because the Act must be implemented at the local government level, it is imperative that the local entities understand its various aspects.

Appendix A
ALQUIST-PRIOLO EARTHQUAKE FAULT ZONING ACT[1]
Excerpts from California Public Resources Code

DIVISION 2. Geology, Mines and Mining
CHAPTER 7.5 Earthquake Fault Zones[2]

2621. This chapter shall be known and may be cited as the Alquist-Priolo Earthquake Fault Zoning Act[1].

2621.5. (a) It is the purpose of this chapter to provide for the adoption and administration of zoning laws, ordinances, rules, and regulations by cities and counties in implementation of the general plan that is in effect in any city or county. The Legislature declares that this chapter is intended to provide policies and criteria to assist cities, counties, and state agencies in the exercise of their responsibility to prohibit the location of developments and structures for human occupancy across the trace of active faults. Further, it is the intent of this chapter to provide the citizens of the state with increased safety and to minimize the loss of life during and immediately following earthquakes by facilitating seismic retrofitting to strengthen buildings, including historical buildings, against ground shaking.

(b) This chapter is applicable to any project, as defined in Section 2621.6, which is located within a delineated earthquake fault zone, upon issuance of the official earthquake fault zones maps to affected local jurisdictions, except as provided in Section 2621.7.

(c) The implementation of this chapter shall be pursuant to policies and criteria established and adopted by the Board[3]

2621.6. (a) As used in this chapter, “project” means either of the following:

(1) Any subdivision of land which is subject to the Subdivision Map Act, (Division 2 (commencing with Section 66410) of Title 7 of the Government Code), and which contemplates the eventual construction of structures for human occupancy.

(2) Structures for human occupancy, with the exception of either of the following:

(A) Single-family wood-frame or steel-frame dwellings to be built on parcels of land for which geologic reports have been approved pursuant to paragraph (1).

(B) A single-family wood-frame or steel-frame dwelling not exceeding two stories when that dwelling is not part of a development of four or more dwellings.

(b) For the purposes of this chapter, a mobilehome whose body width exceeds eight feet shall be considered to be a single-family wood-frame dwelling not exceeding two stories.

2621.7. This chapter, except Section 2621.9, shall not apply to any of the following:

(a) The conversion of an existing apartment complex into a condominium.

(b) Any development or structure in existence prior to May 4, 1975, except for an alteration or addition to a structure that exceeds the value limit specified in subdivision (c).

(c) An alteration or addition to any structure if the value of the alteration or addition does not exceed 50 percent of the value of the structure.

(d) (1) Any structure located within the jurisdiction of the City of Berkeley or the City of Oakland which was

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1 Known as the Alquist-Priolo Special Studies Zones Act prior to January 1, 1994.

2 Know as Special Studies Zones prior to January 1, 1994.

3 State Mining and Geology Board.

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damaged by fire between October 20, 1991, and October 23, 1991, if granted an exemption pursuant to this subdivision.

(2) The city may apply to the State Geologist for an exemption and the State Geologist shall grant the exemption only if the structure located within the earthquake fault zone is not situated upon a trace of an active fault line, as delineated in an official earthquake fault zone map or in more recent geologic data, as determined by the State Geologist.

(3) When requesting an exemption, the city shall submit to the State Geologist all of the following information:

(A) Maps noting the parcel numbers of proposed building sites that are at least 50 feet from an identified fault and a statement that there is not any more recent information to indicate a geologic hazard.

(B) Identification of any sites within 50 feet of an identified fault.

(C) Proof that the property owner has been notified that the granting of an exemption is not any guarantee that a geologic hazard does not exist.

(4) The granting of an exemption does not relieve a seller of real property or an agent for the seller of the obligation to disclose to a prospective purchaser that the property is located within a delineated earthquake fault zone, as required by Section 2621.9.

(e) (1) Alterations which include seismic retrofitting, as defined in Section 8894.2 of the Government Code, to any of the following listed types of buildings in existence prior to May 4, 1975:

(A) Unreinforced masonry buildings, as described in subdivision (a) of Section 8875 of the Government Code.

(B) Concrete tilt-up buildings, as described in Section 8893 of the Government Code.

(C) Reinforced concrete moment resisting frame buildings as described in Applied Technology Council Report 21 (FEMA Report 154).

(2) The exemption granted by paragraph (1) shall not apply unless a city or county acts in accordance with all of the following:

(A) The building permit issued by the city or county for the alterations authorizes no greater human occupancy load, regardless of proposed use, than that authorized for the existing use permitted at the time the city or county grants the exemption. This may be accomplished by the city or county making a human occupancy load determination that is based on, and no greater than, the existing authorized use, and including that determination on the building permit application as well as a statement substantially as follows: "Under subparagraph (A) of paragraph (2) of subdivision (e) of Section 2621.7 of the Public Resources Code, the occupancy load is limited to the occupancy load for the last lawful use authorized or existing prior to the issuance of this building permit, as determined by the city or county."

(B) The city or county requires seismic retrofitting, as defined in Section 8894.2 of the Government Code, which is necessary to strengthen the entire structure and provide increased resistance to ground shaking from earthquakes.

(C) Exemptions granted pursuant to paragraph (1) are reported in writing to the State Geologist within 30 days of the building permit issuance date.

(3) Any structure with human occupancy restrictions under subparagraph (A) of paragraph (2) shall not be granted a new building permit that allows an increase in human occupancy unless a geologic report, prepared pursuant to subdivision (d) of Section 3603 of Title 14 of the California Code of Regulations in effect on January 1, 1994, demonstrates that the structure is not on the trace of an active fault, or the requirement of a geologic report has been waived pursuant to Section 2623.

(4) A qualified historical building within an earthquake fault zone that is exempt pursuant to this subdivision may be repaired or seismically retrofitted using the State Historical Building Code, except that, notwithstanding any provision of that building code and its implementing regulations, paragraph (2) shall apply.

2621.8. Notwithstanding Section 818.2 of the Government Code, a city or county which knowingly issues a permit that grants an exemption pursuant to subdivision (e) of Section 2621.7 that does not adhere to the requirements of paragraph (2) of subdivision (e) of Section 2621.7, may be liable for earthquake-related injuries or deaths caused by failure to so adhere.

2621.9. (a) A person who is acting as an agent for a transferor of real property that is located within a delineated earthquake fault zone, or the transferor, if he or she is acting without an agent, shall disclose to any prospective transferee the fact that the property is located within a delineated earthquake fault zone.

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(b) Disclosure is required pursuant to this section only when one of the following conditions is met:

(1) The transferor, or the transferor's agent, has actual knowledge that the property is within a delineated earthquake fault zone.

(2) A map that includes the property has been provided to the city or county pursuant to Section 2622, and a notice has been posted at the offices of the county recorder, county assessor, and county planning agency that identifies the location of the map and any information regarding changes to the map received by the county.

(c) In all transactions that are subject to Section 1103 of the Civil Code, the disclosure required by subdivision (a) of this section shall be provided by either of the following means:

(1) The Local Option Real Estate Transfer Disclosure Statement as provided in Section 1102.6a of the Civil Code.

(2) The Natural Hazard Disclosure Statement as provided in Section 1103.2 of the Civil Code.

(d) If the map or accompanying information is not of sufficient accuracy or scale that a reasonable person can determine if the subject real property is included in a delineated earthquake fault hazard zone, the agent shall mark "Yes" on the Natural Hazard Disclosure Statement. The agent may mark "No" on the Natural Hazard Disclosure Statement if he or she attaches a report prepared pursuant to subdivision (c) of Section 1103.4 of the Civil Code that verifies the property is not in the hazard zone. Nothing in this subdivision is intended to limit or abridge any existing duty of the transferor or the transferor's agents to exercise reasonable care in making a determination under this subdivision.

(e) For purposes of the disclosures required by this section, the following persons shall not be deemed agents of the transferor:

(1) Persons specified in Section 1103.11 of the Civil Code.

(2) Persons acting under a power of sale regulated by Section 2924 of the Civil Code.

(f) For purposes of this section, Section 1103.13 of the Civil Code shall apply.

(g) The specification of items for disclosure in this section does not limit or abridge any obligation for disclosure created by any other provision of law or that may exist in order to avoid fraud, misrepresentation, or deceit in the transfer transaction.

2622. (a) In order to assist cities and counties in their planning, zoning, and building-regulation functions, the State Geologist shall delineate, by December 31, 1973, appropriately wide earthquake fault zones to encompass all potentially and recently active traces of the San Andreas, Calaveras, Hayward, and San Jacinto Faults, and such other faults, or segments thereof, as the State Geologist determines to be sufficiently active and well-defined as to constitute a potential hazard to structures from surface faulting or fault creep. The earthquake fault zones shall ordinarily be one-quarter mile or less in width, except in circumstances which may require the State Geologist to designate a wider zone.

(b) Pursuant to this section, the State Geologist shall compile maps delineating the earthquake fault zones and shall submit the maps to all affected cities, counties, and state agencies, not later than December 31, 1973, for review and comment. Concerned jurisdictions and agencies shall submit all comments to the State Mining and Geology Board for review and consideration within 90 days. Within 90 days of such review, the State Geologist shall provide copies of the official maps to concerned state agencies and to each city or county having jurisdiction over lands lying within any such zone.

(c) The State Geologist shall continually review new geologic and seismic data and shall revise the earthquake fault zones or delineate additional earthquake fault zones when warranted by new information. The State Geologist shall submit all revised maps and additional maps to all affected cities, counties, and state agencies for their review and comment. Concerned jurisdictions and agencies shall submit all comments to the State Mining and Geology Board for review and consideration within 90 days. Within 90 days of that review, the State Geologist shall provide copies of the revised and additional official maps to concerned state agencies and to each city or county having jurisdiction over lands lying within the earthquake fault zone.

(d) In order to ensure that sellers of real property and their agents are adequately informed, any county that receives an official map pursuant to this section shall post a notice within five days of receipt of the map at the offices of the county recorder, county assessor, and county planning commission, identifying the location of the map and the effective date of the notice.

2623. (a) The approval of a project by a city or county shall be in accordance with policies and criteria established by the State Mining and Geology Board and the findings of the State Geologist. In the development of such policies and criteria, the State Mining and Geology Board shall seek the comment and advice of affected cities, counties,

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and state agencies. Cities and counties shall require, prior to the approval of a project, a geologic report defining and delineating any hazard of surface fault rupture. If the city or county finds that no undue hazard of that kind exists, the geologic report on the hazard may be waived, with the approval of the State Geologist.

(b) After a report has been approved or a waiver granted, subsequent geologic reports shall not be required, provided that new geologic data warranting further investigations is not recorded.

(c) The preparation of geologic reports that are required pursuant to this section for multiple projects may be undertaken by a geologic hazard abatement district.

2624. Notwithstanding any provision of this chapter, cities and counties may do any of the following:

(1) Establish policies and criteria which are stricter than those established by this chapter.

(2) Impose and collect fees in addition to those required under this chapter.

(3) Determine not to grant exemptions authorized under this chapter.

2625. (a) Each applicant for approval of a project may be charged a reasonable fee by the city or county having jurisdiction over the project.

(b) Such fees shall be set in an amount sufficient to meet, but not to exceed, the costs to the city or county of administering and complying with the provisions of this chapter.

(c) The geologic report required by Section 2623 shall be in sufficient detail to meet the criteria and policies established by the State Mining and Geology Board for individual parcels of land.

2630. In carrying out the provisions of this chapter, the State Geologist and the board shall be advised by the Seismic Safety Commission.

SIGNED INTO LAW DECEMBER 22, 1972; AMENDED SEPTEMBER 16, 1974, MAY 4, 1975, SEPTEMBER 28, 1975, SEPTEMBER 22, 1976, SEPTEMBER 27, 1979, SEPTEMBER 21, 1990, JULY 29, 1991, AUGUST 16, 1992, JULY 25, 1993, OCTOBER 7, 1993, AND OCTOBER 7, 1997

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Appendix B

POLICIES AND CRITERIA OF THE STATE MINING AND GEOLOGY BOARD

With Reference to the Alquist-Priolo Earthquake Fault Zoning Act

(Excerpts from the California Code of Regulations, Title 14, Division 2)

3600. Purpose.

It is the purpose of this subchapter to set forth the policies and criteria of the State Mining and Geology Board, hereinafter referred to as the "Board," governing the exercise of city, county, and state agency responsibilities to prohibit the location of developments and structures for human occupancy across the trace of active faults in accordance with the provisions of Public Resources Code Section 2621 et seq. (Alquist-Priolo Earthquake Fault Zoning Act). The policies and criteria set forth herein shall be limited to potential hazards resulting from surface faulting or fault creep within earthquake fault zones delineated on maps officially issued by the State Geologist.

NOTE: Authority cited: Section 2621.5, Public Resources Code. Reference: Sections 2621-2630, Public Resources Code.

3601. Definitions.

The following definitions as used within the Act and herein shall apply:

(a) An "active fault" is a fault that has had surface displacement within Holocene time (about the last 11,000 years), hence constituting a potential hazard to structures that might be located across it.

(b) A "fault trace" is that line formed by the intersection of a fault and the earth's surface, and is the representation of a fault as depicted on a map, including maps of earthquake fault zones.

(c) A "lead agency" is the city or county with the authority to approve projects.

(d) "Earthquake fault zones" are areas delineated by the State Geologist, pursuant to the Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Section 2621 et seq.) and this subchapter, which encompass the traces of active faults.

(e) A "structure for human occupancy" is any structure used or intended for supporting or sheltering any use or occupancy, which is expected to have a human occupancy rate of more than 2,000 person-hours per year.

(f) "Story" is that portion of a building included between the upper surface of any floor and the upper surface of the floor next above, except that the topmost story shall be that portion of a building included between the upper surface of the topmost floor and the ceiling or roof above. For the purpose of the Act and this subchapter, the number of stories in a building is equal to the number of distinct floor levels, provided that any levels that differ from each other by less than two feet shall be considered as one distinct level.

NOTE: Authority cited: Section 2621.5, Public Resources Code. Reference: Sections 2621-2630, Public Resources Code.

3602. Review of Preliminary Maps.

(a) Within 45 days from the issuance of proposed new or revised preliminary earthquake fault zone map(s), cities and counties shall give notice of the Board's announcement of a ninety (90) day public comment period to property owners within the area of the proposed zone. The notice shall be by publication, or other means reasonably calculated to reach as many of the affected property owners as feasible. Cities and counties may also give notice to consultants who may conduct geologic studies in fault zones. The notice shall state that its purpose is to provide an opportunity for public comment including providing to the Board geologic information that may have a bearing on the proposed map(s).

(b) The Board shall also give notice by mail to those California Registered Geologists and California Registered Geophysicists on a list provided by the State Board of Registration for Geologists and Geophysicists. The notice shall indicate the affected jurisdictions and state that its purpose is to provide an opportunity to present written technical comments that may have a bearing on the proposed zone map(s) to the Board during a 90-day public comment period.

(c) The Board shall receive public comments during the 90-day public comment period. The Board shall

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conduct at least one public hearing on the proposed zone map(s) during the 90-day public comment period.

(d) Following the end of the 90-day public comment period, the Board shall forward its comments and recommendations with supporting data received to the State Geologist for consideration prior to the release of official earthquake fault zone map(s).

NOTE: Authority cited: Section 2621.5, Public Resources Code. Reference: Section 2622, Public Resources Code.

3603. Specific Criteria.

The following specific criteria shall apply within earthquake fault zones and shall be used by affected lead agencies in complying with the provisions of the Act:

(a) No structure for human occupancy, identified as a project under Section 2621.6 of the Act, shall be permitted to be placed across the trace of an active fault. Furthermore, as the area within fifty (50) feet of such active faults shall be presumed to be underlain by active branches of that fault unless proven otherwise by an appropriate geologic investigation and report prepared as specified in Section 3603(d) of this subchapter, no such structures shall be permitted in this area.

(b) Affected lead agencies, upon receipt of official earthquake fault zones maps, shall provide for disclosure of delineated earthquake fault zones to the public. Such disclosure may be by reference in general plans, specific plans, property maps, or other appropriate local maps.

(c) No change in use or character of occupancy, which results in the conversion of a building or structure from one not used for human occupancy to one that is so used, shall be permitted unless the building or structure complies with the provisions of the Act.

(d) Application for a development permit for any project within a delineated earthquake fault zone shall be accompanied by a geologic report prepared by a geologist registered in the State of California, which is directed to the problem of potential surface fault displacement through the project site, unless such report is waived pursuant to Section 2623 of the Act. The required report shall be based on a geologic investigation designed to identify the location, recency, and nature of faulting that may have affected the project site in the past and may affect the project site in the future. The report may be combined with other geological or geotechnical reports.

(e) A geologist registered in the State of California, within or retained by each lead agency, shall evaluate the geologic reports required herein and advise the lead agency.

(f) One (1) copy of all such geologic reports shall be filed with the State Geologist by the lead agency within thirty (30) days following the report's acceptance. The State Geologist shall place such reports on open file.

NOTE: Authority cited: Section 2621.5, Public Resources Code. Reference: Sections 2621.5, 2622, 2623, and 2625(c), Public Resources Code.

ADOPTED NOVEMBER 23, 1973; REVISED JULY 1, 1974, AND JUNE 26, 1975.
CODIFIED IN CALIFORNIA CODE OF REGULATIONS JANUARY 31, 1979;
REVISED OCTOBER 18, 1984, JANUARY 5, 1996, AND APRIL 1, 1997.

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Appendix C

GUIDELINES FOR EVALUATING THE HAZARD OF SURFACE RUPTURE

(These guidelines, also published as DMG Note 49 (1997), are not part of the Policies and Criteria of the State Mining and Geology Board. Similar guidelines were adopted by the Board for advisory purposes in 1996.)

These guidelines are to assist geologists who investigate faults relative to the hazard of surface fault rupture. Subsequent to the passage of the Alquist-Priolo Earthquake Fault Zoning Act (1972), it became apparent that many fault investigations conducted in California were incomplete or otherwise inadequate for the purpose of evaluating the potential of surface fault rupture. It was further apparent that statewide standards for investigating faults would be beneficial. These guidelines were initially prepared in 1975 as DMG Note 49 and have been revised several times since then.

The investigation of sites for the possible hazard of surface fault rupture is a deceptively difficult geologic task. Many active faults are complex, consisting of multiple breaks. Yet the evidence for identifying active fault traces is generally subtle or obscure and the distinction between recently active and long-inactive faults may be difficult to make. It is impractical from an economic, engineering, and architectural point of view to design a structure to withstand serious damage under the stress of surface fault rupture. Once a structure is sited astride an active fault, the resulting fault-rupture hazard cannot be mitigated unless the structure is relocated, whereas when a structure is placed on a landslide, the potential hazard from landsliding often can be mitigated. Most surface faulting is confined to a relatively narrow zone a few feet to a few tens of feet wide, making avoidance (i.e., building setbacks) the most appropriate mitigation method. However, in some cases primary fault rupture or rupture along branch faults can be distributed across zones hundreds of feet wide or manifested as broad warps, suggesting that engineering strengthening or design may be of additional mitigative value (e.g., Lazarte and others, 1994).

No single investigative method will be the best, or even useful, at all sites, because of the complexity of evaluating surface and near surface faults and because of the infinite variety of site conditions. Nonetheless, certain investigative methods are more helpful than others in locating faults and evaluating the recency of activity.

The evaluation of a given site with regard to the potential hazard of surface fault rupture is based extensively on the concepts of *recency* and *recurrence* of faulting along existing faults. In a general way, the more recent the faulting the greater the probability for future faulting (Allen, 1975). Stated another way, faults of known historic activity during the last 200 years, as a class, have a greater probability for future activity than faults classified as Holocene age (last 11,000 years) and a much greater probability of future activity than faults classified as Quaternary age (last 1.6 million years). However, it should be kept in mind that certain faults have recurrent activity measured in tens or hundreds of years whereas other faults may be inactive for thousands of years before being reactivated. Other faults may be characterized by creep-type rupture that is more or less on-going. The magnitude, sense, and nature of fault rupture also vary for different faults or even along different strands of the same fault. Even so, future faulting generally is expected to recur along pre-existing faults (Bonilla, 1970, p. 68). The development of a new fault or reactivation of a long-inactive fault is relatively uncommon and generally need not be a concern in site development.

As a practical matter, fault investigations should be directed at the problem of locating existing faults and then attempting to evaluate the recency of their activity. Data should be obtained both from the site and outside the site area. The most useful and direct method of evaluating recency is to observe (in a trench or road cut) the youngest geologic unit faulted and the oldest unit that is not faulted. Even so, active faults may be subtle or discontinuous and consequently overlooked in trench exposures (Bonilla and Lienkaemper, 1991). Therefore, careful logging is essential and trenching needs to be conducted in conjunction with other methods. For example, recently active faults may also be identified by direct observation of young, fault-related geomorphic (i.e., topographic) features in the field or on aerial photographs. Other indirect and more interpretive methods are identified in the outline below. Some of these methods are discussed in Bonilla (1982), Carver and McCalpin (1996), Hatheway and Leighton (1979), McCalpin

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(1996a, b, c), National Research Council (1986), Sherard and others (1974), Slemmons (1977), Slemmons and dePolo (1986), Taylor and Cluff (1973), the Utah Section of the Association of Engineering Geologists (1987), Wallace (1977), Weldon and others (1996), and Yeats and others (1997). McCalpin (1996b) contains a particularly useful discussion of various field techniques. Many other useful references are listed in the bibliographies of the references cited here.

The purpose, scope, and methods of investigation for fault investigations will vary depending on conditions at specific sites and the nature of the projects. Contents and scope of the investigation also may vary based on guidelines and review criteria of agencies or political organizations having regulatory responsibility. However, there are topics that should be considered in all comprehensive fault investigations and geologic reports on faults. For a given site some topics may be addressed in more detail than at other sites because of the difference in the geologic and/or tectonic setting and/or site conditions. These investigative considerations should apply to any comprehensive fault investigation and may be applied to any project site, large or small. Suggested topics, considerations, and guidelines for fault investigations and reports on faults are provided in the following annotated outline. Fault investigations may be conducted in conjunction with other geologic and geotechnical investigations (see DMG Notes 42 and 44; also California Department of Conservation, Division of Mines and Geology, 1997). Although not all investigative techniques need to be or can be employed in evaluating a given site, the outline provides a checklist for preparing complete and well-documented reports. Most reports on fault investigations are reviewed by local or state government agencies. Therefore it is necessary that the reports be documented adequately and written carefully to facilitate that review. The importance of the review process is emphasized here, because it is the reviewer who must evaluate the adequacy of reports, interpret or set standards where they are unclear, and advise the governing agency as to their acceptability (Hart and Williams, 1978; DMG Note 41).

The scope of the investigation is dependent not only on the complexity and economics of a project, but also on the level of risk acceptable for the proposed structure or development. A more detailed investigation should be made for hospitals, high-rise buildings, and other critical or sensitive structures than for low-occupancy structures such as wood-frame dwellings that are comparatively safe. The conclusions drawn from any given set of data, however, must be consistent and unbiased. Recommendations must be clearly separated from conclusions, because recommendations are not totally dependent on geologic factors. The final decision as to whether, or how, a given project should be developed lies in the hands of the owner and the governing body that must review and approve the project.

CONTENTS OF GEOLOGIC REPORTS ON FAULTS

Suggested topics, considerations, and guidelines for investigations and reports

The following topics should be considered and addressed in detail where essential to support opinions, conclusions, and recommendations, in any geologic report on faults. It is not expected that all of the topics or investigative methods would be necessary in a single investigation. In specific cases it may be necessary to extend some of the investigative methods well beyond the site or property being investigated. Particularly helpful references are cited parenthetically below.

I. Text.

   A. Purpose and scope of investigation; description of proposed development.

   B. Geologic and tectonic setting. Include seismicity and earthquake history.

   C. Site description and conditions, including dates of site visits and observations. Include information on geologic units, graded and filled areas, vegetation, existing structures, and other factors that may affect the choice of investigative methods and the interpretation of data.

   D. Methods of investigation.

      1. Review of published and unpublished literature, maps, and records concerning geologic units, faults, ground-water barriers, and other factors.

      2. Stereoscopic interpretation of aerial photographs and other remotely sensed images to detect fault-related topography (geomorphic features), vegetation and soil contrasts, and other lineaments of possible fault origin. The area interpreted usually should extend beyond the site boundaries.

      3. Surface observations, including mapping of geologic and soil units, geologic structures, geomorphic features and surfaces, springs, deformation of engineered structures due to fault creep, both on and beyond the site.

      4. Subsurface investigations.

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a. Trenching and other excavations to permit detailed and direct observation of continuously exposed geologic units, soils, and structures; must be of adequate depth and be carefully logged (see Taylor and Cluff, 1973; Hatheway and Leighton, 1979; McCalpin, 1996b).

b. Borings and test pits to permit collection of data on geologic units and ground water at specific locations. Data points must be sufficient in number and spaced adequately to permit valid correlations and interpretations.

c. Cone penetrometer testing (CPT) (Grant and others, 1997; Edelman and others, 1996). CPT must be done in conjunction with continuously logged borings to correlate CPT results with on-site materials. The number of borings and spacing of CPT soundings should be sufficient to adequately image site stratigraphy. The existence and location of a fault based on CPT data are interpretative.

5. Geophysical investigations. These are indirect methods that require a knowledge of specific geologic conditions for reliable interpretations. They should seldom, if ever, be employed alone without knowledge of the geology (Chase and Chapman, 1976). Geophysical methods alone never prove the absence of a fault nor do they identify the recency of activity. The types of equipment and techniques used should be described and supporting data presented (California Board of Registration for Geologists and Geophysicists, 1993).

a. High resolution seismic reflection (Stephenson and others, 1995; McCalpin, 1996b).

b. Ground penetrating radar (Cai and others, 1996).

c. Other methods include: seismic refraction, magnetic profiling, electrical resistivity, and gravity (McCalpin, 1996b).

6. Age-dating techniques are essential for determining the ages of geologic units, soils, and surfaces that bracket the time(s) of faulting (Pierce, 1986; Birkeland and others, 1991; Rutter and Catto, 1995; McCalpin, 1996a).

a. Radiometric dating (especially ^{14}C).

b. Soil-profile development.

c. Rock and mineral weathering.

d. Landform development.

e. Stratigraphic correlation of rocks/minerals/fossils.

f. Other methods -- artifacts, historical records, tephrochronology, fault scarp modeling, thermoluminescence, lichenometery, paleomagnetism, dendrochronology, etc.

7. Other methods should be included when special conditions permit or requirements for critical structures demand a more intensive investigation.

a. Aerial reconnaissance overflights.

b. Geodetic and strain measurements.

c. Microseismicity monitoring.

E. Conclusions.

1. Location and existence (or absence) of hazardous faults on or adjacent to the site; ages of past rupture events.

2. Type of faults and nature of anticipated offset, including sense and magnitude of displacement, if possible.

3. Distribution of primary and secondary faulting (fault zone width) and fault-related deformation.

4. Probability of or relative potential for future surface displacement. The likelihood of future ground rupture seldom can be stated mathematically, but may be stated in semiquantitative terms such as low, moderate, or high, or in terms of slip rates determined for specific fault segments.

5. Degree of confidence in and limitations of data and conclusions.

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F. Recommendations.

1. Setback distances of proposed structures from hazardous faults. The setback distance generally will depend on the quality of data and type and complexity of fault(s) encountered at the site. In order to establish an appropriate setback distance from a fault located by indirect or interpretative methods (e.g. borings or cone penetrometer testing), the area between data points also should be considered underlain by a fault unless additional data are used to more precisely locate the fault. State and local regulations may dictate minimum distances (e.g., Sec. 3603 of California Code of Regulations, Appendix B).

2. Additional measures (e.g., strengthened foundations, engineering design, flexible utility connections) to accommodate warping and distributive deformation associated with faulting (Lazarte and others, 1994).

3. Risk evaluation relative to the proposed development.

4. Limitations of the investigation; need for additional studies.

II. References.

A. Literature and records cited or reviewed; citations should be complete.

B. Aerial photographs or images interpreted -- list type, date, scale, source, and index numbers.

C. Other sources of information, including well records, personal communications, and other data sources.

III. Illustrations -- these are essential to the understanding of the report and to reduce the length of text.

A. Location map -- identify site locality, significant faults, geographic features, regional geology, seismic epicenters, and other pertinent data; 1:24,000 scale is recommended. If the site investigation is done in compliance with the Alquist-Priolo Act, show site location on the appropriate Official Map of Earthquake Fault Zones.

B. Site development map -- show site boundaries, existing and proposed structures, graded areas, streets, exploratory trenches, borings, geophysical traverses, locations of faults, and other data; recommended scale is 1:2,400 (1 inch equals 200 feet), or larger.

C. Geologic map -- show distribution of geologic units (if more than one), faults and other structures, geomorphic features, aerial photographic lineaments, and springs; on topographic map 1:24,000 scale or larger; can be combined with III(A) or III(B).

D. Geologic cross-sections, if needed, to provide 3-dimensional picture.

E. Logs of exploratory trenches and borings -- show details of observed features and conditions; should not be generalized or diagrammatic. Trench logs should show topographic profile and geologic structure at a 1:1 horizontal to vertical scale; scale should be 1:60 (1 inch = 5 feet) or larger.

F. Geophysical data and geologic interpretations.

IV. Appendix: Supporting data not included above (e.g., water well data, photographs, aerial photographs).

V. Authentication: Investigating geologist's signature and registration number with expiration date.

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Appendix D

GENERAL GUIDELINES FOR REVIEWING GEOLOGIC REPORTS

(These general guidelines are published as DMG Note 41 (1997). Similar guidelines were adopted by the State Mining and Geology Board for advisory purposes in 1996).

The purpose of this article is to provide general guidance for those geologists who review geologic reports of consultants on behalf of agencies having approval authority over specific developments. These general guidelines are modified from an article titled, “Geologic Review Process” by Hart and Williams (1978).

The geologic review is a critical part of the evaluation process of a proposed development. It is the responsibility of the reviewer to assure that each geologic investigation, and the resulting report, adequately addresses the geologic conditions that exist at a given site. In addition to geologic reports for tentative tracts and site development, a reviewer evaluates Environmental Impact Reports, Seismic Safety and Public Safety Elements of General Plans, Reclamation Plans, as-graded geologic reports, and final, as-built geologic maps and reports. In a sense, the geologic reviewer enforces existing laws, agency policies, and regulations to assure that significant geologic factors (hazards, mineral and water resources, geologic processes) are properly considered, and potential problems are mitigated prior to project development. Generally, the reviewer acts at the discretion or request of, and on behalf of a governing agency -- city, county, regional, state, federal -- not only to protect the government’s interest but also to protect the interest of the community at large. Examples of the review process in a state agency are described by Stewart and others (1976). Review at the local level has been discussed by Leighton (1975), Berkland (1992), Larson (1992), and others. Grading codes, inspections, and the review process are discussed in detail by Scullin (1983). Nelson and Christenson (1992) specifically discuss review guidelines for reports on surface faulting.

THE REVIEWER

Qualifications

In order to make appropriate evaluations of geologic reports, the reviewer should be an experienced geologist familiar with the investigative methods employed and the techniques available to the profession. Even so, the reviewer must know his or her limitations, and at times ask for the opinions of others more qualified in specialty fields (e.g., geophysics, mineral exploitation and economics, ground water, foundation and seismic engineering, seismology). In California, the reviewer must be licensed by the State Board of Registration for Geologists and Geophysicists in order to practice (Wolfe, 1975). The Board also certifies engineering geologists and hydrogeologists, and licenses geophysicists. Local and regional agencies may have additional requirements.

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The reviewer must have the courage of his or her convictions and should not approve reports if an inadequate investigation has been conducted. Like any review process, there is a certain "give-and-take" involved between the reviewer and investigator. If there is clear evidence of incompetence or misrepresentation in a report, this fact should be reported to the reviewing agency or licensing board. California Civil Code Section 47 provides an immunity for statements made "in the initiation or course of any other proceedings authorized by law." Courts have interpreted this section as providing immunity to letters of complaint written to provide a public agency or board, including licensing boards, with information that the public board or agency may want to investigate (see *King v. Borges*, 28 Cal. App. 3d 27 [1972]; and *Brody v. Montalbano*, 87 Cal. App. 3d 725 [1978]). Clearly, the reviewer needs to have the support of his or her agency in order to carry out these duties.

The reviewer should bear in mind that some geologic investigators are not accomplished writers, and almost all are working with restricted budgets. Also, the reviewer may by limited by their agency's policies, procedures, and fee structures. Thus, while a reviewer should demand that certain standards be met, he or she should avoid running rough-shod over the investigator. The mark of a good reviewer is the ability to sort out the important from the insignificant and to make constructive comments and recommendations.

A reviewer may be employed full time by the reviewing agency or part-time as a consultant. Also, one reviewing agency (such as a city) may contract with another agency (such as a county) to perform geologic reviews. The best reviews generally are performed by experienced reviewers. Thus, the use of multiple, part-time reviewers by a given agency tends to prevent development of consistently high-quality and efficient reviews. One of the reasons for this is that different reviewers have different standards, which results in inconsistent treatment of development projects. The primary purpose of the review procedure should always be kept in mind -- namely, to assure the adequacy of geologic investigations.

Other Review Functions

Aside from his or her duties as a reviewer, the reviewing geologist also must interpret the geologic data reported to other agency personnel who regulate development (e.g., planners, engineers, inspectors). Also, the reviewing geologist sometimes is called upon to make investigations for his or her own agency. This is common where a city or county employs only one geologist. In fact, some reviewers routinely divide their activities between reviewing the reports of others and performing one or several other tasks for the employing agency (such as advising other agency staff and boards on geologic matters; making public presentations) (see Leighton, 1975).

Conflict of Interest

In cases where a reviewing geologist also must perform geologic investigations, he or she should never be placed in the position of reviewing his or her own report, for that is no review at all. A different type of conflict commonly exists in a jurisdiction where the geologic review is performed by a consulting geologist who also is practicing commercially (performing geologic investigations) within the same jurisdictional area. Such situations should be avoided, if at all possible.

GEOLOGIC REVIEW

The Report

The critical item in evaluating specific site investigations for adequacy is the resulting geologic report. A report that is incomplete or poorly written cannot be evaluated and should not be approved. As an expediency, some reviewers do accept inadequate or incomplete reports because of their personal knowledge of the site. However, unless good reasons can be provided in writing, it is recommended that a report not be accepted until it presents the pertinent facts correctly and completely.

The conclusions presented in the report regarding the geologic hazards or problems must be separate from and supported by the investigative data. An indication regarding the level of confidence in the conclusions should be provided. Recommendations based on the conclusions should be made to mitigate those geology-related problems which would have an impact on the proposed development. Recommendations also should be made concerning the need for additional geologic investigations.

Report Guidelines and Standards

An investigating geologist may save a great deal of time (and the client's money), and avoid misunderstandings, if he or she contacts the reviewing geologist at the initiation of the investigation. The reviewer should not only be familiar with the local geology and sources of information, he or she also should be able to provide specific guidelines for investigative reports and procedures to be followed. Guidelines and check-lists for geologic or geotechnical reports have been prepared by a number of reviewing agencies and are available to assist the reviewer in his or her evaluation of reports (e.g., DMG Notes 42, 44, 46, 48, and 49; California Department of Conservation, Division of

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Mines and Geology, 1997). A reviewer also may wish to prepare his or her own guidelines or check-lists for specific types of reviews.

If a reviewer has questions about an investigation, these questions must be communicated in writing to the investigator for response. After the reviewer is satisfied that the investigation and resulting conclusions are adequate, this should be clearly indicated in writing to the reviewing agency so that the proposed development application may be processed promptly. The last and one of the more important responsibilities of the reviewer should be implementation of requirements assuring report recommendations are incorporated and appropriate consultant inspections are made.

The biggest problem the reviewer faces is the identification of standards. These questions must be asked: "Are the methods of investigation appropriate for a given site?" and "Was the investigation conducted according to existing standards of practice?" Answers to these questions lie in the report being reviewed. For example, a reported landslide should be portrayed on a geologic map of the site. The conclusion that a hazard is absent, where previously reported or suspected, should be documented by stating which investigative steps were taken and precisely what was seen. The reviewer must evaluate each investigative step according to existing standards. It should be recognized that existing standards of practice generally set minimum requirements (Keaton, 1993). Often the reviewer is forced to clarify the standards, or even introduce new ones, for a specific purpose.

Depth (Intensity) of Review

The depth of the review is determined primarily by the need to assure that an investigation and resulting conclusions are adequate, but too often the depth of review is controlled by the time and funds available. A report on a subdivision (e.g., for an EIR or preliminary report) may be simply evaluated against a check-list to make certain it is complete and well-documented. Additionally, the reviewer may wish to check cited references or other sources of data, such as aerial photographs and unpublished records.

Reviewers also may inspect the development site and examine excavations and borehole samples. Ideally, a field visit may not be necessary if the report is complete and well-documented. However, field inspections are of value, and generally are necessary to determine if field data are reported accurately and completely. Also, if the reviewer is not familiar with the general site conditions, a brief field visit provides perspective and a visual check on the reported conditions. Whether or not on-site reviews are made, it is important to note that the geologic review process is not intended to replace routine grading inspections that may be required by the reviewing agency to assure performance according to an approved development plan.

Review Records

For each report and development project reviewed, a clear, concise, and logical written record should be developed. This review record may be as detailed as is necessary, depending upon the complexity of the project, the geology, and the quality and completeness of the reports submitted. At a minimum, the record should:

1. Identify the project, permits, applicant, consultants, reports, and plans reviewed;

2. Include a clear statement of the requirements to be met by the parties involved, data required, and the plan, phase, project, or report being considered or denied;

3. Contain summaries of the reviewer's field observations, associated literature and aerial photographic review, and oral communications with the applicant and the consultant;

4. Contain copies of any pertinent written correspondence; and

5. The reviewer's name and license number(s), with expiration dates.

The report, plans, and review record should be kept in perpetuity to document that compliance with local requirements was achieved and for reference during future development, remodeling, or rebuilding. Such records also can be a valuable resource for land-use planning and real-estate disclosure.

Appeals

In cases where the reviewer is not able to approve a geologic report, or can accept it only on a conditional basis, the developer may wish to appeal the review decision or recommendations. However, every effort should be made to resolve problems informally prior to making a formal appeal. An appeal should be handled through existing local procedures (such as a hearing by a County Board of Supervisors or a City Council) or by a specially appointed Technical Appeals and Review Panel comprised of geoscientists, engineers, and other appropriate professionals. Adequate notice should be given to allow time for both sides to prepare their cases. After an

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appropriate hearing, the appeals decision should be in writing as part of the permanent record.

Another way to remedy conflicts between the investigator and the reviewer is by means of a third party review. Such a review can take different paths ranging from the review of existing reports to in-depth field investigations. Third party reviews are usually done by consultants not normally associated with the reviewing/permitting agency.

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DMG NOTE 41 - General guidelines for reviewing geologic reports, 1997.

DMG NOTE 42 - Guidelines to geologic/seismic reports, 1986.

DMG NOTE 44 - Recommended guidelines for preparing engineering geologic reports, 1986.

DMG NOTE 46 - Guidelines for geologic/seismic considerations in environmental impact reports, 1986.

DMG NOTE 48 - Checklists for the review of geologic/seismic reports for California public schools, hospitals and essential services buildings, 1997.

DMG NOTE 49 - Guidelines for evaluating the hazard of surface fault rupture, 1997 (see Appendix C).

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Appendix E

PRODUCTS OF THE FAULT EVALUATION AND ZONING PROGRAM

Since the passage of the AP Act, staff of the Fault Evaluation and Zoning Program have published numerous reports on the Act and the surface fault rupture hazard. These, as well as unpublished files of geologic information, are listed below. A notation next to each entry is the publication number: CD – California Geological Survey compact disc, CG -- California Geology, N – DMG/CGS Note, SP -- Special Publication, SR -- Special Report, o.p. -- report is out of print, * -- an outside publication not available from CGS. Numbers alone (e.g., 89-16) are Open-File Report numbers. The publications are listed chronologically by groups below.

AVAILABILITY

Reports listed here are available for reference at offices of the California Geological Survey in Sacramento, Menlo Park, and Los Angeles. Some reports are also available for reference at county and university libraries. Copies of available CGS reports may be purchased by mail order or over-the-counter from any office (see exceptions below):

OFFICES OF THE CALIFORNIA GEOLOGICAL SURVEY

GEOLOGIC INFORMATION AND PUBLICATIONS
801 K Street, MS 14-34
Sacramento, CA 95814
(916) 445-5716

BAY AREA REGIONAL OFFICE
345 Middlefield Road, MS 520
Menlo Park, CA 94025
(650) 688-6327

SOUTHERN CALIFORNIA REGIONAL OFFICE
888 South Figueroa Street, Suite 475
Los Angeles, CA 90017
(213) 239-0878

IMPLEMENTATION OF THE ALQUIST-PRIOLO ACT

Official Maps of Earthquake Fault Zones, by California Geological Survey, 1974-2007. As of August 2007, 547 new and revised Official APEFZ maps have been issued. Special Publication 42 provides an index to these maps and describes how they can be purchased.

SP 42 **Fault-rupture hazard zones in California,** by W.A. Bryant and E.W. Hart, 2007, 42 p. (pdf version only). Includes an index map which identifies all 7.5-minute topographic maps in which AP Earthquake Fault Zones are located. (Revised periodically).

CG **Zoning for surface fault hazards in California -- The New Special Studies Zones maps,** by E.W. Hart, 1974: v. 27, n. 10, p. 227-230.

SP 47 o.p. **Active fault mapping and evaluation program – 10-year program to implement Alquist-Priolo Special Studies Zones Act, 1976.**

CG **The review process and the adequacy of geologic reports,** by R.M. Stewart, E.W. Hart, and P.Y. Amimoto, 1976: Bulletin of the International Association of Engineering Geology, n. 14, p. 83-88. (Reprinted in California Geology, v. 30, n. 10, p. 224-229).

CG **Geologic review process,** by E.W. Hart and J.W. Williams, 1978: v. 31, n. 10, p. 235-236.

***** **Zoning for the hazard of surface fault rupture in California,** by E.W. Hart, 1978, *in* Proceedings of the Second International Conference on Microzonation, San Francisco, November 26-December 1, 1978: NSF Special Publication, p. 635-645.

CG **Fault Evaluation and Zoning Program,** by E.W. Hart, 1980: v. 33, n. 7, p. 147-152.

***** **Zoning for surface-faulting in California,** by E.W. Hart, 1986, *in* Proceedings of Conference XXXII -- Workshop on future directions in evaluating earthquake hazards in southern California, November 12-13, 1985: U.S. Geological Survey Open-File Report 86-401, p. 74-83.

90-18 **A study of the effectiveness of the Alquist-Priolo Program,** by R. Reitherman and D.J. Leeds, 1990.

N 41 **General guidelines for reviewing geologic reports,** by E.W. Hart and W.A. Bryant, 1997. (Also Appendix D in SP 42).

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N 49 **Guidelines for evaluating the hazard of surface fault rupture,** by E.W. Hart and W.A. Bryant 1997. (Also Appendix C in SP 42).

CD 2000-03 - **Digital images of official maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region,** by DMG staff, 2000.

CD 2000-04 - **Digital images of official maps of Alquist-Priolo Earthquake Fault Zones of California, Central Coastal Region,** by DMG staff, 2000.

CD 2000-05 - **Digital images of official maps of Alquist-Priolo Earthquake Fault Zones of California, Northern and Eastern Region,** by DMG staff, 2000.

CD 2001-04 - **GIS files of official Alquist-Priolo Earthquake Fault Zones, Central Coastal Region**, developed by W.A. Bryant, R. Martin, P.Wong, D. Maldonado, J. Wampole, and D. Dixon, 2001.

CD 2001-05 - **GIS files of official Alquist-Priolo Earthquake Fault Zones, Southern Region**, developed by W.A. Bryant, R. Martin, P.Wong, D. Maldonado, J. Wampole, and D. Dixon, 2001.

CD 2001-06 - **GIS files of official Alquist-Priolo Earthquake Fault Zones, Northern and Eastern Region**, developed by W.A. Bryant, R. Martin, P.Wong, D. Maldonado, J. Wampole, and D. Dixon, 2001.

POST-EARTHQUAKE INVESTIGATIONS

CG **Ground rupture associated with faulting -- Oroville earthquake, August 1975,** by E.W. Hart, 1975: v. 28, p. 274-276.

SR 124 **Ground rupture along the Cleveland Hill fault,** by E.W. Hart and J.S. Rapp, 1975, *in* Sherburne, R.W. and Hauge, C.J., editors, Oroville, California, Earthquake 1 August 1975, p. 61-72.

* **Geologic setting, historical seismicity and surface effects of the Imperial Valley earthquake, October 15, 1979, Imperial County, California,** by E. Leivas, E.W. Hart, R.D. McJunkin, and C.R. Real, 1980, *in* Imperial County, California, Earthquake October 15, 1979: EERI Reconnaissance Report, February 1980, p. 5-19.

81-5 **Preliminary map of October 1979 fault rupture, Imperial and Brawley faults, Imperial County, California,** by E.W. Hart, 1981.

80-12 o.p. **Preliminary map of surface rupture associated with the Mammoth Lakes earthquakes, May 25 and 27, 1980,** by W.A. Bryant, G.C. Taylor, E.W. Hart, and J.E. Kahle, 1980.

SR 150 **Surface rupture associated with the Mammoth Lakes earthquakes of 25 and 27 May, 1980,** by G.C. Taylor and W.A. Bryant, 1980, *in* Sherburne, R.W., editor, Mammoth Lakes, California earthquakes of May 1980, p. 49-67.

SR 150 **Rockfalls generated by the Mammoth Lakes earthquakes of May 25 and 27, 1980,** by W.A. Bryant, 1980, *in* Sherburne, R.W., editor, Mammoth Lakes, California earthquakes of May 1980, p. 69-73.

SR 150 **Planned zoning of active faults associated with the Mammoth Lakes earthquakes of May 1980,** by E.W. Hart, 1980, *in* Sherburne, R.W., editor, Mammoth Lakes, California earthquakes of May 1980, p. 137-141.

CG **Ground rupture, Coalinga earthquake of 10 June 1983,** by R.D. McJunkin and E.W. Hart, 1983: v. 36, n. 8, p. 182-184.

SP 66 **Surface faulting northwest of Coalinga, California, June and July 1983,** by E.W. Hart and R.D. McJunkin, 1983, *in* Bennett, J.H. and Sherburne, R.W., editors, The 1983 Coalinga, California earthquakes, p. 201-219.

SP 68 **Evidence for surface faulting associated with the Morgan Hill earthquake of April 24, 1984,** by E.W. Hart, 1984, *in* Bennett, J.H. and Sherburne, R.W., editors, The 1984 Morgan Hill, California earthquake, p. 161-173.

CG **Fault rupture associated with the July 21, 1986 Chalfant Valley Earthquake, Mono and Inyo counties, California,** by J.E. Kahle, W.A. Bryant, and E.W. Hart, 1986: v. 39, n. 11, p. 243-245.

CG **Magnitude 5.9 North Palm Springs earthquake, July 8, 1986, Riverside County, California: Lifeline damage,** by G. Borchardt and M.W. Manson, 1986: v. 39, n. 11, p. 248-252.

CG **Preliminary report: Surface rupture, Superstition Hills earthquakes of November 23 and 24, 1987,** by J.E. Kahle, C.J. Wills, E.W. Hart, J.A. Treiman, R.B. Greenwood, and R.S. Kaumeyer, 1988: v. 41, n. 4, p. 75-84.

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CG **Liquefaction at Soda Lake: Effects of the Chittenden earthquake swarm of April 18, 1990, Santa Cruz County, California,** by C.J. Wills and M.W. Manson, 1990: v. 43, n. 10, p. 225-232.

***** **Surface fissures and the mapping of CDMG Special Studies Zones,** by E.W. Hart, 1990, *in* Reid, G., editor, What we have learned from the October 17, 1989 7.1M Loma Prieta earthquake: 16th Annual Saber Society Symposium Proceedings Volume, p. 87-99.

SP 104 **The search for fault rupture and the significance of ridge-top fissures, Santa Cruz Mountains, California,** by E.W. Hart, W.A. Bryant, C.J. Wills, and J.A. Treiman, 1990, *in* McNutt, S.R. and Sydnor, R.H., editors, The Loma Prieta Earthquake of October 17, 1989, p. 83-94.

CG **The Mono Lake earthquake of October 23, 1990,** by S.R. McNutt, W.A. Bryant, and R. Wilson, 1991: v. 44, n. 2, p. 27-32.

***** **Eureka Peak and Burnt Mountain faults, two "new" faults in Yucca Valley, San Bernardino County, California,** by J.A. Treiman, *in* Landers earthquake of June 28, 1992, San Bernardino County, California, Field Trip Guidebook: Southern California Section of Association of Engineering Geologists, 1992, p. 19-22.

CG **Surface faulting associated with the June 1992 Landers earthquake, California,** by E.W. Hart, W.A. Bryant, and J.A. Treiman, 1993, v. 46, p. 10-16.

SP 116 **The search for fault rupture after the Northridge earthquake**, by E.W. Hart, J.A. Treiman, and W.A. Bryant, 1995, *in* Woods, M.C. and Seiple, W.R., editors**,** The Northridge, California, earthquake of 17 January 1994, p. 89-101.

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STUDIES OF INDIVIDUAL FAULTS

FERs **Fault Evaluation Reports,** by Fault Evaluation and Zoning Project Staff, 1976-2007, copies of the FERs are available for reference in the Bay Area and Southern California regional offices of CGS. An index to FERs and copies of FERs through 1989 on microfiche are available as Open-File Reports 90-9 to 90-14 (see below). FERs completed through 2000 have been digitally archived and are available for purchase (see below).

81-6 **Evidence of Holocene movement of the San Andreas fault zone, northern San Mateo County, California,** by T.C. Smith, 1981.

81-7 **Sargent, San Andreas, and Calaveras fault zones: Evidence for recency in the Watsonville East, Chittenden and San Felipe quadrangles, California,** by W.A. Bryant, D.P. Smith, and E.W. Hart, 1981.

81-8 **Recently active strands of the Greenville fault, Alameda, Contra Costa and Santa Clara counties, California,** by E.W. Hart, 1981.

81-9 **Evidence for recent faulting, Calaveras and Pleasanton faults, Diablo and Dublin quadrangles, California,** by E.W. Hart, 1981.

SP 62 **Southern Hayward fault zone, Alameda and Santa Clara counties, California,** by W.A. Bryant, 1982, *in* Proceedings **--** Conference on earthquake hazards of the eastern San Francisco Bay area, p. 35-44.

***** **Self-guided field trip No. 4 -- Fault creep along the Hayward fault** in the Richmond-San Pablo area, by T.C. Smith, 1982, *in* Conference on earthquake hazards of the [eastern] San Francisco Bay area, Field Trip Guidebook: California State University, Hayward.

84-54 **Evidence of recent faulting along the Owens Valley, Round Valley, and White Mountains fault zones, Inyo and Mono counties, California,** by W.A. Bryant, 1984.

84-55 **Evidence of recent faulting along the Mono Lake fault zone, Mono County, California,** by W.A. Bryant, 1984.

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84-56 **Evidence of recent faulting along the Antelope Valley fault zone, Mono County, California,** by W.A. Bryant, 1984.

88-14 **Recently active traces of the Newport-Inglewood fault zone, Los Angeles and Orange counties, California,** by W.A. Bryant, 1988.

CG **A neotectonic tour of the Death Valley fault zone,** by C.J. Wills, 1989: v. 42, n. 9, p. 195-200.

CG **Deep Springs fault, Inyo County, California, An example of the use of relative-dating techniques,** by W.A. Bryant, 1989: v. 42, n. 11, p. 243-255.

* **The Rose Canyon fault zone; a historical review,** by J.A. Treiman, 1989, *in* Seismic risk in the San Diego region, a workshop on the Rose Canyon fault system: Proceedings volume of a workshop sponsored by the Southern California Earthquake Preparedness Project, June 29-30, 1989.

90-9 **Index to fault evaluation reports prepared 1976-1989 under the Alquist-Priolo Special Studies Zones Act,** by C.J. Wills, P. Wong, and E.W. Hart, 1990.

90-10 **Microfiche copies of Fault Evaluation Reports for northern California,** by Division of Mines and Geology staff.

90-11 **Microfiche copies of Fault Evaluation Reports for the southern Coast Ranges,** by Division of Mines and Geology staff.

90-12 **Microfiche copies of Fault Evaluation Reports for the Transverse Ranges,** by Division of Mines and Geology staff.

90-13 **Microfiche copies of Fault Evaluation Reports for the Peninsular Ranges,** by Division of Mines and Geology staff.

90-14 **Microfiche copies of Fault Evaluation Reports for eastern California,** by Division of Mines and Geology staff.

CG **Active faults north of Lassen Volcanic National Park,** by C.J. Wills, 1991, v. 44, p. 51-58.

* **The Green Valley Fault,** by W.A. Bryant, *in* Field trip guide to the geology of western Solano County: Northern California Geological Society, 1991, p. 1-10.

SP 113 **Progress in understanding the Concord fault through site specific studies,** by C.J. Wills and E.W. Hart, *in* Proceedings -- Conference on earthquake hazards in the eastern San Francisco Bay area, 1992, p. 311-317.

SP 113 **The elusive Antioch fault,** by C.J. Wills, *in* Proceedings -- Conference on earthquake hazards in the eastern San Francisco Bay area, 1992, p. 325-331.

SP 113 **Pseudo-mole tracks from clay beds east of Healdsburg,** by M.D. Malone, G. Borchardt, E.W. Hart, and S.R. Korbay, *in* Proceedings -- Conference on earthquake hazards in the eastern San Francisco Bay area, 1992, p. 419-425.

92-7 **Recently active traces of the Rodgers Creek fault, Sonoma County, California,** by E.W. Hart, 1992, 14 p.

93-2 **The Rose Canyon fault zone, southern California,** by J.A. Treiman, 1993, 45 p.

* **Holocene slip rate and earthquake recurrence on the Honey Lake fault zone, northeastern California,** by C.J. Wills and G. Borchardt, 1993, Geology, v. 21, p. 853-856.

CD 2002-01 - Fault evaluation reports prepared under the Alquist-Priolo Earthquake Fault Zoning Act, Region 1 – Central California, developed by W.A. Bryant and P. Wong, 2002.

CD 2002-02 - Fault evaluation reports prepared under the Alquist-Priolo Earthquake Fault Zoning Act, Region 2 – Southern California, developed by W.A. Bryant and P. Wong, 2002.

CD 2002-03 - Fault evaluation reports prepared under the Alquist-Priolo Earthquake Fault Zoning Act, Region 3 – Northern and Eastern California, developed by W.A. Bryant and P. Wong, 2002.

REGIONAL SUMMARY REPORTS

77-8 **Summary report -- Fault evaluation program, 1976 area (western Transverse Ranges),** by E.W. Hart, E.J. Bortugno, and T.C. Smith, 1977.

78-10 **Summary report -- Fault evaluation program, 1977 area (Los Angeles Basin region),** by E.W. Hart, D.P. Smith, and T.C. Smith, 1978.

79-10 **Summary report -- Fault evaluation program, 1978 area (Peninsular Ranges-Salton Trough region),** by E.W. Hart, D.P. Smith, and R.B. Saul, 1979.

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81-3 **Summary report -- Fault evaluation program, 1979-1980 area (southern San Francisco Bay region),** by E.W. Hart, W.A. Bryant, and T.C. Smith, 1981.

SP 62 **California's fault evaluation program -- southern San Francisco Bay region,** by E.W. Hart, T.C. Smith, and W.A. Bryant, 1982, *in* Proceedings -- Conference on earthquake hazards in the eastern San Francisco Bay area, p. 395-404.

83-10 **Summary report -- Fault evaluation program, 1981-1982 area (northern Coast Ranges region),** by E.W. Hart, W.A. Bryant, and T.C. Smith, 1983.

84-52 **Summary report -- Fault evaluation program, 1983 area (Sierra Nevada region),** by E.W. Hart, W.A. Bryant, and T.C. Smith, 1984.

86-3 **Summary report -- Fault evaluation program, 1984-1985, southern Coast Ranges region and other areas,** by E.W. Hart, W.A. Bryant, M.W. Manson, and J.E. Kahle, 1986.

88-1 **Summary report -- Fault evaluation program, 1986-1987, Mojave Desert region and other areas,** by E.W. Hart, W.A. Bryant, J.E. Kahle, M.W. Manson, and E.J. Bortugno, 1987.

89-16 **Summary report -- Fault evaluation program, 1987-1988, southwestern Basin and Range region and supplemental areas,** by E.W. Hart, W.A. Bryant, C.J. Wills, J.A. Treiman, and J.E. Kahle, 1989.

91-9 **Summary report -- Fault evaluation program, 1989-1990, northeastern California and supplemental areas,** by E.W. Hart, W.A. Bryant, J.A. Treiman, C.J. Wills, and R.H. Sydnor, 1991.

CONSULTANTS REPORTS

A-P File, reports by consulting geologists, 1974-2007; reports for sites within Earthquake Fault Zones submitted to the California Geological Survey in compliance with the APEFZ Act. Over 4,000 reports on file. Reports filed with CGS through 2000 have been digitally archived and are available for purchase (see below). Reports filed after 2000 are available for reference at the Geologic Information and Publications Office in Sacramento.

C File, reports by consulting geologists that predate the Earthquake Fault Zones or are outside the Zones at the time of the study. Over 600 reports on file. Reports are available for reference at the Bay Area and Southern California regional offices of CGS, and the Geologic Information and Publications Office in Sacramento.

77-6 o.p. **Index to geologic reports for sites within Special Studies Zones,** by W.Y.C. Lo and J.G. Moreno, 1977 (superseded by OFR 84-31).

84-31 **Index to geologic reports for sites within Special Studies Zones,** by P. Wong, 1984. (Index map to the AP File reports).

89-5 **Index to geologic reports for development sites within Special Studies Zones in California, July 1, 1984 to December 31, 1988,** by P. Wong, 1989. (Update for OFR 84-31).

90-15 **Directory of fault investigation reports for development sites within Special Studies Zones in California, 1974-1988,** by P. Wong, E.W. Hart, and C.J. Wills, 1990. (Listing of all AP File reports through December 1988).

95-9 **Index to geologic reports for development sites within Earthquake Fault Zones in California**, **January 1, 1989 to December 31, 1994**, by P. Wong, 1995 (Update for OFR 89-5).

CD 2003-01 - Fault investigation reports for development sites within Alquist-Priolo Earthquake Fault Zones in Northern California, 1974-2000, developed by P. Wong, W.A. Bryant, and J.A. Treiman, 2003.

CD 2003-02 - Fault investigation reports for development sites within Alquist-Priolo Earthquake Fault Zones in Southern California, 1974-2000, developed by P. Wong, W.A. Bryant, and J.A. Treiman, 2003.

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Appendix F

WAIVER PROCEDURE FOR THE ALQUIST-PRIOLO ACT

Section 2623 of the Act states, "If the city or county [having jurisdiction over the lands] finds that no undue [fault] hazard...exists, the geologic report on such hazard may be waived, with approval of the State Geologist." The location of the proposed development or structure may be approved following such waiver.

The State Geologist will review waiver requests only after receiving the Waiver Form completed by the city or county geologist and the property owner, and accompanied by supporting statements and data in writing that would justify approval of the waiver request.

WAIVER FORM FOR THE ALQUIST-PRIOLO ACT

(Pursuant to Chapter 7.5, Div. 2, California Public Resources Code)

1. City or County Geologist, State Registered

I, ______________________________ , Registered Geologist,
(*Print Name*)

representing ______________________________ , recommend that the
(*City/County*)

property: ______________________________
(*Description, size, proposed development*)

____
(*Location of Site - also show location on "Earthquake Fault Zones" maps*)

______________________________ , be granted a waiver from geologic studies
(*Permit Number*)

relating to active faults*. Supporting statements that no undue hazard relative to faults exists at the site are attached to this form in writing on City or County letterhead with the City or County Geologist's signature and registration number, and that the Geologist representing the City or County is in agreement with the data:

Attached Data Includes:	YES	NO		YES	NO
1. Geologic Fault Map(s)	____	____	4. Aerial Photo(s)	____	____
2. Geologic Report(s)	____	____	5. Reference to Report(s)	____	____
3. Subsurface Geologic Data	____	____	6. Other information	____	____

____
(*City or County Registered Geologist's Signature*) (*R.G. No.*) (*Date*)

2. Owner of the Property

I, ______________________________ , acknowledge that the property

is within an Earthquake Fault Zone associated with the ______________________________ fault.

____
(*Owner's Signature*) (*Date*)

3. State Geologist

Date Received by CGS ______________________________
(*Date*)

Reviewer______________________________
(*Registered Geologist's Signature*) (*R.G. No.*) (Date)

Recommendation of Waiver:

Approved: ☐ Not Approved: ☐ (Explanation attached)

State Approval of Review: ______________________________
(*State Geologist*) (*Date*)

*Defined in Policies and Criteria of the State Mining and Geology Board (See Appendix B)

Mail form to: **State Geologist**
California Geological Survey
801 K Street, MS 12-30
Sacramento, California 95814-3531

CGS Form/Alquist-Priolo

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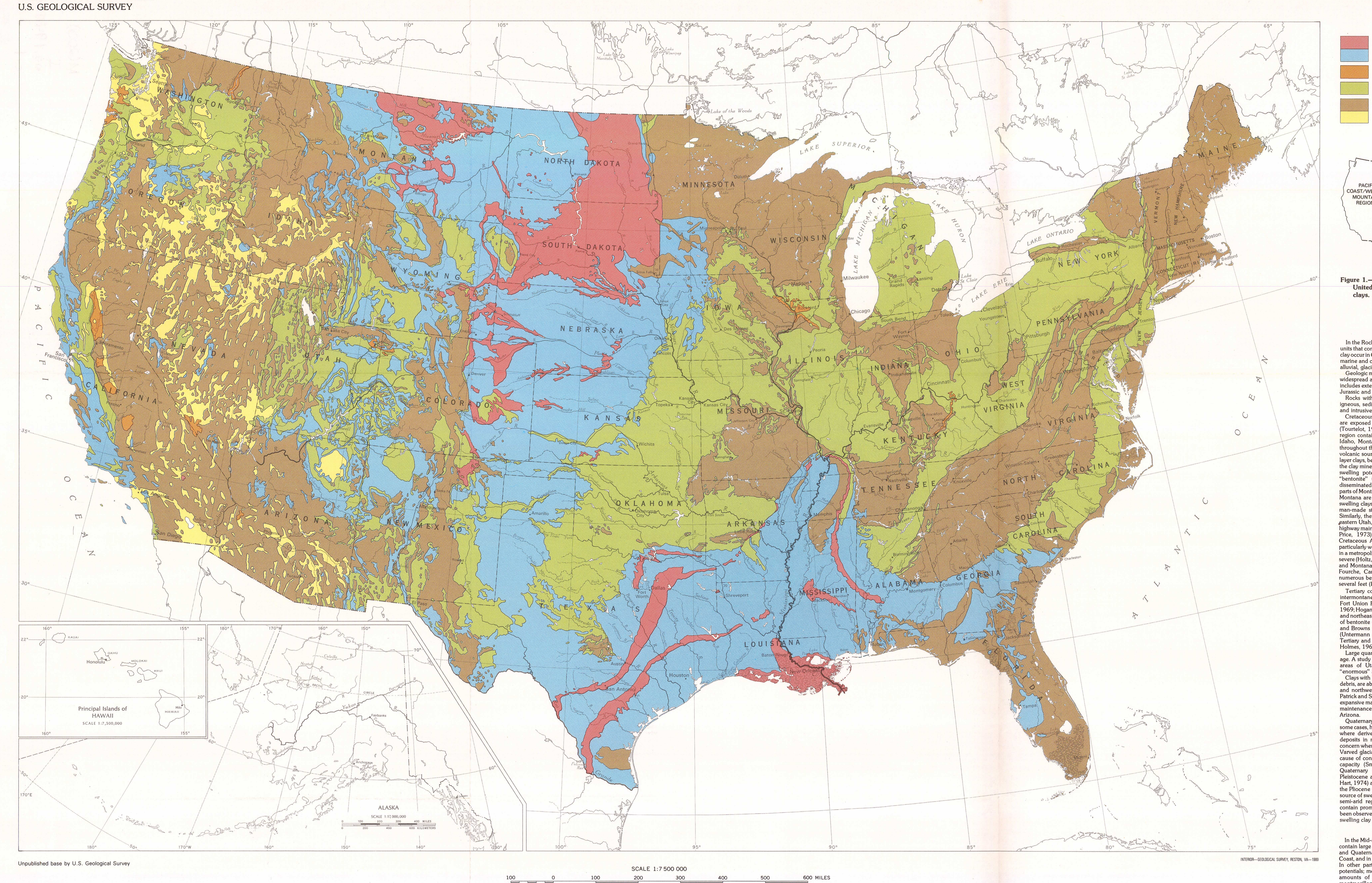
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I-1940



Unpublished base by U.S. Geological Survey

SCALE 1:7 500 000

COLOR-CODE EXPLANATION FOR SWELLING-CLAY MAP

- Unit contains abundant clay having high swelling potential
- Part of unit, generally less than 50 percent, consists of clay having high swelling potential
- Unit contains abundant clay having slight to moderate swelling potential
- Part of unit, generally less than 50 percent, consists of clay having slight to moderate swelling potential
- Unit contains little or no swelling clay
- Data insufficient to indicate clay content of unit and (or) swelling potential of clay. Shown in westernmost States only

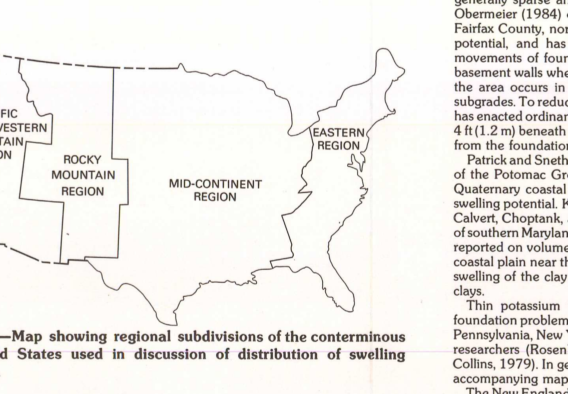


Figure 1.—Map showing regional subdivisions of the conterminous United States used in discussion of distribution of swelling clays.

INTRODUCTION

This map identifies geologic units that contain swelling clays and, within broad limits, categorizes these units according to their swelling potential. This information is useful in identifying areas in which detailed investigation might be desirable to determine more precisely the distribution and swelling potential of clay bodies for purposes of land–use planning and for general assessment of environmental problems on a national scale.

Swelling clays occur in all 48 States of the conterminous United States. Where they are at or near the surface and within the zone of weathering, they constitute a potential source of damage to foundations and structures. Particularly susceptible are lightweight types of construction such as concrete slabs for highways, canal linings, spillways, and basement floors and foundations of buildings, as well as walls supported by these foundations. Slope materials containing swelling clays are especially susceptible to landsliding. Annual loss due to damage resulting from swelling clays within the United States is estimated to be at least 2.3 billion dollars, and during this century these losses have been twice as great as those from floods, earthquakes, hurricanes, and tornadoes (Jones and Holtz, 1973).

A swelling clay, according to the American Geological Institute Glossary of Geology (Bates and Jackson, 1980, p. 631), is a "clay that is capable of absorbing large quantities of water, thus increasing greatly in volume . . ."

Dry clays that are capable of absorbing water, if unconfined, will increase in volume in an amount proportional to the amount of water absorbed. However, the amount of water absorbed and the degree of expansiveness for particular types of clay are dependent on many variable and interrelated factors that have not been, and probably cannot be, formulated in such terms as to be applicable to all possible combinations that exist in nature.

For purposes of this map, the term swelling clays is applied to those clays that, due to swelling caused by absorption of moisture, are known to cause damage to foundations and structures; it also includes those clays that, on the basis of their mineralogic composition and physical properties, are believed to have the potential to do so. These same clays also may be a source of engineering problems due to shrinkage resulting from a loss of moisture.

MINERALOGY AND PROPERTIES OF SWELLING CLAYS

The term "clay" is used for a natural, earthy, fine-grained material that develops plasticity when mixed with a limited amount of water. The term also applies to a definite group of hydrous aluminum silicate minerals and to grains or particles that are either <2μm or <5μm in diameter, depending upon which grain-size classification is used (see Truesdell and Varnes, 1950, for comparison of grain-size definitions of sedimentary materials). The most common clay minerals can be classified into five groups: smectite (montmorillonite, beidellite, nontronite, and others); illite (illite and glauconite); kaolinite (kaolinite, halloysite, and others); chlorite (chlorite and others); and sepolite (sepolite and palygorskite). Many of these clay minerals do occur as the dominant mineral in some areas and almost all of them occur as minor constituents with other clay minerals. Discrete clay crystals may consist of alternating layers of two or more different clay minerals, which are referred to as mixed-layer clays. Common combinations contain the expandable clay mineral montmorillonite or beidellite, interlayered with chlorite or with a mica.

The inherent swelling potential of aggregates of clay minerals is closely related to the total external and internal surface areas of clay-mineral particles. Clay minerals are capable of adsorbing water on their outer surfaces, and water so adsorbed will cause a small amount of swelling related to enlargement of the capillary films. Some clay minerals, however, such as montmorillonite and beidellite of the smectite group, are capable of absorbing appreciable amounts of water between the individual silicate layers of the structural lattice, which results in a high swelling potential. Vermiculite, attapulgite, nontronite, and degraded mica (illite) and chlorite, though less common, are also capable of absorbing appreciable amounts of water. These expandable clay minerals consist of atoms arranged in lattice structures in which sheets or layers of the lattices are bound together by atomic physicochemical forces. The strengths of these forces vary with the types of clay minerals and with the water-retention properties of the cations that occur between the lattice layers.

The swelling potential of clay is dependent upon the amount and kind of clay minerals present, their exchangeable ions, the electrolyte content of the aqueous solution, particle-size distribution, void size and distribution, water content, superimposed load, and probably other factors.

Clay units composed almost entirely of Na–, Ca–, and Mg-montmorillonite are commonly referred to as bentonites. They have a number of commercial uses, many of which are related to their absorptive and swelling properties.

Volume changes of 1400 to 2000 percent are reported from laboratory tests in which samples of dry Na-montmorillonite were immersed in water, and changes of 45 to 145 percent are reported for Ca-montmorillonite (Mielenz and King, 1955, p. 232). The inherent swelling capacities of vermiculite, attapulgite, illite, and degraded chlorite have not been fully investigated. Available evidence suggests that they have low to moderate swelling capacities.

The amount of volume change and pressure generated by a swelling clay under laboratory conditions is usually considerably greater than that generated by the same clay in the field under natural conditions. This is possibly due to changes in diagenetic and environmental factors as a consequence of collecting and preparing specimens for testing (Holtz and Bara, 1965; Parcher and Liu, 1965; Woodward-Clyde and Associates, 1967, p. 75).

The results of specific field measurements of volume changes in swelling clays generally are lacking, because of difficulties in obtaining and recording relevant data. The most obvious volume changes are those that affect the land surface; in many cases these changes are manifest as a result of damage to structures. Uplift of land surface due to increase in volume of swelling clay generally amounts to no more than a few inches; however, uplift of more than a foot has been reported (Mielenz and Okeson, 1946, p. 271). Horizontal displacement also results from swelling; however, information on the amounts of displacement is meager. Laboratory tests conducted on undisturbed specimens of swelling clay indicated a vertical to horizontal displacement ratio varying between 0.3 and 0.7 (Parcher and Liu, 1965).

SWELLING CLAYS MAP OF THE CONTERMINOUS UNITED STATES

By

W. W. Olive, A. F. Chleborad, C. W. Frahme, Julius Schlocker, R. R. Schneider, and R. L. Schuster

1989

M(200)
I
no.1940
c.1

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WATER SUPPLY AGREEMENT

The parties to this agreement, entered into this 27th day of October 1992, are IMPERIAL IRRIGATION DISTRICT, an irrigation district (hereinafter referred to as "IID"); and SECOND IMPERIAL GEOTHERMAL COMPANY a California general partnership (hereinafter referred to as "SIGC").

1. RECITALS:

This agreement (hereinafter referred to as the "Agreement") is made with reference to the following facts:

1.1 WHEREAS, SIGC is currently undertaking geothermal development activities precedent to the construction and operation of the SIGC Geothermal Power Project (hereinafter referred to as the "Project") located within the service area of the IID, Imperial County, California. Exhibit A attached hereto identifies the expected site of the proposed Project.

1.2 WHEREAS, SIGC requires a continuous supply of water in connection with construction and operation of the Plant.

1.3 WHEREAS the Board of Directors of the IID has determined that it is in its best interest to make available up to 5,000 acre-feet annually of water from its canal system for beneficial consumptive use by SIGC in accordance with the terms and conditions hereinafter recited.

2. AGREEMENT:

2.1 In consideration of the mutual covenants contained herein, SIGC and IID agree as follows.

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3. DELIVERY:

3.1 Upon receipt of the payment described in paragraph 7.1(a), IID shall permit SIGC to take from an IID operated canal at the location depicted on Exhibit B (or where otherwise agreed by the parties) such water as may be required by SIGC for use in and incidental to the operation of its Project, and for no other purpose in a total quantity not to exceed 5000 acre-feet during any consecutive 12-month period; provided, however, nothing in this agreement shall be construed to require IID to modify or enlarge its existing canal system to make water available to SIGC, and SIGC shall not be entitled to take water at a rate which will unreasonably deplete the supply available in the canal for other uses.

3.2 SIGC shall be responsible, at its sole cost and expense, for the construction, installation, and maintenance of any structures, facilities or improvements necessary in connection with its retrieval of water from said IID canal. The IID shall assist SIGC in obtaining any necessary easements, permits or other rights to transport said water from the canal to the Project and SIGC may terminate this agreement if it cannot reasonably obtain such permits.

4. DRAINAGE RIGHTS:

4.1 IID shall permit SIGC to discharge drain water into the IID drainage system.

5. TERM:

5.1 The term of this Agreement shall commence upon execution of this Agreement by both parties (the "Effective Date") and shall remain in effect until terminated pursuant to this Section 5. The obligation of IID to furnish water to SIGC under this Agreement shall commence on the date SIGC initiates start-up and check-out operations of the Project which will utilize such water and shall terminate the earlier of:

(a) 30 years following the date the Project achieves Firm Operation as such term is defined in Section 2.17 of the Power Purchase Contract dated April 16, 1985, between SIGC and Southern California Edison Company

(b) At the option of the IID, thirty-six (36) months from the date the Project has ceased to operate.

(c) December 31, 2024.

The termination date for delivery of water from IID's canal system may be extended by mutual agreement of the parties. Any such extension must be in writing.

6. <u>REQUIREMENTS NOTICE</u>:

6.1 SIGC shall project the total quantity of water to be purchased by SIGC on an annual basis, to reflect the anticipated water requirements for the Project. SIGC shall on or before each November 1st, provide IID with written notice of the approximate quantity of water to be purchased during each month of the following calendar year ("Quantity Notice Letter"). Such amount shall constitute a good faith estimate on the part of SIGC, but shall not constitute a minimum or maximum quantity of water to be purchased during the specified period.

7. <u>PAYMENT/BILLING</u>:

7.1 For the right to take and use the water identified herein:

(a) SIGC agrees to pay IID a one-time fee for the cost of water conservation

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projects in the amount of $500,000, payable March 31, 1993, provided however that the foregoing payment shall not be owed by SIGC until a financial closing occurs which enables SIGC to proceed with construction of the Project, provided further, however, that the foregoing payment shall be made no later than September 30, 1993.

(b) SIGC shall pay a per acre-foot charge for water used by the Project at IID's industrial water rate (currently $57.50 per acre-foot) as amended, from time to time, payable monthly.

(c) SIGC shall install a meter at the inlet to its Project to measure water usage at such Project.

7.2 For the right to discharge into IID's drainage system, SIGC shall pay:

(a) an amount equal to double the industrial rate per acre-foot for drainage water in excess of 15% of the IID water used by the Project.

The above shall be calculated and payable monthly based on meter readings provided by SIGC to the Regional Water Quality Control Board with copies provided to IID.

8. <u>RULES AND REGULATIONS</u>:

8.1 SIGC shall be obligated to comply with the "Rules and Regulations Governing the Distribution and Use of Water and Construction, Operation and Maintenance of the Canal and Drainage System of Imperial Irrigation District," in its present form or as it may be reasonably amended hereafter. Notwithstanding SIGC's obligation to comply with said Rules and Regulations, any conflict between this agreement and said Rules and Regulations pertaining to SIGC's payment obligation set forth in paragraph 7 of this

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agreement, shall be resolved in favor of the provisions of this Agreement.

9. GOVERNING LAW:

9.1 This agreement shall be interpreted, governed by and construed under the laws of the State of California or the laws of the United States, as applicable, as if executed within and to be performed wholly within the State of California.

10. BINDING OBLIGATIONS; ASSIGNMENT:

10.1 This agreement shall be binding upon and inure to the benefit of the parties and their successors and assigns. No party may assign or transfer its rights or obligations under this agreement without the prior written consent of the other party hereto. Such consent shall not be unreasonably withheld. However, without prior consent, IID may assign its rights under this agreement as security for any water conservation financing IID might obtain in carrying out this agreement. SIGC may, without prior consent, assign its rights to a lender, lessor, and/or trustee acting on behalf of a lender or lessor, or any other financing entity which acquires an interest in the Project (collectively "Financing Entities") in connection with any financing involving the Project. Notwithstanding the foregoing, IID agrees that no successor or assignee, including any such Financing Entity shall, by reason of any assignment, be subject to any liability or obligation hereunder, unless such party shall have elected to assume the role of SIGC under this Agreement, in which case such Financing Entities (or any transferee of the Project) shall become liable to perform such duties and obligations. In the event of an assignment of SIGC's rights hereunder to any Financing Entities, IID shall take such further actions and execute such documents as are reasonably requested by such Financing Entities to effectuate such assignment.

Solely with respect to any Financing Entity which acquires an interest in this agreement, IID agrees to give written notice to such Financing Entities of any default and will afford such Financing Entities a reasonable period of time to commence appropriate action to cure such default, should they choose to do so and, in the event that this Agreement is terminated by reason of bankruptcy of any party, IID will, at the option of any Financing Entity, enter into a new contract with such Financing Entities or their successors or assigns, having terms similar to this Agreement.

11. <u>NO THIRD PARTY RIGHTS</u>:

11.1 Except as provided in paragraph 10.1, the parties do not intend to create rights and/or to grant remedies to any third party or others as a beneficiary of this Agreement or of any duty, covenant, obligation or undertaking established hereunder.

12. <u>NO DEDICATION OF FACILITIES</u>:

12.1 Any undertaking by one party to another party under any provision of this Agreement shall not constitute the dedication of the system or any portion thereof of the party to the public or to the other party, and it is understood and agreed that any such undertaking under any provision of this Agreement by a party shall cease upon the termination of its obligations hereunder.

13. <u>NON-WAIVER</u>:

13.1 None of the provisions of this agreement shall be considered waived by any party except when such waiver is given in writing. The failure of any party to insist in any one or more instances upon strict performance of any of the provisions of this agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or their relinquishment of any such rights for the future, but the same

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shall continue and remain in full force and effect.

14. UNCONTROLLABLE FORCES:

14.1 No party shall be considered to be in default in the performance of any of its obligations under this agreement when a failure of performance shall be due to an uncontrollable force. The term "Uncontrollable Force" shall mean any cause beyond the control of the party affected including, but not restricted to, flood, drought, earthquake, tornado, storm, fire, pestilence, lightning and any other natural catastrophe, epidemic, war, riot, civil disturbance or disobedience, strike, labor dispute, labor or material shortage, sabotage, acts, including restraint or enjoinder by proper authority, of civil or military authority (whether valid or invalid), inaction or non-action by or inability to obtain or keep the necessary authorizations or approvals from any governmental agency or authority, which by exercise of due diligence such party could not reasonably have been expected to avoid and which by exercise of due diligence it has been unable to overcome. Nothing contained herein shall be construed as to require a party to settle any strike or labor dispute in which it may be involved. Any party rendered unable to fulfill any of its obligations under this agreement by reason of an uncontrollable force shall give prompt written notice of such fact to the other parties and shall exercise due diligence, and cooperate with any efforts of such other parties, to remove such inability with all reasonable dispatch.

15. WATER RIGHTS:

15.1 Nothing contained in this Agreement is intended or shall be construed to affect, alter, or in any way limit or restrict the rights held by IID by contract or law to divert or use Colorado River water. The right of the Project to use water hereunder is

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not cumulative, and it has no right in subsequent 12-month periods to water that is not used in a current 12-month period. Any water that is not required to be made available for use by the Project in any 12-month period may be used by IID as it, in its sole discretion, shall determine.

16. LATE PAYMENT PENALTY:

16.1 If SIGC (solely with respect to the payments under 7.1(a) and 7.1(b) and 7.2(a)) fails to pay any amount when due, an interest charge on the unpaid amount due based on the late payment charge percentage calculated by the Department of the Treasury and published quarterly in the Federal Register (but not less than 0.5% per month) shall be added on the first day following the due date and monthly thereafter until the payment, any penalty and interest are paid in full. Additionally, if any payment is not made within three (3) business days after written notice received by the defaulting party, that such payment is overdue, a penalty of two percent (2%) of the amount due shall be added thereto.

17. TERMINATION:

17.1 If SIGC breaches this Agreement, including failure to make payment when due, IID shall have the following rights and remedies:

(a) If usage charges for water used by the Project is not paid within sixty (60) days after written notice is received by SIGC and any Financing Entities, IID may suspend this Agreement with respect to such Project, and such Project shall have no further rights to use water hereunder until and unless such default (plus penalty and interest) is fully cured within an additional six months, after which time

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IID may terminate this Agreement with respect to such Project if such default is still outstanding.

(b) If SIGC fails to make any payment for discharge into IID's drainage system under paragraph 7.2 within sixty (60) days after receipt of notice by SIGC and any Financing Entities of such failure, IID may terminate all discharge rights hereunder until such default is cured but such suspension shall not affect any usage rights hereunder which shall continue in full force and effect.

(c) IID may charge penalties and interest only in accordance with paragraph 16 above.

(d) IID may institute any available and appropriate legal or equitable action to enforce the terms of this Agreement.

(e) IID may cease delivering water to SIGC upon the expiration of the period referenced in Section 17.1(a).

IID may use any or all of these rights and remedies in case of SIGC's breach and if it selects one, shall not waive its rights to select or use any other. IID acknowledges (and will accept) that any Financing Entities or other parties which acquire an interest in the Project may cure any breach of this Agreement and such cure shall be considered as full performance hereunder.

18. <u>NOTICES</u>:

18.1 All notices, requests, demands and other communications required or permitted under this agreement shall be in writing and

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shall be deemed to have been received when delivered or on the fifth business day following the mailing, by registered or certified mail, postage prepaid, return receipt requested, thereof address as set forth below:

If to IID:

IMPERIAL IRRIGATION DISTRICT
Attention: General Manager
P.O. Box 937
333 E. Barioni Blvd.
Imperial, CA 92251

If to SIGC:

SECOND IMPERIAL GEOTHERMAL COMPANY
Attention: Ros Pont, Executive Director
343 Second Street
Los Altos, CA 94022

with copies to: OESI Power Corporation
Attn: General Counsel
Bldg. One, Suite 255
4000 Kruse Way Place
Lake Oswego, OR 97035

Any party may change the addressee or address to which communications or copies are to be sent by giving notice of such change of addressee or address in conformity with the provisions of this paragraph for the giving of notice.

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19. CONDITIONS AND MISCELLANEOUS PROVISIONS

19.1 SIGC is a general partnership duly organized and validly existing in good standing under the California Uniform Partnership Act, and has all requisite power and authority to enter into and perform its obligations hereunder. The execution, delivery and performance by SIGC of this Agreement has been duly authorized by all necessary action on the part of SIGC and does not require any approval or consent of any holder (or any trustee for any holder) of any indebtedness or other obligation of SIGC. This agreement has been duly executed and delivered on behalf of SIGC by the appropriate officers of a general partner and constitutes the legal, valid and binding obligation of SIGC, enforceable against SIGC in accordance with its terms. However, SIGC understands that there are some third parties which claim that IID does not have the legal right to deliver conserved water for use in geothermal operations. If IID is enjoined, restrained, or otherwise precluded by proper authority from delivering conserved water to SIGC, IID shall use diligent best efforts so as to enable IID to perform its obligations under this Agreement.

19.2 IID is an irrigation district duly organized and validly existing in good standing under the laws of the State of California, and has all requisite power and authority to enter into and perform its obligations hereunder. The execution, delivery and performance by IID of this Agreement has been duly authorized by all necessary action on the part of IID and does not require any approval or consent of any holder (or any trustee for any holder) of any indebtedness or other obligation of IID. This Agreement has been duly executed and delivered on behalf of IID by the appropriate officers of IID and constitutes the legal, valid and binding obligation of IID, enforceable against IID in accordance with its terms.

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19.3 This agreement sets forth the entire agreement between SIGC and IID with respect to the matters to herein, superseding all previous agreements, oral or written.

19.4 Any owner trustee (the "Owner Trustee") which acquires an interest in the Project shall only be liable hereunder from the income and proceeds of the trust estate created in connection with the financing pursuant to which the Owner Trustee acquires an interest in the Project (the "Trust Estate") and only to the extent that the Owner Trustee shall have received sufficient assets, income and/or proceeds from the Trust Estate to make such payments. Each of IID and SIGC agrees for itself and for its successors and assigns that, as against the Owner Trustee, it will look solely to the assets, income and/or proceeds of the Trust Estate for the payment of any amounts payable by the Owner Trustee hereunder and agrees and confirms that the Owner Trustee is in no way personally liable for any such amounts or on account of any such representation, warranty, covenant or agreement, but nothing hereunder shall limit the liability of the Owner Trustee, in its individual capacity or as Owner Trustee, for its own gross negligence or willful misconduct.

IN WITNESS WHEREOF, SIGC and IID have caused this agreement to be executed on the day and year first above written.

IMPERIAL IRRIGATION DISTRICT

IMPERIAL IRRIGATION DISTRICT ORGANIZED JULY 25, 1911 EL CENTRO, CALIFORNIA

By ______________________
President

ATTEST: ______________________
Secretary

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SECOND IMPERIAL GEOTHERMAL COMPANY

By Amor 14 Corporation,
a general partner

By ______________________
Name:
Title:

ATTEST: ______________________

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BOARD AGENDA FACT SHEET

CLERK USE ONLY
BOS ACTION
#____________

Air Pollution Control District
Department /Agency

October 23, 2018
Requested Board Date

1. Request:

Board Approval	X	**Information Only/Presentation**	
Other (specify) ____________		**Schedule Hearing Time:** ______	

2. Requested Action: *Type requested action below*

The Imperial County Air Pollution Control District is requesting the Air Pollution Control District Board of Directors to hold a public hearing, October 23, 2018 at 10:45 am to consider 1) The approval and adoption of the 2018 PM10 Redesignation Request and Maintenance Plan (2018 PM10 Plan) with associated staff report, and 2) Certification and adoption of the Notice of Exemption for the 2018 PM10 Plan

3. **Cost $** 0.00 **Source:** N/A

4. **If approval of Contract, reviewed/approved by County Counsel on:** N/A

By: ____________ **Action Request #** ____________
Assigned by County Counsel's Office

5. **If approval of position allocation change, approved by Human Resources on:** N/A

By: ____________

6. **Electronic copy submittal date:** October 9, 2018 **By:** Reyes Romero

Matt Dessert
Department Head/Agency Representative

INSTRUCTIONS: ***Back-up must be submitted 11 BUSINESS days prior to requested date. Back-up submitted must contain an Original and 6 copies. Copies must be submitted double sided and three (3) hole punched. Back-up must be submitted in a PDF format to cobstaff@co.imperial.ca.us.***

CEO/CLERK USE ONLY:

DATE STAMP

BOARD DATE: ____________

Action ______ **Filing** ______

Consent ______ **Presentation** ______

Hearing ______ **CEO Approval** ______

Other (specify) ____________

CEO *Date*

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150 SOUTH NINTH STREET
EL CENTRO, CA 92243-2850

TELEPHONE: (442) 265-1800
FAX: (442) 265-1799

AIR POLLUTION CONTROL DISTRICT

October 23, 2018

TO: Honorable Board of Directors

CC: Tony Rouhotas, County Executive Officer

FROM: Matt Dessert, Air Pollution Control Officer

SUBJECT: The Imperial County Air Pollution Control District is requesting the Air Pollution Control District Board of Directors to hold a public hearing, October 23, 2018 at 10:45 am to consider 1) The approval and adoption of the 2018 PM_{10} Redesignation Request and Maintenance Plan (2018 PM_{10} Plan) with associated staff report, and 2) Certification and adoption of the Notice of Exemption for the 2018 PM_{10} Plan

The Imperial County Air Pollution Control District (Air District) respectfully requests approval and adoption of the 2018 PM_{10} Request for Redesignation and Maintenance Plan (2018 PM_{10} Plan), the associated staff report, findings and certification and adoption of the Categorical Exemption for the 2018 PM_{10} Plan.

The Air District is asking for the Board's consideration in adopting the following:

1. 2018 PM_{10} Plan – is a Request for Redesignation of the Imperial Valley Planning Area from a "Serious" non-attainment to an attainment area of the PM_{10} National Ambient Air Quality Standard (NAAQS) and a Maintenance Plan. The Request provides the data review requirements associated with the quality-assured PM_{10} monitoring data from 2014 through 2016, which illustrates that, when excluding exceptional events, the Imperial Valley Planning Area did not violate the NAAQS. The Request further discusses and provides those elements necessary for the US EPA Administrator to make five findings prior to granting the Request for Redesignation. One of those elements is a fully approved maintenance plan, which contains a contingency plan for the Imperial Valley Planning Area.

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2. 2018 PM_{10} SIP Staff Report - gives background on the PM_{10} "Serious" non-attainment status, Request for Redesignation and the elements of the maintenance plan. It also summarizes the PM_{10} problem in Imperial County, the development of the 2018 PM_{10} Plan, the CEQA environmental review process, recommendations made by the advisory board and APCD staff, and a declaration of findings.

3. Categorical Exemption- Staff is recommending the filing of a Notice of Exemption under the provisions of the California Code of Regulations §15307. Class 8 exemptions include actions taken by regulatory agencies to assure the maintenance, restoration, enhancement, or protection of the environment. The 2018 PM_{10} Plan does not require any foreseeable construction activities nor any relaxation of the standards allowing for the degradation of the environment.

Recommendations
The Air District staff recommends the adoption of the proposed 2018 PM_{10} Plan, staff report and findings. Concurrently, the Air District recommends the certification and adoption of the filing of a Notice of Exemption for the 2018 PM_{10} Plan.

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STAFF REPORT

IMPERIAL COUNTY 2018 REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR PARTICULATE MATTER LESS THAN 10 MICRONS IN DIAMETER (2018 PM_{10} PLAN)

October 23, 2018

I. BACKGROUND

In 1987, the United States Environmental Protection Agency (USEPA) adopted the 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS) of 150 micrograms per cubic meter (µg/m^3). The Imperial Valley Planning Area is currently designated as a Serious nonattainment area for the 24-hour PM_{10} NAAQS. Under the Clean Air Act (CAA), an area can be redesignated as attainment if, among other requirements, the USEPA determines that the NAAQS has been attained. The 24-hour PM_{10} NAAQS allows for one exceedance of the 24-hour average PM_{10} standard (150 µg/m^3) per year averaged over a three consecutive calendar year period, excluding exceptional events, measured at each monitoring site within an area based on quality-assured air quality monitoring data.

The Imperial County Air Pollution Control District (ICAPCD) adopted a PM_{10} State Implementation Plan for Imperial County in 2009 (2009 PM_{10} Plan). The 2009 PM_{10} Plan demonstrated that the Imperial Valley Planning Area would have been in attainment of the 24-hour PM_{10} NAAQS "but-for" international emissions emanating from Mexico, based on air quality monitoring data for 2006 through 2008. The 2009 PM_{10} Plan established a dust-focused control strategy for attaining the 24-hour PM_{10} NAAQS. In 2012, USEPA and ICAPCD negotiated additional revisions to the Regulation VIII fugitive dust rules related to paved and unpaved roads, agricultural activities, construction and demolition activities, and open area wind erosion; ICAPCD adopted those revisions in October 2012. In February 2013, USEPA finalized approval of the revised Regulation VIII fugitive dust rules as Best Available Control Measures (BACM) and confirmed that they constituted "reasonable control" of the sources covered by them, "for the purpose of evaluating whether the exceedance of the PM_{10} NAAQS is an 'exceptional event' including reasonable and appropriate control measures on significant contributing anthropogenic sources."

Now, the ICAPCD has developed this 2018 PM_{10} Plan and is requesting redesignation of Imperial County Planning Area as attainment. A review of the quality-assured PM_{10} monitoring data from 2014 through 2016 shows that, when excluding exceptional events submitted by ICAPCD and the California Air Resources Board (CARB), the Imperial Valley Planning Area did not violate the federal 24-hour PM_{10} NAAQS. During this period, elevated PM_{10} events associated with high wind driven dust storms were flagged and

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documented in accordance with the USEPA's Exceptional Events regulation (40 CFR § 50.14). Upon concurrence from the USEPA, these events will be excluded from NAAQS determination and a clean data finding will be sought. A clean data finding does not constitute a redesignation to attainment under the CAA. Accordingly, the purpose of the 2018 PM_{10} Plan is to request redesignation of the Imperial Valley Planning Area as a PM_{10} attainment area and to submit the requisite maintenance plan and other required actions to qualify for such redesignation by the USEPA.

II. THE NATURE OF THE PM_{10} PROBLEM WITHIN IMPERIAL COUNTY

Particulate matter (PM) is a general term used to describe a complex group of airborne solid, liquid, or semi-volatile materials of various size and composition. Primary PM is emitted directly into the atmosphere from both human activities (including agricultural operations, industrial processes, construction and demolition activities, and entrainment of road dust into the air) and non-anthropogenic activities (such as windblown dust and ash resulting from forest fires). Secondary PM is formed in the atmosphere from predominantly gaseous combustion by-product precursors, such as sulfur and nitrogen oxides (SO_X and NO_X) and volatile organic compounds (VOCs). The relative proportion of primary and secondary PM in a given geographic area can vary widely depending upon such factors as the mix of sources in the area, the mix of PM precursors, and local meteorology.

The overwhelming majority of airborne PM in the Imperial Valley Planning Area is primary PM. The major source of Imperial's primary PM is fugitive windblown dust, with other contributions resulting from entrained road dust, farming, and construction activities. During the 2014 through 2016 monitoring period, all elevated PM_{10} events were directly related to high wind driven dust storms in which precursor emissions played an insignificant role. In addition, on days favouring the build-up of local PM_{10} precursor emissions (i.e., low wind days) ambient PM_{10} concentrations remained below the NAAQS. CARB evaluated the role that precursor emissions play in the overall ambient PM levels in Imperial County and concluded that the contribution of each precursor can be considered insignificant for the purposes of this redesignation request and maintenance plan.

PM air pollution has undesirable and detrimental environmental effects. PM affects vegetation, both directly (e.g., deposition of nitrates and sulfates may cause direct foliar damage) and indirectly (e.g., coating of plants upon gravitational settling reduces light absorption). PM_{10} is respirable, with fine and ultrafine particles reaching the alveoli deep in the lungs, and larger particles depositing principally in the nose and throat area. PM_{10} deposition in the lungs results in irritation that triggers a range of inflammation responses, such as mucus secretion and bronchoconstriction, and exacerbates pulmonary dysfunctions, such as asthma, emphysema, and chronic bronchitis.

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Imperial County continues making steady progress towards improving air quality and expeditious attainment of the PM_{10} NAAQS. The overwhelming majority of 24-hour ambient PM_{10} concentration measurements by the Imperial County PM_{10} beta attenuation monitoring (BAM) monitors show PM_{10} concentrations are well below the 150 μg/m^3 NAAQS. Only three to nine percent of measurements at those stations were above 100 μg/m^3 during 2014-2016, and only 21 to 48 percent were above 50 μg/m^3. An analysis of the PM_{10} concentrations shows a decrease of the average annual PM_{10} concentration that is the result of the permanent and enforceable reductions that have been achieved due to implementation of the Regulation VIII rules. Since 2000, the average annual PM_{10} concentration in Imperial County, when exceptional events are excluded, has fallen from 96 μg/m^3 to 46 μg/m^3 in 2016. This represents an approximate 52 percent decrease in the general PM_{10} levels in Imperial County over that period. This type of reduction is also seen in the trend of the annual average of individual 24-hour average PM_{10} levels, when exceptional events are excluded, at all long-term (1-in-6 day sampling) monitors across Imperial County. The table below shows these declining trends, with a trend annual average of 24-hour PM_{10} levels in 2016 at less than 26% of the 24-hour average PM_{10} NAAQS.

Station	24-hour Average PM_{10} Trend per Year from 2000-2016/7 (ug/m^3/year)	24-hour Average PM_{10} Trend Average in 2016 (ug/m^3)
Calexico	-1.9	40
El Centro	-0.7	33
Brawley	-0.4	39
Westmorland	-0.9	33
Niland	-0.1	37

III. 2018 PM_{10} PLAN AND MAINTENANCE PLAN

The ICAPCD is requesting redesignation of the Imperial Valley Planning Area from Serious nonattainment to attainment of the PM_{10} NAAQS under CAA Section 107(d)(3)(E) protocol.

Section 107(d)(3)(E) of the CAA requires the USEPA administrator to make five findings prior to granting a request for redesignation:

1. The USEPA has determined that the NAAQS has been attained;
2. The applicable implementation plan has been fully approved by the USEPA under Section 110(k);
3. The USEPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions;
4. The State has met all applicable requirements for the area under Section 110 and Part D; and

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5. The USEPA has fully approved a maintenance plan, including a contingency plan, for the area under Section 175A.

Since the first Imperial County PM_{10} Attainment Plan was adopted in 2009, the ICAPCD has adopted stringent Best Available Control Measures (BACM) to control fugitive dust. These measures have provided for continuous attainment of the 24-hour PM_{10} standard (excluding exceptional or natural events) in the region, despite regional growth.

Based on analyses of long-term meteorological variables, including rainfall and wind speeds, the ICAPCD found that meteorological conditions during the 2014-2016 period were conducive to higher PM_{10} concentrations. Yet, excluding exceptional events, the Imperial County did not violate the 24-hour PM_{10} standard during this three-year period. In the 2014-2016 period, Imperial County experienced 58 days with PM_{10} concentrations in excess of the 24-hour NAAQS. All of these exceedances were due to exceptional events. These events were primarily caused by gusty westerly winds brought on by low pressure systems. A smaller fraction of the events were the result of monsoonal fronts passing through the region. These events were documented, publicly noticed, and are being submitted to the USEPA in separate submittals.

As described above, the Imperial Valley Planning Area, did not violate the NAAQS from 2014 through 2016 (when excluding exceptional events), and this is attributable to a successful emissions control strategy. The PM_{10} Control Strategy, including adopted Regulation VIII fugitive dust rules, has led to permanent and enforceable emissions reductions in the area. In 2013, the USEPA approved the Regulation VIII rules as BACM for significant sources. Another important component of the ICAPCD's strategy to maintain attainment of the PM_{10} NAAQS is mitigation of the exposed playa at the Salton Sea. The Salton Sea will continue to shrink, especially as drainage flows from local agricultural use continue to reduce. Stabilizing the parts of the playa expected to become emissive as they are exposed will minimize dust emissions. The State's Salton Sea Management Program (SSMP) and Phase I Plan and Imperial Irrigation District's (IID) Salton Sea Air Quality Management Program (SS AQM Program) are designed to proactively provide reasonable controls as the playa is exposed.

The CAA specifies that for an area to be redesignated as attainment, the USEPA must approve a maintenance plan. The purpose of the maintenance plan is to provide for the maintenance of the 24-hour PM_{10} NAAQS for at least ten years after the redesignation. The Imperial County PM_{10} Maintenance Plan includes the following components:

1. Attainment emission inventories for directly emitted PM_{10};
2. Demonstration that PM_{10} attainment concentrations at federal reference monitoring stations will be maintained for ten years after redesignation;
3. Commitment to ongoing monitoring network operation for continued verification of attainment; and
4. Contingency provisions to address any future violations.

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In addition, eight years after the area is redesignated as attainment, the ICAPCD will submit a revised Imperial County PM_{10} Maintenance Plan providing for continued attainment for an additional ten years.

IV. 2018 PM_{10} PLAN AND MAINTENANCE PLAN DEVELOPMENT

After several months of cooperative and coordinated efforts between the ICAPCD, CARB and USEPA, the ICAPCD prepared and released a draft version of the 2018 PM_{10} Plan and Maintenance Plan for review by the respective agencies on September 6, 2018. The Draft 2018 PM_{10} Plan and Maintenance Plan address and include all comments by the agencies.

A public notice for two public workshops inviting the community to review and comment on the Draft 2018 PM_{10} Plan and Maintenance Plan was published in the Imperial County local newspaper of greatest circulation, the Imperial Valley Press, on September 21, 2018 (English). In addition, a second public notice was published in Adelante Valle, on September 21, 2018 (Spanish), with a simultaneous publication on the ICAPCD's website.

ICAPCD staff conducted two public workshops to present, discuss, and take comments on the Draft 2018 PM_{10} Plan and Maintenance Plan. The first workshop was held in the morning in El Centro while the second workshop was held late afternoon in Brawley on September 25, 2018. The ICAPCD considered written comments received from the public and affected sources during the public workshops and incorporated comments into the proposed Draft 2018 PM_{10} Plan as appropriate.

A public notice for a Public Hearing on the adoption of the Draft 2018 PM_{10} Plan and Maintenance Plan was published in the Imperial County local newspaper of greatest circulation, the Imperial Valley Press, on September 20, 2018 (English), in Adelante Valle, on September 21, 2018 (Spanish), and simultaneously on the ICAPCD's website.

Adoption by our Governing Board is scheduled for October 23, 2018, after which the Draft 2018 PM_{10} Plan and Maintenance Plan will be forwarded to CARB for adoption by the CARB Board.

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

The Draft 2018 PM_{10} Plan and Maintenance Plan is a "project" as defined by the California Environmental Quality Act (CEQA). Under CEQA, a lead agency has the principal responsibility for carrying out or approving a project that may have a significant effect upon the environment. Since the Draft 2018 PM_{10} Plan and Maintenance Plan imposes the greatest discretionary authority of approval upon the ICAPCD, it is therefore the lead agency for the project.

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As part of the review process, the ICAPCD examined the Draft 2018 PM_{10} Plan and Maintenance Plan for applicability to CEQA. As directed by §21084 of the Public Resources Code, the Secretary for Resources identified a list of projects determined not to have a significant effect on the environment and which by their very nature are therefore exempt from the provisions of CEQA. Because the Draft 2018 PM_{10} Plan and Maintenance Plan does not propose or impose any new regulation and in fact demonstrates attainment of the NAAQS but for exceptional events, a Class 8 categorical exemption (§15307 of the guidelines) applies. A Class 8 exemption describes those actions taken by regulatory agencies, as authorized by state or local ordinance to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment. No reasonably foreseeable construction activities may occur nor any relaxation of the standards allowing for the degradation of the environment are proposed. Therefore, under CEQA, the Draft 2018 PM_{10} Plan and Maintenance Plan is exempt.

Staff is recommending the filing of a Notice of Exemption under the provisions of California Code of Regulations §15307.

VI. RECOMMENDATIONS

ADVISORY BOARD:

On September 25, 2018, the ICAPCD presented the Draft 2018 PM_{10} Plan and Maintenance Plan to the Advisory Board for consideration. After discussion of the influence, impact, determinations, and findings, the Advisory Board gave its full approval and recommended forwarding the plan and associated findings on to the ICAPCD Board of Directors for adoption and approval.

STAFF:

ICAPCD staff recommends adoption of the attached Draft Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less Than 10 Microns in Diameter. After addressing the technical and non-technical issues raised by CARB and the USEPA during its development, the Draft 2018 PM_{10} Plan and Maintenance Plan effectively demonstrates that with concurrence of USEPA on the submitted exceptional events, Imperial County is in attainment of the PM_{10} NAAQS. In addition, the filing of a Notice of Exemption for the 2018 PM_{10} Plan.

VII. DECLARATION OF FINDINGS:

The ICAPCD Board hereby finds as follows:

The ICAPCD is a regulatory agency and the public agency with the principle responsibility

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for carrying out the project and is exempt from CEQA.

Clean air is a valuable and essential natural resource.

Imperial Valley was reclassified as a "Serious" nonattainment area August 11, 2004 and on December 11, 2007 the USEPA finalized its ruling that the Imperial Valley failed to attain the PM_{10} NAAQS by December 21, 2001.

The Draft Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less Than 10 Microns in Diameter meets the requirements of the federal CAA for areas classified as "Serious" nonattainment of the NAAQS for PM_{10}. Failure to adopt the 2018 PM_{10} Plan for the Particulate Matter Less Than 10 Microns in Diameter and Maintenance Plan would guarantee that the Imperial County would not meet federal PM_{10} standards as required by the CAA.

The Draft Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less Than 10 Microns in Diameter demonstrates attainment as required by the CAA with a long-term effect resulting in a reduction in emissions from stationary and mobile sources.

The Draft Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less Than 10 Microns in Diameter incorporates updated emissions inventories and ambient measurements.

The Draft Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less Than 10 Microns in Diameter satisfies the planning requirements set forth in the federal CAA including establishing a transportation conformity budget based on the latest planning assumptions.

The emissions reductions achieved by the continued implementation of the 2018 PM_{10} Plan for the Particulate Matter Less Than 10 Microns in Diameter and Maintenance Plan control measures would provide for continued attainment of the PM_{10} NAAQS.

The Draft Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less Than 10 Microns in Diameter demonstrates that air quality monitoring data for 2014 through 2016 shows that the Imperial Valley Planning Area is in attainment of the 24-hour PM_{10} NAAQS, excluding exceptional events.

The Draft Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less Than 10 Microns in Diameter is technically sound and capable of being understood by those persons directly affected by it.

The Draft Imperial County 2018 Redesignation Request and Maintenance Plan for

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Particulate Matter Less Than 10 Microns in Diameter does not conflict with or contradicts any existing statute, court decision, state, or federal regulation.

The Draft Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less Than 10 Microns in Diameter is not duplicative of any existing state or federal regulation or plan.

The ICAPCD has a population of less than 500,000 people.

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AIR POLLUTION CONTROL DISTRICT

DRAFT

IMPERIAL COUNTY 2018 REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR PARTICULATE MATTER LESS THAN 10 MICRONS IN DIAMETER

Adopted _________ __, 2018

Air Pollution Control Officer

Matt Dessert

Assistant Air Pollution Control Officer

Reyes Romero

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Ramboll US Corporation

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2018 IMPERIAL COUNTY
REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR PARTICULATE MATTER LESS THAN 10 MICRONS IN DIAMETER

DRAFT

Prepared for

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OCTOBER 2018

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Abbreviations and Acronyms

AVTD	Average Vehicle Trips per Day
BACM	Best Available Control Measure
BACT	Best Available Control Technology
CAA	Federal Clean Air Act
CARB	California Air Resources Board
CEPAM	California Emissions Projection Analysis Model
CMP	Conservation Management Practice (agriculture)
DM	*de minimis*
ICAPCD	Imperial County Air Pollution Control District
ICPWD	Imperial County Public Works Department
IID	Imperial Irrigation District
NAA	nonattainment area
NAAQS	National Ambient Air Quality Standards
NEAP	Natural Events Action Plan
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter
RACM	Reasonably Available Control Measure
RFP	Reasonable Future Progress
RTP	Regional Transportation Plan
SCAG	Southern California Association of Governments
SCS	Sustainable Communities Strategy
SIP	State Implementation Plan
SSI	Size Selective Inlet
TPA	Regional Transportation Planning Agency
tpd	tons per day
USEPA	United States Environmental Protection Agency
VDT	Vehicle Daily Trips
VDE	Visible Dust Emissions
WESTAR	Western States Air Resources Council
WRAP	Western Regional Air Partnership
$\mu g/m^3$	microgram per cubic meter
µm	micron or micrometer

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1 Introduction

On behalf of the Imperial County Air Pollution Control District (ICAPCD or "District"), this document brings together the data and discussion necessary to revise the previous State Implementation Plan submittal ("Plan" or "SIP submittal") for particulate matter less than 10 microns in aerodynamic diameter (PM_{10}) and requests redesignation of the Imperial Valley Planning Area as attainment. Particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$), which is a size subset of PM_{10}, has its own federal standards and separate SIPs will address $PM_{2.5}$ Clean Air Act (CAA) requirements. This Plan includes all required elements in CAA Section 107(d)(3)(E) for a redesignation request and maintenance plan needed by the United States Environmental Protection Agency (USEPA) to approve a redesignation. This chapter provides an overview of particulate matter as an air pollutant, a brief description of the Imperial County area, and a discussion of the purpose and regulatory background associated with this document.

1.1 Purpose

The Imperial Valley Planning Area is currently designated as a Serious nonattainment area for the 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS). Under the CAA, an area can be redesignated as attainment if, among other requirements, the USEPA determines that the NAAQS has been attained. The 24-hour PM_{10} NAAQS allows for one exceedance of the 24-hour average PM_{10} standard (150[1] micrograms per cubic meter [$\mu g/m^3$]) per year averaged over a three consecutive calendar year period, excluding exceptional events, measured at each monitoring site within an area based on quality-assured air quality monitoring data.

A review of the quality-assured PM_{10} monitoring data from 2014 through 2016 shows that, when excluding exceptional events, the Imperial Valley Planning Area did not violate the federal 24-hour PM_{10} standard. During this period, elevated PM_{10} events associated with high wind driven dust storms were flagged and documented in accordance with the USEPA's Exceptional Events regulation (40 CFR § 50.14).[2] Upon concurrence from the USEPA, these events will be excluded from NAAQS determination and a clean data finding will be sought. A clean data finding does not constitute a redesignation to attainment under the CAA. Accordingly, the purpose of this document is to request redesignation of the Imperial Valley Planning Area as attainment for PM_{10} and to submit the requisite maintenance plan and other required actions to qualify for such redesignation by the USEPA.

1.2 Particulate Matter Air Pollution

Particulate matter (PM) is a general term used to describe a complex group of airborne solid, liquid, or semi-volatile materials of various size and composition. Primary PM is emitted directly into the atmosphere from both human activities (including agricultural operations, industrial processes, construction and demolition activities, and entrainment of road dust into the air) and non-anthropogenic activities (such as windblown dust and ash resulting from forest fires). Secondary PM is formed in the atmosphere from predominantly gaseous combustion by-product

1 Per USEPA data handling procedures, an exceedance is a measurement over 154.9 $\mu g/m^3$, since a reading of 154.9 $\mu g/m^3$ would round down to 150 $\mu g/m^3$.

2 Treatment of air quality monitoring data influenced by exceptional events, 40 CFR § 50.14

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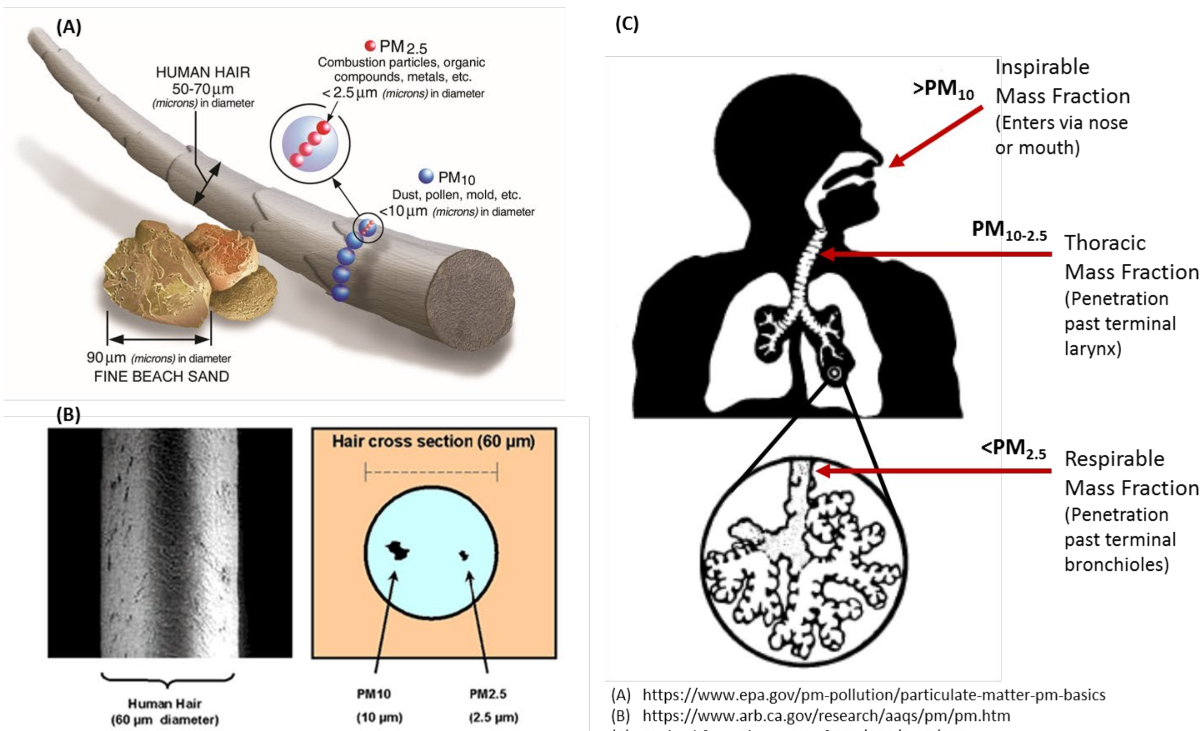
precursors, such as sulfur and nitrogen oxides (SO_X and NO_X), and volatile organic compounds (VOCs). The relative proportion of primary and secondary PM in a given geographic area can vary widely depending upon such factors as the mix of sources in the area, the mix of PM precursors, and meteorology. In addition, PM and its precursors can be transported hundreds or thousands of miles while suspended in the atmosphere.[3] Consequently, ambient PM in an area may be the combination of primary and secondary particles that result from the emissions of local and remote sources.

Federal and state regulators have established both PM_{10} and $PM_{2.5}$ as separate criteria pollutants based, in part, on how the human body reacts to the different sized particulate and the composition of the different size fractions. Figure 1-1 shows the relative sizes of PM_{10} and $PM_{2.5}$, as well as how far they travel into the human body.



(A) https://www.epa.gov/pm-pollution/particulate-matter-pm-basics
(B) https://www.arb.ca.gov/research/aaqs/pm/pm.htm
(C) Derived from Figure 4-1 of EPA/600/R-95/115

Figure 1-1. $PM_{2.5}$ and PM_{10} Relative Sizes and Health Impact Pathways

PM_{10} and $PM_{2.5}$ are based on the size of the particulates; however, they also have different components. Although PM_{10} includes all "fine" $PM_{2.5}$-sized particulates, it also includes "coarse" primary particulates such as dust generated from activities (e.g., construction, mining, etc.) and entrained from soil surfaces by the wind. Figure 1-2 is a general schematic of the components in

[3] National Research Council. 2010. *Global Sources of Local Pollution: An Assessment of Long-Range Transport of Key Air Pollutants to and from the United States*. Washington, DC: The National Academies Press. Available at: https://doi.org/10.17226/12743. Accessed: June 2018.

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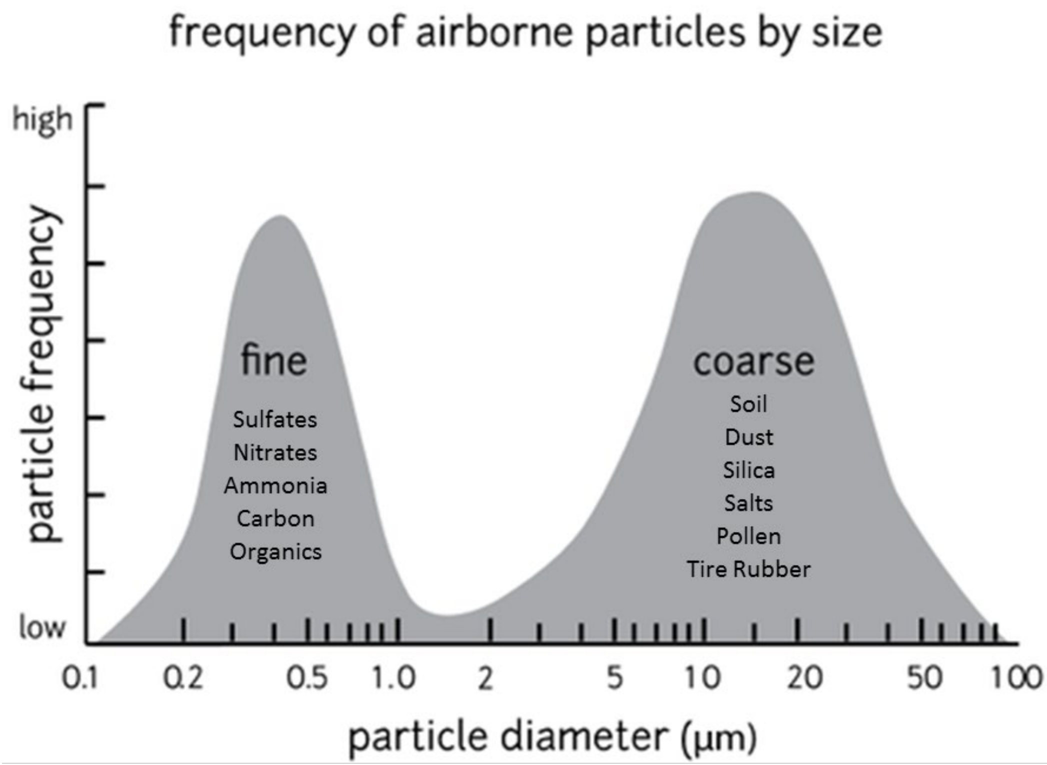
fine and coarse PM; the relative contribution depends on how the different sources are represented in a given area.



Derived from https://publiclab.org/wiki/revisions/pm/25078

Figure 1-2. Properties and Sources of $PM_{2.5}$ and PM_{10}

Ammonium nitrate and ammonium sulfate are formed by NO_X and SO_X (generally from combustion) and ammonia (from fertilizers, manures, wastewater treatment, etc.). Combustion also produces primary (or elemental) carbon and many organic aerosols. Note that the relative contribution of fine and coarse material is dependent on the location, sources, and meteorology.

For PM_{10}, the overwhelming majority of airborne PM in the Imperial Valley Planning Area is primary PM. The major source of primary PM is fugitive windblown dust, with other contributions from entrained road dust, farming, and construction activities. During the 2014 through 2016 monitoring period, all elevated PM_{10} events were directly tied to high wind driven dust storms in which precursor emissions played an insignificant role. In addition, on days favoring the build-up of local PM_{10} precursor emissions (i.e. low wind days) ambient PM_{10} concentrations remained below the NAAQS. CARB evaluated the role that precursor emissions play in the overall ambient PM levels in Imperial County in a study that involved comparing PM_{10} and $PM_{2.5}$ concentration and speciation data from 2007 through 2016. Specifically, five dates with complete concentration and matching speciation data were selected and the data analyzed. CARB's goal was to estimate on each day what percentage of the measured PM_{10}'s mass was contributed by SO_X, NO_X, NH_3, and VOCs. CARB determined that each of these precursors contributed to about 2% or less of the total PM_{10} as an average across the five selected days.

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Comparing these percentages to a precursor significance threshold level developed for the $PM_{2.5}$ 24-hr standard, CARB concluded that the contribution of each precursor can be considered insignificant for the purposes of this redesignation request and maintenance plan. A more detailed summary of the precursor analysis conducted by CARB is provided in Appendix A.

As discussed previously, particle size is a critical characteristic of PM that primarily determines the location of PM deposition along the respiratory system (and associated health effects) as well as the degradation of visibility through light scattering. In the United States, federal and state agencies have established two types of PM air quality standards, reported in Table 1-1 below. PM_{10} corresponds to the fraction of PM no greater than 10 microns or micrometers (µm) in aerodynamic diameter, while $PM_{2.5}$ refers to the subset of PM_{10} of aerodynamic diameter smaller than 2.5 µm, which is commonly called fine particulate matter. The California state standards are presented for comparative purposes, but are otherwise outside the scope of this document.

Table 1-1. National and State Ambient Air Quality Standards for Particulate Matter

Pollutant	Averaging Time	California Standards	National Standards
Respirable Particulate Matter (PM_{10})	Annual	20 µg/m^3	--
	24-hour	50 µg/m^3	150 µg/m^3
Fine Particulate Matter ($PM_{2.5}$)	Annual	12 µg/m^3	12 µg/m^3
	24-hour	--	35 µg/m^3

PM air pollution has undesirable and detrimental environmental effects. PM affects vegetation, both directly (e.g., deposition of nitrates and sulfates may cause direct foliar damage) and indirectly (e.g., coating of plants upon gravitational settling reduces light absorption). PM also accumulates to form regional haze, which reduces visibility due to scattering of light. Agencies concerned with haze include the National Park Service, the U.S. Forest Service, the Western Regional Air Partnership (WRAP), and the Western States Air Resources Council (WESTAR).

PM_{10} is respirable, with fine and ultrafine particles reaching the alveoli deep in the lungs, and larger particles depositing principally in the nose and throat area. PM_{10} deposition in the lungs results in irritation that triggers a range of inflammation responses, such as mucus secretion and bronchoconstriction, and exacerbates pulmonary dysfunctions, such as asthma, emphysema, and chronic bronchitis. Sufficiently small particles may penetrate into the bloodstream and impact functions such as blood coagulation, cardiac autonomic control, and mobilization of inflammatory cells from the bone marrow. Individuals susceptible to higher health risks from exposure to PM_{10} airborne pollution include children, the elderly, smokers, and people of all ages with low pulmonary/cardiovascular function. For these individuals in particular, adverse health effects of PM_{10} pollution include coughing, wheezing, shortness of breath, phlegm,

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bronchitis, and aggravation of lung or heart disease, leading to increased risks of hospitalization and mortality from asthma attacks and heart attacks.[4]

1.3 Imperial County

1.3.1 Geography, Population, and Land Use

Imperial County extends over 4,284 square miles[5] in the southeastern corner of California. It is bordered on the south by Mexico, on the east by Arizona, on the west by the Coyote and Fish Creek Mountains (which are in San Diego County), and on the north by Riverside County. The Salton Trough runs approximately northwest to southeast through the center of the County and extends into Mexico. The elevation in Imperial County ranges from about 230 feet below sea level at the Salton Sea in the north to more than 2,800 feet on the mountain summits to the west.

Imperial County's population is about 190,600[6] and its principal industries are farming and retail trade. Most of the population, farming, and retail trade exist in a band of land that, on average, comprises less than one-fourth the width of the County, stretching from the south shore of the Salton Sea to the Mexican border. The road network is densest within this strip, as shown in Figure 1-3. The rest of Imperial County is the Salton Sea and mostly dry, barren desert areas with little or no human population.

Imperial County's agricultural industry was valued at $2.06 billion in 2016. Vegetable and melon crops led the County tally, grossing more than $1 billion, followed by livestock which grossed $468 million. More than 100 types of crops and commodities are grown in Imperial County, and in 2016, it ranked among the top ten out of all 58 counties in California for gross value of agricultural production.[7] Approximately half a million acres of land were harvested in Imperial County in 2014 and this amount has remained fairly constant over the past decade. During the high season, approximately 25 percent of Imperial County's labor force work in the agricultural sector. Additionally, Imperial County has more acreage and production of alfalfa than any other county in the United States. It is also a major producer of lettuce, feedlot beef, melons, carrots, Sudan grass hay, onions, and numerous other commodities.

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4 Additional details regarding the adverse health effects of PM can be found in the San Joaquin Valley 2006 PM_{10} Plan (Chapter 1, Section 1.5). Available at: http://www.valleyair.org/Air_Quality_Plans/06PM10.htm. Accessed: June 2018.

5 Official website of Imperial County. Available at: http://www.co.imperial.ca.us/. Accessed: June 2018.

6 State of California Department of Finance. Population Estimates. Available at: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/. Accessed: June 2018.

7 Agricultural Impact Associates. Economic Contributions of Imperial County Agriculture. Crop Report PLUS Series. December 2017. Available at: http://www.co.imperial.ca.us/ag/docs/spc/2016_Imperial_County_Crop_Report_Plus.pdf Accessed: June 2018.

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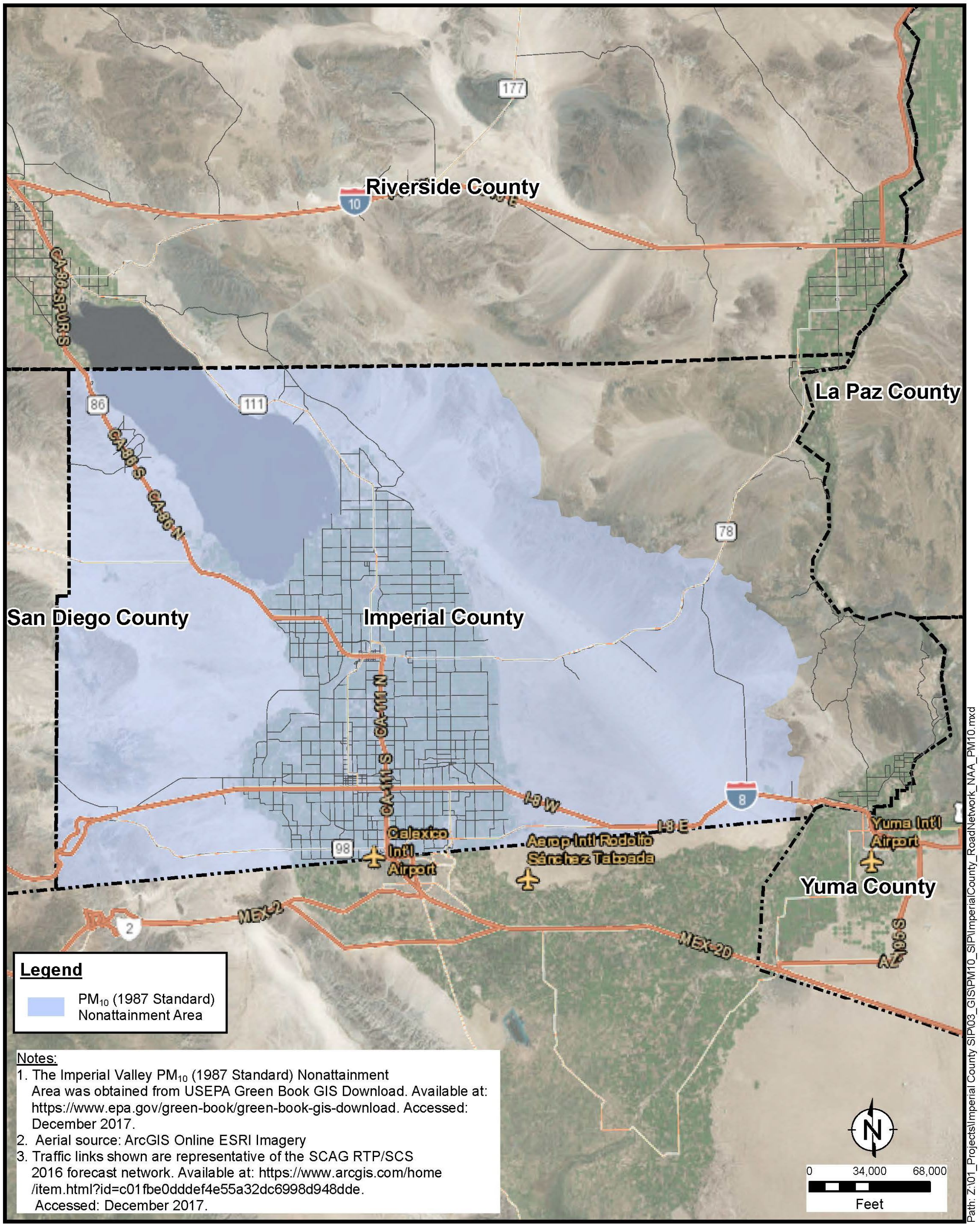

Figure 1-3. Road map of Imperial County

1.3.2 Climate and Meteorology

Climatic conditions in Imperial County are governed by the large-scale sinking and warming of air in the semi-permanent tropical high pressure center of the Pacific Ocean. The high pressure ridge blocks out most mid-latitude storms except in winter when it is weakest and farthest south. The coastal mountains prevent the intrusion of any cool, damp air found in California coastal

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environs. Because of the barrier and weakened storms, Imperial County experiences clear skies, extremely hot summers, mild winters, and little rainfall. The sun shines, on the average, more in Imperial County than anywhere else in the United States.

Winters are mild and dry with daily average temperatures ranging between 65 and 75ºF (18-24ºC). During winter months it is not uncommon to record maximum temperatures of up to 80ºF. Summers are extremely hot with daily average temperatures ranging between 104 and 115ºF (40-46ºC). It is not uncommon to record maximum temperatures of 120ºF during summer months.

The flat terrain of the valley and the strong temperature differentials created by intense solar heating, produce moderate winds and deep thermal convection. The combination of subsiding air, protective mountains, and distance from the ocean all combine to severely limit precipitation. Rainfall is highly variable with precipitation from a single heavy storm able to exceed the entire annual total during a later drought condition. The average annual rainfall is just over three inches (7.5 centimeters) with most of it occurring in late summer or mid-winter.

Humidity is low throughout the year, ranging from an average of 28 percent in summer to 52 percent in winter. The large daily oscillation of temperature produces a corresponding large variation in the relative humidity. Nocturnal humidity rises to 50 to 60 percent, but drops to about 10 percent during the day.

The wind in Imperial County follows two general patterns. Wind statistics indicate prevailing winds are from the west-northwest through southwest; a secondary flow maximum from the southeast is also evident. The prevailing winds from the west and northwest occur seasonally from fall through spring and are known to be from the Los Angeles area. Occasionally, Imperial County experiences periods of extremely high wind speeds. Wind speeds can exceed 31 miles per hour (mph) and this occurs most frequently during the months of April and May. However, speeds of less than 6.8 mph account for more than one-half of the observed wind measurements.

1.3.3 Atmospheric Stability and Dispersion

Air pollutant concentrations are primarily determined by the amount of pollutant emissions in an area and the degree to which these pollutants are dispersed in the atmosphere. The stability of the atmosphere is one of the key factors affecting pollutant dispersion. Atmospheric stability regulates the amount of vertical and horizontal air exchange, or mixing, that can occur within a given air basin. Restricted mixing and low wind speeds are generally associated with a high degree of stability in the atmosphere. These conditions are characteristic of temperature inversions.

In the atmosphere, air temperatures normally decrease as altitude increases. At varying distances above the Earth's surface, however, a reversal of this gradient can occur. This condition, termed an “inversion”, is simply a warm layer of air above a layer of cooler air, and it has the effect of limiting the vertical dispersion of pollutants. The height of the inversion determines the size of the mixing volume trapped below. Inversion strength or intensity is measured by the thickness of the layer and the difference in temperature between the base and

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the top of the inversion. The strength of the inversion determines how easily it can be broken by winds or solar heating.

Imperial County experiences surface inversions almost every day of the year. Due to strong surface heating, these inversions are usually broken allowing pollutants to be more easily dispersed. Weak surface inversions are caused by radiative cooling of air in contact with the cold surface of the Earth at night. In valleys and low lying areas, this condition is intensified by the addition of cold air flowing down slope from the hills and pooling on the valley floor.

However, in some circumstances the presence of the Pacific high pressure cell can cause the air to warm to a temperature higher than the air below. This highly stable atmospheric condition, termed a subsidence inversion can act as a nearly impenetrable lid to the vertical mixing of pollutants. The strength of these inversions makes them difficult to disrupt. Consequently, they can persist for one or more days, causing air stagnation and the build-up of pollutants—a condition that frequently occurs across the southern border of Imperial County in the densely populated city of Mexicali, Mexico. In the past these elevated pollution levels have been observed to impact ambient air quality in the nearby city of Calexico, Imperial County.

1.4 Regulation VIII and Imperial County 2009 PM_{10} SIP

1.4.1 Background

In response to the opinion of the U.S. Court of Appeals for the Ninth Circuit in *Sierra Club* v. *United States Environmental Protection Agency, et al.*, in August 2004 the USEPA found that the Imperial Valley Planning Area had failed to attain the NAAQS by the Moderate area PM_{10} attainment date of December 31, 1994, and as a result reclassified the area from a Moderate to a Serious PM_{10} nonattainment area.[8] Also in August 2004, the USEPA proposed a rule to find that the Imperial Valley Planning Area had failed to attain the annual and 24-hour PM_{10} standards by the Serious area deadline of December 31, 2001.[9] The USEPA finalized the rule on December 11, 2007,[10] citing as the basis for the rule that six Imperial County monitoring stations were in violation of the 24-hour standard during 1999 to 2001. The USEPA's final rule action required the state to submit to the USEPA by December 11, 2008 (within one year of the rule's publication in the Federal Register) an air quality plan that demonstrates that the County will attain the PM_{10} standard as expeditiously as practicable.

In response to this rule action, ICAPCD developed the *2009 Imperial County State Implementation Plan for Particulate Matter Less than 10 Microns in Aerodynamic Diameter*[11]

8 United States Environmental Protection Agency. 2004. *Finding of Failure to Attain and Reclassification to Serious Nonattainment; Imperial Valley Planning Area; California; Particulate Matter of 10 Microns or Less; Final Rule.* Federal Register. Vol. 69. No. 154. August 11, 2004. p. 48792.

9 United States Environmental Protection Agency. 2004. *Finding of Failure to Attain; Imperial Valley Planning Area; California; Particulate Matter of 10 Microns or Less; Proposed Rule*. Federal Register. Vol. 69. No. 154. August 11, 2004. p. 48835.

10 United States Environmental Protection Agency. 2007. *Finding of Failure to Attain; California – Imperial Valley Nonattainment Area; PM-10. Final Rule.* Federal Register. Vol. 72. No. 237. December 11, 2007. p. 70222.

11 Imperial County Air Pollution Control District. 2009. 2009 Imperial County State Implementation Plan for Particulate Matter Less Than 10 Microns in Aerodynamic Diameter. August 11. Available at: http://www.co.imperial.ca.us/airpollution/attainment%20plans/final%20ic%202009%20pm10%20sip%20document.pdf. Accessed: June 2018.

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("2009 PM_{10} SIP") which included the required sections of an air quality assessment, emission inventory, District control strategy (including Best Available Control Measures [BACM] and Best Available Control Technology [BACT]), and transportation conformity budgets. For the first main required section, the air quality assessment, an evaluation of the air quality data from 2006 to 2008 was performed in order to determine the peak concentrations around which the control strategy was to be designed. It was found that during this period, there were five days with ambient air PM_{10} concentration measurements that exceeded the 24-hour NAAQS.[12] After extensive technical analysis, the District concluded that each of these exceedances was caused by either transport of pollutants from Mexico or natural high wind events. In the case of exceedances caused by international transport, the CAA contains a specific provision to address them. It establishes that although these exceedances are still considered violations of the standard, the state is not required to develop an attainment strategy addressing the pollution that causes them. For exceedances caused by wind events, there is an applicable provision in the Exceptional Events Rule adopted by the USEPA in 2007 and revised in 2016.[13] This rule recognizes that there are certain naturally occurring, uncontrollable events that can result in exceedances of federal air quality standards, and that appropriately documented events can be excluded from consideration of a region's attainment status.

Given these circumstances, the Imperial Valley Planning Area was considered to have met the federal PM_{10} standard "but-for" international emissions and hence, no attainment demonstration was required. Additionally, the requirements for reasonable further progress (RFP), a five percent yearly reduction in emissions, and contingency measures were not applicable since their sole purpose is to bring an area into attainment of the standard. Nevertheless, the District did address contingency measures in the 2009 PM_{10} SIP in order to provide additional assurance that PM_{10} levels would remain below the standard into the future.

The next major requirement for the 2009 SIP was the emission inventory. This section provided an estimate of the amounts of PM_{10} emissions coming from specific sources. To perform this analysis, the District chose 2005 as the baseline year, from which future emission estimates were calculated based on factors such as growth trends and reductions from rules and regulations. The results of the analysis showed that the greatest sources of PM_{10} emissions in the Imperial Valley Planning Area from 2006 to 2010 were from fugitive dust. More specifically, area-wide dust sources and windblown dust were responsible for the vast majority of the emissions, together comprising approximately 97 percent of PM_{10} emissions for all of Imperial County in 2006. Estimates for 2007 to 2010 were similar.

The conclusions reached based on the emission inventory provided the basis for the next major requirement: the District control strategy. Since the CAA requires Serious nonattainment areas to implement BACM for all area sources considered to be significant contributors to violations of the federal standard, a strategy was created to address them. It was found that there were only two significant area source categories in the emission inventory: agricultural tilling and unpaved

[12] Imperial County was only implementing one-in-six day monitoring at this time; therefore, five measured exceedances would have been interpreted as 30 "expected" exceedances under Appendix K to 40 CFR Part 50.

[13] United States Environmental Protection Agency. 2016. *Treatment of Data Influenced by Exceptional Events; Final rule; notification to states with areas subject to mitigation requirements; final guidance.* Federal Register. Vol. 81. No. 191. October 3, 2016. p. 68216.

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road dust. Although these were the only two source categories requiring BACM, in 2005 the District developed a set of fugitive dust rules to address multiple different sources. Collectively, these rules are known as Regulation VIII. In total, the six source categories covered by Regulation VIII are construction and earthmoving activities, bulk materials, carry-out and track-out, open areas, paved and unpaved roads, and agricultural conservation management practices, with the last two specifically addressing the significant area sources identified in the emission inventory. By 2006, the rules were submitted to the USEPA, but no action was taken until February 2010, at which time the USEPA proposed only a partial approval of the rules.[14] The USEPA also identified several rule components which they believed required additional analysis in order to demonstrate BACM-level equivalence.

In response to the partial approval/disapproval of the rules and SIP submission, the District and the California Department of Parks and Recreation challenged the USEPA's decision and related actions on proposed exceptional events.[15] These challenges were overseen by the U.S. Court of Appeals for the Ninth Circuit, which ultimately suggested that the parties engage in a discussion to determine if the dispute could be resolved through a settlement agreement.

1.4.2 Settlement Agreement

On February 17, 2012, the U.S. Court of Appeals issued an Order that directed the parties in litigation to undergo mediation. Eventually a Settlement Agreement was reached, the details of which were published in the Federal Register on August 21, 2012.[16] Several specific stipulations were put forth by the agreement (provided as Appendix B), which ICAPCD and the USEPA were required to adhere to for a speedy approval and subsequent promulgation of the revised rules. First, the proposed agreement required that the District revise Regulation VIII and submit it to the District Governing Board within ninety days of the execution of the settlement. Additionally, the revisions were to be substantially the same as those laid out within the Settlement Agreement, and meet all local, state, and federal administrative requirements before they could be incorporated into the revised SIP. Second, the Settlement Agreement required that once the District Governing Board adopted the rules, the District had fourteen days to submit them to the California Air Resources Board (CARB) for expedited submittal to the USEPA to be incorporated into the California SIP. Third, it was required that the USEPA sign for publication in the Federal Register a proposal to take action on the submission within sixty days of the submittal by CARB. As long as the revised Regulation VIII was substantially the same as set forth in the Settlement Agreement, the USEPA had to propose full approval of the submission.

Fourth, once the USEPA approved the submission, they also had to make a statement that their preliminary determination was that the revised Regulation VIII constituted "reasonable control" of the sources covered by it, "for the purpose of evaluating whether the exceedance of the PM_{10}

[14] United States Environmental Protection Agency. 2010. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 75. No. 130. July 8, 2010. p. 39366.

[15] See *Imperial County Air Pollution Control District v. EPA,* No. 10-72709 (9th Cir.) and *California Department of Parks and Recreation v. EPA*, No. 10-72729 (9th Cir.).

[16] United States Environmental Protection Agency. 2012. *Proposed Settlement Agreement, Clean Air Act Citizen Suit; Notice of Proposed Settlement Agreement; Request for Public Comment.* Federal Register. Vol. 77. No. 162. August 21, 2012. p. 50506.

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NAAQS is an 'exceptional event' including reasonable and appropriate control measures on significant contributing anthropogenic sources." It is important to note that this statement only applied to the exceedance of the PM_{10} NAAQS and no other pollutant standards. In addition, events that differ significantly from those discussed during mediation in terms of meteorology, sources, or conditions were excluded. Fifth, the USEPA was to make a determination to defer imposition of any previously assigned sanctions pursuant to the Administrative Procedure Act, 5 U.S.C. 553(d)(1), pending public comments on the proposed action. Sixth, the USEPA was to take final action on the Regulation VIII submission within sixty days of the public comments. Then, the USEPA was required to deliver the notice of final rulemaking promptly to the Office of Federal Register for final review and publication.

Along with these six major requirements, the Settlement Agreement also included a set of provisions to detail the consequences if either the District or the USEPA failed to adhere to the terms of the agreement. However, both parties executed their ends of the agreement in a timely manner, and the provisions did not need to be enforced. On October 16, 2012, the rule revisions in the Settlement Agreement were adopted by ICAPCD and submitted to the USEPA soon after on November 7, 2012. Finally, on January 7, 2013,[17] the USEPA proposed to approve the revisions to Regulation VIII and opened it for public comment. After thirty days, the USEPA finalized both the approval of the revisions and a temporary termination of previously imposed highway funding sanctions.

1.5 Document Organization

The District is requesting redesignation of the Imperial Valley Planning Area from Serious nonattainment to attainment of the PM_{10} NAAQS under CAA Section 107(d)(3)(E) protocol.

Section 107(d)(3)(E) of the CAA requires the USEPA administrator to make five findings prior to granting a request for redesignation:

1. The USEPA has determined that the NAAQS has been attained.
2. The applicable implementation plan has been fully approved by the USEPA under Section 110(k).
3. The USEPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions.
4. The State has met all applicable requirements for the area under Section 110 and Part D.
5. The USEPA has fully approved a maintenance plan, including a contingency plan, for the area under Section 175A.

As will be described in the following Chapter, PM_{10} air quality in the Imperial Valley Planning Area, excluding exceptional events, did not violate the NAAQS from 2014 through 2016. Therefore, Chapter 2 provides information on the required monitoring network and confirmation that the 2014-2016 24-hour PM_{10} concentration data shows attainment of the NAAQS. Chapter 3 describes the PM_{10} Control Strategy, including adopted Regulation VIII fugitive dust

[17] United States Environmental Protection Agency. 2013. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Proposed rule.* Federal Register. Vol. 78. No. 4. January 7, 2013. p. 922.

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rules, that has led to permanent and enforceable emissions reduction in the area and that USEPA approved as BACM for significant sources in 2013 (see Section 1.4 for a summary of the previous 2009 PM_{10} SIP submittal, subsequent Settlement Agreement with the USEPA, and USEPA's approval of Imperial County's fugitive dust rules as BACM for significant sources). Chapter 4 addresses the applicable requirements for a maintenance plan and CAA Section 110 and Part D, including emission inventories, continuous monitoring requirements, and contingency provisions. Chapter 5 discusses issues related to the contraction of the Salton Sea and federal, state, and local programs to stabilize the playa as it becomes exposed. Chapter 6 is the formal redesignation request. Together these chapters directly address and satisfy the requirements of CAA Section 107. Chapter 6 also includes a checklist of all these satisfied requirements.

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2 PM_{10} Air Quality

2.1 Overview

As briefly described in the previous section of this document, PM_{10} air quality in the Imperial Valley Planning Area, excluding exceptional events, did not violate the NAAQS from 2014 through 2016. This Chapter describes a monitoring network that is consistent with CAA Section 110 and Part D requirements and demonstrates that the 2014-2016 24-hour PM_{10} concentration data shows attainment of the NAAQS. According to USEPA guidance, a demonstration of attainment of the PM_{10} standard must rely on three complete, consecutive calendar years of quality-assured air quality monitoring data collected in accordance with 40 CFR Part 50, Appendix J. The NAAQS allows for one exceedance of the 24-hour PM_{10} standard per year averaged over a three consecutive calendar year period.

2.2 Imperial County Air Monitoring Network

During the 2014-2016 time period, ICAPCD operated filter-based, size-selective inlet (SSI) PM_{10} monitors at five stations located in the populated areas of the County (see Figure 2-1): Calexico-Ethel, El Centro, Brawley, Westmorland, and Niland.[18, 19] These stations form a monitoring network oriented south to north from the United States-Mexico border. These SSI monitors meet federal performance criteria and historically had been the sole source of official data for long-term air quality planning and attainment demonstrations. Beginning in 2013, data collected by collocated Beta Attenuation Mass (BAM) monitors at the Brawley and Niland stations were deemed suitable for submission to the USEPA Air Quality System (AQS) and subsequent regulatory compliance evaluations. Similar data became available at the Westmorland and El Centro stations beginning in the third quarter of 2015 and at the Calexico-Ethel station in the first quarter of 2016. Detailed information regarding these monitors is provided below.

Calexico-Ethel - The Calexico-Ethel monitoring station was installed in 1994 and is operated and maintained by CARB. Located above sea level, it has an absolute location of latitude 32° 40' 34" and longitude 115° 28' 59". Its relative location is 1029 Belcher Street within the property boundary on the southeast corner of the Calexico High School football field parking lot. To the north is located an athletic sports field used for football, baseball, and track. The monitoring station is surrounded by a suburban neighborhood directly to the south, southeast, and southwest and is approximately 0.75 miles (1.2 kilometers) directly north of the international border crossing. The site currently records measurements for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), $PM_{2.5}$, PM_{10}, lead (Pb), and toxics.

El Centro - The El Centro monitoring station was installed in 1986. Located above sea level, its absolute location is latitude 32° 47' 32" and longitude 115°33' 47". Its relative location is 150

[18] The Calexico-Grant station was permanently decommissioned after July 2007.

[19] The minimum number of monitors required by USEPA regulations (40 CFR Part 58, Appendix D) for the purpose of PM_{10} air quality monitoring in an area is based on the population of the area and on the nature of the PM_{10} air quality in the area. For the Imperial County area, the five PM_{10} monitors currently operated by CARB and ICAPCD are well in excess of the 1-2 monitors needed to satisfy the federal minimum requirements (CARB. 2015. Annual Monitoring Network Report for Twenty-five Districts in California. Volume I. June. Available at: http://www.co.imperial.ca.us/AirPollution/Monitoring/2015%20Annual%20Network%20Plan_Volume%201.pdf. Accessed: June 2018.).

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South 9th Street on the roof of the ICAPCD building. The monitoring station is surrounded by governmental and commercial buildings. It is the first monitoring site north of the city of Calexico, continuing the south to north monitoring network for Imperial County. The El Centro monitoring station is classified as urban with large agricultural areas to the east and west of the city's boundaries. This site records measurements for O_3, CO, NO_2, $PM_{2.5}$, and PM_{10}.

Brawley - The current Brawley monitoring station, which was installed in 2003 as a new station, replaced the old one which was installed in 1982. It is located below sea level and has an absolute location of latitude 32° 58' 42" and longitude 115° 32' 21". Its relative location is 220 Main Street atop the Imperial County courthouse in the middle of the city of Brawley, surrounded by commercial buildings. Like other cities within Imperial County, Brawley is surrounded by agricultural lands to the east, north, and west. The Brawley station is the third northernmost station within the Imperial County monitoring network. This site records measurements for $PM_{2.5}$ and PM_{10}.

Westmorland - The Westmorland monitoring station was installed in 1994. Located below sea level, its absolute location is latitude 33° 1' 57" and longitude 115° 37' 25". Its relative location is 570 Cook Street in Westmorland. The site is the second northernmost station within the Imperial County monitoring network. It lies west of the Brawley monitor, but southwest of the Niland monitor. Residential and agricultural areas lie within 10 meters and 400 meters of the site. The site originally monitored both O_3 and PM_{10} concentrations; however, in November 2012, the station experienced an electrical fire and the O_3 monitor was placed out of commission.

Niland - The Niland monitoring station was installed in 1996. Located below sea level, its absolute location is latitude 33° 12' 49" and longitude 115° 32' 43". Its relative location is 7711 English Road. It is adjacent to English Road which is an unpaved and lightly traveled road (approximately 100 vehicles per day). The monitoring site is surrounded by agricultural land to the south, southwest, and southeast. A single residence exists to the west of the station, across English Road. The monitoring station is southeast of Riverside County and the Salton Sea and is the most northerly site within the Imperial County monitoring network. The site records measurements for O_3 and PM_{10}.

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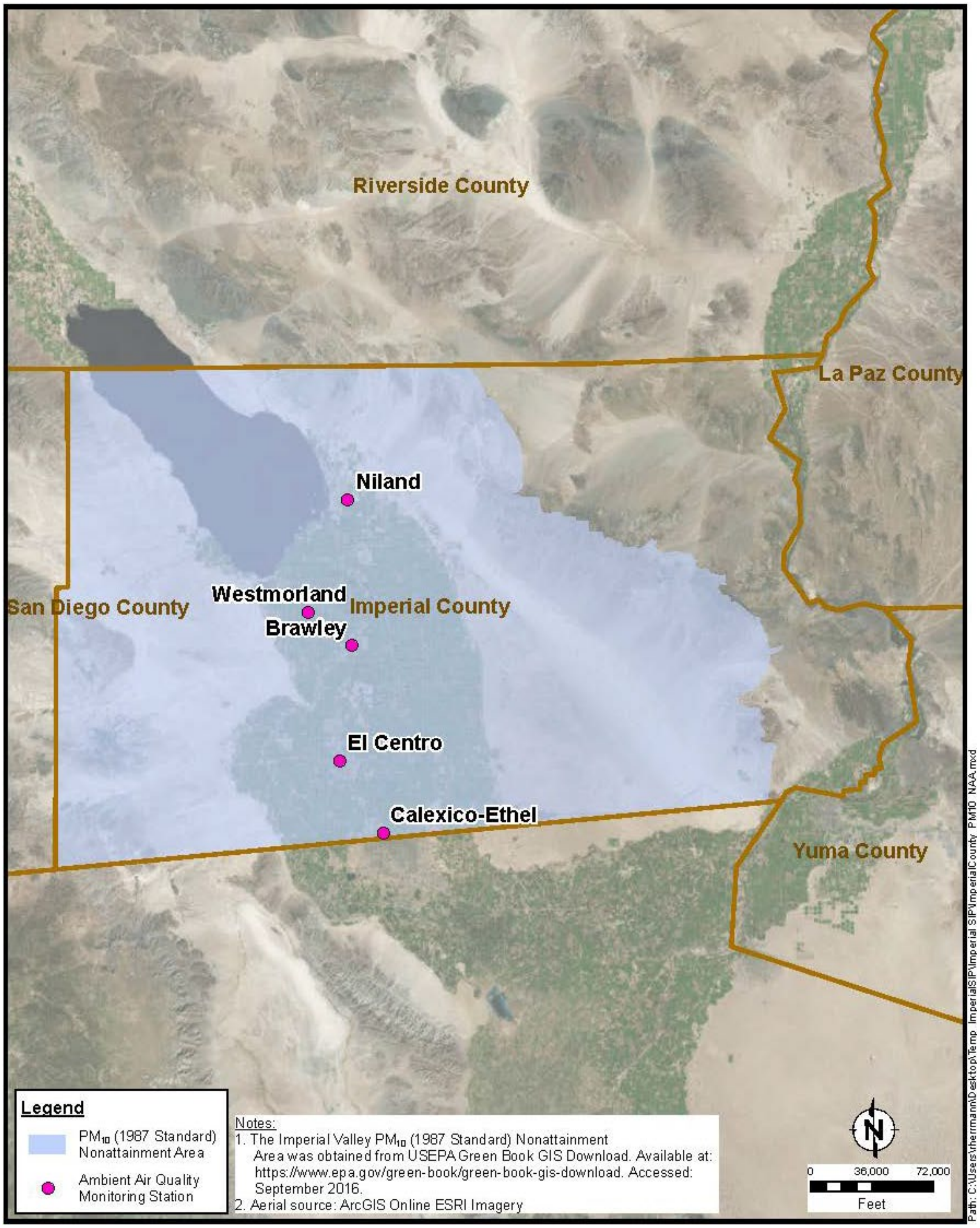

Figure 2-1. Locations of Imperial County PM_{10} monitoring stations

2.3 Ambient Air Quality Data (2014-2016)

SSI and BAM monitor measurements acquired during 2014-2016 are plotted by station in Figure 2-2 and tabulated in Appendix C, Table C-1.[20] The plots reveal that the overwhelming

[20] Table C-2 in Appendix C presents data completeness information by monitor parameter occurrence code and year.

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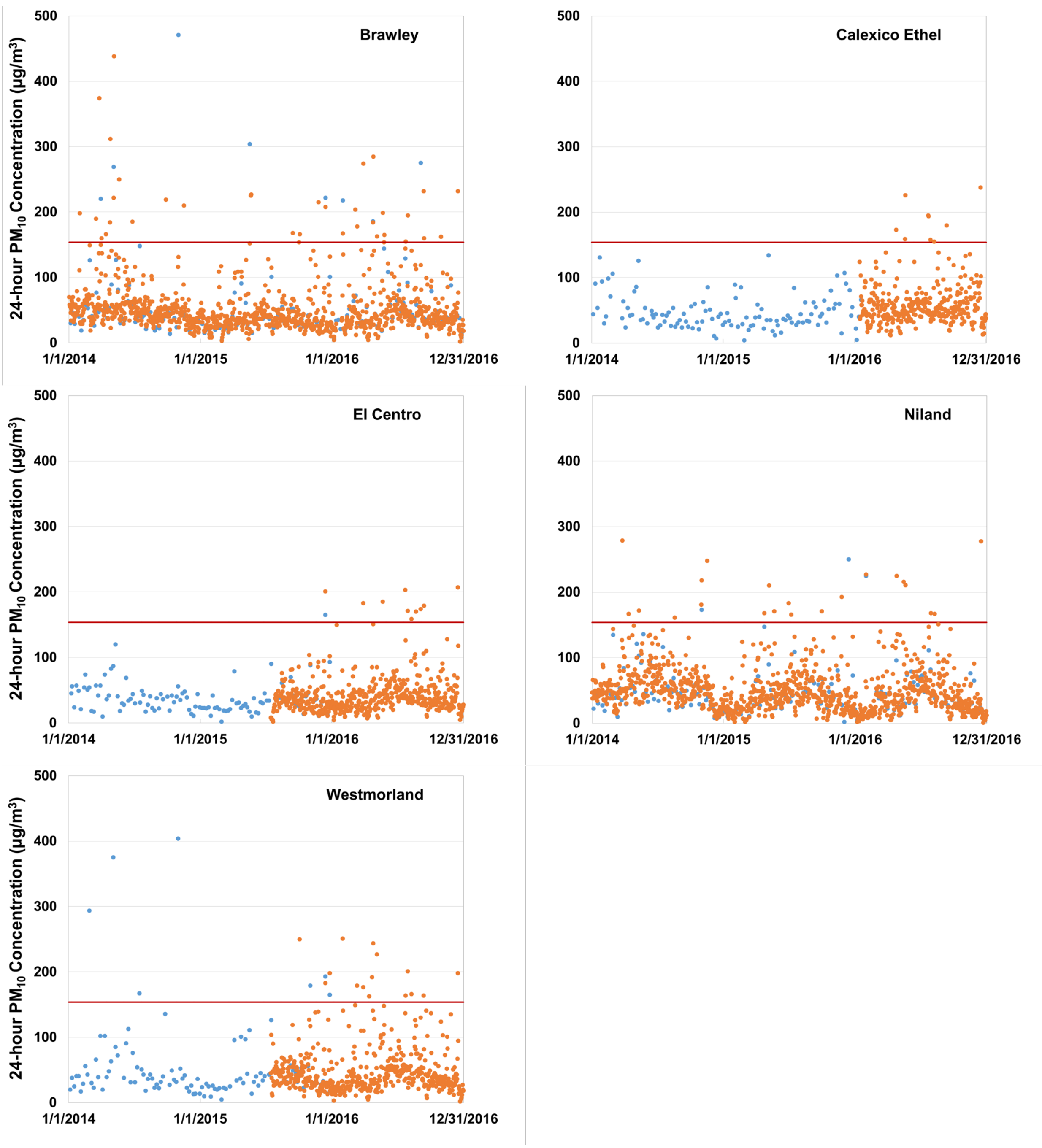
majority of 24-hour ambient PM_{10} concentration measurements are well below the 150 μg/m^3 NAAQS: only three to nine percent of measurements at those stations were above 100 μg/m^3 during 2014-2016, and only 21 to 48 percent were above 50 μg/m^3.

Figure 2-2. Time series plots of 24-hour PM_{10}



Time-series plots of 24-hour PM_{10} ambient air concentration in Imperial County during 2014-2016. Blue-colored measurements are from 1-in-6 day monitors, while orange-colored measurements are from daily monitors. Tabulated results are provided in Appendix C, Table C-1.

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2.3.1 Exceptional Events

The USEPA promulgated a Natural Events Policy (NEP) in 1996, allowing exclusion of "PM_{10} air quality data…attributable to uncontrollable natural events from the decisions regarding an area's nonattainment status."[21] This policy enabled local air districts to exclude from the decisions regarding an area's attainment status documented high ambient PM_{10} air quality data that were caused by uncontrollable natural events such as (i) volcanic, seismic activity, (ii) wild land fires, and/or (iii) high wind episodes.[22] The NEP has been incorporated into and superseded by the 2007 Exceptional Event Rule, discussed below.

As of May 21, 2007, states petitioning the USEPA to exclude any air quality monitoring data from regulatory determinations related to compliance with the NAAQS must comply with the USEPA's updated Exceptional Event policy.[23] The rule defines an Exceptional Event as one that "affects air quality, is not reasonably controllable or preventable, is caused by a natural event or by human activity that is unlikely to recur at a particular location, and is determined by the USEPA to be an exceptional event." A clear causal relationship must be established between a measured exceedance of a NAAQS and an exceptional event in order to exclude the exceedance from regulatory determination of an area's attainment status. In September of 2016, the Exceptional Events Rule was updated[24] in order to increase the efficiency of the process by which these events are demonstrated and reviewed. One specific change to the rule was a revision of its language to more closely align with that of the CAA. This included removing the "but for" criterion and adding the "affects air quality" and "historical fluctuations" criteria. Other changes to the rule include clarifying the analyses, content, and organization for demonstrations of exceptional events, requiring that the air agency send an initial notification to USEPA of a potential exceptional event demonstration, and removing specific exceptional event-related deadlines, among others. The final action of approving the revisions to the rule supersedes both the 2007 Exceptional Events Rule and the 2013 Interim Exceptional Events Implementation Guidance.

[21] United States Environmental Protection Agency. 1996. Areas Affected by PM-10 Natural Events. Memorandum from Mary D. Nichols to USEPA Division Directors. June 6. Available at: https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19960530_nichols_pm10_natural_events.pdf. Accessed: June 2018.

[22] As a requirement for data flagging and data exclusion from NAAQS compliance determination, the NEP required states to develop area-specific Natural Events Action Plans (NEAPs) designed to protect public health through public education, public notification, and efforts to minimize emissions from contributing anthropogenic sources during natural events. The ICAPCD satisfied this requirement by collaborating with local governments and stakeholders to develop the Imperial County NEAP document in 2005. The Imperial County NEAP, which dealt specifically with natural events caused by high winds and wildland fires, was adopted by the ICAPCD Board of Directors on August 9, 2005. The Imperial County NEAP development process involved the development of BACM measures to satisfy the requirements of controlling and abating wind-generated dust from anthropogenic sources.

[23] United States Environmental Protection Agency. 2007. *Treatment of Data Influenced by Exceptional Events; Final Rule*. Federal Register. Vol. 72. No. 55. March 22, 2007. p. 13560.

[24] United States Environmental Protection Agency. 2016. *Treatment of Data Influenced by Exceptional Events; Final Rule.* Federal Register. Vol. 81. No. 191. October 3, 2016. p. 68216.

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2.3.2 Exceedances of the 24-Hour PM_{10} NAAQS (2014-2016)

In the 2014 to 2016 time period, Imperial County experienced 58 days with PM_{10} concentrations in excess of the 24-hour NAAQS. As shown in Table 2-1, all of these exceedances were due to Exceptional Events. These events were primarily caused by gusty westerly winds brought on by low pressure systems. A smaller fraction of the events were the result of monsoonal fronts passing through the region. Additional details regarding these events are provided in Appendix D. These events were documented, publicly noticed, and are being submitted to the USEPA in separate submittals. In contrast to the variation in the number of high readings over these three years, we note that Imperial County emissions (and related underlying activity) did not change appreciably over this period.

Table 2-1. Expected Exceedances of 24-hour PM_{10} NAAQS at Imperial County Air Quality Monitoring Stations from 2014 to 2016

Station Name	POC [1]	Expected Exceedances [2,3], including Exceptional Events			Expected Exceedances [2,3], excluding Exceptional Events		
		2014	2015	2016	2014	2015	2016
Brawley	1	21	13	18	0	0	0
	3	13	6	21	0	0	0
Calexico-Ethel	1	0	0	0	0	0	0
	3	--	--	9	--	--	0
El Centro	2	0	6 [4]	--	0	0	--
	4	--	1	10	--	0	0
Niland	1	6	6	6	0	0	0
	3	7	7	9	0	0	0
Westmorland	1	25	31	--	0	0	--
	3	--	3	18	--	0	0

Notes:

[1] Parameter Occurrence Codes (POCs) 1 and 2 represent 1-in-6 day monitoring, whereas POCs 3 and 4 represent continuous, daily monitoring.

[2] Expected exceedance data is observed exceedance data adjusted to account for exceedances measured at monitors with incomplete data or those sampling less frequently than daily.

[3] "--" indicates monitor not in service or data not reported.

[4] A potential discrepancy with how this value is reported within AQS is being resolved by USEPA Region IX.

2.4 Section 110 and Part D Requirements – Monitoring and Analysis

CAA Section 110 contains the general requirements for SIPs and Part D specifies additional requirements applicable to nonattainment areas. Both Section 110 and Part D describe the elements of a SIP and include, among other things, a monitoring network and air quality analysis. These two requirements have been adequately addressed in this Chapter.

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With the submittal of this redesignation request and maintenance plan, Imperial County meets all SIP requirements applicable to the area under Section 110 and Part D, as required by CAA Section 107(d)(3)(E), and requests that approval action on these items occurs simultaneously with this redesignation request. Refer to the checklist in Chapter 6 for a summary of how all applicable requirements have been addressed.

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3 Control Strategies - Permanent and Enforceable Emission Reductions

Reclassification of the Imperial Valley Planning Area to Serious nonattainment in 2004 prompted the ICAPCD to begin the development of revised Regulation VIII fugitive dust control rules at the BACM level. This process was initiated ahead of SIP development[25] to accelerate BACM implementation and to meet the requirements and schedule of the District's National Events Action Plan (NEAP) (approved in August 2005). In March 2004, the ICAPCD began a review and assessment of BACM in other areas. Rule development, initiated at a stakeholder meeting in October 2004, was conducted in a public process that involved a local Technical Advisory Committee[26] as well as state and federal air agencies.[27] The process resulted in the adoption in November 2005 of revised Regulation VIII fugitive dust control measures, which form the core of the Imperial County PM_{10} control strategy.[28] Provisions in these rules went into effect in January 2006.[29]

The control strategy consists of <u>rules adopted in 2005 and 2012</u> that have been determined by the USEPA as meeting BACM-level stringency for sources previously identified as significant. An updated significant source analysis shows that no new emission sources would qualify as significant that weren't identified previously. Therefore, no new control measures are being proposed with this Plan.

After its initial review of the newly updated Regulation VIII in February 2010, the USEPA proposed only a partial approval of the rules. The District challenged this decision, and the dispute led to litigation within the U.S. Court of Appeals, and ultimately to a Settlement Agreement. The terms of the Settlement Agreement included agreed-upon revisions to the rules and a schedule for resubmittal to and approval by the USEPA. A more thorough description of the Settlement Agreement is provided in Section 1.4.2. Both ICAPCD and the USEPA adhered to the terms of the Settlement Agreement and the revised rules were ultimately approved by the USEPA in early 2013 and determined to meet BACM-level stringency for significant sources of PM_{10}, a requirement for Serious nonattainment areas under the CAA. Ultimately, four out of the seven Regulation VIII rules were amended including Rules 800, 804, 805, and 806. The changes to these rules included more specific definitions of agricultural dust management practices, opacity, and stabilization requirements for

[25] The USEPA did not take final action regarding nonattainment of the Imperial Valley Planning Area until December 2007.

[26] Including representatives from the Coalition of Labor and Business, the Farm Bureau, the Bureau of Land Management, Border Patrol, the Imperial Irrigation District (IID), the Imperial County Public Works Department (ICPWD), as well as farmers and private industry stakeholders.

[27] Meetings with the CARB and the USEPA were held on March 23, 2005 and on August 10, 2005. Informal comments were also submitted by the California Department of Transportation.

[28] Note that additional controls of PM_{10} emissions in Imperial County are outlined in ICAPCD Rule 420 (beef feedlots) and Rule 701 (agricultural burning). These rules, which were most recently updated in October 2006 and August 2002, respectively, are SIP approved.

[29] The only exception was that control of county unpaved roads under Rule 805 was phased over a 10-year period.

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high-traffic agricultural roads and more detailed requirements for land managers to control dust from off-highway vehicle (OHV) areas. More recently, in April 2016, Rule 804 was updated to accommodate the changing conditions and potential future emissions at the Salton Sea. More on the amendments to Rule 804 is provided below.

An update to Imperial County's significant source analysis shows that no new PM_{10} emission sources would qualify as significant that haven't been identified previously as such (see Appendix E for details). This finding implies that all significant sources of PM_{10} in Imperial County are currently being controlled to BACM-level stringency. Therefore, no new control measures are being proposed with this Plan.

The section below provides a summary of the current Regulation VIII fugitive dust rules. Only a brief description of the control measures of the Regulation VIII rules are presented in this section; the complete rules are provided in Appendix F.

3.1 Regulation VIII Rules

3.1.1 Rule 800: General Requirements for Control of Fine Particulate Matter

Purpose and Requirements: The purpose of Regulation VIII is to reduce the amount of PM_{10} entrained in the ambient air as a result of anthropogenic fugitive dust sources generated from within Imperial County. The rules of Regulation VIII require that landholders and other responsible parties take specific actions in order to prevent, reduce, or mitigate PM_{10} emissions. The rules apply to human activities or human-caused conditions capable of generating fugitive dust. The purpose of Rule 800 specifically is to define all the relevant terms that appear throughout the regulation, such as what constitutes "fugitive dust", the characteristics of "open areas", and the requirements for labeling a surface as "stabilized." Also included in this rule are a compliance schedule, descriptions of exempt activities, and the test methods for determining if responsible parties are in compliance with the rules' requirements.

Rule Revisions: Rule 800 was revised as part of the Settlement Agreement to both edit and add new definitions to the list of defined terms. Terms that were added or revised include "Disturbed Surface Area", "Off-Road Event and/or Competitions", "Off-Highway Vehicle" (changed from "Off-Road Vehicle"), and "Recreational Off-Highway Vehicle Use Area". An important update to the compliance schedule added a requirement that any person who owns or operates a Recreational OHV Use Area must draft and submit a dust control plan. Before the revision, only the Bureau of Land Management or United States Border Patrol were required to do so. Additionally, updates to the rule require that a public agency must meet and confer with ICAPCD before they can designate a property as a "New Recreational OHV Use Area." The rule includes descriptions of all the necessary steps required to do this.

3.1.2 Rule 801: Construction and Earthmoving Activities

*Purpose and Requirements***.** The purpose of Rule 801 is to reduce the amount of PM_{10} that is emitted into the air as a result of construction and other earthmoving activities, such as land clearing, excavating, land leveling, grading, demolishing, etc. All persons who own or operate a construction site or who perform any earthmoving activities are required to limit visible dust emissions (VDE) to 20 percent opacity by complying with the following measures:

- Phase work to minimize the amount of disturbed surface area at one time;

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- Apply water or chemical stabilization;
- Construct and maintain wind barriers around the activity site;
- Restrict vehicular access to the area by fencing or signage;
- Mitigate track out/carry out of Bulk Materials[30] at the site in compliance with Rule 803; and
- Transport Bulk Material to, from, and around the site in compliance with Rule 802.

Dust Control Plan. Owners or operators of construction/earthmoving sites greater than or equal to 10 acres for residential developments and greater than or equal to 5 acres for non-residential development are required to provide written notification to the ICAPCD 10 days prior to the commencement of activities, and to develop a dust control plan. The plan is expected to document the type and location of the project, the expected start and completion dates of the dust generating activities, the total area of land surface to be disturbed, the actual and potential sources of fugitive dust emissions on the site (including the location of Bulk Material handling and storage areas, paved and unpaved roads, entrances and exits where track out/carry out may occur, etc.), and all the fugitive dust control measures to be implemented before, during, and after any dust-generating activity.

3.1.3 Rule 802: Bulk Materials

Purpose and Requirements. The purpose of Rule 802 is to reduce the amount of PM_{10} that is emitted into the air as a result of outdoor handling, storage, and transport of Bulk Material. The rule requires implementation of the following controls in order to limit VDE to 20 percent opacity:

- For Bulk Material handling (e.g. stacking, loading, unloading, conveying, etc.), control measures include spraying with water, applying and maintaining chemical stabilization, and protecting from wind erosion by sheltering or enclosing;
- For Bulk Material storage, control measures include confinement of the material using a physical barrier (e.g. covering with tarps, plastic, etc.) and confinement by applying water or other chemical/organic stabilizers/suppressants;
- For Bulk Material transport/hauling, control measures include complete covering or enclosing of all haul truck loads, proper selection and maintenance of the cargo compartments of haul trucks to ensure no spillage or loss of Bulk Materials from holes or openings in the compartment's floor, side, or tailgate, and adequate cleaning of the cargo compartment of all haul trucks at the delivery site after removal of Bulk Material.

3.1.4 Rule 803: Carry-Out and Track-Out

*Purpose and Requirements***.** The purpose of Rule 803 is to reduce the amount of PM_{10} that is entrained in the ambient air as a result of Track-Out and Carry-Out[31] occurring on paved public roads. The rule requires mitigation of the deposition of Bulk Material by tracking out/carrying out onto a paved road surface by implementation of the following controls:

[30] Bulk Material is any organic and/or inorganic material consisting of or containing particulate matter with greater than or equal to 5 percent silt content, including materials such as earth, rock, silt, sediment, sand, gravel, soil, fill, aggregate, dirt, mud, or debris.

[31] Track-out/carry out refers to any Bulk Material that adhere to and agglomerate on the exterior surfaces of motor vehicles and/or equipment (including tires) that may then fall onto the pavement.

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- Any Bulk Material tracked out or carried out onto a paved road is to be cleaned up at the end of the workday (or immediately if within an urban area and Track-Out or Carry-Out extends a cumulative distance of greater than or equal to 50 feet);
- All sites with access to a paved road and with greater than or equal to 150 Average Vehicle Trips per Day[32] (AVTD) are to (i) install one or more Track-Out prevention devices and (ii) apply and maintain paving, chemical stabilization, or gravel for a distance of greater than or equal to 50 consecutive feet, at access points where unpaved roads adjoin paved roads.

3.1.5 Rule 804: Open Areas

Purpose and Requirements. The purpose of Rule 804 is to reduce the amount of PM_{10} that is emitted from non-agricultural[33] open areas, such as vacant portions of residential or commercial lots. The rule applies to any open area of greater than or equal to 0.5 acres within urban areas, or greater than or equal to 3 acres within rural areas, that contain greater than or equal to 1,000 square feet of disturbed surface area. Rule 804 requires all persons who own or otherwise have jurisdiction over an open area to prevent vehicle use in the open area by posting “No Trespassing” signs or installing physical barriers to prevent trespassing. In addition, surface stabilization is required in open areas to limit VDE to 20 percent opacity by (i) applying water or dust suppressant(s) to all unvegetated areas, (ii) establishing vegetation on all previously disturbed areas, (iii) paving, applying and maintaining gravel, or applying and maintaining chemical stabilizers/suppressants, and/or (iv) by applying alternative BACM, so long as the alternative BACM has been tested and approved by ICAPCD.

Rule Revisions. Rule 804 was revised as a result of the Settlement Agreement to include an exemption for recreational OHV use areas on public lands which are already subject to Rule 800. The 2016 revisions to Rule 804 included a fourth option for controlling dust in open areas by adding language which allows for the development and approval of new types of BACM or “alternative” BACM. This amendment was strategically proposed as a contingency measure for controlling dust on unstabilized playa exposed as the Salton Sea recedes. A more detailed explanation of the Rule 804 revisions and the Salton Sea is found in Chapter 5.

3.1.6 Rule 805: Paved and Unpaved Roads

*Purpose and Requirements***.** The purpose of Rule 805 is to reduce the amount of PM_{10} that is windblown or entrained from new or modified paved roads, from unpaved traffic areas and all non-farm[34] unpaved roads, or from road construction or road modification projects in Imperial County. The rule requirements are the following:

- For unpaved haul/access roads, unpaved traffic areas larger than 1 acre and with greater than or equal to 75 AVTD, unpaved roads with greater than or equal to 50 AVTD, and canal roads with greater than or equal to 20 AVTD, VDE must be limited to 20 percent opacity by applying at least one of the stabilization methods described below;

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[32] Or ≥20 AVTD by vehicles with three or more axles.

[33] Emissions from agricultural open areas are controlled by regulations outlined in Rule 806.

[34] Emissions from agricultural unpaved roads are controlled by regulations outlined in Rule 806.

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- Parties responsible for the use of canal roads with greater than or equal to 20 AVTD are further required to implement one of a number of additional measures that include maintenance of canal bank surfaces, conversion of open canals to pipeline, installation of remote-control delivery gates to eliminate manual gate operation by maintenance personnel in vehicles along canal banks, or lining of canals to eliminate maintenance associated with the control of silt or weed;
- Construction of new unpaved roads is prohibited within any area with a population greater than or equal to 500, except for temporary activity and if the road is stabilized to limit VDE to 20 percent opacity;
- New or modified paved roads must be constructed with curbing adjacent to the travel lanes, or with shoulders of width two to six feet (depending on the frequency of road usage) that are either paved or that meet the conditions of a stabilized surface.

Stabilization Methods. BACMs for fugitive PM_{10} dust emitted from unpaved roads include stabilization of the unpaved surfaces by (i) paving, (ii) applying chemical stabilization as directed by the product manufacturer, (iii) applying and maintaining gravel, recrushed/recycled asphalt, or other material of low silt content (less than five percent) to a depth of three or more inches, or (iv) wetting by applying water one or more times daily.

Rule Implementation. Rule 805 requires each city or county agency with primary responsibility for any existing unpaved road to provide to the ICAPCD (by March 31, 2006) a compliance plan and a compliance schedule demonstrating implementation of Rule 805 to all unpaved roads within its jurisdiction at an incremental rate of no less than 10 percent per fiscal year during the time period of 2006-2015. General compliance with Rule 805 is required past 2015. The plan identifies the control measures selected for each unpaved road segment, and report of yearly progress is to be made to the APCD by July 31 of each year through 2015.

Rule Revisions. Rule 805 was revised as a result of the Settlement Agreement to include an exemption for recreational OHV use areas on public lands which are already subject to Rule 800. Additionally, a requirement for existing unpaved public roads was edited to mandate that the portions of road being stabilized each year are new, so that all roads were to be stabilized by 2015. This was done to prevent re-stabilization of the same length of roadway multiple times. Another update in this rule added a requirement that a list of all mitigated roads be supplied to ICAPCD and that these public roads must comply with the requirements of a stabilized unpaved road, as defined in the BACM section of Rule 805.

3.1.7 Rule 806: Conservation Management Practices

*Purpose and Requirements***.** The purpose of Rule 806 (effective since January 1, 2006) is to reduce the amount of PM_{10} emitted from agricultural operations in Imperial County. The rule requires all owners or operators of Agricultural Operation Sites of greater than or equal to 40 acres to implement in each Agricultural Parcel at least one Conservation Management Practice (CMP, described below) for each of the following categories: (i) land preparation and cultivation, (ii) harvest activities, (iii) unpaved roads, (iv) unpaved traffic areas, (v) cropland-other CMPs, and (vi) windblown dust control CMPs. Owners and operators are required to prepare, for each Agricultural Operation Site, a CMP Plan that must be made available to the ICAPCD upon request within 72 hours of notice.

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Conservation Management Practices for Fugitive Dust (PM_{10}). One or more of a number of listed CMPs must be implemented to satisfy the requirements of Rule 806. Owners or operators of Agricultural Operation Sites may develop and implement alternative CMPs, provided that the achieved PM_{10} emission reductions are at least equivalent to those obtained from CMPs listed for the applicable operation. An alternative CMP must receive approval by the ICAPCD after review of its technical merit before it may be included in a CMP Plan. A subset of the allowed CMPs is reported below for each category covered by Rule 806; a comprehensive listing of the practices is available on the ICAPCD webpage.[35]

- For the control of PM_{10} emissions from land preparation and cultivation, owners or operators may implement alternate tilling, non-tillage, or chemical tillage, chemigation/fertigation, covering of crops, land fallowing, mulching, or night farming;
- For the control of PM_{10} emissions from harvesting, owners or operators may implement green chopping, hand harvesting, night harvesting, pre-harvesting soil preparation, no-burning, or equipment changes/technological improvements;
- For the control of PM_{10} emissions from unpaved roads and unpaved traffic areas, owners or operators may implement graveling, paving, restricted access, speed limits, track-out control, or wind barriers.
- For the control of PM_{10} emissions from cropland-others, owners or operators may implement alternate tilling, mulching, organic practices, reduced tilling, and other CMPs in this category.
- For the control of windblown dust, the owner or operator must minimize the time that newly tilled soil is smooth when preparing a field for planting. This should be done by leaving the field surface with larger clods until immediately before bedding and planting the field. For fields that are in between crops or permanently fallow, at least one other CMP must be implemented, and options include surface roughening, creating wind barriers, managing crop residues, and other practices.

Rule Revisions. Rule 806 was revised as a result of the Settlement Agreement to include additional specifications on how certain agricultural activities are to be conducted in order to limit fugitive dust emissions. These activities include grinding prunings and orchard removals instead of burning them, surface roughening, planting rows of vegetation perpendicular to the direction of wind to create barriers, and many more. These new CMPs were added to existing categories of PM_{10} emission sources, as well as to two new ones: those deemed as “cropland-other” and those specific to windblown dust.

3.2 Record of Control Implementation

Any person subject to the requirements of any one of the Regulation VIII rules is required to compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). The records are expected to document the type of treatment or control measure, extent of coverage, frequency of application, and date applied. Records must be kept for at least two years and be made available to ICAPCD upon request.

[35] Available at: http://www.co.imperial.ca.us/AirPollution/index.asp?fileinc=compag. Accessed: June 2018.

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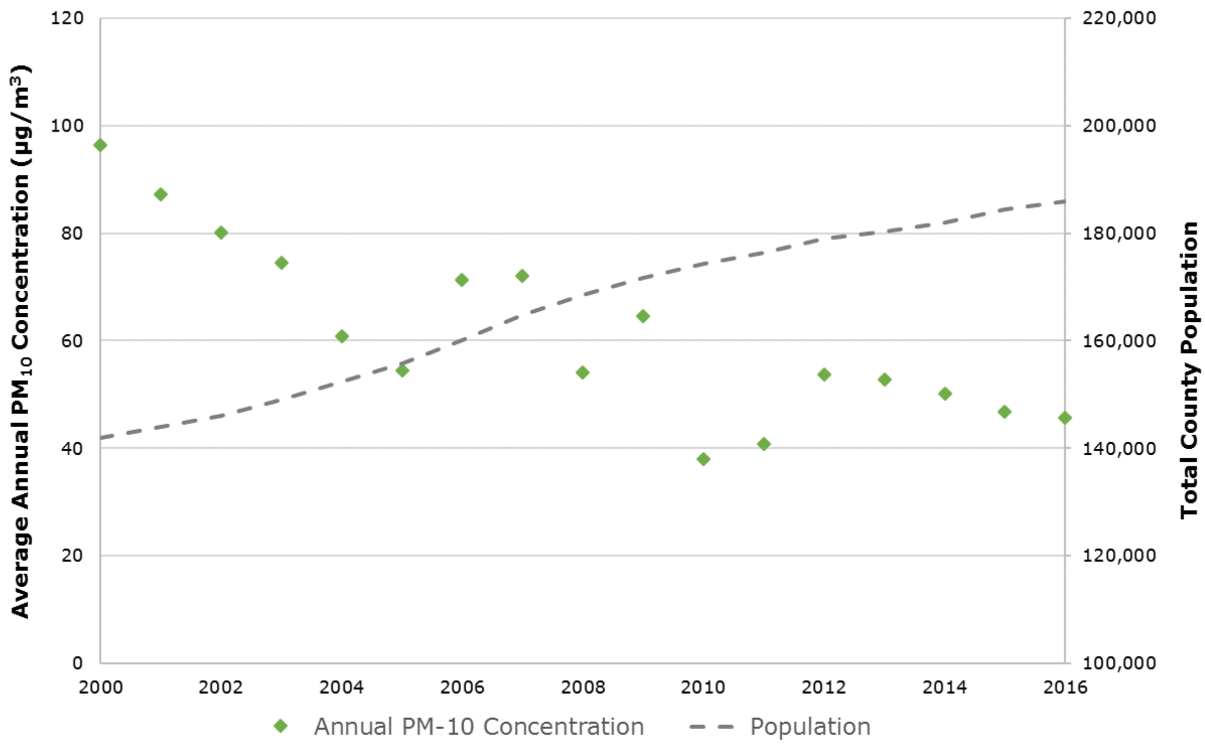
3.3 Permanent and Enforceable Emission Reductions

The USEPA eliminated an annual PM_{10} NAAQS in 2006,[36] though it is instructive to track annual PM_{10} values in order to observe trends. As shown in Figure 3-1, implementation of the Regulation VIII fugitive dust rules has led to a continual decline in annual average PM_{10} concentrations in Imperial County despite a steady increase in population.

Figure 3-1. Annual Average PM_{10} Concentration and Population in Imperial County from 2000 to 2016



The data in the above plot was provided by CARB. The annual average PM_{10} concentrations depicted in the plot represent the highest values measured at all Imperial County monitoring stations in each calendar year. Exceptional events have been excluded from the data sets.

The decrease in average annual PM_{10} concentration in Imperial County that is shown in Figure 3-1 is the result of the permanent, enforceable reductions that have been achieved due to implementation of the aforementioned rules. Since 2000, the average annual PM_{10} concentration in Imperial County, when exceptional events are excluded, has fallen from 96 $\mu g/m^3$ to 46 $\mu g/m^3$ in 2016. This represents an approximate 52 percent decrease in the general PM_{10} levels in Imperial County over that period. When exceptional events are included, the reduction is still substantial with an approximate 39 percent decrease over the 16-year period. It is technically possible for reductions of this magnitude to be attributed to other factors, such as a reduction in economic activity or unusually favorable meteorological conditions, but this is not

[36] Prior to its revocation, the annual PM_{10} NAAQS was 50 $\mu g/m^3$.

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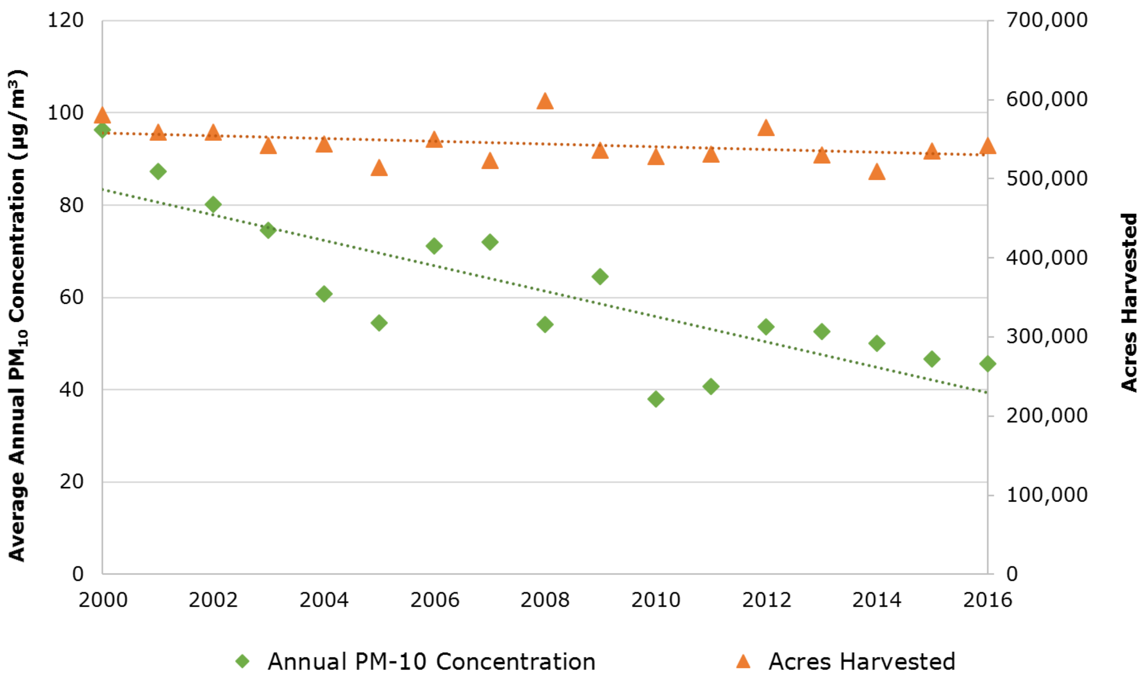
the case for Imperial County. In fact, these reductions have occurred despite a relatively small change in agricultural activity (as measured by total acres harvested), which can be used as a proxy for the local economy overall since agriculture is the largest industry in Imperial County.[37] Figure 3-2 displays the same PM_{10} concentration data shown in Figure 3-1, but also includes data from the annual Imperial County Agricultural Crop and Livestock Reports.[38]

Figure 3-2. Annual Average PM_{10} Concentration and Acres Harvested in Imperial County from 2000 to 2016



As the crop data show, the amount of agricultural activity in Imperial County has remained fairly constant since 2000. The number of acres harvested decreased by only 1.5 percent when comparing the numbers for 2016 and 2000. As a result, the relatively large decrease in average PM_{10} levels is likely attributable to other factors, such as the revisions to the Regulation VIII rules in the early 2000s and the subsequent effect on the Imperial County PM_{10} emission inventory.[39]

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[37] El Centro Chamber of Commerce and Visitors Bureau. *Community*. Available at: https://web.archive.org/web/20101103174411/http://elcentrochamber.org/the-city-of-el-centro/community/. Accessed: June 2018.

[38] Total harvested acres. Data obtained from Imperial County annual Agricultural Crop and Livestock Reports, 2000-2016. Available at http://www.co.imperial.ca.us/ag/?page=iccr. Accessed: August 2018.

[39] According to CARB's Comprehensive Emissions Projection Analysis Model (CEPAM), total Imperial County PM_{10} emissions decreased by approximately 11 percent between 2000 and 2016. CARB's CEPAM is available at: https://www.arb.ca.gov/app/emsinv/fcemssumcat/fcemssumcat2016.php. Accessed: August 2018.

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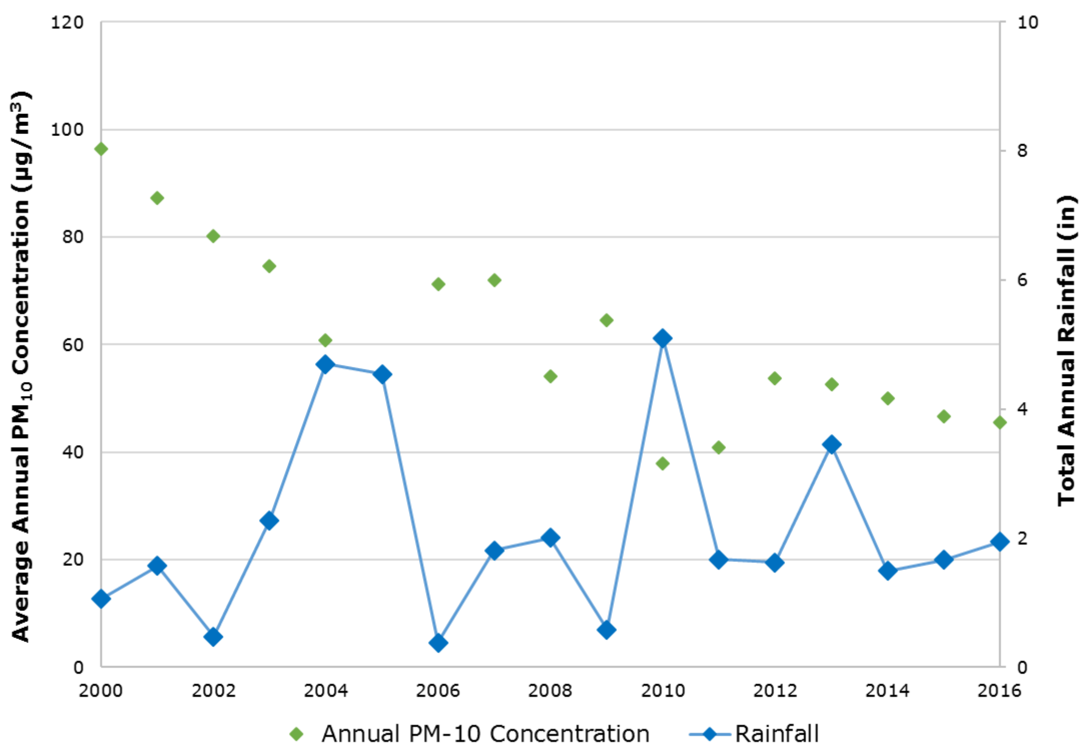
Another factor that can affect fugitive dust emissions (and as a result, ambient levels of PM_{10}) is rainfall. Outdoor surfaces with higher levels of moisture tend to emit less fugitive dust compared to drier surfaces of the same type. Thus, rain acts as a type of control for fugitive dust emissions, and enough rainfall can contribute to decreased PM_{10} levels. Figure 3-3 was created to aide in visualization of the relationship between ambient PM_{10} and precipitation. It displays the same PM_{10} concentration data shown in Figure 3-1 with annual rainfall data overlaid.[40]

Figure 3-3. Annual Average PM_{10} Concentration and Rainfall from 2000 to 2016



The data in the plot shows the average of the total rainfall in each year for all National Centers for Environmental Information Monitoring Stations in Imperial County with data available for the given year. The sharp increases in rainfall in 2004, 2005, and 2010 correlate with relative decreases in the annual average PM_{10} concentrations (excluding exceptional events), suggesting that the increased rainfall may have had an effect. However, it is important to note that while 2004 and 2005 were two of the top three rainiest years in the plotted period, they do not represent the lowest levels of ambient PM_{10}. Every year from 2010 to 2016 had the same or lower average PM_{10} concentrations (excluding exceptional events) than 2004 or 2005, despite also having lower amounts of rain. This illustrates that the observed reductions in the annual average PM_{10} concentrations in the most recent years are not attributable to favorable meteorology, but instead are the result of the permanent, enforceable reductions in PM_{10} emissions from sources where the District has focused control efforts.

[40] Data queried from the National Oceanic and Atmospheric Administration's National Centers for Environmental Information for Imperial, County. Available at: https://www.ncdc.noaa.gov/cdo-web/. Accessed: June 2018.

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3.4 Section 110 and Part D Requirements – Control Strategy and Enforcement

CAA Section 110 contains the general requirements for SIPs and Part D specifies additional requirements applicable to nonattainment areas. Both Section 110 and Part D describe the elements of a SIP and include, among other things, enforcement mechanisms, and regulations which have been adopted by the state to attain or maintain the NAAQS. In its rulemakings on the Imperial County 2009 PM_{10} SIP and the subsequent Regulation VIII rule revisions, the USEPA ultimately confirmed that PM_{10} sources previously identified as significant were controlled to BACM-level stringency through Imperial County's rulebook.[41,42] An update to Imperial County's significant source analysis shows that no new PM_{10} emission sources would qualify as significant that haven't been identified previously as such (see Appendix E for details). This finding implies that all significant sources of PM_{10} in Imperial County are currently being controlled to BACM-level stringency. Therefore, no new control measures are being proposed with this Plan.

With the submittal of this redesignation request and maintenance plan, Imperial County meets all SIP requirements applicable to the area under Section 110 and Part D, as required by CAA Section 107(d)(3)(E), and requests that approval action on these items occurs simultaneously with this redesignation request. Refer to the checklist in Chapter 6 for a summary of how all applicable requirements have been addressed.

[41] United States Environmental Protection Agency. 2010. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 75. No. 130. July 8, 2010. p. 39366.

[42] United States Environmental Protection Agency. 2013. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 78. No. 77. April 22, 2013. p. 23677.

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4 Maintenance Plan

Section 107(d)(3)(E) of the CAA specifies that for an area to be redesignated as attainment, the USEPA must approve a maintenance plan that meets the requirements of Section 175A. The purpose of the maintenance plan is to provide for the maintenance of the 24-hour PM_{10} NAAQS for at least ten years after the redesignation (not ten years after the redesignation submittal). CAA Section 107(d)(3)(D) allows the USEPA Administrator up to 18 months from receipt of a complete submittal to process a redesignation request. To accommodate the USEPA's review time, this maintenance plan covers the period of the USEPA's approval (2018 to 2020) through the following ten years and features a maintenance demonstration, commitment to a future monitoring network, verification of continued attainment, a contingency plan, and provisions for contingency plan implementation.

Section 4.0 provides the proposed Imperial County PM_{10} Maintenance Plan. Section 4.1 presents the PM_{10} emission inventories for the attainment year (2016) and the period covered by this maintenance plan (2018-2030), as well as the transportation conformity budgets, all updated to include the latest planning assumptions. The maintenance plan also provides a commitment to maintain a future PM_{10} monitoring network in the Imperial Valley Planning Area to verify continued attainment of the NAAQS (Sections 4.2 and 4.3). Finally, Section 4.4 presents a contingency plan that addresses potential future air quality issues. The Imperial Valley PM_{10} Maintenance Plan defined in Section 4.0 of this document meets the criteria specified in CAA Sections 107 and 175A and upon approval by USEPA will complete the five criteria required for granting the Imperial County's request for redesignation to attainment of the PM_{10} NAAQS.

4.1 Maintenance Demonstration

According to USEPA guidance,[43] a maintenance plan may demonstrate future maintenance of the NAAQS by either showing that future emissions will not exceed the level of the attainment inventory or by modeling to show that the future mix of sources and emissions rates will not cause a violation of the NAAQS. The District has chosen the first approach to demonstrate future maintenance of the NAAQS.

4.1.1 Emissions Inventories

The inventories supporting this Plan were developed from CARB's California Emissions Projection Analysis Model (CEPAM), Version 1.05. Appendix G provides a full overview of the emission inventory development process. Appendix H presents comprehensive emission inventories for PM_{10} (including filterable and condensable components) as well as PM_{10} precursors.

Table 4-1 presents the PM_{10} emissions inventory for Imperial County for the attainment year, 2016, which shows average total daily emissions of approximately 284.17 tons PM_{10} per day. Consistent with the 2009 PM_{10} SIP, area-wide dust sources and windblown dust are responsible

[43] United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

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for the vast majority of PM_{10} emissions in the County. Table 4-2 presents the PM_{10} emission inventory for Imperial County for the period covered by this maintenance plan, 2018 through 2030. As can be seen, the overall inventory is projected to remain fairly constant throughout the 2018-2030 maintenance period, only increasing 0.6 percent from 2016 to 2030. These modest increases are primarily due to the paved road dust, mineral processes, and construction and demolition emissions categories—sources that currently do not qualify as significant (as shown in Appendix E) and whose impact on the 24-hour PM_{10} NAAQS is generally *de minimis*.

As discussed previously, the 24-hour PM_{10} NAAQS is exceeded in Imperial County only under high wind conditions where fugitive dust from outlying desert and mountain areas becomes entrained. During these events, the temporary influx of particulate matter to the County increases 24-hour average concentrations much more than an equivalent increase of emissions of 0.6 percent. When exceptional events are excluded from the 2014-2016 design value calculation, as is provided for in the Exceptional Events Rule, the resulting design value for Imperial County, 149 μg/m^3, is approximately 3.8 percent less than the standard.[44] With this headroom, the slight increase in emissions from these sources would not be expected to cause an exceedance of the NAAQS.

[44] This is when assuming a standard value of 154.9 μg/m^3, since USEPA data handling procedures would round this value down to 150 μg/m^3, a value not above the standard.

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Table 4-1. PM_{10} Attainment Inventory for Imperial County, 2016 (tons per day)

Category[1]	2016
Electric Utilities	0.09
Manufacturing and Industrial	0.03
Food and Agricultural Processing	0.01
Service and Commercial	0.07
Food and Agriculture	0.30
Mineral Processes	3.67
Other (Industrial Processes)	0.01
Residential Fuel Combustion	0.05
Farming Operations	8.48
Construction and Demolition	3.02
Paved Road Dust	1.16
Unpaved Road Dust	51.88
Fugitive Windblown Dust	212.52
Managed Burning and Disposal	1.30
Cooking	0.08
On-road Mobile	0.43
Other Mobile	1.07
TOTAL	**284.17**

Notes:

[1] Sources with emissions less than 0.005 tons/day have been omitted from the table.

Abbreviations: BLM – Bureau of Land Management

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Table 4-2. PM_{10} Future Year Inventory for Imperial County, 2018-2030 (tons per day)

Category	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Electric Utilities	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Manufacturing and Industrial	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Food and Agricultural Processing	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Service and Commercial	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.08	0.08
Food and Agriculture	0.31	0.32	0.32	0.33	0.33	0.34	0.34	0.35	0.35	0.36	0.36	0.37	0.37
Mineral Processes	3.95	4.08	4.22	4.35	4.48	4.61	4.75	4.89	5.03	5.17	5.32	5.47	5.62
Other (Industrial Processes)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Residential Fuel Combustion	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Farming Operations	8.37	8.31	8.25	8.22	8.20	8.17	8.14	8.11	8.09	8.06	8.03	8.00	7.98
Construction and Demolition	3.29	3.40	3.51	3.59	3.66	3.71	3.76	3.82	3.90	3.98	4.06	4.14	4.22
Paved Road Dust	1.27	1.24	1.28	1.30	1.38	1.35	1.39	1.43	1.40	1.42	1.45	1.47	1.50
Unpaved Road Dust	51.85	51.84	51.83	51.82	50.22	50.21	50.20	50.20	50.19	50.18	50.18	50.17	50.16
Fugitive Windblown Dust	212.51	212.50	212.50	212.49	212.49	212.48	212.48	212.47	212.47	212.46	212.46	212.45	212.45
Managed Burning and Disposal	1.27	1.26	1.25	1.24	1.23	1.23	1.22	1.22	1.21	1.20	1.20	1.19	1.19
Cooking	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10
On-road Mobile	0.44	0.43	0.44	0.44	0.46	0.45	0.46	0.48	0.47	0.48	0.49	0.50	0.51
Other Mobile	1.05	1.05	1.04	1.04	1.04	1.55	1.55	1.55	1.56	1.57	1.57	1.58	1.59
TOTAL	**284.65**	**284.77**	**284.99**	**285.19**	**283.84**	**284.44**	**284.66**	**284.88**	**285.02**	**285.24**	**285.48**	**285.71**	**285.96**

Notes:

[1] Sources with emissions less than 0.005 tons/day have been omitted from the table.

Abbreviations:

BLM – Bureau of Land Management

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As discussed previously and analyzed in Appendix A, CARB has concluded that PM_{10} precursor contributions can be considered insignificant for the purposes of this redesignation request and maintenance plan. Furthermore, as shown in Figure 4-1 and Table 4-3, emissions of main PM_{10} precursors are expected to decrease between the attainment year (2016) and the end of the maintenance period (2030). As a result, PM_{10} precursors are not expected to negatively impact maintenance of the PM_{10} NAAQS during the maintenance period.

Figure 4-1. PM_{10} Precursor Emissions for Imperial County, 2016-2030

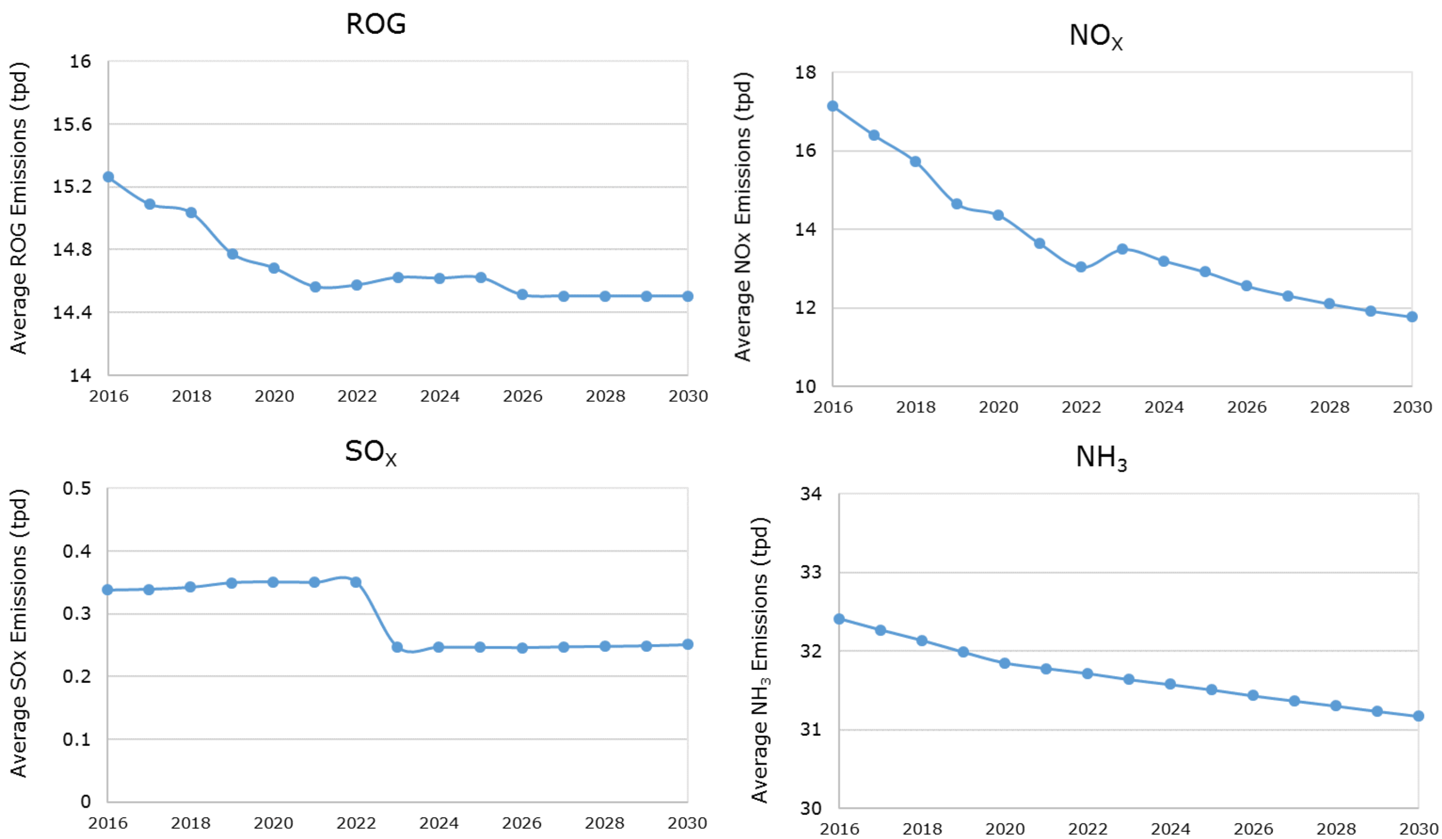

Table 4-3. PM_{10} Precursor Emission Totals for Imperial County, 2016 and 2030								
	ROG Emissions (tpd)		NO_X Emissions (tpd)		SO_X Emissions (tpd)		NH_3 Emissions (tpd)	
	2016	2030	2016	2030	2016	2030	2016	2030
	15.26	14.51	17.14	11.77	0.34	0.25	32.41	31.17
% Change from 2016 to 2030	-5.0%		-31.4%		-25.8%		-3.8%	

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4.1.2 Transportation Conformity

Section 176(c) of the CAA establishes transportation conformity requirements that are intended to ensure that transportation activities do not interfere with air quality progress.[45] The CAA requires that transportation plans, programs, and projects that obtain federal funds or approvals *conform to* applicable SIPs before being approved by a Metropolitan Planning Organization (MPO). Conformity to a SIP means that proposed activities must not:

1) Cause or contribute to any new violation of any standard,
2) Increase the frequency or severity of any existing violation of any standard in any area, or
3) Delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

A SIP analyzes the region's total emissions inventory from all sources for purposes of demonstrating RFP, attainment, or maintenance. The portion of the total emissions inventory from on-road highway and transit vehicles in these analyses becomes the "motor vehicle emissions budget." Motor vehicle emission budgets are defined in the transportation conformity regulation[46] as the "portion of the total allowable emissions defined in [a SIP] for a certain date for the purpose of meeting reasonable further progress milestones or demonstrating attainment or maintenance of the NAAQS…[that is] allocated to highway and transit vehicle use and emissions." For conformity purposes, the motor vehicle emissions budget for PM_{10} includes, in addition to vehicular exhaust, tire, and brake wear emissions, re-entrained dust from travel on paved and unpaved roads (71 FR 12498), as well as emissions from road construction if found significant (§ 93.122(e)(2)). Motor vehicle emissions budgets are the mechanism for ensuring that transportation planning activities conform to the SIP. Budgets are set for each criteria pollutant or its precursors, for all RFP base and attainment years. Subsequent transportation plans and programs produced by transportation planning agencies are required to conform to the SIP by demonstrating that the emissions from the proposed plan, program, or project do not exceed the budget levels established in the applicable SIP.

The Imperial County transportation conformity budget is derived from projected PM_{10} emissions within the Southern California Association of Governments (SCAG) Imperial County PM_{10} nonattainment area (Imperial County PM_{10} NAA). Although this area differs from the Imperial County area as shown in Figure 4-2, it captures the overwhelming majority (95%) of transportation emissions generated within Imperial County.

[45] Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T, and in 40 CFR Part 93, subpart A, Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. of the Federal Transit Laws.

[46] 40 CFR Part 93, Subpart A, §93.101—Definitions. Available at: http://law.justia.com/us/cfr/title40/40-20.0.1.1.7.1.1.2.html. Accessed: November 2016.

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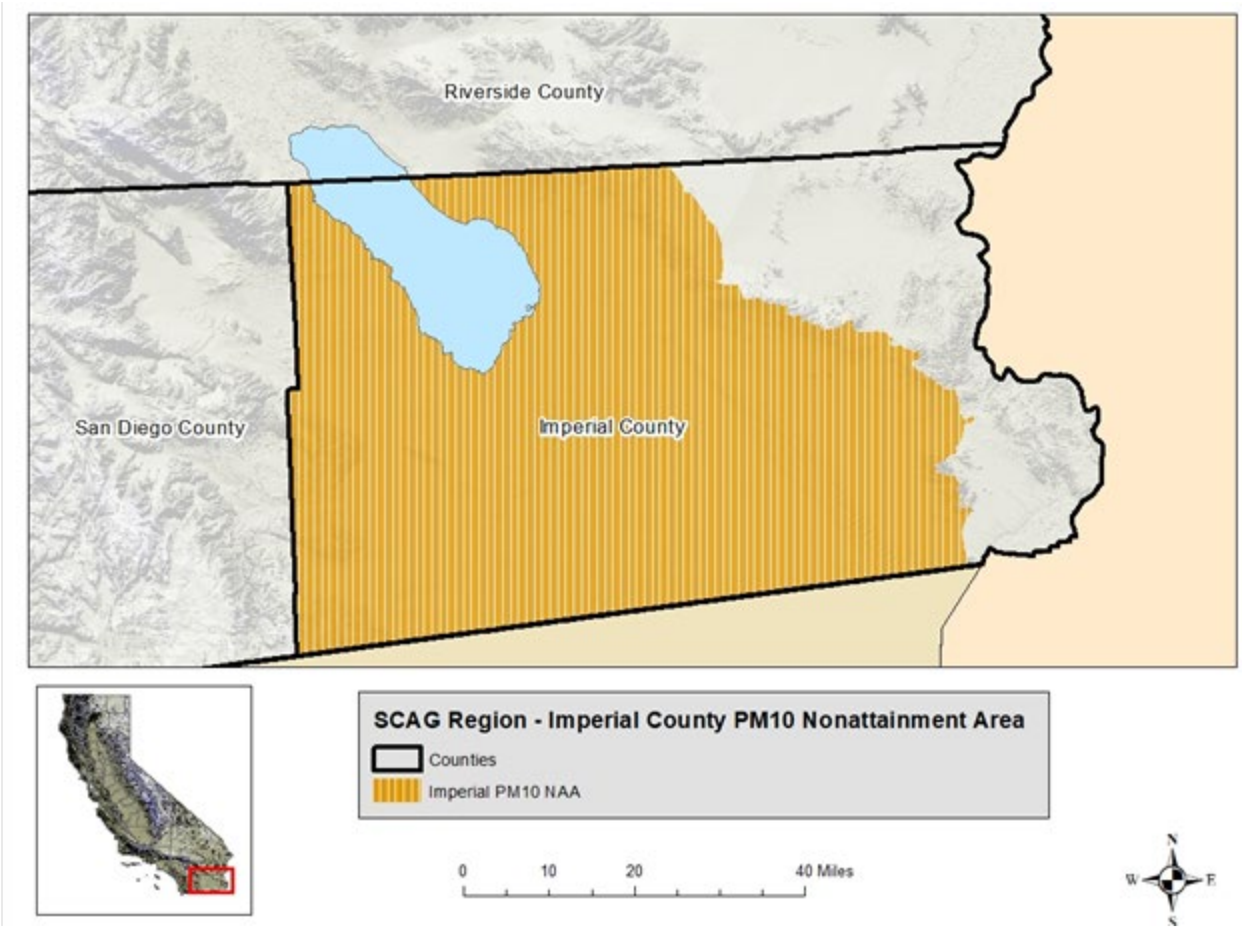
Figure 4-2. Imperial County PM_{10} Nonattainment Area as represented in SCAG Model



4.1.2.1 PM_{10} Emission Category and Precursor Requirements for Conformity

Guidance on the motor vehicle emission categories and precursors that must be considered in transportation conformity determinations is found in the transportation conformity regulation and final rules implementing amendments to the regulation.

Direct PM_{10} Emissions

Section 93.102(b)(1) of the Conformity Regulation indicates that directly emitted PM_{10} motor vehicle emissions from the tailpipe, brake wear, and tire wear must be considered in conformity determinations.

Re-Entrained Paved and Unpaved Road Dust PM_{10} Emissions

The March 10, 2006, Final Rule amending the transportation conformity regulation to establish criteria for project-level $PM_{2.5}$ and PM_{10} conformity determinations (71 FR 12498) indicates road dust must be included in regional conformity determinations: "EPA has intended for road dust emissions to be included in all conformity analyses of direct PM_{10} emissions."

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Transportation-Related Construction Dust PM_{10} Emissions

Section 93.122(f) of the Conformity Regulation requires regional conformity determinations to include fugitive dust PM_{10} emissions from highway and transit construction activities if these sources are deemed significant contributors to the PM_{10} problem.

4.1.2.2 Assessment of Significance

To facilitate the assessment of significance of sources of mobile PM_{10} dust sources, Table 4-4 lists the mobile PM_{10} dust source categories in the Imperial County PM_{10} NAA and the corresponding percent contribution when compared to the entire PM_{10} emission inventory for the region. Please see Appendix G for a detailed description of the methodology used to estimate emissions found in Table 4-4.

Re-Entrained Paved and Unpaved Road Dust PM_{10} Emissions

As indicated in Table 4-4, re-entrained paved road dust accounts for less than one percent of the region's total direct PM_{10} emissions inventory in the budget years (0.4% in 2016 and 0.5% in 2030), while unpaved road dust accounts for less than seven percent (6.5% in 2016 and 5.9% in 2030). The March 10, 2006, Final Rule amending the transportation conformity regulation to establish criteria for project-level $PM_{2.5}$ and PM_{10} conformity determinations (71 FR 12498) indicates road dust must be included in regional conformity determinations: "EPA has intended for road dust emissions to be included in all conformity analyses of direct PM_{10} emissions." Consequently, this plan makes a finding that PM_{10} emissions from transportation-related paved and unpaved road dust are significant.

Transportation-Related Construction Dust PM_{10} Emissions

As indicated in Table 4-4, road construction dust is less than one percent (0.2% in 2016 and 0.3% in 2030) of the region's total direct PM_{10} emissions inventory in the budget years. Consequently, this plan makes a finding that PM_{10} emissions from transportation-related construction dust are insignificant.

Table 4-4. Annual Average Mobile PM_{10} Dust Categories Contribution to Total PM_{10} Emissions (Tons per Annual Day)

Source Category	2016	Percent of PM_{10} Inventory[b]	Significant?	2030	Percent of PM_{10} Inventory[b]	Significant?
Vehicular Exhaust, Tire, and Brake Wear	0.4	0.2%	Yes	0.5	0.2%	Yes
Re-Entrained Paved Road Dust (Total)	1.2	0.4%	Yes	1.5	0.5%	Yes
Re-Entrained Unpaved Road Dust (City and County Roads)	18.4	6.5%	Yes	16.8	5.9%	Yes
Road Construction Dust	0.6	0.2%	No	0.8	0.3%	No
Total[a]	20.5	NA	NA	19.6	NA	NA

[a] Values from CEPAM v1.05 may not add up due to rounding.
[b] Total PM_{10} emissions in the Imperial County PM_{10} NAA are 284.2 tons per annual day in 2016 and 286.0 tons per annual day in 2030.
Source: CEPAM 1.05 and EMFAC2014

The projected PM_{10} transportation emission inventory for the 2030 horizon year reveals that PM_{10} emissions from road construction; vehicular exhaust, tire wear, and brake wear; and re-entrained paved road dust emissions are projected to increase steadily at a slow rate relative to

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2016 year, while re-entrained unpaved road dust emissions are projected to decrease and then remain constant. The Imperial County motor vehicle emissions budgets (i.e., the transportation conformity budgets) reported in Table 4-5 were chosen here to be equal to the projected levels of emissions from the contributing source categories.

4.1.2.3 PM_{10} Conformity Budgets

Conformity budgets must be set for the attainment year for each NAAQS as well as the last year of the maintenance plan. The year 2016 represents a year in attainment and 2030 is the last year of the maintenance plan. The transportation conformity budgets developed for this plan include more recent travel activity projections provided by the SCAG. This travel activity is consistent with SCAG's Final 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS).

Average daily emissions are used in the plan consistent with how the PM_{10} standard is measured. Consequently, conformity budgets were calculated in EMFAC2014 using annual average daily emissions for the analysis years listed above. Please see Appendix G for a detailed description of the methodology used to estimate emissions found in Table 4-5.

The transportation conformity budgets in Table 4-5, which were established in consultation with SCAG, the Federal Highway Administration, ICAPCD, CARB, and USEPA satisfy the requirements established in 40 CFR Part 93, Section 118(e)(4). The budgets apply as a "ceiling" or limit on transportation emissions in Imperial County in the year for which they are defined and for all subsequent years until another year for which a different budget is defined (or until a SIP revision modifies the budget).

The motor vehicle emission budgets, presented in the last row in Table 4-5, have been prepared consistent with the on-road emissions inventory by rounding the values to the nearest integer using conventional rounding.

Table 4-5. Annual Average Transportation Conformity Budgets for the Imperial County PM_{10} NAA (Tons per Annual Day)

Source Category	2016	2030
Vehicular Exhaust, Tire, and Brake Wear	0.4	0.5
Re-Entrained Paved Road Dust (Total)	1.2	1.5
Re-Entrained Unpaved Road Dust (City and County Roads)	18.4	16.8
Total[a]	20.0	18.8
Motor Vehicle Emission Budget[b]	**20**	**19**

[a] Values from CEPAM v1.05 may not add up due to rounding.
[b] Motor Vehicle Emission Budgets calculated with EMFAC2014 are rounded up to the nearest tpd.
Source: CEPAM 1.05 and EMFAC2014

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4.2 Future Monitoring Network

USEPA guidance[47] states that once an area has been redesignated, the state should continue to operate an appropriate air quality monitoring network in accordance with 40 CFR Part 58 to verify the attainment status of the area. More specifically, daily PM_{10} sampling is required in the area reporting the peak PM_{10} concentration. As discussed in Section 2.2, the District and CARB presently operate SSI and BAM monitors at the Calexico-Ethel, El Centro, Brawley, Westmorland, and Niland air quality monitoring stations. The District in conjunction with CARB will assure the on-going quality of the measured data by performing the operational procedures for data collection including routine calibrations, pre-run and post-run test procedures, and routine service checks. An annual review of the District's entire air quality monitoring network is required by federal regulations to determine if the network is effectively meeting the objectives of the monitoring program. Recently, this responsibility has been taken on by CARB with their annual monitoring network report.[48] If relocation or a closure is recommended in the annual network review, reports are submitted to the USEPA to document compliance with siting criteria. The data collection procedures already in place, in conjunction with the annual review program, will ensure that future PM_{10} ambient concentrations are monitored in the Imperial Valley Planning Area. The District is committed to continue monitoring in the Imperial Valley Planning Area in accordance with 40 CFR Part 58 to verify the attainment status of the area.

4.3 Verification of Continued Attainment

USEPA guidance[49] requires the District to indicate how it will track the progress of its maintenance plan over time. Two options suggested by the guidance include 1) periodic updates to the emissions inventory and 2) periodic review of the inputs and assumptions used for the emission inventory and subsequent updates to the inventory if those inputs or assumptions have significantly changed. The emissions inventory for Imperial County is currently maintained as part of a broader statewide inventory effort led by CARB, as CARB is required to inventory sources of air pollution within California under various state and federal laws.[50] As part of this effort, CARB works with local air districts to create and maintain inventory data. Since portions of the statewide inventory are updated with varying regularity, the District is committing to the second of the two above options to verify continued attainment, that is, the District will review the inputs and assumptions used for the emission inventory on an annual basis. If the District finds that these inputs have changed significantly, the District will solicit

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47 United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

48 California Air Resources Board. 2015. Annual Monitoring Network Report for Twenty-five Districts in California. June. Available at: http://www.co.imperial.ca.us/AirPollution/Monitoring/2015%20Annual%20Network%20Plan_Volume%201.pdf. Accessed: June 2018.

49 United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

50 California Air Resources Board. 2013. Needs and Legal Requirements for the Emission Inventory. Available at: https://www.arb.ca.gov/ei/drei/maintain/legalrequirements.pdf. Accessed: June 2018.

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CARB to update the existing inventory and will evaluate the revised inventory against the inventories presented in this maintenance plan.

In addition to the verification actions listed above, the District will assess on a regular basis the PM_{10} air quality data collected from its future monitoring network. Specifically, the PM_{10} 24-hour average concentrations will be compared directly with the PM_{10} NAAQS and will be continually assessed for potential impacts by exceptional events.

4.4 Contingency Plan

CAA Section 175A(d) requires maintenance plans to identify contingency provisions to offset any unexpected increases in emissions and ensure maintenance of the NAAQS. Per the 1992 USEPA guidance[51] regarding contingency plans for areas seeking redesignation, the following are required elements for contingency:

- Clearly identified control measures;
- A schedule and procedure for adoption and implementation of the measures;
- A defined time limit by which the state must take action; and
- An established action level that triggers the contingency measures.

4.4.1 Contingency Plan Trigger

Contingency provisions are traditionally held in reserve and are implemented only if air quality deteriorates beyond a specific level. In general, exceedances or violations of the NAAQS are acceptable triggers for contingency plan implementation. Imperial County, however, often experiences exceedances of the PM_{10} NAAQS[52] caused by high wind dust events, despite the implementation of reasonable controls. To address Imperial's unique circumstances and to ensure appropriate implementation of the contingency plan, the District has developed a process for determining when the trigger for implementation of the continency plan has occurred.

Under this contingency plan trigger process, implementation of the contingency plan will be required when the number of exceedances recorded at a monitor averaged over three consecutive years, is greater than 1.05. The contingency plan trigger process, however, allows certain exceedances to be excluded from this calculation. This aspect of the process is intended to distinguish between exceedances that are not within the District's control, and therefore need not be considered in determining whether the contingency plan has been triggered, and those that are within the District's control, and therefore should be considered.

The process would exclude exceedances from the contingency plan trigger calculation in conjunction with the process for Initial Notification of Potential Exceptional Event (Initial Notification) set forth in 40 CFR 50.14(c)(2). At the conclusion of each quarter, the District will

[51] United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

[52] 40 CFR Part 50, Appendix K defines an exceedance to mean a daily value that is above the level of the 24-hour standard after rounding to the nearest 10 $\mu g/m^3$.

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have 60 days to prepare and submit to CARB a list of exceedances that occurred during the previous quarter, designating those proposed as potential exceptional event exceedances, flagging the data, and providing an initial event description in AQS. The District will also include a copy of previously submitted Initial Notification data and an update on exceedances that occurred in the previous 12 quarters that describes the status of the CARB and USEPA reviews of those events. Once submitted to CARB, CARB will have 60 days to review, during which time they may request additional readily available information from the District. Following CARB's review, CARB will forward the information to USEPA.

In addition to the Initial Notification data, for those exceedances the District believes should be excluded from the contingency plan trigger calculation, the District and/or CARB will provide additional information as an appendix summary table to the Initial Notification as follows:

Analysis/Product	**Criteria**
Hourly and 24-hour average PM_{10} concentrations from following areas: - Imperial County - Coachella Valley - Yuma	Exceedances at multiple monitors in the specified areas (i.e. >2 exceedances/day)
NOAA LCD hourly observation tables - Imperial Co Airport - El Centro NAF - Upwind sites	Wind speed $\geq$ 25 mph consistent w/ increase in hourly PM_{10}
NOAA LCD hourly observation tables - Imperial Co Airport - El Centro NAF - Upwind sites	Reduced visibility < 10 miles consistent w/ increase in hourly PM_{10}
NWS wind/dust advisories or warnings for following areas: - Imperial County - San Diego Mountains - San Diego Deserts - Coachella Valley - Yuma	Issuance of advisory or warning in the specified forecast areas consistent w/ increase in hourly PM_{10}
Summaries of dust complaints and/or notice of violations	No dust complaints are received, or dust complaints do not involve anthropogenic source(s) located upwind of an exceeding monitor.

If any of these five criteria are not met, or if other available data contradict the assessment, the District and/or CARB will include additional information and analysis in the appendix to the quarterly report to support exclusion of the data from determinations of whether the contingency plan has been triggered. The District will confer with USEPA to determine the type of

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information needed to determine the cause of the exceedance prior to submittal of the quarterly report. This additional information might include:

- a detailed analysis of upwind wind speed and direction;
- PM_{10} and/or $PM_{2.5}$ concentrations from non-regulatory monitors in the area;
- HYSPLIT back-trajectory analysis;
- satellite image or remote sensing analysis;
- an evaluation of upwind source area (including further evaluation of dust complaints/NOVs or known contributing anthropogenic sources);
- PM speciation or $PM_{10}/PM_{2.5}$ ratio analysis; and/or
- other event specific analysis needed to appropriately determine cause of exceedance.

USEPA will review the quarterly reports submitted by CARB and the District. USEPA will notify the District if submitted documentation is insufficient to support exclusion from the contingency plan trigger calculation, and will include such exceedances in calculating the trigger for the contingency plan. If the contingency plan is triggered, the District will begin implementation as described in the next section. If the District and/or CARB subsequently provide additional information to USEPA such that the criteria for exclusion from the contingency plan trigger calculation are satisfied, USEPA will notify the District that the contingency plan trigger will be adjusted. If the resulting value is less than 1.05, implementation of the contingency plan can be halted unless triggered in a subsequent quarter. Figure 4-3 provides a visual depiction of the timeline of events for this proposed process.

4.4.2 Contingency Provisions

If USEPA determines that contingency provisions have been triggered in Imperial County, the District would have 18 months from the USEPA notification date to evaluate the cause of the exceedance and to take the appropriate action. This process would consist of first analyzing the exceedances that caused the violation to determine its possible causes. Based on the potential sources causing the increase in ambient PM_{10}, certain measures would be examined to determine if there exist emission reductions not already used for demonstrating maintenance.

To initiate this process, ICAPCD will first consult with community and local industry members to determine if any voluntary or incentive-based control measures could be implemented to achieve reductions in PM_{10} emissions. If these measures do not adequately address the causes of the exceedances, then the District will look to its collection of fugitive dust rules (ICAPCD Rules 800-806 or collectively, Regulation VIII), or other rules, as appropriate, for measures that can be improved or expanded to achieve additional PM_{10} emissions reductions. For example, if it were determined that non-exceptional event exceedances could be attributed to windblown dust (a known significant source of PM_{10} in the Imperial Valley Planning Area), then a contingency control measure based on revisions to Rule 804 (Open Areas) could be implemented. Table 4-6 includes a summary of potential sources that could contribute to exceedances and the ICAPCD rules that would be explored as options for control through improvement or expansion of applicability. The examples provided are specific to sources of fugitive dust, as it accounts for the majority of PM_{10} emissions in Imperial County.

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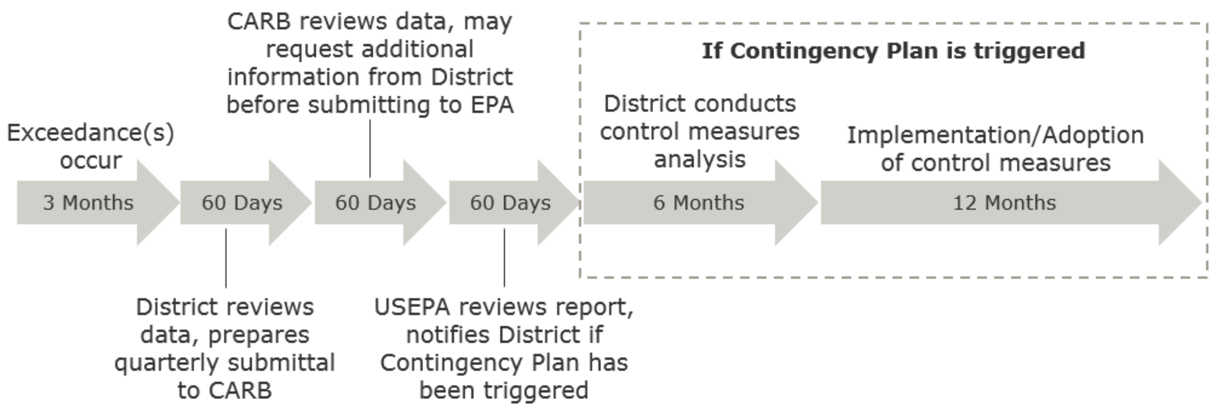
Table 4-6. Example Emission Sources and Corresponding Rules to Improve/Expand Applicability for Additional Control

Emission Source	ICAPCD Rule
Construction and Earthmoving Activities	801
Bulk Materials	802
Carry-out and Track-out	803
Open Areas	804
Paved and Unpaved Roads	805
Agricultural Operations	806

The District will aim to complete its analysis of the exceedances and available contingency measures within six months of USEPA's notification that contingency was triggered. This will then be followed by a 12-month period during which the contingency measures will be adopted and implemented. Figure 4-3 displays this timeline, including the events leading up to implementation.

Figure 4-3. Timeline of Events Leading to Implementation of Contingency Measures



4.4.3 Contingency Plan Implementation

The District is committed to maintaining its regular review of the ambient PM_{10} monitoring data to assess continued maintenance of the 24-hour standard. If the Contingency Plan Trigger is reached (i.e., a potential violation of the 24-hour PM_{10} NAAQS, consistent with 40 CFR Part 50 Appendix K, Section 2.3(c) following an initial review of exceedances through the Initial Notification of an Exceptional Event Process described above), the District commits to initiating the contingency provisions described above, including identifying measures, either through expanding existing rules or utilizing measures from outside the rulebook to achieve the necessary reductions within 18 months of USEPA's notification. Consistent with CAA Section 175A(b), the District also commits to submitting a second maintenance plan eight years after formal redesignation by USEPA to show maintenance for at least the next 10-year period.

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5 Salton Sea Considerations

Located in the northwest corner of Imperial County, the Salton Sea lies in the bed of an ancient lake that has been repeatedly desiccated and reformed by flooding within the Lower Colorado Basin. The current Sea was formed by a break in the bank of a canal carrying water from the Colorado River to the Imperial Valley in 1905. The water level of the Sea has been sustained since then by agricultural drainage waters flowing from lands under cultivation in the Coachella and Imperial Valleys. In 2002, a water transfer agreement was executed by the Imperial Irrigation District (IID), the Coachella Valley Water District (CVWD), and urban water agencies in Southern California that arranges for the transfer of agricultural water to urban areas for domestic use. This and related agreements, collectively referred to as the Quantification Settlement Agreement (QSA), will significantly reduce drainage flows to the Salton Sea after 2017, the year until which IID must maintain existing salinity levels in the Sea by supplying mitigation water.

The Salton Sea will continue to shrink, especially as drainage flows from local agricultural use are significantly reduced in 2017 and beyond. Stabilizing the parts of the playa expected to be emissive as they are exposed will minimize dust. The State's Salton Sea Management Program (SSMP) and Phase I Plan and IID's Salton Sea Air Quality Management Program (SS AQM Program) are designed to proactively provide reasonable controls as the playa is exposed. 2016 Amendments to ICAPCD Rule 804 allow establishment of alternate BACM on exposed playa that is not stabilized; this provides an adopted contingency mechanism for any emissive playa that is not stabilized as it is exposed.

An increase in salinity levels in the Salton Sea threatens both fish and waterfowl habitat values. Under legislation enacted in 2003, the Secretary of Resources in consultation with the Department of Water Resources, appropriate air agencies, and other relevant agencies was required to undertake a restoration study to determine a preferred alternative for the restoration of the Salton Sea ecosystem and the permanent protection of wildlife dependent on that ecosystem. In June 2007, a final Programmatic Environmental Impact Report[53] that analyzed each of eight alternative restoration options was certified and a preferred alternative was recommended to the state legislature. Under all of the alternatives studied, a portion of the Sea bed would be exposed. These exposed areas could become sources of windblown dust, depending on the granularity of the exposed soils and the behavior of salt crystals on the soil surface.

The control of windblown dust from exposed sea bed or playa has benefitted dramatically from control efforts tested in a similar environment at Owens Lake, California. Owens Lake was completely desiccated in the 1920s by the diversion of all incoming flows to an aqueduct

[53] California Department of Water Resources, *et. al*. 2007. Salton Sea Ecosystem Restoration Program. Final Programmatic Environmental Impact Report. Available at: https://www.water.ca.gov/Programs/Integrated-Regional-Water-Management/Salton-Sea-Unit. Accessed: June 2018.

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constructed by the Los Angeles Department of Water and Power. Due to the highest PM_{10} concentrations recorded in the United States from windblown dust, the Owens Lake region has been subject to federal CAA nonattainment planning requirements since 1991. Under the most recently approved PM_{10} attainment plan, almost 45 square miles of lakebed surface are being treated with gravel cover, shallow flooding, and managed vegetation BACM. The plan also calls for controls on an additional 3.62 square miles by December 31, 2017, and recognizes modifications to existing BACM, including "reduced thickness gravel", "brine shallow flooding", and "tillage with BACM backup."[54]

Differences in soil and wind conditions between Owens Lake and the Salton Sea suggest that windblown dust issues may be less of a problem at the Salton Sea than experienced at Owens Lake. Salts at Owens Lake are dominated by sodium carbonate, which tends to fracture easily into very fine particles, while sodium chloride, which is harder and less vulnerable to abrasion, constitutes the majority of the salt at the Salton Sea. Additionally, peak wind speeds and the number of hours per year with wind speeds above recognized windblown dust generation thresholds are substantially higher at Owens Lake than at the Salton Sea. On the basis of these two conditions, worse case PM_{10} windblown emission rates—and resultant ambient PM_{10} concentrations—are expected to be lower at the Salton Sea than are recorded at Owens Lake.

Several state statutes and water use permits provide significant authority to ICAPCD and CARB to control windblown PM_{10} emissions from the Salton Sea. Section 2081.7 of the California Fish and Game Code makes the state Department of Water Resources responsible for any environmental impacts related to the use or transfer of water from the Imperial Valley to out-of-basin users that would cause declines in Salton Sea levels or increases in salinity. The California State Water Resources Control Board permit that authorizes transfer of agricultural water to urban water districts[55] requires IID to comply with all PM_{10} ICAPCD rules, including Rule 804. This rule requires the owner of undeveloped property[56] to use BACM to maintain stabilized soil surfaces and to prevent the emission of visible dust in concentrations greater than those which produce 20 percent or more opacity. Rule 804 was recently amended to accommodate the changing conditions at the Salton Sea. Details regarding the changes are provided in Section 5.3.

In May 2015, Governor Brown of California established the Salton Sea Task Force with the objective of preserving two aspects of the environment that are affected by the water levels of the Sea: the area's ecosystem and its air quality. This is made possible by managing the various sources of water inflow to the Sea in order to maintain its salinity and area of exposed playa, both of which are most heavily influenced by changes in the Sea's volume. The Salton

[54] Ramboll Environ. 2016. Great Basin Unified Air Pollution Control District 2016 Owens Valley Planning Area PM_{10} State Implementation Plan. April. Available at: https://www.gbuapcd.org/District/AirQualityPlans/OwensValley/. Accessed: June 2018.

[55] Order WRO 2002-0013, In the Matter of Imperial Irrigation District's (IID) and San Diego County Water Authority's (SDCWA) Amended Joint Petition for Approval of a Long-Term Transfer of Conserved Water From IID to SDCWA and To Change The Point of Diversion, Place of Use, and Purpose of Use Under Permit 7643 Issued on Application 7482 of IID, State Water Resources Control Board, December 20, 2002.

[56] 0.5 acres or more in urban areas or 3.0 acres or more in rural areas, and contains at least 1000 square feet of disturbed surface areas.

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Sea Task Force has committed to developing a plan that consists of clearly defined and measurable goals. Its main short-term goal is to create between 9,000 and 12,000 acres of habitat and dust suppression projects. Later on, the medium-term plan is to expand these projects to cover an area of 18,000 to 25,000 acres. Achieving these goals will require effort from various regulatory agencies and other groups. At the initiation of the task force, Governor Brown appointed members to it from the Natural Resources Agency, the California Environmental Protection Agency, the State Water Resources Control Board, CARB, and the California Energy Commission. Additional oversight from the Colorado River Regional Water Board, ICAPCD, and South Coast Air Quality Management District (SCAQMD) will be provided alongside the work from these groups in order to monitor and assess progress and ensure that the goals are met in a timely manner.

The objectives of the Salton Sea Task Force will be implemented through the Salton Sea Management Program (SSMP). Moving forward the SSMP, in March 2017 the task force released a draft technical memorandum titled, "Phase I: Ten-Year Plan". This document outlines the first 10-year phase of the SSMP and also addresses the development of additional management measures that will be implemented in later phases. In November 2017, certain provisions of the Phase I Plan, specifically the acreages to be controlled on an annual basis, were incorporated into water order WRO 2002-0013.[57] Additional details regarding the Phase I Plan are provided in Section 5.1.

Representatives from ICAPCD serve on the Air Quality Committee of the SSMP and with fellow committee members are tasked with coordinating with agencies and existing mitigation programs to develop a comprehensive air quality program for the SSMP. One such existing mitigation program is the IID's Salton Sea Air Quality Mitigation Program (SS AQM Program). In July 2016, IID released a document outlining the SS AQM Program and IID's approach to addressing air quality mitigation requirements associated with the QSA.[58] Details regarding the SS AQM Program are provided in Section 5.2.

The requirements to control PM_{10} emissions from exposed playa surfaces incorporated into state law and water transfer permits will mitigate potential impacts on air quality from implementation of the QSA.

5.1 Salton Sea Management Program - Phase I: 10 Year Plan

In March 2017, the State of California (through the Salton Sea Task Force) published a draft of a document entitled "Phase 1: 10 Year Plan" (provided as Appendix I). This technical memorandum outlines the first phase of the SSMP and serves as a guide for state and federal actions towards developing projects designed to minimize environmental and human health impacts resulting from water level reductions at the Salton Sea. A major component of this plan is to expedite both the construction of wildlife habitats and the suppression of fugitive dust at the Sea, specifically at areas where playa is exposed or will be exposed in the near future due to

[57] One can find additional information about these revisions here: http://www.waterboards.ca.gov/waterrights/water_issues/programs/salton_sea/. Accessed: June 2018.

[58] Formation Environmental, LLC. *et al*. 2016. Salton Sea Air Quality Mitigation Program. Prepared for Imperial Irrigation District. July. Available at: http://www.iid.com/Home/ShowDocument?id=11827. Accessed: June 2018.

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decreasing water levels. The 10 year plan lays out specific goals for the acreage of playa to be covered by these types of projects annually between 2019 and 2029. The locations for habitat development projects will be selected based on landscape characteristics, such as water and soil availability, compatibility within the overall habitat already present, and degree of soil emissivity. The locations for dust suppression projects will be determined in coordination with the Imperial Irrigation District's SS AQM Program, as well as ICAPCD, CARB, and SCAQMD. Collaborative efforts among these groups will ensure that the projects implemented to achieve the acreage goals are compatible with the interests of all parties involved and feasible within established budgets. The projects will be conducted through the existing Water Transfer Joint Powers Authority budget process.

For areas deemed amenable to dust suppression projects, the SSMP will include an air quality component modeled after the SS AQM Program, focusing on the portions of it that deal with researching and monitoring at the Sea to determine particular dust suppression needs in order to identify and implement potential solutions for them. The current vision for the SSMP includes both water-dependent and waterless methods for dust suppression, though continuous monitoring and evaluation will take place to determine which techniques to use for specific areas. The Phase I Plan includes a breakdown of cost estimates to go along with the acreage goals for the dust suppression and habitat development projects. Overall, construction is proposed to cover 29,800 of the 48,300 acres of newly exposed playa by 2029. For Phase I, the projects will be implemented in areas on the north and south ends of the lake, with efforts to focus on exposed playa that have demonstrated emissivity. The estimated cost of these Phase I projects is $303 million.

5.2 Salton Sea Air Quality Mitigation Program

In order to determine if and when new control measures at the Salton Sea should be implemented, conditions there must be monitored. Based on these observations, an effective dust control strategy can be developed to address the specific emission source areas. With this approach in mind, IID created the SS AQM Program, the most comprehensive Salton Sea air quality mitigation program established to date (provided as Appendix J). As mentioned previously, as part of the Salton Sea Task Force the SSMP and the Air Quality Committee are tasked with integrating existing mitigation programs into an overarching air quality program for the Salton Sea. Therefore, this program is relevant to the future of air quality in Imperial County.

The SS AQM Program contains three distinct components which identify, prioritize, and guide implementation of various dust control measures for use on the exposed playa at the Salton Sea. The first component consists of an annual PM_{10} Emissions Inventory and Monitoring Program, which includes goals of mapping the current and projected exposed playa, monitoring its surface characteristics, and measuring its emission potential. Accomplishing these goals each year leads to the report of the annual inventory monitoring results. This information is then used to prioritize the playa dust source areas for control. From this, the second major component of the program can be executed: the dust control strategy. This includes developing and testing different dust control measures which have been tailored to the specific climate and soil conditions at the Salton Sea. These test results are then considered along with Salton Sea restoration projects, renewable energy and habitat projects, and agricultural and other land use

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projects in order to develop the Annual Proactive Dust Control Plan. These plans are completed within the first quarter of every year by IID, in collaboration with Imperial County and ICAPCD.

Finally, the third component of the SS AQM Program is the implementation of the Annual Proactive Dust Control Plan. The IID takes into account the details of the plan, along with any potential regulatory orders from ICAPCD or SCAQMD, in order to reach a final board action. Once the plan is implemented, the dust control performance is monitored and, if necessary, the measures are enhanced to achieve a more stabilized surface. The performance of the dust control measures is partially evaluated through ambient air monitoring. Since February 2010, six monitoring stations surrounding the Salton Sea have measured and recorded particulate matter concentrations in the ambient air. All six stations measure $PM_{2.5}$ and PM_{10} over five-minute and one-hour averaging periods. The data generated by these monitoring stations are used to produce the annual emissions inventories,[59] assemble dust control plans, and evaluate the performances of said plans and thus, represent an important aspect of the SS AQM Program.

It is important to note that the SS AQM Program does not alter or replace any of the Salton Sea air quality monitoring and mitigation requirements previously set forth. Rather, it expands upon them by providing additional contingency measures specific to newly exposed playa around the Sea. Those playa which are exposed as a direct result of water transfers under the QSA are subject to the air quality monitoring and mitigation requirements described within the QSA, and IID is specifically tasked with controlling the related dust. To ensure that this occurs, ICAPCD has the ability to issue regulatory orders to IID and other culpable entities if dust control measures on the Salton Sea playa are inadequate. On top of this, all other federal, state, and local rules and regulations pertaining to air quality still apply. Included among these is the previously mentioned Rule 804. This rule involves the control of fugitive dust sources from disturbed open areas, which by definition, includes emissive Salton Sea playa.

5.3 2016 Rule 804 Amendments

Rule 804 requires the owner of undeveloped property[60] to use BACM to maintain stabilized soil surfaces and to prevent the emission of visible dust in concentrations greater than those which produce 20 percent or more opacity. Recognizing the possibility that previously established BACM might not be efficient or effective at controlling dust on future exposed playa at the Salton Sea, ICAPCD proposed a strategic amendment to Rule 804, which became effective on April 12, 2016. Prior to the amendment, Rule 804 limited the available BACM to the following controls: apply water or dust suppressants to all unvegetated areas; establish vegetation on all previously disturbed areas; and pave, apply, and maintain gravel or chemical stabilizers or suppressants.[6] The amendment added language to allow for "Alternative BACM" to be permissible. In order for Alternative BACM to be approved, the amendment stipulates that a technical evaluation must be submitted to ICAPCD and an ICAPCD-witnessed field test must take place and demonstrate that the proposed Alternative BACM achieves PM_{10} emission reductions equivalent to the previously established BACM. In addition, the Alternative BACM

[59] The results from the 2016/2017 monitoring year are available online at: https://www.iid.com/water/library/qsa-water-transfer/mitigation-implementation/air-quality-mitigation. Accessed: June 2018.

[60] 0.5 acres or more in urban areas or 3.0 acres or more in rural areas, and contains at least 1000 square feet of disturbed surface areas.

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must achieve the stabilized surface and opacity requirements of the rule.[61] Once these conditions have been met, an Alternative BACM can be approved and used for Rule 804 compliance. This amendment allows for the testing and potential use of “new” dust control measures which might be better suited than the current BACM for addressing the changing conditions at the Salton Sea. In this sense, the amendment to Rule 804 is a proactive contingency measure.

[61] Imperial County Air Pollution Control District. 2016. Rule 804: Open Areas. Revised April 12, 2016. Available at: http://www.arb.ca.gov/DRDB/IMP/CURHTML/R804.PDF. Accessed: June 2018.

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6 Redesignation Request and Summary Checklist

The District is requesting redesignation of the Imperial Valley Planning Area from Serious nonattainment to attainment of the PM_{10} NAAQS under CAA Section 107(d)(3)(E) protocol.

Section 107(d)(3)(E) of the CAA requires the USEPA administrator to make five findings prior to granting a request for redesignation:

1. The USEPA has determined that the NAAQS has been attained.
2. The applicable implementation plan has been fully approved by the USEPA under Section 110(k).
3. The USEPA has determined that the improvement in air quality is due to permanent and enforceable reductions in emissions.
4. The State has met all applicable requirements for the area under Section 110 and Part D.
5. The USEPA has fully approved a maintenance plan, including a contingency plan, for the area under Section 175A.

As described in Chapter 2 of this document, PM_{10} air quality in the Imperial Valley Planning Area, excluding exceptional events, did not violate the NAAQS from 2014 through 2016. Specifically, Section 2.3 provides the confirmation that the 2014-2016 24-hour PM_{10} concentration data has attained the NAAQS. Section 1.4 characterizes the Imperial County 2009 PM_{10} SIP and subsequent Settlement Agreement with the USEPA and provides reference to the USEPA's approval of Imperial County's fugitive dust rules as BACM for significant sources. With the full execution of the provisions in the Settlement Agreement, Imperial County satisfied its requirements under CAA Section 110(k). In accordance with USEPA guidance, Imperial County requests that approval action on outstanding SIP elements occurs simultaneously with this redesignation request. Chapter 3 discusses how Imperial County's BACM fugitive dust rules have led to permanent and enforceable emissions reduction in the area. Sections 2.4 and 3.4 address the applicable requirements under CAA Section 110 and Part D and Chapter 4 presents the District's maintenance plan. Together these sections directly address and satisfy the requirements of CAA Section 107.

A checklist of requirements pertinent to this 2018 Redesignation Request and Maintenance Plan (as outlined both in CAA Section 107(d)(3)(E) and in the September 4, 1992 USEPA memorandum[62] regarding procedures for processing requests to redesignate areas to attainment) is presented in Table 6-1. In addition, because Imperial County is requesting approval action on outstanding SIP elements under CAA Section 110 and Part D as part of this redesignation request, those items have been included in Table 6-1 as well. Note that because Imperial County is shown in this document to have attained the 24-hour PM_{10} NAAQS, based on 2014-2016 monitoring data, RFP and milestone requirements are unnecessary, and specifically the five percent yearly emission reductions requirement does not apply to future years. As

[62] United States Environmental Protection Agency. 1992. Procedures for Processing Requests to Redesignate Areas to Attainment. Memorandum from John Calcagni to USEPA Regional Directors. September 4. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/calcagni_memo_-_procedures_for_processing_requests_to_redesignate_areas_to_attainment_090492.pdf. Accessed: June 2018.

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documented in Table 6-1, all remaining requirements applicable to this 2018 Redesignation Request and Maintenance Plan have been successfully addressed.

Table 6-1. Plan Checklist

Plan Components	Required Elements	Document Reference	Comments
Redesignation Request	Attainment of the NAAQS; CAA Sec. 107(d)(3)(E)(i)	Section 2.3	Pending USEPA review and approval of exceptional event documentation
	USEPA approval of State Implementation Plan; CAA Sec. 107(d)(3)(E)(ii)	Sections 2.4 and 3.4	Pending as part of this submittal; see Section 110 and Part D portion of this table.
	Air quality improvements due to permanent and enforceable emissions reductions; CAA Sec. 107(d)(3)(E)(iii)	Section 3.3	Included.
	USEPA approval of a maintenance plan and contingency plan; CAA Sec. 107(d)(3)(E)(iv)	Chapter 4	Pending as part of this submittal.
	Section 110 and Part D requirements have been met; CAA Sec. 107(d)(3)(E)(v)	Sections 2.4 and 3.4	Pending as part of this submittal; see Section 110 and Part D portion of this table.
Maintenance Plan	Attainment Inventory; CAA Sec. 175A(a) and (USEPA, 1992)	Section 4.1.1	Included; emissions inventory for attainment year (2016)
	Maintenance Demonstration; CAA Sec. 175A(a) and (USEPA, 1992)	Section 4.1	Included; future year emissions inventories (2018-2030) provided in support of maintenance demonstration.
	Future Monitoring Network, featuring daily PM_{10} monitoring; CAA Sec. 175A(a) and (USEPA, 1992)	Section 4.2	Commitment established
	Verification of Continued Attainment; CAA Sec. 175A(a) and (USEPA, 1992)	Section 4.3	Commitment established
	Contingency Plan; CAA Sec. 175A(d) and (USEPA, 1992)	Section 4.4	Included

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Table 6-1. Plan Checklist

Plan Components	Required Elements	Document Reference	Comments
Section 110 and Part D Requirements	Emissions Inventory; CAA Sec. 172(c)(3)	Section 4.1.1 and Appendix H	Included.
	A plan that enables attainment of the PM_{10} federal air quality standard; CAA Sec. 189(b)(1)(A)	Chapters 2 and 3	This plan demonstrates that Imperial County attained the PM_{10} NAAQS, based on 2014-2016 monitoring data. Attainment was due, in part, to ICAPCD's adoption and subsequent implementation of Regulation VIII fugitive dust rules, which have been declared by USEPA as BACM for significant sources of PM_{10}.
	Annual reductions in PM_{10} or PM_{10} precursor emissions that are of no less than 5 percent until attainment; CAA Sec. 189(d)	Does not apply	Imperial County is shown in this document to have already attained the PM_{10} NAAQS. Therefore, this provision is not applicable to future years.
	BACM and BACT for significant sources and major stationary sources of PM_{10}, to be implemented no later than 4 years after reclassification of the area as serious; CAA Sec. 189(b)(1)(B)	Sections 1.4.1, 1.4.2, Chapter 3, and Appendix E	Reclassification of Imperial County to Serious nonattainment for PM_{10} occurred on August 2004. ICAPCD's Regulation VIII fugitive dust rules have been declared by USEPA as BACM for significant sources. A revised significance source analysis was included in this Plan and shows that no new emission sources would qualify as significant.
	Transportation conformity and motor vehicle emission budgets in accord with the plan; CAA Sec. 176	Section 4.1.2	Included.
	RFP and quantitative milestones; CAA Sec. 172(c)(2) and Sec. 189(c)	Does not apply	These requirements are not applicable in the present plan since Imperial County is already in attainment, based on 2014-2016 monitoring data.
	Contingency measures; CAA Sec. 172(c)(9)	Section 4.4	Included.

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Appendix A
PM_{10} Precursor Analysis for Imperial County

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Appendix A. Precursor Analysis

In addition to direct emissions, particulate matter is formed when gases are transformed into particles through chemical reactions in the atmosphere. We refer to these gases as precursors. Sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOC) and ammonia (NH_3) all contribute to the formation of particulate matter. For this analysis, we evaluated their contribution to the formation of PM_{10}.

PM_{10} contains coarse particles (larger than 2.5 µm in diameter), and fine particles (2.5 µm in diameter or smaller). The fine particles ($PM_{2.5}$) consist primarily of nitrate, sulfate, and elemental and organic carbon. Coarse particles usually contain earth crustal materials and fugitive dust produced by the break-up of larger solid particles. This can include wind-blown dust from agricultural processes, uncovered soil, and unpaved roads, as well as re-entrained road dust.

For this analysis, staff considered all available PM_{10} and $PM_{2.5}$ mass and speciation data. Because PM_{10} and $PM_{2.5}$ speciation data is only recorded once every 6 days, it is important to analyze more data points to evaluate whether PM_{10} precursors play a significant role to the PM_{10} exceedances in Imperial County. In order to assure that the most data points are considered, Staff reviewed the last ten years of data, from 1/1/2007 through 12/31/2016, to identify days with matching PM_{10} mass data and PM_{10} and $PM_{2.5}$ speciation data. In order to maximize the number of days with parallel PM_{10} mass and PM_{10} and $PM_{2.5}$ speciation data, we considered days with concentrations greater than 95 percent of the PM_{10} standard (>143 µg/m^3). For days near or over the PM_{10} standard that also coincided with a PM_{10} and $PM_{2.5}$ speciation sample day, Staff identified five days with PM_{10} concentrations ranging from 144 µg/m^3 to 305 µg/m^3 (Table 1).

Table 1. High PM_{10} days between 1/1/2007 and 12/31/2016 with matching PM_{10} and $PM_{2.5}$ speciation data

	Mass (µg/m^3)		**Measured or Estimated PM_{10} Contribution (µg/m^3)**				**Estimated Precursor Contribution (µg/m^3)**			
Date	**PM_{10}**	**$PM_{2.5}$**	**NO_3**	**SO_4**	**NH_4**	**Carbon**	**NO_X**	**SO_X**	**NH_3**	**VOC**
6/5/07	282	30	2.9	4.6	2.6	14.4	3.7	4.6	5.5	7.2
10/21/07	144	15	1.1	3.2	1.5	3.8	1.4	3.2	2.6	1.9
7/18/09	147.9	25	2.1	3.7	2.0	8.2	2.7	3.7	4.1	4.1
9/4/09	265.8	27	1.9	6.5	3.0	5.5	2.5	6.5	4.9	2.8
8/13/12	305.3	23	3.8	4.4	2.8	8.6	4.9	4.4	6.6	4.3
Average	229	24	2.4	4.5	2.4	8.1	3.0	4.5	4.7	4.1
Percent Contribution of the Average Precursor Contribution to the Average PM_{10} Mass							1.3	2.0	2.1	1.8

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PM_{10} nitrate and PM_{10} sulfate in Table 1 represent measured concentrations. PM_{10} ammonium represents the calculated value based on the amount needed to fully neutralize all measured nitrate and sulfate. PM_{10} carbon data are not measured at Calexico. Since most of the PM_{10} carbon is in the fine fraction, we used $PM_{2.5}$ carbon estimate as a surrogate for the PM_{10} carbon. We estimated $PM_{2.5}$ carbon as a difference between measured $PM_{2.5}$ mass and the sum of ammonium nitrate, ammonium sulfate, geological material, and elemental species concentrations.

The paragraphs that follow examine each precursor.

Sulfur Oxides - SO_x

Since sulfate can exist in the atmosphere in the form of sulfuric acid if it's not neutralized by ammonia, the SO_x contribution is evaluated by estimating sulfate contribution to the elevated PM_{10} concentrations. On average, sulfate contributes 4.5 µg/m^3 or 2 percent of PM_{10} mass.

Nitrogen Oxides - NO_x

Since NO_x contributes directly to ammonium nitrate formation, its impact on the PM_{10} design value was evaluated by summing all measured nitrate plus ammonium needed to fully neutralize measured nitrate. On average, the two components together contribute 3 µg/m^3 or 1.3 percent to the PM_{10} mass.

Ammonia – NH3

Since in the absence of ammonia, nitrate would only exist as a gas, ammonia contribution to the elevated PM10 concentrations is represented by all measured ammonium plus all measured nitrate ion. On average, the two components together contribute 4.7 µg/m^3 or 2.1 percent to the PM_{10} mass.

Volatile Organic Compounds - VOC

There are two routes by which VOCs can contribute to ambient PM_{10}. The first is through various chemical reactions leading to the formation of Secondary Organic Aerosols (SOAs). The second is through photochemical reactions that create oxidants such as ozone and hydroxyl radicals, which in turn oxidize NO_X emissions leading to the formation of particulate ammonium nitrate. As noted above, ammonium nitrate is not a significant component of $PM_{2.5}$. Therefore, the impact of VOC emissions on the PM_{10} design value through nitrate formation is also insignificant and our analysis will be limited to the impact of VOC emissions on SOA formation. Between January 2015 and February 2016 CARB contracted with Professor Schauer's group at the University of Wisconsin, Madison (UWM), to conduct a yearlong organic molecular marker study in the San Joaquin Valley. We used these data to estimate SOA contribution to the

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measured carbon concentrations. The estimated contribution ranged from 17 percent to 45 percent depending on the site and averaging time (annual, exceedance, or winter average). In order to consider a worst-case scenario, we assumed that 50 percent of organic matter is due to SOAs. Applying this assumption to measured concentrations, we estimated that VOCs contribute 4.1 µg/m^3 or 1.8 percent of PM_{10} mass. This value represents the highest possible SOA concentration.

In order to evaluate the appropriateness of this estimate, we used the organic aerosol tracer tool located at the Western Regional Air Partnership (WRAP) Technical Support System (TSS) website (http://vista.cira.colostate.edu/tss/). This tool allows us to investigate the contribution of primary and secondary anthropogenic and biogenic sources on modeled carbon at Class I areas. Annual average biogenic and anthropogenic SOA concentrations at the Joshua Tree National Park, the closest Class I area monitor to Calexico, were estimated to be about 0.58 and 0.09 µg/m^3, respectively for the 2002-2004 baseline. Therefore, our estimate of 4.1 µg/m^3 is reasonable and conservative.

Whether a $PM_{2.5}$ precursor is significant for the 24-hour $PM_{2.5}$ standard is determined by evaluating if a precursor contributes 1.3 µg/m^3 or more to the 24-hour $PM_{2.5}$ standard of 35 µg/m^3 (or approximately 3.7%). Taking into consideration that the level of the 24-hr PM_{10} standard is much higher than the level of the $PM_{2.5}$ standard (150 µg/m^3 vs. 35 µg/m^3), the threshold level for PM_{10} is presumed to be higher than for $PM_{2.5}$. As shown in Table 1, since on average each precursor is found to contribute less than 2.1% to the PM_{10} concentrations, their contribution is considered insignificant.

We also considered whether precursor contribution would be higher for PM_{10} design values over the 229 µg/m^3 average estimated in Table 2. Figures 1 and 2 illustrate relationships between $PM_{2.5}$ and PM_{10} in Imperial Valley. It is evident from the charts that elevated $PM_{2.5}$ concentrations, in general, correspond to PM_{10} concentrations below the level of the standard. When PM_{10} levels exceed the 24-hour standard of 150 µg/m^3, $PM_{2.5}$ contributes a small percent of the PM_{10} mass. This suggests that high PM_{10} levels are driven by fugitive dust and secondary PM_{10} components are not expected to increase with PM_{10} mass increasing beyond the level of PM_{10} standard.

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Figure 1. Relationship between PM_{10} and $PM_{2.5}$ at Calexico, 2007 -2016

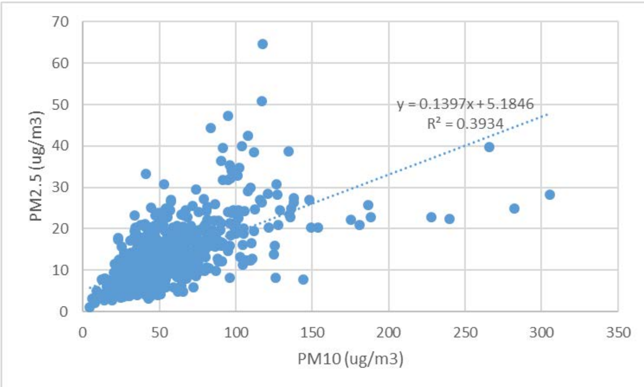
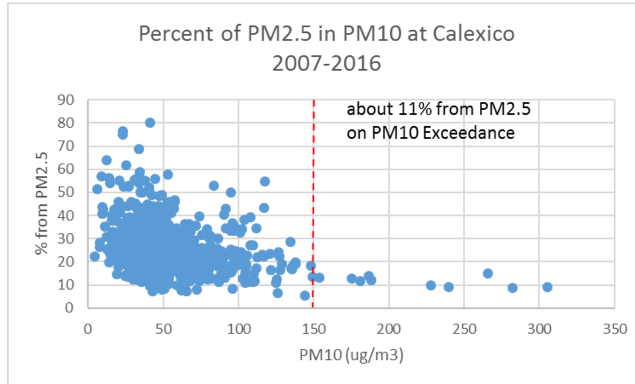


Figure 2. Percent of $PM_{2.5}$ in PM_{10} at Calexico, 2007-2016



Elevated PM_{10} concentrations in Imperial County are dominated by primary PM_{10} emissions from wind-blown dust rather than by secondarily formed PM_{10}. This precursor contribution analysis demonstrates that secondary formation is negligible compared with directly emitted PM_{10}. Reductions in emissions of PM_{10} precursors would not be effective in reducing PM_{10} concentrations and would lead to insignificant air quality changes. We conclude that precursor controls do not need to be included in the evaluation of potential control measures.

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Appendix B
Executed Settlement Agreement

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SETTLEMENT AGREEMENT

WHEREAS, on August 11, 2004, the United States Environmental Protection Agency ("EPA") reclassified the Imperial Valley Planning Area ("Imperial Valley") as a "serious" nonattainment area for coarse particulate matter ("PM10") national ambient air quality standards ("NAAQS") under the Clean Air Act, 69 Fed. Reg. 48,792 (Aug. 11, 2004), triggering the Clean Air Act requirement in 42 U.S.C. § 7513a(b)(1)(B) that the State of California submit to EPA within four years a state implementation plan containing provisions for the implementation of best available control measures ("BACM") for the control of PM10;

WHEREAS, in 2005 the Imperial County Air Pollution Control District ("Air District") adopted Rules 800 through 806 (known as "Regulation VIII") intended to limit emissions of PM10 within Imperial County;

WHEREAS, in 2006 the California Air Resources Board submitted the 2005 version of Regulation VIII to EPA as a revision to the state implementation plan;

WHEREAS, on July 8, 2010, EPA published a final rule in the Federal Register approving in part and disapproving in part the 2005 version of Regulation VIII, *see* 75 Fed. Reg. 39,366 (July 8, 2010) ("Final Rule");

WHEREAS, the Air District filed a petition for review of the Final Rule in the United States Court of Appeals for the Ninth Circuit (Case No. 10-72709);

WHEREAS, the California Department of Parks and Recreation ("Parks") filed a petition for review of the Final Rule in the United States Court of Appeals for the Ninth Circuit (Case No. 10-72729);

WHEREAS, the petitions for review were consolidated (referred to hereinafter as "the Existing Litigation");

WHEREAS, briefing on the Existing Litigation has concluded and oral argument was held on February 15, 2012;

WHEREAS, on February 17, 2012 the United States Court of Appeals for the Ninth Circuit issued an Order (Docket No. 83) that referred the Existing Litigation to mediation, vacated submission of the Existing Litigation to the Court until further order, and noted that in the event that mediation efforts fail, the panel will finalize a disposition of the Existing Litigation without further briefing or argument from the parties;

WHEREAS, the Air District, Parks (hereinafter referred to together as "Petitioners"), and EPA (collectively, "the Parties") have a mutual interest in ensuring that the Air District's Regulation VIII satisfies the Clean Air Act's requirements for best available control measures for the control of PM10 air pollution, 42 U.S.C. § 7513a(b)(1)(B);

WHEREAS, EPA's determination of whether an exceedance of the PM10 NAAQS is an "exceptional event" within the meaning of section 319 of the Act, 42 U.S.C. § 7619, and EPA's regulations at 40 C.F.R. §§50.1 and 50.14 requires that EPA consider, among other criteria, whether the exceedance was "reasonably controllable or preventable" and EPA's consideration of this factor, evaluates, among other criteria, whether "reasonably available reasonable and appropriate measures" are in place to control anthropogenic PM10 sources and to abate or minimize the exposure of the public associated with the exceptional event (hereinafter referred to as "reasonable control");

WHEREAS, the Air District intends to prepare and transmit to the California Air Resources Board for submittal to EPA a revision to the state implementation plan as required by Clean Air Act section 189(d), 42 U.S.C. § 7513a(d);

WHEREAS, in order to avoid the uncertainty, delay, and costs associated with continued litigation, the Air District, Parks, and EPA wish to implement this Settlement Agreement;

NOW THEREFORE, the Parties agree as follows:

1. The parties to this Settlement Agreement ("Agreement") are the Petitioners and EPA. Nothing in this Agreement shall be construed to make any other person or entity not executing this Agreement a third-party beneficiary to this Agreement.

2. This Agreement applies to, is binding upon, and inures to the benefit of the Petitioners (and their successors, assigns, and designees) and EPA.

3. This Agreement shall not constitute an admission or evidence of any fact, wrongdoing, misconduct, or liability on the part of the Parties, their officers, or any person affiliated with them.

4. Within fourteen days (14) after this Agreement is finalized pursuant to Paragraph 22 of this Agreement, the Parties shall file a motion and proposed order (attached hereto as Attachment A) in the Ninth Circuit Court of Appeals requesting that the case continue to be withheld from submission to the panel pending completion of, and subject to, the terms of this Agreement.

5. Any deadline stated herein that falls on a Saturday, a Sunday, or a legal holiday shall be extended to the next day which is not one of the aforementioned days.

6. Within 90 days after this Agreement is executed by all Parties, but before finalization pursuant to Paragraph 22 of this Agreement, the Air District shall submit to its Governing Board revisions to the Regulation VIII rules that are substantially the same in substance as set forth in Attachment B to this Agreement, and supporting documentation (including off-highway vehicle BACM demonstration).

7. Within fourteen (14) days of the Governing Board's adoption of the revised Regulation VIII rules, the Air District shall submit the revised Regulation VIII rules and supporting documentation (including off-highway vehicle BACM demonstration) to the California Air Resources Board and request expedited submittal to EPA for incorporation into the California state implementation plan.

8. Within sixty (60) days of the California Air Resources Board's submittal of the revised Regulation VIII rules and supporting documentation (including off-highway vehicle BACM demonstration) to EPA as a revision to the California state implementation plan, the EPA Region 9 Regional Administrator will sign for publication in the Federal Register a notice of proposed rulemaking that proposes taking action on the submittal pursuant to Clean Air Act section 110(k), 42 U.S.C. § 7410(k). If the rules are substantially the same in substance as set forth in Attachment B to this Agreement, the notice to be signed by the Regional Administrator shall propose full approval of the submittal pursuant to Clean Air Act sections 110(k) and 189(b)(1)(B), 42 U.S.C. §§ 7410(k), 7513a(b)(1)(B). EPA shall include in the notice of proposed rulemaking a statement that EPA's preliminary view is that the revised Regulation VIII rules constitute "reasonable control" of the sources covered by Regulation VIII for the purpose of evaluating whether an exceedance of the PM10 NAAQS is an "exceptional event" including reasonable and appropriate control measures on significant contributing anthropogenic sources. This statement does not extend to exceedances of NAAQS other than the PM10 NAAQS, or to events that differ significantly in terms of meteorology, sources, or conditions from the events that are at issue in the Existing Litigation. Once signed, EPA shall promptly deliver the notice of proposed rulemaking to the Office of Federal Register for review and publication.

9. If the Regional Administrator proposes full approval of the submittal referenced in Paragraph 8, then concurrently with signature of the notice in Paragraph 8, the Regional Administrator shall sign for publication in the Federal Register a notice making an interim final determination to defer imposition of sanctions pursuant to the Administrative Procedure Act, 5 U.S.C. § 553(d)(1). However, as is standard for such determinations, EPA may lift the deferral of sanctions if EPA receives significant and substantive public comments that change its assessment described in the determination and the proposed approval of the revised Regulation VIII rules.

10. Within sixty (60) days of the close of public comment on EPA's proposed rule referenced in Paragraph 8 of this Agreement, the EPA Region 9 Regional Administrator will sign for publication in the Federal Register a notice of final rulemaking taking action pursuant to Clean Air Act section 110(k), 42 U.S.C. § 7410(k). Once signed, EPA shall promptly deliver the notice of final rulemaking to the Office of Federal Register for review and publication.

11. Within ninety (90) days after publication in the Federal Register of EPA's notice of final rulemaking on a section 189(d) plan for the Imperial Valley PM10 serious nonattainment area, the Petitioners shall act to terminate the Existing Litigation by filing motions to dismiss their petitions with prejudice pursuant to Fed. R. App. Pro. 42, with each party to bear its own costs and attorneys' fees.

12. If EPA does not comply with any requirement of Paragraphs 8 through 10 of this Agreement, or if the final action required by Paragraph 10 does not finalize approval of the revised Regulation VIII rules, then the Air District and Parks may at their election, move to request that the Ninth Circuit Court of Appeals submit the Existing Litigation to the panel and proceed to a decision on the Existing Litigation. The Parties agree that this Paragraph 12

constitutes the Petitioners' sole remedy under this Agreement if EPA does not comply with any requirement of Paragraphs 8 through 10.

13. If EPA takes any final action to require the State of California, on behalf of the Air District, to submit any plan required under Clean Air Act section 189(d), 42 U.S.C. § 7513a(d), prior to the dismissal described in Paragraph 11 of this Agreement, then the Air District may at its election, move to request that the Ninth Circuit Court of Appeals submit the Existing Litigation to the panel and proceed to a decision on the Existing Litigation. The Parties agree that this Paragraph 13 constitutes the Petitioners' sole remedy under this Agreement if EPA takes any final action to require a section 189(d) plan from the State of California on behalf of Imperial County.

14. If the California Air Resources Board does not submit the revised Regulation VIII rule submission to EPA within sixty (60) days after receiving it, then any of the Parties may at their election move to request that the Ninth Circuit Court of Appeals submit the Existing Litigation to the panel and proceed to a decision on the Existing Litigation.

15. In any event, no later than four years after the implementation date(s) within Imperial County for the revised Regulation VIII rules, the Petitioners shall act to terminate the Existing Litigation by filing motions to dismiss their petitions with prejudice pursuant to Fed. R. App. Pro. 42, with each party to bear its own costs and attorneys' fees.

16. This Agreement constitutes a full and final resolution of all matters related to the Existing Litigation, subject to the rights of the Parties to terminate this Agreement as referenced herein. Petitioners agree to release, discharge, and covenant not to assert (by way of the commencement of an action, the joinder of EPA in an existing action or in any other fashion) any and all claims, causes of action, suits or demands of any kind whatsoever in law or equity which

they may have had, or may now or hereafter have, against the United States based upon matters related to the Existing Litigation.

17. If EPA's final action taken pursuant to Paragraph 10 of this Agreement is full approval, then Petitioners shall not bring a legal challenge to such action. Nothing in this Agreement shall preclude Petitioners from bringing a legal challenge to a final action taken pursuant to Paragraph 10 of this Agreement, other than full approval.

18. Nothing in this Agreement shall be construed to limit or modify the discretion accorded to EPA by the Clean Air Act, or by general principles of administrative law, nor shall it in any way be deemed to limit EPA's discretion in adopting any final rule.

19. Nothing in this Agreement shall be construed to limit or modify EPA's discretion to alter, amend, or revise any regulations, guidance, or interpretation EPA may issue in accordance with or on matters related to this Agreement from time to time or to promulgate or issue superseding regulations, guidance, or interpretations, or to limit any right that the Petitioners may have to seek judicial review in a subsequent case of any such action by EPA.

20. The Parties agree that they do not waive or limit any defense relating to the Existing Litigation if the Ninth Circuit Court of Appeals submits the Existing Litigation to the panel and the panel proceeds to a decision. EPA specifically reserves the right to argue that the Existing Litigation is moot in the event that any request to the Ninth Circuit Court of Appeals to submit the Existing Litigation to the panel occurs after EPA's final rulemaking referenced in Paragraph 10 of this Agreement and such final rulemaking is a full approval of the revised Regulation VIII rules.

21. No provision of this Agreement shall be interpreted as or constitute a commitment or requirement that EPA obligate or pay funds in contravention of the Anti-Deficiency Act, 31

U.S.C. § 1341, or take actions in contravention of the Administrative Procedure Act, 5 U.S.C. §§ 551-559, 701-706, the Clean Air Act, or any other law or regulation, either substantive or procedural.

22. The Parties agree and acknowledge that before this Agreement is final, EPA must provide notice in the Federal Register and an opportunity for comment pursuant to Clean Air Act § 113(g), 42 U.S.C. § 7413(g). After this Agreement has undergone an opportunity for notice and comment, the Administrator and/or the Attorney General, as appropriate, shall promptly consider any such written comments in determining whether to withdraw or withhold consent to this Agreement, in accordance with section 113(g) of the Clean Air Act. If the federal government elects to withdraw or withhold consent to this Agreement, Petitioners shall have the right to withdraw from this Agreement. This Agreement shall become final on the date that EPA provides written notice of such finality to Petitioners.

23. The Parties may modify any deadline or other term of this agreement by written stipulation.

24. Any notices required or provided for by this Agreement shall be in writing, and shall be deemed effective (i) upon receipt if sent by U.S. Post or (ii) upon the date sent if sent by overnight delivery, facsimile, or email. In addition, to be effective, any such notice must be sent to the following:

For the Air District:

Rick Rothman
Bingham McCutchen LLP
355 South Grand Avenue, Suite 4400
Los Angeles, CA 90071-3106
tele: (213) 680-6400
fax: (213) 680-6499
email: rick.rothman@bingham.com

Michael Rood
County of Imperial
Office of the County Counsel
County Administration Center
940 Main Street, Suite 205
El Centro, CA 92243-2869
tele: (760) 482-4400
fax: (760) 353-9347
email: michaelrood@co.imperial.ca.us

For Parks:

Hayley Peterson
Office of the Attorney General
110 West A Street, Suite 1100
San Diego, CA 92101
tele: (619) 645-2540
fax: (619) 645-2012
email: hayley.peterson@doj.ca.gov

Legal Office
California Department of Parks and Recreation
1416 9th Street, 14th Floor
Sacramento, CA 95814

For EPA:

Christina L. Richmond
Environmental Defense Section
Environment and Natural Resources Division
United States Department of Justice
P.O. Box 7611
Washington, D.C. 20026-3986
tele: (202) 514-3376
fax: (202) 514-8865
email: christina.richmond2@usdoj.gov

Geoffrey L. Wilcox
Office of General Counsel
United States Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N. W.
Mail Code: 2344A
Washington, DC 20460

tele: (202) 564-5601
fax: (202) 564-5603
email: wilcox.geoffrey@epa.gov

Kara Christenson
Office of Regional Counsel
United States Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105
tele: (415) 972-3881
fax: (415) 947-3570
email: christenson.kara@epa.gov

or such other person as any party may subsequently identify in writing to the other parties.

25. The various terms, paragraphs, and sections contained herein shall be deemed separable and severable. If any provision of this Agreement is deemed invalid or unenforceable, the balance of the Agreement shall remain in full force and effect.

26. It is hereby expressly understood and agreed that this Agreement was jointly drafted by Petitioners and EPA. Accordingly, the Parties hereby agree that any and all rules of construction to the effect that ambiguity is construed against the drafting Party shall be inapplicable in any dispute concerning the terms, meaning, or interpretation of this Agreement.

27. Each undersigned representative of the Parties to this Agreement certifies that he or she is fully authorized by the party to enter into and execute the terms and conditions of this Agreement, and to legally bind such party to this Agreement.

28. This Agreement may be executed in any number of counterpart originals, each of which shall be deemed to constitute an original agreement, and all of which shall constitute one agreement. The execution of one counterpart by any party shall have the same force and effect as if that party had signed all other counterparts.

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FOR THE AIR DISTRICT:

Date: __________

____
MICHAEL W. KELLEY
Chairman of the Board
Imperial County Air Pollution Control District

FOR PARKS:

Date: __________

____
RUTH COLEMAN
Director
California Department of Parks and Recreation

FOR EPA:

Date: 7/27/2012

Christina L. Richmond / TGT
CHRISTINA L. RICHMOND, Trial Attorney
Environmental Defense Section
Environment and Natural Resources Division
United States Department of Justice

EEC ORIGINAL PKG

FOR THE AIR DISTRICT:

Date: 7/17/12

Michael W. Kelley

MICHAEL W. KELLEY
Chairman of the Board
Imperial County Air Pollution Control District

FOR PARKS:

Date: __________

____
RUTH COLEMAN
Director
California Department of Parks and Recreation

FOR EPA:

Date: __________

____
CHRISTINA L. RICHMOND, Trial Attorney
Environmental Defense Section
Environment and Natural Resources Division
United States Department of Justice

FOR THE AIR DISTRICT:

Date: __________

MICHAEL W. KELLEY
Chairman of the Board
Imperial County Air Pollution Control District

FOR PARKS:

Date: 7/25/12

~~RUTH COLEMAN~~ Janelle Beland
~~Director~~ Acting Director
California Department of Parks and Recreation

FOR EPA:

Date: __________

CHRISTINA L. RICHMOND, Trial Attorney
Environmental Defense Section
Environment and Natural Resources Division
United States Department of Justice

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Appendix C
2014-2016 Monitoring Data for Imperial County

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM10 Concentration (µg/m3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
1/1/2014	--	--	--	70	--	--	--	--	--	47
1/2/2014	--	--	--	58	--	--	--	--	--	38
1/3/2014	--	--	--	56	--	--	--	--	--	66
1/4/2014	--	--	--	55	--	--	--	--	--	47
1/5/2014	44	--	30	46	--	--	20	--	22	38
1/6/2014	--	--	--	34	--	--	--	--	--	40
1/7/2014	--	--	--	51	--	--	--	--	--	43
1/8/2014	--	--	--	65	45	--	--	--	--	41
1/9/2014	--	--	--	56	--	--	--	--	--	50
1/10/2014	--	--	--	54	--	--	--	--	--	65
1/11/2014	91	--	46	61	56	--	38	--	44	62
1/12/2014	--	--	--	70	--	--	--	--	--	49
1/13/2014	--	--	--	43	--	--	--	--	--	38
1/14/2014	--	--	--	32	--	--	--	--	--	48
1/15/2014	--	--	--	35	--	--	--	--	--	34
1/16/2014	--	--	--	42	--	--	--	--	--	41
1/17/2014	54	--	29	39	24	--	25	--	30	41
1/18/2014	--	--	--	45	--	--	--	--	--	51
1/19/2014	--	--	--	59	--	--	--	--	--	49
1/20/2014	--	--	--	54	--	--	--	--	--	42
1/21/2014	--	--	--	54	--	--	--	--	--	45
1/22/2014	--	--	--	55	--	--	--	--	--	47
1/23/2014	131	--	--	79	57	--	41	--	--	43
1/24/2014	--	--	--	53	--	--	--	--	--	60
1/25/2014	--	--	--	43	--	--	--	--	--	57
1/26/2014	--	--	--	48	--	--	--	--	--	49
1/27/2014	--	--	--	66	--	--	--	--	--	51
1/28/2014	--	--	--	53	--	--	--	--	--	44
1/29/2014	94	--	40	54	49	--	41	--	27	51
1/30/2014	--	--	--	111	--	--	--	--	--	89
1/31/2014	--	--	--	198	--	--	--	--	--	86
2/1/2014	--	--	--	31	--	--	--	--	--	36
2/2/2014	--	--	--	29	--	--	--	--	--	35
2/3/2014	--	--	--	32	--	--	--	--	--	61
2/4/2014	30	--	19	29	21	--	17	--	19	34
2/5/2014	--	--	--	42	--	--	--	--	--	46
2/6/2014	--	--	--	56	--	--	--	--	--	47
2/7/2014	--	--	--	29	--	--	--	--	--	35
2/8/2014	--	--	--	60	--	--	--	--	--	58
2/9/2014	--	--	--	46	--	--	--	--	--	47
2/10/2014	41	--	35	50	--	--	29	--	30	45
2/11/2014	--	--	--	34	--	--	--	--	--	29
2/12/2014	--	--	--	52	--	--	--	--	--	39
2/13/2014	--	--	--	65	54	--	--	--	--	56
2/14/2014	--	--	--	82	--	--	--	--	--	50
2/15/2014	--	--	--	--	--	--	--	--	--	62
2/16/2014	99	--	58	82	74	--	56	--	--	58
2/17/2014	--	--	--	61	--	--	--	--	--	62
2/18/2014	--	--	--	67	--	--	--	--	--	50
2/19/2014	--	--	--	73	--	--	--	--	--	66
2/20/2014	--	--	--	64	--	--	--	--	--	38

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m³)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
2/21/2014	--	--	--	60	--	--	--	--	--	50
2/22/2014	71	--	53	73	51	--	43	--	44	58
2/23/2014	--	--	--	59	--	--	--	--	--	59
2/24/2014	--	--	--	74	--	--	--	--	--	59
2/25/2014	--	--	--	67	--	--	--	--	--	58
2/26/2014	--	--	--	71	--	--	--	--	--	44
2/27/2014	--	--	--	39	--	--	--	--	--	38
2/28/2014	106	--	126	149	54	--	294	--	135	144
3/1/2014	--	--	--	39	--	--	--	--	--	47
3/2/2014	--	--	--	19	--	--	--	--	--	17
3/3/2014	--	--	--	27	--	--	--	--	--	19
3/4/2014	--	--	--	33	--	--	--	--	--	26
3/5/2014	--	--	--	35	--	--	--	--	--	28
3/6/2014	--	--	41	60	18	--	30	--	39	58
3/7/2014	--	--	--	73	--	--	--	--	--	46
3/8/2014	--	--	--	39	--	--	--	--	--	22
3/9/2014	--	--	--	30	--	--	--	--	--	15
3/10/2014	--	--	--	36	--	--	--	--	--	58
3/11/2014	--	--	--	55	--	--	--	--	--	44
3/12/2014	--	--	26	35	17	--	23	--	10	19
3/13/2014	--	--	--	48	--	--	--	--	--	60
3/14/2014	--	--	--	51	--	--	--	--	--	39
3/15/2014	--	--	--	49	--	--	--	--	--	39
3/16/2014	--	--	--	44	--	--	--	--	--	48
3/17/2014	--	--	--	190	--	--	--	--	--	87
3/18/2014	--	--	77	113	57	--	66	--	53	80
3/19/2014	--	--	--	55	--	--	--	--	--	29
3/20/2014	--	--	--	40	--	--	--	--	--	46
3/21/2014	--	--	--	53	--	--	--	--	--	52
3/22/2014	--	--	--	59	--	--	--	--	--	69
3/23/2014	--	--	--	59	--	--	--	--	--	51
3/24/2014	--	--	47	69	42	--	39	--	35	50
3/25/2014	--	--	--	137	--	--	--	--	--	127
3/26/2014	--	--	--	374	--	--	--	--	--	279
3/27/2014	38	--	--	94	--	--	--	--	--	115
3/28/2014	--	--	--	51	--	--	--	--	--	52
3/29/2014	--	--	--	57	--	--	--	--	--	49
3/30/2014	64	--	220	150	57	--	102	--	84	80
3/31/2014	--	--	--	106	--	--	--	--	--	102
4/1/2014	--	--	--	160	--	--	--	--	--	101
4/2/2014	--	--	--	137	--	--	--	--	--	38
4/3/2014	--	--	--	30	--	--	--	--	--	39
4/4/2014	--	--	--	50	--	--	--	--	--	53
4/5/2014	24	--	49	35	10	--	20	--	29	48
4/6/2014	--	--	--	28	--	--	--	--	--	30
4/7/2014	--	--	--	42	--	--	--	--	--	42
4/8/2014	--	--	--	46	--	--	--	--	--	53
4/9/2014	--	--	--	58	--	--	--	--	--	53
4/10/2014	--	--	--	56	--	--	--	--	--	87
4/11/2014	54	--	53	62	74	--	102	--	--	74
4/12/2014	--	--	--	103	--	--	--	--	--	167

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
4/13/2014	--	--	--	166	--	--	--	--	--	130
4/14/2014	--	--	--	58	--	--	--	--	--	66
4/15/2014	--	--	--	50	--	--	--	--	--	66
4/16/2014	--	--	--	57	--	--	--	--	54	73
4/17/2014	42	--	38	52	36	--	39	--	--	59
4/18/2014	--	--	--	47	--	--	--	--	--	57
4/19/2014	--	--	--	38	--	--	--	--	--	60
4/20/2014	--	--	--	36	--	--	--	--	--	44
4/21/2014	--	--	--	51	--	--	--	--	--	64
4/22/2014	--	--	--	131	--	--	--	--	--	134
4/23/2014	43	--	53	81	42	--	48	--	57	75
4/24/2014	--	--	--	75	--	--	--	--	--	73
4/25/2014	--	--	--	184	--	--	--	--	--	--
4/26/2014	--	--	--	312	--	--	--	--	--	149
4/27/2014	--	--	--	23	--	--	--	--	--	54
4/28/2014	--	--	--	47	--	--	--	--	--	53
4/29/2014	79	--	89	141	83	--	63	--	48	82
4/30/2014	--	--	--	58	--	--	--	--	--	75
5/1/2014	--	--	--	39	--	--	--	--	--	32
5/2/2014	--	--	--	37	--	--	--	--	--	37
5/3/2014	--	--	--	46	--	--	--	--	--	62
5/4/2014	--	--	--	55	--	--	--	--	--	74
5/5/2014	86	--	269	222	87	--	375	--	121	100
5/6/2014	--	--	--	438	--	--	--	--	--	--
5/7/2014	--	--	--	54	--	--	--	--	--	72
5/8/2014	--	--	--	40	--	--	--	--	--	69
5/9/2014	--	--	--	50	--	--	--	--	--	72
5/10/2014	--	--	--	104	--	--	--	--	--	--
5/11/2014	126	--	127	135	120	--	85	--	103	172
5/12/2014	--	--	--	50	--	--	--	--	--	29
5/13/2014	--	--	--	59	--	--	--	--	--	33
5/14/2014	--	--	--	45	--	--	--	--	--	61
5/15/2014	--	--	--	53	--	--	--	--	--	64
5/16/2014	--	--	--	78	--	--	--	--	--	65
5/17/2014	35	--	81	113	41	--	72	--	92	110
5/18/2014	--	--	--	100	--	--	--	--	--	106
5/19/2014	--	--	--	130	--	--	--	--	--	95
5/20/2014	--	--	--	250	--	--	--	--	--	122
5/21/2014	--	--	--	36	--	--	--	--	--	32
5/22/2014	--	--	--	56	--	--	--	--	--	42
5/23/2014	36	--	30	34	18	--	--	--	136	44
5/24/2014	--	--	--	58	--	--	--	--	--	62
5/25/2014	--	--	--	41	--	--	--	--	--	39
5/26/2014	--	--	--	51	--	--	--	--	--	72
5/27/2014	--	--	--	48	--	--	--	--	--	72
5/28/2014	--	--	--	48	--	--	--	--	--	72
5/29/2014	54	--	37	61	30	--	--	--	47	79
5/30/2014	--	--	--	48	--	--	--	--	--	71
5/31/2014	--	--	--	69	--	--	--	--	--	51
6/1/2014	--	--	--	29	--	--	--	--	--	42
6/2/2014	--	--	--	127	--	--	--	--	--	--

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
6/3/2014	--	--	--	45	--	--	--	--	--	42
6/4/2014	30	--	34	35	28	--	38	--	33	59
6/5/2014	--	--	--	59	--	--	--	--	--	82
6/6/2014	--	--	--	108	--	--	--	--	--	133
6/7/2014	--	--	--	38	--	--	--	--	--	95
6/8/2014	--	--	--	62	--	--	--	--	--	78
6/9/2014	--	--	--	88	--	--	--	--	--	90
6/10/2014	--	--	--	116	69	--	91	--	94	135
6/11/2014	--	--	--	73	--	--	--	--	--	103
6/12/2014	--	--	--	62	--	--	--	--	--	89
6/13/2014	--	--	--	97	--	--	--	--	--	99
6/14/2014	--	--	64	81	--	--	--	--	--	85
6/15/2014	--	--	--	61	--	--	--	--	--	100
6/16/2014	--	--	--	83	34	--	113	--	46	61
6/17/2014	49	--	88	92	--	--	--	--	--	122
6/18/2014	--	--	--	34	--	--	--	--	--	55
6/19/2014	43	--	--	57	--	--	--	--	--	71
6/20/2014	--	--	--	62	--	--	--	--	--	87
6/21/2014	--	--	--	54	--	--	--	--	--	74
6/22/2014	39	--	45	48	37	--	31	--	37	49
6/23/2014	--	--	--	45	--	--	--	--	--	61
6/24/2014	--	--	--	62	--	--	--	--	--	64
6/25/2014	--	--	--	53	--	--	--	--	--	84
6/26/2014	--	--	--	185	--	--	--	--	--	130
6/27/2014	--	--	--	96	--	--	--	--	--	100
6/28/2014	44	--	58	64	44	--	76	--	66	88
6/29/2014	--	--	--	46	--	--	--	--	--	65
6/30/2014	--	--	--	54	--	--	--	--	--	60
7/1/2014	--	--	--	60	--	--	--	--	--	71
7/2/2014	--	--	--	68	--	--	--	--	--	77
7/3/2014	--	--	--	116	--	--	--	--	--	120
7/4/2014	24	--	32	37	30	--	31	--	34	48
7/5/2014	--	--	--	40	--	--	--	--	--	64
7/6/2014	--	--	--	48	--	--	--	--	--	89
7/7/2014	--	--	--	54	--	--	--	--	--	83
7/8/2014	--	--	--	62	--	--	--	--	--	75
7/9/2014	--	--	--	63	--	--	--	--	--	82
7/10/2014	27	--	40	44	--	--	54	--	--	46
7/11/2014	--	--	--	53	--	--	--	--	--	83
7/12/2014	--	--	--	34	--	--	--	--	--	49
7/13/2014	--	--	--	64	--	--	--	--	--	69
7/14/2014	--	--	--	44	--	--	--	--	--	56
7/15/2014	--	--	--	47	--	--	--	--	--	48
7/16/2014	43	--	148	63	--	--	167	--	116	142
7/17/2014	--	--	--	66	--	--	--	--	--	101
7/18/2014	--	--	--	40	31	--	--	--	--	89
7/19/2014	--	--	--	45	--	--	--	--	--	51
7/20/2014	--	--	--	28	--	--	--	--	--	37
7/21/2014	--	--	--	34	--	--	--	--	--	50
7/22/2014	33	--	39	46	--	--	51	--	52	61
7/23/2014	--	--	--	51	--	--	--	--	--	52

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m³)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
7/24/2014	--	--	--	59	49	--	--	--	--	--
7/25/2014	--	--	--	90	--	--	--	--	--	--
7/26/2014	--	--	--	49	--	--	--	--	--	--
7/27/2014	--	--	--	103	--	--	--	--	--	--
7/28/2014	42	--	42	46	43	--	43	--	--	--
7/29/2014	--	--	--	53	--	--	--	--	--	--
7/30/2014	--	--	--	58	--	--	--	--	56	91
7/31/2014	--	--	--	64	--	--	--	--	--	95
8/1/2014	--	--	--	70	--	--	--	--	--	89
8/2/2014	--	--	--	45	--	--	--	--	--	50
8/3/2014	47	--	21	28	17	--	18	--	20	31
8/4/2014	--	--	--	25	--	--	--	--	--	43
8/5/2014	--	--	--	28	--	--	--	--	--	46
8/6/2014	--	--	--	49	--	--	--	--	--	108
8/7/2014	--	--	--	69	--	--	--	--	--	64
8/8/2014	--	--	--	49	--	--	--	--	--	52
8/9/2014	26	--	--	53	28	--	36	--	47	61
8/10/2014	--	--	--	34	--	--	--	--	--	40
8/11/2014	--	--	--	43	--	--	--	--	--	63
8/12/2014	--	--	--	63	--	--	--	--	--	102
8/13/2014	--	--	--	59	--	--	--	--	--	59
8/14/2014	--	--	--	40	--	--	--	--	--	61
8/15/2014	54	--	47	63	41	--	43	--	69	90
8/16/2014	--	--	--	39	--	--	--	--	--	58
8/17/2014	--	--	--	32	--	--	--	--	--	50
8/18/2014	--	--	--	102	--	--	--	--	--	161
8/19/2014	--	--	--	97	--	--	--	--	--	80
8/20/2014	--	--	--	63	--	--	--	--	--	53
8/21/2014	25	--	--	36	23	--	37	--	49	54
8/22/2014	--	--	--	29	--	--	--	--	--	30
8/23/2014	--	--	--	23	--	--	--	--	--	24
8/24/2014	--	--	--	25	--	--	--	--	--	29
8/25/2014	--	--	--	41	--	--	--	--	--	26
8/26/2014	--	--	--	41	--	--	--	--	--	45
8/27/2014	30	--	19	34	19	--	23	--	25	32
8/28/2014	--	--	--	45	--	--	--	--	--	38
8/29/2014	--	--	--	40	--	--	--	--	--	42
8/30/2014	--	--	--	41	--	--	--	--	--	75
8/31/2014	--	--	--	48	--	--	--	--	--	91
9/1/2014	--	--	--	32	--	--	--	--	--	79
9/2/2014	35	--	24	34	38	--	28	--	46	60
9/3/2014	--	--	--	44	--	--	--	--	--	59
9/4/2014	--	--	--	48	--	--	--	--	--	64
9/5/2014	--	--	--	53	--	--	--	--	--	59
9/6/2014	--	--	--	37	--	--	--	--	--	52
9/7/2014	--	--	--	26	--	--	--	--	--	27
9/8/2014	24	--	22	35	22	--	22	--	25	35
9/9/2014	--	--	--	42	--	--	--	--	--	39
9/10/2014	--	--	--	34	--	--	--	--	--	41
9/11/2014	--	--	--	44	--	--	--	--	--	49
9/12/2014	--	--	--	48	--	--	--	--	--	32

EEC ORIGINAL PKG

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
9/13/2014	--	--	--	54	--	--	--	--	--	69
9/14/2014	45	--	--	41	44	--	32	--	31	42
9/15/2014	--	--	--	65	--	--	--	--	--	63
9/16/2014	--	--	--	37	--	--	--	--	--	49
9/17/2014	--	--	--	33	--	--	--	--	--	33
9/18/2014	--	--	--	73	--	--	--	--	--	104
9/19/2014	--	--	--	40	--	--	--	--	--	83
9/20/2014	33	--	35	51	36	--	40	--	50	64
9/21/2014	--	--	--	43	--	--	--	--	--	38
9/22/2014	--	--	--	52	--	--	--	--	--	61
9/23/2014	--	--	--	53	--	--	--	--	--	63
9/24/2014	--	--	--	44	--	--	--	--	--	66
9/25/2014	--	--	--	56	--	--	--	--	--	66
9/26/2014	25	--	55	68	--	--	136	--	--	130
9/27/2014	--	--	--	219	--	--	--	--	--	--
9/28/2014	--	--	--	41	--	--	--	--	--	37
9/29/2014	--	--	--	43	--	--	--	--	--	37
9/30/2014	--	--	--	45	--	--	--	--	61	75
10/1/2014	--	--	--	51	--	--	--	--	--	59
10/2/2014	--	--	47	67	40	--	--	--	28	63
10/3/2014	--	--	--	40	--	--	--	--	--	37
10/4/2014	56	--	--	42	--	--	--	--	--	42
10/5/2014	--	--	--	40	--	--	--	--	--	45
10/6/2014	--	--	--	53	--	--	--	--	--	70
10/7/2014	--	--	--	33	--	--	--	--	--	82
10/8/2014	23	--	14	20	19	--	27	--	40	49
10/9/2014	--	--	--	33	--	--	--	--	--	56
10/10/2014	--	--	--	44	--	--	--	--	--	46
10/11/2014	--	--	--	34	--	--	--	--	--	41
10/12/2014	--	--	--	32	--	--	--	--	--	42
10/13/2014	--	--	--	51	--	--	--	--	--	48
10/14/2014	60	--	47	59	42	--	49	--	59	82
10/15/2014	--	--	--	56	--	--	--	--	--	76
10/16/2014	--	--	--	56	--	--	--	--	--	61
10/17/2014	--	--	--	46	--	--	--	--	--	87
10/18/2014	--	--	--	55	--	--	--	--	--	79
10/19/2014	--	--	--	35	--	--	--	--	--	62
10/20/2014	32	--	38	53	32	--	35	--	45	60
10/21/2014	--	--	--	60	--	--	--	--	--	70
10/22/2014	--	--	--	58	--	--	--	--	--	66
10/23/2014	--	--	--	60	--	--	--	--	--	55
10/24/2014	--	--	--	76	--	--	--	--	--	65
10/25/2014	--	--	--	48	--	--	--	--	--	52
10/26/2014	21	--	24	32	--	--	32	--	29	42
10/27/2014	--	--	--	47	--	--	--	--	--	55
10/28/2014	--	--	--	65	40	--	--	--	--	52
10/29/2014	--	--	--	57	--	--	--	--	--	49
10/30/2014	--	--	--	54	--	--	--	--	--	64
10/31/2014	--	--	--	116	--	--	--	--	--	181
11/1/2014	--	--	471	131	56	--	404	--	173	218
11/2/2014	--	--	--	24	--	--	--	--	--	22

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
11/3/2014	--	--	--	36	--	--	--	--	--	27
11/4/2014	33	--	--	46	--	--	--	--	--	25
11/5/2014	--	--	--	31	--	--	--	--	--	28
11/6/2014	--	--	--	43	--	--	--	--	--	24
11/7/2014	63	--	43	46	35	--	52	--	54	56
11/8/2014	--	--	--	52	--	--	--	--	--	86
11/9/2014	--	--	--	42	--	--	--	--	--	44
11/10/2014	--	--	--	42	--	--	--	--	--	72
11/11/2014	--	--	--	45	--	--	--	--	--	55
11/12/2014	--	--	--	67	--	--	--	--	--	69
11/13/2014	49	--	42	54	45	--	37	--	35	45
11/14/2014	--	--	--	47	--	--	--	--	--	63
11/15/2014	--	--	--	89	--	--	--	--	--	60
11/16/2014	--	--	--	210	--	--	--	--	--	248
11/17/2014	--	--	--	36	--	--	--	--	--	52
11/18/2014	--	--	--	48	--	--	--	--	--	72
11/19/2014	85	--	42	54	48	--	42	--	40	44
11/20/2014	--	--	--	60	--	--	--	--	--	58
11/21/2014	--	--	--	20	--	--	--	--	--	21
11/22/2014	--	--	--	27	--	--	--	--	--	53
11/23/2014	--	--	--	42	--	--	--	--	--	40
11/24/2014	--	--	--	27	--	--	--	--	--	23
11/25/2014	51	--	--	34	39	--	23	--	28	33
11/26/2014	--	--	--	40	--	--	--	--	--	44
11/27/2014	--	--	--	34	--	--	--	--	--	29
11/28/2014	--	--	--	50	--	--	--	--	--	56
11/29/2014	--	--	--	66	--	--	--	--	--	55
11/30/2014	--	--	--	30	--	--	--	--	--	36
12/1/2014	37	--	19	22	20	--	17	--	22	28
12/2/2014	--	--	--	41	--	--	--	--	--	57
12/3/2014	--	--	--	15	--	--	--	--	--	--
12/4/2014	--	--	--	24	--	--	--	--	--	--
12/5/2014	--	--	--	37	--	--	--	--	--	28
12/6/2014	--	--	--	23	--	--	--	--	--	20
12/7/2014	11	--	--	14	14	--	26	--	8	11
12/8/2014	--	--	--	33	--	--	--	--	--	17
12/9/2014	--	--	--	26	--	--	--	--	--	11
12/10/2014	--	--	--	29	--	--	--	--	--	16
12/11/2014	--	--	--	36	--	--	--	--	--	29
12/12/2014	--	--	--	14	--	--	--	--	--	14
12/13/2014	7	--	--	15	11	--	13	--	8	7
12/14/2014	--	--	--	11	--	--	--	--	--	8
12/15/2014	--	--	--	24	--	--	--	--	--	12
12/16/2014	--	--	--	25	--	--	--	--	--	19
12/17/2014	--	--	--	18	--	--	--	--	--	15
12/18/2014	--	--	--	34	--	--	--	--	--	17
12/19/2014	40	--	--	37	25	--	14	--	9	11
12/20/2014	--	--	--	32	--	--	--	--	--	11
12/21/2014	--	--	--	32	--	--	--	--	--	21
12/22/2014	--	--	--	38	--	--	--	--	--	25
12/23/2014	--	--	--	33	--	--	--	--	--	17

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration ($\mu g/m^3$)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
12/24/2014	--	--	--	24	--	--	--	--	--	18
12/25/2014	45	--	35	45	44	--	36	--	--	36
12/26/2014	--	--	--	16	--	--	--	--	--	22
12/27/2014	--	--	--	16	--	--	--	--	--	23
12/28/2014	--	--	--	21	--	--	--	--	--	14
12/29/2014	--	--	--	31	--	--	--	--	--	23
12/30/2014	--	--	--	40	--	--	--	--	--	30
12/31/2014	28	--	--	32	24	--	14	--	17	25
1/1/2015	--	--	--	50	--	--	--	--	--	22
1/2/2015	--	--	--	40	--	--	--	--	--	35
1/3/2015	--	--	--	61	--	--	--	--	--	54
1/4/2015	--	--	--	51	--	--	--	--	--	43
1/5/2015	--	--	--	44	--	--	--	--	--	24
1/6/2015	32	--	29	31	23	--	24	--	17	20
1/7/2015	--	--	--	38	--	--	--	--	--	19
1/8/2015	--	--	--	41	--	--	--	--	--	22
1/9/2015	--	--	--	49	--	--	--	--	--	35
1/10/2015	--	--	--	38	--	--	--	--	--	44
1/11/2015	--	--	--	19	--	--	--	--	--	26
1/12/2015	46	--	15	17	23	--	10	--	10	14
1/13/2015	--	--	--	18	--	--	--	--	--	11
1/14/2015	--	--	--	19	--	--	--	--	--	7
1/15/2015	--	--	--	24	--	--	--	--	--	12
1/16/2015	--	--	--	25	--	--	--	--	--	22
1/17/2015	--	--	--	27	--	--	--	--	--	15
1/18/2015	34	--	26	27	22	--	29	--	18	18
1/19/2015	--	--	--	35	--	--	--	--	--	21
1/20/2015	--	--	--	36	--	--	--	--	--	43
1/21/2015	--	--	--	24	--	--	--	--	--	31
1/22/2015	--	--	--	33	--	--	--	--	--	38
1/23/2015	--	--	--	38	--	--	--	--	--	47
1/24/2015	27	--	20	22	24	--	25	--	--	69
1/25/2015	--	--	--	13	--	--	--	--	--	19
1/26/2015	--	--	--	8	--	--	--	--	--	11
1/27/2015	--	--	--	16	--	--	--	--	--	7
1/28/2015	--	--	--	23	--	--	--	--	13	13
1/29/2015	--	--	--	26	--	--	--	--	--	19
1/30/2015	--	--	13	15	11	--	9	--	7	9
1/31/2015	--	--	--	10	--	--	--	--	--	5
2/1/2015	--	--	--	8	--	--	--	--	--	2
2/2/2015	--	--	--	24	--	--	--	--	--	8
2/3/2015	89	--	--	37	--	--	--	--	--	17
2/4/2015	--	--	--	41	--	--	--	--	--	27
2/5/2015	69	--	37	47	42	--	26	--	21	24
2/6/2015	--	--	--	45	--	--	--	--	--	31
2/7/2015	--	--	--	36	--	--	--	--	--	27
2/8/2015	--	--	--	31	--	--	--	--	--	28
2/9/2015	--	--	--	35	--	--	--	--	--	15
2/10/2015	--	--	--	25	--	--	--	--	--	--
2/11/2015	25	--	20	23	23	--	21	--	26	25
2/12/2015	--	--	--	23	--	--	--	--	--	13

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
2/13/2015	--	--	--	40	--	--	--	--	--	22
2/14/2015	--	--	--	40	--	--	--	--	--	22
2/15/2015	--	--	--	34	--	--	--	--	--	21
2/16/2015	--	--	--	23	--	--	--	--	--	23
2/17/2015	--	--	26	30	24	--	20	--	14	17
2/18/2015	--	--	--	41	--	--	--	--	--	25
2/19/2015	85	--	--	58	--	--	--	--	--	37
2/20/2015	--	--	--	60	--	--	--	--	--	42
2/21/2015	--	--	--	109	--	--	--	--	--	124
2/22/2015	--	--	--	85	--	--	--	--	--	88
2/23/2015	29	--	23	26	21	--	22	--	7	7
2/24/2015	--	--	--	28	--	--	--	--	--	21
2/25/2015	--	--	--	38	--	--	--	--	--	22
2/26/2015	--	--	--	53	--	--	--	--	--	33
2/27/2015	--	--	--	117	--	--	--	--	--	102
2/28/2015	--	--	--	43	--	--	--	--	--	62
3/1/2015	4	--	4	3	2	--	5	--	6	6
3/2/2015	--	--	--	8	--	--	--	--	--	2
3/3/2015	--	--	--	26	--	--	--	--	--	3
3/4/2015	--	--	--	13	--	--	--	--	--	5
3/5/2015	--	--	--	18	--	--	--	--	--	4
3/6/2015	--	--	--	19	--	--	--	--	--	6
3/7/2015	39	--	25	24	19	--	23	--	18	18
3/8/2015	--	--	--	24	--	--	--	--	--	26
3/9/2015	--	--	--	41	--	--	--	--	--	28
3/10/2015	--	--	--	32	--	--	--	--	--	25
3/11/2015	--	--	--	33	--	--	--	--	--	26
3/12/2015	--	--	--	28	--	--	--	--	--	20
3/13/2015	20	--	22	27	18	--	21	--	11	9
3/14/2015	--	--	--	26	--	--	--	--	--	22
3/15/2015	--	--	--	41	--	--	--	--	--	38
3/16/2015	--	--	--	36	--	--	--	--	--	32
3/17/2015	--	--	--	33	--	--	--	--	--	47
3/18/2015	--	--	--	31	--	--	--	--	--	39
3/19/2015	26	--	16	17	19	--	--	--	35	22
3/20/2015	--	--	--	22	--	--	--	--	--	17
3/21/2015	--	--	--	61	--	--	--	--	--	47
3/22/2015	--	--	--	31	--	--	--	--	--	47
3/23/2015	--	--	--	35	--	--	--	--	--	57
3/24/2015	--	--	--	64	--	--	--	--	--	120
3/25/2015	27	--	28	33	21	--	25	--	27	36
3/26/2015	--	--	--	24	--	--	--	--	--	26
3/27/2015	--	--	--	29	--	--	--	--	--	52
3/28/2015	--	--	--	25	--	--	--	--	--	49
3/29/2015	--	--	--	21	--	--	--	--	--	34
3/30/2015	--	--	--	38	--	--	--	--	--	38
3/31/2015	39	--	40	45	35	--	--	--	64	81
4/1/2015	--	--	--	61	--	--	--	--	--	66
4/2/2015	--	--	--	47	--	--	--	--	--	50
4/3/2015	--	--	--	36	--	--	--	--	--	29
4/4/2015	--	--	--	35	--	--	--	--	--	49

Table C-1. 2014-2016 Monitoring Data for Imperial County

Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
4/5/2015	--	--	--	52	--	--	--	--	--	97
4/6/2015	59	--	77	99	79	--	96	--	72	100
4/7/2015	--	--	--	107	--	--	--	--	--	65
4/8/2015	--	--	--	28	--	--	--	--	--	12
4/9/2015	--	--	--	22	--	--	--	--	--	23
4/10/2015	--	--	--	33	--	--	--	--	--	49
4/11/2015	--	--	--	34	--	--	--	--	--	39
4/12/2015	40	--	27	31	30	--	34	--	27	33
4/13/2015	--	--	--	36	--	--	--	--	--	40
4/14/2015	--	--	--	38	--	--	--	--	--	63
4/15/2015	--	--	--	109	--	--	--	--	--	122
4/16/2015	--	--	--	32	--	--	--	--	--	42
4/17/2015	--	--	--	30	--	--	--	--	--	34
4/18/2015	52	--	31	36	31	--	--	--	36	48
4/19/2015	--	--	--	38	--	--	--	--	--	43
4/20/2015	--	--	--	46	--	--	--	--	--	54
4/21/2015	--	--	--	67	--	--	--	--	--	47
4/22/2015	--	--	--	34	--	--	37	--	--	48
4/23/2015	--	--	--	35	--	--	--	--	--	36
4/24/2015	22	--	91	109	23	--	101	--	147	168
4/25/2015	--	--	--	101	--	--	--	--	--	113
4/26/2015	--	--	--	25	--	--	--	--	--	11
4/27/2015	--	--	--	20	--	--	--	--	--	37
4/28/2015	--	--	--	28	--	--	--	--	--	20
4/29/2015	--	--	--	37	--	--	--	--	--	34
4/30/2015	--	--	31	30	26	--	30	--	39	42
5/1/2015	--	--	--	38	--	--	--	--	--	42
5/2/2015	35	--	--	36	--	--	--	--	--	30
5/3/2015	--	--	--	44	--	--	--	--	--	39
5/4/2015	--	--	--	42	--	--	--	--	--	62
5/5/2015	--	--	--	40	--	--	--	--	--	38
5/6/2015	--	--	61	73	29	--	97	--	90	117
5/7/2015	134	--	--	127	--	--	--	--	--	210
5/8/2015	--	--	--	33	--	--	--	--	--	21
5/9/2015	--	--	--	15	--	--	--	--	--	23
5/10/2015	--	--	--	23	--	--	--	--	--	27
5/11/2015	--	--	--	32	--	--	--	--	--	37
5/12/2015	35	--	27	29	24	--	44	--	51	59
5/13/2015	--	--	--	44	--	--	--	--	--	43
5/14/2015	--	--	--	75	--	--	--	--	--	105
5/15/2015	--	--	--	6	--	--	--	--	--	12
5/16/2015	--	--	--	14	--	--	--	--	--	10
5/17/2015	--	--	--	21	--	--	--	--	--	23
5/18/2015	18	--	304	152	17	--	111	--	39	74
5/19/2015	--	--	--	31	--	--	--	--	--	51
5/20/2015	--	--	--	41	--	--	--	--	--	60
5/21/2015	--	--	--	225	--	--	--	--	--	171
5/22/2015	--	--	--	227	--	--	--	--	--	122
5/23/2015	--	--	--	17	--	--	--	--	--	40
5/24/2015	12	--	15	--	10	--	14	--	23	25
5/25/2015	--	--	--	--	--	--	--	--	--	32

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
5/26/2015	--	--	--	--	--	--	--	--	--	34
5/27/2015	--	--	--	43	--	--	--	--	--	46
5/28/2015	--	--	--	33	--	--	--	--	--	41
5/29/2015	--	--	--	37	--	--	--	--	--	62
5/30/2015	34	--	31	31	38	--	32	--	29	30
5/31/2015	--	--	--	29	--	--	--	--	--	58
6/1/2015	--	--	--	45	--	--	--	--	--	76
6/2/2015	27	--	--	59	--	--	--	--	--	60
6/3/2015	--	--	--	39	--	--	--	--	--	53
6/4/2015	--	--	--	34	--	--	--	--	--	45
6/5/2015	--	--	39	47	16	--	40	--	30	33
6/6/2015	--	--	--	29	--	--	--	--	--	56
6/7/2015	--	--	--	44	--	--	--	--	--	36
6/8/2015	--	--	--	53	--	--	--	--	--	58
6/9/2015	--	--	--	36	--	--	--	--	--	29
6/10/2015	--	--	--	21	--	--	--	--	--	27
6/11/2015	16	--	22	26	15	--	26	--	22	24
6/12/2015	--	--	--	36	--	--	--	--	--	42
6/13/2015	--	--	--	37	--	--	--	--	--	48
6/14/2015	--	--	--	36	--	--	--	--	--	31
6/15/2015	--	--	--	48	--	--	--	--	--	45
6/16/2015	--	--	--	53	--	--	--	--	--	49
6/17/2015	37	--	--	51	32	--	45	--	50	54
6/18/2015	--	--	--	61	--	--	--	--	--	60
6/19/2015	--	--	--	36	--	--	--	--	--	45
6/20/2015	--	--	47	58	--	--	--	--	--	49
6/21/2015	--	--	--	44	--	--	--	--	--	37
6/22/2015	--	--	--	49	--	--	--	--	--	57
6/23/2015	35	--	37	42	30	--	34	--	41	44
6/24/2015	--	--	--	61	--	--	--	--	--	78
6/25/2015	--	--	--	66	--	--	--	--	--	60
6/26/2015	--	--	--	61	--	--	--	--	--	54
6/27/2015	--	--	--	45	--	--	--	--	--	39
6/28/2015	--	--	--	40	--	--	--	--	--	33
6/29/2015	42	--	--	49	45	--	41	--	66	66
6/30/2015	--	--	--	88	--	--	--	--	--	183
7/1/2015	--	--	--	40	--	--	--	--	--	52
7/2/2015	--	--	--	40	--	--	--	--	--	37
7/3/2015	--	--	--	27	--	--	--	--	--	48
7/4/2015	--	--	--	58	--	--	--	--	--	86
7/5/2015	38	--	--	42	34	--	--	--	33	46
7/6/2015	--	--	--	39	--	--	--	--	--	65
7/7/2015	--	--	--	55	--	--	--	--	--	90
7/8/2015	--	--	--	128	--	--	--	--	--	166
7/9/2015	--	--	--	79	--	--	--	--	--	105
7/10/2015	--	--	--	28	--	--	--	--	--	48
7/11/2015	31	--	37	39	34	--	43	--	42	49
7/12/2015	--	--	--	25	--	--	--	--	--	43
7/13/2015	--	--	--	43	--	--	--	--	--	78
7/14/2015	--	--	--	41	--	--	--	--	--	71
7/15/2015	--	--	--	41	--	--	--	--	--	63

EEC ORIGINAL PKG

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
7/16/2015	--	--	--	40	--	8	--	45	--	76
7/17/2015	84	--	101	115	90	8	126	104	109	132
7/18/2015	--	--	--	29	--	6	--	38	--	24
7/19/2015	--	--	--	17	--	5	--	14	--	18
7/20/2015	--	--	--	14	--	5	--	11	--	12
7/21/2015	--	--	--	34	--	5	--	48	--	68
7/22/2015	--	--	--	52	--	2	--	90	--	58
7/23/2015	28	--	23	26	--	17	--	33	45	46
7/24/2015	--	--	--	34	--	20	--	26	--	33
7/25/2015	--	--	--	27	--	24	--	27	--	30
7/26/2015	--	--	--	51	--	28	--	52	--	79
7/27/2015	--	--	--	38	--	26	--	27	--	43
7/28/2015	--	--	--	36	--	38	--	46	--	53
7/29/2015	32	--	34	38	37	43	--	29	30	33
7/30/2015	--	--	--	38	--	44	--	56	--	74
7/31/2015	--	--	--	49	--	34	--	62	--	28
8/1/2015	--	--	--	30	--	35	52	53	--	60
8/2/2015	--	--	--	24	--	18	--	33	--	29
8/3/2015	--	--	--	37	--	40	--	46	--	39
8/4/2015	44	--	43	45	39	41	50	49	75	72
8/5/2015	--	--	--	51	--	49	--	47	--	54
8/6/2015	--	--	--	51	--	42	--	50	--	96
8/7/2015	--	--	--	79	--	30	--	43	--	76
8/8/2015	--	--	--	30	--	27	--	29	--	29
8/9/2015	--	--	--	26	--	24	--	26	--	35
8/10/2015	31	--	36	37	39	42	40	40	47	46
8/11/2015	--	--	--	43	--	44	--	44	--	45
8/12/2015	--	--	--	43	--	42	--	41	--	41
8/13/2015	--	--	--	40	--	43	--	49	--	88
8/14/2015	--	--	--	38	--	41	--	40	--	80
8/15/2015	--	--	--	34	--	31	--	30	--	54
8/16/2015	62	--	55	62	61	76	50	69	52	61
8/17/2015	--	--	--	67	--	66	--	58	--	97
8/18/2015	--	--	--	52	--	48	--	59	--	113
8/19/2015	--	--	--	41	--	35	--	47	--	79
8/20/2015	--	--	--	62	--	56	--	52	--	68
8/21/2015	--	--	--	72	--	64	--	67	--	74
8/22/2015	34	--	32	36	33	39	33	35	47	40
8/23/2015	--	--	--	29	--	38	--	32	--	33
8/24/2015	--	--	--	34	--	38	--	38	--	52
8/25/2015	--	--	--	60	--	67	--	63	--	45
8/26/2015	--	--	--	26	--	35	--	30	--	38
8/27/2015	--	--	--	37	--	32	--	31	--	66
8/28/2015	33	--	30	31	30	33	32	29	64	65
8/29/2015	--	--	--	32	--	27	--	30	--	49
8/30/2015	--	--	--	27	--	32	--	29	--	46
8/31/2015	--	--	--	33	--	31	--	40	--	111
9/1/2015	--	--	--	51	--	45	--	52	--	106
9/2/2015	--	--	--	37	--	33	--	47	--	111
9/3/2015	44	--	38	40	35	41	52	63	70	69
9/4/2015	--	--	--	46	--	39	--	54	--	70

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
9/5/2015	--	--	--	35	--	37	--	42	--	65
9/6/2015	--	--	--	22	--	22	--	22	--	43
9/7/2015	--	--	--	23	--	24	--	31	--	40
9/8/2015	--	--	--	--	--	64	--	70	--	128
9/9/2015	62	--	52	58	70	81	57	67	61	79
9/10/2015	--	--	--	34	--	40	--	36	--	42
9/11/2015	--	--	--	48	--	45	--	43	--	43
9/12/2015	--	--	--	32	--	29	--	37	--	40
9/13/2015	--	--	--	67	--	82	--	55	--	90
9/14/2015	--	--	--	168	--	63	--	119	--	117
9/15/2015	55	--	52	67	42	51	49	55	41	90
9/16/2015	--	--	--	36	--	18	--	26	--	7
9/17/2015	--	--	--	65	--	35	--	55	--	31
9/18/2015	--	--	--	48	--	38	--	60	--	39
9/19/2015	--	--	--	36	--	40	--	63	--	39
9/20/2015	--	--	--	25	--	24	--	32	--	25
9/21/2015	28	--	30	34	30	39	--	37	59	66
9/22/2015	--	--	--	30	--	32	--	23	--	22
9/23/2015	--	--	--	41	--	48	45	42	--	37
9/24/2015	--	--	--	47	--	44	--	50	--	51
9/25/2015	--	--	--	55	--	52	--	54	--	70
9/26/2015	--	--	--	46	--	42	--	53	--	54
9/27/2015	41	--	27	29	27	30	32	36	30	33
9/28/2015	--	--	--	32	--	34	--	33	--	56
9/29/2015	--	--	--	32	--	45	--	37	--	48
9/30/2015	--	--	--	50	--	46	--	48	--	69
10/1/2015	--	--	--	154	--	86	--	97	--	171
10/2/2015	--	--	--	43	--	34	--	45	--	43
10/3/2015	45	--	29	32	25	27	43	41	67	61
10/4/2015	--	--	--	166	--	45	--	250	--	110
10/5/2015	--	--	--	20	--	20	--	22	--	8
10/6/2015	--	--	--	22	--	20	--	20	--	17
10/7/2015	--	--	--	36	--	26	--	73	--	21
10/8/2015	--	--	--	36	--	28	--	48	--	48
10/9/2015	65	--	36	32	38	37	53	62	67	67
10/10/2015	--	--	--	29	--	43	--	42	--	43
10/11/2015	--	--	--	29	--	33	--	53	--	34
10/12/2015	--	--	--	43	--	50	--	57	--	38
10/13/2015	--	--	--	42	--	41	--	53	--	38
10/14/2015	--	--	--	44	--	33	--	47	--	41
10/15/2015	31	--	25	28	14	22	23	32	23	28
10/16/2015	--	--	--	14	--	15	--	10	--	5
10/17/2015	--	--	--	14	--	14	--	18	--	10
10/18/2015	--	--	--	27	--	23	--	68	--	55
10/19/2015	--	--	--	18	--	15	--	55	--	14
10/20/2015	--	--	--	24	--	21	--	37	--	19
10/21/2015	52	--	24	24	41	45	26	26	48	26
10/22/2015	--	--	--	27	--	42	--	32	--	82
10/23/2015	--	--	--	33	--	29	--	75	--	40
10/24/2015	--	--	--	27	--	21	--	26	--	33
10/25/2015	--	--	--	26	--	--	--	33	--	35

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
10/26/2015	--	--	--	30	--	33	--	38	--	28
10/27/2015	80	--	42	40	45	47	56	59	60	41
10/28/2015	--	--	--	68	--	47	--	69	--	69
10/29/2015	--	--	--	34	--	30	--	50	--	34
10/30/2015	--	--	--	80	--	104	--	127	--	47
10/31/2015	--	--	--	26	--	24	--	34	--	35
11/1/2015	--	--	--	43	--	55	--	39	--	41
11/2/2015	--	--	--	128	88	90	179	117	39	131
11/3/2015	--	--	--	66	--	36	--	74	--	43
11/4/2015	53	--	--	23	--	24	--	23	--	17
11/5/2015	--	--	23	24	--	20	--	32	--	18
11/6/2015	--	--	--	29	--	21	--	23	--	16
11/7/2015	--	--	--	20	--	18	--	28	--	19
11/8/2015	60	--	23	21	24	24	27	30	21	16
11/9/2015	--	--	--	60	--	71	--	53	--	88
11/10/2015	--	--	--	141	--	32	--	84	--	24
11/11/2015	--	--	--	21	--	15	--	28	--	25
11/12/2015	--	--	--	25	--	16	--	28	--	26
11/13/2015	--	--	--	34	--	24	--	28	--	43
11/14/2015	103	--	37	36	35	37	30	26	81	72
11/15/2015	--	--	--	85	--	45	--	66	--	73
11/16/2015	--	--	--	119	--	48	--	138	--	66
11/17/2015	--	--	--	38	--	37	--	39	--	33
11/18/2015	--	--	--	46	--	48	--	41	--	36
11/19/2015	--	--	--	35	--	39	--	34	--	30
11/20/2015	60	--	31	34	37	41	38	38	44	44
11/21/2015	--	--	--	26	--	26	--	30	--	29
11/22/2015	--	--	--	17	--	15	--	18	--	14
11/23/2015	--	--	--	50	--	51	--	40	--	42
11/24/2015	--	--	--	101	--	86	--	90	--	102
11/25/2015	--	--	--	215	--	93	--	139	--	193
11/26/2015	15	--	18	18	11	12	16	14	28	21
11/27/2015	--	--	--	14	--	11	--	11	--	15
11/28/2015	--	--	--	22	--	18	--	19	--	15
11/29/2015	--	--	--	19	--	18	--	14	--	14
11/30/2015	--	--	--	25	--	16	--	23	--	12
12/1/2015	--	--	--	26	--	18	--	21	--	17
12/2/2015	--	--	32	30	27	26	28	25	2	20
12/3/2015	--	--	--	27	--	33	--	23	--	15
12/4/2015	107	--	--	34	--	55	--	28	--	51
12/5/2015	--	--	--	28	--	20	--	23	--	20
12/6/2015	--	--	--	16	--	14	--	18	--	24
12/7/2015	--	--	--	34	--	33	--	27	--	30
12/8/2015	91	--	39	39	37	37	33	32	46	47
12/9/2015	--	--	--	53	--	56	--	50	--	42
12/10/2015	--	--	--	77	--	95	--	81	--	49
12/11/2015	--	--	--	84	--	79	--	82	--	89
12/12/2015	--	--	--	18	--	15	--	17	--	20
12/13/2015	--	--	--	48	--	23	--	44	--	53
12/14/2015	--	--	222	208	165	201	193	183	250	33
12/15/2015	--	--	--	19	--	18	--	27	--	26

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
12/16/2015	--	--	--	22	--	22	--	25	--	19
12/17/2015	--	--	--	31	--	32	--	30	--	15
12/18/2015	81	--	--	27	--	25	--	24	--	16
12/19/2015	--	--	--	24	--	29	--	30	--	39
12/20/2015	--	--	19	18	12	11	14	13	12	10
12/21/2015	--	--	--	26	--	30	--	26	--	16
12/22/2015	42	--	--	89	--	45	--	127	--	40
12/23/2015	--	--	--	30	--	17	--	50	--	24
12/24/2015	--	--	--	62	--	33	--	30	--	26
12/25/2015	--	--	--	72	--	71	--	80	--	21
12/26/2015	55	--	101	132	93	102	165	198	73	132
12/27/2015	--	--	--	16	--	22	--	18	--	26
12/28/2015	--	--	--	32	--	30	--	34	--	23
12/29/2015	--	--	--	10	--	26	--	23	--	12
12/30/2015	--	--	--	30	--	41	--	62	--	29
12/31/2015	--	--	--	26	--	31	--	29	--	18
1/1/2016	--	--	25	23	--	29	--	13	21	16
1/2/2016	--	--	--	45	--	34	--	52	--	41
1/3/2016	--	--	--	44	--	22	--	31	--	46
1/4/2016	--	--	--	23	--	30	--	25	--	17
1/5/2016	22	--	--	20	--	26	--	20	--	12
1/6/2016	--	--	--	9	--	9	--	18	--	16
1/7/2016	5	--	6	4	--	4	--	3	4	2
1/8/2016	--	--	--	21	--	21	--	13	--	7
1/9/2016	--	--	--	23	--	24	--	18	--	9
1/10/2016	--	--	--	22	--	27	--	23	--	10
1/11/2016	--	--	--	19	--	18	--	13	--	4
1/12/2016	--	--	--	19	--	15	--	12	--	3
1/13/2016	40	--	34	29	--	31	--	19	11	9
1/14/2016	--	--	--	--	--	45	--	25	--	9
1/15/2016	--	124	--	--	--	150	--	60	--	28
1/16/2016	--	37	--	--	--	26	--	23	--	23
1/17/2016	--	40	--	--	--	22	--	18	--	14
1/18/2016	--	103	--	--	--	46	--	28	--	19
1/19/2016	66	71	35	--	--	47	--	30	19	18
1/20/2016	--	58	--	--	--	28	--	18	--	12
1/21/2016	--	58	--	--	--	23	--	22	--	8
1/22/2016	--	65	--	--	--	25	--	21	--	6
1/23/2016	--	43	--	--	--	25	--	20	--	17
1/24/2016	--	46	--	--	--	14	--	12	--	9
1/25/2016	--	49	21	--	--	23	--	14	11	11
1/26/2016	--	45	--	--	--	19	--	14	--	10
1/27/2016	--	46	--	--	--	23	--	20	--	20
1/28/2016	--	52	--	34	--	31	--	24	--	11
1/29/2016	--	85	--	38	--	45	--	33	--	23
1/30/2016	--	95	--	72	--	80	--	66	--	64
1/31/2016	--	93	218	167	--	48	--	251	225	227
2/1/2016	--	48	--	135	--	40	--	141	--	55
2/2/2016	--	43	--	22	--	27	--	26	--	11
2/3/2016	--	42	--	21	--	24	--	19	--	9
2/4/2016	--	31	--	20	--	15	--	18	--	8

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
2/5/2016	--	33	--	19	--	17	--	16	--	15
2/6/2016	--	17	18	15	--	9	--	11	13	8
2/7/2016	--	27	--	13	--	10	--	11	--	9
2/8/2016	--	23	--	23	--	20	--	21	--	10
2/9/2016	--	44	--	27	--	21	--	23	--	17
2/10/2016	--	44	--	35	--	26	--	31	--	18
2/11/2016	--	63	--	33	--	28	--	24	--	17
2/12/2016	--	66	42	39	--	32	--	40	18	15
2/13/2016	--	42	--	35	--	34	--	32	--	26
2/14/2016	--	24	--	30	--	18	--	25	--	19
2/15/2016	--	27	--	25	--	19	--	23	--	14
2/16/2016	--	66	--	30	--	34	--	32	--	15
2/17/2016	--	97	--	88	--	58	--	117	--	67
2/18/2016	--	76	52	56	--	42	--	48	20	23
2/19/2016	--	39	--	26	--	25	--	19	--	11
2/20/2016	--	51	--	27	--	34	--	20	--	12
2/21/2016	--	33	--	23	--	19	--	21	--	15
2/22/2016	--	77	--	51	--	42	--	47	--	34
2/23/2016	--	62	--	35	--	37	--	42	--	21
2/24/2016	--	44	32	28	--	23	--	26	17	14
2/25/2016	--	59	--	34	--	24	--	46	--	14
2/26/2016	--	73	--	33	--	30	--	40	--	17
2/27/2016	--	85	--	39	--	45	--	31	--	25
2/28/2016	--	91	--	48	--	46	--	34	--	44
2/29/2016	--	124	--	52	--	71	--	51	--	53
3/1/2016	--	115	64	72	--	83	--	77	48	52
3/2/2016	--	89	--	55	--	51	--	45	--	43
3/3/2016	--	69	--	47	--	40	--	40	--	46
3/4/2016	--	54	--	70	--	38	--	86	--	69
3/5/2016	--	58	--	51	--	47	--	68	--	56
3/6/2016	--	64	--	204	--	86	--	149	--	124
3/7/2016	--	42	72	45	--	26	--	32	38	41
3/8/2016	--	18	--	12	--	16	--	11	--	8
3/9/2016	--	28	--	24	--	11	--	31	--	15
3/10/2016	--	48	--	30	--	24	--	25	--	20
3/11/2016	--	89	--	178	--	47	--	179	--	140
3/12/2016	--	31	--	63	--	15	--	31	--	46
3/13/2016	--	32	44	45	--	26	--	37	48	54
3/14/2016	--	23	--	40	--	20	--	41	--	37
3/15/2016	--	57	--	41	--	32	--	39	--	24
3/16/2016	--	52	--	40	--	30	--	40	--	43
3/17/2016	--	52	--	38	--	34	--	27	--	56
3/18/2016	--	65	--	42	--	51	--	38	--	72
3/19/2016	--	60	28	31	--	43	--	29	45	45
3/20/2016	--	41	--	25	--	20	--	20	--	40
3/21/2016	--	76	--	65	--	50	--	55	--	117
3/22/2016	--	109	--	142	--	46	--	110	--	116
3/23/2016	--	37	--	30	--	23	--	32	--	33
3/24/2016	--	51	--	25	--	19	--	18	--	19
3/25/2016	--	43	33	32	--	25	--	32	45	40
3/26/2016	--	54	--	48	--	49	--	29	--	27

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
3/27/2016	--	39	--	27	--	30	--	24	--	27
3/28/2016	--	138	--	274	--	183	--	177	--	--
3/29/2016	--	58	--	104	--	40	--	110	--	79
3/30/2016	--	19	--	16	--	12	--	21	--	12
3/31/2016	--	29	26	26	--	13	--	29	22	25
4/1/2016	--	44	--	23	--	22	--	28	--	32
4/2/2016	--	58	--	31	--	44	--	29	--	31
4/3/2016	--	35	--	23	--	22	--	24	--	30
4/4/2016	--	42	--	34	--	32	--	41	--	44
4/5/2016	--	75	--	47	--	43	--	39	--	47
4/6/2016	--	65	55	57	--	40	--	54	47	54
4/7/2016	--	37	--	57	--	17	--	76	--	45
4/8/2016	--	13	--	8	--	7	--	8	--	5
4/9/2016	--	13	--	11	--	9	--	18	--	11
4/10/2016	--	12	--	4	--	10	--	5	--	5
4/11/2016	--	18	--	10	--	13	--	8	--	9
4/12/2016	--	19	11	13	--	11	--	9	8	8
4/13/2016	--	39	--	30	--	25	--	21	--	33
4/14/2016	--	61	--	113	--	48	--	163	--	118
4/15/2016	--	53	--	84	--	55	--	89	--	75
4/16/2016	--	31	--	34	--	18	--	26	--	14
4/17/2016	--	36	--	24	--	30	--	18	--	29
4/18/2016	--	47	30	27	--	21	--	22	20	21
4/19/2016	--	58	--	33	--	33	--	35	--	35
4/20/2016	--	48	--	34	--	35	--	32	--	42
4/21/2016	--	55	--	38	--	49	--	44	--	44
4/22/2016	--	87	--	134	--	85	--	192	--	115
4/23/2016	--	43	--	62	--	63	--	33	--	32
4/24/2016	--	65	186	184	--	48	--	141	96	126
4/25/2016	--	173	--	285	--	151	--	244	--	225
4/26/2016	--	47	--	28	--	34	--	29	--	25
4/27/2016	--	99	--	141	--	68	--	75	--	136
4/28/2016	--	69	--	75	--	53	--	128	--	63
4/29/2016	--	35	--	44	--	23	--	36	--	43
4/30/2016	--	45	44	42	--	38	--	72	25	31
5/1/2016	--	24	--	13	--	20	--	17	--	12
5/2/2016	--	35	--	38	--	59	--	30	--	22
5/3/2016	--	41	--	37	--	28	--	20	--	19
5/4/2016	--	45	--	41	--	42	--	53	--	50
5/5/2016	--	125	--	163	--	85	--	227	--	135
5/6/2016	--	18	25	23	--	11	--	30	12	13
5/7/2016	--	16	--	7	--	10	--	16	--	24
5/8/2016	--	15	--	10	--	8	--	24	--	15
5/9/2016	--	32	--	22	--	22	--	23	--	35
5/10/2016	--	34	--	26	--	32	--	26	--	43
5/11/2016	--	45	--	30	--	40	--	35	--	28
5/12/2016	--	44	35	35	--	45	--	41	37	41
5/13/2016	--	49	--	31	--	42	--	34	--	29
5/14/2016	--	50	--	77	--	45	--	84	--	123
5/15/2016	--	57	--	59	--	67	--	100	--	216
5/16/2016	--	40	--	59	--	44	--	103	--	90

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
5/17/2016	--	55	--	43	--	44	--	55	--	55
5/18/2016	--	44	18	20	--	31	--	17	30	25
5/19/2016	--	50	--	95	--	34	--	90	--	66
5/20/2016	--	159	--	--	--	74	--	--	--	211
5/21/2016	--	226	--	199	--	185	--	93	--	113
5/22/2016	--	46	--	47	--	20	--	53	--	53
5/23/2016	--	35	--	81	--	44	--	105	--	77
5/24/2016	--	67	144	154	--	50	--	148	74	103
5/25/2016	--	78	--	165	--	--	--	119	--	76
5/26/2016	--	33	--	26	--	--	--	38	--	38
5/27/2016	--	47	--	39	--	38	--	34	--	46
5/28/2016	--	43	--	39	--	48	--	37	--	45
5/29/2016	--	35	--	27	--	30	--	26	--	33
5/30/2016	--	41	30	30	--	38	--	30	31	34
5/31/2016	--	57	--	46	--	66	--	51	--	54
6/1/2016	--	59	--	51	--	51	--	44	--	58
6/2/2016	--	67	--	50	--	57	--	42	--	61
6/3/2016	--	55	--	37	--	43	--	38	--	38
6/4/2016	--	34	--	70	--	35	--	55	--	38
6/5/2016	--	36	108	121	--	38	--	64	79	96
6/6/2016	--	49	--	58	--	38	--	42	--	55
6/7/2016	--	56	--	48	--	56	--	49	--	70
6/8/2016	--	63	--	56	--	61	--	55	--	51
6/9/2016	--	60	--	48	--	55	--	50	--	51
6/10/2016	--	59	--	56	--	59	--	56	--	56
6/11/2016	--	62	58	65	--	64	--	68	63	78
6/12/2016	--	32	--	66	--	31	--	82	--	50
6/13/2016	--	44	--	22	--	24	--	32	--	32
6/14/2016	--	51	--	49	--	46	--	57	--	72
6/15/2016	--	124	--	106	--	68	--	112	--	105
6/16/2016	--	51	--	33	--	39	--	55	--	51
6/17/2016	--	63	38	40	--	45	--	55	29	35
6/18/2016	--	43	--	50	--	28	--	50	--	24
6/19/2016	--	22	--	23	--	20	--	26	--	18
6/20/2016	--	75	--	76	--	79	--	69	--	72
6/21/2016	--	62	--	69	--	77	--	67	--	79
6/22/2016	--	66	--	101	--	66	--	65	--	98
6/23/2016	--	76	51	58	--	71	--	55	58	67
6/24/2016	--	67	--	53	--	64	--	53	--	50
6/25/2016	--	59	--	49	--	53	--	47	--	44
6/26/2016	--	54	--	51	--	55	--	49	--	46
6/27/2016	--	55	--	52	--	47	--	48	--	50
6/28/2016	--	64	--	58	--	57	--	65	--	81
6/29/2016	--	84	65	73	--	80	--	74	70	92
6/30/2016	--	64	--	59	--	53	--	55	--	64
7/1/2016	--	41	--	44	--	40	--	42	--	49
7/2/2016	--	61	--	51	--	55	--	48	--	50
7/3/2016	--	51	--	37	--	38	--	33	--	54
7/4/2016	--	40	--	67	--	33	--	95	--	68
7/5/2016	--	62	80	89	--	50	--	85	73	85
7/6/2016	--	77	--	64	--	66	--	83	--	93

EEC ORIGINAL PKG

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m³)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
7/7/2016	--	61	--	39	--	40	--	40	--	56
7/8/2016	--	49	--	42	--	38	--	42	--	64
7/9/2016	--	60	--	63	--	52	--	49	--	50
7/10/2016	--	66	--	117	--	39	--	66	--	116
7/11/2016	--	48	48	54	--	60	--	76	48	54
7/12/2016	--	60	--	33	--	43	--	45	--	76
7/13/2016	--	66	--	51	--	55	--	45	--	50
7/14/2016	--	55	--	48	--	43	--	51	--	58
7/15/2016	--	67	--	59	--	59	--	57	--	70
7/16/2016	--	68	--	56	--	59	--	48	--	65
7/17/2016	--	75	61	68	--	65	--	72	53	68
7/18/2016	--	62	--	45	--	38	--	48	--	51
7/19/2016	--	47	--	52	--	45	--	58	--	47
7/20/2016	--	46	--	44	--	44	--	51	--	54
7/21/2016	--	50	--	39	--	38	--	34	--	48
7/22/2016	--	63	--	56	--	60	--	57	--	55
7/23/2016	--	195	129	144	--	203	--	137	111	147
7/24/2016	--	194	--	155	--	126	--	164	--	131
7/25/2016	--	49	--	40	--	42	--	37	--	37
7/26/2016	--	47	--	50	--	50	--	50	--	66
7/27/2016	--	43	--	46	--	37	--	49	--	46
7/28/2016	--	61	--	48	--	51	--	55	--	65
7/29/2016	--	69	92	87	--	66	--	54	82	79
7/30/2016	--	158	--	195	--	171	--	201	--	168
7/31/2016	--	33	--	27	--	31	--	23	--	31
8/1/2016	--	37	--	34	--	33	--	30	--	42
8/2/2016	--	35	--	44	--	35	--	38	--	43
8/3/2016	--	37	--	42	--	36	--	50	--	44
8/4/2016	--	40	39	36	--	39	--	38	48	50
8/5/2016	--	43	--	48	--	46	--	55	--	58
8/6/2016	--	47	--	39	--	40	--	37	--	44
8/7/2016	--	36	--	33	--	31	--	56	--	48
8/8/2016	--	84	--	62	--	94	--	74	--	75
8/9/2016	--	155	--	141	--	159	--	166	--	167
8/10/2016	--	--	43	40	--	40	--	44	38	44
8/11/2016	--	43	--	27	--	30	--	27	--	31
8/12/2016	--	46	--	27	--	34	--	31	--	26
8/13/2016	--	53	--	36	--	38	--	44	--	34
8/14/2016	--	49	--	34	--	33	--	32	--	40
8/15/2016	--	48	--	33	--	33	--	37	--	38
8/16/2016	--	51	38	35	--	47	--	45	39	39
8/17/2016	--	94	--	82	--	99	--	99	--	105
8/18/2016	--	55	--	63	--	50	--	86	--	60
8/19/2016	--	114	--	119	--	105	--	126	--	151
8/20/2016	--	89	--	84	--	89	--	82	--	93
8/21/2016	--	138	--	113	--	170	--	118	--	76
8/22/2016	--	42	58	66	--	33	--	75	57	69
8/23/2016	--	46	--	42	--	46	--	48	--	70
8/24/2016	--	58	--	46	--	60	--	49	--	56
8/25/2016	--	77	--	68	--	73	--	75	--	73
8/26/2016	--	53	--	42	--	44	--	40	--	46

EEC ORIGINAL PKG

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	**60250005**	**60250005**	**60250007**	**60250007**	**60251003**	**60251003**	**60254003**	**60254003**	**60254004**	**60254004**
8/27/2016	--	34	--	45	--	39	--	41	--	30
8/28/2016	--	41	24	23	--	30	--	21	27	25
8/29/2016	--	54	--	48	--	36	--	44	--	32
8/30/2016	--	62	--	55	--	47	--	52	--	60
8/31/2016	--	63	--	62	--	72	--	68	--	83
9/1/2016	--	52	--	53	--	52	--	49	--	95
9/2/2016	--	44	--	52	--	40	--	44	--	64
9/3/2016	--	97	275	119	--	174	--	130	--	97
9/4/2016	--	69	--	81	--	39	--	72	--	73
9/5/2016	--	33	--	44	--	28	--	52	--	43
9/6/2016	--	65	--	49	--	54	--	54	--	49
9/7/2016	--	52	--	47	--	49	--	46	--	41
9/8/2016	--	41	--	36	--	40	--	35	--	30
9/9/2016	--	51	37	33	--	38	--	37	33	32
9/10/2016	--	49	--	39	--	31	--	34	--	38
9/11/2016	--	31	--	56	--	27	--	53	--	42
9/12/2016	--	82	--	232	--	106	--	164	--	75
9/13/2016	--	180	--	160	--	179	--	82	--	93
9/14/2016	--	42	--	28	--	29	--	25	--	17
9/15/2016	--	48	36	33	--	32	--	28	27	24
9/16/2016	--	66	--	55	--	49	--	65	--	40
9/17/2016	--	49	--	48	--	37	--	43	--	39
9/18/2016	--	45	--	33	--	26	--	27	--	25
9/19/2016	--	129	--	99	--	110	--	141	--	104
9/20/2016	--	20	--	12	--	12	--	11	--	9
9/21/2016	--	19	10	9	--	10	--	7	8	6
9/22/2016	--	82	--	89	--	82	--	102	--	144
9/23/2016	--	71	--	52	--	50	--	41	--	54
9/24/2016	--	27	--	30	--	20	--	25	--	15
9/25/2016	--	30	--	37	--	30	--	21	--	12
9/26/2016	--	54	--	54	--	56	--	45	--	36
9/27/2016	--	39	40	40	--	46	--	33	35	36
9/28/2016	--	47	--	30	--	37	--	25	--	24
9/29/2016	--	53	--	28	--	36	--	49	--	48
9/30/2016	--	46	--	28	--	24	--	32	--	37
10/1/2016	--	33	--	24	--	27	--	28	--	26
10/2/2016	--	119	--	86	--	67	--	137	--	84
10/3/2016	--	55	79	95	--	57	--	76	--	60
10/4/2016	--	41	--	35	--	30	--	31	--	41
10/5/2016	--	51	--	--	--	33	--	39	29	30
10/6/2016	--	48	--	44	--	33	--	37	--	30
10/7/2016	--	62	--	33	--	28	--	26	--	29
10/8/2016	--	39	--	30	--	27	--	27	--	24
10/9/2016	--	40	32	30	--	31	--	32	26	23
10/10/2016	--	54	--	40	--	58	--	43	--	41
10/11/2016	--	56	--	37	--	37	--	43	--	30
10/12/2016	--	74	--	43	--	53	--	45	--	50
10/13/2016	--	78	--	50	--	47	--	44	--	45
10/14/2016	--	90	--	67	--	55	--	60	--	57
10/15/2016	--	54	38	38	--	43	--	39	34	36
10/16/2016	--	51	--	26	--	28	--	25	--	38

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Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (µg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
10/17/2016	--	44	--	44	--	20	--	41	--	38
10/18/2016	--	51	--	41	--	32	--	36	--	26
10/19/2016	--	59	--	43	--	35	--	28	--	21
10/20/2016	--	63	--	33	--	35	--	32	--	20
10/21/2016	--	76	48	45	--	44	--	38	31	30
10/22/2016	--	101	--	61	--	70	--	56	--	50
10/23/2016	--	45	--	29	--	38	--	30	--	34
10/24/2016	--	83	--	36	--	47	--	29	--	26
10/25/2016	--	29	--	21	--	19	--	17	--	10
10/26/2016	--	38	--	30	--	24	--	20	--	16
10/27/2016	--	51	29	27	--	31	--	35	17	13
10/28/2016	--	115	--	49	--	65	--	40	--	30
10/29/2016	--	64	--	39	--	38	--	33	--	23
10/30/2016	--	62	--	162	--	79	--	124	--	58
10/31/2016	--	48	--	23	--	23	--	28	--	16
11/1/2016	--	33	--	38	--	25	--	39	--	32
11/2/2016	--	46	36	30	--	23	--	20	33	10
11/3/2016	--	103	--	68	--	91	--	39	--	34
11/4/2016	--	133	--	107	--	82	--	103	--	68
11/5/2016	--	78	--	39	--	29	--	32	--	28
11/6/2016	--	69	--	27	--	28	--	24	--	22
11/7/2016	--	61	--	47	--	39	--	35	--	30
11/8/2016	--	54	33	33	--	30	--	25	24	22
11/9/2016	--	63	--	37	--	34	--	36	--	17
11/10/2016	--	61	--	46	--	39	--	73	--	21
11/11/2016	--	45	--	41	--	45	--	41	--	23
11/12/2016	--	40	--	38	--	30	--	28	--	37
11/13/2016	--	--	--	32	--	22	--	30	--	27
11/14/2016	--	--	39	35	--	32	--	37	--	17
11/15/2016	--	85	--	55	--	67	--	52	--	32
11/16/2016	--	136	--	105	--	128	--	101	76	57
11/17/2016	--	70	--	85	--	59	--	83	--	60
11/18/2016	--	67	--	35	--	29	--	31	--	16
11/19/2016	--	67	--	31	--	26	--	31	--	19
11/20/2016	--	98	37	36	--	51	--	37	30	32
11/21/2016	--	31	--	13	--	21	--	26	--	11
11/22/2016	--	28	--	20	--	19	--	15	--	12
11/23/2016	--	31	--	23	--	23	--	20	--	12
11/24/2016	--	21	--	20	--	26	--	16	--	9
11/25/2016	--	32	--	36	--	28	--	31	--	20
11/26/2016	--	92	88	98	--	53	--	135	65	91
11/27/2016	--	70	--	43	--	21	--	30	--	11
11/28/2016	--	31	--	39	--	39	--	30	--	39
11/29/2016	--	50	--	29	--	27	--	27	--	15
11/30/2016	--	58	--	31	--	33	--	19	--	11
12/1/2016	--	76	--	34	--	36	--	25	--	10
12/2/2016	--	50	39	47	--	49	--	51	20	24
12/3/2016	--	51	--	30	--	37	--	37	--	15
12/4/2016	--	55	--	15	--	24	--	12	--	14
12/5/2016	--	104	--	48	--	73	--	40	--	17
12/6/2016	--	93	--	58	--	57	--	54	--	45

Table C-1. 2014-2016 Monitoring Data for Imperial County
Imperial County 2018 PM_{10} Plan

Date	PM_{10} Concentration (μg/m^3)									
	Calexico - Ethel		Brawley		El Centro		Westmorland		Niland	
	POC 1	POC 3	POC 1	POC 3	POC 2	POC 4	POC 1	POC 3	POC 1	POC 3
Station ID	60250005	60250005	60250007	60250007	60251003	60251003	60254003	60254003	60254004	60254004
12/7/2016	--	52	--	40	--	33	--	39	--	32
12/8/2016	--	54	38	35	--	38	--	27	18	15
12/9/2016	--	65	--	41	--	40	--	32	--	23
12/10/2016	--	87	--	46	--	45	--	38	--	36
12/11/2016	--	87	--	53	--	57	--	44	--	33
12/12/2016	--	76	--	42	--	56	--	33	--	34
12/13/2016	--	91	--	53	--	56	--	43	--	29
12/14/2016	--	69	42	41	--	46	--	36	24	21
12/15/2016	--	93	--	61	--	69	--	67	--	37
12/16/2016	--	238	--	232	--	207	--	198	--	278
12/17/2016	--	102	--	77	--	118	--	95	--	22
12/18/2016	--	25	--	21	--	14	--	14	--	16
12/19/2016	--	28	--	25	--	27	--	22	--	8
12/20/2016	--	38	38	27	--	27	--	25	19	18
12/21/2016	--	31	--	18	--	23	--	20	--	13
12/22/2016	--	13	--	2	--	5	--	2	--	1
12/23/2016	--	27	--	12	--	24	--	16	--	6
12/24/2016	--	14	--	11	--	15	--	14	--	12
12/25/2016	--	24	--	8	--	11	--	6	--	4
12/26/2016	--	15	15	12	--	10	--	8	--	4
12/27/2016	--	38	--	20	--	18	--	12	--	5
12/28/2016	--	34	--	28	--	21	--	19	12	8
12/29/2016	--	43	--	35	--	27	--	27	--	13
12/30/2016	--	44	--	27	--	25	--	20	--	18
12/31/2016	--	38	--	18	--	28	--	18	--	12

Notes:
Data obtained from United States Environmental Protection Agency Outdoor Air Quality Data. Available at: https://www.epa.gov/outdoor-air-quality-data/download-daily-data. Accessed: October 2017.

Abbreviations:
POC - parameter occurrence code

EEC ORIGINAL PKG

Table C-2. 2014-2016 Monitoring Data Completeness
Imperial County 2018 PM_{10} Plan

Year	Monitoring Frequency	AQS Site ID	Name	POC	% Complete
2014	Continuous	60250007	Brawley-Main Street	3	99
2014	Continuous	60254004	Niland-English Road	3	96
2014	Intermittent	60250005	Calexico-Ethel Street	1	95
2014	Intermittent	60250007	Brawley-Main Street	1	86
2014	Intermittent	60251003	El Centro-9th Street	2	98
2014	Intermittent	60254003	Westmorland North	1	96
2014	Intermittent	60254004	Niland-English Road	1	93
2015	Continuous	60250007	Brawley-Main Street	3	98
2015	Continuous	60251003	El Centro-9th Street	4	91
2015	Continuous	60254003	Westmorland North	3	91
2015	Continuous	60254004	Niland-English Road	3	99
2015	Intermittent	60250005	Calexico-Ethel Street	1	98
2015	Intermittent	60250007	Brawley-Main Street	1	96
2015	Intermittent	60251003	El Centro-9th Street	2	98
2015	Intermittent	60254003	Westmorland North	1	93
2015	Intermittent	60254004	Niland-English Road	1	100
2016	Continuous	60250005	Calexico-Ethel Street	3	99
2016	Continuous	60250007	Brawley-Main Street	3	95
2016	Continuous	60251003	El Centro-9th Street	4	99
2016	Continuous	60254003	Westmorland North	3	99
2016	Continuous	60254004	Niland-English Road	3	100
2016	Intermittent	60250005	Calexico-Ethel Street	1	100
2016	Intermittent	60250007	Brawley-Main Street	1	100
2016	Intermittent	60254004	Niland-English Road	1	98

Notes:
1. Continuous monitoring refers to the collection of measurements once per day. Intermittent monitoring refers to the collection of measurements once every six days.
2. Data compiled from USEPA AMP600 certification reports.

Abbreviations:
AQS - Air Quality System
POC - parameter occurrence code
USEPA - United States Environmental Protection Agency

Appendix D
2014-2016 Documented Exceptional Events for Imperial County

EEC ORIGINAL PKG

Monitoring Site	AQS No.	POC	Date	PM_{10} Concentration (µg/m^3)	Documentation Status	Event Description
Brawley	06-025-0007	3	01/31/2014	198	Submitted to CARB	Predominantly west-southwest winds with gusts as high as 38 mph.
Westmorland	06-025-4003	1	02/28/2014	294	Submitted to CARB	Predominantly south southwest with gusts as high as 41 mph.
Brawley	06-025-0007	3	03/17/2014	190	Submitted to CARB	Predominantly southwest winds with gusts as high as 31 mph.
Brawley	06-025-0007	3	03/26/2014	374	Submitted to CARB	Predominantly west winds with gusts as high as 43 mph.
Niland	06-025-4004	3	03/26/2014	279		
Brawley	06-025-0007	1	03/30/2014	220	Submitted to CARB	Predominantly west southwest winds with gusts as high as 36 mph.
Brawley	06-025-0007	3	04/01/2014	160		Predominantly west southwest winds with gusts as high as 34 mph.
Niland	06-025-4004	3	04/12/2014	167	Submitted to CARB	Predominantly west winds with gusts as high as 25 mph.
Brawley	06-025-0007	3	04/13/2014	166		
Brawley	06-025-0007	3	04/25/2014	184	Submitted to CARB	Predominantly west southwest winds with gusts as high as 42 mph.
Brawley	06-025-0007	3	04/26/2014	312		Predominantly west winds with gusts as high as 40 mph.
Brawley	06-025-0007	1	05/05/2014	269	Submitted to CARB	Predominantly west southwest winds with gusts as high as 40 mph.
Westmorland	06-025-4003	1	05/05/2014	375		Predominantly west southwest winds with gusts as high as 40 mph.
Brawley	06-025-0007	3	05/05/2014	222		Predominantly west southwest winds with gusts as high as 40 mph.
Brawley	06-025-0007	3	05/06/2014	438		Predominantly west winds with gusts as high as 51 mph.
Niland	06-025-4004	3	05/11/2014	172	Submitted to CARB	Predominantly west winds with gusts as high as 25 mph.
Brawley	06-025-0007	3	05/20/2014	250	Submitted to CARB	Predominantly west southwest winds with gusts as high as 38 mph.
Brawley	06-025-0007	3	06/26/2014	185	Submitted to CARB	Predominantly west southwest winds with gusts as high as 36 mph.
Westmorland	06-025-4003	1	07/16/2014	167	Submitted to CARB	Predominantly west southwest winds with gusts as high as 30 mph.
Niland	06-025-4004	3	08/18/2014	161	Submitted to CARB	Predominantly southeast winds with gusts as high as 41 mph.
Brawley	06-025-0007	3	09/27/2014	219	Submitted to CARB	Predominantly west southwest winds with gusts as high as 39 mph.
Niland	06-025-4004	3	10/31/2014	181	Submitted to CARB	Predominantly west southwest winds with gusts as high as 23 mph.
Brawley	06-025-0007	1	11/01/2014	471		Predominantly west southwest winds with gusts as high as 40 mph.
Westmorland	06-025-4003	1	11/01/2014	404		Predominantly west southwest winds with gusts as high as 40 mph.
Niland	06-025-4004	1	11/01/2014	173		Predominantly west southwest winds with gusts as high as 40 mph.
Niland	06-025-4004	3	11/01/2014	218		Predominantly west southwest winds with gusts as high as 40 mph.
Brawley	06-025-0007	3	11/16/2014	210	Submitted to CARB	Predominantly south southwest winds with gusts as high as 34 mph.
Niland	06-025-4004	3	11/16/2014	248		
Niland	06-025-4004	3	04/24/2015	168	Submitted to CARB	According to the weather briefing issued by the National Weather Service on April 24, 2015 unsettled weather occurred within the southeast desert region of California affecting Imperial County. As a result of the unsettled weather the NWS issued a "Wind Advisory" indicating that elevated winds were expected for April 24, 2015. West wind 10 to 20mph in the morning increasing to 20 to 30mph in the afternoon. Gusts up to 40mph in the afternoon. Affected areas include Southeast California including El Centro, Plaster City, Blythe, Desert Center, Joshua Tree National Park and additional locations along the Interstate 8 and 10 corridors.
Niland	06-025-4004	3	05/07/2015	210	Submitted to CARB	According to the National Weather Service Zone forecast and Wind Advisory, Sustained west southwest winds 25 to 30mph with strong gusts 40 to 45mph. Strong gusts were expected to create hazardous crosswinds and potentially reduce visibilities due to blowing dust. Affected areas include Southeast California including El Centro, Plaster City, Blythe, Desert Center, Joshua Tree National Park and additional locations along the Interstate 8 and 10 corridors.
Brawley	06-025-0007	1	05/18/2015	304	Submitted to CARB	According to the National Weather Service Zone forecast west winds 5 to 25mph throughout the day with evening gusts up to 30mph. Affected areas include Southeast California including Brawley, Calexico, El Centro, Glamis, Imperial and the Salton Sea.
Brawley	06-025-0007	3	05/21/2015	225	Submitted to CARB	According to the National Weather Service issued wind advisory west winds 15 to 25mph with gusts up to 40mph were expected in the afternoon. Affected areas included cities of Brawley, Calexico, El Centro, Glamis, Imperial and the Salton Sea
Niland	06-025-4004	3	05/21/2015	171		
Brawley	06-025-0007	3	05/22/2015	227		
Niland	06-025-4004	3	06/30/2015	183	Submitted to CARB	According to NOAA's National Climatic Centers an early-season monsoon pattern set up across the southwest U.S., bringing several days of enhanced mid-level moisture from the southeast. A disturbance moving through Baja on the 30th produced an active day of thunderstorms over southern California, reaching all the way to the coast with prolific lightning and rainfall for several areas. Lightning sparked a few small fires near Poway and La Mesa. The National Weather Service issued a weather briefing for the Arizona Desert area.

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Imperial County 2018 PM_{10} Plan

Monitoring Site	AQS No.	POC	Date	PM_{10} Concentration ($\mu g/m^3$)	Documentation Status	Event Description
Niland	06-025-4004	3	07/08/2015	166	Submitted to CARB	According to NOAA's National Climatic Centers an unseasonable upper level low moving in from the Pacific helped trigger thunderstorms over eastern California and adjacent areas of western Nevada. Isolated severe weather and flash flooding occurred. The National Weather Service zone forecast indicated west winds 10 to 15mph becoming southwest 15 to 25mph in the afternoon with gusts up to 35mph
Brawley	06-025-0007	3	09/14/2015	168	Submitted to CARB	According to a High Wind Advisory issued for the Coachella Valley - a low pressure system from the Gulf of Alaska produced periods of strong and gusty west winds to the Coachella Valley and Riverside county mountains. Area west winds from 20 to 30mph with gusts to 45mphs were predicted. The area identified in the wind advisory included the San Diego County Deserts along the desert mountain slopes an into the adjacent desert areas which border the Imperial County Deserts.
Niland	06-025-4004	3	10/01/2015	171	Submitted to CARB	According to a High Wind Advisory issued for both Imperial County and the Coachella Valley - a low pressure system from the Gulf of Alaska produced periods of strong and gusty west winds to the Imperial and Coachella Valleys and Riverside county mountains. Area west winds from 20 to 30mph with gusts to 45mphs were predicted. The issued wind advisory identified Imperial County, including the cities of Brawley, Calexico, El Centro, Glamis, Imperial and the Salton Sea.
Westmorland	06-025-4003	3	10/04/2015	250	Submitted to CARB	According to zone forecast issued by the National Weather Service conditions were breezy with southwest winds 10 to 15mph becoming west 15 to 25 in the afternoon. Imperial County including Brawley, Calexico, El Centro, Glamis, Imperial and the Salton Sea
Brawley	06-025-0007	3	10/04/2015	166		
Westmorland	06-025-4003	1	11/02/2015	179	Submitted to CARB	The National Weather Service in Phoenix issued a wind advisory for west winds at 30 to 40mph with occasional gust around 50 affecting Imperial County including El Centro, Imperial and the Salton Sea
Niland	06-025-4004	3	11/25/2015	193	Submitted to CARB	The National Weather Service in Phoenix and San Diego synopsis indicated that a chilly Pacific weather system (low pressure system) would be moving into the desert southwest bringing cooler temperatures, breezy conditions, more cloud cover and a slight chance for light mountain showers. The low pressure system over the great basin and southwest states brought cooler weather and a few periods of mainly light showers through Friday with gusty west winds in the mountains and deserts
Brawley	06-025-0007	3	11/25/2015	215		
Brawley	06-025-0007	1	12/14/2015	222	Submitted to CARB	The NWS issued high wind warnings for the San Diego mountain and desert areas while only issuing a Freeze alert for Imperial County. "Low pressure aloft will slowly move east today and result in a continued weakening of the winds," according to the weather service. "The low pressure system will leave behind a cold air mass which will result in areas of frost tonight in the valleys as temperatures fall to 30 to 35 degrees in many locations. Peak wind gusts recorded between Sunday evening and Monday morning were 59 mph in Borrego Springs; 55 mph in Boulevard and Ocotillo Wells; 50 mph in In-Koh-Pah. Gusts of less than 45 mph were noted in numerous other areas.
El Centro	06-025-1003	2	12/14/2015	165		
Westmorland	06-025-4003	1	12/14/2015	193		
Niland	06-025-4004	1	12/14/2015	250		
Westmorland	06-025-4003	3	12/14/2015	183		
Brawley	06-025-0007	3	12/14/2015	208		
El Centro	06-025-1003	4	12/14/2015	201		
Westmorland	06-025-4003	1	12/26/2015	165	Submitted to CARB	The NWS issued high wind warnings for the San Diego mountain and desert areas while only issuing a Freeze alert for Imperial County. "Low pressure aloft will slowly move east today and result in a continued weakening of the winds," according to the weather service. "The low pressure system will leave behind a cold air mass which will result in areas of frost tonight in the valleys as temperatures fall to 30 to 35 degrees in many locations. Peak wind gusts recorded between Sunday evening and Monday morning were 59 mph in Borrego Springs; 55 mph in Boulevard and Ocotillo Wells; 50 mph in In-Koh-Pah. Gusts of less than 45 mph were noted in numerous other areas.
Westmorland	06-025-4003	3	12/26/2015	198		
Brawley	06-025-0007	1	01/31/2016	218	Submitted to CARB	The NWS issued a Wind Advisory for a wide portion of southeast CA for warning of winds up to 35 mph and gusts up to 50 mph. Blowing dust was also expected.
Niland	06-025-4004	1	01/31/2016	225		
Brawley	06-025-0007	3	01/31/2016	236		
Niland	06-025-4004	3	01/31/2016	259		
Westmorland	06-025-4003	3	01/31/2016	344		
Brawley	06-025-0007	3	02/01/2016	207		
Brawley	06-025-0007	3	03/06/2016	237	Submitted to CARB	The NWS issued a Blowing Dust Advisory for southeast CA and the Yuma, Arizona area. West winds of 20 to 30 mph were expected with gusts up to 40 to 45 mph. Visibility was expected to drop below one mile.
Westmorland	06-025-4003	3	03/06/2016	220		
Brawley	06-025-0007	3	03/11/2016	178	Submitted to CARB	The NWS issued a Wind Advisory for southeast CA and western Arizona. Strong southwest winds of 30 mph with frequent gusts up to 45 mph were expected, along with occasional dense blowing dust.
Westmorland	06-025-4003	3	03/11/2016	179		

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Monitoring Site	AQS No.	POC	Date	PM_{10} Concentration ($\mu g/m^3$)	Documentation Status	Event Description
Brawley	06-025-0007	3	03/28/2016	334	Submitted to CARB	The NWS issued a Wind Advisory for southeast CA and western Arizona. Strong southwest winds of 30 mph with frequent gusts up to 45 mph were expected, along with occasional dense blowing dust.
Niland	06-025-4004	3	03/28/2016	333		
Westmorland	06-025-4003	3	03/28/2016	465		
El Centro	06-026-1003	4	03/28/2016	284		
Brawley	06-025-0007	3	04/14/2016	228	Submitted to CARB	According to the NWS San Diego office, a trough of low pressure moving inland across southern California generated west winds with gusts in excess of 60 mph across the mountains and deserts of San Diego County. A High Wind Warning was issued, advising of west to northwest winds up to 35 mph, with gusts up to 60 mph. Strong winds were expected along desert sloes west of Imperial County, with the potential of limited visibility below three miles due to blowing dust.
Westmorland	06-025-4003	3	04/14/2016	163		
Brawley	06-025-0007	3	04/22/2016	242	Submitted to CARB	West to southwest winds up to 30 mph with gusts over 35 mph. A Wind Advisory was issued along with warnings of possible blowing dust for portions of southeast California.
Westmorland	06-025-4003	3	04/22/2016	192		
Brawley	06-025-0007	1	04/24/2016	186	Submitted to CARB	Westerly winds over 30 mph with gusts up to 45 mph. The NWS issued a Wind Advisory for southeast California for winds 25-35 mph with gusts to 45 mph. Gusts up to 55 mph along with blowing dust and sand were expected along corridors like Interstate 8.
Brawley	06-025-0007	3	04/24/2016	218		
Westmorland	06-025-4003	3	04/24/2016	177		
Brawley	06-025-0007	3	04/25/2016	285		
Calexico	06-025-0005	3	04/25/2016	173		
Niland	06-025-4004	3	04/25/2016	225		
Westmorland	06-025-4003	3	04/25/2016	244		
Brawley	06-025-0007	3	05/05/2016	163	Submitted to CARB	The NWS issued a Blowing Dust Advisory for Imperial County with emphasis on the western portion. West winds of 25 to 30 mph were expected, with gusts up to 40 mph. Blowing dust was expected to limit visibility to one mile.
Niland	06-025-4004	3	05/05/2016	171		
Westmorland	06-025-4003	3	05/05/2016	227		
Niland	06-025-4004	3	05/15/2016	216	Submitted to CARB	A strong onshore flow brought gusty west winds over southern California. The NWS San Diego office issued a Wind Advisory for areas including the deserts of San Diego County west of Imperial County. West winds of 20 to 30 mph were expected with gusts up to 50 mph. Visibility was expected to be reduced due to blowing dust and sand.
Brawley	06-025-0007	3	05/20/2016	283	Submitted to CARB	A strong upper low moving inland over northern California created gusty winds over southeast California. The post frontal gradient over the southern California terrain brought strong downslope mountain waves to Imperial County. A Wind Advisory was issued May 20 for a wide area of southeast California including Imperial County. Southwest winds of 20 to 30 mph were expected, with gusts up to 40 mph. Dangerous cross-winds and dense patches of blowing dust.
Calexico	06-025-0005	3	05/20/2016	159		
Niland	06-025-4004	3	05/20/2016	309		
Westmorland	06-025-4003	3	05/20/2016	370		
Brawley	06-025-0007	3	05/21/2016	199		
Calexico	06-025-0005	3	05/21/2016	226		
El Centro	06-026-1003	4	05/21/2016	252		
Brawley	06-025-0007	3	05/25/2016	165	Submitted to CARB	West winds over 30 mph with gusts over 40 mph. Advisories were issued for wind and blowing dust in the mountains and deserts of southeastern California.
Calexico	06-025-0005	3	07/23/2016	195	Submitted to CARB	Southeast monsoonal winds with winds up to 20 mph.
El Centro	06-026-1003	4	07/23/2016	203		
Brawley	06-025-0007	3	07/24/2016	155		
Calexico	06-025-0005	3	07/24/2016	194		
Westmorland	06-025-4003	3	07/24/2016	164		
El Centro	06-026-1003	4	07/24/2016	162		
Brawley	06-025-0007	3	07/30/2016	195	Submitted to CARB	Southeast monsoonal winds up to 25 mph with gusts over 35 mph. The NWS issued a Dust Storm Warning for Imperial County and the eastern deserts of Riverside County.
Calexico	06-025-0005	3	07/30/2016	158		
Niland	06-025-4004	3	07/30/2016	206		
Westmorland	06-025-4003	3	07/30/2016	201		
El Centro	06-026-1003	4	07/30/2016	205		
Calexico	06-025-0005	3	08/09/2016	155	Submitted to CARB	Southern gulf surge monsoonal winds up to 25 mph. Possibility of suspended dust reducing visibility.
Niland	06-025-4004	3	08/09/2016	167		
Westmorland	06-025-4003	3	08/09/2016	166		
El Centro	06-026-1003	4	08/09/2016	159		

Appendix D. 2014-2016 Documented Exceptional Events for Imperial County

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Monitoring Site	AQS No.	POC	Date	PM_{10} Concentration ($\mu g/m^3$)	Documentation Status	Event Description
Brawley	06-025-0007	3	08/19/2016	155	Submitted to CARB	Southern gulf surge monsoonal winds up to 25 mph. Possibility of suspended dust reducing visibility.
Westmorland	06-025-4003	3	08/19/2016	164		Southern gulf surge monsoonal winds up to 25 mph. Possibility of suspended dust reducing visibility.
El Centro	06-026-1003	4	08/21/2016	170		Monsoonal winds mostly from the southeast. The NWS issued a Blowing Dust Advisory for western Arizona.
Brawley	06-025-0007	1	09/03/2016	275	Submitted to CARB	Fall-like Pacific storm moved into the western states. West to southwest winds up to 25 mph forecasted.
Westmorland	06-025-4003	3	09/03/2016	202		
El Centro	06-026-1003	4	09/03/2016	174		
Brawley	06-025-0007	3	09/12/2016	232	Submitted to CARB	A weather disturbance moving through the region generated west to southwest up to 28 mph with gusts of 33 mph at El Centro NAF. Smoke Text Product identified blowing dust over portions of southern California and southern Arizona.
Westmorland	06-025-4003	3	09/12/2016	164		
Brawley	06-025-0007	3	09/13/2016	160		
Calexico	06-025-0005	3	09/13/2016	180		
El Centro	06-026-1003	4	09/13/2016	179		
Westmorland	06-025-4003	3	09/19/2016	176	Submitted to CARB	A weather system moving through the region generated west to southwest up over 25mph.
Brawley	06-025-0007	3	10/30/2016	162	Submitted to CARB	A vigorous trough dropped through southern California, generating southwest winds of 10 to 20 mph with gusts up to 30 mph.
Brawley	06-025-0007	3	12/16/2016	645	Submitted to CARB	A strong Pacific low pressure system and accompanying cold front moved through the region, generating gusty winds across southeast California and western Arizona. A Wind Advisory was issued for southeast California, with expected west to southwest winds of 20 to 35/40 mph and gusts exceeding 40/50 mph. Patches of blowing dust throughout the region were expected.
Calexico	06-025-0005	3	12/16/2016	238		
Niland	06-025-4004	3	12/16/2016	529		
Westmorland	06-025-4003	3	12/16/2016	733		
El Centro	06-026-1003	4	12/16/2016	207		

Notes:

Adjacent, color-blocked rows indicate multiple concentration measurements impacted by a singular exceptional event.

Abbreviations:

AQS - Air Quality System
CA - California
mph - miles per hour
NAF - Naval Air Facility
NOAA - National Oceanic and Atmospheric Administration
NWS - National Weather Service
PM_{10} - particulate matter less than 10 microns in aerodynamic diameter
POC - parameter occurrence code
$\mu g/m^3$ - micrograms per cubic meter
U.S. - United States

Appendix E
Best Available Control Measures Analysis for the 2018 Imperial County Redesignation Request and Maintenance Plan for PM_{10}

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BEST AVAILABLE CONTROL MEASURES ANALYSIS
FOR THE 2018 IMPERIAL COUNTY
REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR PARTICULATE MATTER
LESS THAN 10 MICRONS IN DIAMETER

Prepared for

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Abbreviations and Acronyms

BACM	Best Available Control Measure
BACT	Best Available Control Technology
CAA	Clean Air Act
CARB	California Air Resources Board
CEMS	continuous emissions monitoring system
GE	General Electric
ICAPCD	Imperial County Air Pollution Control District
mph	miles per hour
MW	megawatts
NOx	nitrogen oxides
PM_{10}	Particulate Matter Less than 10 Microns in Diameter
SCR	selective catalytic reduction
SIP	State Implementation Plan
$\mu g/m_3$	micrograms per cubic meter
USG	United States Gypsum

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1. INTRODUCTION

1.1 PM_{10} State Implementation Plan

The *Imperial County 2018 Redesignation Request and Maintenance Plan for Particulate Matter Less than 10 Microns in Diameter (PM_{10})* ("Plan") compiles the data and discussion necessary to revise the previous State Implementation Plan submittal for PM_{10} and requests redesignation as attainment for the Imperial Valley Planning Area. This appendix provides an overview of the analysis that was conducted to determine that the control strategies currently implemented in Imperial County meet the Clean Air Act (CAA) requirement of controlling significant sources of PM_{10} to Best Available Control Measure (BACM) or Best Available Control Technology (BACT) standards. In particular, this appendix features a revision to Imperial County's previous PM_{10} significant source analysis and demonstrates that no new emission source categories qualify as significant. In addition, this appendix discusses the current major stationary sources of PM_{10} in Imperial County and how they are controlled to BACT-level stringency.

1.2 Background

CAA Section 189(b) requires areas designated as Serious nonattainment for PM_{10} to implement BACM/BACT for the control of PM_{10}. BACM/BACT is a label describing practices that allow for the maximum degree of emission reduction considering technical and economic feasibility and environmental impacts of the control. While the BACM/BACT requirement can also apply to sources of PM_{10} precursors, ambient PM_{10} in Imperial County is overwhelmingly primary PM_{10}, with little or no contribution from secondary aerosols. This observation is supported by a technical analysis performed by the California Air Resources Board (CARB) and included as Appendix A to this Plan. As a result, BACM/BACT for sources of PM_{10} precursors are not addressed under this Plan.

USEPA guidance for State Implementation Plans for Serious PM_{10} nonattainment areas[1] instructs that BACM standards are required for all source categories except those that "the State [can] demonstrate [do] not contribute significantly to nonattainment of the NAAQS." A source category is presumed to contribute significantly to a violation of the PM_{10} NAAQS if its PM_{10} impact exceeds 5 micrograms per cubic meter ($\mu g/m^3$). Analyses of the PM_{10} sources and controls in place in Imperial County have been conducted by the Imperial County Air Pollution Control District (ICAPCD or "District") in the past. This was first done in 2005 and resulted in the development of a set of fugitive dust rules, collectively known as Regulation VIII. That analysis had identified the following four sources as significant and requiring BACM: **windblown dust from open areas**, **entrained and windblown dust from unpaved roads**, **windblown dust from non-pasture agricultural lands**, and **tilling dust from agricultural operations.**

In 2008 and 2009, to support its *2009 Imperial County State Implementation Plan for Particulate Matter Less than 10 Microns in Aerodynamic Diameter* ("2009 PM_{10} SIP"),[2] the District revised its analysis of significant sources to reflect a 2005 base year inventory and 2006-2008 ambient data. That analysis identified only **entrained dust from unpaved roads** and **tilling dust from agricultural operations** as significant sources of PM_{10}. The USEPA disagreed with certain

[1] United States Environmental Protection Agency. 1994. *State Implementation Plans for Serious PM-10 Nonattainment Areas, and Attainment Date Waivers for PM-10 Nonattainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990.* Federal Register. Vol. 59. No. 157. August 16, 1994. p. 41998.

[2] Imperial County Air Pollution Control District. 2009. 2009 Imperial County State Implementation Plan for Particulate Matter Less Than 10 Microns in Aerodynamic Diameter. August 11. Available at: http://www.co.imperial.ca.us/airpollution/attainment%20plans/final%20ic%202009%20pm10%20sip%20document.pdf. Accessed: July 2018.

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portions of that analysis, particularly the exclusion of certain high-wind exceedance days, and determined that **windblown dust from unpaved roads**, **windblown dust from open areas**, and **windblown dust from non-pasture agricultural lands** would also qualify as significant sources requiring BACM.[3] Ultimately, in 2010 the USEPA published a rule issuing limited approval and limited disapproval of Imperial County's Regulation VIII rules, citing certain BACM-related deficiencies in the rule set.[4]

In response to the limited approval/disapproval of the rules and related SIP submission, the District and the California Department of Parks and Recreation challenged the USEPA's decision in the U.S. Court of Appeals for the Ninth Circuit. Ultimately, the dispute was resolved through mediation and a Settlement Agreement (see Section 1.4.2 of the main text of the Plan for additional information). In 2013, the USEPA published a rule[5] finalizing approval of Imperial County's Regulation VIII rules, acknowledging that they satisfy BACM requirements for sources previously identified as significant for PM_{10}. Table 1-1 below presents a summary of these source categories and the most relevant Regulation VIII rule(s) that govern them.

Table 1-1. Source Categories Previously Identified as Significant for PM_{10} and Most Applicable Regulation VIII Rule(s)

Source Category	Applicable Regulation VIII Rule
Windblown Dust from Open Areas	Rule 800, Rule 804
Entrained Dust from Unpaved Roads	Rule 805
Windblown Dust from Unpaved Roads	Rule 805
Windblown Dust from Non-Pasture Agricultural Lands	Rule 806
Tilling Dust from Agricultural Operations	Rule 806

3 United States Environmental Protection Agency. 2010. Technical Support Document for EPA's Notice of Proposed Rulemaking on Revisions to the California State Implementation Plan as Submitted by the State of California for the Imperial County Air Pollution Control District. EPA's Analysis of Imperial County Air Pollution Control District's Regulation VIII – Fugitive Dust Rules 800-806. February.

4 United States Environmental Protection Agency. 2010. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 75. No. 130. July 8, 2010. p. 39366.

5 United States Environmental Protection Agency. 2013. *Revisions to the California State Implementation Plan, Imperial County Air Pollution Control District; Final rule.* Federal Register. Vol. 78. No. 77. April 22, 2013. p. 23677.

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2. DETERMINATION OF SIGNIFICANT SOURCES OF PM_{10}

As discussed above, analyses have been conducted in the past to determine significant sources of PM_{10} in Imperial County. Those analyses were conducted using the most recent emission inventory and monitoring data available at that time. Since several years have passed since the most recent significant source analyses occurred, they are being revisited under this Plan using the most recent emission inventory and monitoring data available.

2.1 De Minimis Criterion

As a criterion for classification of PM_{10} sources into significant or *de minimis* categories, USEPA guidance states that "a source category….will be presumed to contribute significantly to a violation of the 24-hour NAAQS if its PM_{10} impact at the location of the expected violation would exceed 5 µg/m^3." [6] This language unambiguously implies that this test should be applied, for any violation, to every source category using information specific to the day of the violation. The implementation of the criterion for any specific violation requires a day-specific decomposition of the air quality impacts into fractional contributions from all relevant source categories (i.e., a day-specific emission inventory). This type of information can be difficult to obtain without comprehensive air dispersion modeling. Therefore, this analysis utilizes a more practical, alternative approach that involves evaluating the fractional contribution of sources in Imperial County's average annual daily emission inventory and then performing a sensitivity analysis to determine if variations in the inventory would alter the conclusions of the analysis.

From 2014 to 2016, Imperial County experienced 58 days where PM_{10} concentrations were greater than the 24-hour PM_{10} NAAQS. However, all of the exceedances on these days have been identified by the District as Exceptional Events and are currently going through USEPA's review process for affirmation. Therefore, the 5 µg/m^3 criterion was compared against a hypothetical "near-exceedance" concentration of 154 µg/m^3 to establish the fractional cut-off point (5 µg/m^3/154 µg/m^3 = 3.25%) above which Imperial County source categories would qualify as significant.

2.2 Average Annual Daily Emission Inventory Comparison

Table 2-1 presents the average annual daily PM_{10} emissions inventory for Imperial County for the attainment year, 2016. This table is organized by emission source category and features the percent contribution of each category. When compared against the established fractional cut-off point of 3.25%, three categories qualify as significant. These include **windblown dust from open areas – others** (which includes unpaved roads)**, windblown dust from non-pasture agricultural lands,** and **entrained dust from unpaved roads** (specifically city/county and canal roads). All three of these categories have been previously identified by the District as significant sources of PM_{10} and are currently controlled by rules approved by the USEPA as BACM for these source categories.[7] The following section presents a sensitivity analysis and demonstrates how variations in the inventory would not alter the conclusions of this analysis.

[6] United States Environmental Protection Agency. 1994. *State Implementation Plans for Serious PM-10 Nonattainment Areas, and Attainment Date Waivers for PM-10 Nonattainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990.* Federal Register. Vol. 59. No. 157. August 16, 1994. p. 41998.

[7] Windblown dust from open areas is regulated under ICAPCD Rule 804: Open Areas. Windblown dust from non-pasture agricultural lands is regulated under ICAPCD Rule 806: Conservation Management Practices. Entrained dust from unpaved roads is regulated under ICAPCD Rule 805: Paved and Unpaved Roadways.

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Table 2-1. Imperial County 2016 Average Annual Daily PM_{10} Emission Inventory

Inventory Category	PM_{10} Emissions[1] (tpd)	Percent of Total[2]
Electrical Utilities	0.09	0.03%
Cogeneration	0.00	0.00%
Manufacturing and Industrial	0.04	0.01%
Service and Commercial	0.07	0.03%
Fuel Combustion	0.00	0.00%
Industrial Processes		
Mineral Processes	3.67	1.29%
Food/Agriculture	0.31	0.11%
Residential Fuel Combustion	0.05	0.02%
Farming		
Tilling	4.87	1.71%
Harvest	0.99	0.35%
Cattle	2.62	0.92%
Construction[3]	3.02	1.06%
Paved Road Dust	1.16	0.41%
Entrained Unpaved Road Dust		
City/County	18.38	6.47%
Canal	30.74	10.82%
BLM/USFS	1.39	0.49%
Farm	1.37	0.48%
Fires	0.00	0.00%
Waste Burning	1.30	0.46%
Cooking	0.08	0.03%
On-Road Mobile	0.43	0.15%
Other Mobile	1.07	0.38%
Windblown Dust		
Open Areas - Urban	0.00	0.00%
Open Areas - Others	199.96	70.37%
Non-Pasture Agricultural Lands	10.77	3.79%
Pasture	1.79	0.63%
TOTAL:	**284.17**	**100.0%**

Notes:
[1] 2016 inventory data was queried from the California Air Resources Board's California Emissions Project Analysis Model, Version 1.05; however, some emissions have been recategorized to better align with past Imperial County significant source analyses.
[2] Highlighting indicates that the value exceeds the *de minimis* level for a near-exceedance day (3.25%; 5 µg/m^3 / 154 µg/m^3).

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3. SIGNIFICANT SOURCE SENSITIVITY ANALYSIS

As discussed previously, from 2014 to 2016 all measured exceedances of the 24-hour PM_{10} NAAQS in Imperial County were identified as Exceptional Events. These events were primarily caused by gusty westerly winds brought on by low pressure systems. A smaller fraction of the events can be attributed to monsoonal fronts passing through the region. For most of these events, one would expect that the fractional contribution of windblown dust to ambient PM_{10} levels to be greater compared to its average annual daily contribution. As a result, this sensitivity analysis focuses on the potential scenario of an exceedance occurring on a low-wind day, when the fractional contribution of windblown dust would be less than its daily average.

3.1 Low-Wind Day Emission Inventory Comparison

Table 3-1 presents the average annual daily PM_{10} emissions inventory for Imperial County for the attainment year, 2016; however, the percent contribution of each source category has been calculated for varying levels of windblown dust to assess how changes in the contribution of PM_{10} from windblown dust would affect the significance determination of other categories. It was found that if windblown dust were reduced to just 25% of its average annual daily contribution to the inventory, then one additional category, **tilling dust from agricultural operations**, would get added to the list of sources contributing more than 3.25% of the total emissions for that day. However, at 50% windblown dust, this category drops back below the fractional cut-off point, leaving only **entrained dust from unpaved roads** (specifically city/county and canal roads) as the only non-windblown dust source category above the cut-off point.

If the windblown dust category were completely excluded from the inventory (i.e., reduced to 0% contribution), several other source categories would rise above the 3.25% cut-off value. However, a review of the PM_{10} concentration data and collocated wind speed data from 2014 to 2016 shows that it’s unlikely that this theoretical “no-wind” day would result in an exceedance of the 24-hour PM_{10} NAAQS. This scenario is further analyzed in the following section.

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Table 3-1. Imperial County 2016 Average Annual Daily PM_{10} Emission Inventory – Windblown Dust Sensitivity Analysis

Inventory Category	PM_{10} Emissions[1] (tpd)	Percent of Total When Windblown Dust Category Equals X% of its 2016 Inventory Value[2]				
		0%	25%	50%	75%	100%
Electrical Utilities	0.09	0.13%	0.07%	0.05%	0.04%	0.03%
Cogeneration	0.00	0.00%	0.00%	0.00%	0.00%	0.00%
Manufacturing and Industrial	0.04	0.06%	0.03%	0.02%	0.02%	0.01%
Service and Commercial	0.07	0.10%	0.06%	0.04%	0.03%	0.03%
Fuel Combustion	0.00	0.00%	0.00%	0.00%	0.00%	0.00%
Industrial Processes						
Mineral Processes	3.67	5.12%	2.94%	2.06%	1.59%	1.29%
Food/Agriculture	0.31	0.43%	0.25%	0.17%	0.13%	0.11%
Residential Fuel Combustion	0.05	0.06%	0.04%	0.03%	0.02%	0.02%
Farming						
Tilling	4.87	6.80%	3.90%	2.74%	2.11%	1.71%
Harvest	0.99	1.38%	0.79%	0.56%	0.43%	0.35%
Cattle	2.62	3.66%	2.10%	1.47%	1.13%	0.92%
Construction	3.02	4.21%	2.42%	1.70%	1.31%	1.06%
Paved Road Dust	1.16	1.62%	0.93%	0.65%	0.50%	0.41%
Entrained Unpaved Road Dust						
City/County	18.38	25.65%	14.73%	10.33%	7.96%	6.47%
Canal	30.74	42.90%	24.64%	17.28%	13.31%	10.82%
BLM/USFS	1.39	1.95%	1.12%	0.78%	0.60%	0.49%
Farm	1.37	1.91%	1.10%	0.77%	0.59%	0.48%
Fires	0.00	0.01%	0.00%	0.00%	0.00%	0.00%
Waste Burning	1.30	1.81%	1.04%	0.73%	0.56%	0.46%
Cooking	0.08	0.11%	0.06%	0.04%	0.03%	0.03%
On-Road Mobile	0.43	0.60%	0.35%	0.24%	0.19%	0.15%
Other Mobile	1.07	1.49%	0.85%	0.60%	0.46%	0.38%
Windblown Dust						
Open Areas - Urban	0.00	0.00%	0.00%	0.00%	0.00%	0.00%
Open Areas - Others	199.96	0.00%	40.06%	56.20%	64.91%	70.37%
Non-Pasture Agricultural Lands	10.77	0.00%	2.16%	3.03%	3.50%	3.79%
Pasture	1.79	0.00%	0.36%	0.50%	0.58%	0.63%
TOTAL:	**284.17**					

Notes:
[1] 2016 inventory data was queried from the California Air Resources Board's California Emissions Project Analysis Model, Version 1.05; however, some emissions have been recategorized to better align with past Imperial County significant source analyses.
[2] Highlighting indicates that the value exceeds the *de minimis* level for a near-exceedance day (3.25%; 5 $\mu g/m^3$ / 154 $\mu g/m^3$).

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3.2 Example "Low-Wind" Near-Exceedance Day

The 2014 to 2016 PM_{10} monitoring data for Imperial County were reviewed in conjunction with collocated wind speed data to see if there were any days in which a monitor measured a near exceedance on a low- or no-wind day. This analysis was done by creating a scatter plot for each year of data, with the x-axis representing measured 24-hour PM_{10} concentration values from the five Imperial County PM_{10} monitoring stations and the y-axis representing the average hourly wind speed measured each day at the collocated meteorological station (see Figures 3-1 through 3-3).[8] The vertical orange line represents a near-exceedance concentration of 154 µg/m^3. As discussed previously, all measurements above the standard during this period (colored orange in the plots below) have been identified as potential Exceptional Events and are being thoroughly evaluated through the USEPA's review process. Upon concurrence from the USEPA, these data points would be excluded from Imperial County's NAAQS determination.

Out of the three years of data, the 24-hour PM_{10} measurement at the El Centro monitoring station on January 15, 2016 (highlighted green in Figure 3-3) is the closest example of a low-wind near-exceedance day. On that day the average hourly wind speed at the collocated meteorological station was 4.28 miles per hour (mph), which was over 35% less than the next closest low-wind near-exceedance data point. However, a review of the hourly wind speed data from that day (as shown in Figure 3-4), shows that while the average hourly wind speed was relatively low, the day still exhibited periods of elevated wind speed and could not reasonably be categorized as a "no-wind" day. Seeing how this is the closest example to a low-wind near-exceedance scenario, this finding supports the conclusion that it's unlikely that a day with low winds and 0% windblown dust contributions would result in an exceedance of the 24-hour PM_{10} NAAQS at a monitor in Imperial County.

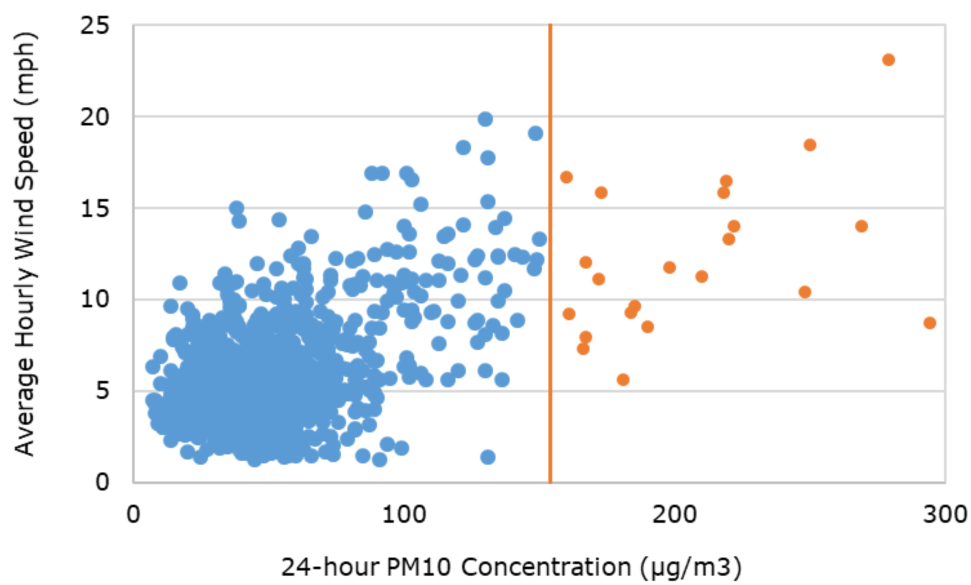

Figure 3-1. 24-hour PM_{10} Concentration vs. Wind Speed in Imperial County, 2014

[8] Except for the Brawley monitor, which does not have collocated wind speed data. For that monitor, wind speed data from the Imperial County Airport was used as a surrogate.

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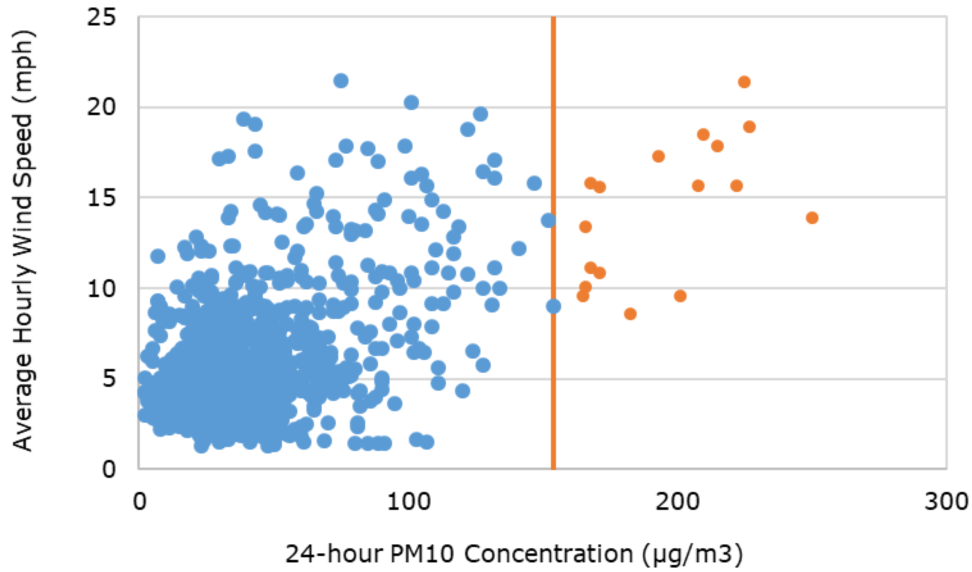

Figure 3-2. 24-hour PM_{10} Concentration vs. Wind Speed in Imperial County, 2015

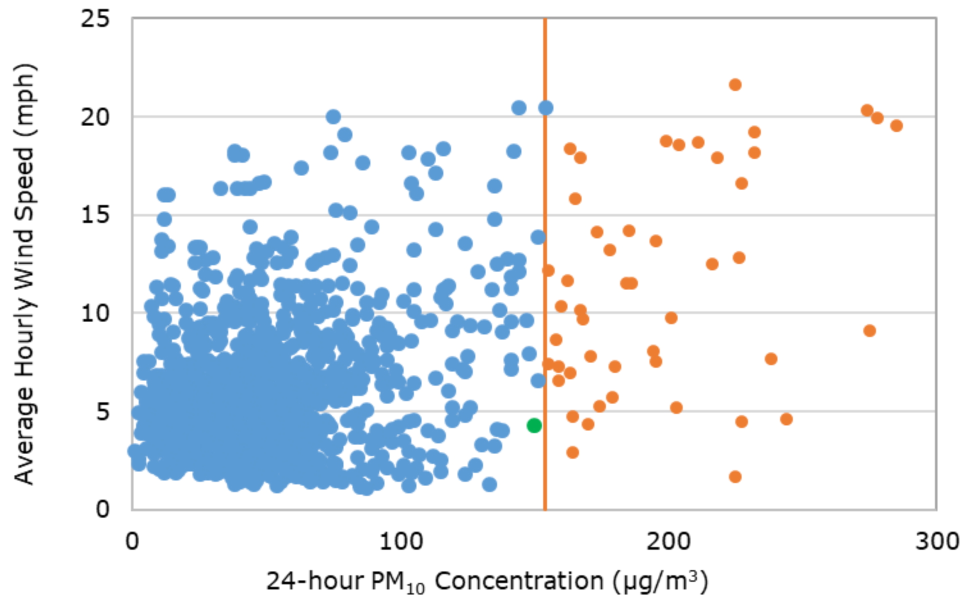

Figure 3-3. 24-hour PM_{10} Concentration vs. Wind Speed in Imperial County, 2016

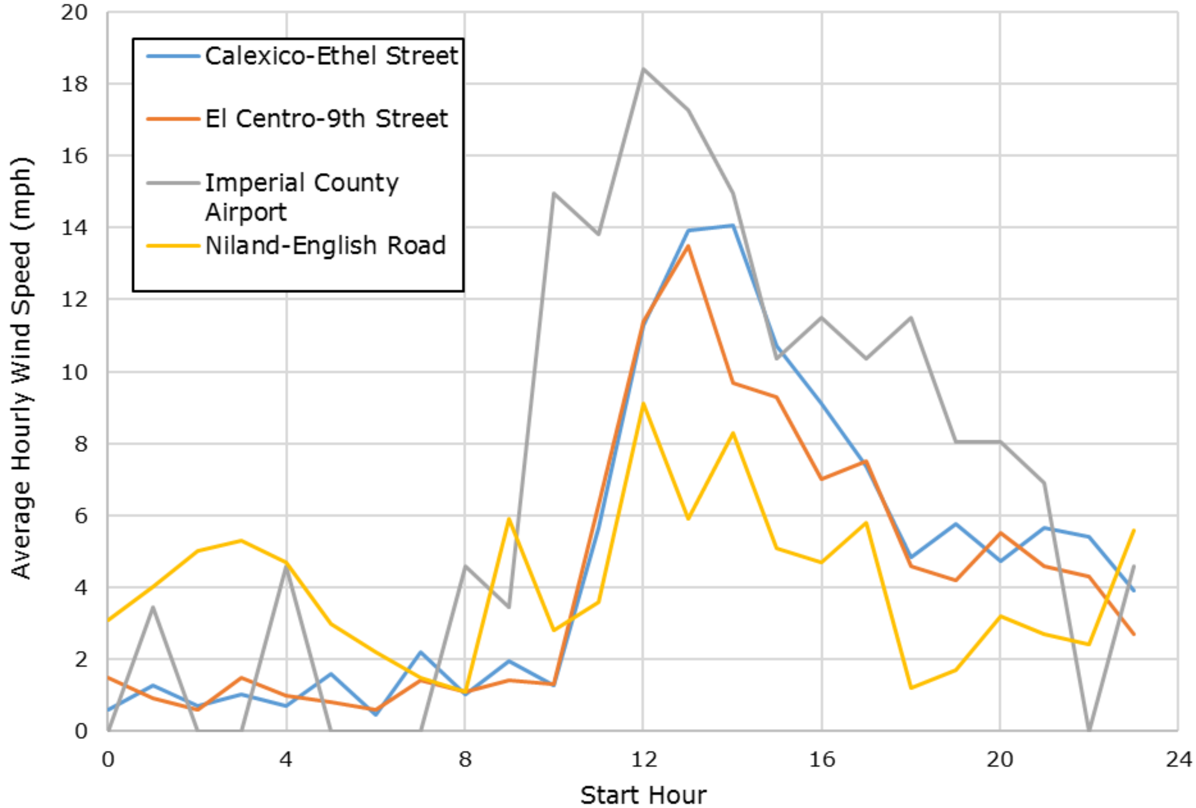

Figure 3-4. Average Hourly Wind Speed in Imperial County on January 15, 2016[9]

[9] The Westmorland data was omitted from this plot as there were only two hours of wind speed data available for this day.

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4. BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

For Serious PM_{10} nonattainment areas, CAA Section 189(b)(3) defines a major source as “any stationary source or group of stationary sources located within a contiguous area and under common control that emits, or has the potential to emit, at least 70 tons per year of PM_{10}.” Imperial County currently has two facilities that qualify as major stationary sources of PM_{10}. These include the Imperial Irrigation District El Centro Generating Station and the United States Gypsum Plaster City facility. As described below, both facilities are controlled to BACT-level stringency.

4.1 Imperial Irrigation District El Centro Generating Station

The Imperial Irrigation District El Centro Generating Station features three main operational units (Units 2-4). Unit 2 is a General Electric (GE) Frame 7EA combined cycle unit (i.e., combustion and steam) capable of generating 115 megawatts (MW), of which the combustion turbine provides 83 MW. Unit 3 features two 48.0 MW Siemens SGT-800 combustion turbines and one condensing steam turbine. Unit 4 is a Riley Stoker Boiler rated at 74 MW.

Unit 2 was repowered with a gas turbine in 1993 and uses selective catalytic reduction (SCR) technology for the control of nitrogen oxides (NOx). The unit is allowed to burn No. 2 diesel as secondary fuel for 720 hours per year. In 2007, a new GEA CDX-080 cooling tower with drift eliminators rated at 0.0005% was installed at Unit 2, which at the time of installation satisfied BACT.

The two combustion turbines at Unit 3 operate solely on natural gas and are equipped with ultra-low NOx combustors and SCR. Unit 3 is equipped with a cooling tower with drift eliminators rated at 0.0005%, which at the time of installation satisfied BACT.

The Riley Boiler at Unit 4 commenced operation in 1968 and is a wall-fired type boiler with six Peabody burners (two rows of three). The boiler burns natural gas as the primary fuel, but is allowed to burn No. 6 fuel oil as secondary fuel. Over the years the Riley Boiler has been modified to meet various District rules. In 2000, an SCR system and a continuous emissions monitoring system (CEMS) were installed to meet NOx emission limits under ICAPCD Rule 400 (Fuel Burning Equipment – Oxides of Nitrogen). In 2013, a new SPX cooling tower with drift eliminators rated at 0.0005% was installed, which at the time satisfied BACT. At the same time, the permit was modified to incorporate ICAPCD rule 400.2 (Boilers, Process Heaters, and Steam Generators) NOx emissions limits.

4.2 United States Gypsum Plaster City Facility

The United States Gypsum (USG) Corporation manufactures gypsum wallboard and related products at its Plaster City facility, which has been in operation since the 1940s. Raw gypsum is mined at the Split Mountain quarry where it undergoes primary crushing and is stored. The ore is eventually transported via rail 20 miles to the Plaster City facility where wallboard and other gypsum products are manufactured. Over the past ten years, the Plaster City facility has undergone nearly a complete equipment modification upgrade. More energy efficient equipment has replaced older, less efficient equipment. Furthermore, each equipment modification has been subject to New Source Review permitting with increased emissions control requirements, including the installation of baghouses at transfer and crushing points. USG has various permitted combustion sources that are all fueled by natural gas, which meets BACT for PM_{10}. The mills have also been retrofitted with dust collectors limited to 0.01 grains per dry standard cubic feet, which also satisfies BACT.

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5. CONCLUSION

Concurrent with its submittal of the *Imperial County 2018 Redesignation Request and Maintenance Plan* for PM_{10}, the District evaluated its current control strategy to ensure that all significant sources of PM_{10} are being controlled to BACM/BACT standards. This appendix provides an overview of that analysis and demonstrates, using the 2016 attainment inventory and 2014 to 2016 monitoring data, that all source categories that that have the potential to contribute significantly to a violation of the PM_{10} NAAQS in Imperial County are controlled by rules that have been approved by the USEPA as BACM for those sources. Furthermore, this appendix demonstrates that current major sources of PM_{10} in Imperial County are controlled to BACT-level stringency. Therefore, no new control measures are being proposed with this Plan.

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Appendix F
Regulation VIII Fugitive Dust Rules

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RULE 800 GENERAL REQUIREMENTS FOR CONTROL OF FINE PARTICULATE MATTER (PM-10)
(Adopted 10/10/94; Revised 11/25/96; Revised 11/08/2005; Revised 10/16/2012)

A. General Description

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from anthropogenic (man-made) Fugitive Dust (PM-10) sources generated from within Imperial County by requiring actions to prevent, reduce, or mitigate PM-10 emissions. The Rules contained within this Regulation have been developed pursuant to United States Environmental Protection Agency guidance for Serious PM10 Non Attainment Areas.

B. Applicability

The requirements of this rule shall apply to any Active Operation, and/or man-made or man-caused condition or practice capable of generating Fugitive Dust (PM-10) as specified in this Regulation except those determined exempt as defined in Part E of this Rule. The definitions, exemptions, requirements, administrative requirements recordkeeping requirements, and test methods set forth in this rule are applicable to all the rules under Regulation VIII (Fugitive Dust Requirements) of the Rules and Regulations of the Imperial County Air Pollution Control District.

C. Definitions

For the purpose of this Regulation, the following terms are defined:

C.1 ACTIVE OPERATION: Activities capable of generating Fugitive Dust (PM-10), including but not limited to, Earthmoving Activities, Construction activities, Unpaved Roads, Track-Out/Carry-Out, Bulk Material storage and transport, Unpaved Haul/Access Roads.

C.2 AGGREGATE MATERIALS: Consists of sand, Gravel, quarried stone and/or rock fragments that are typically used in Construction. Aggregates may be natural, artificial or recycled.

C.3 ANEMOMETRS: Are devices used to measure wind speed and direction in accordance with manufacturer's performance standards, maintenance and calibration criteria.

C.4 ANNUAL AVERAGE DAILY VEHICLE TRIPS: annual average 24-hour total of all vehicles counted on a road.

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C.5 APCD: The Imperial County Air Pollution Control District.

C.6 APCO: The Imperial County Air Pollution Control Officer.

C.7 AVERAGE VEHICLE TRIPS PER DAY: Means the average number of vehicles that cross a given point surface during a specific 24-hour period as determined by the most recent Institute of Transportation Engineers trip generation manual, tube counts, or observations.

C.8 BLM: The Bureau of Land Management.

C.9 BP: The United States Border Patrol.

C.10 BULK MATERIAL: Earth, rock, Silt, sediment, sand, Gravel, soil, fill, Aggregate, dirt, mud, debris, and other organic and/or inorganic material consisting of or containing Particulate Matter with five percent or greater Silt content. For the purpose of this Regulation, the Silt content level is assumed to be 5 percent or greater, unless the Person responsible for the Active Operation conducts the applicable laboratory tests and demonstrate that the Silt content is less than 5 percent. Active Operations seeking to determine if the Silt content is less than five percent are required to conduct the laboratory analysis in accordance with ASTM method C-136-a (Standard Test Method for Sieve analysis of Fine and Coarse Aggregates), or other equivalent test methods approved by EPA, ARB, and the APCD.

C.11 CANAL BANK: A rise of land on either side of an irrigation canal.

C.12 CHEMICAL STABILIZATION/SUPPRESSION: A means of Fugitive Dust (PM-10) control implemented to mitigate PM-10 emissions by applying petroleum resins, asphaltic emulsions, acrylics, adhesives, or any other materials approved for use by the California Air Resources Board (CARB), U.S. Environmental Protection Agency (U.S. EPA) and/or the APCO.

C.13 CONSTRUCTION: Any on-site mechanical activities preparatory to or related to the building, alteration, rehabilitation, or demolition of an improvement on real property, including, but not limited to, land clearing, excavation related to construction, land leveling, grading, cut and fill grading, and the erection or demolition of any structure. As used in Regulation VIII, a construction site may encompass several contiguous parcels, or may encompass only a portion of one parcel, depending on the relationship of the property boundaries to the actual construction activities.

C.14 DESIGNATED REPRESENTATIVE: The agent for a Person. The Designated Representative shall be responsible for and have the full authority to implement BACM on behalf of the Person.

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C.15 DISTURBED SURFACE AREA: An area in which naturally occurring soils, or soils or other materials placed thereon, have been physically moved, uncovered, destabilized, or otherwise modified by grading, land leveling, scraping, cut and fill activities, excavation, bush and timber clearing, or grubbing, and soils on which vehicle traffic and/or equipment operation has occurred. An area is considered to be disturbed until the activity that caused the disturbance has been completed, and the disturbed area meets the stabilized surface conditions specified in this rule, or the area has been paved or otherwise covered by a permanent structure.

C.16 DPR: The California Department of Parks and Recreation.

C.17 EARTHMOVING ACTIVITIES: The use of any equipment for an activity that may generate Fugitive Dust emissions, including, but not limited to, cutting and filling, grading, leveling, excavation, trenching, loading or unloading of Bulk Materials, demolishing, drilling, adding to or removing bulk materials from open storage piles, weed abatement through disking, and back filling.

C.18 FUGITIVE DUST: The Particulate Matter entrained in the ambient air which is caused from man-made and natural activities such as, but not limited to, movement of soil, vehicles, equipment, blasting, and wind. This excludes Particulate Matter emitted directly in the exhaust of motor vehicles or other fuel combustion devices, from portable brazing, soldering, or welding equipment, pile drivers, and stack emissions from stationary sources.

C.19 GRAVEL: Gravel travelways shall have a three (3) inch minimum depth Stabilized Surface. The travelway shall have a relative compaction of not less than 95% as determined by Test Method No. California 216 of State of California, Business and Transportation Agency Department of Transportation, and conforming to the following grading:

Sieve Designation	¾” Maximum Percent Passing
1”	100
¾”	90-100
#4	35-60
#30	10-30
#200	2-9

Reference: California Department of Transportation Standard Specification Section 26/class II Aggregate Base

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C.20 HAUL/ACCESS ROAD: Any on-site road used for commercial, industrial, institutional, and/or governmental traffic.

C.21 HAUL TRUCK: Any fully or partially open-bodied licensed motor vehicle used for transporting Bulk Material for industrial or commercial purposes.

C.22 IMPLEMENT OF HUSBANDRY: An unlicensed vehicle which is used exclusively in the conduct of Agricultural Operations. An Implement of Husbandry does not include a vehicle if its existing design is primarily for the transportation of persons or property on a highway, unless specifically designated as such by some other provision of the Vehicle Code of California.

C.23 NON-RESIDENTIAL AREA: Any unpaved vehicle and equipment traffic area operated at any commercial, manufacturing or government sites.

C.24 MODIFIED PAVED ROAD: Any Paved Road that is widened or improved so as to increase traffic capacity. This term does not include road maintenance, repair, chip seal, pavement or roadbed rehabilitation that does not affect roadway geometrics, or surface overlay work.

C.25 OFF-FIELD AGRICULTURAL SOURCE: Any Agricultural Source or activity at an Agricultural Source that falls into one or more of the following categories:

C.25.a Outdoor handling, storage and transport of Bulk Material;

C.25.b Paved Road;

C.25.c Unpaved Road; or

C.25.d Unpaved Traffic Area.

C.26 OFF-ROAD EVENT AND/OR COMPETITIONS: Means any of the following: any organized, sanctioned, or structured use, event or activity on public land in which two hundred and fifty (250) or more contestants compete and either or both of the following elements apply: (i) Participants register, enter, or complete an application for the event; (ii) A predetermined course or area is designated.

C.27 OFF- HIGHWAY VEHICLE(OHV): An off-highway vehicle is a motorized vehicle when operating off a highway, including a two-wheel, three-wheel or four-wheel vehicle, motorcycle, four-wheel drive vehicle, dune buggy, amphibious vehicle, ground effects or air cushion vehicle and any other means of land transportation deriving motive power from a source other than muscle or wind. "Highway" means the entire width between the

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boundary lines of every way publicly maintained by the federal government, a city, a town or a county if any part of the way is generally open to the use of the public for purposes of vehicular travel, excluding unpaved trails and paths specifically intended for recreational use.

C.28 ON-FIELD AGRICULTURAL SOURCE: Any Agricultural Source or activity at an Agricultural Source that is not an Off-Field Agricultural Source, including (but not limited to) the following:

C.28.a Activities conducted solely for the purpose of preparing land for the growing of crops or the raising of fowl or animals, such as brush or timber clearing, grubbing, scraping, ground excavation, land leveling, grading, turning under stalks, disking, or tilling;

C.28.b Drying or pre-cleaning of agricultural crop material on the field where it was harvested;

C.28.c Handling or storage of agricultural crop material that is baled, cubed, pelletized, or long-stemmed, on the field where it was harvested, and the handling of fowl or animal feed materials at sites where animals or fowl are raised;

C.28.d Disturbances of cultivated land as a result of fallowing, planting, fertilizing or harvesting.

C.29 OPEN AREA: Any of the following described in Subsection C.29.a through C.29.c of this rule. For the purpose of this rule, vacant portions of residential or commercial lots and contiguous parcels that are immediately adjacent to and owned and/or operated by the same individual or entity are considered one open area. An open area does not include any Unpaved Traffic Area as defined in this rule.

C.29.a An un-subdivided or undeveloped land whether or not it is adjoining a developed (or partially developed) residential, industrial, institutional, governmental, or commercial area.

C.29.b A subdivided residential, industrial, institutional, governmental, or commercial lot, which contains no approved or permitted building or structures of a temporary or permanent nature.

C.29.c A partially developed residential, industrial, institutional, governmental, or commercial lot and contiguous lots under common ownership.

C.30 PARTICULATE MATTER: Any material, except uncombined water, which exists in a finely divided form as a liquid or solid at 60 degrees F and one

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atmosphere pressure.

C.31 PAVED ROADS: An improved street, highway, alley, public way, that is covered by concrete, asphaltic concrete, or asphalt.

C.32 PERSON: Any individual, public or private corporation, partnership, association, firm, trust, estate, municipality, or any other legal entity whatsoever which is recognized by law as the subject of rights and duties, who is responsible for an Active Operation.

C.33 PM-10: Particulate Matter with an aerodynamic diameter smaller than or equal to a nominal 10 microns as measured by the applicable State and Federal reference test methods.

C.34 RECREATIONAL OFF-HIGHWAY VEHICLE (OHV) USE AREA: The entire area of a parcel of land, except for camping and approved buffer areas, that is managed for off-highway vehicle use through the development or designation of off-highway vehicle trails or areas.

C.35 RURAL: Areas not classified as urban constitute "rural."

C.36 SILT: Any Aggregate Material with a particle size less than 75 micrometers in diameter as measured by a No. 200 sieve as defined in ASTM D-2487 and as tested by ASTM-C-136 or other equivalent test methods approved by EPA, ARB, and the APCD.

C.37 STABILIZED SURFACE: Any disturbed surface area or open bulk storage pile that is resistant to wind blown Fugitive Dust emissions. A surface is considered to be stabilized if it meets at least one of the following conditions specified in this Section and as determined by the test methods specified in Appendix B, Section A, B and D-G tests of this rule:

C.37.a A visible crust; or

C.37.b A threshold friction velocity (TFV) for disturbed surface areas corrected for non-erodible elements of 100 centimeters per second or greater; or

C.37.c A flat vegetative cover of at least 50 percent that is attached or rooted vegetation; or unattached vegetative debris lying on the surface with a predominant horizontal orientation that is not subject to movement by wind; or

C.37.d A standing vegetative cover of at least 30 percent that is attached or rooted vegetation with a predominant vertical orientation; or

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C.37.e A standing vegetative cover that is attached or rooted vegetative with a predominant vertical orientation that is at least 10 percent and where the TFV is at least 43 centimeters per second when corrected for non-erodible elements; or

C.37.f A surface that is greater than or equal to 10 percent of non-erodible elements such as rocks, stones, or hard-packed clumps of soil.

C.38 STABILIZED UNPAVED ROAD: Any Unpaved Road or unpaved vehicle/equipment traffic area surface which meets the definition of Stabilized Surface as determined by the test method in Appendix B, Section C of this rule, and where VDE is limited to 20% opacity.

C.39 TACTICAL TRAINING: Training conducted by the U.S. Department of Defense, the U.S. military services, or its allies for combat, combat support, combat service support, tactical or relief operations. Examples include but are not limited to munitions training.

C.40 TEMPORARY UNPAVED ROAD: Any Unpaved Road surface which is created to support a temporary or periodic activity and the use of such road surface is limited to vehicle access for a period of not more than six months during any consecutive three-year period.

C.41 THRESHOLD FRICTION VELOCITY (TFV): The corrected velocity necessary to initiate soil erosion as determined by the test method specified in Appendix B, Section D, of this rule. The lower TFV, the greater the propensity for fine particles to be lifted at relatively low wind speeds.

C.42 TRACK-OUT/CARRY-OUT: Any and all Bulk Materials that adhere to and agglomerate on the exterior surfaces of motor vehicles and/or equipment (including tires) that may then fall onto the pavement.

C.43 TRACK-OUT PREVENTION DEVICE: A Gravel pad, grizzly, wheel wash system, or a paved area, located at the point of intersection of an unpaved area and a Paved Road that prevents or controls Track-Out.

C.44 UNPAVED ROADS: Streets, alley ways, or roadways that are not covered by one of the following: concrete, asphaltic concrete, asphalt, or other similar materials specified by the U.S.EPA, CARB and/or the APCO.

C.45 UNPAVED TRAFFIC AREA: Any nonresidential area that is:

C.45.a Not covered by asphalt, recycled asphalt, asphaltic concrete, concrete, or concrete pavement, and

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C.45.b Used for fueling and servicing; shipping, receiving and transfer; or parking or storing equipment, haul trucks, vehicles, and any conveyances.

C.46 URBAN AREA: An area within an incorporated city boundary or within unincorporated areas completely surrounded by an incorporated city.

C.47 VDE: Visible dust emissions. Dust emissions that are visible to an observer.

C.48 VMT: Vehicle miles traveled.

C.49 WIND GUST: Is the maximum instantaneous wind speed as measured by an anemometer.

D. Compliance Schedule

D.1 Existing sources subject to this Regulation shall comply with its requirements no later than 90 days after its adoption date.

D.2 New sources subject to this Regulation shall comply with its requirements prior to initiation of activity.

D.3 BP and any person (including BLM and DPR) who owns or operates a Recreational OHV Use Area on public lands shall each comply with the following compliance schedule:

D.3.a Submit a draft dust control plan addressing all applicable portions of this Regulation including section F.5 and F.7 within three (3) months of the adoption date of this rule, to which the APCO shall respond within 60 days;

D.3.b Submit a final dust control plan addressing all APCO comments within two (2) months after receiving APCO's comments, which the APCO shall transmit to CARB and U.S. EPA for 45-day review and comment;

D.3.c If comments received from CARB or EPA, submit to them and APCO a revised final dust control plan addressing all comments within two (2) months after receiving comments.

D.3.d Implement all final dust control plan elements within six (6) months of submittal; and

D.3.e Submit an updated dust control plan every two calendar years

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by the procedures described in D.3.a to D.3.d. The updated plans shall be transmitted to the District no later than 90 days after the end of the calendar year and, in addition to information required of the initial plan, shall include a summary of actions taken to prevent or mitigate PM10 emissions during the previous two years.

E. Exemptions

The following activities are exempt from provisions of this Regulation:

E.1 Actions required by the Federal or State Endangered Species Act or any order issued by a court or governmental agency.

E.2 Off-Field Agricultural Sources necessary to minimize or respond to adverse effects on agricultural crops caused during freezing temperatures as declared by the National Weather Service.

E.3 Emergency maintenance of flood control channels and water spreading basins.

E.4 Any emergency operation activities performed to ensure public health and safety. Emergency activities lasting more than 30 days shall be subject to this Regulation, except where compliance would limit the effectiveness of the emergency activity performed to ensure public health and safety.

E.5 Blasting operations permitted by the California Division of Industrial Safety. Other activities performed in conjunction with blasting are not exempt from complying with the provisions of this rule.

E.6 The following military training activities conducted by the Department of Defense: (1) military Tactical Training, (2) maintenance, repair, and removal of targets and munitions associated with military Tactical Training, (3) open areas on active military ranges, including but not limited to designated impact areas, landing zones, and bivouac areas. However, unpaved roads, staging areas, parking lots, and other activities performed in conjunction with military Tactical Training are not exempt from complying with the provisions of this Regulation, as applicable.

F. General Requirements

F.1 Materials used for Chemical Stabilization of soils, including petroleum resins, asphaltic emulsions, acrylics, and adhesives shall not violate State Water Quality Control Board standards for use as a soil stabilizer. Materials accepted by the California Air Resources Board (ARB) and the

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United States Environmental Protection Agency (EPA), and which meet State water quality standards, shall be considered acceptable to the ICAPCD.

F.2 Any material prohibited for use as dust Suppressant by EPA, the ARB, or other applicable law, rule, or regulation is also prohibited under Regulation VIII.

F.3 Use of hygroscopic materials may be prohibited by the APCD in areas lacking sufficient atmospheric moisture of soil for such materials to effectively reduce Fugitive Dust emissions. The atmospheric moisture of soil is considered to be sufficient if it meets the application specifications of the hygroscopic product manufacturer. Use of such materials may be approved in conjunction with sufficient wetting of the controlled area.

F.4 Any use of dust Suppressants or gravel pads, and paving materials such as asphalt or concrete for paving, shall comply with other applicable District Rules.

F.5 Recreational OHV Use Area on Public lands Dust Control Plan Requirements

The BLM, DPR, or any other owner or operator of a Recreational OHV Use Area on public lands shall prepare a dust control plan to minimize PM-10 emissions. The dust control plan shall include at a minimum the following:

F.5.a A stipulation that all new authorizations for point and area stationary emission sources obtain all necessary permits and satisfy all applicable SIP provisions, including Regulation VIII specific control measures;

F.5.b A summary of:

F.5.b.1 The total miles of roads in the Recreational OHV Use Area on public lands that are paved, paved with unpaved shoulders, and unpaved roads with 50 or more average vehicle trips per day, including length and level of usage of each such road; the priority for control of road segments based on annual and episodic (e.g. event) usage; the plans for control of PM-10 emissions from these roads;

F.5.b.2 The location and extent (acreage and where feasible, estimate of number of vehicles) of open areas disturbed by legal and illegal Recreational Use,

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including maps such as those required by California Public Resources Code (PRC) section 5090.34; the priority for control of these open areas based on annual and episodic (e.g. event) usage; the plans for control of PM-10 emissions from these areas;

F.5.c Unpaved Roads and Unpaved Vehicle/Equipment Traffic Area. The dust control plan shall be implemented on all days that traffic exceeds, or is expected to exceed, the number of average daily vehicle trips per day as specified in sections F.5.c.1 and F.5.c.2 of this rule, except where measures are demonstrated by owner/operator to be prohibited by federal or state laws, regulations, or approved plans concerning wilderness preservation and species management and recovery.

F.5.c.1 On each day of an Off-Road Event and/or Competition that 50 average vehicle daily trips per day will occur on an unpaved road segment, the owner/operator shall limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by application and/or re-application/maintenance of at least one of the following control measures:

F.5.c.1.1 Watering;
F.5.c.1.2 Uniform layer of washed gravel;
F.5.c.1.3 Paving;
F.5.c.1.4 Restrict access;
F.5.c.1.5 Restrict speed limit at or below 15 mph;
F.5.c.1.6 Chemical/organic dust suppressants;
F.5.c.1.7 Roadmix;
F.5.c.1.8 Any other method(s) that can be demonstrated that effectively limits VDE to 20% opacity and meets the conditions of a stabilized unpaved road.

F.5.c.2 On each day of an Off-Road Event and/or Competition that 50 average vehicle daily trips per day will occur on an unpaved surface area dedicated to any vehicle parking and Unpaved Traffic Area, the owner/operator shall limit VDE to 20% opacity and comply with the requirements of a stabilized unpaved road by application and/or re-application/maintenance of at least one of the following control measures:

F.5.c.2.1 Watering;
F.5.c.2.2 Uniform layer of washed gravel;

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F.5.c.2.3 Paving;
F.5.c.2.4 Restricted access below the limit;
F.5.c.2.5 Restrict speed limit at or below 15 mph;
F.5.c.2.6 Chemical/organic dust suppressants;
F.5.c.2.7 Roadmix;
F.5.c.2.8 Any other method(s) that can be demonstrated that effectively limits VDE to 20% opacity and meets the conditions of a stabilized unpaved road.

F.5.d The dust control plan must describe all PM-10 control measures that will be implemented, such as restricted use areas, stabilization of Unpaved Traffic Areas and current Recreation Area Management Plan (RAMP) measures, all applicable soil and habitat conservation requirements, and all monitoring and corrective actions taken to reduce PM10 emissions during Off-Road Events and/or Competitions on public land and include all those measures that are feasible and not prohibited by the laws, regulations and plans described in F.5.c;

F.5.e Use BLM-standard road design and drainage specifications when maintaining existing roads or authorizing road maintenance and new road construction;

F.5.f Include public educational information on reducing PM-10 emissions with agency (e.g., BLM and DPR) open area literature (e.g. identification of restricted areas and/or applicable speed limits) and on related information signs in heavily used areas; and

F.5.g The owner or operator of a recreational OHV use area on public lands shall not permit Off-Road Events and/or Competitions from June 15th to August 15th, unless a specific dust control plan is submitted to and approved by the ICAPCD. The dust control plan shall include specific fugitive dust control measures and demonstrate that all control measures, including the requirements of this rule, can be implemented and enforced.

F.6 Border Patrol (BP) Requirements

The BP shall prepare a dust control plan designed to minimize PM10 emissions from sources under the control of the BP. The dust control plan shall include the following fugitive dust control measures:

F.6.a A stipulation that all new authorizations for point and area stationary emission sources obtain all necessary permits and

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satisfy all applicable SIP provisions, including Regulation VIII specific control measures;

F.6.b Implement alternatives to tire-dragging that result in fewer PM10 emissions, unless BP demonstrates such alternatives to be inconsistent with the monitoring of immigration across the U.S.-Mexico border;

F.7 New Recreational OHV Use Area(s) on Public Land Requirements

Before a public agency (including BLM and DPR) designates a property as “New Recreational OHV Use Area” (hereafter referred to as “New Recreational OHV Use Area”) for OHV recreation, the agency shall meet and confer with ICAPCD. A “New Recreational OHV Use Area” shall include areas physically undisturbed by OHV usage as of January 1, 2013. After development and approval of an agency’s first Dust Control Plan under Section D.3 of this rule, “New Recreational OHV Use Area also includes areas not described in the previous public agency’s dust control plan.”

F.7.a ICAPCD shall review the public agency’s draft General Plan, Specific Plan, or RAMP and/or related documents for consistency and compliance with the rules and requirements applicable to and/or implementing Imperial County’s plan for attainment and/or maintenance of the 24-hour federal PM-10 standard. During the applicable public comment period, ICAPCD may provide comments on the applicable plan to the public agency related to consistency and compliance with such rules and requirements, and where applicable, describe additional measures necessary for consistency and compliance with such rules and requirements.

F.7.b For any New Recreational OHV Use Area(s) with PM-10 emissions of 70 tons per year or above, the public agency must demonstrate in a federal- and/or state-required environmental assessment that these emissions would not:

F.7.b.1 Cause or contribute to any new violations of any PM-10 NAAQS in the area.

F.7.b.2 Interfere with provisions in the applicable PM-10 SIP for maintenance of the PM-10 NAAQS.

F.7.b.3 Increase the frequency or severity of any existing violation of PM-10 NAAQS; or

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F.7.b.4 Delay timely attainment of the PM-10 NAAQS or any required interim emission reductions or other milestones in any area including, where applicable, emission levels specified in the applicable SIP for purposes of: (i) a demonstration of reasonable further progress; (ii) a demonstration of attainment; or (iii) a maintenance plan.

F.7.c The public agency shall not approve the applicable General Plan, Specific Plan, or RAMP unless and until it has incorporated ICAPCD's comments and recommended mitigation measures or explained why a comment or recommended mitigation measure does not apply or is infeasible. If the public agency does not accept a mitigation measure or comment, the public agency shall consult with ICAPCD to identify an alternative measure or way to address ICAPCD's concern. In any event, all New Recreational OHV Use Areas shall comply with Section F.5 above.

G. Administrative Requirements

G.1 Test Methods

G.1.a Determination of VDE Opacity

Opacity observations to determine compliance with VDE standards shall be conducted in accordance with the test procedures for "Visual Determination of Opacity" as described in Appendix A of this rule. Opacity observations for sources other than unpaved traffic areas (e.g., roads, parking areas) shall be conducted per Section B of Appendix A and shall require 12 readings at 15-second intervals.

G.1.b Determination of Stabilized Surface

Observations to determine compliance with the conditions specified for a stabilized surface, in any inactive disturbed surface area, whether at a work site that is under construction, at a work site that is temporarily or permanently inactive, or on an open area and vacant lot, shall be conducted in accordance with the test methods described in Appendix B of this rule. If a disturbed surface area passes any of the applicable Appendix B-Section A, B and D-G tests, then the surface shall be considered stabilized.

G.1.c Determination of Soil Moisture Content

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Soil moisture content shall be determined by using ASTM Method D2216-98 (Standard Test Method for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass), or other equivalent test methods approved by the EPA, ARB, and the APCO.

G.1.d Determination of Silt Content for Bulk Materials

Silt content of a Bulk Material shall be determined by ASTM Method C136a (Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates), or other equivalent test methods approved by EPA, ARB, and the APCD.

G.1.e Determination of Silt Content for Unpaved Roads and Unpaved Vehicle/Equipment Traffic Areas

Silt Content for Unpaved Roads and Unpaved Traffic Areas shall be determined by using Section C of Appendix B of this Rule or other equivalent test methods approved by EPA, ARB, and the APCO.

G.1.f Determination of Threshold Friction Velocity (TFV)

TFV shall be determined by using Section D of Appendix B of this Rule or other equivalent test methods approved by EPA, ARB, and the APCO.

H. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application and compliance with this rule (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

I. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII. Failure to comply with the provisions of an APCO approved dust control plan shall also constitute a violation of this Regulation. Regardless of whether an APCO approved dust control plan is being implemented or not, or

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whether a Person responsible for an Active Operation(s) is complying with an approved dust control plan, the Person is still subject to the requirements of Regulation VIII at all times.

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APPENDIX A
Visual Determination of Opacity

SECTION A Test Method For Unpaved Roads and Unpaved Traffic Areas
SECTION B Test Method For Time-Averaged Regulations

SECTION A TEST METHOD FOR UNPAVED ROADS AND UNPAVED TRAFFIC AREAS

A Opacity Test Method. The purpose of this test method is to estimate the percent opacity of Fugitive Dust plumes caused by vehicle movement on Unpaved Roads and Unpaved Traffic Areas. This method can only be conducted by an individual who has current certification as a qualified observer.

A.1 Step 1: Stand at least 16.5 feet from the fugitive dust source in order to provide a clear view of the emissions with the sun oriented in the 140° sector to the back. Following the above requirements, make opacity observations so that the line of vision is approximately perpendicular to the dust plume and wind direction. If multiple plumes are involved, do not include more than one plume in the line of sight at one time.

A.2 Step 2: Record the Fugitive Dust source location, source type, method of control used, if any, observer's name, certification data and affiliation, and a sketch of the observer's position relative to the Fugitive Dust source. Also, record the time, estimated distance to the Fugitive Dust source location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), observer's position to the Fugitive Dust source, and color of the plume and type of background on the visible emission observation form both when opacity readings are initiated and completed.

A.3 Step 3: Make opacity observations, to the extent possible, using a contrasting background that is perpendicular to the line of vision. Make opacity observations approximately 1 meter above the surface from which the plume is generated. Note that the observation is to be made at only one visual point upon generation of a plume, as opposed to visually tracking the entire length of a dust plume as it is created along a surface. Make two observations per vehicle, beginning with the first reading at zero seconds and the second reading at five seconds. The zero-second observation should begin immediately after a plume has been created above the surface involved. Do not look continuously at the plume but, instead, observe the plume briefly at zero seconds and then again at five seconds.

A.4 Step 4: Record the opacity observations to the nearest 5% on an observational record sheet. Each momentary observation recorded represents the average opacity of emissions for a 5-second period. While it is not required by the test method, EPA recommends that the observer estimate the size of the vehicles which generate dust plumes for which readings are taken (e.g. mid-size passenger car or heavy-duty truck.) and take the approximate speeds the vehicles are traveling when the readings are being taken.

A.5 Step 5: Repeat Step 3 (Section A.3. of this appendix) and Step 4 (Section A.4. of this appendix) until you have recorded a total of 12 consecutive opacity readings. This will occur once six vehicles have driven on the source in your line of observation for which you are able to take proper readings. The 12 consecutive readings must be taken within the same period of observation but must not exceed 1 hour. Observations immediately preceding and following interrupted observations can be considered consecutive.

A.6 Step 6: Average the 12 opacity readings together. If the average opacity reading equals 20% or lower, the source is in compliance with the opacity standard described in the applicable rule.

SECTION B TEST METHOD FOR VISUAL DETERMINATION OF OPACITY OF EMISSIONS FROM SOURCES FOR TIME-AVERAGED REGULATIONS

B Applicability. This method is applicable for the determination of the opacity of emissions from sources of visible emissions for time-averaged regulations. A time-averaged regulation is any regulation that requires averaging visible emission data to determine the opacity of visible emissions over a specific time period.

B.1 Principle. The opacity of emissions from sources of visible emissions is determined visually by a qualified observer who has received certification.

B.2 Procedures. A qualified observer who has been certified shall use the following procedures for visually determining the opacity of emissions.

B.2.a Position. Stand at a position at least 5 meters from the Fugitive Dust source n order to provide a clear view of the emissions with the sun oriented in the 140° sector to the back. Consistent as much as possible with maintaining the above requirements, make opacity observations from a position such that the line of sight is approximately perpendicular to the plume and wind direction. The observer may follow the Fugitive Dust plume generated by mobile earthmoving equipment, as long as the sun remains oriented in the 140° sector to the back. As much as possible, if multiple plumes are involved, do not include more than one plume in the line of sight at one time.

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B.2.b Field Records. Record the name of the site, Fugitive Dust source type (i.e., pile, material handling (i.e., transfer, loading, sorting)), method of control used, if any, observer's name, certification data and affiliation, and a sketch of the observer's position relative to the Fugitive Dust source. Also, record the time, estimated distance to the Fugitive Dust source location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds,) observer's position relative to the fugitive dust source, and color of the plume and type of the background on the visible emission observation form when opacity readings are initiated and completed.

B.2.c Observations. Make opacity observations, to the extent possible, using a contrasting background that is perpendicular to the line of sight. For storage piles, make opacity observations approximately 1 meter above the surface from which the plume is generated. For extraction operations and the loading of haul trucks in open-pit mines, make opacity observations approximately one meter above the rim of the pit. The initial observation should begin immediately after a plume has been created above the surface involved. Do not look continuously at the plume, but instead observe the plume momentarily at 15-second intervals. For Fugitive Dust from Earthmoving equipment, make opacity observations approximately 1 meter above the mechanical equipment generating the plume.

B.2.d Recording Observations. Record the opacity observations to the nearest 5% every 15 seconds on an observational record sheet. Each momentary observation recorded represents the average opacity of emissions for a 15-second period. If a multiple plume exists at the time of an observation, do not record an opacity reading. Mark an "x" for that reading. If the equipment generating the plume travels outside of the field of observation, resulting in the inability to maintain the orientation of the sun within the 140° sector or if the equipment ceases operating, mark an "x" for the 15 – second interval reading. Readings identified as "x" shall be considered interrupted readings.

B.2.e Data Reduction For Time-Averaged Regulations. For each set of 12 or 24 consecutive readings, calculate the appropriate average opacity. Sets must consist of consecutive observations, however, readings immediately preceding and following interrupted readings shall be deemed consecutive and in no case shall two sets overlap, resulting in multiple violations.

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APPENDIX B
Determination of Stabilization

SECTION A TEST METHODS FOR DETERMINING STABILIZATION

The test methods described in Section B through Section G of this appendix shall be used to determine whether an area has a Stabilized Surface. Should a disturbed area contain more than one type of disturbance, soil, vegetation, or other characteristics, which are visibly distinguishable, test each representative surface separately for stability, in an area that represents a random portion of the overall disturbed conditions of the site, according to the appropriate test methods in Section B through Section G of this appendix, and include or eliminate it from the total size assessment of disturbed surface area(s) depending upon test method results.

SECTION B VISIBLE CRUST DETERMINATION

B.1 Where a visible crust exists, drop a steel ball with a diameter of 15.9 millimeters (0.625 inches) and a mass ranging from 16-17 grams from a distance of 30 centimeters (one foot) directly above (at a 90° angle perpendicular to) the soil surface. If blowsand is present, clear the blowsand from the surfaces on which the visible crust test method is conducted. Blowsand is defined as thin deposits of loose uncombined grains covering less than 50% of a site which have not originated from the representative site surface being tested. If material covers a visible crust, which is not blowsand, apply the test method in Section D of this appendix to the loose material to determine whether the surface is stabilized.

B.2 A sufficient crust is defined under the following conditions: once a ball has been dropped according to section B.1 of this appendix, the ball does not sink into the surface, so that it is partially or fully surrounded by loose grains and, upon removing the ball, the surface upon which it fell has not been pulverized, so that loose grains are visible.

B.3 Drop the ball three times within a survey area that measures 1 foot by 1 foot and that represents a random portion of the overall disturbed conditions of the site. The survey area shall be considered to have passed the Visible Crust Determination Test if the results of at least two out of the three times that the ball

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was dropped, met the criteria in section B.2 of this appendix. Select at least two other survey areas that represent a random portion of the overall disturbed conditions of the site, and repeat this procedure. If the results meet the criteria of section B.2 of this appendix for all of the survey areas tested, then the site shall be considered to have passed the Visible Crust Determination Test and shall be considered sufficiently crusted.

B.4 At any given site, the existence of a sufficient crust covering one portion of the site may not represent the existence or protectiveness of a crust on another portion of the site. Repeat the visible crust test as often as necessary on each random portion of the overall conditions of the site for an accurate assessment.

SECTION C DETERMINATION OF SILT CONTENT FOR UNPAVED ROADS AND UNPAVED VEHICLE/EQUIPMENT TRAFFIC AREAS

The purpose of this test method is to estimate the silt content of the trafficked parts of Unpaved Roads and Unpaved vehicle/equipment Traffic Areas. The higher the Silt content, the more fine dust particles that are released when vehicles travel on Unpaved Roads and Unpaved vehicle/equipment Traffic Areas.

C.1 Equipment:

C.1.a A set of sieves with the following openings: 4 millimeters (mm), 2mm, 1mm, 0.5mm and 0.25 mm, a lid, and collector pan.
C.1.b A small whisk broom or paintbrush with stiff bristles and dustpan 1 ft. in width (the broom/brush should preferably have one, thin row of bristles no longer than 1.5 inches in length.)
C.1.c A spatula without holes.
C.1.d A small scale with half-ounce increments (e.g., postal/package scale.)
C.1.e A shallow, lightweight container (e.g., plastic storage container.)
C.1.f A sturdy cardboard box or other rigid object with a level surface.
C.1.g A basic calculator.
C.1.h Cloth gloves (optional for handling metal sieves on hot, sunny days.)
C.1.i Sealable plastic bags (if sending samples to a laboratory.)
C.1.j A pencil/pen and paper.

C.2 Step 1: Look for a routinely traveled surface, as evidenced by tire tracks. Only collect samples from surfaces that are not damp due to precipitation or dew. This statement is not meant to be a standard in itself for dampness where watering is being used as a control measure. It is only intended to ensure that surface testing is done in a representative manner. Use caution when taking samples to ensure personal safety with respect to passing vehicles. Gently press the edge of a dustpan (1 foot in width) into the surface four times to mark an area that is 1 square foot. Collect a sample of loose surface material into the dustpan, minimizing escape of dust particles. Use a spatula to lift heavier elements such as gravel. Only collect dirt/Gravel to an approximate depth of 3/8

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inch or 1 cm in the 1 square foot area. If you reach a hard, underlying subsurface that is <3/8 inch in depth, do not continue collecting the sample by digging into the hard surface. In other words, you are only collecting a surface sample of loose material down to 1 cm. In order to confirm that samples are collected to a 1cm depth, a wooden dowel or other similar narrow object at least one-foot in length can be laid horizontally across the survey area while a metric ruler is held perpendicular to the dowel. (Optional: At this point, you can choose to place the sample collected into a plastic bag or container and take it to an independent laboratory for silt content analysis. A reference to the procedure the laboratory is required to follow is at the end of this section.)

C.3 Step 2: Place a scale on a level surface. Place a lightweight container on the scale. Zero the scale with the weight of the empty container on it. Transfer the entire sample collected in the dustpan to the container, minimizing escape of dust particles. Weigh the sample and record its weight.

C.4 Step 3: Stack a set of sieves in order according to the size openings specified above, beginning with the largest size opening (4mm) at the top. Place a collector pan underneath the bottom (0.25mm) sieve.

C.5 Step 4: Carefully pour the sample into the sieve stack, minimizing escape of dust particles by slowly brushing material into the stack with a whiskbroom or brush. On windy days, use the trunk or door of a vehicle as a wind barrier. Cover the stack with a lid. Lift up the sieve stack and shake it vigorously up and down and sideways for at least 1 minute.

C.6 Step 5: Remove the lid from the stack and disassemble each sieve separately, beginning with the top sieve. As you remove each sieve, examine it to make sure that all of the material has been sifted to the finest sieve through which it can pass (e.g., material in each sieve (besides the top sieve that captures a range of larger elements) should look the same size.) If this is not the case, re-stack the sieves and collector pan, cover the stack with the lid, and shake it again for at least 1 minute. You only need to reassemble the sieve(s) that contain material, which require further sifting.

C.7 Step 6: After disassembling the sieves and collector pan, slowly sweep the material from the collector pan into the empty container originally used to collect and weigh the entire sample. Take care not to minimize escape of dust particles. You do not need to do anything with material captured in the sieves – only the collector pan. Weigh the container with the materials from the collector pan and record its weight.

C.8 Step 7: If the source is an unpaved road, multiply the resulting weight by 0.38. If the source is an Unpaved vehicle/equipment Traffic Area, multiply the resulting weight by 0.55. The resulting number is the estimated silt loading. Then, divide the total weight of the sample you recorded earlier in Step 2 (Section C.4) and

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multiply by 100 to estimate the percent Silt content.

C.9 Step 8: Select another two routinely traveled portions of the Unpaved Road or Unpaved vehicle/equipment Traffic Area and repeat this test method. Once you have calculated the silt loading and percent silt content of the 3 samples collected, average your results together.

C.10 Step 9: Examine Results. If the average silt loading is less than 0.33 oz/ft^2, the surface is STABLE. If the average silt loading is greater than or equal to 0.33 oz/ft^2, then proceed to examine the average percent Silt content. If the source is an Unpaved Road and the average percent Silt content is 6% or less, the surface is STABLE. If the source is an unpaved parking lot and the average percent Silt content is 8% or less, the surface is STABLE. If your field test results are within 2% of the standard (for example, 4%-8% Silt content on an Unpaved Road) it is recommended that you collect 3 additional samples from the source according to Step 1 (section C.2) and take them to an independent laboratory for Silt content analysis.

C.11 Independent Laboratory Analysis: You may choose to collect samples from the source, according to Step 1 (section C.2) and send them to an independent laboratory for Silt content analysis rather than conduct the sieve field procedure. If so, the test method the laboratory is required to use is: “Procedures For Laboratory Analysis for Surface/Bulk Dust Loading Samples,” (Fifth Edition, Volume 1, Appendix C.2.3 “Silt Analysis,” 1995,) AP-42, Office of Air Quality Planning & Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

SECTION D DETERMINATION OF THRESHOLD FRICTION VELOCITY (TFV)

For disturbed surface areas that are not crusted or vegetated, determine threshold friction velocity (TFV) according to the following sieving field procedure (based on a 1952 laboratory procedure published by W.S. Chepil).

D.1 Obtain and stack a set of sieves with the following openings: 4 millimeters (mm), 2 mm, 1 mm, 0.5 mm, and 0.25 mm or obtain and stack a set of standard/commonly available sieves. Place the sieves in order according to size openings, beginning with the largest size opening at the top. Place a collector pan underneath the bottom (0.25 mm) sieve. Collect a sample of loose surface material from an area at least 30 cm by 30 cm in size to a depth of approximately 1 cm using a brush and dustpan or other similar device. Only collect soil samples from dry surfaces (i.e. when the surface is not damp to the touch). Remove any rocks larger than 1 cm in diameter from the sample. Pour the sample into the top sieve (4 mm opening) and cover the sieve/collector pan unit with a lid. Minimize escape of particles into the air when transferring surface soil into the sieve/collector pan unit. Move the covered sieve/collector pan unit by hand using a broad, circular arm motion in the horizontal plane. Complete twenty

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circular arm movements, ten clockwise and ten counterclockwise, at a speed just necessary to achieve some relative horizontal motion between the sieves and the particles. Remove the lid from the sieve/collector pan unit and disassemble each sieve separately beginning with the largest sieve. As each sieve is removed, examine it for loose particles. If loose particles have not been sifted to the finest sieve through which they can pass, reassemble and cover the sieve/collector pan unit and gently rotate it an additional ten times. After disassembling the sieve/collector pan unit, slightly tilt and gently tap each sieve and the collector pan so that material aligns along one side. In doing so, minimize escape of particles into the air. Line up the sieves and collector pan in a row and visibly inspect the relative quantities of catch in order to determine which sieve (or whether the collector pan) contains the greatest volume of material. If a visual determination of relative volumes of catch among sieves is difficult, use a graduated cylinder to measure the volume. Estimate TFV for the sieve catch with the greatest volume using Table 1 of this appendix, which provides a correlation between sieve opening size and TFV.

Table 1. Determination of Threshold Friction Velocity (TFV)

Tyler Sieve No.	ASTM 11 Sieve No.	Opening (mm)	TFV (cm/s)
5	5	4	135
9	10	2	100
16	18	1	76
32	35	0.5	58
60	60	0.25	43
Collector Pan	---	---	30

D.2 Collect at least three soil samples which represent random portions of the overall conditions of the site, repeat the above TFV test method for each sample and average the resulting TFVs together to determine the TFV uncorrected for non erodible elements. Non-erodible elements are distinct elements, in the random portion of the overall conditions of the site, that are larger than 1 cm in diameter, remain firmly in place during a wind episode, and inhibit soil loss by consuming Section of the shear stress of the wind. Non-erodible elements include stones and bulk surface material but do not include flat or standing vegetation. For surfaces with non-erodible elements, determine corrections to the TFV by identifying the fraction of the survey area, as viewed from directly overhead, that is occupied by non-erodible elements using the following procedure. Select a survey area of 1 meter by 1 meter that represents a random portion of the overall conditions of the site. Where many non-erodible elements lie within the survey area, separate the non-erodible elements into groups according to size. For each group, calculate the overhead area for the non-erodible elements according to the following equations:

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Average Dimensions = (Average Length) x (Average Width)	Eq. 1
Overhead Area = (Average Dimensions) x (Number of Elements)	Eq. 2
Total Overhead Area = Overhead Area Of Group 1 + Overhead Area of Group 2 (etc)	Eq. 3
Total Frontal Area = Total Overhead Area/2	Eq. 4
Percent Cover of Non-Erodible Elements = (Total Frontal Area/Survey Area) x 100	Eq. 5

Note: Ensure consistent units of measurements (e.g., square meters or square inches when calculating percent cover).

Repeat this procedure on an additional two distinct survey areas that represent a random portion of the overall conditions of the site and average the results. Use Table 2 of this appendix to identify the correction factor for the percent cover of non-erodible elements. Multiply the TFV by the corresponding correction factor to calculate the TFV corrected for non-erodible elements.

Table 2. Correction Factors for Threshold Friction Velocity

Percent Cover of Non-Erodible Elements	Correction Factor
Greater than or equal to 10%	5
Greater than or equal to 5% and less than 10%	3
Less than 5% and greater than or equal to 1%	2
Less than 1%	None

SECTION E DETERMINATION OF FLAT VEGETATIVE COVER

Flat vegetation includes attached (rooted) vegetation or unattached vegetative debris lying on the surface with a predominant horizontal orientation that is not subject to movement by wind. Flat vegetation, which is dead but firmly attached, shall be considered equally protective as live vegetation. Stones or other aggregate larger than 1 centimeter in diameter shall be considered protective cover in the course of

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conduction the line transect test method. Where flat vegetation exists conduct the following line transect test method.

E.1 Line Transect Test Method. Stretch a 100 foot measuring tape across a survey area that represents a random portion of the overall conditions of the site. Firmly anchor both ends of the measuring tape into the surface using a tool such as a screwdriver, with the tape stretched taut and close to the soil surface. If vegetation exists in regular rows, place the tape diagonally (at approximately a 45° angle) away from a parallel or perpendicular position to the vegetated rows. Pinpoint an area the size of a 3/32 inch diameter brazing rod or wooden dowel centered above each 1 foot interval mark along one edge of the tape. Count the number of times that flat vegetation lies directly underneath the pinpointed area at 1 foot intervals. Consistently observe the underlying surface from a 90° angle directly above each pinpoint on one side of the tape. Do not count the underlying surface as vegetated if any portion of the pinpoint extends beyond the edge of the vegetation underneath in any direction. If clumps of vegetation or vegetative debris lie underneath the pinpointed area, count the surface as vegetated, unless bare soil is visible directly below the pinpointed area. When 100 observations have been made, add together the number of times a surface was counted as vegetated. This total represents the percent of flat vegetations cover (e.g., if 35 positive counts were made, then vegetation cover is 35%.) If the survey area that represents a random portion of the overall conditions of the site is too small for 100 observations, make as many observations as possible. Then multiply the count of vegetated surface areas by the appropriate conversion factor to obtain percent cover. For example, if vegetation was counted 20 times within a total of 50 observations, divide 20 by 50 and multiply by 100 to obtain a flat vegetation cover of 40%.

E.2 Conduct the line transect test method, as described in section E.1 of this appendix, an additional two times on areas that represent a random portion of the overall conditions of the site and average results.

SECTION F DETERMINATION OF STANDING VEGETATIVE COVER.

Standing vegetation includes vegetation that is attached (rooted) with a predominant vertical orientation. Standing vegetation, which is dead but firmly rooted, shall be considered equally protective as live vegetation. Conduct the following standing vegetation test method to determine if 30% cover or more exists. If the resulting percent cover is less than 30% but equal to or greater than 10%, then conduct the test in Section D; "Determination Of Threshold Friction Velocity (TFV,) of this appendix in order to determine if the site is stabilized, such that the standing vegetation cover is equal to or greater than 10%, where threshold friction velocity, corrected for non-erodible elements, is equal to or greater than 43cm/second.

F.1 For standing vegetation that consists of large, separate vegetative structures (e.g., shrubs and sagebrush,) select a survey area that represents a random

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portion of the overall conditions of the site that is the shape of a square with sides equal to at least 10 times the average height of the vegetative structures. For smaller standing vegetation, select a survey area of three feet by three feet.

F.2 Count the number of standing vegetative structures within the survey area. Count vegetation, which grows in clumps as a single unit. Where different types of vegetation exist and/or vegetation of different height and width exists, separate the vegetative structures with similar dimensions into groups. Count the number of vegetative structures in each group within the survey area. Select an individual structure within each group that represents the average height and width of the vegetation in the group. If the structure is dense (e.g., when looking at it vertically from base to top there is little or zero open air space within its perimeter,) calculate and record its frontal silhouette area, according to Equation 6 of this appendix. Also, use Equation 6 of this appendix to estimate the average height and width of the vegetation if the survey area is larger than nine square feet. Otherwise, use the procedure in section F.3 of this appendix to calculate the frontal silhouette area. Then calculate the percent cover of standing vegetation according to Equations 7, 8, and 9 of this appendix.

Frontal Silhouette Area = (Average Height) x (Average Width)	Eq. 6
Frontal Silhouette Area Of Group= (Frontal Silhouette Area Of Individual Vegetative Structure) x (Number Of Vegetation Structures Per Group)	Eq. 7
Total Frontal Silhouette Area = Frontal Silhouette Area Of Group 1 + Frontal Silhouette Area Of Group 2 (etc.)	Eq. 8
Percent Cover Of Standing Vegetation = (Total Frontal Silhouette Area/Survey Area) x 100	Eq. 9
Percent Open Space = [(Number Of Circled Gridlines Within The Outlined Area Counted That Are Not Covered By Vegetation/Total Number Of Gridline Intersections Within The Outlined Area) x 100]	Eq.10
Percent Vegetative Density = 100 – Percent Open Space	Eq. 11
Vegetative Density = Percent Vegetative Density/100	Eq. 12
Frontal Silhouette Area = [Max. Height x Max. Width] x [Vegetative Density/.04]o.5	Eq. 13

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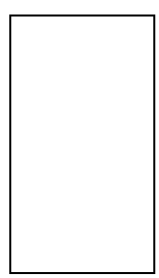
Note: Ensure consistent units of measurement (e.g., square meters or square inches when calculating percent cover.)

F.3 Vegetative Density Factor. Cut a single, representative piece of vegetation (or consolidated vegetative structure) to within 1cm of surface soil. Using a white paper grid or transparent grid over white paper, lay the vegetation flat on top of the grid (but do not apply pressure to flatten the structure.) Grid boxes of 1 inch or ½ inch squares are sufficient for most vegetation when conducting this procedure. Using a marker or pencil, outline the shape of the vegetation along its outer perimeter, according to Figure B, C, or D of this appendix, as appropriate. (Note: Figure C differs from Figure D primarily in that the width of vegetation in Figure C is narrow at its base and gradually broadens to its tallest height. In Figure D, the width of the vegetation generally becomes narrower from its midpoint to its tallest height.) Remove the vegetation, count and record the total number of gridline intersections within the outlined area, but do not count gridline intersections that connect with the outlined shape. There must be at least 10 gridline intersections within the outlined area and preferably more than 20, otherwise, use smaller grid boxes. Draw small circles (no greater than a 3/32 inch diameter) at each gridline intersection counted within the outlined area. Replace the vegetation on the grid within its outlined shape. From a distance of approximately 2 feet directly above the grid, observe each circled gridline intersection. Count and record the number of circled gridline intersections that are not covered by any piece of the vegetation. To calculate percent vegetative density, use Equations 10 and 11 of this appendix. If percent vegetative density is equal to or greater than 30, use an equation (one of the equations-Equations 16, 17, or 18 of this appendix) that matches the outline used to trace the vegetation (Figure B, C, or D) to calculate its frontal silhouette area. If percent vegetative density is less than 30, use Equations 12 and 13 of this appendix to calculate the frontal silhouette area.

Figure B. Cylinder



$$\text{Frontal Silhouette Area} = \text{Maximum Height} \times \text{Maximum Width} \qquad \text{Eq.16}$$

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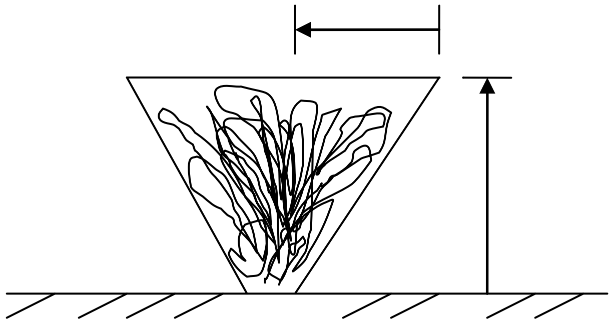
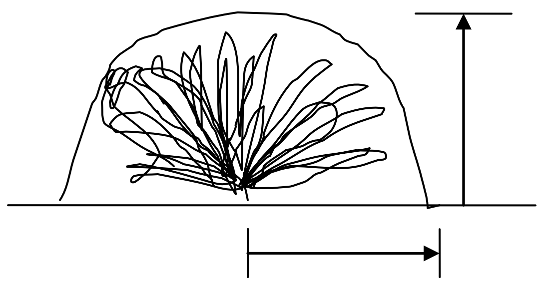
Figure C. Inverted Cone



Frontal Silhouette Area = Maximum Height x ½ Maximum Width Eq. 17

Figure D. Upper Sphere



Frontal Silhouette Area = (3.14 x Maximum Height x ½ Maximum Width)/2 Eq.18

SECTION G ROCK TEST METHOD

The Rock Test Method, which is similar to Section D, Test Methods For Stabilization-Determination Of Threshold Friction Velocity (TFV) of this appendix, examines the wind-resistance effects of rocks and other non-erodible elements on disturbed surfaces. Non-erodible elements are objects larger than 1 centimeter (cm) in diameter that remain firmly in place even on windy days. Typically, non-erodible elements include rocks, stones, glass fragments, and hardpacked clumps of soil lying on or embedded in the surface. Vegetation does not count as a non-erodible element in this method. The purpose of this test method is to estimate the percent cover of non-erodible elements on a given surface to see whether such elements take up enough space to offer protection against windblown dust. For simplification, the following test method refers to all non-erodible elements as ‘rocks.”

G.1 Select a 1 meter by 1 meter survey area that represents the general rock distribution on the surface. A 1 meter by 1 meter area is slightly greater than a 3 foot by 3 foot area. Mark-off the survey area by tracing a straight, visible line in the dirt along the edge of a measuring tape or by placing short ropes, yard sticks,

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or other straight objects in a square around the survey area.

G.2 Without moving any of the rocks or other elements, examine the survey area. Since rocks >3/8 inch (1cm) in diameter are of interest, measure the diameter of some of the smaller rocks to get a sense of which rocks need to be considered.

G.3 Mentally group the rocks >3/8 inch (1cm) diameter lying in the survey area into small, medium, and large size categories. Or, if the rocks are all approximately the same size, simply select a rock of average size and typical shape. Without removing any of the rocks from the ground, count the number of rocks in the survey area in each group and write down the resulting number.

G.4 Without removing rocks, select one or two average-size rocks in each group and measure the length and width. Use either metric units or standard units. Using a calculator, multiply the length times the width of the rocks to get the average dimensions of the rocks in each group. Write down the results for each rock group.

G.5 For each rock group, multiply the average dimensions (length times width) by the number of rocks counted in the group. Add the results from each rock group to get the total rock area within the survey area.

G.6 Divide the total rock area, calculated in section G.5 of this appendix, by two (to get frontal area.) Divide the resulting number by the size of the survey area (make sure the units of measurement match,) and multiply by 100 for percent rock cover. For example, the total rock area is 1,400 square centimeters divide 1,400 by 2 to get 700. Divide 700 by 10,000 (the survey area is 1 meter by 1 meter, which is 100 centimeters by 100 centimeters or 10,000 centimeters) and multiply by 100. The result is 7% rock cover. If rock measurements are made in inches, convert the survey area from meters to inches (1 inch = 2.54 centimeters.)

G.7 Select and mark-off two additional survey areas and repeat the procedures described in section G.1 through section G.6 of this appendix. Make sure the additional survey areas also represent the general rock distribution on the site. Average the percent cover results from all three survey areas to estimate the average percent of rock cover.

G.8 If the average rock cover is greater than or equal to 10%, the surface is stable. If the average rock cover is less than 10%, follow the procedures in section G.9 of this appendix.

G.9 If the average rock cover is less than 10%, the surface may or may not be stable. Follow the procedures in Section D.3 Determination Of Threshold Friction Velocity (TFV) of this rule and use the results from the rock test method as a correction (i.e., multiplication) factor. If the rock cover is at least 1%, such rock

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cover helps to limit windblown dust. However, depending on the soil's ability to release fine dust particles into the air, the percent rock cover may or may not be sufficient enough to stabilize the surface. It is also possible that the soil itself has a high enough TFV to be stable without even accounting for rock cover.

G.10 After completing the procedures described in Section G.9 of this appendix, use Table 2 of this appendix to identify the appropriate correction factor to the TFV, depending on the percent rock cover.

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RULE 801 CONSTRUCTION AND EARTHMOVING ACTIVITIES
(Adopted 11/08/2005)

A. Purpose

The purpose of this rule is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Construction and other Earthmoving Activities by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to any Construction and other Earthmoving Activities, including, but not limited to, land clearing, excavation related to construction, land leveling, grading, cut and fill grading, erection or demolition of any structure, cutting and filling, trenching, loading or unloading of bulk materials, demolishing, drilling, adding to or removing bulk of materials from open storage piles, weed abatement through disking, back filling, travel on-site and travel on access roads to and from the site.

C. Definitions

The definitions of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Construction or demolition at existing single family residential dwellings.

D.2 The 20% opacity limit of Sections E.1.a and E.2.b shall not apply when Wind Gusts exceed 25 miles per hour, provided that at least one of the following control measures is implemented for each applicable Fugitive Dust source type:

D.2.a Cease dust generating activities for a period of one hour after Wind Gusts last exceed the threshold. If operations cease for the remainder of the day, stabilization measures must be implemented.

D.2.b Apply water or dust Suppressants once per hour.

D.2.c Apply water to maintain 12% soil moisture content.

D.2.d Construct fences 3-5 feet high with 50% or less porosity, and must

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be done in conjunction with another measure, as above.

E. Requirements

E.1 Construction sites and Earthmoving Activities:

E.1.a All Persons who own or operate a Construction site shall comply with the requirements of Section F.1 so as to limit VDE to 20% opacity and comply with the conditions for a Stabilized Surface when applicable.

E.1.b All Persons who perform any Earthmoving Activities shall comply with the requirements of Section F.1 so as to limit VDE to 20% opacity.

E.1.c All Persons who own or operate a Construction site of 10 acres or more in size for residential developments or 5 acres or more for non-residential developments shall develop a dust control plan. The dust control plan shall be made available to the APCD upon request. The dust control plan shall comply with the requirements of Section F.

E.1.d The owner or operator required to develop a dust control plan shall provide written notification to the APCD within 10 days prior to the commencement of any Construction activities via fax or mail. The requirement to develop a dust control plan shall apply to all such activities conducted for residential and non-residential (e.g., commercial, industrial, or institutional) purposes or conducted by any governmental entity. Regardless of whether a dust control plan is in place or not the owner or operator is still subject to comply with all requirements of the applicable rules under Regulation VIII at all times.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 Construction and Earthmoving Activities shall comply with the following requirements:

F.1.a Pre-Activity:

F.1.a.1 Pre-water site sufficient to limit VDE to 20% opacity, and

F.1.a.2 Phase work to minimize the amount of disturbed surface area at any one time.

F.1.b During Active Operations:

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F.1.b.1 Apply water or Chemical Stabilization as directed by product manufacturer to limit VDE to 20% opacity, or

F.1.b.2 Construct and maintain wind barriers sufficient to limit VDE to 20% opacity. If utilizing wind barriers, control measure F.1.b.1 above shall be implemented.

F.1.b.3 Apply water or Chemical Stabilization as directed by product manufacturer to unpaved haul/access roads and Unpaved Traffic Areas sufficient to limit VDE to 20% opacity and meet the conditions of a Stabilized Unpaved Road.

F.1.c Temporary Stabilization During Periods of Inactivity:

F.1.c.1 Restrict vehicular access to the area by fencing or signage; and

F.1.c.2 Apply water or Chemical Stabilization, as directed by product manufacturer, sufficient to comply with the conditions of a Stabilized Surface. If an area having 0.5 acres or more of disturbed surface area remains unused for seven or more days, the area must comply with the conditions for a Stabilized Surface area.

F.1.d Track Out/Carry Out of Bulk Materials at the site shall be mitigated in compliance with Rule 803.

F.1.e Unpaved Roads and Unpaved Traffic Areas at the site shall comply with Rule 805.

F.1.f Bulk Material handling operations at the site shall comply with Rule 802.

F.1.g Material transport of Bulk Material to, from, or around the site shall comply with Rule 802.

F.1.h Haul trucks transporting Bulk Material to, from, or around the site shall comply with Rule 802.

F.2 Dust Control Plan:

F.2.a Retain a copy of the dust control plan at the project site.

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F.2.b Comply with the requirements of the approved dust control plan.

F.2.c A dust control plan shall contain all of the following information:

1. Name, address, and phone number of the Person responsible for the preparation, submittal, and implementation of the dust control plan and responsible for the project site.

2. A plot plan which shows the type and location of each project.

3. The total area of land surface to be disturbed, estimated daily throughput volume of earthmoving in cubic yards, and total area in acres of the entire project site.

4. The expected start and completion dates of dust generating and soil disturbance activities to be performed on the site.

5. The actual and potential sources of Fugitive Dust emissions on the site and the location of Bulk Material handling and storage areas, Paved and Unpaved Roads, entrances and exits where Track Out/Carry Out may occur, and Unpaved Traffic Areas.

6. Dust Suppressants to be applied, including: product specifications; manufacturer's usage instructions (method, frequency, and intensity of application); type, number, and capacity of application equipment; and information on environmental impacts and approvals or certifications related to appropriate and safe use for ground application.

7. Specific surface treatment(s) and/or control measures utilized to control Track Out/Carry Out, and sedimentation where unpaved and/or access points join paved public access roads.

8. The dust control plan should describe all Fugitive Dust control measures to be implemented before, during, and after any dust generating activity.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of

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treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

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RULE 802 BULK MATERIALS
(Adopted 11/08/2005)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from outdoor handling, storage, and transport of Bulk Material by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to the outdoor handling, storage, and transport of Bulk Material, including, but not limited to, earth, rock, silt, sediment, sand, gravel, soil, fill, Aggregate Materials, dirt, mud, debris, and other organic and/or inorganic material consisting of or containing Particulate Matter with five percent or greater silt content.

C. Definitions

The definitions of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Outdoor storage, transport, or handling of Bulk Materials (including, but not limited to, organic or inorganic fertilizer, grains, seed, soil amendments, and feed) which would be damaged by wetting with water or by the application of Chemical Stabilization/Suppression, provided owners/operators demonstrate to the satisfaction of the APCO that none of the control measures required by this rule can be implemented to limit VDE to 20% opacity or provide a Stabilized Surface, as defined in Rule 800.

D.2 Outdoor storage or handling of any Bulk Material at a single site where no material is actively being added or removed at the end of the workday or overnight and where the total material stored is less than 100 cubic yards.

D.3 Transport of a Bulk Material in an outdoor area for a distance of twelve feet or less with the use of a chute or conveyor device.

D.4 Transport/hauling of Bulk Materials when conducted within the boundaries of a premises, are exempt from the requirements specified in Sections

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F.3.a and F.3.d.

E. Requirements

E.1 Bulk Material handling: no Person shall cause, suffer, allow or engage in any Bulk Material handling operation including, but not limited to stacking, loading, unloading, conveying and reclaiming of Bulk Material, for industrial or commercial purposes without complying with one or more of the requirements of Section F.1 so as to limit VDE to 20% opacity.

E.2 Bulk Material storage: no Person shall cause, suffer, allow or engage in any Bulk Material storage, for industrial or commercial purposes without complying with one or more of the requirements of Section F.2 so as to limit VDE to 20% opacity.

E.3 Material transport: no Person shall cause, suffer, allow or otherwise engage in the transportation of Bulk Materials for industrial or commercial purposes, without complying with all of the requirements of Section F.3 so as to limit VDE to 20% opacity.

E.4 Haul Trucks: no Person shall cause, suffer, allow or otherwise engage in the use or operation of any Haul Truck, for industrial or commercial purposes, of transporting or storing Bulk Material without complying with all of the requirements of Section F.3 so as to limit VDE to 20% opacity.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 BULK MATERIAL HANDLING/TRANSFER:

F.1.a Spray with water prior to handling and/or at points of transfer; or.

F.1.b Apply and maintain Chemical Stabilization, or

F.1.c Protect from wind erosion by sheltering or enclosing the operation and transfer line.

F.2 BULK MATERIAL STORAGE

F.2.a When storing Bulk Materials, comply with the conditions for a Stabilized Surface; or

F.2.b Cover Bulk Materials stored outdoors with tarps, plastic, or other suitable material and anchor in such a manner that prevents the cover from being removed by wind action, or

F.2.c Construct and maintain barriers with less than 50% porosity. If

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utilizing fences or wind barriers, apply water or chemical/organic stabilizers/suppressants, or

F.2.d Utilize a 3-side structure with a height at least equal to the height of the storage pile and with less than 50% porosity.

F.3 MATERIAL TRANSPORT/HAULING:

F.3.a Completely cover or enclose all Haul Truck loads of Bulk Material.

F.3.b Haul Trucks transporting loads of Aggregate Materials shall not be required to cover their loads if the load, where it contacts the side, front, and back of the cargo container area remains six inches from the upper area of the container area, and if the load does not extend, at its peak, above any part of the upper edge of the cargo container area (As defined in Section 23114 of the California Vehicle Code for both public and private roads).

F.3.c The cargo compartment(s) of all Haul Trucks are to be constructed and maintained so that no spillage and loss of Bulk Material can occur from holes or other openings in the cargo compartment's floor, side, and/or tailgate. Seals on any openings used to empty the load including, but not limited to, bottom-dump release gates and tailgates to be properly maintained to prevent the loss of Bulk Material from those areas.

F.3.d The cargo compartment of all Haul Trucks is to be cleaned and/or washed at delivery site after removal of Bulk Material.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

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RULE 803 CARRY-OUT AND TRACK-OUT
(Adopted 11/08/2005)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Track-Out and Carry-Out by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to all sites that are subject to Regulation VIII where Track-Out or Carry-Out has occurred or may occur on paved public roads or the paved shoulders of a paved public road.

C. Definitions

The definition~~s~~ of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions:

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Agricultural Operation Sites defined in and subject to Rule 806, Conservation Management Practices, are exempt from the requirements specified in Sections F.1.b and F.1.c.

D.2 Any operation site that operates no more than 10 days within a 90 days period at each location is exempt from the requirements specified in Sections F.1.b and F.1.c.

E. Requirements

E.1 Track Out/Carry Out: any Person who causes the deposition of Bulk Material by tracking out or carrying out onto a Paved Road surface shall comply with the requirements of Section F.1, as specified, to prevent or mitigate such deposition.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 TRACK OUT/CARRY OUT:

F.1.a Clean up any Bulk Material tracked out or carried out onto a Paved

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Road on the following time-schedule:

(1) Within urban areas, immediately, when Track-Out or Carry-Out extends a cumulative distance of 50 linear feet or more; and

(2) At the end of the workday, for all other Track-Out or Carry-Out.

F.1.b In addition to F.1.a, all sites with access to a Paved Road and with 150 or more Average Vehicle Trips per Day, or 20 or more Average Vehicle Trips per Day by vehicles with three or more axles shall install one or more Track-Out Prevention Devices or other APCO approved Track-Out control device or wash down system at access points where unpaved traffic surfaces adjoin Paved Roads; or

F.1.c In addition to F.1.a, all sites with access to a Paved Road and with 150 or more Average Vehicle Trips per Day, or 20 or more Average Vehicle Trips per Day by vehicles with three or more axles shall apply and maintain paving, Chemical Stabilization, or at least 3 inch depth of Gravel (using Gravel or other low Silt (<5%) content material), for a distance of 50 or more consecutive feet at access points where Unpaved Roads adjoin Paved Roads.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

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RULE 804 OPEN AREAS
(Adopted 11/08/2005; Revised 10/16/2012; 04/12/2016)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM_{10}) entrained in the ambient air as a result of emissions generated from Open Areas by requiring actions to prevent, reduce, or mitigate PM_{10} emissions.

B. Applicability

This rule shall apply to any open area having 0.5 acres or more within urban areas, or 3.0 acres or more within rural areas; and contains at least 1000 square feet of disturbed surface area.

C. Definitions

The definition of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM_{10}) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Agricultural Operation Sites subject to Rule 806, Conservation Management Practices.

D.2 Recreational OHV Use Areas on public lands subject to Rule 800, General Requirements for Control of Fine Particulate Matter (PM_{10}).

E. Requirements

E.1 Open Areas: all Persons who own or otherwise have jurisdiction over an Open Area shall comply with one or more of the requirements of Section F.1 to comply with the conditions of a Stabilized Surface at all times and limit VDE to 20% opacity.

E.2 Vehicle use in Open Areas: within 30 days following initial discovery of evidence of trespass, a Person who owns or otherwise has jurisdiction over an Open Area shall prevent unauthorized vehicle access by posting "No Trespassing" signs or installing physical barriers such as fences, gates, posts, and/or appropriate barriers to effectively prevent access to the area.

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F. Best Available Control Measures for Fugitive Dust (PM_{10})

F.1 OPEN AREAS

Any Combination of BACM and Alternative BACM is permissible.

F.1.a Apply and maintain water or dust suppressant(s) to all unvegetated areas.

F.1.b Establish vegetation on all previously disturbed areas.

F.1.c Pave, apply and maintain Gravel, or apply and maintain Chemical Stabilizers/Suppressants

F.1.d Implement Alternative BACM, approved in accordance with subdivision G.

G. Alternative BACM Approval Process

G.1 The APCD may approve Alternative BACM if:

G.1a Both a technical evaluation submitted to the APCD and APCD-witnessed field test(s) (number and nature of tests determined by APCO) demonstrate that the proposed Alternative BACM achieves PM_{10} emissions reductions equivalent to BACM measures identified at F.1.a, F.1.b, and F.1.c available for the applicable operation and that the dust control method will achieve a STABALIZED SURFACE and meet the 20% opacity requirement; and,

G.2 After the APCD has accepted the Alternative BACM, the proposed Alternative BACM will be submitted to EPA for its approval.

H. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

I. Violations

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Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

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RULE 805 PAVED AND UNPAVED ROADS
(Adopted 11/08/2005; Revised 10/16/2012)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from new or existing public or private Paved or Unpaved Road, road construction project, or road modification project by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to any new or existing public or private Paved or Unpaved Road, road construction project, or road modification project.

C. Definitions

The definition of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this Rule:

D.1 Paved and unpaved driveways serving one single family residential dwelling.

D.2 Agricultural Operation Sites subject to Rule 806, Conservation Management Practices.

D.3 Recreational OHV Use Areas on public lands subject to Rule 800, General Requirements for Control of Fine Particulate Matter (PM-10).

E. Requirements

E.1 Unpaved Haul/Access Roads: No Person shall cause, suffer or allow the operation, use, or maintenance of any unpaved Haul/Access Road without complying with one or more of the requirements of Section F.1 so as to limit VDE to 20% opacity.

E.2 Unpaved Roads: On any Unpaved Road segment with 50 or more Average Vehicle Trips per Day, the owner/operator shall limit VDE to 20% opacity, as determined by the test methods for "Visual Determination of Opacity" in Rule 800, Appendix A, and comply with the requirements of a

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Stabilized Unpaved Road by application and/or maintenance of at least one of the requirements of Section F.1.

E.3 The construction of any new Unpaved Road is prohibited within any area with a population of 500 or more unless the road meets the definition of a Temporary Unpaved Road. The Temporary Unpaved Road shall meet the definition of a Stabilized Unpaved Road as determined by the test methods in Rule 800, Appendix B, Section C, and where VDE is limited to 20% opacity.

E.4 Canal Roads: all Persons who cause, suffer or allow the operation, use or maintenance of any Canal Road with 20 or more Average Vehicle Trips per Day shall comply with one or more of the requirements of Section F.1 to comply with the requirements of a Stabilized Unpaved Road and limit VDE to 20% opacity, as determined by the test methods in Rule 800, Appendix A, and shall also comply with one or more of the requirements of Section F.2.

E.5 Unpaved Traffic Areas: All Persons who cause, suffer or allow the operation, use or maintenance of any Unpaved Traffic Area larger than one (1) acre and with 75 or more Average Vehicle Trips per Day shall comply with one or more of the requirements of Section F.3 and limit VDE to 20% opacity.

E.6 Paved Roads: any new or Modified Paved Roads shall comply with the requirements of section F.4.

E.7 Requirements for Existing Unpaved Public Roads in City and Rural Areas:

Each city or county agency with primary responsibility for any existing Unpaved Road shall take the following actions:

E.7.a By January 1, 2006 provide the APCD with a list of all Unpaved Roads under its jurisdiction in any city or Rural area(s), including data on length of, and Average Vehicle Trips per Day on, each Unpaved Road segment.

E.7.b By March 31, 2006 the County Public Works Department shall provide the APCD and comply with a compliance plan. The compliance plan shall include a compliance schedule indicating that during the period 2006 through 2015 a 10% per each fiscal year, beginning July 1 and ending June 30, of all Unpaved Roads subject to the requirements of this rule will comply with a 20% VDE and comply with the requirements of a Stabilized Unpaved Road (Treatment in excess of the annual requirement can be credited toward future year requirements). The plan shall identify the control

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measures implemented or that will be implemented at each Unpaved Road segment with 50 or more Average Vehicle Trips per Day. The plan shall clarify that the 10% stabilized each year differ from the roads previously stabilized so that 100% of roads are stabilized by 2015.

E.7.c By July 31 of each year, 2007 through 2016, the County Public Works Department shall submit to the APCD the total number of Unpaved Road miles which were mitigated during the previous fiscal year, a list of the specific mitigated roads, and the percentage of cumulative miles relative to the schedule provided pursuant to Section E.7.b. Once stabilized pursuant to Section E.7, Public Roads must comply with the requirements of a Stabilized Unpaved Road by application and/or maintenance of at least one of the requirements of Section F.1.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 UNPAVED ROADS, INCLUDING UNPAVED HAUL AND ACCESS ROADS:

F.1.a Pave.

F.1.b Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.

F.1.c Apply and maintain Gravel, recrushed/recycled asphalt or other material of low Silt (<5%) content to a depth of three or more inches.

F.1.d Wetting. Apply water one or more times daily

F.1.e Permanent road closure

F.1.f Restrict unauthorized vehicle access.

F.1.g Any other method that effectively limits VDE to 20% opacity and meets the conditions of a Stabilized Unpaved Road.

F.2 CANAL ROADS:

F.2.a Stocking of Triploid Grass Carp in canals to reduce maintenance vehicle trips along Canal Banks to mechanically remove aquatic weeds.

F.2.b Installation of remote control delivery gates to eliminate manual

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gate operation by maintenance personnel in vehicles along Canal Banks.

F.2.c Implement Silt removal program to delay grading of spoil piles deposited on Canal Bank after cleaning operations until the next cleaning operation to eliminate vehicle access to Canal Bank.

F.2.d Permanent road closure.

F.2.e Conversion of open canals to pipeline.

F.2.f Lining canals to eliminate maintenance for Silt/weed control.

F.2.g Canal Bank surface maintenance.

F.3 UNPAVED TRAFFIC AREAS:

F.3.a Pave.

F.3.b Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.

F.3.c Apply and maintain Gravel, recrushed/recycled asphalt or other material of low silt (<5%) content to a depth of three or more inches.

F.3.d Wetting. Apply water one or more times daily.

F.4 NEW OR MODIFIED PAVED ROADS

Any Person having jurisdiction over, or ownership of, public or private Paved Roads shall construct, or require to be constructed, all new or Modified Paved Roads in conformance with the Imperial County Public Works Department guidelines for width of shoulders and median shoulders as specified below:

F.4.a New arterial roads or streets or modifications to existing arterial roads or streets shall be constructed with paved shoulders that meet following widths:

Annual Average Daily Vehicle Trips	Minimum Paved or Stabilized Shoulder Width in Feet
1-2000	2
Greater than 2000	6

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F.4.b New or modified collector roads or streets or local roads or streets shall be constructed with paved shoulders that meet following widths:

Annual Average Daily Vehicle Trips	Minimum Paved or Stabilized Shoulder Width in Feet
1-2000	2
Greater than 2000	4

F.4.c A curbing adjacent to and contiguous with the travel lane or paved shoulder or a road may be constructed, in lieu of meeting the paved shoulder width standard listed in Sections F.4.a and F.4.b. Any road paving projects constructing curbing in County road right of ways shall be approved by the Director of Public Works Department prior to construction.

F.4.d Intersections, auxiliary entry lanes, and auxiliary exit lanes may be constructed adjacent to and contiguous with the roadway, in lieu of meeting the paved shoulder width standard in Sections F.4.a and F.4.b.

F.4.e New Paved Road construction or modifications to an existing Paved Road that are required to comply with California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) determinations regarding environmental, cultural, archeological, historical, or other considerations addressed in such documents, are exempt from the paved shoulder width requirements specified in Section F.4.a.

F.4.f Whenever any Paved Road which has projected Annual Average Daily Vehicle Trips of 500 or more is constructed, or modified with medians, the medians shall be constructed with paved shoulders having a minimum width of four feet adjacent to the traffic lanes unless:

F.4.f.1 The medians of roads having speed limits set at or below 45 miles per hour are constructed with curbing; or

F.4.f.2 The medians are landscaped and maintained with grass or other vegetative ground cover to comply with the definition of Stabilized Surface.

F.4.g In lieu of complying with the paving or vegetation requirements a Person may apply oils or other Chemical Stabilizers/Suppressants to the required width of shoulder and median areas as specified in

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Sections F.4.a and F.4.b. The material shall be reapplied and maintained to limit VDE to 20% opacity and fulfill conditions for a Stabilized Surface.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

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RULE 806 CONSERVATION MANAGEMENT PRACTICES
(Adopted 11/08/2005; Revised 10/16/2012)

A. Purpose

The purpose of this regulation is to reduce the amount of coarse Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Agricultural Operation Sites by requiring Conservation Management Practices to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to Agricultural Operation Sites located within Imperial County. Effective on and after January 1, 2013, an owner/operator shall implement the applicable CMPs selected for each Agricultural Operation Site. The provisions of this rule adopted on November 8, 2005 shall remain in effect until January 1, 2013 at which time the amendments adopted on October 16, 2012 shall take effect.

C. Definitions

In addition to the definitions of terms in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10), the following definitions shall govern the implementation of this rule:

C.1 AGRICULTURAL OPERATIONS: The growing and harvesting of crops for the primary purpose of earning a living.

C.2 AGRICULTURAL OPERATION SITE: One or more agricultural parcels that meet the following:

C.2.a Are under the same or common ownership or operation, or which are owned or operated by entities which are under common control; and

C.2.b Are located on one or more contiguous or adjacent properties wholly within Imperial County.

C.3 AGRICULTURAL PARCEL: A portion of real property used by an owner or operator for carrying out a specific agricultural operation. Roads, vehicle/equipment traffic areas, and facilities, on or adjacent to the cropland are part of the agricultural parcel.

C.4 ALTERNATIVE TILLING: Till alternative rows for weed management, reducing approximately 50% of field activity related to tilling, in addition to stabilizing soil surface and reducing soil compaction.

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C.5 APPLICATION EFFICIENCIES: Use more efficient application equipment so as to reduce a minimum of one ground operation. Examples include: compact or low volume spray equipment; aerial applications; micro-heads or infrared spot sprayers; electrostatic sprayers. Reduces soil compaction, passes and chemical usage.

C.6 BALING/LARGE BALES: Reduce a minimum of one pass through the field per acre by using large balers to harvest crops.

C.7 BED/ROW SIZE OR SPACING: Reduce a minimum of one tillage operation by Increasing or decreasing the size of the planting bed area (can be done for field and permanent crops) or adjusting spacing. Spacing adjustments reduce the number of passes and soil disturbance by increasing plant density/canopy through reduction of row width to contain PM within the canopy.

C.8 BULK MATERIALS CONTROL: Minimize visible dust emissions from bulk materials by using dust suppressant or water to form a stabilized surface, or using a tarp to fully cover the pile or truckbed, or using a wind barrier or 3-sided structure to reduce entrainment of fugitive dust.

C.9 CHEMIGATION/FERTIGATION: Reduce a minimum of one ground operation by applying chemicals through an irrigation system. This reduces the need to travel in the field for application purposes, thus reducing operations and soil disturbance while increasing the efficiency of the application.

C.10 CHIPS/MULCHES, ORGANIC MATERIALS, POLYMERS, ROAD OIL & SAND: Application of any nontoxic chemical or organic dust suppressant that meets all specification required by any federal, state, or local water agency and is not prohibited for use by any applicable regulations. Chips/Mulches and organic materials should meet the specifications in the mulches definition below. Polymers, road oil and sand should create a stabilized surface during high traffic times such as harvest.

C.11 COMBINED OPERATION: Combine equipment to perform several operations during one pass, thereby reducing a minimum of one tillage operation. Examples include: use of one-pass till equipment in ground preparation or crop tillage; and cultivation and fertilization of a field crop in a single pass. Other benefits are reduction of soil compaction and time to prepare fields, both of which can be precursors to additional tillage requirements. If a combined operation is accomplished through equipment change/technological improvement, that action is considered one CMP, and either Equipment Changes/Technological Improvements CMP or Combined Operations CMP may be selected in a CMP Plan, but not both.

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C.12 CONSERVATION IRRIGATION: Reduce a minimum of one tillage operation related to weeding by conserving the amount of water used by using either drip, sprinkler, or buried/underground line irrigation. Conserving water reduces weed population, which in turn reduces the need for tillage and reduces soil compaction.

C.13 CONSERVATION MANAGEMENT PRACTICE (CMP): An activity or procedure that prevents, reduces, or mitigates PM-10 normally emitted by, or associated with, an agricultural activity.

C.14 CONSERVATION MANAGEMENT PRACTICES PLAN (CMP PLAN): A document prepared by the owner or operator of an Agricultural Operation site that lists the selected CMPs for implementation. The CMP Plan also contains, but is not limited to, contact information for the owner or operator, a description of the Agricultural Operation Site and locations of Agricultural Parcels, and other information describing the extent and duration of CMP implementation.

C.15 CONSERVATION TILLAGE (e.g.: no tillage, minimum tillage): A tillage system that reduces a minimum of three tillage operations. This system reduces soil and water loss by reducing the number of passes and by leaving crop residue on the field after harvest as well as managing the residue so that it remains intact during the planting season. It reduces the number of passes and amount of soil disturbance. It improves soil because it retains plant residue and increases organic matter.

C.16 COVER CROPS: Establish cover crops that maintain a minimum of 60 percent ground cover, as determined by the Line Transect Test Method. Native or volunteer vegetation that meets the minimum ground cover requirement is acceptable.

C.17 CROP RESIDUE MANAGEMENT: Maintain crop residue from previous crops until tilling for the next crop. Crop residues must maintain a minimum of 60 percent ground cover as determined by Line Transect Test Method. Implements such as undercuters or sweeps can maintain crop residues without burying or destroying residues.

C.18 CROPLAND - OTHER: This CMP category includes CMPs to reduce windblown emissions.

C.19 CROSS WIND STRIPCROPING: Establish crops in parallel strips across the prevailing wind erosion direction and arranged so that strips susceptible to wind erosion are alternated with strips having a protective cover that is resistant to wind erosion. The strips with the protective cover should be at least as wide as the strips susceptible to wind erosion.

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C.20 EQUIPMENT CHANGES/TECHNOLOGICAL IMPROVEMENTS: Reduce a minimum of one tillage operation by modifying equipment or making technological improvements. Examples include flame cultivation or equipment that combines discing, chiseling and ring rolling. If an equipment change/technological improvement is made in order to combine operations, that action is considered one CMP; either Equipment Changes/Technological Improvements CMP or Combined Operations CMP may be selected in the CMP plan, but not both.

C.21 FALLOW LAND: Temporary or permanent removal from production. Eliminates entire operation/passes or reduces activities.

C.22 FIELD WINDBREAKS: Plant or maintain a single or multiple row of trees or shrubs adjacent to windward edge of the field as close to perpendicular as practical with the direction of erosive winds. Windbreaks such as trees or shrubs should be established at a right angle to the prevailing wind direction. Sites downwind of the windbreak are considered protected if they fall within an area that is less than or equal to 10 times the height of the windbreak. The windbreak should have a porosity of 50 %.

C.23 GRAVEL: Placing a layer of Gravel at least 3 inches in depth to minimize dust generated from vehicle movement and to dislodge any excess debris which can become entrained. Gravel should conform to the grading defined in Rule 800.

C.24 GREEN CHOP: Reduce a minimum of one ground operation by harvesting a forage crop without allowing it to dry in the field. This practice reduces soil disturbance and soil compaction.

C.25 GRINDING/CHIPPING/SHREDDING: Grinding pruning's and orchard removals instead of burning; incorporate to soil. Reduces PM from burning crop residues.

C.26 GROUND OPERATION: An agricultural operation that is not a tillage operation that involves equipment passing across the field, such as a chemical spray application. A pass through the field may be a subset of a ground operation.

C.27 HAND HARVESTING: Reduce a minimum of one ground operation by harvesting a crop by hand. It reduces soil disturbance due to machinery passes.

C.28 INTEGRATED PEST MANAGEMENT: Reduce a minimum of one ground operation by using a combination of techniques including organic, conventional and biological farming concepts to suppress pest problems.

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It creates beneficial insect habitat that reduces the use of herbicides/pesticides thereby reducing number of passes for spraying. It also reduces soil compaction and the need for additional tillage. If integrated pest management CMP uses the same practices described in the Organic Practices CMP, this action is considered one CMP, and either Integrated Pest Management CMP or Organic Practices CMP may be selected in a CMP plan, but not both.

C.29 IRRIGATION POWER UNITS: Use cleaner burning engines, electric motors (CMP only applicable if engines are cleaner than otherwise required by current local, state and federal requirements).

C.30 MULCHING: Reducing PM10 emissions and wind erosion and preserving soil moisture by uniformly applying a protective layer of plant residue or other material to a soil surface prior to disturbing the site to reduce soil movement. Mulching material shall be evenly applied, and if necessary, anchored to the soil. Mulch should achieve a minimum 70% cover, and a minimum of 2 inch height above the surface. Inorganic material used for mulching should consist of pieces of .75 to 2 inches in diameter.

C.31 NIGHT FARMING: Operate at night when moisture levels are higher and winds are lighter. It decreases the concentration of PM emissions during daytime and the increased ambient humidity reduces PM emissions during the night. Night farming should take place between sundown and sunrise.

C.32 NIGHT HARVESTING: Implementing harvesting practices at night when moisture levels are higher and winds are lighter. It reduces PM by operating when ambient air is moist, thereby reducing PM emissions. Night harvesting should take place between sundown and sunrise.

C.33 NO BURNING: Switching to a crop/system that would not require waste burning. It reduces emissions associated with burning.

C.34 NON TILLAGE/CHEMICAL TILLAGE: Reduce a minimum of one tillage operation by, for example, using a flail mower or low volume sprayers. It reduces soil compaction and stabilizes soil.

C.35 ORGANIC PRACTICES: Reduce a minimum of one ground or tillage operation by using biological control methods or non-chemical control methods. Examples include: organic certification, biological controls, mulches and humus. If an organic practice CMP uses the same practice as described in the integrated pest management CMP, this action is considered one CMP, and either Organic Practices CMP or Integrated Pest Management CMP may be selected in a CMP plan, but not both.

C.36 PAVING: To pave currently Unpaved Roads.

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C.37 PERMANENT CROPS: Having an established permanent crop that is not replanted annually.

C.38 PRECISION FARMING (GPS): Reduce a minimum of one pass through the field per acre by using satellite navigation to calculate position in the field, therefore manage/treat the selective area. It reduces overlap and allows operations to occur during inclement weather conditions and at night thereby generating less PM.

C.39 PRE-HARVEST SOIL PREPARATION: Applying a water or stabilizing material to soil prior to harvest to form a visible crust. It reduces PM emissions at harvest.

C.40 REDUCED PRUNING: Reduce a minimum of one ground operation by reducing the frequency of pruning (e.g. one time per year, or every other year).

C.41 RESTRICTED ACCESS: To restrict or eliminate public access to unpaved private roads with signs or physical obstructions. At each access point, install signs or physical barriers such as gates, fencing, posts, signs, shrubs, trees that block or effectively control access to the area. It reduces vehicle traffic and thus reduces associated fugitive dust.

C.42 RIDGE ROUGHNESS: Establish stabilized ridges by normal tillage and planting equipment as close to perpendicular as practical with the direction of erosive winds (not appropriate for unstable soils such as sands or loamy sands). After establishment, ridges shall be maintained through those periods when wind erosion is expected to occur, or until growing crops provide enough cover to protect the soil from wind erosion. Ridge spacing should be no greater than 4 times the ridge height.

C.43 ROAD MIX: A mixture of tank bottoms from crude oil storage tanks, material from crude oil spills, or other crude-oil-containing soil mixed with aggregates and soils, that are used as a base cover materials for roads, parking lots, berms, tank and well locations, or similar applications.

C.44 SHED PACKING: Reducing a minimum of one pass through the field per acre by packing commodities in a covered or closed area, rather than field-pack. It reduces field traffic, thereby reducing PM emissions.

C.45 SHUTTLE SYSTEM/LARGE CARRIER: Reduce a minimum of one pass through the field per acre by hauling multiple or larger trailers/bins per trip.

C.46 SOIL AMENDMENTS: Organic or chemical materials uniformly applied to the soil for improvement (e.g: gypsum, lime, polyacrylamide).

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C.47 SPEED LIMITS: Control speed limits to 15 mph on unpaved roads through worker behavior modifications, signage, or any other necessary means.

C.48 SULFUR REDUCTION OR ELIMINATION: Reduce a minimum of one ground operation by reducing or eliminating sulfur dusting, an organic chemical used to control disease in crop, ornamental and home and gardens.

C.49 SURFACE ROUGHENING: Produce and maintain stable clods or aggregates on the land surface by bedding, rough disking, or tillage that leaves the surface covered by stable clods. Soil clods prevent wind erosion because they resist the forces of the wind and because they shelter other erodible materials. This CMP should be implemented consistent with NRCS Code 609 – Surface Roughening.

C.50 TILLAGE OPERATION: An agricultural operation that mechanically manipulates the soil for the enhancement of crop production. Examples include discing, weeding, or bedding. A pass through the field may be a subset of a tillage operation.

C.51 TRACK-OUT CONTROL: Minimize any and all material that adheres to and agglomerates on all vehicle and equipment from unpaved roads and falls onto a paved public road or the paved shoulder of a paved public road. Install one of the following devices: a grizzly, a gravel pad or a wheelwash system at all intersections of unpaved roads and public roads.

C.52 TRANSGENIC CROPS: Use of GMO or Transgenic crops such as "herbicide-ready" to reduce a minimum of one tillage operation. It reduces the need for tillage or cultivation operations, as well as reduces soil disturbance. It can also reduce the number of chemical applications.

C.53 WATER APPLICATION: Application of water to unpaved roads and traffic areas to create a visibly moist surface.

C.54 WIND BARRIER: Reduce wind erosion by planting or maintaining perennial or annual plants established in rows or narrow strips interspersed throughout a crop field as close to perpendicular as practical with the direction of erosive winds. To be effective, the selected plant(s) must create a stand at least three feet tall, with a porosity of 50%.

D. Requirements for Agricultural Operation Sites:

D.1 All Persons who own or operate an Agricultural Operation Site of forty (40) acres or more in size shall implement in each Agricultural Parcel at least one of the Conservation Management Practices from each of D.1.a through D.1.f. unless they implement the Conservation Tillage CMP. On

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acres implementing the Conservation Tillage CMP, persons do not need to select additional measures for D.1.a, D.1.b or D.1.e, but do need to implement at least one CMP each from D.1.c, D.1.d and D.1.f. Persons may choose the same CMP for D.1.c and D.1.d since they apply to different land, but must choose a unique and individual CMP for each of D.1.a, D.1.b, D.1.e and D.1.f (unless using Conservation Tillage CMP) since they apply to the same land.

D.1.a Land preparation and cultivation, CMPs in Section E.1;

D.1.b Harvest activities, CMPs in section E.2;

D.1.c Unpaved Roads, CMPs in Section E.3;

D.1.d Unpaved Traffic Areas, CMPs in Section E.4;

D.1.e Cropland-Other CMPs, in Section E.5; and

D.1.f Windblown Dust Control CMPs in Section E.6.

D.2 Agricultural unpaved roads with greater than fifty (50) or more vehicle daily trips (VDT), or twenty (20) or more VDT with three (3) or more axle vehicles, must meet the stabilization and opacity requirements in Section E.3.

D.3 Agricultural unpaved equipment or traffic areas with fifty (50) or more VDT, or twenty (20) or more VDT with 3 or more axle vehicles, must meet the stabilization and opacity requirements in Section E.4.

D.4 The owner or operator of an Agricultural Operation Site may implement more than one Conservation Management Practices for one or more of the categories.

D.5 The owner or operator of an Agricultural Operation Site shall ensure that the implementation of each selected Conservation Management Practices does not violate any other local, state, or federal law.

D.6 The owner or operator of an Agricultural Operation Site may develop alternative CMPs. The owner or operator shall submit to the APCD a technical evaluation of the alternative CMPs, demonstrating that the alternative CMP achieves PM-10 emission reductions that are at least equivalent to the most effective CMPs available for the applicable operation (e.g., by eliminated equivalent passes or operations). The APCD will review the technical evaluation, and the alternative CMP must receive approval by the APCD before being included in the CMP Plan.

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D.7 The owner or operator shall prepare a CMP Plan for each Agricultural Operation Site. The CMP Plan shall be made available to the APCD upon request. The CMP Plan shall be provided to the APCD within 72 hours of notice to the owner or operator.

E. Conservation Management Practices for Fugitive Dust (PM-10)

E.1 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs in each Agricultural Parcel to reduce PM10 emissions from land preparation and cultivation (CMP Category D.1.a). If the owner or operator selects “Fallow Land” as its CMP, the owner/operator must comply with section E.6 of this rule.

E.1.a Alternative Tilling,
E.1.b Bed/Row Size Spacing,
E.1.c Chemigation/Fertigation,
E.1.d Combined Operations,
E.1.e Conservation Irrigation,
E.1.f Cover Crops,
E.1.g Equipment Changes/Technological Improvements,
E.1.h Fallow Land,
E.1.i Integrated Pest Control,
E.1.j Mulching,
E.1.k Night Farming,
E.1.l Non Tillage /Chemical Tillage,
E.1.m Organic Pesticides,
E.1.n Precision Farming (GPS), or
E.1.o Transgenic Crops

E.2 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs in each Agricultural Parcel to reduce PM10 emissions from harvest activities (CMP Category D.1.b). If the owner or operator selects “Fallow Land” as its CMP, the owner/operator must comply with Section E.6 of this rule.

E.2.a Baling /Large Bales
E.2.b Combined Operations
E.2.c Equipment Changes/Technological Improvements
E.2.d Green Chop
E.2.e Hand Harvesting
E.2.f Fallow Land
E.2.g Night Harvesting
E.2.h No Burning
E.2.i Pre-Harvesting Soil Preparation
E.2.j Shed Packing
E.2.k Shuttle System/Large Carrier

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E.3 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs for each unpaved road (CMP Category D.1.c) to reduce PM10 emissions at all times:

E.3.a Chips/Mulches, Organic Materials, polymers, road oil and sand,
E.3.b Gravel
E.3.c Paving,
E.3.d Restricted access
E.3.e Speed limit
E.3.f Track-out control
E.3.g Water Application
E.3.h Field windbreak

On each day that high traffic accounts for 50 or more vehicle daily trips (VDT), or 20 or more VDT with 3 or more axles, on an unpaved road segment, the owner/operator of an Agricultural Operation Site shall comply with the requirements of a stabilized unpaved road and limit VDE to 20% opacity by implementing or maintaining one or more of the following CMPs:

E.3.i Pave.
E.3.j Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.
E.3.k Apply and maintain Gravel, recrushed/recycled asphalt or other material of low Silt (<5%) content to a depth of three or more inches.
E.3.l Water Application.
E.3.m Permanent road closure.
E.3.n Restrict unauthorized vehicle access.

E.4 The owner or operator of an agricultural operation site shall implement at least one of the following CMPs for each unpaved traffic area (CMP Category D.1.d) to reduce PM10 emissions at all times:

E.4.a Chips/Mulches, Organic Materials, Polymers, Road Oil and Sand,
E.4.b Gravel
E.4.c Paving
E.4.d Restricted Access
E.4.e Speed Limit
E.4.f Track-Out Control
E.4.g Water Application
E.4.h Field windbreak

On each day that high traffic accounts for 50 or more vehicle daily trips (VDT), or 20 or more VDT with 3 or more axles, on an Unpaved Traffic

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Area larger than one (1) acre, the owner/operator of an Agricultural Operation Site shall comply with the requirements of a stabilized unpaved road and limit VDE to 20% opacity by implementing or maintaining one or more of the following CMPs:

E.4.i Pave.
E.4.j Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.
E.4.k Apply and maintain Gravel, recrushed/recycled asphalt or other material of low Silt (<5%) content to a depth of three or more inches.
E.4.l Water Application.

E.5 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs in each Agricultural Parcel to reduce PM10 emissions from cropland-others (Category D.1.e). If the owner or operator selects "Fallow Land" as its CMP, the owner/operator must comply with Section E.6 of this rule.

E.5.a Alternate Tilling
E.5.b Application Efficiencies
E.5.c Bailing/Large Bales
E.5.d Bulk Materials Control
E.5.e Chemigation/Fertigation
E.5.f Conservation Irrigation
E.5.g Fallow Land
E.5.h Grinding/Chipping/Shredding
E.5.i Integrated Pest Management
E.5.j Irrigation Power Units
E.5.k Mulching
E.5.l Night Farming
E.5.m No Burning
E.5.n Non Tillage/Chemical Tillage
E.5.o Organic Practices
E.5.p Permanent Crops
E.5.q Reduced Pruning
E.5.r Soil Amendments
E.5.s Soil Incorporation
E.5.t Sulfur: Reduction or Elimination of Dusting
E.5.u Surface Roughening
E.5.v Transgenic Crops
E.5.w Wind Barrier

E.6 For windblown dust control (CMP Category D.1.f), the owner or operator of an agricultural operation site shall implement E.6.1. In addition to following E.6.1, if the owner or operator of an Agricultural Operation Site

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has fields that are in between crops or more permanently fallow, the owner or operator shall implement at least one of the CMPs in E.6.2.

E.6.1 When preparing a field for planting, minimize the time that newly tilled soil is smooth and dry by leaving the field surface with large clods for as long as possible and bedding and planting the field as soon as possible once it no longer has large clods.

E.6.2 For fields that are in between crops or are permanently fallow, the owner shall implement at least one of the CMPs below:

E.6.2a Cover Crop
E.6.2b Conservation Tillage
E.6.2c Crop Residue Management
E.6.2d Cross Wind Stripcropping
E.6.2e Field Windbreaks
E.6.2f Ridge Roughness
E.6.2g Surface Roughening
E.6.2h Wind Barrier

F. CMP Plan Preparation

An owner or operator shall prepare a CMP Plan for each Agricultural Operation Site. An owner or operator must maintain a CMP Plan that corresponds to the current crops being grown in the field and the corresponding CMPs for those crops. Each CMP Plan shall include, but is not limited to, the following information:

F.1 The name, business address, and telephone number of the owner or operator responsible for the preparation and implementation of the CMP Plan.

F.2 The signature of the owner or operator and the date that the CPM Plan was signed.

F.3 The location of the Agricultural Operation Site: cross roads; canal and gate number.

F.4 The crop grown at each location covered by the CMP Plan, total acreage for each crop, the length (miles) of unpaved roads, and the total area (acres or square feet) of the unpaved equipment and traffic areas to be covered by the CMP Plan

F.5 The CMPs being implemented for each crop, unpaved road, unpaved equipment and traffic area, and windblown dust control. The CMPs implemented should be described to verify that implementation is

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consistent with the CMP definitions in this rule.

F.6 Other relevant information as determined by the APCD.

G. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII. Failure to comply with the provisions of a CMP Plan shall also constitute a violation of Regulation VIII.

H. Record of Control Implementation

Any Person subject to the requirements of this rule shall maintain a copy of the CMP Plan and any supporting documentation necessary to confirm implementation of the CMPs. An owner or operator implementing alterative CMPs shall maintain a copy of technical evaluation for alternative CMPs and documentation of APCD approval of alternative CMPs. Records shall be maintained for two years after the date of each entry and shall be provided to the APCD upon request.

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Appendix G
Emission Inventory Documentation

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Appendix G. Emissions Inventory Documentation for the Imperial County PM_{10} Nonattainment Area Maintenance Plan

Emissions inventories are one of the fundamental building blocks in the development of a State Implementation Plan (SIP or Plan). In simple terms, an emissions inventory is a systematic listing of the sources of air pollution along with the amount of pollution emitted from each source or category over a given time period. This document describes the emissions inventory included in the Plan for the Imperial County PM_{10} Nonattainment Area.

The California Air Resources Board (CARB) and Imperial County Air Pollution Control District (District) have developed a comprehensive, accurate, and current emissions inventory consistent with the requirements set forth in Section 182(a)(1) of the federal Clean Air Act. CARB and District staff conducted a thorough review of the inventory to ensure that the emission estimates reflect accurate emission reports for point sources, and that estimates for mobile and areawide sources are based on the most recent models and methodologies.

CARB also reviewed the growth profiles for point and areawide source categories and updated them as necessary to ensure that the emission projections are based on data that reflect historical trends, current conditions, and recent economic and demographic forecasts. Growth forecasts for most point and areawide sources were developed either by CARB or by the Southern California Association of Governments (SCAG) and provided to CARB through the South Coast Air Quality Management District. SCAG is the metropolitan planning organization representing Imperial County, along with five other counties in Southern California.

Emissions Inventory Overview

Emissions inventories are estimates of the amount and type of pollutants emitted into the atmosphere by industrial facilities, mobile sources, and areawide sources such as consumer products and paint. They are fundamental components of an air quality plan, and serve critical functions such as:

1) the primary input to air quality modeling used in attainment demonstrations;
2) the emissions data used for developing control strategies; and
3) a means to track progress in meeting emission reduction commitments.

The United States Environmental Protection Agency (U.S. EPA) regulations require that the emissions inventory for a PM_{10} SIP contain emissions data for directly emitted PM_{10} and its precursors: oxides of nitrogen (NOx), sulfur oxides (SOx), volatile organic compounds (VOC), and ammonia (NH_3). The inventory included in this plan substitutes VOC with reactive organic gases (ROG), which in general represent a slightly broader group of compounds than those in U.S. EPA's list of VOCs. Although precursor emissions are included in this Plan, elevated PM_{10} concentrations in Imperial County are dominated by primary PM_{10} emissions from wind-blown dust rather than by

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secondarily formed PM_{10}. The precursor contribution analysis in Appendix A demonstrates that secondary formation is negligible compared with directly emitted PM_{10}.

Agency Responsibilities

CARB and District staff worked jointly to develop the emissions inventory for Imperial County. The District worked closely with operators of major stationary facilities in their jurisdiction to develop the point source emission estimates. CARB staff developed the emission inventory for mobile sources, both on-road and off-road. The District and CARB shared responsibility for developing estimates for the nonpoint (areawide) sources such as paved road dust and agricultural burning. CARB worked with several State and local agencies such as the Department of Transportation (Caltrans), the Department of Motor Vehicles (DMV), the Department of Pesticide Regulation (DPR), and the California Energy Commission (CEC) to assemble activity information necessary to develop the mobile and areawide source emission estimates.

Inventory Base Year

The base year inventory forms the basis for all future year projections and also establishes the emission levels against which progress in emission reductions will be measured. U.S. EPA regulations establish that the base year inventory should be preferably consistent with the triennial reporting schedule required under the Air Emissions Reporting Requirements (AERR) rule. However, U.S. EPA allows a different year to be selected if justified by the state. CARB worked with the local air districts to determine the base year that should be used across the State. Since the South Coast Air Quality Management District typically aligns their base year inventory with the data collection period for their Multiple Air Toxics Exposure Study, which was last conducted in 2012, CARB selected 2012 as the base year to maintain consistency across the various plans being developed in the State. A 2016 inventory was forecasted from this 2012 base year inventory. This coincides with the Plan’s attainment year of 2016.

Forecasted Inventories

In addition to a base year inventory, U.S. EPA regulations also require future year inventory projections for specific years. Forecasted inventories are a projection of the base year inventory that reflects expected growth trends for each source category and emission reductions due to adopted control measures. CARB develops emission forecasts by applying growth and control profiles to the base year inventory.

Growth profiles for point and areawide sources are derived from surrogates such as economic activity, fuel usage, population, housing units, etc., that best reflect the expected growth trends for each specific source category. Growth projections were obtained primarily from government entities with expertise in developing forecasts for specific sectors, or in some cases, from econometric models. Control profiles, which account for emission reductions resulting from adopted rules and regulations, are

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derived from data provided by the regulatory agencies responsible for the affected emission categories.

Projections for mobile source emissions are generated by models that predict activity rates and vehicle fleet turnover by vehicle model year. As with stationary sources, the mobile source models include control algorithms that account for all adopted regulatory actions. This Plan includes forecasted emissions inventories for 2018-2030, which encompasses the maintenance period.

Temporal Resolution

Planning inventories typically include annual as well as seasonal (summer and winter) emission estimates. Annual emission inventories represent the total emissions over an entire year (tons per year), or the daily emissions produced on an average day (tons per day). Seasonal inventories account for temporal activity variations throughout the year, as determined by category-specific temporal profiles. The emission inventory used in the Plan is an annual inventory.

Quality Assurance and Quality Control

CARB has established a quality assurance and quality control (QA/QC) process involving CARB and District staff to ensure the integrity and accuracy of the emissions inventories used in the development of air quality plans. QA/QC occurs at the various stages of SIP emission inventory development. Base year emissions are assembled and maintained in the California Emission Inventory Development and Reporting System (CEIDARS). CARB inventory staff works with District staff, who are responsible for developing and reporting point source emission estimates, to verify these data are accurate. The locations of point sources, including stacks, are checked to ensure they are valid. Areawide source emission estimates are reviewed by CARB and District staff before their inclusion in the emission inventory. Additionally, CEIDARS is designed with automatic system checks to prevent errors such as double counting of emission sources. The system also makes various reports available to assist staff in their efforts to identify and reconcile anomalous emissions.

Future year emissions are estimated using the California Emission Projection Analysis Model (CEPAM), 2016 SIP Baseline Emission Projections, Version 1.05. Growth and control factors are reviewed for each category and year along with the resulting emission projections. Year to year trends are compared to similar and past datasets to ensure general consistency. Emissions for specific categories are checked to confirm they reflect the anticipated effects of applicable control measures. Mobile categories are verified with mobile source staff for consistency with the on-road and off-road emission models.

A summary of the information supporting the Imperial PM_{10} Nonattainment Area Maintenance Plan emissions inventory is presented in the sections below.

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Point Sources

The inventory reflects actual emissions from industrial point sources reported to the District by the facility operators through calendar year 2012, in accordance with the requirements set forth in U.S. EPA's AERR rule. The data elements in the 2012 baseline inventory are consistent with the data elements required by the AERR rule. Estimation methods include source testing, direct measurement by continuous emissions monitoring systems, or engineering calculations. The point source categories that occur in the PM_{10} nonattainment area are listed below in Table 1.

Table 1
Point Source Categories

Source Category	Subcategory
Fuel Combustion	Electrical Utilities
	Cogeneration
	Manufacturing and Industrial
	Food and Agricultural Processing
	Service and Commercial
	Other (I.C. Reciprocating Engines)
Waste Disposal	Sewage Treatment
	Landfills
	Other
Cleaning and Surface Coatings	Laundering
	Degreasing
	Coatings and Thinners
	Adhesives and Sealants
Petroleum Production and Marketing	Petroleum Refining
	Petroleum Marketing
	Other (Petroleum Production & Marketing)
Industrial Processes	Food and Agriculture
	Mineral Processes

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The point source inventory includes emissions from stationary area sources, which are categories such as internal combustion engines and gasoline dispensing facilities that are not inventoried individually, but are estimated as a group and reported as an aggregated total. Estimates for the following categories were developed by CARB:

Stationary Nonagricultural Diesel Engines

This category includes emissions from backup and prime generators and pumps, air compressors, and other miscellaneous stationary diesel engines that are widely used throughout the industrial, service, institutional, and commercial sectors. The emission estimates, including emission forecasts, are based on a 2003 CARB methodology derived from the OFFROAD model. Additional information on this methodology is available at:
https://www.arb.ca.gov/ei/areasrc/FULLPDF/FULL1-2.pdf

Agricultural Diesel Irrigation Pumps

This category includes emissions from the operation of diesel-fueled stationary and mobile agricultural irrigation pumps. The emission estimates are based on a 2003 CARB methodology using statewide population and include replacements due to the Carl Moyer Program. Emissions are grown based on projected acreage for irrigated farmland. Additional information on this category is available at:
https://www.arb.ca.gov/ei/areasrc/arbfuelcombagric.htm

Waste Disposal, Composting Facilities

This category includes emissions from composting facilities that process organic materials via an open windrow composting or aerated static pile processes. The emission estimates are based on a 2015 CARB methodology using facility specific emissions testing or an emission factor derived from testing at composting facilities. No growth is assumed for future years. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/index2.htm

Laundering

This category includes emissions from perchloroethylene (perc) dry cleaning establishments. The emission estimates are based on a 2002 CARB methodology that used nationwide perc consumption rates allocated to the county level based on population and an emission factor of 10.125 pounds per gallon used. Emissions were grown from the original estimates to 2012 using human population growth trends from SCAG. Additional information on this methodology is available at:
https://www.arb.ca.gov/ei/areasrc/onehtm/one3-1.htm

Degreasing

This category includes emissions from solvents in degreasing operations in the manufacturing and maintenance industries. The emissions estimates are based on a 2000 CARB methodology using survey and industry data, activity factors, emission factors and a user's fraction. Growth for this category is based on CARB/REMI industry-

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specific economic output. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbcleandegreas.htm

Coatings and Thinners

This category includes emissions from coatings and related process solvents. Auto refinishing emissions estimates are based on a 1990 CARB methodology using production data and a composite emission factor derived from surveys. Growth is based on projected vehicle miles traveled (VMT) provided by SCAG. Estimates for industrial coatings emissions are based on a 1990 CARB methodology using production and survey data, and emission factors derived from surveys. Estimates for thinning and cleaning solvents are based on a 1991 CARB methodology, census data and a default emission factor developed by CARB. Growth for these categories is projected using CARB/REMI industry-specific economic output and employment. Additional information on these methodologies is available at:
https://www.arb.ca.gov/ei/areasrc/arbcleancoatreproc.htm

Adhesives and Sealants

This category includes emissions from solvent-based and water-based solvents contained in adhesives and sealants. Emissions are estimated based on a 1990 CARB methodology using production data and default emission factors. Growth for this category is based on CARB/REMI industry-specific economic output. Additional information on this methodology is available at:
https://www.arb.ca.gov/ei/areasrc/arbcleanadhseal.htm

Gasoline Dispensing Facilities

CARB staff developed an updated methodology to estimate emissions from fuel transfer and storage operations at gasoline dispensing facilities (GDFs). The methodology addresses emissions from underground storage tanks, vapor displacement during vehicle refueling, customer spillage, and hose permeation. The updated methodology uses emission factors developed by CARB staff that reflect more current in-use test data and also accounts for the emission reduction benefits of onboard refueling vapor recovery (ORVR) systems. The emission estimates are based on the 2012 statewide gasoline sales data from the California Board of Equalization that were apportioned to the county level using fuel consumption estimates from CARB's on-road mobile sources model (EMFAC). Additional information on this category is available at:
https://www.arb.ca.gov/ei/areasrc/arbpetprodmarkpm.htm

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Areawide Sources

Areawide sources are categories such as consumer products, unpaved road dust, fireplaces, and prescribed burning for which emissions occur over a wide geographic area. Emissions for these categories are estimated by both CARB and the local air districts using various models and methodologies. The areawide sources are listed below in Table 2.

Table 2
Areawide Sources

Source Category	Subcategory
Solvent Evaporation	Consumer Products
	Architectural Coatings and Related Solvents
	Pesticides/Fertilizers
	Asphalt Paving and Roofing
Miscellaneous Processes	Residential Fuel Combustion
	Farming Operations
	Construction And Demolition
	Paved Road Dust
	Unpaved Road Dust
	Fugitive Windblown Dust
	Fires
	Managed Burning and Disposal
	Cooking
	Other (Miscellaneous Processes)

A summary of the areawide methodologies is presented below:

Ammonia Emissions from Publicly Owned Treatment Works, Landfills, Composting, Fertilizer Application, Domestic Activity, Native Animals, and Native Soils

CARB staff updated the ammonia emissions inventory methodology for publicly owned treatment works, landfills, composting, fertilizer application, domestic activity, native animals, and native soils. Revisions for these categories consist primarily of updated activity data for the 2008 calendar year. Emission factors were revised only for fertilizer application.

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Ammonia Emissions, Miscellaneous Sources

Ammonia emissions from miscellaneous domestic processes (human respiration and perspiration, smoking, pets, untreated human waste, etc.) were grown from a 2005 CARB estimate using DOF population projections. Ammonia emissions for other categories such as residential wood combustion, livestock husbandry, managed burning, and on-road motor vehicles, were estimated as part of the methodologies for those specific area source categories.

Consumer Products

The consumer products category reflects the four most recent surveys conducted by CARB staff for the years 2003, 2006, 2008, and 2010. Together these surveys collected updated product information and ingredient information for approximately 350 product categories. Based on the survey data, CARB staff determined the total product sales and total VOC emissions for the various product categories. The growth trend for most consumer product subcategories is based on the latest SCAG human population growth projections, except for aerosol coatings. Staff determined that a no-growth profile would be more appropriate for aerosol coatings based on survey data that show relatively flat sales of these products over the last decade. Additional information on CARB's consumer products surveys is available at: https://www.arb.ca.gov/consprod/survey/survey.htm.

Architectural Coatings

The architectural coatings category reflects emission estimates based on a comprehensive CARB survey for the 2004 calendar year. The emission estimates include benefits of the 2000 and 2007 CARB Suggested Control Measures. These emissions are grown based on SCAG projections for number of households. Additional information about CARB's architectural coatings program is available at: https://www.arb.ca.gov/coatings/arch/arch.htm

Pesticides

DPR develops month-specific emission estimates for agricultural and structural pesticides. Each calendar year, DPR updates the inventory based on the Pesticide Use Report, which provides updated information from 1990 to the most current data year available. The inventory includes estimates through the 2014 calendar year. For agricultural categories, emission forecasts for years 2015 and beyond are based on the average of the most recent five years. Growth for agricultural pesticides is based on CARB projections of harvested acreage provided by the U.S. Department of Agriculture (USDA). Growth for structural pesticides is based on CARB projections of housing expenditures.

Asphalt Paving/Roofing

Asphalt paving emissions for 2012 were estimated using a District methodology, and asphalt roofing emissions were grown from a 2005 estimate. Emissions are estimated based on tons of asphalt applied and a default emission factor for each type of asphalt

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operation. The growth profile for both categories is based on construction employment from the CARB/REMI forecasting model. Additional information on the District's methodology is available at: https://www.arb.ca.gov/ei/areasrc/distsolevapasphpav.htm

Residential Wood Combustion

CARB staff updated the methodology to reflect 2005 fuel use, and more recent emission factors and calculation approaches. The emission estimates reflect emission factors from U.S. EPA's National Emission Inventory. No growth is assumed for future years. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocresfuelcom.htm

Farming Operations

CARB staff updated the inventory based on CARB methodologies for Agricultural Land Preparation and Agricultural Harvest Operations to reflect 2012 harvested crop acreage from the USDA's National Agricultural Statistics Service (NASS). NASS data are based on reports compiled by County Agricultural Commissioner staff. Emissions reflect crop and operation specific emission factors. Temporal profiles were updated based on crop specific activity profiles. In addition, the inventory reflects the emission reductions from District Rule 806. Growth is based on projected harvested acreage. The methodologies are available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocfarmops.htm

CARB staff updated the Livestock Husbandry methodology to reflect livestock population data based on the USDA's 2007 Census of Agriculture, and ammonia emission factors for dairy support cattle. A seasonal adjustment was added to account for the suppression of dust emissions in months in which rainfall occurs. Animal populations and emission factors for feedlots and dairies were updated for 2012 based on District data and California specific testing. CARB projects growth for feedlot cattle based on county livestock report data. Based on an analysis of livestock population trends, no growth is assumed for other livestock categories. In addition, the inventory reflects emission reductions from District Rules 420 and 217.
Additional information on CARB's methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscproclivestock.htm

Additional information on the District's update is available here: https://www.arb.ca.gov/ei/areasrc/districtmeth/imperial/2016mar16_dairyfeedlotops.pdf

Construction and Demolition

Emission estimates for building construction and road construction were grown from CARB estimates developed in 2002 and 1997, respectively. The growth profile for both categories is based on construction employment from the CARB/REMI forecasting model. In addition, the inventory reflects emission reductions from District Rules 801, 802 and 805. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocconstdem.htm

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Paved Road Dust

Paved road dust emissions for 2012 were estimated using an CARB methodology consistent with the current U.S. EPA method (AP-42). The emission estimates are based on VMT provided by SCAG, California-specific silt loading values, VMT distribution (travel fractions) for various paved road categories, and an Imperial County specific rain adjustment. Emissions were grown using VMT projections from SCAG. The inventory also reflects the emission reductions from District Rules 803 and 805. Additional information is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocpaverddst.htm

Unpaved Road Dust – Farm Roads

Emissions for unpaved farm roads were updated based on CARB's methodology and 2012 harvested crop acreage from NASS. Emissions reflect crop specific VMT factors and an emission factor based on California test data conducted by the University of California, Davis (UC Davis), and the Desert Research Institute (DRI). Temporal profiles were updated based on crop specific activity profiles. Growth for this category is based on harvested acreage. In addition, the inventory reflects the emission reductions from District Rule 806. The methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocunpaverddst.htm

Unpaved Nonfarm Road Dust

Emissions from unpaved nonfarm roads were estimated from 2008 unpaved road data collected from the California Statewide Local Streets and Roads Needs Assessment, Caltrans, and local agencies. Dust emissions were calculated using an emission factor derived from tests conducted by UC Davis and DRI. In addition, a rainfall adjustment factor was applied. Staff assumed no growth for this category based on the assumption that existing unpaved roads tend to get paved as vehicle traffic on them increases, which counteracts any additional emissions from new unpaved roads. The inventory also reflects the emission reductions from District Rule 805. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocunpaverddst.htm

Fugitive Windblown Dust from Open Areas and Non-pasture Agriculture Lands

The District provided estimates of windblown fugitive dust derived from a model developed by ENVIRON Inc. under a contract with the District. The model assesses emission characteristics, hourly emission factors and hourly meteorological data for each land parcel within the modeling domain, and applies correction terms based on vegetative cover, as well as non-climatic corrections for agricultural lands. Based on these inputs, the model was used to estimate fugitive windblown dust emission from open areas and non-pasture agriculture lands in the Imperial County PM_{10} Nonattainment Area. Growth for agricultural lands is based on projected acreage from the California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP). No growth is assumed for non-agricultural lands. The inventory also reflects the emission reductions from District Rules 804 and 806. Additional information

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about CARB's methodology is available at:
https://www.arb.ca.gov/ei/areasrc/arbmiscprocfugwbdst.htm

Windblown Dust from Unpaved Roads

Emissions for this source category were estimated based on a 1997 CARB methodology reflecting unpaved road mileage and local parameters that affect wind erosion. The estimates assume no growth. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocfugwbdst.htm

Fires

Emissions from structural and automobile fires were estimated based on a 1999 CARB methodology using the number of fires and the associated emission factors. Estimates for structural fires are calculated using the amount of the structure that is burned, the amount and content of the material burned, and emission factors derived from test data. Estimates for automobile fires are calculated using the weight of the car and components and composite emission factors derived from AP-42 emission factors. No growth is assumed for this category. Additional information on this methodology is available at: https://www.arb.ca.gov/ei/areasrc/arbmiscprocfires.htm

Managed Burning & Disposal

CARB updated the emissions inventory to reflect burn data reported by District staff for 2012. Emissions are calculated using crop specific emission factors and fuel loadings. Temporal profiles reflect monthly burn activity. Growth for agricultural burning is based on projected harvested acreage. No growth is assumed for burning associated with weed abatement. CARB's methodology for managed burning is available at:
https://www.arb.ca.gov/ei/areasrc/distmiscprocwstburndis.htm
Additional background information is available here:
https://www.arb.ca.gov/ei/see/see.htm

Commercial Cooking

Commercial cooking emissions were grown from a 2005 estimate. The emissions estimates were developed from the number of restaurants, the number and types of cooking equipment, the food type, and default emission factors. The growth profile reflects the latest population projections provided by SCAG.

Point and Areawide Source Emissions Forecasting

Emission forecasts (2013 and subsequent years) are based on growth profiles that in many cases incorporate historical trends up to the base year or beyond. The growth surrogates used to forecast the emissions from these categories are presented below in Table 3.

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Table 3
Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Fuel Combustion	Electric Utilities	SoCAL Gas Company (SCG) 2014 report
	Cogeneration	ARB/REMI industry-specific economic output
	Manufacturing and Industrial Area Source/Natural Gas	SCG 2014 report
	Manufacturing and Industrial Others	ARB/REMI industry-specific economic output
	Food and Agricultural Processing Ag Irrigation I. C. Engines	Modeled estimate
	Food and Agricultural Processing Point Sources	ARB/REMI industry-specific economic output
	Service and Commercial Natural Gas	SCG 2014 Report
	Service and Commercial Other Fuels	ARB/REMI industry-specific employment
	Other, Diesel	ARB EMFAC model for fuel consumption
	Other Fuels	ARB/REMI industry specific economic output/employment
Waste Disposal	Sewage Treatment	SCAG population
	Landfills	SCAG population
	Other (Composting)	No growth
Laundering	Dry Cleaning	SCAG population
Degreasing	All	ARB/REMI industry-specific economic output
Coatings & Thinners	Auto Refinishing	SCAG Vehicle Miles Traveled (VMT)
	Others	ARB/REMI industry specific economic output/employment
Adhesives & Sealants	All	ARB/REMI industry-specific economic output
Petroleum Refining	All	ARB EMFAC model fuel consumption
Petroleum Marketing	All	ARB EMFAC model fuel consumption
Petroleum Production & Marketing	All	ARB/REMI industry-specific economic output
Food & Agriculture	All	ARB/REMI industry specific economic output

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Table 3
Growth Surrogates for Point and Areawide Sources

Source Category	Subcategory	Growth Surrogate
Mineral Processes	All	ARB/REMI industry-specific economic output/employment
Other Industrial Processes	Electrical Power Generation	SCG 2014 report
	Others	ARB/REMI industry-specific economic output
Consumer Products	Consumer Products	SCAG population
	Aerosol Coatings	No growth
Architectural Coatings and Related Process Solvents	All	SCAG households
Pesticides/Fertilizers	Agricultural Pesticides	Harvested acreage
	Structural Pesticides	ARB housing expenditure
Asphalt Paving/Roofing	All	ARB/REMI industry-specific employment
Residential Fuel Combustion	Natural Gas	SCG 2014 report
	Woodstoves & Fireplaces - Wood	No growth
	Water Heating	SCAG households
	Cooking	SCAG households
	Other	SCAG households
Farming Operations	Tilling & Harvest Operations	Harvested acreage
	Livestock / Feedlot Cattle	County livestock report data/ARB
	Livestock / Others	No growth
Construction & Demolition	All	ARB/REMI industry-specific employment
Paved Road Dust	All	SCAG VMT
Unpaved Road Dust	Farm Roads	Harvested acreage
	Others	No growth
Fugitive Windblown Dust	Agricultural & Pasture Lands	ARB FMMP data
	Others	No growth
Fires	All	No growth
Managed Burning & Disposal	Agricultural Burning, Prunings & Field Crops	Harvested acreage
	Weed Abatement	No growth
Cooking	All	SCAG population
Other (Miscellaneous Processes)	All	SCAG population

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Stationary Source Control Profiles

The emissions inventory reflects emission reductions from point and areawide sources subject to District rules and CARB regulations. The rules and regulations reflected in the inventory are listed below in Table 4.

Table 4
District and ARB Stationary and Areawide Source Control Rules and Regulations Included in the Inventory

Agency	Rule/Reg No.	Rule Title	Source Categories Impacted
District	217	Large Confined Animal Facilities (LCAF) Permits Required	Livestock Husbandry
District	420	Beef Feedlots	Livestock Operations
District	801	Construction and Earthmoving Activities	Construction and Demolition
District	802	Bulk Materials	Point Sources
District	803	Carry-Out and Track-Out	Paved Roads
District	804	Open Areas	Windblown Dust
District	805	Paved and Unpaved Roads	Paved and Unpaved Non-farm Roads
District	806	Conservation Management Practices	Tilling and Harvesting Operations, Windblown Dust, Unpaved Farm Roads Unpaved Traffic Areas
CARB	AC_SCM2007	Architectural Coatings 2007 SCM	Architectural coatings
CARB	ARCH_SCM	Architectural Coatings 2000 SCM	Architectural coatings
CARB	ARB_R003	Consumer Product Regulations & Amendments	Consumer products
CARB	ARB_R003_A	Consumer Product Regulations & Amendments	Consumer products
CARB	ARB_R007	Aerosol Coating Regulation	Consumer products / Aerosol coatings
CARB	GDF_HOSREG	Gasoline Dispensing Facilities - Hose Permeation	Petroleum marketing
CARB	ORVR	Fueling emissions from ORVR vehicles	Petroleum marketing

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Mobile Sources

CARB uses the EMFAC model to assess emissions from on-road vehicles. Off-road mobile source emissions are estimated using a new modular approach for different source categories. On-road and off-road models account for the effects of various adopted regulations, technology types, and seasonal conditions on emissions.

On-Road Mobile Sources

Emissions from on-road mobile sources, which include passenger vehicles, buses, and trucks, were estimated using outputs from CARB's EMFAC2014 model. The on-road emissions were calculated by applying EMFAC2014 emission factors to the transportation activity data provided by SCAG from their 2016 adopted Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS).

EMFAC2014 includes data on California's car and truck fleets and travel activity. Light-duty motor vehicle fleet age, vehicle type, and vehicle population were updated based on 2012 DMV data. The model also reflects the emissions benefits of CARB's recent rulemakings such as the Pavley Standards and Advanced Clean Cars Program, and includes the emissions benefits of CARB's Truck and Bus Rule and previously adopted rules for other on-road diesel fleets.

EMFAC2014 utilizes a socio-econometric regression modeling approach to forecast new vehicle sales and to estimate future fleet mix. Light-duty passenger vehicle population includes 2012 DMV registration data along with updates to mileage accrual using Smog Check data. Updates to heavy-duty trucks include model year specific emission factors based on new test data, and population estimates using DMV data for in-state trucks and International Registration Plan (IRP) data for out-of-state trucks.

Additional information and documentation on the EMFAC2014 model is available at: https://www.arb.ca.gov/msei/categories.htm#emfac2014

Off-Road Mobile Sources

Emissions from off-road sources were estimated using a suite of category-specific models or, where a new model was not available, the OFFROAD2007 model. Many of the newer models were developed to support recent regulations, including in-use off-road equipment, ocean-going vessels and others. The sections below summarize the updates made to specific off-road categories.

Cargo Handling Equipment (CHE)

The emissions inventory for the Cargo Handling Equipment category has been updated to reflect new information on equipment population, activity, recessionary impacts on growth, and engine load. The new information includes regulatory reporting data which provide an accounting of all the cargo handling equipment in the State including their

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model year, horsepower and activity. Background and supporting documents for the Cargo Handling Equipment Regulation are available here: https://www.arb.ca.gov/ports/cargo/cheamd2011.htm

Pleasure Craft and Recreational Vehicles

A new model was developed in 2011 to estimate emissions from pleasure craft and recreational vehicles. In both cases, population, activity, and emission factors were re-assessed using new surveys, registration information, and emissions testing. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

In-Use Off-Road Equipment

CARB developed this model in 2010 to support the analysis for amendments to the In-Use Off-Road Diesel Fueled Fleets Regulation. Staff updated the underlying activity forecast to reflect more recent economic forecast data, which suggests a slower rate of recovery through 2024 than previously anticipated. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Locomotives

In 2016, CARB updated California's Class I and Class II line-haul locomotive model. The new model provides the following updates: age and model year distribution based on 2011 and 2014 rail company data, activity based on FAF data, fuel growth based on Board of Equalization historical rail data, and new locomotive populations, survival rates, and Tier distributions. To estimate emissions, CARB used duty cycle, fuel consumption and activity data reported by the rail lines in 2011. These results were combined with the Class III locomotive emissions inventory from previous SIPS, that were incorporated in the 2006 locomotive inventory, to create an overall California line-haul locomotive emissions inventory for the SIP. More information may be found at https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles.

Transport Refrigeration Units (TRU)

This model reflects updates to activity, population, growth and turn-over data, and emission factors developed to support the 2011 amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Fuel Storage and Handling

Emissions for fuel storage and handling were estimated using the OFFROAD2007 model. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

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Diesel Agricultural Equipment

The inventory for agricultural diesel equipment (such as tractors, harvesters, combines, sprayers and others) was revised based on a 2008 survey of thousands of farmers, custom operators, and first processors. The survey data, along with information from the 2007 USDA Farm Census, was used to revise almost every aspect of the agricultural inventory, including population, activity, age distribution, fuel use, and allocation. This updated inventory replaces general information on farm equipment in the United States with one specific to California farms and practices. The updated inventory was compared against other available data sources such as Board of Equalization fuel reports, USDA tractor populations and age, and Eastern Research Group tractor ages and activity, to ensure the results were reasonable and compared well against outside data sources. Agricultural growth rates through 2050 were developed through a contract with URS Corp and UC Davis. Additional information is available at: https://www.arb.ca.gov/msei/categories.htm#offroad_motor_vehicles

Military Aircraft

Baseline emission estimates were developed for the El Centro Naval Air Facility by El Centro staff based on actual operational data and were submitted by the District.

Mobile Source Forecasting

Table 5 summarizes the data and methods used to forecast future-year mobile source emissions by broad source category groupings.

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Table 5
Growth Surrogates for Mobile Sources

Category	***Growth Methodology***
On-Road Sources	
All	*Match total VMT projections provided by SCAG*
Off-Road Gasoline Fueled Equipment	
Lawn & Garden	*Household growth projection*
Off-Road Equipment	Employment growth projection
Recreational Boats	Housing starts (short-term) and human population growth (long-term)
Recreational Vehicles	Housing starts (short-term) and human population growth (long-term)
Off-Road Diesel-Fueled Equipment	
Construction and Mining	California construction employment data from U.S. Bureau of Labor Statistics
Farm Equipment	2011 study of forecasted growth by URS Corp.
Industrial Equipment	California construction employment data from Bureau of Labor Statistics
Trains (line haul)	Freight Analysis Framework (FAF) 2015 growth projections and historical Bureau of Transportation Statistics locomotive fuel trends (1990-2013 data)
Transport Refrigeration Units	Projection of historical Truck/Trailer TRU sales from ACT Research, adjusted for recession.
Off-Road Equipment (Other Fuels)	
Military Aircraft	The growth for military aircraft are based on estimates from El Centro Naval Air Facility staff that facilitate the fielding of new weapons systems, potentially expanding operations that accommodate all activities necessary to continue the national security mission.

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Condensable Particulate Matter

Background

Condensable particulate matter (PM) is "material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack."[1] Condensable PM is a component of primary PM, which is the sum of condensable and filterable PM. Filterable PM comprises "particles that are directly emitted by a source as a solid or liquid [aerosol] at stack or release conditions."[2] All condensable PM is assumed to be smaller than 2.5 microns (μm) in diameter; therefore, PM_{10} primary encompasses condensable PM and filterable PM less than 10μm, while $PM_{2.5}$ primary encompasses condensable PM and filterable PM less than 2.5μm. Consequently, the condensable PM value within PM_{10} primary and $PM_{2.5}$ primary are the same.

The AERR requires states to report annual emissions of filterable and condensable components of PM_{10} and $PM_{2.5}$, "as applicable," for large sources every inventory year and for all sources every third inventory year, beginning with 2011.[3] Subsequent emissions inventory guidance[4] from the U.S. EPA clarifies the meaning of the phrase "as applicable" by providing a list of source types "for which condensable PM is expected by the AERR." These source types are stationary point and nonpoint combustion sources that are expected to generate condensable PM and include, for instance, commercial cooking, fuel combustion at electric generating utilities, industrial processes like cement or chemical manufacturing, and flares or incinerators associated with waste disposal. The District reports condensable PM from stationary and area sources using the methodology outlined below.

Mobile sources emit PM in both filterable and condensable form; however, the AERR does not require states to report filterable and condensable PM separately for mobile sources. Emissions from mobile sources are reported in the emissions inventory in Appendix G as primary PM, e.g. the sum of filterable and condensable PM.

Methodology

For future emissions inventory cycles, the District intends to gather condensable PM data for stationary and area sources directly as part of routine data collection. In all previous inventories, however, the District has collected data on primary PM only, containing both filterable and condensable components without distinguishing between the two. Consequently, to be able to report emissions of the condensable component of PM_{10} separately as required by the AERR, the District must use conversion factors to convert primary PM to condensable PM.

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[1] 40 CFR §51.50

[2] Ibid.

[3] 40 CFR §51.15(a)(1) and §51.30(b)(1)

[4] U.S. EPA. *Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations*. May 2017. https://www.epa.gov/sites/production/files/2017-07/documents/ei_guidance_may_2017_final_rev.pdf

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U.S. EPA has published an augmentation tool[5] which contains conversion factors for each source classification code (SCC) to convert filterable PM_{10} (PM10FIL) to condensable PM (PMCON). In this form, these conversion factors ($CF_{PM10FIL \rightarrow PMCON}$) are not useful because the District does not directly collect PM10FIL data. But, the following formula adjusts U.S. EPA's existing conversion factors to obtain new conversion factors for each SCC that convert from primary PM_{10} (PM10PRI)—data which the District does collect—to condensable PM ($CF_{PM10PRI \rightarrow PMCON}$):

$$CF_{PM10PRI \rightarrow PMCON} = \frac{CF_{\mathrm{PM10FIL \rightarrow PMCON}}}{(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})}$$

The formula was derived as follows:

$$PM10PRI = PM10FIL + PMCON$$

and

$$PMCON = PM10FIL\,(CF_{\mathrm{PM10FIL \rightarrow PMCON}})$$

and

$$PMCON = PM10PRI(CF_{\mathrm{PM10PRI \rightarrow PMCON}})$$

$$\therefore \quad PM10PRI = PM10FIL + PM10FIL\,(CF_{\mathrm{PM10FIL \rightarrow PMCON}})$$

$$= PM10FIL(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})$$

and

$$CF_{\mathrm{PM10PRI \rightarrow PMCON}} = \frac{PMCON}{PM10PRI} = \frac{PMCON}{PM10FIL(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})}$$

$$= \frac{PM10FIL\,(CF_{\mathrm{PM10FIL \rightarrow PMCON}})}{PM10FIL(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})} = \frac{CF_{\mathrm{PM10FIL \rightarrow PMCON}}}{(1 + CF_{\mathrm{PM10FIL \rightarrow PMCON}})}$$

To ensure that the calculated condensable PM values are smaller than the District-reported $PM_{2.5}$ values, a 1:1 ratio between PM_{10} and $PM_{2.5}$ is assumed, and the derived conversion factors are applied to convert primary $PM_{2.5}$ (PM25PRI) to condensable PM using the same method. That is, $CF_{PM10PRI \rightarrow PMCON} = CF_{PM25PRI \rightarrow PMCON}$ where $CF_{PM25PRI \rightarrow PMCON}$ represents the conversion factors that convert from primary $PM_{2.5}$—again, data the District does collect—to condensable PM. The resulting calculated condensable PM value is then the PMCON portion of both PM2.5PRI and PM10PRI since the condensable PM value within primary $PM_{2.5}$ are one and the same as the condensable PM value within primary PM_{10}.

[5] U.S. EPA. *PM Augmentation*. Air Emissions Inventories. May 20, 2016. https://www.epa.gov/air-emissions-inventories/pm-augmentation

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Appendix H
PM_{10} and PM_{10} Precursor Emission Inventories

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Table H-1a. PM_{10} Emissions by Major Source Category in Imperial County, 2016-2030
Imperial County PM_{10} Plan

Source Category	PM_{10} (tons/day)														
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Stationary Sources															
Fuel Combustion	0.20	0.20	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Electric Utilities	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*
Cogeneration	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Manufacturing and Industrial	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Food and Agricultural Processing	*0.01*	*0.01*	*0.01*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Service and Commercial	*0.07*	*0.07*	*0.07*	*0.07*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.07*	*0.08*	*0.08*
Other (Fuel Combustion)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Waste Disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sewage Treatment	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Landfills	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Waste Disposal)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cleaning and Surface Coatings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laundering	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Degreasing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Coatings and Related Process Solvents	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Adhesives and Sealants	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Production and Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refining	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Marketing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Petroleum Production and Marketing)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Industrial Processes	3.99	4.14	4.27	4.41	4.56	4.69	4.83	4.96	5.10	5.25	5.39	5.54	5.69	5.85	6.01
Food and Agriculture	*0.30*	*0.31*	*0.31*	*0.32*	*0.32*	*0.33*	*0.33*	*0.34*	*0.34*	*0.35*	*0.35*	*0.36*	*0.36*	*0.37*	*0.37*
Mineral Processes	*3.67*	*3.81*	*3.95*	*4.08*	*4.22*	*4.35*	*4.48*	*4.61*	*4.75*	*4.89*	*5.03*	*5.17*	*5.32*	*5.47*	*5.62*
Metal Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Industrial Processes)	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
Total Stationary Sources	**4.19**	**4.33**	**4.47**	**4.61**	**4.76**	**4.90**	**5.04**	**5.17**	**5.31**	**5.46**	**5.60**	**5.75**	**5.90**	**6.06**	**6.22**
Areawide Sources															
Solvent Evaporation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Architectural Coatings and Related Process Solv	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Pesticides/Fertilizers	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Asphalt Paving/Roofing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Miscellaneous Processes	278.48	278.58	278.69	278.69	278.75	278.81	277.30	277.28	277.33	277.39	277.39	277.45	277.51	277.57	277.64
Residential Fuel Combustion	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*
Farming Operations	*8.48*	*8.42*	*8.37*	*8.31*	*8.25*	*8.22*	*8.20*	*8.17*	*8.14*	*8.11*	*8.09*	*8.06*	*8.03*	*8.00*	*7.98*
Construction and Demolition	*3.02*	*3.16*	*3.29*	*3.40*	*3.51*	*3.59*	*3.66*	*3.71*	*3.76*	*3.82*	*3.90*	*3.98*	*4.06*	*4.14*	*4.22*
Paved Road Dust	*1.16*	*1.20*	*1.27*	*1.24*	*1.28*	*1.30*	*1.38*	*1.35*	*1.39*	*1.43*	*1.40*	*1.42*	*1.45*	*1.47*	*1.50*
Unpaved Road Dust	*51.88*	*51.87*	*51.85*	*51.84*	*51.83*	*51.82*	*50.22*	*50.21*	*50.20*	*50.20*	*50.19*	*50.18*	*50.18*	*50.17*	*50.16*
Fugitive Windblown Dust	*212.52*	*212.51*	*212.51*	*212.50*	*212.50*	*212.49*	*212.49*	*212.48*	*212.48*	*212.47*	*212.47*	*212.46*	*212.46*	*212.45*	*212.45*
Fires	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Managed Burning and Disposal	*1.30*	*1.28*	*1.27*	*1.26*	*1.25*	*1.24*	*1.23*	*1.23*	*1.22*	*1.22*	*1.21*	*1.20*	*1.20*	*1.19*	*1.19*
Cooking	*0.08*	*0.08*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*
Other (Miscellaneous Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Areawide Sources	**278.48**	**278.58**	**278.69**	**278.69**	**278.75**	**278.81**	**277.30**	**277.28**	**277.33**	**277.39**	**277.39**	**277.45**	**277.51**	**277.57**	**277.64**
Mobile Sources															
On-Road Vehicles	0.43	0.43	0.44	0.43	0.44	0.44	0.46	0.45	0.46	0.48	0.47	0.48	0.49	0.50	0.51
Off-Road Vehicles	1.07	1.06	1.05	1.05	1.04	1.04	1.04	1.55	1.55	1.55	1.56	1.57	1.57	1.58	1.59
Total Mobile Sources	**1.50**	**1.49**	**1.49**	**1.47**	**1.48**	**1.48**	**1.50**	**1.99**	**2.01**	**2.03**	**2.03**	**2.04**	**2.06**	**2.08**	**2.09**
Total for Imperial County	**284.17**	**284.40**	**284.65**	**284.77**	**284.99**	**285.19**	**283.84**	**284.44**	**284.66**	**284.88**	**285.02**	**285.24**	**285.48**	**285.71**	**285.96**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Table H-1b. Condensable/Filterable PM_{10} Emissions by Major Source Category in Imperial County, 2016
Imperial County PM_{10} Plan

Source Category	PM_{10} Emissions (tons/day)		
	Total	**Condensable**	**Filterable**
Stationary Sources			
Fuel Combustion	0.199	0.028	0.171
Electric Utilities	*0.091*	*0.025*	*0.066*
Cogeneration	*0.002*	*0.001*	*0.001*
Manufacturing and Industrial	*0.029*	*0.000*	*0.028*
Food and Agricultural Processing	*0.005*	*0.001*	*0.004*
Service and Commercial	*0.072*	*0.000*	*0.071*
Other (Fuel Combustion)	*0.000*	*0.000*	*0.000*
Waste Disposal	0.000	0.000	0.000
Sewage Treatment	*0.000*	*0.000*	*0.000*
Landfills	*0.000*	*0.000*	*0.000*
Other (Waste Disposal)	*0.000*	*0.000*	*0.000*
Cleaning and Surface Coatings	0.000	0.000	0.000
Laundering	*0.000*	*0.000*	*0.000*
Degreasing	*0.000*	*0.000*	*0.000*
Coatings and Related Process Solvents	*0.000*	*0.000*	*0.000*
Adhesives and Sealants	*0.000*	*0.000*	*0.000*
Petroleum Production and Marketing	0.000	0.000	0.000
Petroleum Refining	*0.000*	*0.000*	*0.000*
Petroleum Marketing	*0.000*	*0.000*	*0.000*
Other (Petroleum Production and Marketing)	*0.000*	*0.000*	*0.000*
Industrial Processes	3.989	0.010	3.980
Food and Agriculture	*0.305*	*0.003*	*0.301*
Mineral Processes	*3.672*	*0.006*	*3.666*
Metal Processes	*0.000*	*0.000*	*0.000*
Other (Industrial Processes)	*0.013*	*0.000*	*0.013*
Total Stationary Sources	**4.188**	**0.038**	**4.150**
Areawide Sources			
Solvent Evaporation	0.000	0.000	0.000
Consumer Products	*0.000*	*0.000*	*0.000*
Architectural Coatings and Related Process Solvents	*0.000*	*0.000*	*0.000*
Pesticides/Fertilizers	*0.000*	*0.000*	*0.000*
Asphalt Paving/Roofing	*0.000*	*0.000*	*0.000*
Miscellaneous Processes	278.479	0.080	278.400
Residential Fuel Combustion	*0.046*	*0.000*	*0.046*
Farming Operations	*8.481*	*0.000*	*8.481*
Construction and Demolition	*3.017*	*0.000*	*3.017*
Paved Road Dust	*1.158*	*0.000*	*1.158*
Unpaved Road Dust	*51.881*	*0.000*	*51.881*
Fugitive Windblown Dust	*212.515*	*0.000*	*212.515*
Fires	*0.004*	*0.000*	*0.004*
Managed Burning and Disposal	*1.297*	*0.000*	*1.297*
Cooking	*0.080*	*0.080*	*0.000*
Other (Miscellaneous Processes)	*0.000*	*0.000*	*0.000*
Total Areawide Sources	**278.479**	**0.080**	**278.400**
Mobile Sources			
On-Road Vehicles	0.433	--	--
Off-Road Vehicles	1.066	--	--
Total Mobile Sources	**1.499**	**--**	**--**
Total for Imperial County	**284.167**	**--**	**--**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
"--" indicates that the portion of condensable/filterable PM is unknown/unmeasurable.
The condensable portion of each inventory category was calculated using an individual, source-specific conversion factor applied to the reported PM emissions value. The filterable portion was then calculated as the difference between the PM emissions value and its condensable portion.

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Table H-1c. Condensable/Filterable PM_{10} Emissions by Major Source Category in Imperial County, 2030

Imperial County PM_{10} Plan

Source Category	PM_{10} Emissions (tons/day)		
	Total	**Condensable**	**Filterable**
Stationary Sources			
Fuel Combustion	0.212	0.031	0.181
Electric Utilities	*0.099*	*0.027*	*0.071*
Cogeneration	*0.002*	*0.001*	*0.001*
Manufacturing and Industrial	*0.032*	*0.001*	*0.032*
Food and Agricultural Processing	*0.003*	*0.001*	*0.002*
Service and Commercial	*0.075*	*0.000*	*0.075*
Other (Fuel Combustion)	*0.000*	*0.000*	*0.000*
Waste Disposal	0.000	0.000	0.000
Sewage Treatment	*0.000*	*0.000*	*0.000*
Landfills	*0.000*	*0.000*	*0.000*
Other (Waste Disposal)	*0.000*	*0.000*	*0.000*
Cleaning and Surface Coatings	0.000	0.000	0.000
Laundering	*0.000*	*0.000*	*0.000*
Degreasing	*0.000*	*0.000*	*0.000*
Coatings and Related Process Solvents	*0.000*	*0.000*	*0.000*
Adhesives and Sealants	*0.000*	*0.000*	*0.000*
Petroleum Production and Marketing	0.000	0.000	0.000
Petroleum Refining	*0.000*	*0.000*	*0.000*
Petroleum Marketing	*0.000*	*0.000*	*0.000*
Other (Petroleum Production and Marketing)	*0.000*	*0.000*	*0.000*
Industrial Processes	6.009	0.012	5.996
Food and Agriculture	*0.371*	*0.004*	*0.367*
Mineral Processes	*5.623*	*0.008*	*5.615*
Metal Processes	*0.000*	*0.000*	*0.000*
Other (Industrial Processes)	*0.015*	*0.000*	*0.015*
Total Stationary Sources	**6.221**	**0.043**	**6.178**
Areawide Sources			
Solvent Evaporation	0.000	0.000	0.000
Consumer Products	*0.000*	*0.000*	*0.000*
Architectural Coatings and Related Process Solvents	*0.000*	*0.000*	*0.000*
Pesticides/Fertilizers	*0.000*	*0.000*	*0.000*
Asphalt Paving/Roofing	*0.000*	*0.000*	*0.000*
Miscellaneous Processes	277.642	0.100	277.542
Residential Fuel Combustion	*0.046*	*0.000*	*0.046*
Farming Operations	*7.977*	*0.000*	*7.977*
Construction and Demolition	*4.221*	*0.000*	*4.221*
Paved Road Dust	*1.497*	*0.000*	*1.497*
Unpaved Road Dust	*50.164*	*0.000*	*50.164*
Fugitive Windblown Dust	*212.447*	*0.000*	*212.447*
Fires	*0.004*	*0.000*	*0.004*
Managed Burning and Disposal	*1.186*	*0.000*	*1.186*
Cooking	*0.100*	*0.100*	*0.000*
Other (Miscellaneous Processes)	*0.000*	*0.000*	*0.000*
Total Areawide Sources	**277.642**	**0.100**	**277.542**
Mobile Sources			
On-Road Vehicles	0.507	--	--
Off-Road Vehicles	1.588	--	--
Total Mobile Sources	**2.094**	**--**	**--**
Total for Imperial County	**285.957**	**--**	**--**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
"--" indicates that the portion of condensable/filterable PM is unknown/unmeasurable.
The condensable portion of each inventory category was calculated using an individual, source-specific conversion factor applied to the reported PM emissions value. The filterable portion was then calculated as the difference between the PM emissions value and its condensable portion.

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Table H-2. ROG Emissions by Major Source Category in Imperial County, 2016-2030

Imperial County PM_{10} Plan

Source Category	ROG (tons/day)														
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Stationary Sources															
Fuel Combustion	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Electric Utilities	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*
Cogeneration	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Manufacturing and Industrial	*0.02*	*0.02*	*0.02*	*0.02*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Food and Agricultural Processing	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Service and Commercial	*0.02*	*0.02*	*0.02*	*0.02*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Other (Fuel Combustion)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Waste Disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sewage Treatment	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Landfills	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Waste Disposal)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cleaning and Surface Coatings	0.59	0.59	0.60	0.60	0.61	0.63	0.64	0.65	0.67	0.69	0.70	0.72	0.74	0.76	0.78
Laundering	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
Degreasing	*0.30*	*0.30*	*0.30*	*0.30*	*0.31*	*0.31*	*0.32*	*0.33*	*0.33*	*0.34*	*0.35*	*0.36*	*0.38*	*0.39*	*0.40*
Coatings and Related Process Solvents	*0.19*	*0.20*	*0.20*	*0.20*	*0.21*	*0.21*	*0.22*	*0.22*	*0.22*	*0.23*	*0.23*	*0.24*	*0.24*	*0.25*	*0.25*
Adhesives and Sealants	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.10*	*0.10*	*0.10*	*0.11*	*0.11*	*0.11*	*0.12*	*0.12*
Petroleum Production and Marketing	0.67	0.66	0.65	0.64	0.63	0.62	0.61	0.60	0.59	0.58	0.57	0.56	0.56	0.55	0.55
Petroleum Refining	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Marketing	*0.67*	*0.66*	*0.65*	*0.64*	*0.63*	*0.62*	*0.61*	*0.60*	*0.59*	*0.58*	*0.57*	*0.56*	*0.55*	*0.55*	*0.54*
Other (Petroleum Production and Marketing)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Industrial Processes	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Food and Agriculture	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Mineral Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.01*	*0.01*	*0.01*
Metal Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Industrial Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Stationary Sources	**1.36**	**1.36**	**1.36**	**1.35**	**1.35**	**1.36**	**1.36**	**1.36**	**1.37**	**1.38**	**1.38**	**1.39**	**1.41**	**1.42**	**1.44**
Areawide Sources															
Solvent Evaporation	3.50	3.54	3.59	3.63	3.67	3.69	3.71	3.72	3.74	3.75	3.77	3.78	3.80	3.82	3.83
Consumer Products	*1.10*	*1.14*	*1.17*	*1.20*	*1.24*	*1.25*	*1.26*	*1.28*	*1.29*	*1.30*	*1.31*	*1.33*	*1.34*	*1.35*	*1.36*
Architectural Coatings and Related Process Solv	*0.47*	*0.49*	*0.51*	*0.53*	*0.55*	*0.56*	*0.57*	*0.58*	*0.59*	*0.60*	*0.61*	*0.62*	*0.62*	*0.63*	*0.64*
Pesticides/Fertilizers	*1.79*	*1.78*	*1.76*	*1.74*	*1.72*	*1.72*	*1.71*	*1.70*	*1.69*	*1.68*	*1.67*	*1.66*	*1.66*	*1.65*	*1.64*
Asphalt Paving/Roofing	*0.14*	*0.14*	*0.15*	*0.15*	*0.16*	*0.16*	*0.16*	*0.17*	*0.17*	*0.17*	*0.18*	*0.18*	*0.18*	*0.19*	*0.19*
Miscellaneous Processes	3.48	3.47	3.47	3.46	3.45	3.45	3.44	3.44	3.43	3.43	3.42	3.42	3.42	3.41	3.41
Residential Fuel Combustion	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*
Farming Operations	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*	*2.53*
Construction and Demolition	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Paved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Unpaved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fugitive Windblown Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fires	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Managed Burning and Disposal	*0.90*	*0.89*	*0.88*	*0.88*	*0.87*	*0.86*	*0.86*	*0.85*	*0.85*	*0.84*	*0.84*	*0.84*	*0.83*	*0.83*	*0.82*
Cooking	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*
Other (Miscellaneous Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Areawide Sources	**6.98**	**7.02**	**7.05**	**7.09**	**7.12**	**7.14**	**7.15**	**7.16**	**7.17**	**7.18**	**7.19**	**7.21**	**7.22**	**7.23**	**7.24**
Mobile Sources															
On-Road Vehicles	2.78	2.63	2.60	2.37	2.28	2.18	2.19	2.02	2.00	1.99	1.87	1.85	1.83	1.80	1.77
Off-Road Vehicles	4.13	4.08	4.03	3.97	3.93	3.89	3.87	4.08	4.08	4.08	4.07	4.06	4.05	4.05	4.06
Total Mobile Sources	**6.92**	**6.71**	**6.63**	**6.34**	**6.21**	**6.07**	**6.06**	**6.10**	**6.08**	**6.06**	**5.94**	**5.91**	**5.88**	**5.85**	**5.83**
Total for Imperial County	**15.26**	**15.09**	**15.04**	**14.77**	**14.68**	**14.56**	**14.57**	**14.62**	**14.62**	**14.62**	**14.51**	**14.51**	**14.50**	**14.50**	**14.51**

Notes:

Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.

Totals may not add up due to rounding.

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Table H-3. NO_X Emissions by Major Source Category in Imperial County, 2016-2030
Imperial County PM_{10} Plan

Source Category	NO_X (tons/day)														
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Stationary Sources															
Fuel Combustion	1.63	1.62	1.61	1.60	1.71	1.71	1.71	1.70	1.69	1.69	1.68	1.67	1.66	1.66	1.66
Electric Utilities	*0.37*	*0.36*	*0.36*	*0.36*	*0.36*	*0.37*	*0.38*	*0.39*	*0.40*	*0.40*	*0.40*	*0.40*	*0.40*	*0.40*	*0.40*
Cogeneration	*0.02*	*0.02*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Manufacturing and Industrial	*0.44*	*0.44*	*0.44*	*0.43*	*0.48*	*0.47*	*0.46*	*0.46*	*0.45*	*0.45*	*0.45*	*0.44*	*0.44*	*0.43*	*0.43*
Food and Agricultural Processing	*0.11*	*0.10*	*0.10*	*0.09*	*0.09*	*0.09*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.07*	*0.07*	*0.07*	*0.07*
Service and Commercial	*0.69*	*0.69*	*0.69*	*0.68*	*0.76*	*0.75*	*0.75*	*0.74*	*0.73*	*0.73*	*0.73*	*0.72*	*0.72*	*0.72*	*0.73*
Other (Fuel Combustion)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Waste Disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sewage Treatment	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Landfills	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Waste Disposal)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cleaning and Surface Coatings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laundering	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Degreasing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Coatings and Related Process Solvents	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Adhesives and Sealants	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Production and Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refining	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Marketing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Petroleum Production and Marketing)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Industrial Processes	0.07	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.11	0.11
Food and Agriculture	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*
Mineral Processes	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.04*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.06*
Metal Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Industrial Processes)	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.02*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*	*0.03*
Total Stationary Sources	**1.71**	**1.69**	**1.69**	**1.68**	**1.80**	**1.80**	**1.80**	**1.79**	**1.79**	**1.78**	**1.78**	**1.77**	**1.76**	**1.76**	**1.77**
Areawide Sources															
Solvent Evaporation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Architectural Coatings and Related Process Solv	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Pesticides/Fertilizers	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Asphalt Paving/Roofing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Miscellaneous Processes	0.52	0.52	0.52	0.51	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.49	0.49	0.49	0.49
Residential Fuel Combustion	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*
Farming Operations	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Construction and Demolition	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Paved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Unpaved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fugitive Windblown Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fires	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Managed Burning and Disposal	*0.44*	*0.43*	*0.43*	*0.43*	*0.42*	*0.42*	*0.42*	*0.41*	*0.41*	*0.41*	*0.41*	*0.41*	*0.40*	*0.40*	*0.40*
Cooking	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Miscellaneous Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Areawide Sources	**0.52**	**0.52**	**0.52**	**0.51**	**0.51**	**0.51**	**0.50**	**0.50**	**0.50**	**0.50**	**0.50**	**0.49**	**0.49**	**0.49**	**0.49**
Mobile Sources															
On-Road Vehicles	7.42	6.93	6.58	5.80	5.66	5.20	4.89	3.53	3.46	3.41	3.28	3.25	3.23	3.23	3.24
Off-Road Vehicles	7.49	7.25	6.94	6.65	6.39	6.13	5.84	7.67	7.45	7.22	7.00	6.80	6.62	6.44	6.27
Total Mobile Sources	**14.91**	**14.18**	**13.52**	**12.45**	**12.06**	**11.33**	**10.73**	**11.20**	**10.91**	**10.63**	**10.29**	**10.05**	**9.84**	**9.67**	**9.51**
Total for Imperial County	**17.14**	**16.40**	**15.72**	**14.65**	**14.36**	**13.63**	**13.03**	**13.49**	**13.20**	**12.91**	**12.56**	**12.31**	**12.10**	**11.92**	**11.77**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

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Table H-4. SO_X Emissions by Major Source Category in Imperial County, 2016-2030
Imperial County PM_{10} Plan

Source Category	SO_X (tons/day)														
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Stationary Sources															
Fuel Combustion	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Electric Utilities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cogeneration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing and Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Food and Agricultural Processing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Service and Commercial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other (Fuel Combustion)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste Disposal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sewage Treatment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landfills	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other (Waste Disposal)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cleaning and Surface Coatings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laundering	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Degreasing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coatings and Related Process Solvents	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adhesives and Sealants	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Production and Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other (Petroleum Production and Marketing)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Food and Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mineral Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Metal Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other (Industrial Processes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Stationary Sources	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
Areawide Sources															
Solvent Evaporation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumer Products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Architectural Coatings and Related Process Solv	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pesticides/Fertilizers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt Paving/Roofing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Miscellaneous Processes	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07
Residential Fuel Combustion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Farming Operations	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construction and Demolition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paved Road Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Unpaved Road Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fugitive Windblown Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fires	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Managed Burning and Disposal	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Cooking	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other (Miscellaneous Processes)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Areawide Sources	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**	**0.07**
Mobile Sources															
On-Road Vehicles	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Off-Road Vehicles	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Total Mobile Sources	**0.25**	**0.25**	**0.26**	**0.27**	**0.27**	**0.27**	**0.27**	**0.16**	**0.16**	**0.16**	**0.16**	**0.17**	**0.17**	**0.17**	**0.17**
Total for Imperial County	**0.34**	**0.34**	**0.34**	**0.35**	**0.35**	**0.35**	**0.35**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**

Notes:
Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.
Totals may not add up due to rounding.

Table H-5. NH_3 Emissions by Major Source Category in Imperial County, 2016-2030

Imperial County PM_{10} Plan

Source Category	NH_3 (tons/day)														
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Stationary Sources															
Fuel Combustion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Electric Utilities	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Cogeneration	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Manufacturing and Industrial	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Food and Agricultural Processing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Service and Commercial	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
Other (Fuel Combustion)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Waste Disposal	1.49	1.49	1.49	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.51	1.51	1.51
Sewage Treatment	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Landfills	*0.07*	*0.07*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.08*	*0.09*	*0.09*	*0.09*	*0.09*	*0.09*
Other (Waste Disposal)	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*	*1.42*
Cleaning and Surface Coatings	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Laundering	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Degreasing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Coatings and Related Process Solvents	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Adhesives and Sealants	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Production and Marketing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petroleum Refining	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Petroleum Marketing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Petroleum Production and Marketing)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Food and Agriculture	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Mineral Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Metal Processes	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Industrial Processes)	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Total Stationary Sources	**1.49**	**1.50**	**1.50**	**1.50**	**1.50**	**1.50**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**	**1.51**
Areawide Sources															
Solvent Evaporation	15.34	15.19	15.04	14.89	14.74	14.66	14.59	14.52	14.45	14.37	14.30	14.23	14.16	14.09	14.02
Consumer Products	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Architectural Coatings and Related Process Solv	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Pesticides/Fertilizers	*15.34*	*15.19*	*15.04*	*14.89*	*14.74*	*14.66*	*14.59*	*14.52*	*14.45*	*14.37*	*14.30*	*14.23*	*14.16*	*14.09*	*14.02*
Asphalt Paving/Roofing	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Miscellaneous Processes	15.36	15.37	15.38	15.40	15.41	15.41	15.41	15.42	15.42	15.42	15.43	15.43	15.43	15.44	15.44
Residential Fuel Combustion	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Farming Operations	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*	*14.80*
Construction and Demolition	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Paved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Unpaved Road Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fugitive Windblown Dust	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Fires	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Managed Burning and Disposal	*0.19*	*0.19*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.18*	*0.17*	*0.17*	*0.17*	*0.17*
Cooking	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
Other (Miscellaneous Processes)	*0.37*	*0.39*	*0.40*	*0.41*	*0.42*	*0.43*	*0.43*	*0.44*	*0.44*	*0.45*	*0.45*	*0.45*	*0.46*	*0.46*	*0.47*
Total Areawide Sources	**30.70**	**30.56**	**30.42**	**30.28**	**30.14**	**30.07**	**30.00**	**29.93**	**29.87**	**29.80**	**29.73**	**29.66**	**29.60**	**29.53**	**29.46**
Mobile Sources															
On-Road Vehicles	0.21	0.21	0.22	0.20	0.20	0.20	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.20	0.20
Off-Road Vehicles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Mobile Sources	**0.22**	**0.21**	**0.22**	**0.21**	**0.21**	**0.20**	**0.21**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**
Total for Imperial County	**32.41**	**32.27**	**32.14**	**31.99**	**31.85**	**31.78**	**31.72**	**31.64**	**31.58**	**31.51**	**31.43**	**31.37**	**31.30**	**31.24**	**31.17**

Notes:

Emissions for Imperial County were queried from the California Emissions Projection Analysis Model (CEPAM), Version 1.05.

Totals may not add up due to rounding.

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Appendix I
Salton Sea Management Program Phase I: 10-year Plan (March 2017)

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Salton Sea Management Program
Phase I: 10-Year Plan
March 2017

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Introduction

Under the leadership of Governor Edmund G Brown Jr., the 2014 California Water Action Plan set forth a vision for California water management that balances statewide water supply security with the protection of public, economic and ecological health. The Salton Sea offers a unique opportunity to preserve these values by leveraging a convergence of support from federal, state, and local stakeholders for a smaller and sustainable sea achieved through the projects outlined in this plan.

The Salton Sea is California's largest lake. Thirty-five miles long and 15 miles wide, the desert lake extends from the Coachella Valley into the Imperial Valley. Though saltier than the ocean, the Sea supports an abundance of fish, a food source for millions of migratory birds on the Pacific Flyway. Managing the Sea's natural, agricultural, and municipal water inflows to maximize bird and fish habitat and minimize fine-particle air pollution will allow California to protect regional health, ecological wealth and a stable water supply.

The Salton Sea formed in the Salton Trough in Imperial and Riverside counties. Much of the trough is below sea level and has a long history of periodic inundation from the shifting delta of the Colorado River or from infrequent storm events. The last Colorado River inundation of the area occurred in 1905 when an irrigation canal inlet gate failed and flooded much of the area. Since then, lake inflows have been primarily from agricultural activities in the area. Inflows from the New and Alamo rivers are primarily farm return flow water, although there is some inflow from Mexico, particularly during large precipitation events. Over the last several decades, water levels at the Salton Sea have declined and salinity concentrations have increased due to climate fluctuations, agricultural conservation measures, cropping practices and reduced inflows from Mexico. Recent water transfers from the Imperial Valley have further accelerated the rate of lake elevation decline and have increased the rate of salinity concentration. Declining lake levels threaten important bird habitat and pose public health risk due to particulate air pollution.

Over the last 40 years numerous ideas and plans have been proposed by various entities to restore the Salton Sea. None have been implemented for a variety of reasons, including lack of a shared vision, funding constraints, and reduced inflows.

In 2015, Governor Edmund G. Brown Jr. formed the Salton Sea Task Force with principle staff and members of various state agencies to identify short- and medium-term goals to respond to air quality and ecological threats at the Salton Sea. The Task Force developed actions for the Salton Sea that included:

- Develop and implement the Salton Sea Management Program through departments within the California Natural Resources and Environmental Protection Agencies
- Improve public outreach and local partnerships
- Accelerate project implementation and delivery

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- Meet a short-term goal of 9,000 acres to 12,000 acres of dust suppression and habitat projects
- Establish a medium-term goal of 18,000 acres to 25,000 acres of dust suppression and habitat projects.

The State's Salton Sea Management Plan (SSMP) has several phases of development to protect air quality and ecosystem values at the Salton Sea. This draft technical memorandum prepared by the State of California outlines the SSMP's first, 10-year phase (Phase I Plan). It will guide State and federal actions to meet the commitments outlined in the Memorandum of Understanding (MOU) executed on August 31, 2016, and amended on January 18, 2017 by the Department of Interior (DOI) and the California Natural Resource Agency (CNRA). The MOU, among other things, identified a goal of developing projects to protect or improve air quality, wildlife habitat, and water quality as necessary to minimize human health and ecosystem impact at the Salton Sea in the mid-term. While guided by the MOU, the SSMP is a longer-term process that has been developed and will be implemented by the State of California. This first phase of development has been planned to expedite construction of habitat and to suppress dust on areas of playa that have been or will be exposed at the Salton Sea by 2028. The Phase I Plan outlines the process for developing additional management measurements for the Salton Sea that will be implemented in later phases.

The Phase I Plan also addresses the requirements of Assembly Bill 1095 (Garcia 2015) by including those projects deemed "shovel-ready projects" and including estimates of cost. Those projects include:

- Water backbone infrastructure, which will provide conveyance of river and Salton Sea water to air quality and habitat projects.
- SSMP air quality and habitat projects associated with the water backbone infrastructure
- The CNRA's Phase I Species Conservation Habitat Project (saline impoundments along the southern shore to support fish and wildlife)
- Red Hill Bay Project, an effort of the U.S. Fish and Wildlife Service and Imperial Irrigation District to restore habitat on the southeastern shore
- Torres-Martinez Wetland project, an effort of the Torres Martinez Desert Cahuilla Indians to build shallow wetlands along the northern edge of the Salton Sea.

The Phase I Plan considers the implications of the 17-year drought on the Colorado River. The drought may force reductions of Colorado River water to the Lower Basin States, which in turn could impact inflows to the Salton Sea. The U.S. Bureau of Reclamation, seven Colorado River basin states and key principals of several water management agencies have been developing a Drought Contingency Plan (DCP) that includes implemented and proposed actions to address the potential water shortage. The Department of Interior Order No. 3344 - *Actions to Address Effects of Historic Drought on Colorado River Water Supplies* (DOI, January18, 2017) further outlines the details of the DCP. One component of the Phase I Plan is to evaluate the current

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hydrologic modeling for the Salton Sea and to include some of the proposed actions in the model to evaluate their potential impact to Salton Sea inflows.

As the *Air Quality Planning and Implementation* section of this document notes, the air quality mitigation will consist of measures to keep exposed playa wet or vegetated. A series of Best Available Control Measures (BACM) are being evaluated by the Quantification Settlement Agreement (QSA) Water Transfer mitigation program, which was created under a 2003 agricultural-to-urban water transfer agreement involving the State of California, the Imperial Irrigation District, Coachella Valley Water District, and the San Diego County Water Authority. The work of determining these best strategies will be paid for by the QSA Joint Powers Authority. The Phase I Plan involves coordination among Imperial Irrigation District, Imperial County Air Pollution Control District, South Coast Air Quality Management District and other agencies to ensure that the latest information about how lakebed exposure may affect air quality is included in the development of BACM pilot projects.

In order to provide ample time for public input into this plan, the SSMP will schedule several regional workshops to solicit input from community members and stakeholders as well as provide necessary time for general public comment. This process will be announced via the program's website http://resources.ca.gov/salton-sea/.

Salton Sea Elevation and Exposure Modeling

A key issue at the Salton Sea is exposure of previously submerged lakebed, known as playa, as the lake surface shrinks. This playa exposure is subject to wind erosion and can be a source of fine airborne dust smaller than 10 micrometers, known as particulate matter 10, or PM10; as well as a source of PM 2.5. The dust is a significant health hazard and can contribute to respiratory illness in humans. It can also damage agricultural crops and wildlife and harm the region's tourism industry.

Understanding the extent, type and location of the exposed playa is important in developing a program to address playa emissivity. There also are regulatory requirements to provide an emission inventory, the creation of which demands an understanding of the extent of exposure possible over the course of the Phase I Plan.

The following is a brief explanation of the process used to create the playa exposure assumptions included in this 10-year plan.

Hydrology Inflow Modeling

As part of the initial environmental evaluation of the Imperial Irrigation District Water Conservation and Transfer Project (QSA water Transfer), the Salton Sea Accounting Model (SSAM) was used to estimate inflows and salt concentrations at the lake for the up to 75-year term of the QSA Water Transfer. This evaluation resulted in a series of mitigation measures designed to address water quality and to maintain the salinity trend at the lake. The measures also had a secondary effect of reducing the water elevation decline at the lake.

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In 2012, in response to concerns over the results of the previous modeling, the Salton Sea water inflow and salt balance projections were reevaluated using the Salton Sea Analysis model (SALSA), originally developed in 2006 for the California Department of Water Resources' Salton Sea Ecosystem Restoration Program's environmental documentation. The SALSA model was integrated into the GoldSim modeling platform to provide an interface that would more easily allow for alternative scenario comparisons, allow for customized simulations, and provide for a stochastic simulation mode to evaluate uncertainty. The revised model results were compared/correlated with the additional years of measured elevation data available from 2003 to 2012 (latest available information). Since then, Imperial Irrigation District (IID) has revised the model based on new data and those revisions are included in the exposure projections presented here. Since there is some difference of opinion on the results of the latest hydrology, the State will evaluate the hydrologic model, compare the results with earlier versions and make it available for review as part of the preparation of the SSMP.

Along with the original parameters of the model (agricultural return flow water, mitigation water delivered to the lake, precipitation, groundwater inflow from the Coachella Valley, evaporation, etc.), the revised model has inputs for water use by the Species Conservation Habitat Project and for water-dependent air quality mitigation. The water demands for the habitat and water-dependent air quality mitigation components are determined based on surface area, evapotranspiration rates, total dissolved solids concentrations, and flow-through volumes. These variables can be manipulated in the model inputs to mimic various management scenarios. The various assumptions integrated into the model will be provided to stakeholders as part of the review of the hydrology model. The State will complete a revision/calibration of the SALSA hydrology model. Additional field data will be integrated into the model.

Initial conditions for the model are from the United States Geological Survey (USGS) stream gauge data from December 31, 2012, which measured the lake elevation at -231.35 feet below mean sea level (MSL) based on the North American Vertical Datum of 1988 (NAVD88). The baseline for the salinity concentration is approximately 52.7 parts per thousand (ppt) based on the average of samples taken by the U.S. Bureau of Reclamation at three fixed locations in the lake in February 2012.

A Monte Carlo simulation (stochastic process) is used to provide multiple runs with changes to multiple variables, based on their probability distribution. The runs are then statistically analyzed and an end-of-year Salton Sea water elevation is calculated for each year. The inflow data is combined with lakebed topography (bathymetry) to estimate playa exposure around the lake.

Salton Sea Bathymetry

The revised Salton Sea bathymetric data was developed by consultants from a variety of sources including light detection and ranging (LIDAR) survey technology and boat-based acoustic sonar imagery. This data was manipulated to develop bottom contours for the lake and immediate shore area. It also was used to estimate sediment depth and composition around some areas of the lake. Data relating to the bathymetric model was

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converted to NAV88 using the National Geodetic Survey's VERTON calculator and a standard conversion factor of 2.113 feet.

In order to evaluate the accuracy of the playa exposure model, satellite (Landsat 5, 7 and 8)imagery of the Salton Sea was captured and a spectral water index was used to identify areas covered by water. This was then compared to the results of the playa exposure evaluation model and the existing data from the USGS gauge to compare the results. In general, the results were comparable. But the evaluation identified differences in areas around the bays of the New and Alamo rivers. This is likely the result of errors in the bathymetric data caused by limitations of acoustical sonar data in shallow water areas (while these areas are currently dry, portions were flooded with shallow water during the sonar survey). The bay areas that were exposed in 2016 have been included in the exposure acreage, and the revised hydrology will evaluate the issue and determine if the bathymetric data need to be further adjusted. This information will be included in the revised hydrologic model review process.

Salton Sea Playa Exposure

Based on the above data, Table 1 summarizes the predicted year by year playa exposure from late 2018 to 2028, which totals approximately 48,300 acres. Additional hydrologic analysis will be completed to include potential impacts from the DCP that may revise inflows to the lake, which in turn will cause changes to the exposure profile. Revisions to the hydrology will change the estimated exposed acreage. It is likely that revisions will be made on an annual basis, as new information becomes available, and the revisions will be made available for review by stakeholders.

The original estimates for total playa exposure from the QSA water transfer were approximately 45,000 acres, and the model had the lake stabilizing in approximately 2035. The environmental documentation for the QSA recognized that the amount of exposure might change, and included requirements in the air quality mitigation program that additional modeling be conducted to further evaluate exposure.

Table 1. 2018–2028 Annual Exposure (Acres/Year)

YEAR	ACRES
2018	3,500
2019	4,200
2020	5,000
2021	5,600
2022	5,500
2023	5,300
2024	4,900
2025	4,300
2026	3,900
2027	3,300
2028	2,800
TOTAL	**48,300**

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The exposure projections currently listed for the 10-year period differ from the projections for the original 2003 and later environmental document prepared as part of the QSA Water Transfer. As was noted previously, the State will evaluate the latest hydrology data and make the results of that evaluation available for review. There will be periodic comparisons of the actual playa exposed against what the model predicts will be exposed.

The SSMP Phase I Plan will be implemented within the exposed areas on the south and north ends of the lake. Some of the exposed area may not be emissive and will not require action from the Phase I Plan. The implementation process for the Phase I Plan is outlined in the *Implementation* section of this document.

Salton Sea Salinity

One of the measures incorporated into the QSA Water Transfer mitigation program was the revised Salton Sea Habitat Conservation Strategy, which required delivery of 800,000 acre feet of water to the Salton Sea to maintain the salinity trend at the lake. The delivery of this water mitigates to a large extent the decline in elevation of the lake. Delivery of this so-called “mitigation water” ends December 31, 2017.

The original and revised SALSA models calculate the salt concentration for the lake based on a simple mass balance algorithm. Salinity was modeled and then compared with measured salinity data from the U.S. Bureau of Reclamation’s salinity surveys conducted in February 2012. The model estimates that the salinity of the lake will be approximately 63.4 parts-per-thousand (ppt)at the end of 2018, and approximately 153.1 ppt in 2045. The most recent measurements of salinity (Reclamation 2016) recorded slightly over 59 ppt, which is higher than some of the model predictions.. Additional modeling will be conducted to confirm salinity trends and show any difference between the modeled and measured salinity. While the salinity projections may change based on the modeling, current projections can still be used for planning purposes.

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Phase I – Background

Phase I is designed to address playa exposure by developing habitat or dust suppression projects on exposed playa. The location of habitat projects will be determined primarily based on site logistics such as water availability, soil suitability, and compatibility within the overall habitat landscape. If the primary objectives are met, location of habitat will be further informed by emissivity potential of the playa. Determination of playa emissivity will drive the location of the dust suppression projects. The development of new methods for evaluating emissivity is part of the QSA Water Transfer Air Quality Mitigation Program and the Phase I Plan. The process for determining more advanced methods of measuring emissivity is an ongoing process that is being coordinated with the two local air districts and the California Air Resources Board. More detail regarding measurement of emissivity is included in the *Air Quality Planning and Implementation* section of this document.

The projected playa exposure acreage is based on data from IID's revised hydrology model and will be reviewed by the State and other stakeholders. Figure 1 (all figures are contained in Appendix 1) illustrates the projected lake elevation in 2003, 2018, 2023 and 2028. The exposed playa acreage included in the Phase I Plan is depicted as shaded areas (zones) on the north and south end of the lake. Figures 2 and 3 are of playa exposure at the New River. Figures 4 and 5 depict exposure at the Alamo River, and Figure 6 depicts exposure at the north end of the lake. For graphical and design development purposes, the area encompassed in the Phase I Plan is divided into three increments of playa exposure by year: 2003–2018; 2018–2023 (green shading); and 2023–2028 (blue shading). However, the Phase I Plan addresses annual exposure of playa areas, as noted in Table 2, starting in 2018. The habitat projects will be concentrated in the 2018–2023 and 2023–2028, exposure zones. BACM pilot projects and the water management ponds will be located in the 2003–2018 exposed zone because they require exposed playa, and the water management ponds are located to facilitate gravity flow. Appendix 4 includes a preliminary implementation schedule that will be updated as design advances.

Table 2 summarizes the projected exposure and the amount of treatment of exposed emissive playa on an annual basis. There is lag time between playa exposure and construction of habitat or dust suppression techniques. This delay accounts for the seasonal elevation change of the lake (water elevations during a given year vary based on seasonal changes in inflow volumes), wave action wetting the exposed playa, and desiccation of the playa soil after exposure. Initial evaluations by the air quality management program suggest that the lag time is approximately 1.5 years to two years. A two-year lag time will be used for the purposes of developing annual target numbers. There will be periodic calibrations to assure that the predicted exposure is accurate.

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Table 2. 2018–2028 Exposure and SSMP Phase I Projected Construction

YEAR	EXPOSED ACRES	PROPOSED CONSTRUCTION
2018	3,500	500
2019	4,200	1,300
2020	5,000	1,700
2021	5,600	3,500
2022	5,500	1,750
2023	5,300	2,750
2024	4,900	2,700
2025	4,300	3,400
2026	3,900	4,000
2027	3,300	4,000
2028	2,800	4,200
TOTAL	**48,300**	**29,800**

Table 2 notes more exposed playa area than proposed constructed area. Phase I concentrates on the north and south ends of the playa where the exposure is more pronounced. The proposed construction acreage is all of the shaded areas noted in Figures 1 to 6. The additional exposed area is primarily along the east and west sides of the lake. These areas are outside of the backbone water management infrastructure and will require additional development of water sources to be converted to habitat areas. These areas may require dust suppression methods to address emissions.

Some exposed areas around the lake may not require treatment, as they will be non-emissive or used for some other purpose, such as access for renewable energy projects or agriculture.

The Phase I Plan includes many of the concepts identified in the *Salton Sea Restoration and Renewable Energy Initiative* (Initiative) developed by IID and Imperial County in 2015 and revised in the IID's Backbone Infrastructure Concept Design memo of August 2016. Though the Initiative was developed primarily as a potential solution for exposed playa areas on the south end of the lake, the concept can also be applied to other areas around the lake. Phase I will incorporate two priority elements of the Initiative:
1) maintaining access for the development of renewable energy (primarily geothermal), and 2) incremental construction based on playa access and funding availability. The Torres-Martinez Desert Cahuilla Tribal nation (Torres) has developed plans for several projects on the north end of the lake that will be a part of Phase I. Habitat design will be informed by State and federal wildlife agencies, as well as academic and non-profit partners.

Dust suppression projects will be coordinated with the *Salton Sea Air Quality Mitigation Program* (IID/JPA July, 2016), the Imperial County Air Pollution Control District (ICAPCD), the California Air Resources Board (CARB) and the South Coast Air Quality Management District. The State will continue to coordinate with the Salton Sea Authority

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(SSA), the Water Transfer Joint Powers Authority, IID, and ICAPCD on the development of BACM pilot projects per Imperial County's recent request for letters of interest from affected landowners and the SSA's Natural Resource Conservation Service grant process. The *Air Quality Planning and Implementation* section of this document provides additional detail.

To expedite Phase I, the SSMP design team will include State staff and outside consultants developing the design criteria for the water backbone infrastructure, as well as habitat and dust suppression projects at the north and south end of the lake. The team will work closely with State agencies, IID, SSA, SSMP Committees, the QSA water transfer agencies, and other stakeholders during the development of the project plans.

SB 839 (Statutes of 2015-16) grants the Department of Water Resources design/build contracting authority for the SSMP. This authority will expedite and provides a more flexible design and construction process as well as potentially reducing project costs. Design criteria and preliminary construction design will be used to develop and advertise for a design/build consultant to implement Phase I projects.

Phase I Planning and Design

The State of California will use the amount/rate of playa exposure (subject to lag time and other constraints) to plan and implement each year's annual increment of construction of projects in the Phase I Plan. Each year at a specific timeframe (likely December), the State will determine actual playa exposure using methods similar to those described above for evaluating the playa exposure model's accuracy and adjust the hydrology model if needed. The evaluation will include measuring the emissivity and potential for toxic emissions of the playa to determine if the exposed area requires mitigation. The Phase I Plan will require a certain amount of adaptive management, as there may be seasonal fluctuations at the lake or changes in annual exposures that may require adjustments to Plan implementation.

The exposed area to the west of the New River (Figures 2 and 3, Appendix 1) is identified as the first site to be developed because much of the area was included in the Species Conservation Habitat Project (SCH) environmental documentation and will not require significant additional regulatory compliance effort. The second area developed will be to east of the New River (Figures 4 and 5, Appendix 1). This area will be developed after construction of the SCH is substantially completed. (The SCH serves as both habitat and the water management pond for the SSMP projects on the east side of the river.) Additionally, the Torres project located on the north end of the lake will be developed (Figures 10 and 11, Appendix 1). Permitting work on other areas is underway and will be completed prior to planned construction dates,. The State is currently trying to determine the most expedient process for regulatory compliance and will make every effort to utilize existing California Environmental Quality Act and permitting documentation in that process.

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Areas around the Alamo River (Figures 6, 7, 8, and 9, Appendix 1) will be developed later in the Phase I Plan, as they involve more access issues associated with geothermal development. The Red Hill Bay project is underway on the west side of the Alamo River (Figures 6 and 7, Appendix 1) and will be completed in 2017.

The development of the Phase I Plan is divided into water backbone infrastructure, habitat, and air quality components, as described in the following sections.

Water Backbone Infrastructure Design

The water backbone infrastructure (backbone) is part of the *Salton Sea Restoration and Renewable Energy Initiative* (IID 2015 and revised 2016), and is designed to supply agricultural return flow water for dust suppression, habitat projects and other potential land uses on the south end of the lake. The backbone will consist of a series of outlets from the Alamo and New rivers that supply agricultural return flow water to water management ponds located along the edges of the lakeshore adjacent to the rivers (Figure 1, Appendix 1). The water management ponds will include an inlet for Salton Sea water. The two water sources will be blended in the water management pond, and the resulting brackish water will be used for the habitat areas. The project water distribution system will deliver the brackish water from the water management ponds for habitat and dust suppression.

The Audubon report *Quantifying Bird Habitat at the Salton Sea - Informing the State of California's Salton Sea Management Plan*, October, 2016, details salinity levels tolerated by various avian species.. The Audubon report will help determine specific locations and salinity for the various habitat areas based on target species. Location of the various habitat types will be developed as part of the work planning effort that begins in March 2017.

The backbone is divided into sections based on the agricultural return flow water source. The New River is depicted in Figures 2 and 3 in Appendix 1, and the Alamo River is depicted in Figures 4 and 5 in Appendix 1. The river sections are further subdivided based on the location of the playa that will be served by each section, with the New River divided into east and west, and the Alamo River divided into north and south.

The State team (which includes various SSMP Advisory Committees), along with IID, the QSA Water Transfer agencies, and other stakeholders, will collaborate to develop design and construction standards for the Phase I water backbone delivery system. IID will be involved in the review and approval of the backbone system, as it will be connected to IID infrastructure. The criteria for the backbone water delivery system may include the following:

Geotechnical Evaluation

Utilizing existing data where practical, determine suitable substrate materials available for berm foundation and berm construction. This will be a limited evaluation similar to what was done for the SCH.

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River Delivery System

Evaluate the construction and operation cost of a pump system versus the development of a river check dam structure to facilitate gravity flow from the river.

Identification of Existing Habitat Areas

Evaluate existing habitat and vegetation along the eastern side of the lake to determine if portions can be stabilized or enhanced (Figures 8 and 9). Vegetation, ponded water, and saturated soils in these areas are likely caused by natural or artificial blockage of the agricultural drains in the area. Consider the potential for water quality issues (selenium) in these areas and the potential for impacts to desert pupfish.

Design Criteria

Determine process for assessing the value of engineering of projects with an emphasis on developing standards that compare project longevity against the costs of building and maintenance.

Design-Year Storm

Determine the appropriate design year storm and develop flood control measures to accommodate that flow. The evaluation may include the development of sacrificial berms, cutouts or armoring of the channel to pass large volumes of water from the river channel to the Sea.

Channels

Evaluate the potential for pipe systems instead of open channels for the distribution system. Evaluate size, structure and composition (lined vs. unlined) of the distribution system.

Water Management Ponds

Determine the final structure, size, and location of the water impoundment ponds. Determine sediment control system. Evaluate berm construction parameters (material, compaction etc.).

Easement and Lease Protocols

To the extent practical, develop standardized easement and lease agreements for IID parcels and other parcels that will be used for SSMP projects.

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Develop Contingency Plan for Funding Shortfalls

Develop a program to prioritize certain aspects of the Phase I Plan if funding is not available for the complete implementation. Considerations will include human health concerns, potential impacts to agricultural activities, and ecosystem management.

Operation, Maintenance, and Monitoring

Develop cost estimates for operation, maintenance, and monitoring activities associated with constructed facilities. The State will be responsible for implementing the operation, maintenance, and monitoring of the project. The DOI/CNRA MOU (Appendix 2) identifies federal funding for these activities for a ten-year period.

Compatibility with IID Draft Water Transfer Habitat Conservation Plan

The Phase I Plan will be developed to be compatible with the mitigation measures for desert pupfish, marsh birds, and other Salton Sea or drain species included in the draft Habitat Conservation Plan developed for the water transfer mitigation program.

Compatibility with IID/JPA Water Transfer Air Quality Mitigation Program

The State will coordinate with IID and their consulting team, ICAPCD, Water Transfer Joint Powers Authority, and South Coast Air Quality Management District (SCAQMD) to integrate compatible BACM pilot projects into Phase I of the SSMP. The State will coordinate with Water Transfer Joint Powers Authority partners to implement its air quality mitigation program. Efforts are underway to determine if accelerating portions of the air quality mitigation program are warranted. This coordination will be conducted through the existing Water Transfer Joint Powers Authority budget process and the existing mitigation development program for the water transfer.

This process will follow the four-step air quality mitigation guidelines outlined in the QSA Water Transfer environmental documentation.

Compatibility with Renewable Energy Projects

With the notable exception of the Red Hill Bay project, the initial projects described for Phase I are either outside or at the edges of the Known Geothermal Resource Area (KGRA). However, the remainder of the Phase I projects are within this zone. The State will continue to coordinate with the geothermal developers, regulatory agencies, and land owners to design the SSMP projects to minimize or eliminate conflicts with renewable energy development. Currently, the Phase I design assumes access provisions will be accommodated by the existing drain outlet corridors spaced approximately every half mile along the southeast portion of the lake. This may change as development proceeds.

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Phase I – Implementation

Water Backbone Infrastructure Implementation

The 2018–2023 water management ponds will be the first facilities constructed as part of the water backbone infrastructure, followed by the habitat and dust suppression projects associated with each individual pond. The water management ponds likely will be constructed at the highest ground elevation on the playa as is practical to facilitate gravity delivery of water to the habitat and dust suppression water distribution system. The ponds will provide a blend of agricultural return flow water and Salton Sea water to the habitat and water-dependent dust-suppression project areas in the 2018–2023 zone exposure area. A second water management pond will be constructed in each section later in the Phase I Plan progression after the air quality and habitat projects in the 2018–2023 playa exposure zone have been started (*Appendix 4: Project Schedule*). Construction of the second water management pond will be completed prior to playa exposure in the 2023–2028 playa zone so that it can be used to supply water to habitat and air quality projects in that zone. To the extent practical, the water management ponds will be designed and constructed to provide fishery habitat.

Initial construction will start in the area to the west of the New River (Figures 2 and 3, Appendix 1) to take advantage of existing permits and authorizations. As the construction design for the area west of the New River is completed, the environmental documentation will be finalized for the remaining sites, and implementation will follow on the east side of the New River (Figures 4 and 5, Appendix 1) and the north end of the lake (Figures 10 and 11, Appendix 1). As an access plan for renewable energy is developed on the areas around the Alamo River, the water management ponds will be sequenced, with the initial pond providing water to the 2018–2023 zonecompleted first, and the second pond completed as the lake continues to recede, exposing more playa.

The habitat and dust suppression project distribution system will consists of a series of channels or pipelines that will distribute water from the water management ponds to the various habitat and dust suppression cells. The system will be designed to provide access corridors for renewable energy development. The State will coordinate with IID, Imperial County, geothermal developers, and others to assure that adequate access is maintained.

Habitat Descriptions

The State has partnered with numerous state and federal agencies along with the SSA, IID, Imperial County, Audubon, the University of California, and other academic organizations to develop and fund habitat and dust suppression projects around the Salton Sea.

The State also contracted with Audubon to develop the Audubon technical report, *Quantifying Bird Habitat at the Salton Sea* (Audubon, November 2016). The report identifies and quantifies the current acreage of each habitat type comparing it to the

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amount of habitat in previous years, and will be used to guide habitat program design. It should be noted that development of the habitat types listed below (with the possible exception of playa habitat) also will provide adequate dust suppression in those areas. The different habitat types identified by the report, their importance, and their potential development opportunities are as follows:

Permanent Wetlands with Vegetation

This habitat type is primarily located around the Salton Sea where the agricultural drains back up and flood or where land is deliberately flooded for habitat. Vegetation varies from invasive species such as tamarisk to cattails and bulrush. It is unclear if this habitat type will persist or be recreated at the Salton Sea. The current selenium bioaccumulation mitigation process is to maintain salinity of the various habitat types at a level that precludes or significantly reduces the growth of vegetation within the habitat areas. The SSMP planning process will evaluate the existing areas and the potential for developing additional areas.

Dry Playa Habitat

Exposed dry playa provides some specific nesting and general foraging habitat value, particularly near the water shoreline. This habitat type will tend to follow the receding shoreline and will likely always be part of the Salton Sea ecosystem in areas immediately upslope of the existing shoreline. However, as the salinity of the center lake area increases, it could change the invertebrate population, thus reducing the forage opportunity for the lake's existing bird population.

Therefore, additional playa habitat might be created or marginal habitat may be enhanced with small woody debris and sparse vegetation to further promote nesting areas. These areas could be incorporated into the shallow habitat cells by fluctuating water elevations on the shoreward edge of the cell, or less emissive playa areas might be identified and developed as habitat.

Mudflat, Sandflat, and Beach Habitat

This habitat type is the water/land interface (from wet substrate to less than 0.5 feet of water depth) along the lake shoreline. This habitat type is likely to continue at the lake as the water elevation decreases. The beach areas are normally high in invertebrate populations (insect and other arthropods) and provide foraging habitat for birds, but the extent and quality of the habitat may be degraded by increased salinity. As salinity increases, the invertebrate population may change from less salt-tolerant species to more salt-tolerant species, though it is unclear how, or if, this colonization will occur. Changes in the invertebrate population in turn may impact bird species with specific diets.

The Red Hill Bay project, currently under construction, will contain areas of this habitat type as a foraging area for shore and wading birds. The SCH will have areas of this habitat type along the shallow shoreline and around some of the island structures. The

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SSMP shallow water habitat will contain areas of this habitat type along the shallower end of each pond.

Mid- and Deep-Water Habitat

The Audubon report described mid-water and deep-water as two different habitat types; they are combined here because it may be easier from a construction and management perspective to have both habitat types in one cell. The water depth in this habitat ranges from half a foot to more than 6 feet in depth. This type of habitat provides forage and refuge for fish and marine invertebrate populations. While there will be a considerable amount of mid- to deep-water habitat at the lake, the increases in salinity will likely render this habitat unsuitable for fish reproduction.

The areas noted below are designed, or could be modified, to provide initial mid- and deep-water habitat.

Species Conservation Habitat Project (SCH)

SCH is specifically designed as fish and avian habitat and will have areas that are more than 6 feet deep to accommodate a sustainable fishery. The project is located to the immediate east of the New River on exposed playa. It will be supplied water from an adjacent mixing basin that receives agricultural return flow water from the New River and saline water from the Salton Sea.

Torres- Martinez Wetland Project

The Torres-Martinez project on the north end of the lake is a mid- and deep-water habitat that should be suitable for fish. This project and the SCH will be used to evaluate construction and operation techniques to inform later development of mid- to deep-water habitat.

Water Management Ponds

The water management ponds included in the water backbone infrastructure may also serve as habitat for fish. These ponds will have berms that are six feet or less above the ground surface and likely will not impound water much higher than five feet above the ground surface. However, much of the material to build the berms will be excavated from the interior of the management pond and the total water depth will be deeper.

Red Hill Bay

While Red Hill Bay is generally considered shallow water habitat, there will be some areas of deeper water within the ponded areas. Additional evaluation is necessary to determine if these areas will sustain fish populations.

Habitat Implementation

Habitat projects associated with the first water management ponds will be concentrated in the 2018–2023 playa exposure zone based on the annual exposure, although some habitat or dust suppression projects might be included in the lower elevations of the 2003–2018 playa exposure zone, depending on actual playa exposure and site logistics.

The Red Hill Bay and the SCH are located in the 2002–2018 playa exposure zone. Along with the planned water management ponds, they will cover portions of the 2003–2018 playa exposure zone as they dry, thus reducing or eliminating potential dust emissions from those areas. The State will work with ICAPCD and IID to locate BACM pilot projects in the 2003–2018 playa exposure zone to further reduce the potential for dust emissions. Additional habitat will be planned for the 2018–2023 and 2023–2028 exposed areas. To the extent practical, the SSMP will strive to provide multiple benefit projects that combine dust suppression with habitat enhancement and other positive benefits.

From approximately 2019 to 2021, the second series of water management ponds will be constructed on 2003–2018 exposed playa zone to provide water to the 2023–2038 playa exposure zone. Actual construction of habitat and dust suppression projects in the 2023–2028 zone will commence when portions of that area are dry enough to allow equipment access.

Air Quality Planning and Implementation

The SSMP air quality component is modeled after the IID/Water Transfer Joint Power Authority air quality mitigation program (*Salton Sea Air Quality Mitigation Program*, IID July 2016) for the Imperial Irrigation District Water Conservation and Transfer Project. The SSMP recognizes the four-step process outlined in the final EIR/EIS and concentrates on *Step 2 – Implementing a Research and Monitoring Program* to define the parameters of dust suppression needs and identify solutions, and *Step 4 – Implementing Feasible Dust Suppression Projects* (BACM pilot projects) at the Salton Sea.

The State's SSMP air quality mitigation program will include coordination with IID, Coachella Valley Water District, QSA Water Transfer Joint Powers Authority, SCAQMD, ICAPCD, and CARB to develop BACM and to further develop and implement the emission monitoring process. The *Salton Sea Air Quality Mitigation Program* (IID July, 2016) contains more details on the air quality mitigation effort.

The SSMP envisions a mix of both water-dependent and waterless dust suppression projects in all phases of the SSMP. Ongoing evaluations of the criteria for determining which dust suppression techniques will be used in specific areas will continue as the QSA Water Transfer Air Quality Mitigation Program and the SSMP are developed. Some of the techniques, such as enhanced vegetation, could be considered waterless

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measures if designed to intercept the groundwater level, but they would require surface water for establishment. Many of these techniques are currently being evaluated for efficacy and longevity in the 2003–2018 playa exposure zone. Most of the methods have not been in place long enough to determine longevity or durability, but evaluations will continue.

Water Dependent

The water-dependent dust suppression includes all water impoundment areas (both water management ponds and habitat) as well as vegetation enhancement techniques, and salt or surface crust formation areas. Currently, the SSMP design team is evaluating the potential for seasonal flooding of some areas to provide habitat during migration or nesting seasons, and then reduction of water levels to keep the surface near saturation, which should provide dust suppression. Vegetation enhancement requires some amount of water to irrigate the plant material and leach salts out of the upper portion of the root zone.

Salt crust formation requires some amount of water to form the crust and periodic inundation to stabilize the crust. Initial evaluations of naturally formed salt and surface crusts around the sea (DRI and IID PISWERL results) suggest that the surface crusting weakens with conditions of lower temperature and higher humidity (approximately December - March). More evaluation is needed to determine if the weakening of the crust is sufficient to cause those areas to fail stability testing. Additional evaluation of salt crusts and the development of better emissivity determination techniques, already underway as part of the QSA Water Transfer Mitigation program, will continue as part of the initial phases of the SSMP.

The following table summarizes the projected unit costs for water-dependent dust suppression methods. These costs will likely change as the evaluation process continues.

Table 3. Projected Cost for Water-Dependent Dust Suppression Techniques

DUST SUPPRESSION METHOD	COST PER/ACRE
Vegetation Enhancement	$9,000
Vegetation Swale	$17,000
Managed Vegetation	$25,000
Shallow Flood	$25,000
Brine Stabilization	$21,000

The State, IID, Torres-Martinez, and other landholders are also considering groundwater wells that tap the shallow aquifer to supply water to the enhanced vegetation areas. Much of this aquifer is a result of perched water from agricultural irrigation. While there are some concerns with water quality, this process may provide water to some areas that lack access to a surface water supply. The north end has the most potential for near-surface groundwater, but there are other areas where the

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techniques may be used. The costs for this dust suppression technique have not been developed. The IID/Water Transfer Joint Power Authority air quality management team is currently monitoring groundwater elevations in a number of sites around the lake.

Waterless

The waterless dust suppression techniques may require an initial application of water, but generally do not dependent on periodic application of surface water. Some of these treatments cost less than some water-dependent treatments, but may require more operation and maintenance. Projected unit costs for these methods are noted below. These preliminary cost estimates will change as more information is developed. Some of these methods are currently under evaluation for longevity and efficacy in several areas around the Salton Sea.

Table 4. Projected Cost for Waterless Dust Suppression Techniques

DUST SUPPRESSION METHOD	COST PER/ACRE
Surface Roughening	$400
Moat and Row	$14,000
Suppressants/Surface Stabilizers	$2,000
Gravel Cover (2 inch)	$36,000
Gravel Cover (4 inch)	$48,000

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Projected Costs and Funding

Project Costs

Cost projections for the various components of the Phase I Plan have been developed with the best available information. Projected costs include planning and design costs that are concentrated in the first years of the plan. The developed designs will be used throughout the 10-year implementation of the Phase I plan. The estimates are based on developing habitat in all of the shaded areas (except for renewable energy access or other identified land uses). These projections will change as additional information becomes available on site logistics and on the actual costs of the initial projects. Costs for the Red Hill Bay project and the SCH are not included in the projected costs as they are funded under other sources.

Appendix 3 includes a cost breakdown based on unit costs for each year. Annual costs, constructed acreage and funding availability are summarized in the following table:

Table 5. Projected Annual Cost, Acres Constructed, and Funding of SSMP Phase I 10-Year Plan

YEAR	NEWLY EXPOSED ACRES	PROPOSED CONSTRUCTION	PROJECTED TOTAL COST	AVAILABLE FUNDING	BALANCE
2018	3,500	500	$10.0 M	$10.0 M	($0.0) M
2019	4,200	1,300	$27.0 M	$27.0 M	($0.0) M
2020	5,000	1,700	$35.5 M	$35.5 M	($0.0) M
2021	5,600	3,500	$43.5 M	$7.5 M	($36.0) M
2022	5,500	1,750	$33.5 M	-	($33.5) M
2023	5,300	2,750	$35.5 M	-	($35.5) M
2024	4,900	2,700	$34.0 M	-	($34.0) M
2025	4,300	3,400	$42.5 M	-	($42.5) M
2026	3,900	4,000	$47.5 M	-	($47.5) M
2027	3,300	4,000	$37.5 M	-	($37.5) M
2028	2,800	4,200	$36.5 M	-	($36.5) M
TOTAL	**48,300**	**29,800**	**$383.0 M**	**$80.0 M**	**($303.0) M**

Expenditure Reporting and Process Accountability

CNRA will report each fiscal year on prior year expenditures made for SSMP implementation, availability of funds for future expenditures, and changes to the SSMP program.

Existing Funding

Water Bond Funding (Proposition 1)

Proposition 1, the $7.5 billion water bond passed by California voters in 2014, provided $80.5 million to fund development, permitting, and implementation of the SSMP. This funding is available over the next several years. The expenditure of these funds is reflected in the existing funding column of Table 5 above.

Wildlife Conservation Board Funding for SSMP Projects

The California Wildlife Conservation Board (WCB) approved a $14 million grant in November 2016 to help fund the SSMP's SCH. The grant, along with approximately $21 million from Proposition 84, will fund the construction of an approximately 640-acre aquatic habitat area to support a fishery and provide habitat for Salton Sea avian species.

In 2013, the WCB funded the design and construction of the electrical power distribution system through a grant to IID. The WCB also awarded an approximately $1.85 million grant to the IID to begin work on the Red Hill Bay project, a joint venture project with IID, U.S. Fish and Wildlife, Sonny Bono Salton Sea National Wildlife Refuge, and the State of California.

U.S. Department of Agriculture

The U.S. Department of Agriculture (USDA) recently approved the Salton Sea Regional Conservation Partnership Program to address habitat, air, and water quality on agricultural lands around the Salton Sea. The SSA will administer the $7.5 million grant for water conservation, wetland creation, and air quality mitigation. The wetland creation and air quality management portions of the grant will be used to develop pilot BACM projects and wetland habitat projects on parcels with an agricultural history.

The USDA funding is not included in the projections above. As the program is finalized and grantees are identified, the funding will be accounted for in the annual expenditure reporting process. The success of this grant program is intended to be a proof-of-concept for potentially larger-scale USDA funding. This program could be expanded to include non-agricultural lands at the Salton Sea.

Potential Funding Sources

Water Transfer Joint Powers Authority

The State will work with the members of the Water Transfer Joint Powers Authority to determine if funding included in the existing mitigation program can be utilized for SSMP projects that further the goals of the Water Transfer mitigation program. Currently the

State and IID are exploring acceleration of air quality mitigation efforts that will benefit both programs. The cost of the additional research into determining playa emissivity and methods that suppress dust are projected to range from $5 million to $8 million..

DOI/CNRA Memorandum of Understanding Funding

The MOU between DOI and the CNRA identified a framework for collaboration at the Salton Sea. The MOU calls for $30 million in federal funding over the next ten years for activities associated with the SSMP.

The amendment to the MOU further defines State and federal responsibilities related to dust emissions from the exposed playa at the Salton Sea.

Philanthropic Organizations

The Water Funder Initiative, a collaborative of leading philanthropic organizations, has committed to raise $10 million over the next five years to support implementation of a comprehensive plan to protect public health and the environment and promote renewable energy development at the Salton Sea.

Water Resource Development Act Funding

The Water Resources Development Act (WRDA) of 2016 maintains the $30 million funding identified in the 2007 WRDA bill. The U.S. Army Corps of Engineers (Corps) administers the part of the program pertinent to the Salton Sea. The 2016 Act recognizes the SSA as a preferred partner for funding agreements with the Corps. The 2016 Act also streamlines the methodology for the development and approval of related projects. This funding has not been appropriated.

USDA Partnerships and Funding

After successful implementation of the USDA/SSA grant noted above, additional funding may be possible through development of a partnership between the USDA and the SSMP using the Farm Bill (the Watershed Protection and Flood Prevention Act [PL566]). This program could address air quality, water quality and habitat on non-agricultural lands on and adjacent to the Salton Sea playa. This could include allowing public lands that endanger public health to be included in the USDA's Reserve Enhancement Program or the Environmental Quality Incentives Program.

Additional State and Local Funding

Funding and in-kind support may be available through future state appropriations, water agencies, local infrastructure financing districts, geothermal leases, and other public and private sources. The State will describe its ongoing evaluation of potential funding sources in the annual expenditure reporting process

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Development of Planning Criteria for Additional Phases of the SSMP

The State is committed to continuing the SSMP process and will also work with the SSMP Science Committee, other committees, and stakeholders to evaluate concepts for later phases of the SSMP. The evaluation will include a hydrologic analysis to estimate inflows to the lake and water quality concerns that might impact both the current and later phases of SSMP. Specific areas of concern for evaluation by the Science, Project, and Long Range Planning Committees include:

Determine Habitat Functional Values

State and federal wildlife agencies, Audubon, and other stakeholders, in cooperation with the Science Committee, will develop additional analysis to evaluate the carrying capacity of created habitat versus existing habitat.

Determine Water Use

There is no issue with water availability for the Phase I Plan. However, water demands for the later phases must be calculated and compared to the revised inflow models to determine water availability in the longer term.

Salinity

The Science Committee will work with the stakeholders to evaluate the impact of salinity on the various habitats at the Salton Sea. While a range of salinity has been established for the habitat areas, the Science Committee will evaluate that range to determine its effectiveness.

Water Quality in Constructed Habitat

The Science Committee will evaluate the potential water quality issues associated with the constructed habitat. The water quality parameters will include an evaluation of methods to control nutrient concentrations, metal concentrations, biological/chemical oxygen demand, and other water column constituents. The evaluation of various water quality treatments (treatment wetland cells, bioreactors, algal uptake, and chemical treatments) may also be evaluated.

Selenium Management

Currently, the management of selenium bioaccumulation is based on managing salinity to reduce or eliminate vegetation, thus interrupting, or at least restricting, the bioaccumulation pathway. The Science Committee will look at other potential methods that might be more effective in selenium management.

Development of Best Available Control Measures

The State will work with IID and ICAPCD to integrate the development of BACM into the habitat design.

Harbor and Ancillary Facilities

Evaluate the potential for reconnecting, inundating, or treating harbors and boat docks along the east and west sides of the lake as part of the SSMP, and for reducing odor and vector issues. In some cases, this could include making the harbor functional for shallow draft boats.

Water Import Projects

Before consideration by the SSMP, the State will require that any water import project proposal include an engineering and logistic feasibility study conducted on behalf of the proponent by an accredited or licensed engineering, planning, or equivalent organization recognized by the State of California. The criteria for consideration of any such proposal will include the following requirements: (1) identify planning, development, construction, and operation costs, and (2) identify the funding source for each. Specifics on how the proposal would address salinity and other water quality concerns will also be required. Schedules detailing the phases and funding needs of each project must be provided.

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Adaptive Management, Monitoring, and Contingency Planning

Adaptive management will be fundamental to the success of the SSMP. The adaptive management program will include review by the SSMP Science Committee, the other SSMP committees and the Salton Sea stakeholders. The program relies heavily on the early development of projects (SCH, Red Hill Bay, and other areas) to test aspects of design, construction, and management. These early lessons learned will be valuable in the efficient and economic development of later phases of the SSMP.

An adaptive monitoring program is under development and will be implemented by the State. It will include the identification of a fish stocking program for the SCH (and later habitat), development of a monitoring and management program for existing avian and fishery habitat, and a water quality monitoring program. It is anticipated that a draft of the plan will be available in 2017. Additionally, the California Department of Fish and Wildlife is in the process of evaluating a potential wider-scale monitoring program for the lake that could be combined with the current U.S. Bureau of Reclamation monitoring efforts and ongoing efforts of others. The monitoring program will be developed in compliance with the USGS guidelines for the Salton Sea monitoring and will utilize existing data to the extent practical.

At this point, the Phase I Plan is not fully funded. The State will continue to monitor the existing and potential funding sources and measure those against the projected costs for the projects in the implementation plan. Adjustments may be required to the plan to maintain adequate dust suppression in some areas while delaying the construction of water infrastructure and habitat (the more costly components). The State will coordinate with the stakeholders as adjustments to the Phase I Plan are considered.

The development of this contingency process will be evaluated starting in 2018 and will be done in two- to five-year increments over the course of the Phase I Plan. As part of the initial tasks undertaken in Phase I, a series of specific metrics will be developed to help assess funding opportunities and match them against projected costs for Phase I.

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Outreach

The State is committed to a transparent and open process in the development and implementation of the SSMP. To that end, a set of advisory committees has been formed that meet periodically to discuss specific topics. Those committees include a Science Advisory Committee and committees on air quality, long-range planning, and a public outreach committee. The Public Outreach Committee conducted a series of 13 public outreach meetings around the greater Salton Sea area from April to August 2016 to introduce the SSMP to the public and to solicit input on Salton Sea issues and concerns.

The UC Riverside and UC Irvine Salton Sea programs conducted a series of voluntary surveys of meeting participants (pre- and post-meeting) to gauge the effectiveness of the communication effort. Approximately 43 percent of meeting attendees participated in the surveys. Approximately 36 percent felt they had gained knowledge on the Salton Sea and indicated an increase in their belief that the State was actively addressing issues at the Salton Sea. When asked to prioritize the issues of concern at the Sea, they identified environmental health, public health, and nature as their top three concerns.

One of the things identified after the last series of meetings was the difficulty in contacting some communities and the need to have more robust environmental justice outreach. CNRA, with support from State Water Resources Control Board, developed a communication plan that addresses those concerns and will help guide future outreach efforts. The State is working with several outreach firms and is developing a social media outreach program.

In order to provide ample time for public input into this plan, the SSMP will schedule several regional workshops to solicit input from community members and stakeholders as well as provide necessary time for general public comment. This process will be announced via the program's website http://resources.ca.gov/salton-sea/.

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Conclusion

As the Salton Sea shrinks for a variety of reasons, air quality in Riverside, Imperial, and surrounding counties suffers, because particulates small enough to be dangerous to human health are picked up by the wind from the exposed lakebed. Huge populations of resident and migratory birds are at risk, too, especially the fish-eating birds that depend upon the tilapia that will no longer be able to survive in the Salton Sea if it grows increasingly salty. Sustainable habitat and air quality management at the Salton Sea is critical for the protection of regional public and ecological health, as well as the management of a stable Colorado River supply for California.

This draft Phase 1 Plan aims to protect public health and wildlife by focusing on the north and south ends of the sea where playa exposure is expected to be greatest and availability of agricultural return flows facilitate lowest cost habitat and air quality project development. The draft plan also includes a process for identifying management strategies for implementation in later phases.

As inflows to the Salton Sea decline over the next decade, this 10-year draft plan aims to mitigate harm to communities and ecosystems. The State is committed to leveraging resources, coordinating with a multitude of other agencies, engaging stakeholders, managing adaptively and learning as much as possible from the wildlife habitat and dust suppression projects now or soon to be underway.

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Figure 1. Salton Sea Management Program Overview (2018–2028)

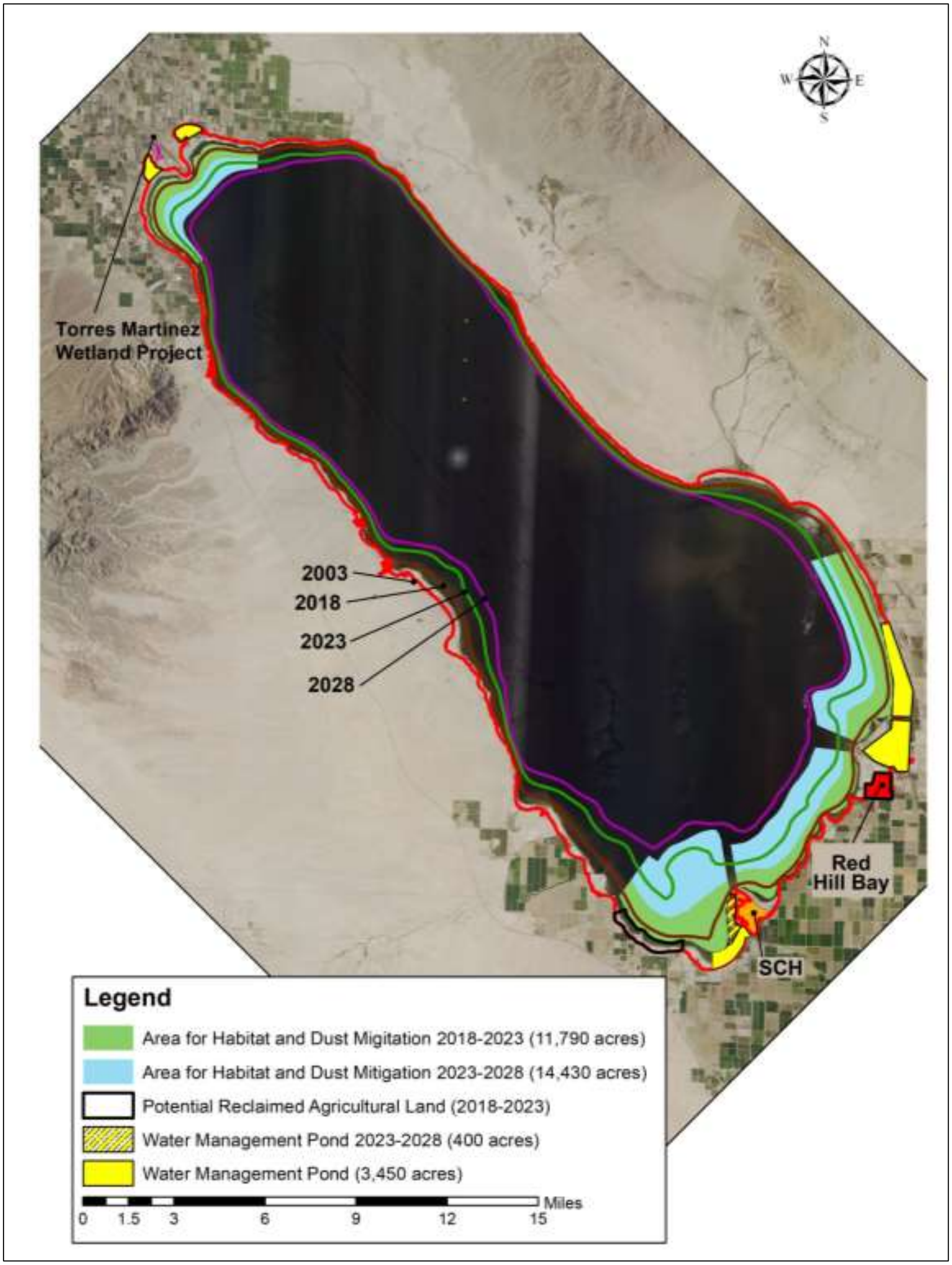

Figure 2. Salton Sea Management Program - SCH Phase 2 (2018-2023)

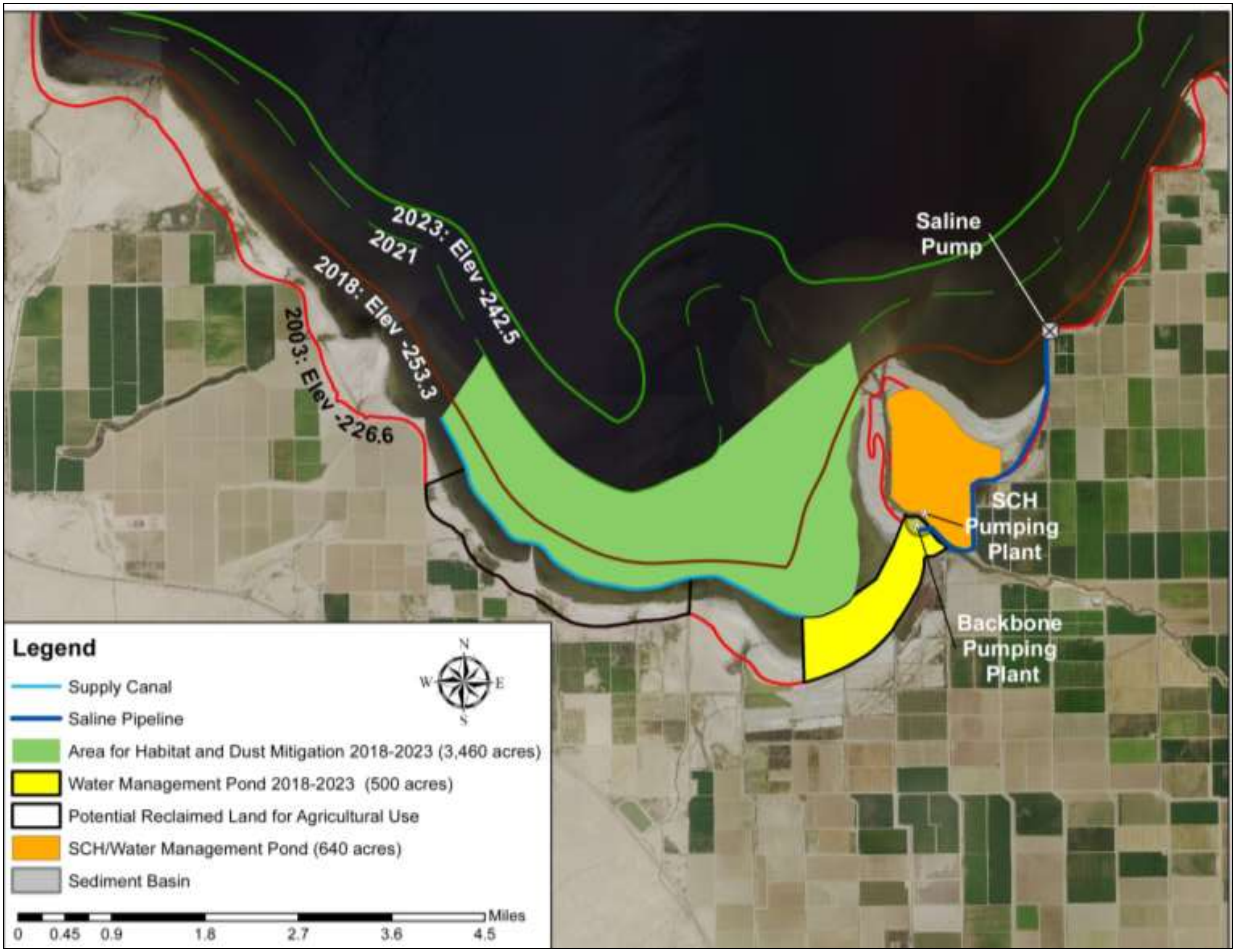

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Figure 3. Salton Sea Management Program - SCH Phase 2 (2023–2028)

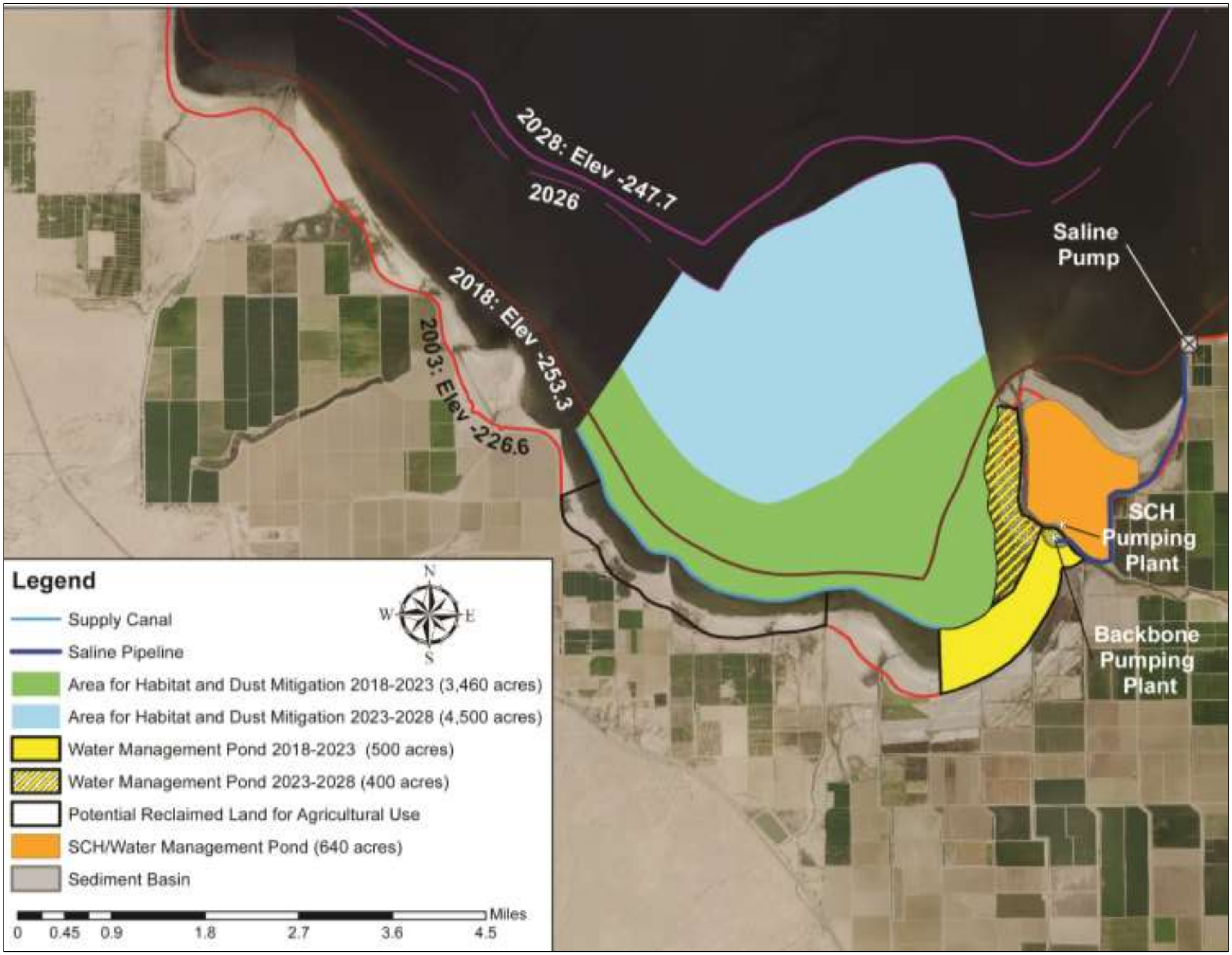

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Figure 4. Salton Sea Management Program - New River East (2018–2023)

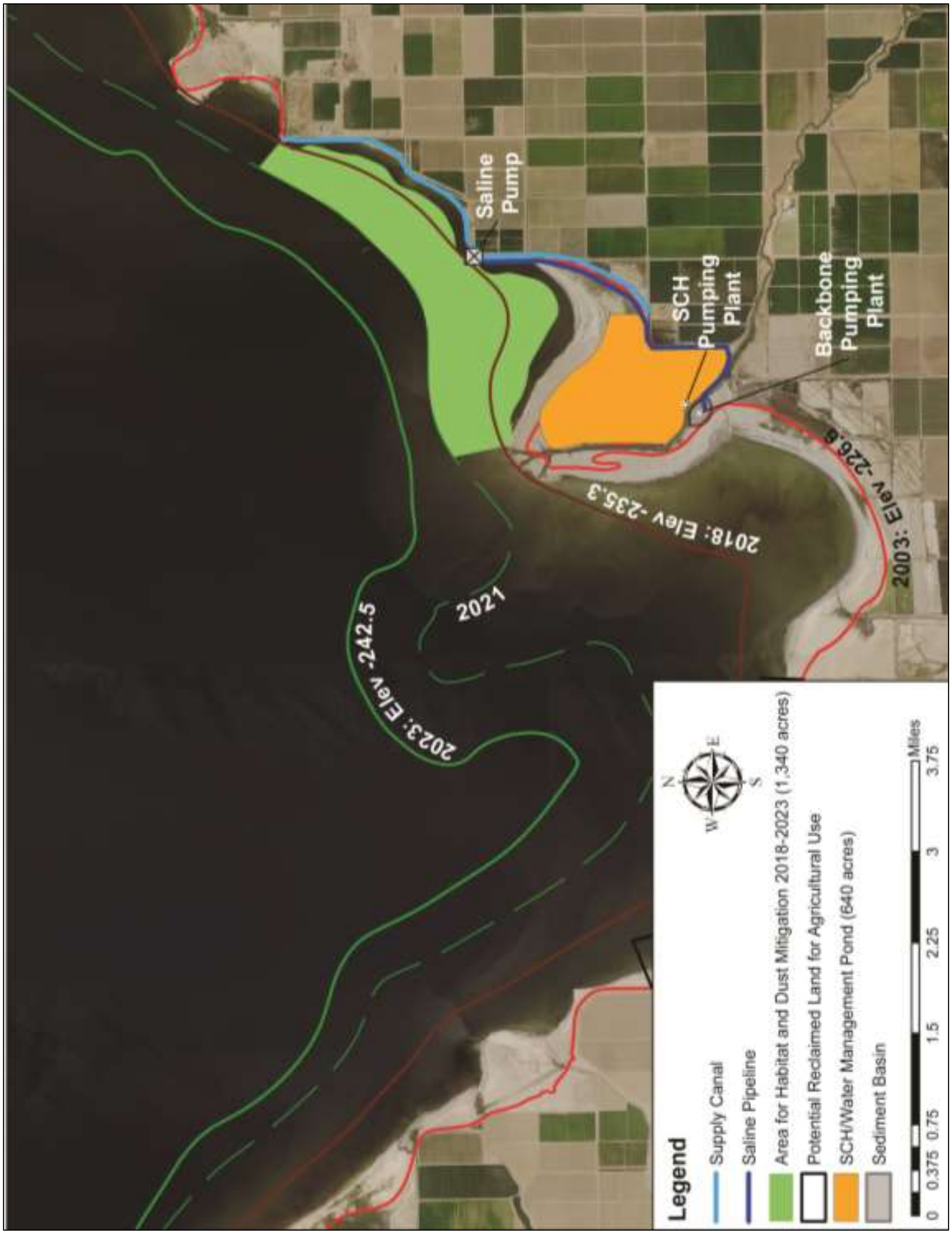

Figure 5. Salton Sea Management Program – New River East (2023–2028)

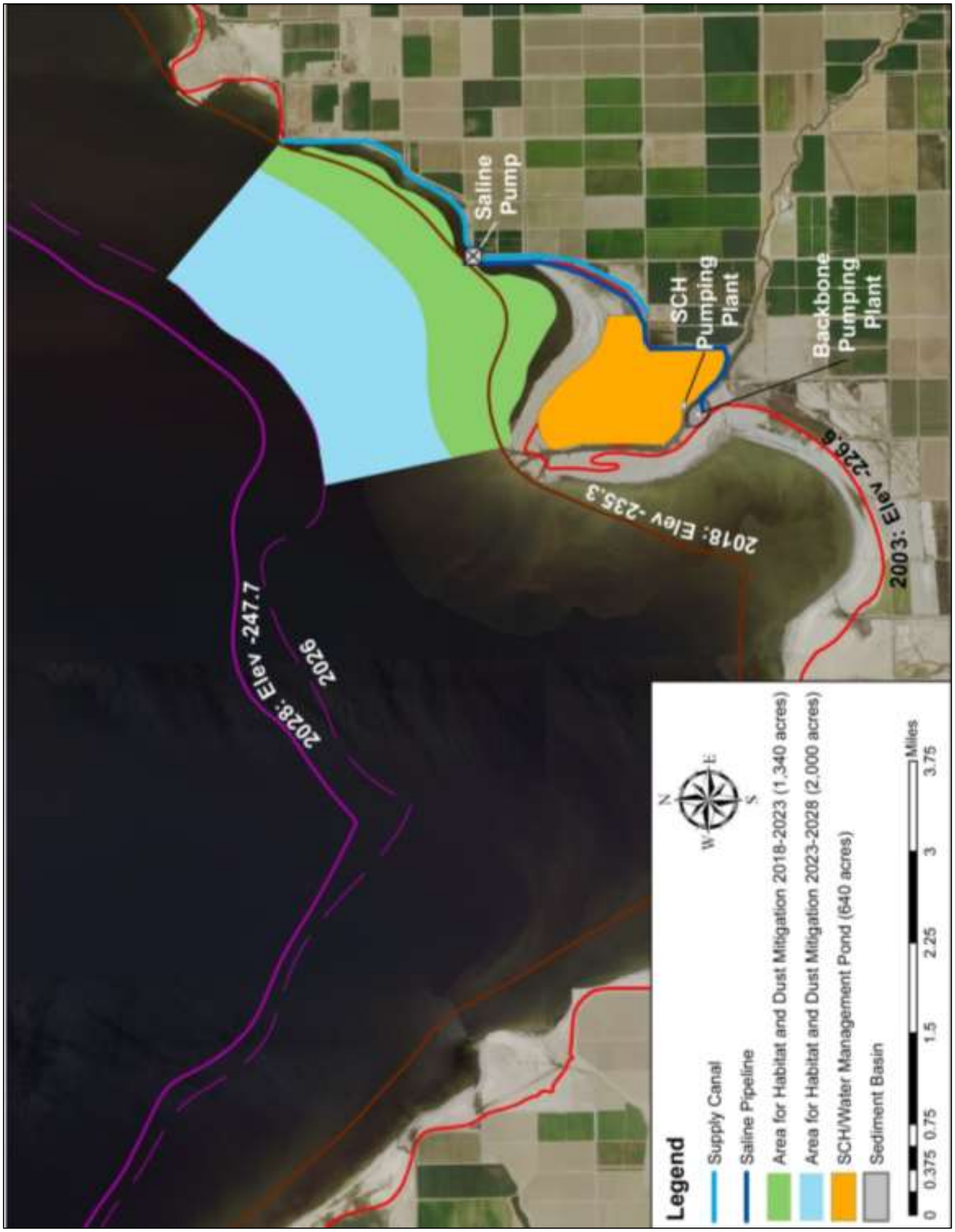

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Figure 6. Salton Sea Management Program – Alamo River South (2018–2023)

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Figure 7. Salton Sea Management Program – Alamo River South (2023–2028)

Figure 8. Salton Sea Management Program – Alamo River North (2018–2023)

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Figure 9. Salton Sea Management Program – Alamo River North (2023–2028)

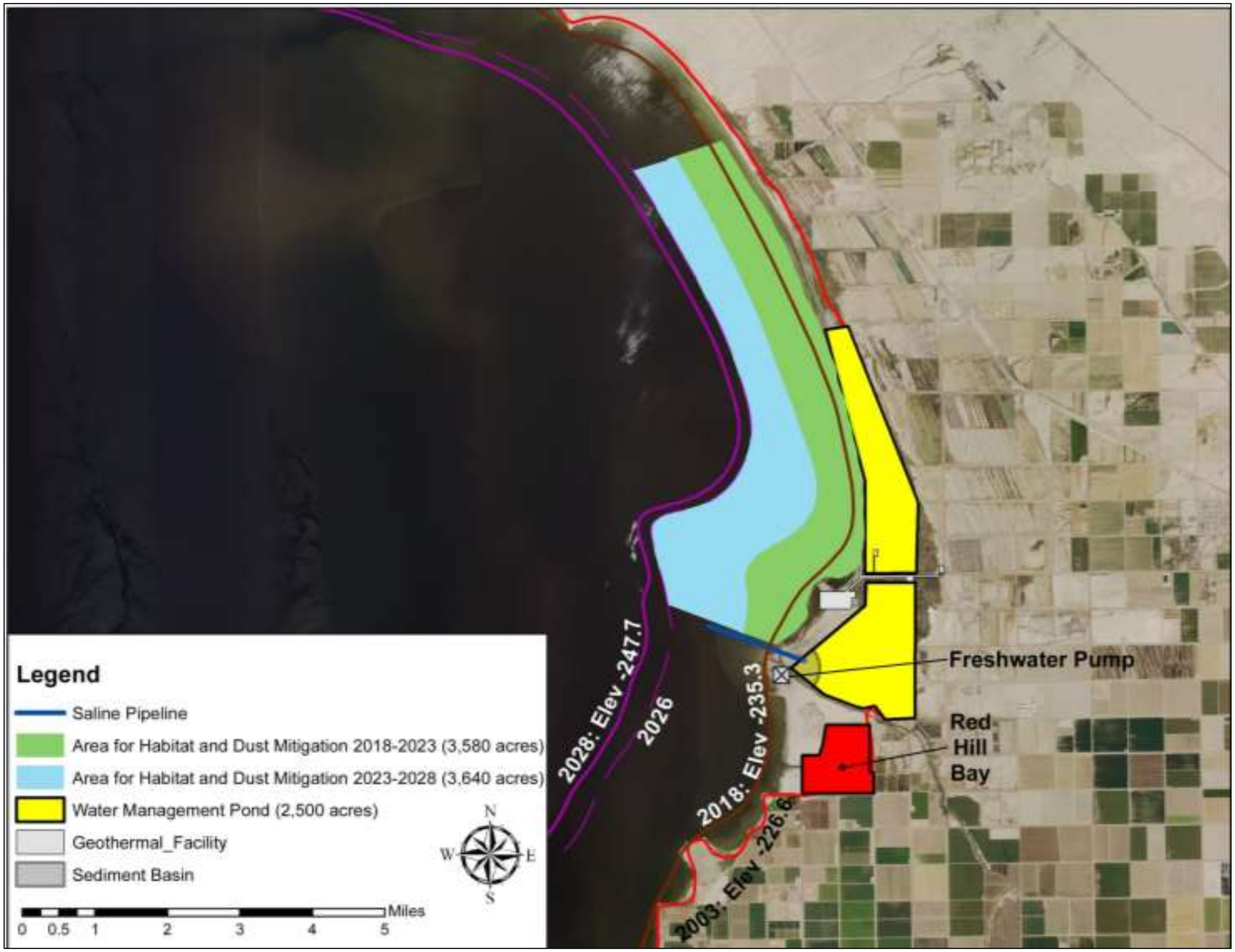

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Figure 10. Salton Sea Management Program – Whitewater River (2018–2023)

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Figure 11. Salton Sea Management Program – Whitewater River (2023–2028)

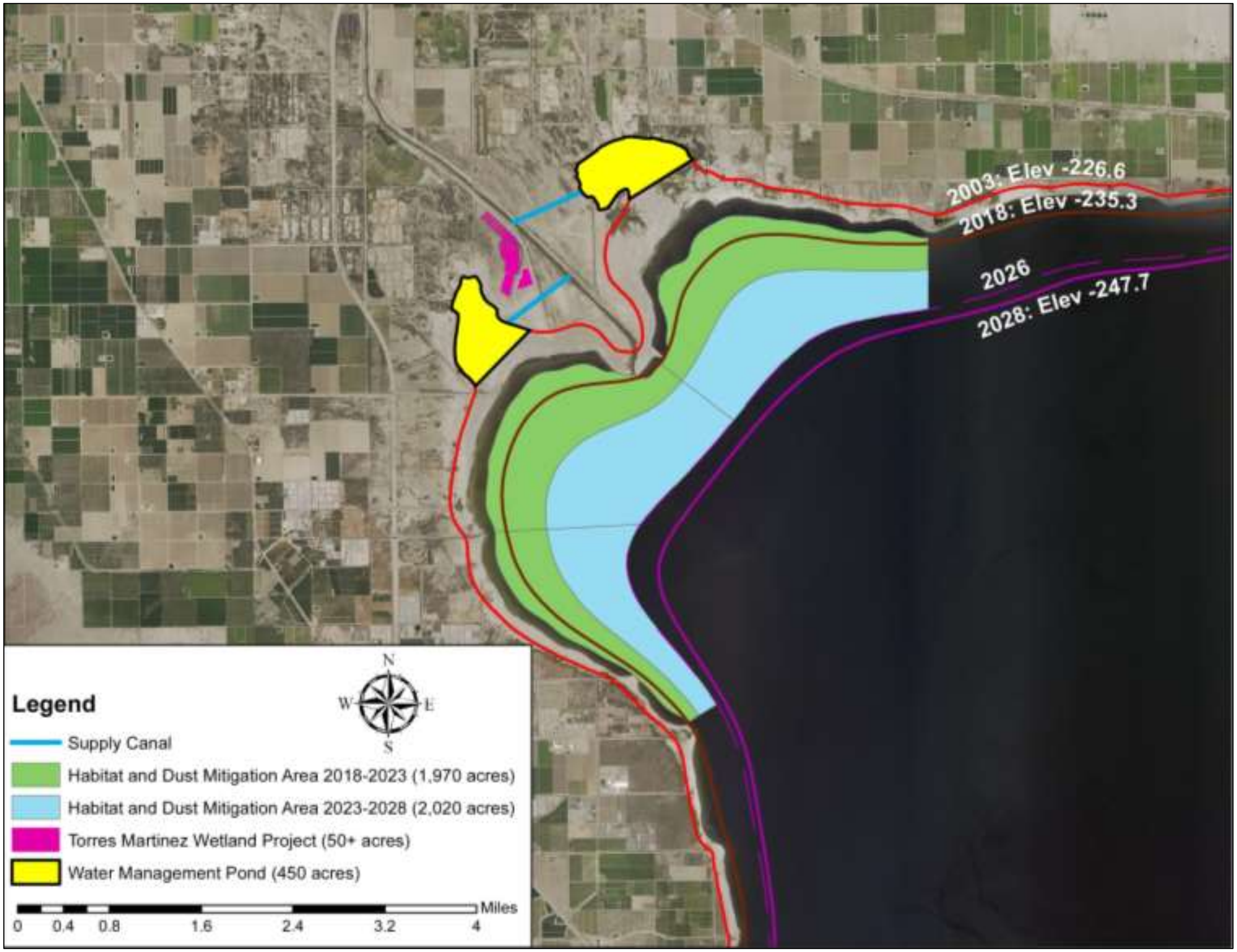

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Table 3-1

	NEW RIVER WEST	NEW RIVER EAST	ALAMO RIVER SOUTH	ALAMO RIVER NORTH	ALAMO COMBINED	WHITEWATER RIVER
BBI (acres)	900	640	1,250	1,250	2,500	450
Habitat (acres)	8,000	3,400	3,600	7,200	10,800	4,000
Channel (ft)	-	-	-	-	-	-
Pipelines (ft)	23,239	10,513	18,613	18,613	18,613	7,493
Pumps	3,750,000		3,750,000	3,750,000	3,750,000	3,750,000
2018–2023 Low berm (ft)	69,626	42,281	44,506	88,796	133,301	86,123
2023–2028 Low berm (ft)	30,548	23,807	25,999	47,159	73,159	36,640
2018–2023 Pond high berm (ft)	25,191	-	32,600	42,489	75,089	28,148
2023–2028 Pond high berm (ft)	24,154					
Spillways	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000
Flow control structures	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
River crossing structure	$25,000	-	$25,000	$25,000	$25,000	
Flood control measure (River banks)	$2,112,000		$2,112,000	$2,112,000	$2,112,000	$2,112,000
Electrical	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Habitat features						
Design	$7,691,145	$1,943,858	$5,412,207	$7,722,339	$12,142,247	$5,800,410
Contingency - CT	$11,536,718	$2,915,788	$8,118,310	$11,583,508	$18,213,370	$8,700,615
Mobilization/Site prep	$6,991,950	$1,767,144	$4,920,188	$7,020,308	$11,038,406	$5,273,100
Construction mgmt (15%)	$10,487,925	$2,650,716	$7,380,282	$10,530,462	$16,557,609	$7,909,650
TOTAL COST	**$76,911,450**	**$19,438,584**	**$54,122,068**	**$77,223,388**	**$121,422,466**	**$58,004,100**
TOTAL COST + CT + MOBIL + MGMT	**$106,627,238**	**$26,948,946**	**$75,032,867**	**$107,059,697**	**$168,335,692**	**$80,414,775**

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Table 3-2

YEAR	COST	ACRES
2018	$10.00	500
2019	$27.00	1,300
2020	$35.50	1,700
2021	$43.50	3,500
2022	$33.50	1,750
2023	$35.50	2,750
2024	$34.00	2,700
2025	$42.50	3,400
2026	$47.50	4,000
2027	$37.50	4,000
2028	$36.50	4,200
TOTAL	**$383.00**	**29,800**

Table 3-3

	UNIT	UNIT COST	SOURCE
Saline Pump Station (45 cfs)	each	$2,500,000	DWR/DOE (SCH)
River Pump Station (75cCfs)	each	$1,250,000	DWR/DOE (SCH)
Berm (Water Storage)	foot	$800	IID/DWR/DOE (SCH)
Berm (Low Berm)	foot	$200	IID/DWR/DOE (SCH)
HDPE Pipeline			
24 Inch	foot	$225	DWR/DOE (SCH)
36 Inch	foot	$300	DWR/DOE (SCH)
Flow Control Structures	each	$100,000	DWR/DOE (SCH)
Outlets/Spillways	each	$50,000	DWR/DOE (SCH)
River Crossing Structure	each	$25,000	DWR/DOE (SCH)
Access Roads	foot	$150	DWR/DOE (SCH)
Habitat Features			
Tall Island	each	$200,000	DWR/DOE (SCH)
Loafing Island	each	$30,000	DWR/DOE (SCH)
Small Island	each	$100,000	DWR/DOE (SCH)
Habitat Channel	foot	$10	DWR/DOE (SCH)
Sheet Piles	foot	$200	DWR/DOE (SCH)
Electrical Work		$1,000,000	IID - SCH

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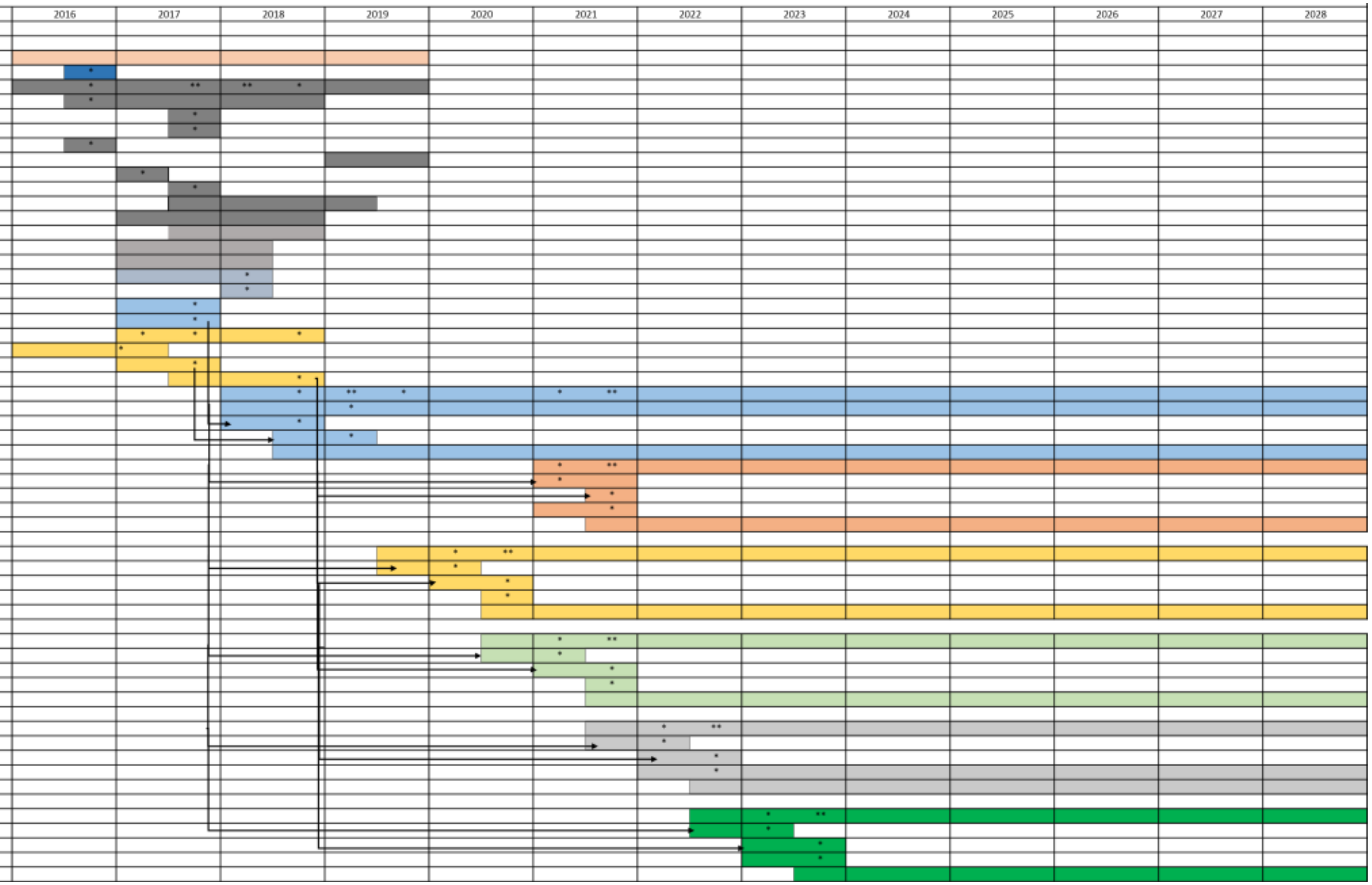
Appendix 3. Ten-Year Phase I Plan Schedule

	Duration (months)	Start	Finish
Design Planning			
1-Programmatic Planning	48	Jan-16	Jan-20
On call Consultant*	6	Jul-16	Jan-17
a-Design Criteria	48	Jan-16	Jan-20
*Determine Goal**	30	Jun-16	Dec-18
Channel Criteria*	6	Jun-17	Dec-17
Water Impoundment Criteria*	6	Jun-17	Dec-17
Audubon Contract /Habitat criteria*	30	Jun-16	Dec-18
SCH MAMP Implementation (Se, fish habitat, water quality eval)	11	Jan-19	Dec-19
Develop Concept TM Wetland*	6	Jan-17	Jul-17
Finalized Hydro Model*	6	Jun-17	Dec-17
Develop BACM pilot Projects*	13	Jun-17	Jul-18
Define criteria/Coordination with IID air Qual. Pr.	23	Jan-17	Dec-18
b-Develop Evaluation Process for later phases	18	Jun-17	Dec-18
c-Identify Footprint	18	Jan-17	Jul-18
Coordination with Geothermal	18	Jan-17	Jul-18
Coordination with Land Owners	18	Jan-17	Jul-18
Coordinate with lease information with IID	6	Jan-18	Jul-18
2-Select Design Builder	12	Jan-17	Jan-18
Design Build Contractor*	12	Jan-17	Jan-18
3-Acquire Real Estate	24	Jan-17	Jan-19
Acquire Easements SCH*	14	Jan-16	Mar-17
Acquire Easements New River West*	24	Jan-17	Jan-19
Develop Easement process (IID, BLM, Private)*	12	Jan-18	Jan-19
New River West (Water Management Pond + Exposed Playa Treat.)	132	Jan-18	Jan-29
Water Backbone Infrastructure - Management Ponds (2 Ponds)	132	Jan-18	Jan-29
Preliminary Design	12	Jul-18	Jul-19
Final Design	12	Jan-19	Jan-20
Construction	114	Jul-19	Jan-29
Habitat/dust suppression and distribution system	102	Jul-20	Jan-29
Preliminary Design	12	Jan-21	Jan-22
Final Design	6	Jul-21	Jan-22
Permits	12	Jan-21	Jan-22
Construction	90	Jul-21	Jan-29
New River East (Water Management Pond + Exposed Playa Treat.)	114	Jul-19	Jan-29
Preliminary Design	12	Jul-19	Jul-20
Final Design	6	Jan-20	Jul-20
Permits	6	Jul-20	Jan-21
Construction	102	Jul-20	Jan-29
Whitewater River (Water Management Pond + Exposed Playa Treat.)	102	Jul-20	Jan-29
Preliminary Design	12	Jul-20	Jul-21
Final Design	6	Jan-21	Jul-21
Permits	6	Jul-21	Jan-22
Construction	90	Jul-21	Jan-29
Alamo South (Water Management Pond + Exposed Playa Treat.)	90	Jul-21	Jan-29
Preliminary Design/Identify Access for Geothermal	12	Jul-21	Jul-22
Final Design	12	Jan-22	Jan-23
Permits	6	Jul-22	Jan-23
Construction	78	Jul-22	Jan-29
Alamo North (Water Management Pond + Exposed Playa Treat.)	78	Jul-22	Jan-29
Preliminary Design/Identify Access for Geothermal	12	Jul-22	Jul-23
Final Design	12	Jan-23	Jan-24
Permits	6	Jul-23	Jan-24
Construction	66	Jul-23	Jan-29



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MEMORANDUM OF UNDERSTANDING

BY AND BETWEEN

THE UNITED STATES DEPARTMENT OF THE INTERIOR

AND

THE STATE OF CALIFORNIA NATURAL RESOURCES AGENCY

REGARDING THE COORDINATION OF ACTIVITIES
TO MANAGE THE SALTON SEA

I. INTRODUCTION AND BACKGROUND

The Salton Sea (Sea), an endorheic water-body, is California's largest lake and located in Imperial and Riverside Counties. The Sea is the modern incarnation of Lake Cahuilla, a prehistoric, intermittent freshwater sea that filled and evaporated multiple times over thousands of years as the Colorado River (River) meandered on its delta—shifting between emptying into the Gulf of California, or diverting northwest, into the Salton Trough.

In 1905 when the River flood flows breached an inadequate diversion structure (built by what was then the California Development Company), the full might of the River emptied once again into the basin. After 2 years the River's course was engineered back to the Gulf, and left behind was the Salton Sea. In 1924, certain specified lands beneath the Sea were designated a drainage reservoir by Presidential Order. Where the Sea would have evaporated once more, agricultural runoff from the Imperial and Coachella Valleys (with water from the Colorado River) and other sources has maintained its elevation and affected its composition over the last century.

The Sea loses approximately one million acre-feet of water a year to evaporation. Early on, the accumulation of salts and nutrients in the terminal lake, by its sustaining agricultural drainage waters, were acknowledged as a challenge to the future viability of the Sea. From the start, various studies were conducted to assess the issue, but no comprehensive actions were taken. Thirty or more species of sport fish were stocked by the California Department of Fish and Game between 1929 and 1956, and soon the Sea was enjoying more yearly visitors than Yosemite National Park. After a period of developmental boom and recreational success at the Sea, a series of storms and heavy River water use in 1977 and 1978 caused widespread flooding and inundation of seaside developments, and the properties were soon abandoned.

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Recognizing that the QSA only provided mitigation flows for the Sea through 2017, and the need for projects that would acknowledge the current and projected resource conditions at the Sea, the State established the Salton Sea Task Force, by order of the Governor of California, in May 2015. Through the work of the Task Force, the State recognizes that immediate implementation of sustainable habitat and air quality management and mitigation at the Sea through a Salton Sea Management Program is critical for the protection of regional air quality, natural resources at the sea, and the management of a stable River water supply for California. After meetings with key stakeholders, the Task Force identified acreage targets for wildlife habitat, mitigation, and other projects, and found that implementation of a successful Salton Sea Management Program depends on the following three principles: 1) strong Federal, State, and local partnerships; 2) clear and achievable milestones with State-directed plans to achieve them; and 3) committed participation from all stakeholders who share the goals of protecting air quality, reducing habitat impacts, and maintaining a secure Colorado River Water Supply. These three principles are driving State-led decisionmaking on short, medium, and long term plans and projects, and require coordinating all available fiscal and technical resources to deliver them in an expedited manner.

The United States and the State have significant and complementary interests regarding development and enhancement of activities that provide certainty to the Sea, anticipate changes in the Sea's elevation, water quality and associated regional environment, and recognize the multiple values and unique opportunities the Sea embodies in the face of a changing climate, resource constraints, and the need to build resiliency and certainty in affected Tribal and regional communities.

II. PARTIES

This Memorandum of Understanding (MOU) is entered into by and between the United States through the Department of the Interior (DOI), and the State of California, through the California Natural Resources Agency (CNRA), and, hereafter referred to as "the Agencies," and will become effective as of the latest date shown below on the signature page.

The Agencies recognize the unique role and interests of tribal governments, including jurisdiction and decisionmaking, in the future of the Sea. The United States recognizes the United States' trust responsibility to all federally recognized Indian tribes and the duty to engage in meaningful government-to-government consultation prior to any action related to the Sea that impacts a tribe. Future activities to address conditions at the Sea must recognize Federal and State responsibilities to any affected tribes pursuant to applicable law (including settlement acts) and agreements, ensure protection of trust resources, and work in a spirit of partnership with affected Indian tribes.

Though not a party to this MOU, other Federal and State agencies, local governments and agencies, and non-profit, philanthropic, and academic institutions are recognized as potentially having jurisdiction, resources, decisionmaking roles, and common interests at the Sea, and will be essential to include for successful management activities and outcomes at the Sea. The Agencies will coordinate and consult with all of these entities as appropriate to develop specific tasks, timelines, and form subsequent agreements to further future partnership at the Sea.

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III. PURPOSE

The Agencies enter into this MOU to ensure that long-term coordination between the Federal and State and Government will be recognized as a priority and will occur in order to facilitate prompt and informed decisionmaking regarding the natural and economic resources of the Sea.

The Agencies recognize that the purpose of this coordination is to facilitate specific, incremental and sequential projects in a timely manner that improve upon air and water quality, existing obligations to Native American communities, fish and wildlife habitat, water security, resource management processes and decisionmaking economic opportunities, and collaboration of scientific research efforts. Coordinating limited resources will be necessary to achieve common goals that address the natural resources and regional interests associated with the Sea.

IV. OBJECTIVES

Recognizing the State's role as lead on Sea management, in line with the findings of the Salton Sea Task Force, and the United States' agreement through this MOU to support the goals and principles of the Salton Sea Management Program (SSMP), and in furtherance of the purpose of this MOU, the Agencies affirm their commitments to undertake the following objectives:

A. In order to facilitate prompt decisionmaking, permitting accountability, and high-level coordination, the Agencies shall each identify at least one senior level policy official to participate in a Salton Sea Working Group (SSWG) tasked with ensuring interagency continuity in Sea management efforts and overseeing the implementation of—and any necessary updates to—this MOU.

B. The Agencies will work together as they coordinate with affected Colorado River Basin States, tribes, and local governments regarding implementation of this MOU.

C. The Agencies recognize that the State has identified a goal of 25,000 acres of wildlife habitat, air and water quality projects, and other projects as necessary to minimize human health and ecosystem impacts at the Sea in the mid-term (through 2025). See "Salton Sea Task Force – Agency Actions" – Attachment 1. The Agencies acknowledge this goal as critical, and a common target to reasonably work toward.

D. The Agencies will undertake an analysis of current Federal and State laws applicable to the Salton Sea to assess existing authorities, identify common objectives, explore opportunities to align authorities that benefit the purpose of this MOU, and inform areas for further coordination.

E. The Agencies will perform a funding analysis that identifies all current Federal and State spending on programs, projects, and studies related to, potentially benefiting, or impacting the Sea. The analysis should also identify opportunities to better coordinate and match existing spending and programs, and provide a foundation for further discussions on the anticipated financial need to reach acreage goals and creative means to meet them.

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F. The Agencies will, within existing authorities, perform an analysis of land ownership, any existing Indian settlement obligations, leases, and other land use agreements in the region to facilitate project development and identify necessary coordination between parties to achieve the purpose of this MOU.

G. The Agencies will, within existing authorities, expand and integrate Sea science and monitoring programs to better inform decisionmaking, coordinate investigations, and aid adaptive management of the Sea. The Agencies will also assess the cost benefit of sharing office or other physical spaces in order to reduce the cost of science activities and increase their efficacy.

H. The Agencies will pursue a multi-year partnership with United States Department of Agriculture (USDA) Natural Resources Conservation Service, tribal governments, local agencies, and others, to advance projects to protect air quality and improve water quality of major inflows to Sea habitat.

I. The Agencies shall make every effort to ensure resources are allocated to expedite and prioritize permitting processes at the Sea.

J. The Agencies will explore the feasibility of developing a common decision support system that integrates the analyses called for in this MOU, the existing wealth of studies and data on the Sea, and any additional information necessary, into a single platform that facilitates the work of the Salton Sea Management Program and the purpose of this MOU.

In furtherance of these Objectives, the United States agrees to pursue the following, in accordance with applicable statutes, and to the extent appropriate and consistent with legislative appropriations, approved budgets, and funding opportunities:

1. \$20 million to operation and maintenance costs of habitat and dust suppression projects associated with the SSMP;
2. \$10 million for State managed monitoring of SSMP projects;
3. Continued USGS scientific and technical support on Sea issues during the implementation of the SSMP;
4. Continued USGS scientific input on, and review of, selenium management measures and target concentrations for selenium in created habitat at Sea;
5. Consideration of a Pilot Project under Phase 2 of the Colorado River Basin Study to continue the ongoing innovative and collaborative efforts underway at the Sea to increase security for California's Colorado River water supplies, consistent with DOI's efforts to increase security for other Basin States' water supplies.

V. GENERAL PROVISIONS

A. This MOU is subject, as applicable, to the laws of the United States of America and the State.

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B. Nothing in this Agreement may be construed to obligate the United States or the State to any current of future expenditures in advance of the availability of legislative appropriations. Nor does this agreement obligate the United States or the State to spend funds on any particular project or purpose, even if funds are available.

C. The mission requirements, funding, personnel, and other priorities of the Agencies may affect their ability to fully implement all the provisions identified in this MOU.

D. Specific activities that involve the transfer of money, services, or property between the Agencies will require execution of separate agreements or contracts.

E. Nothing in this MOU is intended to or will be construed to restrict the Agencies from participating in similar activities or arrangements with other public or private agencies, organizations, or individuals.

F. Any information furnished between the Agencies under this MOU may be subject to the Freedom of Information Act, 5 U.S.C. 552, et seq. (FOIA) and the California Public Records Act, Gov. Code 6250, et.seq. (CPRA). The United States and the State agree to consult each other regarding any such relevant requests and prior to releasing potentially privileged or exempt documents, subject to any applicable regulatory, statutory, or judicial timeframe.

G. This MOU is not intended to, and does not, create any right or benefit, substantive or procedural, enforceable at law or in equity by any party against the United States or the State; their respective departments, agencies, or entities; their respective officers, employees, or agents; or any other person.

H. The Agencies anticipate consensus implementation of this MOU. In the unforeseen event that any disputes arise between the Agencies, the respective representatives and leadership of DOI and CNRA will work promptly to resolve any such matter.

I. This MOU shall remain in effect for an initial term of 10 years after its effective date and may be renewed if both Parties agree. This MOU may be terminated at any time by mutual consent of both Parties, or unilaterally by either Party after 30-days written notice to the other Party of intent to terminate.

J. Either Party to this MOU will consult with the other party in a timely manner prior to release of any statements for publication or public dissemination that refers to this MOU, to the Parties in connection with this MOU, or the name or title of any employee of the Parties in connection with this MOU.

K. Nothing in this MOU may be interpreted to imply that the United States endorses any product, service or policy of the State. Nothing in this MOU may be interpreted to imply that the State endorses any product, service or policy of the United States. Neither Party will take any action or make any statement that suggests or implies such type of endorsement.

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L. The DOI and CNRA may amend or modify this MOU only by agreement of both Parties.

VI. APPROVALS

For the Department of the Interior:

Michael L. Connor
Deputy Secretary

8/31/16
Date

For the State of California:

John Laird
Secretary for Natural Resources

8/31/16
Date

Salton Sea Task Force
Agency Actions

The implementation of sustainable habitat and air quality management and mitigation at the Salton Sea through a Salton Sea Management Program is critical for the protection of regional air quality, natural resources at the sea, and the management of a stable Colorado River Supply for California. The Salton Sea Task Force recognizes the contributions of the local leadership, plans, and initiatives that have informed the Task Force process. Following meetings with key stakeholders, the Task Force finds that implementation of a successful Salton Sea Management Program depends on the following three principles: 1) strong state, federal, and local partnerships; 2) clear and achievable milestones with state-directed plans to achieve them; and 3) committed participation from all stakeholders who share the goals of protecting air quality, reducing habitat impacts, and maintaining a secure Colorado River Water Supply. These three factors will drive decision-making on a short- and a medium-term plan while leveraging fiscal and technical resources to deliver projects in an expedited manner.

The Natural Resources Agency will take the following actions over an accelerated timeline:

- **Begin immediate implementation and further development of Salton Sea management plan**
  - The plan will prioritize actions that respond to air quality and natural resources impacts while incorporating opportunities for regional economic development, including recreational and renewable opportunities that benefit implementation of the plan.
  - A science advisory committee will be utilized to provide scientific expertise into plan development.
  - Colorado River stakeholders will be asked to assist with the development of the plan. The Salton Sea Authority and its members will be asked to help facilitate local involvement.

- **Improve public outreach and local partnership**
  - Air quality and environmental impacts of a reduced Salton Sea will be felt foremost by the residents of the region. The state will provide a meaningful public forum to discuss Salton Sea issues locally and to develop future plans and actions.

- **Accelerate project implementation and delivery**
  - The state will work with Salton Sea, Colorado River partners to accelerate planning, state and federal permitting and construction.

- **Meet a short-term goal of 9,000-12,000 acres of habitat creation and dust suppression projects at the sea**
  - Projects to meet short-term goals will be achievable with available funding.
  - Short-term projects will address dust suppression and natural resources needs while laying the foundation for a long-term Salton Sea management framework.
  - Projects will be staged to address the expected progression of playa exposure and designed to provide access corridors for renewable energy development on those lands.

- **Set medium-term goal of 18,000-25,000 acres of habitat creation and dust suppression projects at the sea**
  - Funding plans to meet medium-term goals will need to be developed by the state with Salton Sea and Colorado River partners.

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Ensure Oversight by Regulatory Agencies:

- The State Water Resources Control Board will regularly monitor and assess progress on the implementation of the Salton Sea Management Program, including the development of management plans and funding options, and any potential action by the State Board.
- The State Water Resources Control Board will periodically hold public workshops as part of its monitoring and assessment function.
- The State Water Resources Control Board will work with the Colorado River Regional Water Board and the Administration to improve water quality and upstream co-benefits in the New River and the Alamo River.
- The California Air Resources Board will coordinate with local partners to address air quality impacts from the Salton Sea, work with Imperial and South Coast air districts to monitor air quality, and provide technical and scientific expertise to ensure effective mitigation of dust impacts from exposed playa.

Consider opportunities for increasing renewable energy development at and around the Salton Sea:

- As part of the implementation of the Clean Energy and Pollution Reduction Act of 2015 (SB 350), the California Energy Commission and the Public Utilities Commission will evaluate how renewables at and around the Salton Sea will further the goals of the integrated resources plans, including a balanced resource mix and the minimization of localized air pollutants.
- Within the next year, as part of planning to meet the 2030 greenhouse gas goals, the Public Utilities Commission, the Energy Commission and the Independent System Operator will consider renewable energy opportunities at and around the Salton Sea and the region, and any additional transmission that may be needed for the near term or long term.

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Addendum to the August 31, 2016, Memorandum of Understanding

By and Between

The United States Department of the Interior

and

The State of California Natural Resources Agency

Regarding

The Coordination of Activities to Manage the Salton Sea

Whereas the Parties to the August 31, 2016, Memorandum of Understanding (MOU) have worked assiduously since its adoption to better identify actions and strategies that can further the purposes of the MOU; and

Whereas the Parties wish to ensure that there is a seamless and continuous effort in furtherance of the goals of the MOU during 2017, given the end of the mitigation flows identified in the 2003 Quantification Settlement Agreement (QSA) agreements, the importance of actions to support implementation of existing Colorado River conservation actions, and additional actions that may be taken in light of the ongoing historic drought on the Colorado River.

Therefore, the Parties find and agree that it is appropriate to supplement the MOU as follows:

1. The State of California (State) will coordinate with the Joint Powers Authority (JPA) parties to develop and implement a plan to facilitate and expedite use of the remainder of the JPA funds on projects to mitigate air quality impacts from emissions in the Salton Sea area resulting from the implementation of the QSA. The State will advocate, through the existing JPA budget process, for a plan that addresses air quality impacts as early as possible, while also maximizing cost-effective use of the funds to accomplish mitigation of air quality impacts. The State will consider strategies that will expend all the JPA funds by December 31, 2025, but such consideration will not foreclose strategies that extend the use of such funds beyond such date if such an approach is found to be more cost-effective and appropriate.

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2. The Parties will comply with all applicable requirements of the Federal Clean Air Act and all implementing rules and regulations in connection with potential air quality emissions from Salton Sea playa lands owned or managed by the Parties that are exposed as a result of decline in elevation of the Salton Sea.

3. The State will adjust current targets for air quality and habitat projects at the Salton Sea when hydrology modeling is completed to reflect updated anticipated rates of exposure.

4. The Parties will coordinate on opportunities for renewable energy and economic development in the Salton Sea area as part of the Phase I - 10 year plan.

Signatures

For the Department of the Interior:

Michael L. Connor
Deputy Secretary

Date

For the State of California:

John Laird
Secretary for Natural Resources

January 18, 2017
Date

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Appendix J
Salton Sea Air Quality Mitigation Program (July 2016)

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Salton Sea Air Quality Mitigation Program

Prepared for:

Imperial Irrigation District

in coordination with the County of Imperial

Prepared by:

Formation Environmental, LLC

Air Sciences Inc.

PlanTierra LLC

JULY 2016

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List of Abbreviations

AOI	Area of Interest
BACM	Best Available Control Measure
BLM	Bureau of Land Management
CAA	Clean Air Act
CARB	California Air Resources Board
CFR	Code of Federal Regulations
CMP	Conservation Management Practice
CSC	Cox Sand Catcher
CVWD	Coachella Valley Water District
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ICAPCD	Imperial County Air Pollution Control District
IID	Imperial Irrigation District
IIDSS	Imperial Irrigation District Support System
KGRA	Known Geothermal Resource Area
LiDAR	Light Detection and Ranging
MNDWI	Modified Normalized Difference Water Index
MPH	Miles Per Hour
MWD	Metropolitan Water District of Southern California
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NTS	Naval Test Station
OHV	Off-Highway Vehicles
PEIR	Programmatic Environmental Impact Report
PI-SWERL	Portable In-Situ Wind Erosion Laboratory
PM	Particulate Matter
PM_{10}	Particulate Matter less than 10 Microns in Aerodynamic Diameter
$PM_{2.5}$	Particulate Matter less than 2.5 Microns in Aerodynamic Diameter
PVID	Palo Verde Irrigation District
QSA	Quantification Settlement Agreement
RACM	Reasonable Available Control Measures
SC	Salton City
SCAQMD	South Coast Air Quality Management District
SDCWA	San Diego County Water Authority

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SIP	State Implementation Plan
SPI	Sediment Profile Imaging
SSAM	Salton Sea Accounting Model
SS AQM Program	Salton Sea Air Quality Mitigation Program
SVRA	State Vehicular Recreation Area
SWIR	Short-Wave Infrared
SWRCB	State Water Resources Control Board
TEOM	Tapered Element Oscillating Microbalance
TIG	Terrestrial Image Georeferencing
tpd	Tons Per Day
tpy	Tons Per Year
UAV	Unmanned Airborne Vehicle
USGS	United States Geological Survey
VDE	Visible Dust Emissions
$\mu g/m^3$	Micrograms Per Cubic Meter

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EXECUTIVE SUMMARY

This Salton Sea Air Quality Mitigation Program (SS AQM Program) was prepared by Imperial Irrigation District (IID) to provide a comprehensive, science-based, adaptive approach to address air quality mitigation requirements associated with the transfer of up to approximately 300,000 acre-feet per year of conserved water under the Quantification Settlement Agreement (QSA).[1] The conserved water transfer reduces the volume of agricultural return flow to the Salton Sea, thereby exposing the playa and increasing the potential for dust emissions that could affect communities near and around the Sea. The required air quality mitigation measures to address these potential dust emissions are generally defined as: 1) restricting access to the exposed playa, 2) researching and monitoring the exposed playa, 3) creating or purchasing offsetting emission reduction credits and 4) implementing direct emission reduction measures on the exposed playa.[2] This SS AQM Program expands upon these general mitigation measures with detailed methods to assess playa dust emissions and identify options to mitigate them. This SS AQM Program also provides support and options for land management decisions associated with the playa as the Salton Sea recedes.

Dust emissions, or $PM_{2.5}$ and PM_{10}[3], are hazardous to human health. Imperial County is currently designated as a serious nonattainment area for PM_{10} due, in part, to windblown dust. Future exposed playa is anticipated to be a new source of dust emissions; however, until it is exposed, the location, frequency and magnitude of future emissions are unknown. The objective of this SS AQM Program is to proactively detect, locate, assess and identify options to mitigate dust emissions from exposed Salton Sea playa. This program includes steps to characterize the actual emission potential of exposed playa as the Salton Sea recedes and options to proactively prevent the occurrence of significant dust emissions. This program also includes steps to understand dust emissions from desert areas adjacent to the Salton Sea, which is critical for distinguishing playa dust emissions from off-Sea sources and for understanding the potential impact of off-Sea sources on exposed playa.

A large portion of the Salton Sea is located in Imperial County, within the jurisdiction of the Imperial County Air Pollution Control District (ICAPCD). A smaller portion of the Salton Sea is in Riverside County, within the jurisdiction of the South Coast Air Quality Management District (SCAQMD). IID anticipates that some or all of the information from this SS AQM Program will be considered in future revisions to the Imperial County PM_{10} State Implementation Plan (SIP). The Imperial County PM_{10} SIP is the regulatory document that guides dust control efforts within Imperial County. This SS AQM Program was developed in coordination with the County of Imperial to be consistent with and provide additional technical and scientific information to inform the ICAPCD SIP revision process.

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[1] Impact AQ-7 is identified in the *Final Imperial Irrigation District Water Conservation and Transfer Project, Draft Habitat Conservation Plan Environmental Impact Report/Environmental Impact Statement*, SCH #99091142 (Final EIR/EIS), and the associated mitigation requirements are found in the *Imperial Irrigation District Water Conservation and Transfer Project Mitigation, Monitoring and Reporting Program*, dated September 2003 (MMRP).
[2] Mitigation Measure AQ-7 of the MMRP.
[3] Particulate matter less than 2.5 and 10 microns in diameter.

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This executive summary provides the key questions to be answered by this SS AQM Program. It summarizes each component of the program and provides a flow chart of program implementation (Figure ES-1).

Air Quality Regulatory Framework

- **What air quality regulations influence this SS AQM Program?**

  The Clean Air Act (CAA) and State Implementation Plans (SIP). The CAA is a United States federal law designed to control air pollution at the national level. It requires the Environmental Protection Agency (EPA) to develop and enforce regulations to protect the public from airborne contaminants known to be hazardous to human health. Under the CAA, states are required to submit a SIP describing how air basins designated as nonattainment areas will be brought into compliance with federal and state ambient air quality standards. The SIP contains the plan for attaining the standards as soon as possible, but in no more than five years, based on the severity of the air pollution and the difficulty posed by obtaining cleaner air. The ICAPCD is the designated agency for developing and implementing the SIP for Imperial County, as is SCAQMD for Riverside County.

  Imperial County Air Pollution Control District Rules and Regulations. ICAPCD regulates fugitive dust emissions in Imperial County through its PM_{10} SIP and Regulation VIII rules. The Regulation VIII rules are based, in part, on an emissions inventory of fugitive dust sources (e.g., construction activities, agricultural operations, disturbed open areas). Rules are developed for each source category and identify the dust control measures (Best Available Control Measures or BACM) to reduce emissions. The type and intensity of dust control measures (e.g., apply water, establish vegetation, apply gravel or chemical stabilizers/suppressants) required to reduce emissions vary for each fugitive dust source.

  Regulation VIII is divided into seven rules. Three of the rules—800, 804 and 806—are relevant to this SS AQM Program. Rule 800 contains the definitions, exemptions, general requirements, administrative requirements and test methods that are applicable to all Regulation VIII rules. Rule 804 applies to open areas that contain disturbed surface area. The Salton Sea is currently categorized as an "open area" and ICAPCD can order implementation of dust control on the Salton Sea playa based on the current Rule 804. Rule 806 applies to agricultural operation sites and pertains to this SS AQM Program because some future exposed Salton Sea playa could be reclaimed for agricultural use.

  South Coast Air Quality Management District Rules and Regulations. SCAQMD regulates fugitive dust emissions in Riverside County and specifically within the Coachella Valley. Fugitive dust emissions are regulated through the Coachella Valley PM_{10} SIP and Regulation IV rules. Regulation IV is divided into several rules and rules 403 and 403.1 are relevant to this SS AQM Program. Rule 403 applies to any activity or man-made condition capable of generating fugitive dust. Rule 403.1 is a supplemental rule and it applies specifically to fugitive dust sources in the Coachella Valley. The dust control measures identified in the rules are similar to those identified in the ICAPCD rules.

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Emissions Inventory and Monitoring Program

- **When and where will exposed playa occur?** The timing and location of future playa exposure is a function of the Salton Sea floor elevation and the Sea's response to inflows, salt loads and evaporation rates. A hydrologic model will be used to simulate projected playa exposure. These simulations will provide planning-level information about the timing and location of anticipated playa exposure. In addition, actual playa exposure will be mapped to provide a real time understanding of playa exposure and to validate the hydrologic model results. Playa exposure will be mapped using Landsat satellite imagery and a combination of United States Geological Survey gauge elevation data and high-resolution bathymetric data (collected in 2005). Results will be used to track actual playa exposure as it occurs, guide monitoring of exposed playa surfaces and adjust assumptions related to future hydrologic model projections.
- **How will the surface characteristics of the playa be determined?** The surface characteristics of exposed playa will be variable and must be reliably mapped because they are directly related to emission potential. Extensive survey methods originally developed for Owens Lake are being adapted for use at the Salton Sea. This includes monitoring protocols to accurately map existing playa surface characteristics (analogous to soil map units) using remotely sensed data resources and ground-based surface evaluations. Ground-based surface evaluations include detailed characterization of surface properties related to erosion (e.g., crust type, crust thickness, soil moisture). These datasets will then be used as calibration data to spatially map playa surface types, vegetation and other surface characteristics using LiDAR (Light Detection and Ranging), UAV (unmanned aerial vehicle) imagery and other sources of satellite-based imagery. These mapping efforts will be done periodically to provide an updated inventory of exposed playa surface units and associated physical characteristics.
- **How will the emission potential of different playa surface types be assessed?** The vulnerability of different playa surfaces to erosion is known to be highly variable. This SS AQM Program will assess which playa surfaces and conditions are actually emissive and establish PM_{10} emission rates for different types of surfaces. Emission potential will be assessed using a device called a Portable In-Situ Wind Erosion Laboratory (PI-SWERL). After placement on the ground surface, the PI-SWERL simulates varying wind speeds and measures the number and size of suspended particles within the device, thus providing an estimate of emission potential under a range of simulated wind conditions. PI-SWERL sampling will occur monthly on each identified playa surface type. Monthly results will facilitate a better understanding of the "dust season" on different parts of the playa. The dust season refers to times of the year when dust emissions typically occur under different climate and soil conditions.
- **How will actively emissive playa dust source areas be identified?** Active dust source areas must be quickly and reliably mapped so that dust control needs can be identified, prioritized and implemented. Active dust source areas will be mapped based on photographic, video and/or visual observations of dust plumes and the presence of erosion and depositional surface features. A high-resolution satellite or UAV image will be collected after each wind event where dust plumes are observed. The imagery will provide a photo-interpretive base for delineating source areas and

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focusing field investigations. Photographic evidence will also be collected for each delineated source area and linked to a GPS (global positioning system) location. Emission rates for each source area will be developed using the PI-SWERL.

- **How will dust emissions from desert areas around the Salton Sea be assessed?** Dust emissions and dust source areas from open areas adjacent to the Salton Sea affect this SS AQM Program in two ways: 1) dust emissions from the surrounding desert sources will mix with emissions from newly exposed playa, making it difficult to distinguish playa dust emissions from the surrounding off-Sea dust emissions and 2) sand intrusion from active alluvial fans and from dune migration toward the playa will increase the emissions potential of exposed playa due to the associated surface disturbance and erosion.

  This SS AQM Program will assess dust emissions from areas adjacent to the Salton Sea to establish the location, timing and magnitude of off-Sea emissions. The approach includes: (1) using data from the existing PM_{10} monitoring network to show the frequency, magnitude and direction of PM_{10} concentrations in the desert areas west of the Salton Sea; (2) a network of fixed sand motion monitoring instruments placed within various surface types; (3) video monitoring to provide visual evidence of dust emissions; and (4) PI-SWERL sampling to characterize the emission potential of various surface types (e.g., dry washes, alluvial fans, sand sheets, dunes). This information will be used to confirm the location and timing of off-Sea emissions and to support an updated PM_{10} emission inventory for the open area source category in the Imperial County PM_{10} SIP.

- **How will playa emissions data be evaluated and reported?** As playa is exposed, the surface characteristics and emission potential will be rigorously evaluated to provide multiple lines of evidence related to playa emissions, as described in the preceding sections. These data will be used to estimate emissions from high wind events and to quantify the tons of PM_{10} generated from each source area on the playa for each specific wind event. Maximum daily (tons per day) and total annual emissions (tons per year) will also be estimated. In addition, the California Puff (CALPUFF) modeling system will be used to model the impacts of the maximum daily emissions from exposed playa sources at monitoring stations located around Imperial and Riverside Counties. Initially, results from these evaluations will be used to establish criteria to prioritize dust source areas that have high emission potential. Once criteria are established, source areas with high emission potential will be prioritized for proactive dust control measures. Depending on the prioritization, proactive dust control measures may be implemented as soon as practicable or incorporated into the Annual Proactive Dust Control Plan for the following year (described in the following sections). Playa emissions will be summarized and reported in an annual Playa Inventory and Monitoring Report.

Dust Control Strategy / Planning and Implementation

- **What dust control measures are allowed by the ICAPCD Regulation VIII rules?** The Salton Sea is currently categorized as an "open area" under ICAPCD rules. Under Rule 804, if visible dust emissions (VDE) in open areas exceed 20 percent opacity or if stabilized surface conditions are not met (pursuant to Rule 800 specifications), then Best Available Control Measures (BACM) must be implemented. BACM for open areas include: (1) applying water or chemical dust suppressants to all

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un-vegetated areas, (2) establishing 50% vegetative cover on previously disturbed areas, (3) paving, applying and maintaining gravel or applying and maintaining chemical dust suppressants and (4) alternative BACM as approved by the ICAPCD. After implementation of BACM, monitoring is required to determine whether the stabilized surface criteria have been achieved.

IID and ICAPCD recognize the need for playa-specific surface stability definitions and emissions measurement methods, alternatives to VDE, alternative BACM and modified performance criteria. As this SS AQM Program is implemented, results will help guide the development of these playa-specific parameters.

- **How will decisions regarding implementation of dust control measures on exposed playa be made?** The overarching goal of this SS AQM Program is to identify the tools that can be used to prevent exposed Salton Sea playa from becoming a significant source of PM_{10} emissions based upon the best available science. A large part of implementing an effective dust control strategy is to identify and implement those dust control measures (DCMs) on emissive playa surfaces *before* they reach thresholds that prompt regulatory orders for dust control. This approach provides increased flexibility for implementing effective dust control measures in the most cost effective manner and for facilitating immediate dust control actions at the Salton Sea. The proactive dust control strategy will include broad-scale implementation of DCMs that are protective of air quality, but also adaptable given the variables regarding temporal exposure and the magnitude of future emissions.

  On an annual basis and as playa is exposed each year, the surface characteristics and emission potential will be rigorously evaluated (i.e., Emissions Inventory and Monitoring Program). Initially, results from these evaluations will be used to establish criteria to identify areas of exposed playa that have high emission potential and prioritize dust control needs and measures. Criteria will be developed for each playa evaluation method (e.g., surface survey, PI-SWERL data, video monitoring), such that any individual line of evidence could be used to identify areas for proactive control. Once the criteria are established, IID will use the monitoring results to develop an Annual Proactive Dust Control Plan. The Annual Proactive Dust Control Plan will inform and take into account current and future land management and land use planning efforts, including those associated with Salton Sea restoration efforts by the State and other activities and projects planned by agencies and/or individuals for specific areas of the playa.

  After each Annual Proactive Dust Control Plan is reviewed and approved, if necessary, by the IID board, DCMs may be implemented in accordance with that plan. Yearly results from the Emissions Inventory and Monitoring Program will be used to prioritize DCM implementation on an on-going basis. As DCMs are implemented, they will be monitored to confirm that adequate surface stabilization is maintained. If the initial proactive DCM does not maintain a stabilized surface, the DCM will be further enhanced. This approach allows resources to be allocated efficiently and effectively, and in an expeditious manner to prevent significant sources of PM_{10}. The dust control strategy also includes development and testing of new DCMs and a playa traffic management plan as described below.

- **How will DCMs be selected for the unique conditions at the Salton Sea?** The dust control strategy includes the development and testing of new DCMs that are specifically tailored to the climate and

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soil conditions on and around the playa and that make efficient use of available resources. Some DCMs have been field-tested and proven to be effective and some DCMs need additional research prior to use at the Salton Sea. For those DCMs needing additional research, pilot field testing (pilot projects) may be pursued. Pilot projects allow IID to gain experience and understanding of locally-adapted methods of dust control and the site-specific factors that could affect their feasibility and cost. Pilot projects also are useful for determining the effectiveness of dust control and refining design criteria for full-scale implementation. This helps develop efficient and effective approaches for the design, construction and operation of DCMs on the playa.

- **How will off-highway vehicle (OHV) traffic be managed?** The dust control strategy includes development and implementation of a playa traffic management plan focused on public outreach and education. Extensive desert areas around the Salton Sea attract recreationalists and OHV traffic. Due to proximity, it is highly likely that OHV use would expand onto the playa as the Salton Sea recedes. This activity will disturb the natural stability of playa crust and soil surfaces and increase erodibility and PM_{10} emissions, as well as disturb DCMs being implemented on the playa. Prevention of vehicle-related disturbances is the most important and cost-effective measure available to prevent and control dust emissions.
- **How will information related to this SS AQM Program be shared with others?** This SS AQM Program is focused on monitoring and mitigating dust emissions from exposed Salton Sea playa. There are numerous agencies and landowners involved in activities at the Salton Sea from an air quality and habitat perspective. Communication and coordination among these agencies is essential to the success of this SS AQM Program. IID will coordinate implementation of this SS AQM Program with these agencies and provide an annual progress report.

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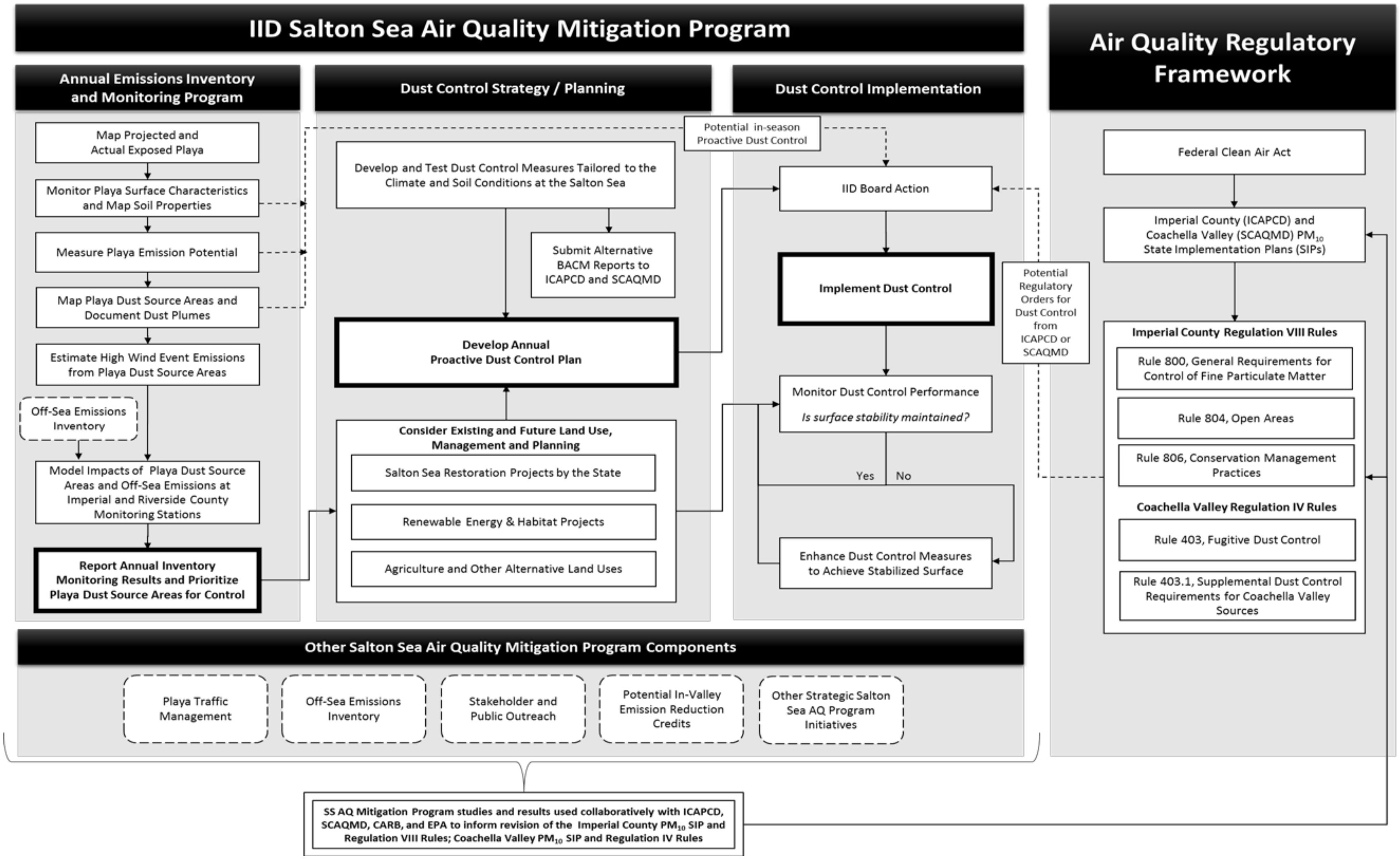
FIGURE ES-1. SS AQM PROGRAM COMPONENTS AND WORKFLOW. Each component of this SS AQM Program is used to identify, prioritize and guide implementation of dust control measures on exposed Salton Sea Playa. This flowchart identifies important program components and how they are used to guide dust control implementation.



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1 INTRODUCTION

This document sets out the general parameters of the Salton Sea Air Quality Mitigation Program (SS AQM Program) prepared for the Imperial Irrigation District (IID). As explained in more detail below, this SS AQM Program expands on the air quality monitoring and mitigation requirements resulting from the conserved water transfers under the Quantification Settlement Agreement (QSA). The objective of this SS AQM Program is to proactively detect, locate, assess and identify options to mitigate dust emissions from exposed Salton Sea playa. This SS AQM Program also provides scientific support and options for land management decisions associated with the playa as the Salton Sea recedes.

This SS AQM Program provides a comprehensive, science-based, adaptive approach to address air quality mitigation requirements to assist in the decision-making process for implementation of air quality mitigation. This program has a limited focus and does not expand into other areas that may provide air quality mitigation as a secondary benefit, but serves other primary purposes, such as habitat creation and restoration or renewable energy development. Further, this program is not intended to provide a restoration plan for the Salton Sea or to make predetermined decisions regarding the implementation of air quality mitigation. This SS AQM Program provides for an annual on-going process to detect, locate, assess and identify options to mitigate dust emissions from exposed Salton Sea playa, which ultimately provides the scientific support to the IID to make decisions regarding the implementation of specific mitigation measures. Several outside factors will contribute to the decision-making process and this program is intended to work with and in light of those factors, including in coordination with any other Salton Sea restoration and mitigation activities taken by other agencies and/or stakeholders. The technical details supporting this document are included in the appendices.

2 BACKGROUND AND REGULATORY FRAMEWORK

This section describes the background and regulatory framework for this SS AQM Program, including the the conserved water transfers under the QSA that are expected to accelerate Salton Sea playa exposure beginning in 2017 and the air quality monitoring and mitigation requirements under the QSA. The regulatory framework is discussed next, including the Clean Air Act (CAA) and its requirements for submitting a State Implementation Plan (SIP) for nonattainment areas, the Imperial County PM_{10} SIP, the Coachella Valley PM_{10} SIP, various Imperial County Air Pollution Control District (ICAPCD) and South Coast Air Quality Management District (SCAQMD) rules that guide future dust control efforts on the Salton Sea playa, and the Environmental Protection Agency (EPA) Exceptional Event Rule.

2.1 THE QUANTIFICATION SETTLEMENT AGREEMENT AND THE JOINT POWERS AUTHORITY

The QSA is a series of agreements that provide for a long-term conserved water transfer of up to 303,000 acre-feet annually from IID to the San Diego County Water Authority (SDCWA) and the

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Coachella Valley Water District (CVWD).[4] These conserved water transfers under the QSA allow California to limit its demand on Colorado River water to its annual 4.4 million acre-feet entitlement and ensures water supply reliability throughout Southern California.

The QSA caps IID's annual consumptive water use to 3.1 million acre-feet and provides for the transfer of conserved water outside of Imperial County. IID conserves the water for transfer through various conservation programs. The transfer of the conserved water means less water is applied to the farm land within the Imperial County, which in turn means reduced agricultural return flows into the Salton Sea causing the Sea elevation to recede over time.

2.1.1 The QSA Air Quality Monitoring and Mitigation Requirements

Pursuant to the California Environmental Quality Act (CEQA), California Public Resources Code sections 21000 et seq., the environmental impacts of the conserved water transfers under the QSA were analyzed in an environmental impact report[5] and then monitoring and mitigation measures were included in a Mitigation, Monitoring and Reporting Program (MMRP) to ensure that identified impacts are monitored and mitigated for the life of the QSA.[6] The Final EIR/EIS identified potential air quality impacts from windblown dust from exposed Salton Sea playa as a result of the conservation of up to approximately 300,000 acre-feet reducing the volume of agricultural inflows to the Sea.[7] The requirements for monitoring and mitigating dust emissions from the exposed Salton Sea playa are identified in the Final EIR/EIS[8] and as Mitigation Measure AQ-7 in the MMRP.[9] The specific section of the Final EIR/EIS is provided in Appendix A of this SS AQM Program for reference. The Salton Sea air quality monitoring and mitigation requirements, in pertinent part, are as follows:

1. **Restrict Access**: Public access, especially off-highway vehicle access, would be limited, to the extent legally and practicably feasible, to minimize disturbance of natural crusts and soils surfaces in future exposed shoreline areas.
2. **Research and Monitoring**: A research and monitoring program would be implemented incrementally as the Sea recedes. The research phase would focus on development of information to help define the potential for problems to occur in the future as the Sea elevation is reduced slowly over time. Research would:
    a. Study historical information on dust emissions from exposed shoreline areas.
    b. Determine how much land would be exposed over time and who owns it.

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[4] Or the Metropolitan Water District of Southern California in place of CVWD under certain circumstances. For more details see the *Quantification Settlement Agreement By and Among Imperial Irrigation District, The Metropolitan Water District of Southern California and the Coachella Valley Water District* and the *Agreement for Acquisition of Water Between Coachella Valley Water District and the Metropolitan Water District of Southern California*, both dated October 10, 2003.
[5] *Final Imperial Irrigation District Water Conservation and Transfer Project, Draft Habitat Conservation Plan Environmental Impact Report/Environmental Impact Statement*, SCH #99091142 (Final EIR/EIS)
[6] *Mitigation, Monitoring and Reporting Program for the IID Water Conservation and Transfer Project EIR/EIS*, dated June 2008 (MMRP).
[7] Section 3.16.2, pages 3-70 to 3-71.
[8] Section 3.9.5, pages 3-50 to 3-52.
[9] Impact AQ-7, Table 1, pages 21-22.

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c. Conduct sampling to determine the composition of "representative" shoreline sediments and the concentrations of ions and minerals in salt mixtures at the Sea.
d. Analyze [data] to predict responses of Salton Sea salt crusts and sediments to environmental conditions, such as rainfall, humidity, temperature and wind.
e. Implement a meteorological, PM_{10} and toxic air contaminant monitoring program to begin under existing conditions and continue as the [Sea recedes]. The goal of the monitoring program would be to observe PM_{10} problems or incremental increases in toxic air contaminant concentrations associated with [receding Sea levels] and to provide a basis for mitigation efforts.
f. If incremental increases in toxic air contaminants (such as arsenic or selenium, for example) are observed at the receptors and linked to emissions from exposed shoreline caused by [receding Sea levels], conduct a health risk assessment to determine whether the increases exceed acceptable thresholds established by the governing air districts and represent a significant impact.
g. If potential PM_{10} or health effects problem areas are identified through research and monitoring and the conditions leading to PM_{10} emissions are defined, study potential dust control measures specific to the identified problems and the conditions at the Salton Sea.

3. **Create or Purchase Offsetting Emission Reduction Credits**: This step would require negotiations with the local air pollution control districts to develop a long-term program for creating or purchasing offsetting PM_{10} emission reduction credits.[10]
4. **Direct Emission Reductions at the Sea**: If sufficient offsetting emission reduction credits are not available or feasible, Step 4 of this mitigation plan would be implemented. It would include either, or a combination of:
    a. Implementing feasible dust mitigation measures; and/or
    b. If feasible, supplying water to the Sea to re-wet emissive areas exposed by the [receding Sea].

In addition to the Final EIR/EIS Salton Sea air quality monitoring and mitigation requirements, the QSA is subject to compliance with the terms and conditions of several state and federal permits and approvals. This includes the California State Water Resources Control Board (SWRCB) Revised Order WRO 2002-0013 approving the water transfers (SWRCB Order). This SWRCB Order incorporated the Final EIR/EIS air quality mitigation measures. The SWRCB Order additionally requires IID to evaluate dust control measures to determine their feasibility and delegates to the Water Rights Division Chief the authority to determine, in consultation with the ICAPCD, SCAQMD and the California Air Resources Board (CARB), whether any dust mitigation measures identified are feasible.

[10] Note: ICAPCD and SCAQMD do not currently support programs for creating or purchasing PM_{10} emission reduction credits. Therefore, this SS AQM Program does not address PM_{10} emission reduction credits. However, this SS AQM Program does not preclude future negotiations with local regulatory agencies to investigate the development of a long-term program for creating or purchasing offsetting PM_{10} emission reduction credits.

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This SS AQM Program does not alter or replace any of these Salton Sea air quality monitoring and mitigation requirements. Rather, it expands on and provides greater detail of these monitoring and mitigation requirements. The Salton Sea playa that is exposed as a direct result of the water transfers under the QSA is subject to the air quality monitoring and mitigation requirements described above under the Final EIR/EIS and the SWRCB Order, in addition to all other federal, state and local laws, rules and regulations pertaining to air quality.

2.1.2 THE QSA JOINT POWERS AUTHORITY

Under the QSA and supporting legislation, the State of California has assumed financial responsibility for QSA-related mitigation, with the exception of the first $133 million (in 2003 dollars) in QSA mitigation costs paid by CVWD, SDCWA and IID.[11] The *Quantification Settlement Agreement Joint Powers Authority Creation and Funding Agreement* was entered into by the State of California, CVWD, SDCWA and IID in October 2003. In that agreement, the Quantification Settlement Agreement Joint Powers Authority (QSA JPA) was created to pay for environmental mitigation requirements and costs "by and through the collection, holding, investing and disbursing of funds."[12] The funds managed by the QSA JPA are from the water agencies for the first $133 million (in 2003 dollars) and then from the State of California for environmental mitigation costs in excess of that limit.[13]

The QSA JPA must adopt an annual budget for the payment of environmental mitigation costs.[14] As IID, or any other party implementing mitigation, incurs direct costs for environmental mitigation activities under the approved budget, IID, or that other party, is reimbursed by the QSA JPA for those costs.[15] The QSA JPA is allowed, but not required, to "adopt a long-term financing plan to assure that sufficient funds are available to meet the reasonably expected annual costs" for environmental mitigation.[16]

Concurrent with the QSA, IID prepared a draft Habitat Conservation Plan (HCP) to cover permitting under the Endangered Species Act (ESA) for activities done under the QSA including conservation programs and mitigation measures. The HCP was prepared in coordination with the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW) and provides specific biological conservation measures for implementation of the QSA, which were included in the MMRP for the QSA. Mitigation measures associated with the HCP are managed by an Implementation Team (IT), which is set forth in the HCP and corresponding mitigation measures. The IT is not directly responsible for managing air quality mitigation, except to the extent that implementation of any air quality mitigation might have an impact on the species covered in the HCP or other wildlife.

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[11] For a detailed discussion regarding California's Salton Sea restoration and QSA mitigation obligations under the QSA and State legislation see the *Petition of Imperial Irrigation District for Modification of Revised Water Rights Order 2002-0013* filed with the California State Water Resources Control Board on November 18, 2014 (http://www.iid.com/water/salton-sea-initiative/swrcb-petition). For the contractual obligations associated with restoration and mitigation see the *Quantification Settlement Agreement Joint Powers Authority Creation and Funding Agreement* and the *Environmental Cost Sharing, Funding, and Habitat Conservation Plan Development Agreement*, both dated October 10, 2003.
[12] Section 2.2 of the QSA JPA Creation and Funding Agreement.
[13] Articles IX and XIV of the QSA JPA Creation and Funding Agreement.
[14] Section 10.1 of the QSA JPA Creation and Funding Agreement.
[15] Section 10.3 of the QSA JPA Creation and Funding Agreement.
[16] Section 10.2 of the QSA JPA Creation and Funding Agreement.

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Nevertheless, the IT provides recommendations to the QSA JPA for adjustments to implementation of the HCP-related mitigation measures and corresponding adjustments to the annual budget. IID coordinates with and keeps the IT informed of air quality mitigation activities to ensure that all activities are in compliance with the HCP and associated permits.

IID, in coordination with the QSA JPA and the IT, prepares an annual budget for review and approval by the QSA JPA. The annual budget is done on a fiscal year basis. As part of that process, IID identifies the air quality mitigation activities that are anticipated for the upcoming year and includes those mitigation costs in the QSA JPA annual budget. Approval of the budget represents a determination by the QSA JPA that the mitigation costs in the budget are subject to reimbursement by the QSA JPA funding. After approval of the budget, IID implements the various mitigation activities included in the annual budget and submits periodic invoices to the QSA JPA for reimbursement. This SS AQM Program anticipates that IID will continue to coordinate with the QSA JPA on inclusion in the annual QSA JPA budget of the air quality monitoring and mitigation activities identified in this program according to the regular process.

2.1.3 Salton Sea Mitigation Water

The SWRCB Order requires IID to deliver mitigation water to the Salton Sea for a period of 15 years, until the end of 2017. The mitigation water is delivered to the Salton Sea in accordance with a schedule that increases each year associated with the ramping up of the water conservation schedules for that 15-year period and reaching a peak amount in 2017 of 150,000 acre-feet.[17] The primary purpose of the delivery of the mitigation water to the Salton Sea was intended to avoid salinity impacts to the Sea specifically affecting fish and wildlife for 15 years.[18] However, a secondary effect of the mitigation water delivered to the Salton Sea is to artificially supply a portion of the reduced flows to the Sea thereby benefitting the elevation by postponing the recession of the Sea to a significant extent until after the mitigation water ceases to be delivered in 2017. The 15-year period assumed that the State would have a Salton Sea restoration plan developed during that time and implementation of restoration activities would be underway.[19]

2.1.4 Salton Sea Restoration

In addition to the QSA mitigation funding obligations, under the QSA and supporting legislation, the State of California has assumed responsibility to restore the Salton Sea, including the associated financial responsibility, with the exception of $30 million in funds contributed to the Salton Sea Restoration Fund by CVWD, SDCWA and IID.[20] The State of California has embarked upon a Salton Sea restoration program.[21] That program is being carried out concurrent with the air quality monitoring and

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[17] Exhibit D of the QSA JPA Creation and Funding Agreement.

[18] For further details regarding the purpose of the 15 years of Salton Sea mitigation water see the SWRCB Order, the *Final Addendum to the IID Water Conservation and Transfer Project, Final EIR* dated September 2003, and the HCP.

[19] For further detail see IID's SWRCB Petition (footnote 11) and the SWRCB Revised Water Rights Order 2002-0013.

[20] See footnote 11. See also the California State Auditor's *Salton Sea Restoration Fund: The State Has Not Fully Funded a Restoration Plan and the State's Future Mitigation Costs are Uncertain, Report 2013-101* dated November 2013 (https://www.bsa.ca.gov/reports/agency/301 and http://www.bsa.ca.gov/pdfs/reports/2013-101.pdf).

[21] See http://resources.ca.gov/salton-sea/.

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mitigation activities set forth in this SS AQM Program. IID anticipates that this program and the implementation of the air quality monitoring and mitigation coming out of this program can inform the State's Salton Sea restoration program and decisions being made under that program. This SS AQM Program provides scientific-based options for addressing air quality that can be used as part of the State's restoration activities. Nevertheless, the State's Salton Sea restoration program and funding associated with those restoration activities is separate from this SS AQM Program.

2.2 THE CLEAN AIR ACT

The CAA [22] is a United States federal law designed to control air pollution at the national level. It requires the Environmental Protection Agency (EPA) to develop and enforce regulations to protect the public from airborne contaminants known to be hazardous to human health. The CAA contains many requirements related to air quality programs and activities. Two areas of those requirements have a direct bearing on this SS AQM Program. They are air quality and emission limitations[23] and plan requirements for nonattainment areas.[24]

The CAA declares that protecting and enhancing the nation's air quality promotes public health.[25] The law encourages prevention of regional air pollution and establishment of regional control programs.[26] It also provides technical and financial assistance for air pollution prevention at both the state and local government level.[27] The CAA also covers cooperation, research, investigation, training and other activities related to air quality.[28] Grants for air pollution planning and control programs and for interstate air quality agencies and program cost limitations are also included in the CAA.[29]

The CAA mandates air quality control regions designated as either attainment or nonattainment areas.[30] Attainment areas are those that meet the national standards for primary or secondary ambient air quality.[31] Nonattainment areas are those that do not meet the standards.[32] Imperial County and Coachella Valley are currently designated as *serious* nonattainment areas for PM_{10}.

Additionally, the CAA contains the requirements for nonattainment areas.[33] Under the CAA, states are required to submit a SIP describing how the nonattainment areas will be brought into compliance with federal and state ambient air quality standards.[34] The SIP contains the program for attaining the

[22] 42 United States Code sections 7401 et seq.
[23] 42 USC sections 7401-7431.
[24] 42 USC sections 7501-7515.
[25] 42 USC section 7401(b).
[26] 42 USC sections 7401(a) and (b).
[27] 42 USC sections 7401(a) and (b).
[28] 42 USC sections 7402-7403.
[29] 42 USC sections 7405-7406.
[30] 42 USC section 7407.
[31] 42 USC section 7410.
[32] 42 USC section 7410.
[33] 42 USC sections 7501-7515.
[34] 42 USC section 7410.

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standards as soon as possible but in no more than five years, based on the severity of the air pollution and the difficulty posed by obtaining cleaner air.[35]

The CAA is implemented according to Title 40 of the Code of Federal Regulations Part 51. According to the federal regulations, SIPs must include the following elements:[36]

- **Emission Inventory**: Detailed inventory of emissions from point and area sources. The inventory must be based upon measured emissions or, where measured emissions are not available, documented emission factors.
- **Control Strategy**: Control strategy for bringing the area into attainment with federal and state air quality standards. The control strategy should identify the sources to be controlled, as well as the type and intensity of control measures applied to reduce emissions. This includes identification of the responsible agency, as well as procedures for monitoring compliance and handling violations.
- **Control Estimate**: Summary of emission levels projected to result from application of the control strategy.
- **Attainment Demonstration Modeling Analysis**: A demonstration of adequacy of the control strategy by means of applicable models, databases and other requirements found in the EPA's Guideline of Air Quality Models.
- **Contingency Planning**: Contingency measures to be applied in the event that the standards are not achieved in the specified time period.

SIPs must be approved by the EPA, or revised if approval is contingent on making changes, and must specify whether local governments or the State will implement and enforce the various changes.[37]

The ICAPCD is the responsible regulatory agency for the SIP in Imperial County and the SCAQMD is the responsible regulatory agency for the SIP in Riverside County. The roles and applicable air quality rules of each local regulatory agency are described below.

2.3 Imperial County Air Pollution Control District

The ICAPCD is the local regulatory agency for air quality compliance within Imperial County. The ICAPCD has a board of directors that adopts the policies and regulations for air quality within Imperial County and is managed by the Air Pollution Control Officer. In addition to developing SIPs for Imperial County as required by the CAA, the ICAPCD has adopted the *Rules and Regulations of the Imperial County Air Pollution Control District*, which includes eleven regulations (Regulations I to XI) each of which is broken down into separate rules.[38]

[35] 42 USC section 7502.
[36] 40 CFR Part 51, subpart G.
[37] 40 CFR Part 51, subparts A and F.
[38] Located at http://www.co.imperial.ca.us/AirPollution/index.asp?fileinc=comprules.

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2.3.1 IMPERIAL COUNTY PM_{10} SIP

On August 11, 2009, the ICAPCD Board held a public hearing and unanimously adopted the *Final 2009 Imperial County State Implementation Plan for Particulate Matter Less Than 10 Microns in Aerodynamic Diameter* (IC 2009 PM_{10} SIP).[39] The IC PM_{10} SIP was based on emission inventory projections for the period of 2006-2010 compared against the baseline year of 2005. Highlights of the IC 2009 PM_{10} SIP include the following:

- Five exceedance days (that is, days exceeding the federal 24-hour PM_{10} standard) were recorded during the period from 2006 through 2008, with 24-hour average PM_{10} concentrations ranging from 167 to 291 micrograms per cubic meter ($\mu g/m^3$). For any given exceedance day, from one to five compliance monitors were affected.
- Two of the exceedance days were associated with PM_{10} transport from Mexico. On each of these days, a single compliance monitor was affected (Grant Calexico). The remaining three exceedance days were associated with high wind speed conditions. On high wind days, two to five compliance monitors were affected.
- On low wind speed days, significant sources of dust included tilling, entrained dust from unpaved roads and open areas. Ninety-nine percent of emissions from open areas were from non-populated areas such as dunes, grasslands and barren areas.
- On an annual basis, wind-blown dust sources accounted for 73 percent of the total PM_{10} emissions in the Imperial County. Other large dust sources include: entrained dust from unpaved roads (19.4 percent of the total) and farming (3.3 percent of the total). All other sources were individually less than one percent of the total emissions.
- The IC 2009 PM_{10} SIP control strategy reduced the maximum daily emissions from 235 tons per day (tpd) to 219 tpd, a difference of 16 tpd.
- The control strategy focused on (greatest to least reduction): entrained city/country roads (reduction of 8.04 tpd), tilling (reduction of 2 tpd), non-pasture agricultural land (reduction of 1.99 tpd), other open areas (reduction of 1.19 tpd), wind-blown dust on unpaved farm roads (reduction of 1.11 tpd), wind-blown dust from city/county roads (reduction of 0.69 tpd) and "track out" (reduction of 0.37 tpd). All other sources were individually reduced less than 0.3 tpd.
- The IC 2009 PM_{10} SIP assumed a restoration program would be implemented at the Salton Sea and therefore did not account for future emissions from exposed playa.
- Dust emissions from the open desert areas located west of the Salton Sea were not captured by the IID special purpose monitoring network because it had not been established yet and therefore did not influence the IC 2009 PM_{10} SIP control strategy.

The ICAPCD is preparing a 2016 PM_{10} SIP as required by the CAA and the EPA regulations. This updated PM_{10} SIP may evaluate two major changes in the conditions and assumptions used as the basis for the IC

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[39] ENVIRON International Corporation, 2009 (http://www.arb.ca.gov/planning/sip/planarea/imperial/imperialsip.htm and http://www.co.imperial.ca.us/airpollution/attainment%20plans/final%20ic%202009%20pm10%20sip%20document.pdf).

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2009 PM_{10} SIP: (1) a more comprehensive method for estimating exposed playa emissions and (2) CARB certified data from the six special purpose PM_{10} monitors operated and maintained by IID around the Salton Sea (see Section 3.1.2.5.1). The latter changes may influence the overall dust control strategy in Imperial County because the IID special purpose monitors indicate source areas that were either nonexistent in the years leading up to the IC 2009 PM_{10} SIP, or were not captured by the PM_{10} monitoring network established at the time.

2.3.2 Imperial County Air Pollution Control District Regulation VIII

The ICAPCD Regulation VIII was adopted on October 10, 1994, and revised on November 25, 1996, to comply with Reasonably Available Control Measures (RACM) to control fugitive dust emissions. On November 11, 2005, this regulation was revised again to include Best Available Control Measures (BACM) and was further divided in a series of seven individual rules. On October 16, 2012, the ICAPCD again adopted revisions to several of the rules contained in Regulation VIII to address further BACM concerns by EPA. On April 12, 2016, the ICAPCD adopted revisions to one rule, Rule 804 pertaining to disturbed open areas and described in further detail below, to provide a process for approval of alternative BACM not already listed as BACM for disturbed open areas in the rule.

Regulation VIII contains BACM as required by the CAA for "serious" PM_{10} nonattainment areas. Regulation VIII requires BACM for source categories such as: construction activities, disturbed open areas, paved roads and agricultural operations. Regulation VIII allows operators to determine the control techniques sufficient to limit visible dust emissions to 20 percent opacity and, if applicable to that source, to implement requirements for a stabilized surface. Dust control plans and recordkeeping are also required under the Regulation's provisions. Regulation VIII also includes test methods and standards.

Regulation VIII is divided into seven rules. Three of the rules—800, 804 and 806—are relevant to this SS AQM Program. Each relevant rule is described below.

2.3.2.1 Rule 800, General Requirements for Control of Fine Particulate Matter

Rule 800 contains the definitions, exemptions, general requirements, administrative requirements and test methods that are applicable to all Regulation VIII rules. Section C of Rule 800 contains the definitions that are essential to understanding each specific rule. Section F contains the general requirements that establish basic guidelines for dust control material(s), specifies requirements that the dust control material(s) must meet ICAPCD, SWRCB, CARB and EPA regulations, and contains guidelines for development of Bureau of Land Management (BLM) and Border Patrol dust control plans. Section G contains administrative requirements for test methods. Appendices A and B contain the test methods for visual determination of opacity and determination of surface stabilization, respectively. The latter contains methods for determining: visible crust strength (ball drop test), threshold friction velocity (sieve measurements to assign soil texture), surface protection from flat and standing vegetation and surface stabilization from rock armoring using the rock test method.

Rule 800 requires recreational off-highway vehicle (OHV) areas to apply BACM to mitigate fugitive dust emissions. On each day of an off-road event and/or competition during which 50 average vehicle daily

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trips per day will occur on an unpaved road segment, the owner or operator shall limit Visible Dust Emissions (VDE) to 20 percent opacity and comply with the requirements of a stabilized unpaved road by application, reapplication, or maintenance of at least one of the following control measures:

- Watering;
- Applying uniform layer of washed gravel;
- Paving;
- Restricting access;
- Restricting speed below 15 mph;
- Applying chemical or organic dust suppressants;
- Applying "road mix;" or
- Using any other method that can be demonstrated to effectively limit VDE to 20 percent opacity and meets the conditions of a stabilized unpaved road surface.

2.3.2.2 Rule 804, Open Areas

Rule 804 applies within rural areas to any open area of 3 acres or more that contains at least 1000 square feet of disturbed surface area. This rule pertains to the Salton Sea because exposed playa around the Sea qualifies as open areas under this rule. Section D of the rule contains exemptions for agricultural operation sites subject to Rule 806 and recreational OHV Use Areas on public lands subject to Rule 800. Section E contains requirements to apply BACM to limit VDE to 20 percent opacity and meet conditions for stabilized surface, and to install barriers to prevent unauthorized vehicle access to stabilized areas. Section F sets forth the permissible BACM for open areas. BACM for open areas includes: (1) applying water or chemical dust suppressants to all unvegetated areas, (2) establishing vegetation on previously disturbed areas, (3) paving, applying and maintaining gravel, or applying and maintaining chemical dust suppressants and (4) implementing alternative BACM that has gone through the approval process set forth in section G.

2.3.2.3 Rule 806, Conservation Management Practices

Rule 806 applies to all agricultural operation sites of 40 or more acres in size. This rule pertains to the Salton Sea because some exposed playa could be reclaimed for agricultural use (this occurred during previous dry periods). Section C of the rule contains definitions that are essential to understand the main terms and Conservation Management Practices (CMPs) in this rule. Section D contains requirements for agricultural operation sites to implement at least one CMP for land preparation and cultivation, harvest activities, unpaved roads and unpaved traffic areas. This section also contains guidelines for operators to develop alternative CMPs. In addition, this section requires the owner/operator to prepare a CMP plan and make it available upon request. Section E contains CMPs for land preparation and cultivation, harvesting, unpaved roads and unpaved traffic areas. Section F contains guidelines to develop a CMP plan.

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2.4 SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

The SCAQMD is the local regulatory agency for air quality compliance within Riverside County. SCAQMD has a governing board that adopts the policies and regulations for air quality within Riverside County and is managed by the Executive Officer. SCAQMD has adopted a SIP specifically for the Coachella Valley, which includes the Salton Sea Air Basin and establishes controls needed to demonstrate expeditious attainment of the PM_{10} standards in that area. SCAQMD has also adopted the *Rules of the South Coast Air Quality Management District*, which includes thirty-five regulations (Regulations I to XXXV) each of which is broken down into separate rules.[40]

2.4.1 COACHELLA VALLEY PM_{10} SIP

On June 21, 2002, the SCAQMD held a public hearing and adopted the *Final 2002 Coachella Valley PM_{10} State Implementation Plan* (CV 2002 PM_{10} SIP).[41] After years of demonstrating attainment of the PM_{10} standards, PM_{10} levels in the years 1999-2001 did not demonstrate attainment of the annual average PM_{10} National Ambient Air Quality Standards, but Coachella Valley had attained the 24-hour PM_{10} standard since 1993. The CV 2002 PM_{10} SIP addressed the rise in PM_{10} levels and established additional controls needed to demonstrate expeditious attainment of the PM_{10} standards. The CV 2002 PM_{10} SIP modified previous analyses and programs, including additional control measures for construction and earthmoving activities, farming, paved and unpaved roads, parking lots, vacant lands and farming. As required by the CAA and the EPA regulations, the CV 2002 PM_{10} SIP included a revised emissions inventory, a control strategy and a demonstration of attainment. At the time of adoption, the SCAQMD committed to revising the CV 2002 PM_{10} SIP with the latest approved mobile source emission estimates, planning assumptions and fugitive dust source emission estimates.[42]

On August 1, 2003, the SCAQMD held a public hearing and adopted the *Final 2003 Coachella Valley PM_{10} State Implementation Plan* (CV 2003 PM_{10} SIP).[43] The CV 2003 PM_{10} SIP contained an updated emissions inventory, emission budgets and attainment modeling.

2.4.2 SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT REGULATION IV

The SCAQMD Regulation IV generally addresses prohibitions relating to air quality. The rules regulating PM_{10} that are relevant to this SS AQM Program include Rules 403 and 403.1.

2.4.2.1 RULE 403, FUGITIVE DUST

Rule 403 applies to any activity or man-made condition capable of generating fugitive dust. Section C of the rule contains the definitions necessary to understand the rule. Section D sets out requirements and prohibitions relating to fugitive dust emissions. For instance, no person shall cause or allow the

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[40] Located at http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book.
[41] Located at http://www.aqmd.gov/home/library/clean-air-plans/coachella-valley-pm10-plan and http://www.aqmd.gov/home/library/clean-air-plans/coachella-valley-pm10-plan/final-2002-cv-pm10-plan.
[42] http://www.aqmd.gov/home/library/clean-air-plans/coachella-valley-pm10-plan.
[43] Located at http://www.aqmd.gov/docs/default-source/clean-air-plans/pm10-plans/final-2003-coachella-valley-pm10-state-implementation-plan.pdf?sfvrsn=2.

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emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area such that 1) the dust remains visible in the atmosphere beyond the property line of the emission source or 2) the dust emission exceeds 20 percent opacity, if the dust emission is the result of movement of a motorized vehicle. Section G provides exemptions to the rule. Table 1 of the rule sets out control measures permitted to address certain source categories.

2.4.2.2 Rule 403.1, Supplemental Fugitive Dust Control Requirements for Coachella Valley Sources

Rule 403.1 applies only to fugitive dust sources in Coachella Valley. Section C of the rule contains the definitions necessary to understand the rule. Section D sets out the general requirements of the rule. Section E provides the requirements for a fugitive dust control plan and other requirements for construction projects or other earth-moving activities. Section F identifies the requirements for a fugitive dust control plan, including submittal and approval. Section G specifies wind monitoring implementation requirements and Section I provides the exemptions to the rule.

2.5 EPA Exceptional Event Rule

Because of its extremely dry climate and vast areas of undeveloped desert land, PM_{10} concentrations in Imperial County and the Coachella Valley are dominated by fugitive dust emissions. The primary sources of high PM_{10} concentrations in Imperial County are: (1) soil disturbance caused by wind and human activity, (2) transport of high PM_{10} concentrations from Mexicali, Mexico, and (3) occasionally, wildfires. High PM_{10} concentrations caused by uncontrollable natural events such as high winds and wildfires may qualify as "Exceptional Events" under current EPA rules and therefore may be excluded from compliance calculations. These events must be properly documented according to the EPA's Exceptional Event Rule guidelines. Both ICAPCD and IID will commit resources and work together to 1) identify and document potential exceptional events that may have been influenced by Salton Sea exposed playa and/or open areas in the surrounding area and 2) apply to EPA for concurrence on the documentation in order to exclude these data in future attainment determinations.

3 SS AQM Program Description

This SS AQM Program is divided into three parts: (1) an updated PM_{10} emission inventory for playa and non-playa sources, (2) a control strategy for playa sources only and (3) a general estimated cost analysis. The program objectives are six-fold:

1. Identify and characterize playa sources as the Salton Sea recedes to facilitate implementation of proactive dust control measures[44] and BACM (currently defined by Rule 804).
2. Investigate the location, magnitude, seasonality and frequency of dust emissions in the desert areas located west of the Salton Sea. This will facilitate future support documentation to exclude data clearly associated with Exceptional Events.

[44] This is the monitoring portion of Objective 3.

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3. Proactively control dust emissions from exposed Salton Sea playa to prevent the occurrence of significant dust emissions.
4. Pilot-test new dust control measures that are specifically tailored to the climate and soil conditions on and around the Salton Sea playa and that make efficient use of available resources and submit for approval successfully tested dust control measures as potential new alternative BACM according existing rules.
5. Identify opportunities to establish new procedures and rules and/or improve existing procedures and rules to fully and successfully implement this SS AQM Program.
6. Develop a general understanding of associated estimated costs and cost areas needing further analysis.

Objectives 1 and 2 are addressed in the PM_{10} emission inventory section (Section 3.1). Objectives 3, 4 and 5 are addressed in the dust control strategy section (Section 3.2). Objective 6 is addressed in the estimated cost analysis section (Section 3.3).

3.1 PM_{10} Emissions Inventory

This section describes the methods used to characterize dust emissions from playa and non-playa sources around the Salton Sea.

3.1.1 Playa Sources

Playa exposure and its associated surface and emissions characteristics are a major focus of this SS AQM Program. Research and monitoring are focused on understanding the location and timing of playa exposure, salt crust surface characteristics and the associated emission potentials.

3.1.1.1 Approach

This section describes the methods that will be used to evaluate playa emissions as the Salton Sea recedes. The generalized approach is as follows:

- Observe and document the extent of playa exposure (see Section 3.1.1.2).
- Characterize the emission potential of exposed playa surfaces (see Section 3.1.1.3).
- Record the time and location of dust plumes or any other indication of dust emission activity (see Section 3.1.1.4).
- Map active source areas using remote sensing methods (see Section 3.1.1.5).
- Quantify total annual and daily dust emissions from active source areas (see Section 3.1.1.6).
- Model dust emissions to evaluate potential impacts at PM_{10} compliance monitors (see Section 3.1.1.7).

Each bullet is described in the sections below. As mentioned above, this information is required to facilitate the proactive dust control planning described in Section 3.2.

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3.1.1.2 Playa Exposure

Projecting future playa exposure as well as tracking actual playa exposure and land ownership of exposed playa is an important aspect of this SS AQM Program. Each component is described below.

3.1.1.2.1 Projected Future Exposure

The timing and location of future playa exposure is a function of the hydrologic response of the Salton Sea to external forces, such as inflows, salt loads and evaporation rates. The Salton Sea Accounting Model (SSAM) was originally developed by Reclamation to simulate the effects of the water transfers under the QSA on Salton Sea surface elevation and salinity. In 2006, the hydrologic modeling framework was revised to incorporate additional data, water balance improvements and add flexibility to the model. The updated model is called the Salton Sea Analysis model (or SALSA model) developed for the Programmatic Environmental Impact Report (PEIR) for the Salton Sea Ecosystem Restoration Program, which was prepared under the direction of the California Department of Water Resources and the California Department of Fish and Wildlife[45] on behalf of the Natural Resources Agency.[46] The SALSA model has since been updated further and is referred to as the SALSA2 model. CH2M[47] is currently preparing a hydrology analysis of the Salton Sea using the SALSA2 model. Details regarding the most recent updates to the model and the assumptions used for the hydrology modeling and analysis will be described in a separate report prepared by CH2M for IID anticipated to be released in the summer of 2016.

The SALSA2 modeling and projected Salton Sea playa exposure is important to this SS AQM Program for several reasons. Projecting future exposed playa will assist in the PM_{10} emission inventory by identifying where, when and the amount of exposed playa that will contribute to the inventory. The SALSA2 modeling will be used for comparative purposes to actual exposed playa as the Salton Sea recedes and will thereby inform the PM_{10} emission inventory as it is carried out. The comparisons that will be drawn are described in further detail below. Additionally, projections of the exposed playa will be used as a tool for planning and decision-making for determining the best use of resources in implementation of the various steps of this program, including the dust control strategy (Section 3.2). Anticipating where, when and the amount of playa that will be exposed will help shape the development of the dust control strategy. Finally, projecting the exposed playa directly attributable to the water transfers under the QSA will allow for the mitigation requirements under the QSA to be fulfilled in accordance with the QSA Final EIR/EIS and the SWRCB Order. While the SALSA2 model is the most current hydrologic modeling, any future updated modeling and projections can be used in the same manner in this SS AQM Program.

3.1.1.2.2 Actual Playa Exposure

Monitoring of the actual Salton Sea surface elevation and associated playa exposure is important for understanding potential air quality impacts. This information will provide a real-time understanding of actual playa exposure as it occurs and will help to validate the SALSA2 model results. Two independent

[45] Formerly the California Department of Fish and Game.
[46] Formerly the California Resources Agency.
[47] CH2M Hill, Inc.

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methods have been developed to quantify actual playa exposure. Each is summarized below. Technical details on monitoring actual exposed playa are in Appendix B.

USGS Salton Sea Elevation. Salton Sea elevation is monitored continuously by the United States Geological Survey (USGS).[48] The monitored Sea elevation data provide the basis for extracting a shoreline from high-resolution bathymetric data (Figure 3-1). All data from the USGS gauge are collected in National Vertical Datum of 1929 (NGVD29). To ensure consistency when using the bathymetric data or comparing to SALSA2 model results, all data must be converted to North American Vertical Datum of 1988 (NAVD88) using the standard conversion factor of 2.113 feet (given the geographic coordinates of the gauge and using the National Geodetic Survey's VERTCON calculator). GIS tools have been developed to provide near real-time estimates of shoreline location and therefore playa exposure (as compared to the modeled projections of playa exposure described above).

A subset of USGS-based Salton Sea elevation and gauge readings have been compiled from 2003 to 2015 (year-end Sea elevations) (Table 3-1). These USGS-based Sea elevation and gauge readings can be compared to SALSA2 model projections or other hydrologic modeling projections in the future. Results from this comparison can indicate the accuracy of the modeling projections for Sea elevations and consistency with the bathymetric data.

TABLE 3-1. USGS GAUGE EXPOSURE ESTIMATES

USGS Gauge Reading (Month)	Average Monthly USGS Salton Sea Elevation (ft NAVD88)	USGS / Bathymetry Playa Exposure (Acres)
12/2003	-229.0	Baseline (0 Acres)
12/2005	-226.9	207
12/2006	-227.6	2,071
12/2008	-228.5	5,244
12/2009	-229.5	7,653
11/2011	-230.2	8,254
12/2013	-230.8	10,029
11/2014	-232.0	12,787
06/2015	-231.7	12,074

[48] USGS Site 10254005 Salton Sea NR Westmoreland, CA.

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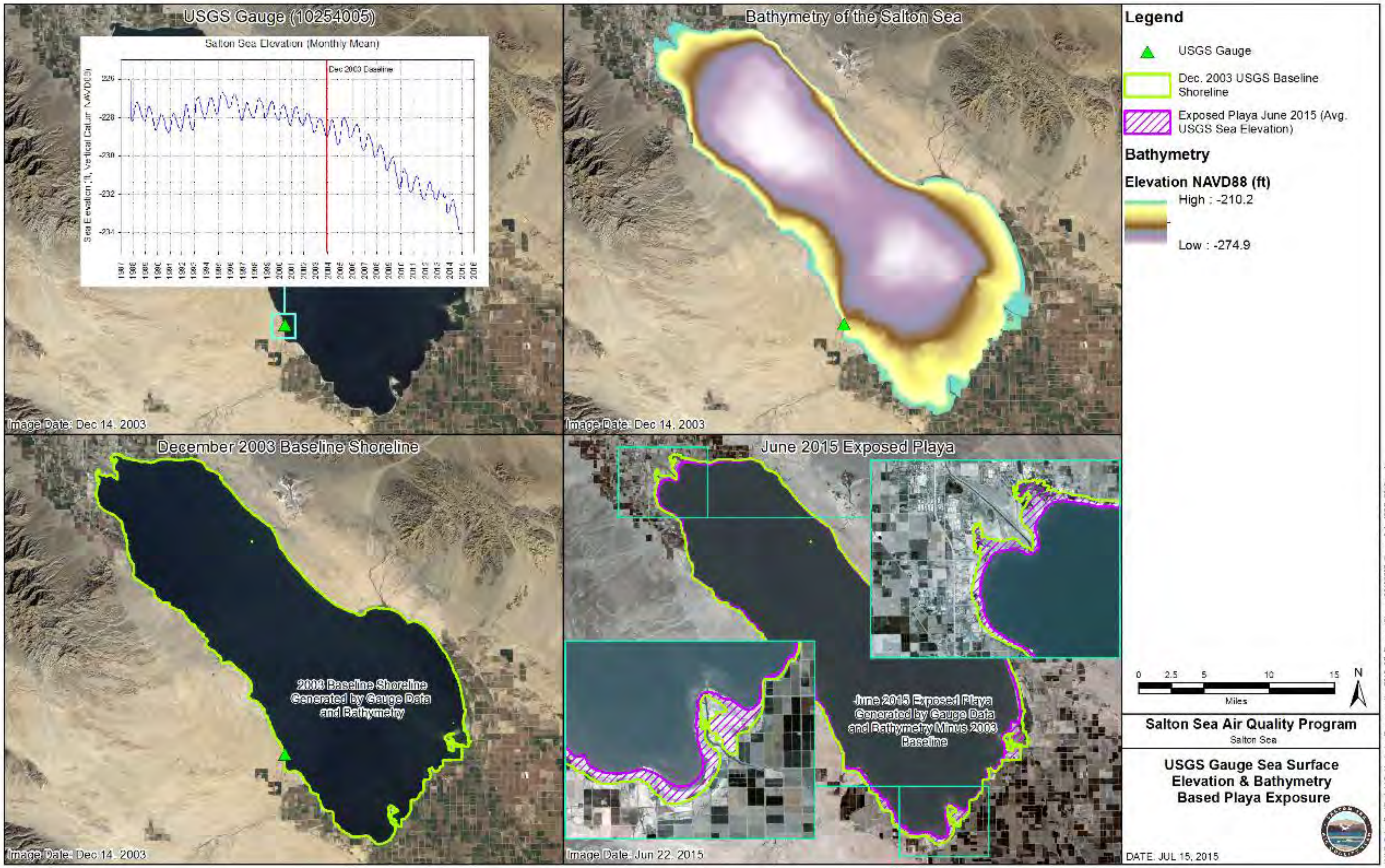
FIGURE 3-1. USGS GAUGE LOCATION AND SHORELINE EXTRACTION PROCESS FOR JUNE 2015

The USGS gauge Salton Sea surface elevation for June 2015 was used to demonstrate actual playa exposure from December 2003 to June 2015.



Landsat Satellite Imagery: The accuracy of the USGS gauge-based shoreline is a function of the Salton Sea elevation data from the USGS as well as the precision of the underlying bathymetric data. Therefore, an independent method for assessing exposed playa was developed using satellite imagery. Specifically, the Landsat 5 (1984 to 2013), Landsat 7 (1999 to present) and Landsat 8 (2013 to present) satellites provide current and historic imagery on an 8-to-16-day basis for the Salton Sea. A spectral water index called the Modified Normalized Difference Water Index (MNDWI) (Equation 1) was used to identify standing water associated with the Salton Sea from Landsat imagery. MNDWI is based on the fact that water absorbs energy at shortwave-infrared (SWIR) wavelengths. The integration of the green band into the equation reduces noise associated with other land-based features.[49] A date-specific threshold of MNDWI was then established to isolate the Salton Sea water body and associated shoreline (Figure 3-2).

EQUATION 1 - MNDWI

$$MNDWI = \frac{\rho\, green - \rho\, SWIR}{\rho\, green + \rho\, SWIR}$$

Table 3-2 depicts the Landsat MNDWI playa exposure compared to USGS gauge Sea elevation playa exposure (year-end Sea elevations). Results indicate that the two methods produce comparable actual playa exposure estimates and are in a 1:1 relationship with an R^2 of 0.98 (Figure 3-3). Further evaluation of individual dates revealed that the USGS gauge and bathymetric approach over-estimated playa exposure in the southern portion of the Salton Sea north of the Alamo River (Figure 3-4). These differences are likely due to errors in the bathymetric model. Acoustic sonar data (captured in 2005 and used as the basis for the bathymetric model) are unreliable in waters less than 1-meter deep (e.g. bay areas around the New and Alamo Rivers). The Landsat MNDWI does not rely on the bathymetric data, so it is able to accurately quantify the Salton Sea extent and therefore playa exposure (Figure 3-4).

Actual playa exposure will continue to be monitored and reported on a quarterly basis using the Landsat imagery as well as the USGS Sea elevation approach. Results of the quarterly monitoring will be shared with the Imperial County and ICAPCD. Results will also be used to update future SALSA2 model projections. Technical details on the monitoring are provided in Appendix B.

[49] Lei Ji, Li Zhang and Bruce Wylie, *Analysis of Dynamic Thresholds for the Normalized Difference Water Index* (2009).

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FIGURE 3-2. LANDSAT MNDWI PLAYA EXPOSURE ESTIMATE

Landsat imagery and the MNDWI water index is used to delineate the Salton Sea shoreline for 2003 and 2015.

TABLE 3-2. LANDSAT MNDWI AND USGS GAUGE PLAYA EXPOSURE ESTIMATES

Landsat MNDWI Date	Landsat MNDWI Playa Exposure (Acres)	USGS Gauge Reading (Month)	Average Monthly USGS Salton Sea Elevation (ft NAVD88)	USGS / Bathymetry Playa Exposure (Acres)
12/15/2003	Baseline (0)	12/2003	-229.0	Baseline (0)
11/17/2005	478	12/2005	-226.9	207
12/06/2006	1,848	12/2006	-227.6	2,071
12/11/2008	3,565	12/2008	-228.5	5,244
12/14/2009	7,050	12/2009	-229.5	7,653
11/02/2011	8,499	11/2011	-230.2	8,254
12/25/2013	10,242	12/2013	-230.8	10,029
11/26/2014	13,470	11/2014	-232.0	12,787
06/22/2015	12,619	06/2015	-231.7	12,074

FIGURE 3-3. LANDSAT MNDWI VS. USGS GAUGE PLAYA EXPOSURE

Landsat MNDWI playa exposure regressed against USGS gauge estimates. Results show the strong relationship and consistent relationship between the two actual playa exposure monitoring methods.

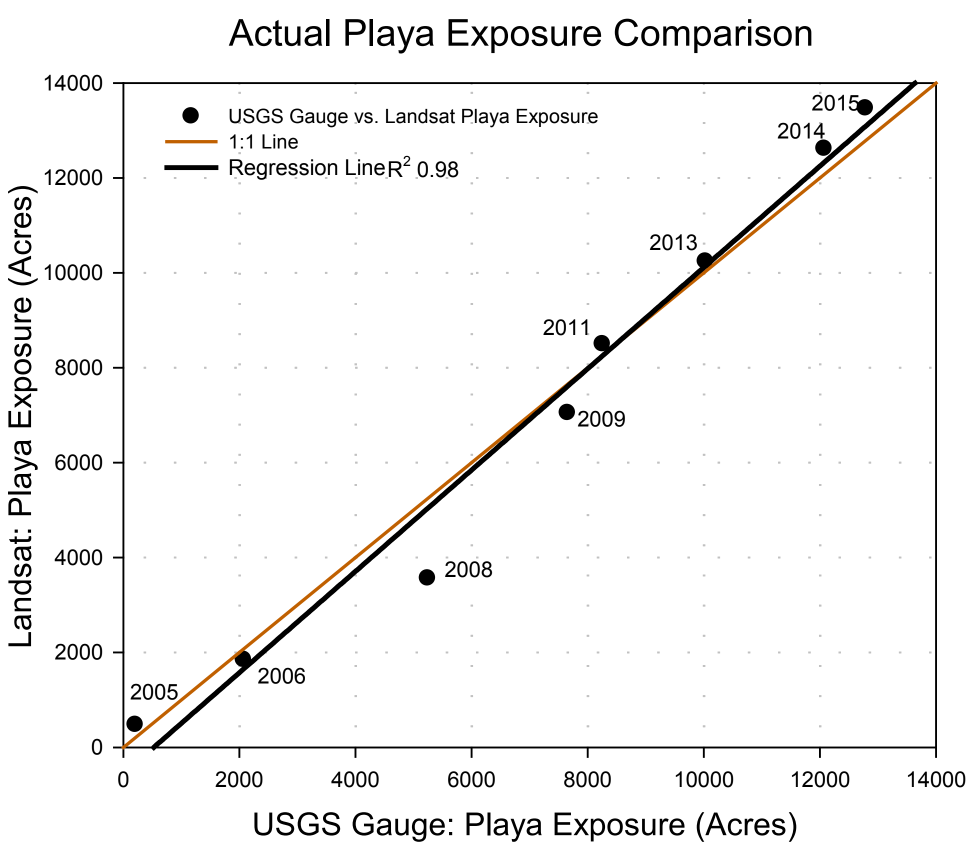

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FIGURE 3-4. LANDSAT MNDWI AND USGS GAUGE EXPOSURE FOR 2008

Landsat imagery was able to accurately capture the shoreline in 2008 around the Alamo and New River areas. These shallow water areas have limited acoustic data for generation of the bathymetric layer and therefore are more error-prone when used to generate playa exposure at certain Salton Sea elevations.

3.1.1.2.3 EXPOSED PLAYA LAND OWNERSHIP

The incremental projected and actual playa exposure data will be overlain with land ownership information. Landowners are responsible for compliance with the air quality requirements contained in the local rules and regulations within that district (i.e., ICAPCD or SCAQMD). The playa exposed as a direct result of the water transfers under the QSA involves the added monitoring and mitigation requirements under the QSA Final EIR/EIS and the SWRCB Order. This added layer of compliance does not change the underlying air quality requirements for land within either local district. The overlay of the projected and actual playa exposure data with the land ownership information simply provides planning level information of land actually impacted or expected to be impacted by the receding Salton Sea.

3.1.1.3 SURFACE CHARACTERISTICS

Playa salt crusts, sand sheets, beach deposits and soil surfaces (surfaces) are a major focus of this SS AQM Program because they represent potential sources of PM_{10} emissions. The mechanisms for production of PM_{10} emissions from playas are relatively well understood. In general, large sustained emissions from playas occur when sand, or sand-sized particles, are moved by high wind (generally 15 miles per hour or greater) such that they begin to bounce or “saltate” across the playa surface. As the moving particles repeatedly impact the fragile salt crust, they can dislodge smaller particles into the air and generate dust. This also can expose underlying and sometimes more erodible soil layers. While the mechanism of saltation is well understood, the vulnerability of different playa surfaces to erosion is not well understood and is known to be highly variable (both spatially and temporally). For instance, some playa surfaces have characteristics that make them more susceptible to erosion (i.e., fluffy, loose salt crust), whereas other surfaces are rigid and sturdy and strongly resist erosion.

Overall, playa surfaces dominated by coarser-textured (sandy) soils have more predictable emissions because emissions are largely a factor of saltating sand. In contrast, emissions from playa surfaces with finer-textured, clay soils have less predictable emissions because of sensitivity to environmental influences (e.g., climatic, hydrologic and anthropogenic). For example, annual weather patterns, including timing of precipitation events, high wind speeds, diurnal temperature changes, depth to groundwater and relative humidity can cause playa surface mineralogy dynamics to change, and increase (or decrease) the potential risk of erosion. The emission inventory under this SS AQM Program will identify the playa surface characteristics and surface mineralogy dynamics that create salt crust conditions vulnerable to erosion. These activities will be designed to provide a better understanding of salt crust formation and erosion at the Salton Sea.

Research and monitoring of playa surface characteristics are divided into two broad categories: existing playa and future playa. Each is described below. Technical details on this monitoring approach are provided in Appendix B.

3.1.1.3.1 EXISTING PLAYA

Existing playa surfaces provide insight into the range of conditions that may be reasonably expected as other playa surfaces are gradually exposed. Specifically, properties controlled by evaporate (water-

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soluble salt) mineral dynamics (e.g., surface type, surface crust thickness and surface crust hardness) will be mapped and monitored because they are directly related to the spatial and temporal nature of PM_{10} dust emissions.[50]

Extensive playa surface survey monitoring methodology originally developed for Owens Lake is being adapted for use at the Salton Sea. This includes monitoring protocols and methodology to accurately map existing playa surface characteristics (analogous to soil map units) using remotely sensed data resources and ground-based surface evaluations. Ground-based surface evaluations include detailed characterization of surface properties related to erosion (Table 3-3). These datasets will then be used as calibration data to spatially map playa surface types, vegetation and other surface characteristics using LiDAR (Light Detection and Ranging), UAV (unmanned aerial vehicle) imagery and other sources of satellite-based imagery (Figure 3-5). These mapping efforts will be done periodically to provide an updated inventory of exposed playa surface units and associated physical characteristics. These data will be used in the assessment of playa emissions potential (see Section 3.1.1.4). Surface classification and mapping methodology will be further adapted as playa exposure progresses and a wider diversity of playa surface categories may become apparent.

[50] Buck, B., J. King, and V. Etyemezian. Effects of Salt Mineralogy on Dust Emissions, Salton Sea, California (2011), Soil Sci. Soc. Am. J. 75:1958–1972. doi:10.2136/sssaj2011.0049.

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FIGURE 3-5. EXAMPLE PLAYA SURFACE CLASSIFICATION MAP

This playa surface classification map was developed using high-resolution aerial imagery and LiDAR data. Playa surface map units and vegetation characteristics provide information related to emissions potential of exposure playa.

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TABLE 3-3. SURFACE PROPERTIES COLLECTED DURING SURFACE CHARACTERIZATION EVENTS

Surface Property	Description
Crust Type	Crust categories may include: smooth, botryoidal, weak botryoidal, hummocky and networked. The dominant crust type of the observation area will be characterized, and if other types are present in smaller amounts, they will be noted as inclusions. Additional crust categories may be developed specifically for the Salton Sea Playa.
Crust Thickness	Crust thickness is measured from the top of salt crust to the top of soil. In some places, the salt crust will be divided into two distinctly different layers: top crust and sub crust. Top crust is usually a harder, salt-cemented crust that forms a shell over the surface. Sub crust usually has weak structure (i.e., soft or crumbly) and extends from the bottom of the top crust to the underlying, often looser soil. In some cases, a top crust will exist without a sub crust and will be directly overlaying the soil. Total crust thickness is considered the sum of top crust and sub crust.
Soil Moisture	Soil moisture will be qualitatively assessed for the first one to two inches of soil directly below the crust. Soil moisture can be classified based on USDA-NRCS classification parameters (Schoenenberger et al., 2002). Soils will usually range from slightly moist to saturated where crust exists and dry to saturated where no crust exists.
Crust Relief	Crust relief is measured to provide a more refined understanding of surface roughness. Roughness affects wind resistance and surface wind velocities and is therefore useful in wind-erosion modeling. Crust relief is determined by measuring the distance from the bottom of a crust depression to the top of a typical crust ridge. Networked, botryoidal and hummocky crusts usually have the greatest relief.
Crust Hardness	Crust hardness indicates the degree of erosion resistance. Crust hardness can be characterized by the amount of force necessary to crush the salt crust by hand according to USDA-NRCS guidelines (Schoenenberger et al., 2002). On average, smooth and weak botryoidal crust types are the softest, while networked and hummocky crusts are harder. Hardness of both top crust and sub crust will be assessed if distinct surface and sub crusts are present. In addition, the "ball drop method" will be used to evaluate crust hardness at each location using Rule 800 specifications
Penetration Resistance	Penetration resistance can be measured with a penetrometer. A penetrometer is inserted through the total crust depth to assess crust resistance. Local penetration resistance can vary substantially and will be measured at several points to calculate an average penetration resistance for a crust type.
Surface Erosion	Surface erosion is generally characterized as a percentage of total crust area that appears to have been eroded by wind. This can be done with visual or remote-sensing techniques.
Free Surface Sand	Free surface sand is visually determined by estimating the percentage of free, sand-sized particles in a square meter of playa surface. The amount of free sand can vary seasonally with crust development, because forming crusts can encapsulate surface sand as they harden. Free sand particles on the surface are often very fine and settle into very small depressions in crust surfaces.
Percentage Vegetation, Overflow and Other Features	Percent surface area of vegetative cover, dune area, berm area, overflow area and representative playa area will be estimated. These estimates will provide a distribution of small inclusions relative to the dominant mapped surface condition. These features also have implications for the formation of crusts and erodibility; percent overflow area and vegetative cover are probably the most influential of these features. The surface area assessment can be performed visually (from the ground) or using remote-sensing techniques.

3.1.1.3.2 FUTURE PLAYA

This SS AQM Program will assess inundated playa soils using datasets and analyses related to Salton Sea floor bathymetry and sediment characteristics. Acoustic sonar data collected by the Bureau of Reclamation were analyzed to provide planning level information on surface soil characteristics of the currently inundated playa. These data were collected at two sonar frequencies (50 khz and 200khz) and combined with ground-truth data of soil sediment characteristics (Figure 3-6). The resulting spatial maps predict surface sediment texture, soft sediment depth, surface roughness/complexity and barnacle bed locations. These data are valuable for understanding the types of soils and surfaces that

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will be exposed as the Salton Sea recedes and for establishing monitoring protocols for specific soil types. In addition, results also provide insight into the types of dust control measures that may work well in specific regions of future exposed playa.

If additional datasets and analyses are required to provide greater detail on currently inundated playa soils, then they will be developed as part of this SS AQM Program. This may include optical Salton Sea floor mapping products designed to quantify sediment characteristics. This can be accomplished using various techniques, but the most promising technique is Sediment Profile Imaging (SPI). SPI is an optical remote monitoring technique used to image, measure and analyze the physical, chemical and biological parameters in aquatic environments to a depth of eight inches or more.

3.1.1.4 Assessing the Emission Potential of Exposed Playa Surfaces

This SS AQM Program will assess which playa surfaces and conditions are actually emissive and identify source areas associated with erosion events. This section describes the purpose of assessing emission potential, the field measurement system and the sampling program.

3.1.1.4.1 Purpose

Periodically assessing the emission potential of exposed Salton Sea playa will serve three purposes:

1. Periodic updating of the emission inventory for exposed Salton Sea playa. To the extent practical, the emission inventory will be refined to differentiate the *active* exposed playa sources (see Section 3.1.1.5).
2. Characterizing the "dust season(s)" on the Salton Sea playa; that is, the times of the year when dust emissions typically occur under different climate and soil conditions.
3. Establishing PM_{10} emission rates (in units of mass per unit area per unit time, e.g. $\mu g/m^3$) for different types of exposed playa. The data will be used to model the PM_{10} contributions at nearby monitoring stations.

The next two sections describe the measurement system and how it will be used on Salton Sea playa.

3.1.1.4.2 Field Measurement System

The emission potential of exposed playa surfaces will be assessed using a device called the Portable In-Situ Wind Erosion Laboratory (PI-SWERL), developed by Vicken Etyemezian and others at the Desert Research Institute, Reno, Nevada (Figure 3-7). The PI-SWERL instrument is an open-bottomed, cylindrical chamber with a top-mounted, direct-current motor that spins a metal ring inside the chamber about 2.5 inches above, and parallel to, the soil surface. Principles of fluid mechanics allow simulation of the turbulence conditions that produce dust storms in the surrounding environment. The spinning ring creates a shear stress profile (which produces turbulence), lofting soil and dust particles, and passing them through particle samplers (both sand-sized and dust-sized particles). The PI-SWERL electronically measures the number and size of suspended particles over the duration of a test cycle, typically less than 10 minutes. By controlling the speed of the ring to simulate varying wind speeds, the potential for a soil surface to produce PM_{10} dust emissions can be determined under a range of simulated wind conditions.

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FIGURE 3-6. SOIL CHARACTERISTICS OF FUTURE EXPOSED PLAYA FROM ACOUSTIC SONAR DATA

Acoustic sonar data from the Bureau of Reclamation were used to map sediment characteristics of future exposured playa. This information will be used for planning monitoring activities and dust control as playa is exposed.

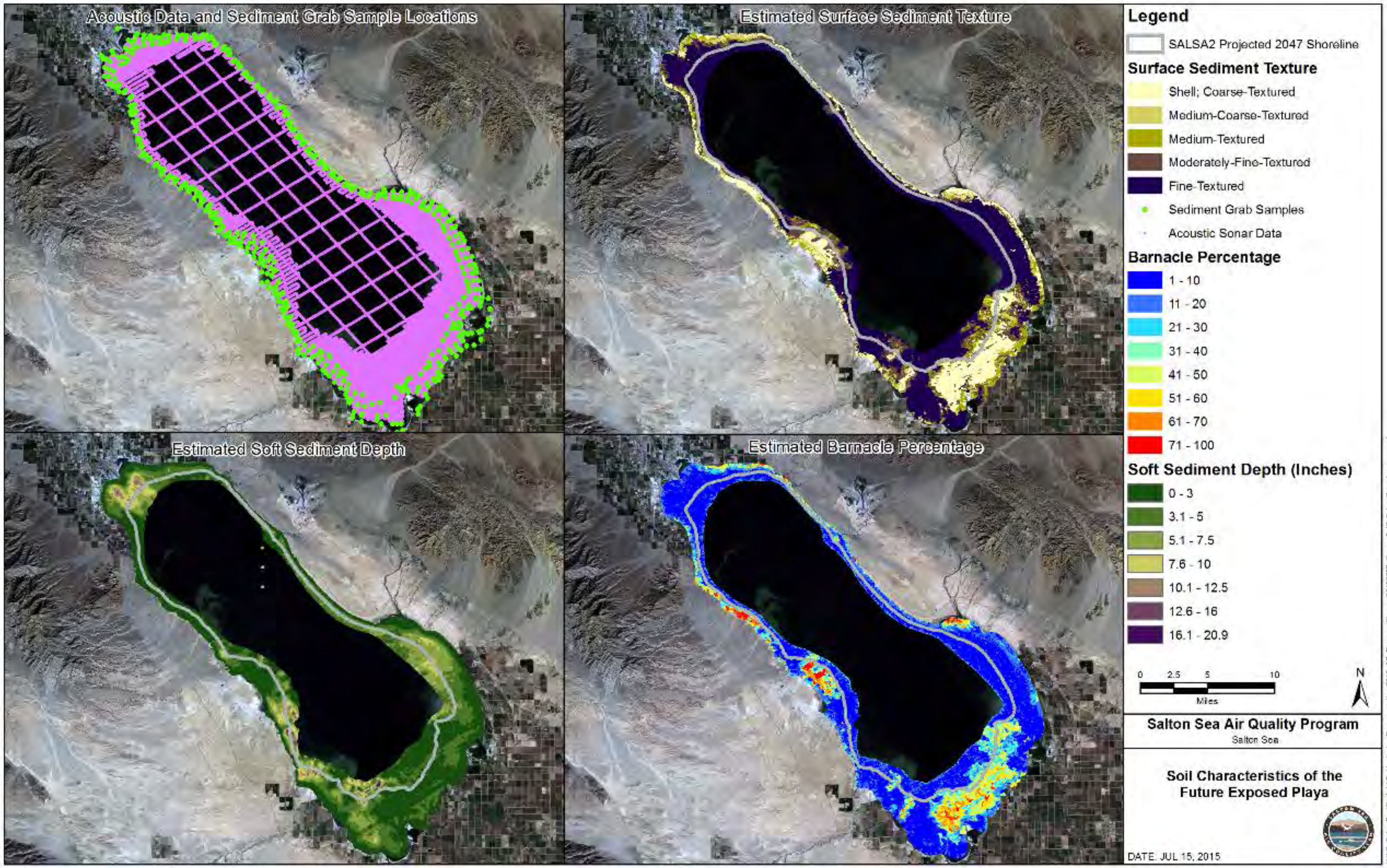

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FIGURE 3-7. PORTABLE IN-SITU WIND EROSION LABORATORY (PI-SWERL)

The PI-SWERL (silver chamber on the right side of photograph) uses a tri-wheeled buggy (left side of photograph) to transport the instrument and all supporting components. The PI-SWERL measures 30 centimeters (roughly 12 inches) in diameter.

The PI-SWERL is a highly portable, easy-to-use device that measures potential sand motion and dust emissions from surfaces under field conditions. The advantage of the PI-SWERL over the traditional rectangular field wind tunnels is its portability combined with rapid testing at a site. The ease and speed of conducting tests allows the investigator to perform many replicate measurements in an efficient manner (typically 25-35 tests daily). The instrument has been used to evaluate potential sand motion and PM_{10} emissions throughout the southwestern United States, as well as abroad.[51]

3.1.1.4.3 PI-SWERL OPERATION ON SALTON SEA PLAYA

This SS AQM Program includes a PI-SWERL sampling program. PI-SWERL sampling will occur monthly on each identified playa surface type, barring wet soils or other conditions that might limit site access. Monthly results will facilitate a better understanding of the "dust season" on different parts of the

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[51] King, James, et al. 2011. Dust emission variability at the Salton Sea, California, USA. Aeolian Research 3.1: 67-79; Macpherson, Torin, et al. 2008. Dust emissions from undisturbed and disturbed supply-limited desert surfaces. Journal of Geophysical Research: Earth Surface (2003–2012) 113.F2; Goossens, Dirk, and Brenda Buck. 2009. Dust dynamics in off-road vehicle trails: measurements on 16 arid soil types, Nevada, USA. Journal of environmental management 90.11: 3458-3469; Bacon, Steven N., et al. 2011. Total suspended particulate matter emissions at high friction velocities from desert landforms. Journal of Geophysical Research: Earth Surface (2003–2012) 116.F3.

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Salton Sea playa. Each surface type will be randomly sampled with a fixed number of replications. Replications are essential for understanding the range of variability that exists within an identified surface type.

The PI-SWERL sampling program will occur across the entire exposed playa, not just the portion that is actively emissive. However, additional sampling will occur within and around the active source areas. Appendix B contains a detailed sampling plan, including the process for determining the number of sampling locations and replications within each surface type.

3.1.1.5 Delineating Active Areas on Exposed Playa

The success of the proactive dust control program described in Section 3.2.1 depends on having available the means to quickly and reliably map dust sources over the vast areas of exposed Salton Sea playa. An efficient way to accomplish this would be to take high-resolution aerial photographs of the playa during high-wind events. The photographs would be evaluated to reveal areas with the highest dust concentrations, which would help to differentiate source areas from more dispersed dust plumes. Relatively low altitude flights over the surface should allow closer inspection of surface activity.

Another approach, albeit somewhat more complicated and costly, would involve traversing the playa with scanning LiDAR mounted on a commercial aircraft. Dust sources would be revealed by filtering out the ground and any low-return-intensity signals indicating a dispersed dust plume. The filtered results would be associated with the highest dust concentrations from or near the point of emissions.

Mapping the playa several times during a single high wind event and then comparing the results across several high wind events would produce a greater understanding of where and how often dust emissions are occurring on the playa. The information would be applied to help prioritize proactive dust controls. Both aerial mapping methods are expensive, but would produce far greater certainty than other fixed monitoring technologies and would lead to a far more cost-effective system than simply placing dust control measures everywhere on the playa.

Several organizations and vendors have this capability, including NASA's Jet Propulsion Laboratory in Pasadena, California. An on-call contract would be necessary to ensure that aircraft can be deployed as needed during active dust storms.

3.1.1.6 Estimating Emissions on Active Areas

The PI-SWERL sampling and active area delineation will enable two types of emission estimates: maximum daily emissions (tpd for active source areas) and total annual emissions (tons per year [tpy] for all active source areas). Each is described below.

3.1.1.6.1 Maximum Daily Emissions

The PI-SWERL-measured emission potential is expected to vary over time depending on the surface type, climate conditions (e.g., temperature, wind speed, wind direction) and other factors. Similarly, the source areas active at any one time are also expected to vary by the same conditions. Accordingly, the maximum daily emissions will be computed by multiplying the maximum daily active area (in square

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meters) by the maximum emission potential (in grams of PM_{10} per square meter per day) *for each identified source type*. The sum of all the source types on the playa yields the maximum daily emissions for the entire playa (converted to tpd). Maximum daily emissions will be computed on a yearly basis.

3.1.1.6.2 Total Annual Emissions

In similar fashion, the total annual emissions will be estimated by summing the product of the average active area per month (in square meters) by the average emission potential (in tons of PM_{10} per square meter per month) for all source types and months. The final units will be in tpy.

3.1.1.7 Modeling Impacts at Monitoring Stations

The CALPUFF modeling system will be used to model the impact of the maximum daily emissions from exposed playa sources at monitoring stations located around Imperial and Riverside Counties. The purpose is to assess the relative contribution of exposed playa sources at the monitors. The difference between the observed PM_{10} concentrations at the monitors and the CALPUFF-predicted PM_{10} concentration is that the CALPUFF emission rates will be based on the maximum daily emission estimate (see Section 3.1.1.6.1).

3.1.2 Non-Playa Sources

This section describes the methods used to evaluate dust emissions from the open areas around the Salton Sea. This section also summarizes the methods used to compute total annual emissions and maximum daily emission rate by surface type within the area of interest (AOI). The approach, AOI, surface types, monitoring and estimation of emission rates are described below. Detailed technical information on the off-Sea inventory plan is provided in Appendix C.

3.1.2.1 Approach

Several lines of evidence will be used to establish the location, timing and magnitude of dust emissions from off-Sea areas, including: (1) "PM_{10} roses"[52] using data from the PM_{10} monitoring network on the west side of the Salton Sea; (2) a network of fixed sand motion monitoring instruments placed within various surface types; (3) video monitoring to provide visual evidence of dust emissions; and (4) PI-SWERL sampling to characterize the emission potential of various surface types.

This information will be used to confirm the location and timing of off-Sea emissions and to support an updated PM_{10} emission inventory that may be used for the revised Imperial County PM_{10} SIP (see Section 2.3.1).

3.1.2.2 Area of Interest

The off-Sea inventory AOI is a 5,805-square-mile area that encompasses the Salton Trough and portions of the surrounding mountain ranges (Figure 3-8). Its southern margin follows the Mexican-American border. It does not include the agricultural areas of the Imperial and Coachella Valleys, nor the Salton Sea. This AOI extent was chosen because it represents the majority of desert surfaces that account for open-area emissions in the Salton Sea Air Basin.

[52] PM_{10} roses are similar to wind roses; however, in the case of the former, the "petals" show the frequency, magnitude and direction of PM_{10} concentrations rather than wind speed.

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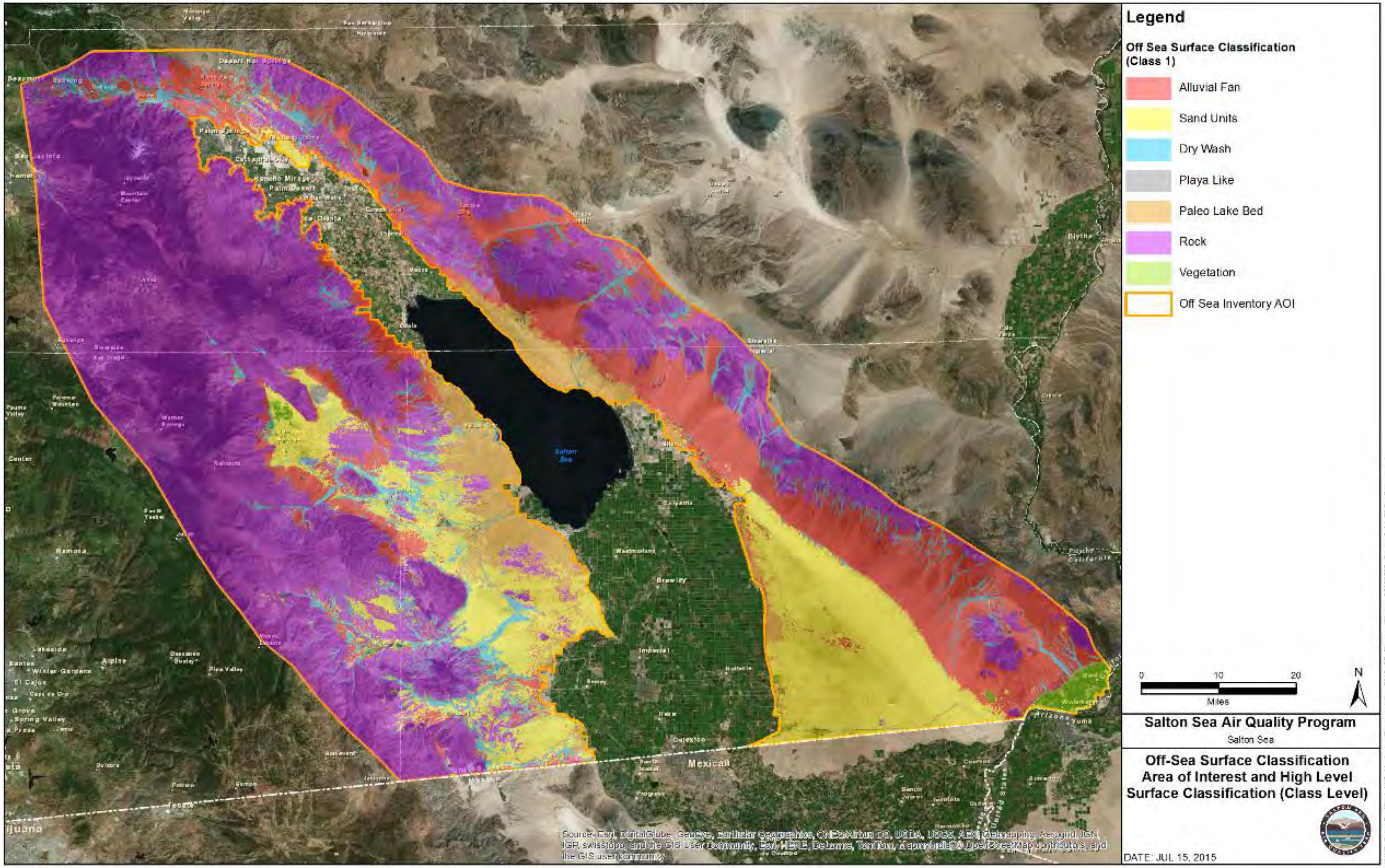
FIGURE 3-8. OFF-SEA SOURCE INVENTORY AREA OF INTEREST (AOI)

The extent of the off-Sea source inventory AOI encompasses the desert surface in the Salton Sea Air Basin contributing to open area emissions.



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3.1.2.3 Surface Types

A surface type classification system was developed in order to quantify off-Sea dust sources. The classification system was created by researching the desert surfaces present in the region, targeted field investigations and the photointerpretation of satellite imagery. The surface types used in this classification system are detailed below (Table 3-4 and Figure 3-9, Figure 3-10, Figure 3-11 and Figure 3-12). Vegetative cover and surface armoring will be spatially mapped using remote sensing based imagery techniques.

Table 3-4. Off-Sea Surface Classification Legend

Class	Sub-Class	Description	Erosion Risk
1-Dry Wash Units	Sand Dominated	Ephemeral drainage dominated by well sorted, fine to coarse grained sand.	High
	Silt Dominated	Ephemeral drainage dominated by silt. Undisturbed silt found in dry washes is often present as a fragile thin mud-cracked sheet.	High
	Gravel Dominated	Ephemeral drainage dominated by gravel.	Low
	Gravel and Sand	Ephemeral drainage consisting of gravel evenly distributed among a sandy matrix. Poor to moderately sorted. The upper surface often has been coarsened by wind erosion and/or OHV activity.	Medium
	Gravel and Silt	Ephemeral drainage consisting of gravel evenly distributed among a silty matrix. Poor to moderately sorted. The upper surface often has been coarsened by wind erosion and/or OHV activity.	Medium
2-Alluvial Fan Units	Sand Dominated	Alluvial fan deposits consisting of primarily sand. Typically located near the periphery of the fan.	High
	Sand and gravel	Alluvial sand capped by gravel lag. Typically located near the middle of the fan.	Medium
	Cobbles	Alluvial fan deposits consisting of sand, gravel and cobbles. Typically located near the top of the fan.	Low
3-Sand Units	Sand Dunes	Active aeolian dune and erosional interdune surface. Large asymmetrical, elongated Transerve dunes are the most common in this region. Dunes are > 1.5 M and typically fine to medium grained.	High
	Sand Sheet	Active aeolian deposit. Flat to low angle, uniform, expansive sand surface. Typically fine to medium grained.	High
	Sand over Alluvium	Sand sheets and coppice dunes < 1.5 m in height superimposed on alluvium. Coppice dunes are small vegetated sand mounds that form when a shrub impedes the flow of air and causes sand grains to settle out on the downwind side of the shrub.	High
4-Paleo Lakebed	Silt-Dominated	Well sorted lacustrine silt deposits from pre-historic Lake Cahuilla.	High
	Cobble over Silt	Large Cobbles regularly distributed among silt situated along the margin of pre-historic Lake Cahuilla. The cobbles serve as armory for the vulnerable underlying silt. The cobbles were deposited by wave action from Lake Cahuilla.	Medium
	Gravel and Sand	A mixture of gravel and sand present on old beach ridges formed by wave action.	Low
6-Rock Units	Sandstone	Highly friable, heavily eroded sandstone. Often taking the form of steep gullies.	Medium
	Bedrock	Undifferentiated bedrock. A consolidated hard surface that is not emissive.	Very Low

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Class	Sub-Class	Description	Erosion Risk
7- Offshore Playa Unit	Offshore Playa	Independent depressions that once held water and now have formed evaporites among very delicate mud-cracked silt. The underside of the mud cracks has a distinct micaceous sheen.	High

FIGURE 3-9. (A) SAND-DOMINATED DRY WASH WITH HEAVY OHV TRAFFIC AND (B) GRAVEL- AND SAND-DOMINATED ALLUVIAL FAN

A. Sand-Dominated Dry Wash with Heavy OHV Traffic

B. Gravel- and Sand-Dominated Alluvial Fan

FIGURE 3-10. (A) LARGE SAND SHEET AND (B) THE ALGODONES DUNE FIELD

A. Large Sand Sheet

B. The Algodones Dune Field

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FIGURE 3-11. (A) COBBLES DISTRIBUTED OVER SILT-DOMINATED PALEO LAKEBED AND (B) SILT-DOMINATED PALEO LAKEBED

A. Cobbles Distributed over Silt-Dominated Paleo Lakebed

B. Silt-Dominated Paleo Lakebed

FIGURE 3-12. (A) SANDSTONE BEDROCK AND (B) OFFSHORE PLAYA

A. Sandstone Bedrock

B. Offshore Playa

3.1.2.4 OFF-SEA / OPEN AREA LAND OWNERSHIP

The majority of the land within the off-Sea inventory AOI is owned by the federal government, the State of California and private landowners. In the east, the Algodones Dunes, the Chocolate Mountains and portions of the Mecca and Indio Hills are owned by the federal government. They also own the San Jacinto Mountains in the northwest and a large portion of the land south of the Superstition Hills. The State of California owns the Santa Rosa Mountains, Anza Borrego State Park and a large portion of the surrounding area in the west. Private land is interspersed throughout the AOI.

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3.1.2.5 MONITORING COMPONENTS

The monitoring components needed to confirm the location and timing of off-Sea emissions and to support an updated PM_{10} emission inventory are discussed below. Appendix C contains a more detailed description of each component.

3.1.2.5.1 AMBIENT PM_{10} CONCENTRATIONS

Since February 2010, five-minute- and one-hour-average ambient PM10 concentrations have been recorded continuously at six locations around the Salton Sea, including two on the west side of the Salton Sea: one at Salton City and the other at the Naval Test Station (Figure 3-13). All stations measure PM_{10} as well as particulate matter less than 2.5 microns in aerodynamic diameter, or $PM_{2.5}$ (Table 3-5). The PM coarse fraction is calculated as: $PM_{Coarse} = PM_{10} - PM_{2.5}$.

All six stations have all been in continuous operation since the start of the program. For the first two years, ICAPCD maintained the instruments and CARB conducted annual audits of the instruments. However, in July 2011, IID took over responsibility for operating and maintaining the PM_{10} network. IID is also responsible for operating and maintaining the meteorological instruments described in the next section.

FIGURE 3-13. SALTON SEA PM10 MONITORING LOCATIONS

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TABLE 3-5. SALTON SEA AEROMETRIC MONITORING INSTRUMENTS

Parameter	Instrument	Comment
Particulate Matter Concentrations	Thermo Fisher Scientific TEOM 1405-D	Real-time measurements of PM_{10} and $PM_{2.5}$
3-Dimensional Wind Speed and Direction	R. M. Young Sonic Anemometer, Model 8100	10-meter height
Horizontal Wind Speed	R. M. Young Gill 3-Cup Anemometer, Model 12101	1-, 2- and 10- meter heights
Ambient Temperature	R. M. Young Platinum Temperature Probe, Model 41342VF	2-meter and 10-meter with aspirated radiation shields
Relative Humidity	R. M. Young Relative Humidity/Temperature Probe, Model 41382VF	2-meter with multi-plate radiation shield
Net Radiation	Met One Instruments Net Radiometer, Model 097	1-meter

The PM_{10} data, along with the meteorological data described in the next section, will be used to generate dust (or PM_{10}) roses for the west side of the Salton Sea. PM_{10} roses are especially useful because they are easy to interpret and reveal the frequency, magnitude and direction of dust sources affecting each PM_{10} monitor. An example set of PM_{10} roses is presented in Figure 3-14. Note that for the year 2014, significant dust sources existed in the desert area west of the Naval Test Station (NTS) monitor and west-southwest of the Salton City (SC) monitor. Appendix C contains a detailed description of the ambient PM_{10} monitoring protocol.

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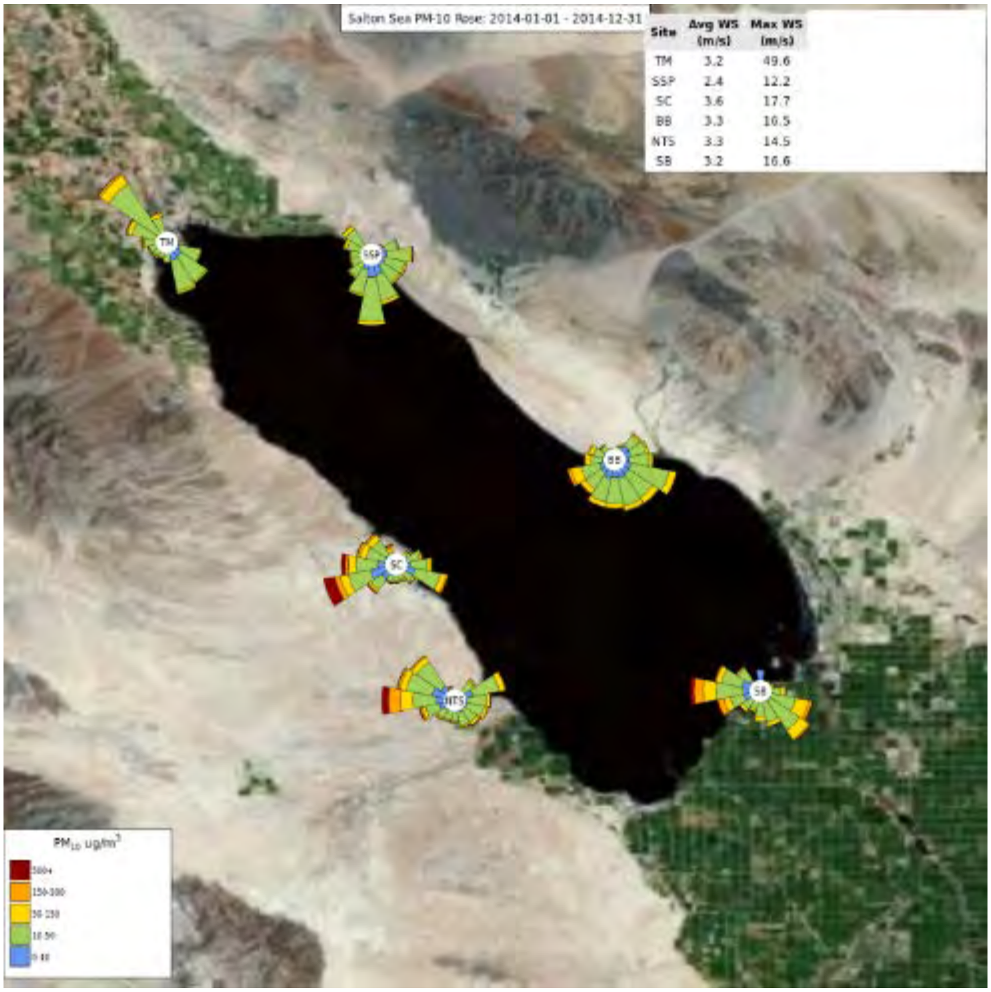
FIGURE 3-14. EXAMPLE SET OF PM10 ROSES FOR SALTON SEA, 2014



3.1.2.5.2 METEOROLOGY

The TEOMs described in Table 3-5 each have a co-located 10-meter-tall meteorological tower equipped with the instruments needed to calculate surface roughness length as well as to support standard regulatory air dispersion models (e.g., AERMOD and CALPUFF). The meteorological instruments mounted on each tower are summarized in Table 3-5. The three-dimensional sonic anemometer data are used to calculate five-minute and hourly wind directions.

3.1.2.5.3 SAND MOTION

Sand motion monitors, including Sensits and Cox Sand Catchers (CSC), will be used to establish real-time horizontal sand fluxes on the various off-Sea surface types identified within the AOI. Horizontal sand flux data, combined with surface-type-specific emission factors (either from published scientific literature or from the PI-SWERL), will be used to calculate vertical PM_{10} fluxes on the surfaces. The individual-area PM_{10} fluxes (in grams of PM_{10} per square meter per hour) will be summed to yield the area-wide PM_{10} emissions. Appendix D contains a detailed description of the sand motion monitoring protocol.

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3.1.2.5.4 PI-SWERL SAMPLING

PI-SWERL sampling will occur periodically on the surface types identified within the off-Sea inventory AOI. Appendix D contains a detailed description of the PI-SWERL sampling protocol.

3.1.2.5.5 VIDEO MONITORING

Portable video monitoring systems will be scattered around the AOI, focused primarily on the most active dust-producing areas west of the Salton Sea. Appendix D contains a detailed description of the video monitoring protocol.

3.1.2.6 ESTIMATING EMISSION RATES

The various types of monitoring and active area delineation will enable two types of emission estimates: maximum daily emissions (tpd for active source areas) and total annual emissions (tpy for active source areas).

3.1.2.6.1 MAXIMUM DAILY EMISSIONS

Maximum daily emissions will be computed by each of the following methods:

- Method 1: Worst-day measured horizontal sand fluxes coupled with PI-SWERL-generated emission factors.
- Method 2: PI-SWERL-generated vertical PM_{10} fluxes (varies with surface friction velocity, u_*) coupled with CALMET[53] estimates of surface friction velocity as a function of the worst-day meteorology.

Each of these methods will be applied to individual source areas identified using the methods described in Section 3.1.2.2, Area of Interest. The individual-area results will be totaled to yield the maximum daily emissions for the AOI. The results will be expressed in units of tpd.

3.1.2.6.2 TOTAL ANNUAL EMISSIONS

The total annual emissions will be calculated using the same methods outlined above in Section 3.1.2.6.1, except that the worst-day horizontal sand fluxes in Method 1 will be replaced with average daily horizontal sand fluxes (averaged over one year) and the PI-SWERL-generated vertical PM_{10} fluxes in Method 2 will be applied for each day of the year (i.e., using the meteorology from each day) and then summed. The results will be expressed in units of tpy.

3.1.3 UPDATES TO THE EMISSION INVENTORIES

The Salton Sea playa emission inventory described in Section 3.1.1 will be updated annually. Monitoring results related to the location and timing of playa exposure, salt crust surface characteristics and the

[53] CALMET, part of the CALPUFF modeling system, is a diagnostic meteorological model that reconstructs 3-dimensional wind and temperature fields starting from meteorological measurements, orography and land use data. http://www.arb.ca.gov/html/soft.htm

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associated emission potentials will be evaluated on an on-going basis and may be done in consultation with the Imperial County and ICAPCD. Results will be used to (1) identify and prioritize implementation of proactive DCMs on active source areas and (2) inform development of Annual Proactive Dust Control Plans (Section 3.2.1.2).

For purposes of this SS AQM Program, the off-Sea emission inventory described in Section 3.1.2 is currently planned to be performed only once unless and until it is necessary to perform this inventory again due to substantial changes in the off-Sea emission sources. However, Imperial County, ICAPCD and/or IID may choose to update the off-Sea emission inventory at any time for any reason or in the event the source characteristics change (either for better or worse). The updated inventories may consider the use of new technologies and methods as they become available.

3.2 Dust Control Strategy

This section describes the dust control strategy for PM_{10} emissions from exposed Salton Sea playa. The main components of the dust control strategy will be collaboratively developed with the Imperial County and ICAPCD, and include the following:

- Develop and implement proactive dust control measures (DCMs) to prevent source areas from becoming a significant source of PM_{10} emissions. This includes development and testing of new DCMs that are specifically tailored to the climate and soil conditions on and around the Salton Sea playa.
- Develop a dust control strategy that can comply with the ICAPCD Regulation VIII rules to the maximum extent possible, utilizing opportunities for alternative BACM to be approved, and identify opportunities to establish new procedures and rules and/or improve existing procedures and rules to fully and successfully implement an effective dust control strategy.
- Develop and implement a playa traffic management plan focused on public outreach and education to prevent disturbance and erosion due to off-highway vehicle (OHV) traffic.

3.2.1 Conceptual Proactive Dust Control Strategy

The goal of proactive dust control is to prevent exposed Salton Sea playa from becoming a significant source of PM_{10} emissions, which will help protect the public health of the communities near and around the Sea. The proactive dust control strategy would be collaboratively developed with the Imperial County and ICAPCD. It will include broad-scale implementation of DCMs that are protective of air quality, but that are also adaptable given the unknowns regarding temporal exposure and the magnitude of future emissions. As playa is exposed, the surface characteristics and emission potential will be rigorously evaluated (see Section 3.1.1). Initially, results from these evaluations will be used to establish criteria to identify and prioritize areas of exposed playa that have high emission potential. Criteria will be developed for each playa evaluation method (e.g., PI-SWERL data, video monitoring), such that any individual line of evidence could be used to prioritize proactive control areas. Once the criteria are established, IID will use the monitoring results to develop and implement an Annual Proactive Dust Control Plan. Results from the active source delineations will be used to prioritize DCM implementation on an on-going basis. This process is illustrated in Figure ES-1.

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Each site would be monitored after DCM implementation to confirm that adequate surface stabilization is maintained. If the initial proactive DCM implementation on the site does not achieve a stabilized surface or if visible emissions occur, then the DCM would be further enhanced. This approach allows resources to be allocated efficiently and effectively, and in an expeditious manner to prevent significant sources of PM_{10} emissions.

The success of a proactive dust control strategy requires the development and testing of DCMs that can be quickly implemented, adequately maintain a stabilized surface and prevent the spread of emissive source areas as playa is exposed. Several DCMs have been field-tested and proven to be effective on playas, while other measures need additional research prior to use at the Salton Sea. Examples of proactive DCMs that could be used at the Salton Sea include surface stabilizers, soil roughening, water-efficient vegetation, vegetated swales, vegetation beach ridge enhancement and roughness elements, such as straw bales. Detailed descriptions of DCMs are included as Appendix E. Some of these measures require further pilot field testing to understand their effectiveness on Salton Sea playa (Section 3.2.1.1).

3.2.1.1 Pilot-Testing for New Dust Control Measures

The dust control strategy includes the development and testing of new DCMs for proactive control and/or for approval as BACM by the ICAPCD and the EPA. The DCMs will be specifically tailored to the climate and soil conditions on and around the Salton Sea playa and make efficient use of available resources. Some DCMs have been field-tested and proven to be effective and some DCMs need additional research prior to use at the Salton Sea. For the more novel and untested approaches, pilot field testing (pilot projects) will occur. The purpose of the pilot projects will be to perform field tests to understand DCM performance on the Salton Sea playa and to support ICAPCD and EPA approval of these DCMs as BACM.

As part of this SS AQM Program, IID is working cooperatively with Imperial County and ICAPCD on several DCM pilot projects. A surface stabilizer pilot project was completed in 2011 and surface roughening and plant community enhancement pilot projects were implemented in 2015. A vegetated swale pilot project is currently being planned. Pilot project sites were selected to represent the range of future playa surface and emission characteristics. Potential sites also were screened according to factors influencing their suitability, including, but not limited to: size, land ownership, permitting challenges, compatibility with anticipated operations and potential future land uses.

Pilot projects will allow IID, the Imperial County and ICAPCD to gain experience and understanding of novel, locally-adapted methods of DCMs and the site-specific factors that could affect their feasibility and cost. Pilot projects also are useful for determining the effectiveness of a DCM and refining design criteria for full-scale implementation. This helps develop efficient approaches for the design, construction and operation of DCMs on the playa.

3.2.1.2 Annual Proactive Dust Control Planning and Implementation

Results from the playa emissions inventory (Section 3.1) will be used to develop an Annual Proactive Dust Control Plan. The plans will be developed by IID in the first quarter of every year and may be done

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in consultation with the Imperial County and ICAPCD. They will include a synthesis of monitoring data for the prior year and will identify and prioritize areas for implementation of proactive DCMs. The plans may also incorporate considerations related to the transition of proactive dust control areas to alternative land uses, such as agriculture or habitat restoration.

3.2.2 ICAPCD Regulation VIII Rules for the Salton Sea Playa

IID intends to develop a proactive dust control strategy that complies with the regulatory requirements of ICAPCD and SCAQMD. However, IID recognizes that it may not be possible to maximize a proactive dust control strategy within existing rules and regulations. Therefore, there is a need to identify opportunities to establish new procedures and rules and/or improve existing procedures and rules to fully and successfully implement an effective dust control strategy to the maximum extent possible.

Exposed Salton Sea playa is subject to the ICAPCD Regulation VIII Rules related to the control of fugitive dust (see Section 2.3.2). Exposed Sea playa is currently subject to Rule 804 (see Section 2.3.2.2). There are several limitations in Rule 804 that would need to be addressed to allow maximum flexibility in implementing a proactive dust control strategy, including new DCMs specifically tailored to conditions on and around the Salton Sea playa.

The following list summarizes some of the limitations of Rule 804 and approaches for addressing them.

- Rule 804 applies to all persons who own or otherwise have jurisdiction or control over an open area. Landowners of exposed playa should have an opportunity to implement dust control in coordination with a responsible third party. While Rule 804 does not prohibit this from occurring, it does not specifically identify this opportunity and how it would work within the rule framework. Potential benefits for the ICAPCD include consolidated points of contact, improved coordination of dust mitigation (particularly for small, fragmented parcels) and consolidated responsible party resources.

- The existing definitions of a stabilized surface do not consider exposed playa surface characteristics and even though playa surfaces may be stable, they may not meet the definitions in Rule 800. A stabilized surface may be more appropriately defined by a broader set of performance standards and measurements, which could be verified through performance monitoring.

  For areas that do not meet the definition of a stabilized surface, the responsible parties should be able to proactively maintain or create a stabilized surface by any scientifically-based and tested reasonable means. The parties could monitor exposed playa to verify stability. In the event that the surface is not stabilized, then the parties would be required to augment the DCM to achieve stability with more intense control methods. This proactive dust control approach is described in more detail in Section 3.2.1.

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- Opacity observations are required to determine compliance with VDE standards, and must be conducted in accordance with the test procedures for "Visual Determination of Opacity" as described in Appendix A of Rule 800**.** Opacity observations to determine compliance with VDE standards are not an appropriate method to attribute dust plumes to specific source areas on such a vast land surface. Surfaces that meet the definition of stabilized surface should be considered adequately controlled. Furthermore, the air basin is designated as serious nonattainment for PM_{10} and isolated plumes are difficult to identify with standard opacity observations. This is a concern due to the significance of off-lake sources. According to the IC 2009 PM_{10} SIP (page 2-1):

  > "The vast majority of PM_{10} emissions impacting Imperial County originate from natural, non-anthropogenic sources (for instance, fugitive dust from barren lands alone accounts for >55% of average daily emissions). During high winds, Imperial County's desert areas can produce PM10 emissions over 50 times greater than the emissions from any anthropogenic source, including agricultural crop land."

3.2.3 Playa Traffic Management

The dust control strategy includes development and implementation of a playa traffic management plan. Extensive desert areas around the Salton Sea attract recreationalists and OHV traffic. OHV use is expected to expand onto the playa as the Salton Sea recedes. This activity will disturb the natural stability of playa crust and soil surfaces and increase erodibility and PM_{10} emissions. This is caused by the physical destruction of the fragile crusts by passes of vehicle tires. Tires pulverize the surface into sand-sized particles (Figure 3-15). These particles are then picked up by the wind, commencing saltation, and leading to loosening of many more particles downwind. This cascading effect increases erodibility on and around designated trails. The larger the footprint of vehicle use (through repeated passes), the larger the impact on the fragile playa crust.

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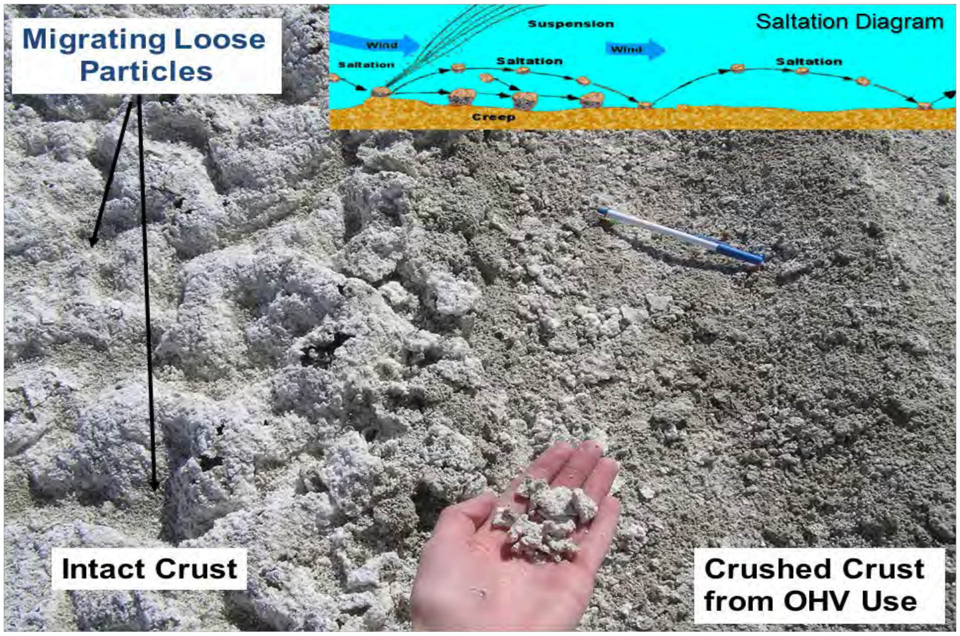

FIGURE 3-15. PHOTO OF SALT CRUST PULVERIZED BY OFF-HIGHWAY VEHICLE TRAFFIC

Prevention of vehicle related disturbances is the most important and cost-effective measure available to prevent and control emissions. Therefore, the playa traffic management plan will focus on limiting public access on fragile playa crusts to the extent legally and reasonably feasible. The ICAPCD, Bureau of Land Management (BLM) and California State Parks have found that approaches such as public outreach, education, sign posting, strategic fencing, gate installation and selectively closing or maintaining roads and trails are effective methods to control OHV activity. Therefore, rather than physical restriction of playa access, this SS AQM Program will focus on developing a plan that includes these approaches (Table 3-6).

TABLE 3-6. PLAYA TRAFFIC MANAGEMENT PLAN – PROGRAM ITEMS AND APPROACH

Program Item	Approach
Partnership and Educational Efforts	• Leverage partnerships relative to resource areas. Work cooperatively with partners to share resources and effectively manage OHV use around the Salton Sea. • Initiate public outreach effort which encourages OHV users to adopt a land use ethic that responsible OHV riders respect land resources and do not travel cross playa off roads and trails except in managed open areas. • Develop an education program in partnership with other federal and state agencies, counties, tribes, communities, OHV dealerships, user and other interest groups to teach the recreating public about the value of public land resources and how they can protect the environment while enjoying their recreation activities.
Land Use / Playa Planning	• Identify sensitive land resource and biological resource areas. • Determine appropriate use of these areas (if any). • Special emphasis on sensitive areas – Managing sensitive areas to ensure non-impairment.

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Program Item	Approach
Restrictive Orders and Monitoring	• Encourage the public to adopt a land use ethic that, except in managed open areas, cross country travel off roads and trails should no longer be considered a responsible use of vehicles. • Restrict vehicle use through signage, enforcement and education in: sensitive playa areas, mitigation facilities, habitat facilities, energy facilities, cultural sites, etc. • Ensure compliance through increased enforcement, posting signs, providing information and monitoring activities and impacts. Work to gain the cooperation and assistance of local government, private citizens and interest groups in completing these actions and obtaining voluntary compliance.
Adaptive Management	• Periodically look back at approach in place. Identify lessons learned and incorporate those into the revised management approach with partners. • Through monitoring results, identify if/where existing trails need to be augmented.

With the help of the basic framework outlined in Table 3-6, a Playa Traffic Management Plan will be more fully developed by IID in coordination with the Imperial County, ICAPCD, the resource agencies, California State Parks and other interested stakeholders. The plan will include an assessment element to gauge success of the plan and to determine whether modifications to the plan are necessary.

3.3 Estimated Program Costs

This section describes the rationale for estimating SS AQM Program costs. The cost estimates and assumptions described below should be considered "order of magnitude" because they were prepared without the benefit of site-specific dust control criteria or detailed designs necessary for more accurate cost estimation. Therefore, these estimates are for planning purposes only, derived from experience at Owens Lake and based on the assumptions outlined in the following sections.

3.3.1 Cost Assumptions

The following sections detail the assumptions used to develop long-term estimated program costs associated with implementing this SS AQM Program.

3.3.1.1 Rate of Playa Exposure

The timing and location of future playa exposure is a function of the hydrologic response of the Salton Sea to external forces, such as inflows, salt loads and evaporation rates. This cost estimate uses reasonable incremental playa exposure acreage estimates, which will be adjusted according to the results of the updated SALSA2 modeling that will be published in the hydrologic report anticipated to be released this summer. It is clear that actual playa exposure rates will affect the amount of playa that may become emissive and ultimately require dust control, thereby affecting the program costs.

For the purpose of estimating costs, a series of 6 construction phases between 2020 and 2045 were identified as dust control implementation periods. Yearly playa exposure estimates were then aggregated to these timeframes and considered in the cost estimate calculations (Table 3-7).

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TABLE 3-7 PLAYA EXPOSED FOR EACH CONSTRUCTION PHASE (ROUNDED TO THE NEAREST THOUSAND)

Year / Phase	Playa Exposed Per Phase (Acres)	Total Playa Exposed (Acres)
2020 / Phase 1	25,000	25,000
2025 / Phase 2	21,000	46,000
2030 / Phase 3	13,000	59,000
2035 / Phase 4	6,000	65,000
2040 / Phase 5	3,000	68,000
2045 / Phase 6	2,000	70,000

3.3.1.2 EMISSIVE CHARACTERISTICS OF THE PLAYA

The vast majority of the future exposed Salton Sea Playa is currently inundated. This makes it difficult to estimate the acreage of future playa that will be emissive (including the magnitude, timing and location of emissions) and require dust control. Restoration activities, including habitat projects and renewable energy development, on the future exposed playa are also uncertain with regard to location, size and timing. Additionally, other land management activities, which may or may not be included in the State's restoration activities, but may occur for other reasons are uncertain as well. Given these unknowns, the cost estimates assume 75 percent of the total playa exposure will be open, emissive and require some level of dust control. As a point of comparison, roughly 60 percent of the exposed Owens Lake playa is currently controlled.

3.3.1.3 DCMS APPROVED AS BACM

The types of DCMs available for implementation on future Salton Sea playa is an important component of the cost estimate. As described in Section 2.3.2.2, all exposed playa within the Imperial County is currently subject to ICAPCD Rule 804, Open Areas. Permissible BACM for open areas include: (1) applying water or chemical dust suppressants to all unvegetated areas, (2) establishing vegetation on previously disturbed areas, and (3) paving, applying and maintaining gravel, or applying and maintaining chemical dust suppressants. Additionally, alternative BACM may become permissible BACM once it has been approved by ICAPCD and the EPA according to the procedure outlined in Rule 804.

This SS AQM Program focuses on developing a proactive dust control strategy specific to the Salton Sea with DCMs that are science-based, practical, effective and feasible, and are anticipated to be approved as BACM for Salton Sea surfaces. While IID recognizes that air quality is ultimately regulated by the local air quality districts and the EPA and this program is structured to work with those agencies and within the applicable regulations, this program takes a broad and proactive approach that is not limited to currently approved BACM. This program anticipates further coordination with the local air quality districts and the EPA as described in Section 4. Nevertheless, an important step in that coordination is DCM pilot projects and studies, which will be a basis to expand the list of DCMs available for approval as BACM.

There are a significant amount of scientific and experience-based resources informing the development of this SS AQM Program. However, there are many unknowns that cannot be known for the Salton Sea until pilot-testing can be done on exposed Salton Sea playa with specific DCMs. DCM pilot projects are

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necessary to inform all interested parties of the broad range of technical issues associated with dust control implementation on the Sea playa. This includes factors such as hydrology, vegetative cover establishment, dust control effectiveness required, water supply planning, constructability and appropriate design criteria to meet dust control objectives.

For purposes of the program cost estimates provided in this SS AQM Program, Table 3-8 outlines the percentage breakdown of DCMs assumed for currently approved BACM under ICAPCD Rule 804 and, for comparison, DCMs anticipated to become approved BACM (both assume DCMs on 75 percent of total exposed playa). The assumptions made in Table 3-8 take the most cost-effective breakdown of DCMs under each scenario purely for informational purposes of providing a program cost estimate. In addition to estimated cost-effectiveness, the DCM percentage breakdown was developed using available surface soil texture information (Section 3.1.1.3). Approximately 42 percent of the future exposed playa will consist of fine textured soils suitable for surface roughening and/or moat and row; 36 percent medium textured soils potentially suitable for surface roughening, moat and row or vegetation establishment; and 22 percent coarse textured soils suitable for vegetation establishment. Table 3-8 is not a plan or proposal for specific DCMs to be implemented on exposed Salton Sea playa. The percentage of DCMs may be revised at any time and will be revised as actual exposed playa is mitigated by the implementation of specific DCMs. As discussed in this program, decisions regarding the type, location and timing of implementing DCMs on exposed playa are to be made on an annual basis as playa is exposed and analyzed to determine the dust control strategy needs of that playa and other contributing outside factors, such as available funding.

ICAPCD Rule 804 currently has only a limited number of approved BACM: water efficient vegetation (to achieve the 50 percent cover requirements), shallow flooding, chemical dust suppressants and gravel cover. This SS AQM Program takes a proactive approach that is not limited by approved BACM, but anticipates that all DCMs outlined in Appendix E will be approved as BACM as allowed under the alternative BACM process under Rule 804.

TABLE 3-8 ASSUMED DCM IMPLEMENTATION PERCENTAGES FOR APPROVED BACM UNDER ICAPCD RULE 804 AND ALL DCMS IDENTIFIED IN THIS PROGRAM

DCM	Rule 804 Approved BACM	All Identified DCMs
Surface Roughening	0%	42%
Moat and Row	0%	3%
Dust Suppressants	0%	0%
Veg. Enhancement	0%	35%
Veg. Swale	0%	10%
Water Efficient Vegetation	85%	7%
Shallow Flood	10%	2%
Brine Stabilization	0%	1%
Gravel Cover (2 inch thickness)	5%	0%
Gravel Cover (4 inch thickness)	0%	0%
Total	**100%**	**100%**

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3.3.1.4 DCM Unit Cost

A description of each DCM used in this cost estimate is provided in Appendix E. The estimated capital costs per DCM (Table 3-9) include construction costs plus engineering design, construction management and engineering services during construction. Operation and maintenance costs (Table 3-9) are based on an assumed percentage of construction cost. It is important to note that these cost estimates are reasonable and based on actual experience at the Salton Sea or Owens Lake, with the exception of dust suppressants, which involves a product that can be priced and purchased. However, air quality mitigation at Owens Lake is the only similar and comparable situation to that of the Salton Sea and that situation is very different from the Salton Sea in many respects including timing of implementation and the largely reactive approach that has been taken. There are no documented resources for costs specific to air quality mitigation associated with these DCMs implemented on a large-scale area of varying soil characteristics and other factors to be considered. Therefore, these cost estimates remain high-level estimates of DCMs that have largely not been performed at the Salton Sea to date and where design, construction and engineering costs may be greatly affected by the unique location, climate and other factors associated with this area. These cost estimates will be refined as this SS AQM Program is implemented.

Table 3-9 Estimated Dust Control Measure Unit Capital and O&M Costs (2014$)

Dust Control Measure	Capital (Per Acre)	Estimated O&M (% of Capital)	Information Source
Surface Roughening	$400	75.00%	IID AQ Program to date
Moat and Row	$14,000	10.00%	LADWP personal communication
Dust Suppressants	$2,000	100.00%	Cargill (Magnesium Chloride)
Vegetation Enhancement	$9,000	7.50%	IID AQ Program to date
Vegetative Swale	$17,000	7.50%	IID AQ Program to date
Managed Vegetation	$25,000	4.50%	LADWP personal communication
Shallow Flood	$25,000	2.00%	LADWP personal communication
Brine Stabilization	$21,000	0.25%	LADWP personal communication
Gravel Cover (2 inch thickness)	$36,000	0.25%	LADWP personal communication
Gravel Cover (4 inch thickness)	$48,000	0.25%	LADWP personal communication

Cost assumptions for water conveyance infrastructure (Table 3-10) were obtained from the Salton Sea Ecosystem Restoration Program, Draft Programmatic Environmental Impact Report (PEIR), Appendix H. Cost estimates from the PEIR were adjusted to 2014 dollars using the U.S. Department of Commerce, Bureau of Economic Analysis, Table 1.1.9. Implicit Price Deflators for Gross Domestic Product [Index numbers, 2009=100] seasonally adjusted values. It was assumed that costs for this infrastructure would begin two years prior to the first dust control construction phase. Water conveyance is likely required to facilitate irrigation of vegetation in certain areas, especially in locations where groundwater cannot be accessed, and potential water based DCMs on the playa as the Sea recedes.

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TABLE 3-10 CAPITAL COST ESTIMATES FOR CONVEYANCE INFRASTRUCTURE AS PRESENTED IN THE PEIR FOR AIR QUALITY MANAGEMENT

Infrastructure	PNA Estimates, Appendix H7 of PEIR ($ 2006)	Total Construction Costs ($ 2014)
Sedimentation Basin	40,776,000	46,741,835
Roads	689,000	789,806
Western AQM Canal (70 cfs, 42 mi)	30,224,000	34,645,998
Eastern AQM Canal (60 cfs, 40 mi)	25,845,000	29,626,318
Central AQM Canal (40 cfs, 10 mi)	4,555,000	5,221,431
Saltwater Conveyance for AQM	13,740,000	15,750,265
Pupfish Channels (30 mi)	9,110,000	10,442,861
Other Construction (5%)	6,246,950	7,160,926
Construction Subtotal	131,185,950	150,379,439
Contingency (30%)	39,355,785	45,113,832
Engineering, Legal, and Administration (12% of Construction Costs)	20,465,008	23,459,193
Total Capital Cost	**191,006,743**	**218,952,464**
Yearly O&M (3.5% of Construction)	**4,591,508**	**5,263,280**

Notes:

Values have been rounded and may not add directly

Values from the PEIR PNA, Appendix H7 are in 2006 dollars and have been escalated to 2014 dollars using U.S. Department of Commerce, Bureau of Economic Analysis, Table 1.1.9. Implicit Price Deflators for Gross Domestic Product [Index numbers, 2009=100] Seasonally adjusted

All values do include costs for land acquisition, easement, or taxes

AQM = Air Quality Management

3.3.2 ESTIMATED PROGRAM COSTS

Using the assumptions outlined in Section 3.3.1, a spreadsheet calculator was developed to estimate costs (using 2014 dollars) through 2076 for currently approved BACM under ICAPCD Rule 804 and the proactive dust strategy using all DCMs identified in this SS AQM Program. The spreadsheet calculator was developed to facilitate changes in assumptions outlined in Section 3.3.1 as more is learned through implementation of this SS AQM Program (e.g., dust control implementation schedule, emission characteristics of the playa, DCM costs, BACM approval, etc.). Table 3-11 provides a summarized version of the total cost on a five-year time step. Given the uncertainty associated with the assumptions outlined in Section 3.3.1, a -15% and +25% multiplier was applied to the final estimate to generate a cost range.

For implementation of the BACM currently approved under Rule 804, the total cost estimate in 2047 (timeframe of estimated maximum playa exposure) is $2.86BN, with a range of $2.43BN to $3.58BN. For implementation of the DCMs identified in this SS AQM Program regardless of approval as BACM, the total cost estimate in 2047 is $1.49BN, with a range of $1.27BN to $1.86BN. Estimated costs for

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implementation of the BACM currently approved under Rule 804 in 2076 (at the end of the water transfer) is $4.56BN, ranging from $3.88BN to $5.70BN. Estimated costs for implementation of the DCMs identified in this SS AQM Program regardless of approval as BACM for this same timeframe is $2.59BN, ranging from $2.11BN to $3.24BN. As discussed above, these are high-level estimates intended for informative purposes only and will be refined as this SS AQM Program is implemented and more is learned from this implementation.

As shown in Table 3-11, the estimated cost of implementing BACM currently approved under Rule 804 is nearly double the cost of the implementation of the DCMs identified in this SS AQM Program regardless of approval as BACM. This is mainly due to the limited amount of BACM currently available under Rule 804 as well as the 50% cover requirements for vegetation in Rule 804. This underscores the need for IID to to continue work with the Imperial County and ICAPCD immediately to seek approval of alternative BACM under Rule 804 and to identify opportunities to establish new procedures and rules and/or improve existing procedures and rules to fully and successfully implement this SS AQM Program. As stated previously, such opportunities should include new BACM performance measures (i.e., determining if the surface is adequately stabilized).

TABLE 3-11 Summary of Dust Control Total Costs (2014$)

	Rule 804 Approved BACM Estimated Cost ($BN)			All Identified DCM Estimated Cost ($BN)		
Year	Total Cost	Total Cost (-15%)	Total Cost (+25%)	Total Cost	Total Cost (-15%)	Total Cost (+25%)
2020	$0.60	$0.51	$0.75	$0.25	$0.22	$0.32
2025	$1.25	$1.06	$1.56	$0.59	$0.50	$0.74
2030	$1.72	$1.46	$2.14	$0.81	$0.69	$1.01
2035	$2.09	$1.77	$2.61	$1.02	$0.86	$1.27
2040	$2.42	$2.06	$3.03	$1.21	$1.03	$1.52
2047	$2.86	$2.43	$3.58	$1.49	$1.27	$1.86
2050	$3.04	$2.58	$3.80	$1.60	$1.36	$2.00
2055	$3.33	$2.83	$4.17	$1.79	$1.52	$2.24
2060	$3.63	$3.08	$4.53	$1.98	$1.69	$2.48
2065	$3.92	$3.33	$4.90	$2.18	$1.85	$2.72
2070	$4.21	$3.58	$5.26	$2.37	$2.01	$2.96
2076	$4.56	$3.88	$5.70	$2.59	$2.21	$3.24

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4 AGENCY COMMUNICATION, COORDINATION AND REPORTING

This section describes agency communication and coordination, as well as a summary of reporting.

4.1 AGENCY COMMUNICATION AND COORDINATION

As described in detail in this document, this SS AQM Program is focused on monitoring and mitigating dust emissions from exposed Salton Sea playa. Accordingly, communication and coordination with several local, state and federal agencies, as well as other stakeholders, will be essential to the success of this program. Different agencies will be involved in different aspects of this program. For instance, the Imperial County, ICAPCD, SCAQMD, CARB and EPA will need to be involved in efforts to expand approved BACM. IID will be communicating and coordinating with the Natural Resources Agency and other state agencies to ensure that the State's restoration activities are informed by and coordinated with the implementation of this program and that, likewise, air quality mitigation activities are informed by and coordinated with the State's restoration activities. Further, the QSA JPA and its member agencies will be involved for funding purposes according to the process described above (Section 2.1.2). IID will coordinate implementation of this SS AQM Program with these agencies and stakeholders as necessary and on an on-going basis. Additionally, IID anticipates that quarterly progress updates will be provided as appropriate and in a forum or format to be determined. IID will prepare an annual progress report that will document detailed aspects of implementation of this program on an annual basis.

4.2 SUMMARY OF REPORTING

A variety of documents will be prepared throughout implementation of this SS AQM Program. Documents may include: technical memoranda describing results of research and monitoring activities; Annual Proactive Dust Control Plans (Section 3.2.1.2); conceptual and final designs for DCMs; and outreach materials for the general public. Progress reports as described above will also be prepared to document progress and findings from implementation of this SS AQM Program. IID will ensure that final and complete materials will be available to the public and posted to the IID website.

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5 References

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APPENDIX A – MASTER RESPONSE ON SALTON SEA AIR QUALITY MONITORING AND MITIGATION PLAN IN FINAL EIR/EIS

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AIR QUALITY

3.9 Master Response on Salton Sea Air Quality Monitoring and Mitigation Plan

3.9.1 Introduction

Commenters have requested additional discussion of measures that might be practical, available, and feasible for problem assessment and avoiding, minimizing, and mitigating potential dust and air quality impacts associated with exposed shoreline around the Salton Sea caused by the Project. This master response is intended to address those comments.

3.9.2 Difficulties Associated with Impact Assessment

Comments on the Air Quality Section of the Draft Environmental Impact Report/ Environmental Impact Statement (EIR/EIS) vary widely but tend to acknowledge that prediction of the scale or intensity of future dust impacts is not possible, given the limited available information on submerged areas and the variability of conditions that might promote or inhibit dust emissions at the Salton Sea. Notes from the Salton Sea Authority on the Salton Sea Air Quality Workshop held April 3, 2002, concluded, "At this time there is neither enough data nor enough exposed shoreline to predict with any credibility where, when, or how bad the emissions will be." As stated in the Draft EIR/EIS, several factors prevent any reasonable quantitative estimate of emissions and associated impacts from the exposed shoreline:

- Lack of data regarding sediment characteristics.
- Lack of data relating sediment characteristics to surface stability and actual emissions rates.
- Spatial variations in sediment characteristics and land surface erodibility.
- Temporal variations in wind conditions.
- Temporal variations in factors contributing to the formation of salt crusts and otherwise influencing the tendency of land surfaces to emit dust in high winds.

It is also not possible to perform modeling of potential impacts on ambient concentrations of PM10 (particulate matter with a diameter of less than 10 micrometers) in areas around the Sea without information on mass emission rates, location, or the areal extent of emissive land surfaces.

3.9.3 Similarities to and Differences from Owens Lake

Several comments pointed to similarities between exposure of sediments at Salton Sea and at Owens Lake, suggesting that similar dust emissions and air quality problems could ensue with lowering of the Salton Sea elevation. This response is based on available information and considerable experience at Owens Lake (where a large dust mitigation program is being implemented by the Los Angeles Department of Water and Power) and at the Salton Sea (where Imperial Irrigation District [IID] has operated for many decades).

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At the April 3, 2002 Air Quality Workshop held by the Salton Sea Authority, it was concluded that definitive data are lacking for prediction of PM10 emissions from exposed seabed sediments. However, several general observations regarding this comparison shed light on the level of risk of major dust emissions resulting from exposure of sediments at the Salton Sea.

Driving forces for dust emissions include wind and sand. Winds at the Salton Sea have been compared with those at Owens Lake in the Master Response on *Air Quality – Wind Conditions at the Salton Sea* in Section 3.16 of this Final EIR/EIS. Those data (Table 3.9-1) show that the frequency of high winds at the Salton Sea are much less frequent than at Owens Lake.

TABLE 3.9-1
Comparison of wind-speed frequency at 10 m above the ground surface for Salton Sea and Owens Lake

Site	>8.5 m/s (19 mph)	>11.0 m/s (25 mph)
Niland (near Salton Sea)	4.4%	1.4%
Tower N3 (Owens Lake)	18.9%	7.9%

Above a threshold wind velocity, sand if it is present on the surface, saltates (skips on the surface), and with each impact may break coherent soil crust and eject finer material upward into the airstream. So pronounced is the correlation of sand motion with PM10 emissions that, at Owens Lake, one of the primary tools for mapping dust emissions for mitigation is sand motion.

The sources of sand at Owens Lake are relatively steep-gradient streams feeding the lake, with few control structures to impede flow and cause sediment removal upstream of the lakebed. This has resulted in the following sand distribution at Owens Lake:

- A relatively continuous ring of sand dunes surrounding Owens Lake at its shoreline.
- Extensive areas of mobile sand (known locally as “sand sheets”) on the lakebed surface.
- Extensive areas of lakebed with deep sand deposits mapped as the dominant soil type.

In contrast, there is very little sand to blow in the southeastern shore areas of the Salton Sea, where bathymetry suggests that sediments would be most extensively exposed. This is because of shallow gradients and extensive control on tributary rivers. Likewise, sand sources such as dunes are absent in this area. Where sand dunes do occur along the western side of the Sea, bathymetry suggests sediment exposure would be very limited. Therefore, the co-occurrence of sand sources and exposed lakebed, which is so widespread and problematic at Owens Lake, appears to be largely absent in this area of the Salton Sea.

Exposed soil surfaces are more resistant to wind erosion when they are roughened or covered with a stable crust. When saline sediments are exposed by lowered water levels, the crust that forms at the soil surface is cemented by salt, and its strength is largely dependent on the strength of this cementation. The salt chemistry at Owens Lake results in a high

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proportion of sodium-carbonate evaporite salts that change radically in degree of hydration and volume at temperature variations within the range commonly experienced at Owens Lake. This has the effect of softening the crust and increasing rates of breakage and emissions. Comparing the makeup of salts in the Salton Sea (Bertram Station) and at Owens Lake (subsurface drainage or aerated groundwater), the following observations can be made (see Figure 3.9-1):

- There is much more (26 percent) calcium and magnesium at the Salton Sea; cations at Owens Lake contain 97 percent sodium.
- Carbonate and bicarbonate are virtually absent at the Salton Sea; they make up about 29 percent of anions at Owens Lake.
- Sulfate levels at Salton Sea (29 percent) are more than twice Owens Lake levels (12 percent).

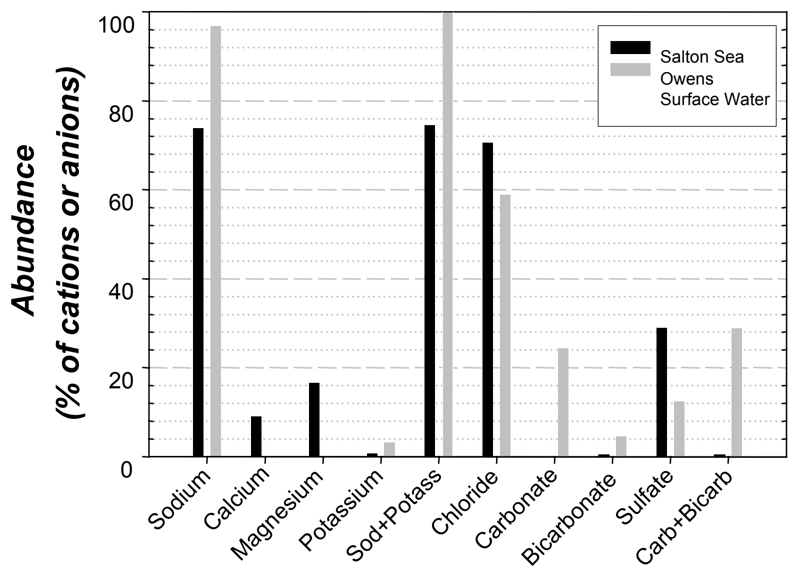

Figure 3.9-1

Relative abundance of major cations and anions at Salton Sea (Bertram Station, 1996-2001) and in subsurface drainage water at Owens Lake (Agrarian and Tree Rows sites, October 1998). Abundance for cations (sodium, calcium, magnesium, and potassium) is given as a percentage of the total cations, and for anions (chloride, carbonate, bicarbonate, and sulfate) as a percentage of total anions (milliequivalents/liter).

Further, the range of temperature variation at the Salton Sea is quite distinct from (generally warmer than) Owens Lake. The particular climatic interaction with salt minerals at Owens Lake influences dust emissions. This will also be the case at the Salton Sea. At the April 3 Air Quality Workshop, it was generally acknowledged that interactions between Salton Sea climate and minerals are undefined and constitute a pressing research need.

Sea levels have fluctuated over the period since the Sea filled during 1905 to 1907, resulting in periodic and extended exposure of significant Sea sediments. Such exposure at Owens

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and Mono Lakes generated unmistakable dust emissions. While there has been no systematic monitoring program at the Salton Sea, there does not appear to be any substantial anecdotal information that these areas have historically contributed observable dust emissions.

This is consistent with observations of soil crusts in the Salton Sea area. Crusts re-form when rain falls on these desert lakebeds and then progressively break apart over time; the extent and rate of breakage indicate the erosive forces to which the crusts are subjected, and, to some extent, the amount of wind erosion. Year-old crusts are generally heavily damaged in emissive areas at Owens Lake. Relatively old crusts (at least 18 months) generally show little damage at the Salton Sea.

In summary, weaker driving forces at Salton Sea, especially the absence of sand in potentially exposed areas, are consistent with observations suggesting that exposed sediments are not as emissive as they have been at Owens Lake.

3.9.4 Difficulties Associated with Specific Prescription of Mitigation

Without information on the nature and extent of the potential problem to be mitigated, it is unwise and impractical to propose or commit prematurely to costly dust control mitigation measures. Further, the dust control mitigation measures studied and under implementation at other lakebeds, such as Mono and Owens, may not be feasible or practical at the Salton Sea, given limitations on financial resources and the constraints on water availability for mitigation in this desert area. Nor would it be prudent to propose use of ratepayers' money to fund dust control measures for a problem that does not currently exist and may never materialize.

Under shoreline exposure scenarios, it is currently impossible to predict the extent and intensity of potential increases in dust emissions or the associated increases in ambient concentrations of the pollutant PM10 in excess of standards. The Draft EIR/EIS describes conditions at the Salton Sea that would naturally inhibit PM10 suspension, i.e., the combination of moisture present in the unsaturated zone beneath the exposed playa, the probable formation of dried algal mats and stable salt crusts consisting of chloride and sulfate salts, and the relatively low frequency of high wind events at the Salton Sea. In the best case, no problem would occur; in the worst case, a problem would emerge at some later date, after 2035, as the Sea's shoreline becomes exposed. Shoreline exposure caused by the Project will be delayed until that date because of implementation of the Salton Sea Habitat Conservation Strategy, which would provide mitigation water to the Sea to offset reductions in inflow caused by the Project. See the Master Response on *Biology – Approach to Salton Sea Habitat Conservation Strategy* in Section 3.5. IID would be responsible for impacts associated with implementation of the Proposed Project, apart from impacts associated with shoreline exposure anticipated from Baseline conditions.

3.9.5 Monitoring and Mitigation Plan

Rather than focusing on site-specific and costly dust control mitigation for an undefined and future potential problem, a phased approach is proposed to detect, locate, assess, and resolve this potentially significant impact. The following 4-step plan would be implemented

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to mitigate significant PM10 emissions and incremental health effects (if any) from Salton Sea sediments exposed by the Proposed Project:

(1) **Restrict Access.** Public access, especially off-highway vehicle access, would be limited, to the extent legally and practicably feasible, to minimize disturbance of natural crusts and soils surfaces in future exposed shoreline areas. Prevention of crust and soil disturbance is viewed as the most important and cost-effective measure available to avoid future dust impacts. IID or other governmental entities own or control most of the lands adjacent to and under the Salton Sea. Fencing and posting would be installed on these lands in areas adjacent to private lands or public areas to limit access.

(2) **Research and Monitoring.** A research and monitoring program would be implemented incrementally as the Sea recedes. The research phase would focus on development of information to help define the potential for problems to occur in the future as the Sea elevation is reduced slowly over time. Research would:

   (a) Study historical information on dust emissions from exposed shoreline areas.

   (b) Determine how much land would be exposed over time and who owns it.

   (c) Conduct sampling to determine the composition of “representative” shoreline sediments and the concentrations of ions and minerals in salt mixtures at the Sea. Review results from prior sampling efforts. Identify areas of future exposed shoreline with elevated concentrations of toxic substances relative to background.

   (d) Analyze to predict response of Salton Sea salt crusts and sediments to environmental conditions, such as rainfall, humidity, temperature, and wind.

   (e) Implement a meteorological, PM10, and toxic air contaminant monitoring program to begin under existing conditions and continue as the Proposed Project is implemented. Monitoring would take place both near the sources (exposed shoreline caused by the Project) and near the receptors (populated areas) in order to assess the source-receptor relationship. The goal of the monitoring program would be to observe PM10 problems or incremental increases in toxic air contaminant concentrations associated with the Proposed Project and to provide a basis for mitigation efforts.

   (f) If incremental increases in toxic air contaminants (such as arsenic or selenium, for example) are observed at the receptors and linked to emissions from exposed shoreline caused by the Project, conduct a health risk assessment to determine whether the increases exceed acceptable thresholds established by the governing air districts and represent a significant impact.

   (g) If potential PM10 or health effects problem areas are identified through research and monitoring and the conditions leading to PM10 emissions are defined, study potential dust control measures specific to the identified problems and the conditions at the Salton Sea.

(3) **Create or Purchase Offsetting Emission Reduction Credits.** This step would require negotiations with the local air pollution control districts to develop a long-term program for creating or purchasing offsetting PM10 emission reduction credits. Credits would be

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used to offset emissions caused by the Proposed Project, as determined by monitoring (see measure 2, above). IID proposes negotiation of an offset program that would allow purchase of credits available under banking programs, such as Imperial County Air Pollution Control District Rule 214 for agricultural burning. Other means of dust control and PM10 emissions reductions available for application to agricultural operations in the IID service area would also be pursued for credit banking opportunities (e.g., managing vacant lands, improving farming practices to reduce PM10, and paving roads). This step would not be used to mitigate toxic air contaminants (if any); Step 4 would be necessary if toxic air contaminants pose a significant health issue.

(4) **Direct emission reductions at the Sea.** If sufficient offsetting emission reduction credits are not available or feasible, Step 4 of this mitigation plan would be implemented. It would include either, or a combination of:

  (a) Implementing feasible dust mitigation measures. This includes the potential implementation of new (and as yet unknown or unproven) dust control technologies that may be developed at any time during the term of the Proposed Project; and/or

  (b) If feasible, supplying water to the Sea to re-wet emissive areas exposed by the Proposed Project, based on the research and monitoring program (Step 2 of this plan). This approach could use and extend the duration of the Salton Sea Habitat Conservation Strategy.

If, at any time during the Project term, feasible dust mitigation measures are identified, these could be implemented in lieu of other dust mitigation measures or the provision of mitigation water to the Sea. Thus, it is anticipated that the method or combination of methods could change from time to time over the Project term.

The success of the proposed plan is dependent on coordination and cooperation of the involved parties and the air quality regulatory agencies. Coordination, communication, staff commitment, and funding will be required in each phase of the proposed research, monitoring, and emissions reduction program.

3.9.6 Impact Assessment; Feasibility of Implementation

The Draft EIR/EIS concludes that windblown dust from exposed shoreline caused by the Proposed Project may result in potentially significant and unavoidable air quality impacts that could not be mitigated. This conclusion was based upon (1) uncertainty regarding the actual air quality impacts of Salton Sea shoreline exposure, because of the lack of sufficient records or research regarding emissive potential, and (2) uncertainty regarding the availability or feasibility of mitigation measures. This conclusion was intended to be conservative in view of the broad disclosure goals of the California Environmental Quality Act and the National Environmental Policy Act.

This master response is intended to propose a method for identifying the scope of actual air quality impacts caused by the Project and for identifying and implementing potentially feasible mitigation measures that could reduce those impacts. The proposed mitigation is potentially sufficient to avoid or suppress PM10 emissions to less than significant levels. However, a level of uncertainty remains regarding whether short-term and long-term impacts can be mitigated to a less-than-significant level, as described below. Therefore, the

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conservative conclusion that these impacts are potentially significant and cannot be mitigated has been retained in this Final EIR/EIS.

With the implementation of Salton Sea Habitat Conservation Strategy, shoreline exposure caused by the Project would not begin until some time after the year 2035. Up to an estimated 16,000 acres of shoreline would potentially be exposed between 2035 and end of the Project term as a result of full implementation of the Proposed Project. The mitigation plan described above works in concert with the Salton Sea Habitat Conservation Strategy and is expected to reduce air quality impacts and PM10-related health effects. However, problem assessment and mitigation implementation would occur subsequent to the development of potential dust emissions. Therefore, interim impacts could be significant.

It is uncertain what the conditions in the Salton Sea Air Basin will be as of 2035 when Project impacts may begin to occur. The Imperial Valley portion of the Salton Sea Air Basin is currently a moderate nonattainment area and the Riverside County/Coachella Valley portion is currently a serious nonattainment area for the National Ambient Air Quality Standard for PM10. The attainment status of the Basin in 2035 cannot be ascertained; however, the Clean Air Act requires a plan for attainment well in advance of that date.

Cost and water availability may affect the feasibility of certain dust mitigation measures and the proposed delivery of water to the Sea to re-wet emissive areas, as proposed under the mitigation plan described above. If mitigation water is generated by non-rotational fallowing within the IID water service area, this may result in significant impacts to agriculture, as described in Section 3.5 of the Draft EIR/EIS. Fallowing may also adversely affect the Imperial Valley economy, as described in Section 3.14 of the Draft EIR/EIS. Before approving the Project, the Lead Agencies must balance the benefits and impacts of the Project as well as the effects and feasibility of proposed mitigation measures.

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APPENDIX B – EXPOSED PLAYA PM_{10} INVENTORY

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B.1 Experimental Design

This section describes the experimental design of the PM_{10} (particulate matter less than 10 microns in diameter) emission inventory for exposed Salton Sea playa, including the inventory goal and objectives, approach, data collection and analysis, mapping and characterization of playa surfaces, collection of aerometric data, and delineation of active plume areas.

B.1.1 Goal and Objectives

The goal of the PM_{10} emission inventory for exposed Salton Sea playa is to develop an updated PM_{10} emission inventory for consideration in the 2016 Revised Imperial County PM_{10} State Implementation Plan (SIP). An accurate PM_{10} emission inventory is a critical aspect of preparing an effective dust control strategy and attainment demonstration modeling analysis.

The objectives of this emission inventory are four-fold:

1. To evaluate the PM_{10} emission *potential* of different exposed playa surfaces over time, with and without a protective surface crust.

2. To gain a better understanding of the length of the dust season on different exposed playa surfaces.

3. To develop methods for remotely observing and mapping active PM_{10} emission sources on exposed Salton Sea playa.

4. To use the information and data gathered to develop a refined estimate of exposed playa PM_{10} emissions.

The initial phase of the playa PM_{10} emission inventory will be completed in 2016. Follow-up inventory estimates will occur at roughly three-year intervals (next estimate in 2018) using updated equipment and methods, if available.

B.1.2 Approach

The approach for assessing PM_{10} emissions from current and future exposed Salton Sea playa is as follows:

1. Map the extent of exposed Salton Sea playa *by surface type* (e.g., coarse, intermediate, fine, barnacles, crusted vs. non-crusted, etc.) before the start of each playa *dust season*.[1]

2. Conduct PI-SWERL sampling to characterize the emission potential of each surface type over the course of the dust season.

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[1] The period of time during which the playa is particularly susceptible to wind erosion (assumed to be January through February).

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3. Record the time and location of dust plumes or any other indications of dust emission activity.

4. Map active dust source areas using remote sensing methods.

5. Quantify maximum hourly and total annual emissions from active source areas.

6. Model dust emissions to evaluate potential impacts at PM_{10} compliance monitors.

Each of these items is discussed in more detail below.

B.1.3 Data Collection and Analysis

This section describes data collection and analysis for mapping and characterizing playa surfaces, for aerometric data, and for delineating active plume areas.

B.1.3.1 Mapping and Characterizing Playa Surfaces

This section describes the mapping and characterization of currently exposed playa surfaces and future exposed playa surfaces.

B.1.3.1.1 Current Exposed Playa

This section describes the objectives, methods, and reporting for mapping and characterizing current exposed playa surfaces.

B.1.3.1.1.1 Objectives

The objective is to map and characterize the surface types of exposed Salton Sea playa. Specifically, properties controlled by evaporate (water-soluble salt) mineral dynamics (e.g., surface type, surface crust thickness, and surface crust hardness) will be mapped and monitored because they are directly related to the spatial and temporal nature of PM_{10} dust emissions (Buck et al. 2011). A secondary objective is to better understand the range of conditions that may be reasonably expected as future playa surfaces are gradually exposed.

B.1.3.1.1.2 Methods

Extensive playa surface survey monitoring methodology originally developed for Owens Lake is being adapted for use at the Salton Sea. This includes monitoring protocols and methodology to accurately map playa exposure and playa surface characteristics (analogous to soil map units) using remotely sensed data resources and ground-based surface evaluations. In addition, mineralogy and groundwater chemistry will be evaluated. Each is described below.

Playa Exposure

Monitoring of the actual Sea surface elevation and associated playa exposure is important for understanding potential air quality impacts. This information will provide a real-time understanding of

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actual playa exposure as it occurs and will help to validate the SALSA2 model results. Two independent methods have been developed to quantify playa exposure.

- **USGS Sea Elevation.** Salton Sea elevation is monitored continuously by the USGS (USGS Site 10254005 Salton Sea NR Westmoreland CA). The monitored Sea elevation data provide the basis for extracting a shoreline from high-resolution bathymetric data. As discussed previously, all data from the USGS gauge are collected in NGVD29 and must be converted to NAVD88 using the standard conversion factor of 2.113 feet when using the bathymetric data or comparing to SALSA2 model results. GIS tools have been developed to provide near real-time estimates of shoreline location and therefore playa

- **Landsat Satellite Imagery:** The accuracy of the USGS gauge-based shoreline is a function of the Sea elevation data from the USGS as well as the precision of the underlying bathymetric data. Therefore, an independent method for assessing exposed playa was developed using satellite imagery. Specifically, the Landsat 5 (1984 to 2013), Landsat 7 (1999 to present), and Landsat 8 (2013 to present) satellites provide current and historic imagery on an 8-to-16-day basis for the Salton Sea. A spectral water index called the Modified Normalized Difference Water Index (MNDWI) (Equation 1) was used to identify standing water associated with the Salton Sea from Landsat imagery. MNDWI is based on the fact that water absorbs energy at shortwave-infrared (SWIR) wavelengths. The integration of the green band into the equation reduces noise associated with other land-based features (Zhang and Wylie 2009). A date-specific threshold of MNDWI was then established to isolate the Salton Sea water body and associated shoreline.

  EQUATION 1 – MNDWI

  $$MNDWI = \frac{\rho\, green - \rho\, SWIR}{\rho\, green + \rho\, SWIR}$$

Actual playa exposure acreage will continue to be monitored and reported on a quarterly basis using the Landsat imagery as well as the USGS Sea elevation approach. Results of the quarterly monitoring will be shared with Imperial County and ICAPCD.

Playa Surface Characteristics

Playa surface characteristics will include detailed characterization of surface properties at various locations, including each PI-SWERL sampling location (see Section B.1.3.2.1.2 for sampling locations). Surface properties are shown in Table B-1. Collector for ArcGIS will be used to record surface characterization data. Unit-defining crust types will be photographed with Collector and linked to the sampling location and associated surface characterization data. The predominant map unit will be described and mapped. The occurrence of significant amounts of surface sand also will be mapped because these features identify important depositional areas.

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The furthest extent of the Salton Sea is typically marked by beach ridges formed by Sea wave action. The intervening areas between beach ridges are generally consistent in terms of exposure time and duration of salt crust development. Thus, playa map units are expected to coincide with these areas. Several salt crust types may be mapped within each map unit due to topographic anomalies where water may have pooled longer or drained earlier than the surrounding area.

Table B-1. Surface Properties Collected During Surface Characterization Events

Surface Property	Description
Crust Type	Crust categories may include: smooth, botryoidal, weak botryoidal, hummocky, and networked. The dominant crust type of the observation area will be characterized, and if other types are present in smaller amounts, they will be noted as inclusions. Additional crust categories may be developed specifically for the Salton Sea playa.
Crust Thickness	Crust thickness is measured from the top of salt crust to the top of soil. In some places, the salt crust will be divided into two distinctly different layers: top-crust and sub-crust. Top-crust is usually a harder, salt-cemented crust that forms a shell over the surface. Sub-crust usually has weak structure (i.e., soft or crumbly) and extends from the bottom of the top-crust to the underlying, often looser soil. In some cases a top-crust will exist without a sub-crust and will be directly overlaying the soil. Total crust thickness is considered the sum of top-crust and sub-crust.
Crust Hardness	Crust hardness indicates the degree of erosion resistance. Crust hardness can be characterized by the amount of force necessary to crush the salt crust by hand according to United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) guidelines (Schoenenberger et al. 2002). On average, smooth and weak botryoidal crust types are the softest, while networked and hummocky crusts are harder. Hardness of both top-crust and sub-crust will be assessed if distinct surface and sub-crusts are present. In addition, the "ball drop method" will be used to evaluate crust hardness at each location using Rule 800 specifications.
Penetration Resistance	Penetration resistance can be measured with a penetrometer. A penetrometer will be inserted through the total crust depth to assess crust resistance. Local penetration resistance can vary substantially and will be measured at several points to calculate an average penetration resistance for a crust type. Penetration resistance readings will be recorded in pounds per square inch (psi). The penetrometer reads in tons per square foot, but the reading is easily converted to psi by multiplying the result by 13.89.
Surface Type and Boundary Type	The surface and boundary types are general field descriptions of the characterized site. The surface types may be classified as open water, saturated mineral soil, saturated salt crust, dry-low relief salt crust, and dry-high relief salt crust. The surface boundaries may be classified as diffuse, distinct, gradual, abrupt, and other.
Soil Moisture	Soil moisture will be qualitatively assessed for the first one to two inches of soil directly below the crust. Soil moisture can be classified based on USDA-NRCS classification parameters (Schoenenberger et al. 2002). Soils will usually range from slightly moist to saturated where crust exists, and dry to saturated where no crust exists.
Soil Texture	Soil texture will be qualitatively assessed for the first one to two inches of soil directly below the crust. Soil texture will be described as fine textured, moderately fine textured, medium textured, moderately coarse textured, coarse textured, or shell.
Free Surface Sand	Free surface sand will be visually determined by estimating the percentage of free, sand-sized particles in a square meter of playa surface. The amount of free sand can vary seasonally with crust development, because forming crusts can encapsulate surface sand as they harden. Free sand particles on the surface are often very fine and settle into very small depressions in crust surfaces.

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Surface Property	Description
Salt Efflorescence	Salt efflorescence is generally a white coating of salt on a surface. At the Salton Sea it is usually seen on top of thinly developed salt crusts. Salt efflorescence is a concern as it consists of extremely fine crystal mats which are very fragile and may be pulverized with the slightest touch.
Crust Relief	Crust relief will be measured to provide a more refined understanding of surface roughness. Roughness affects wind resistance and surface wind velocities, and is therefore useful in wind-erosion modeling. Crust relief will be determined by measuring the distance from the bottom of a crust depression to the top of a typical crust ridge. When applicable, macro- and micro-relief will be differentiated. Networked, botryoidal, and hummocky crusts usually have the greatest relief.
Surface Erosion and Deposition	Surface erosion is generally characterized as a percentage of total crust area that appears to have been eroded by wind. This can be done with visual or remote-sensing techniques. A qualitative description will also be provided using descriptors such as buffed, slightly buffed, scoured, sand shadows, dunes, etc.
Percentage Vegetation, Overflow, and Other Features	Percent surface area of vegetative cover, dune area, berm area, overflow area, and representative playa area will be estimated. These estimates will provide a distribution of small inclusions relative to the dominant mapped surface condition. These features also have implications for the formation of crusts and erodibility; percent overflow area and vegetative cover are probably the most influential of these features. The surface area assessment can be performed visually (from the ground) or using remote-sensing techniques.

Mineralogy

Salt mineralogy and crystal habit affect the vulnerability of various playa surfaces to wind erosion (Buck et al., 2011). The mineralogy of the dominant surfaces will be quantified using a portable X-Ray Diffraction (XRD) device known as the TERRA Portable XRD System. The XRD System bombards finely ground and homogenized samples with X-ray radiation, yielding bulk mineralogy. Bulk mineralogy is determined by measuring the angle and intensity of diffracted X-rays as they pass through the sample. Diffracted X-rays produce two dimensional diffraction patterns, each corresponding to different crystal orientations. Through Fourier Transforms, the two-dimensional diffraction patterns yield three-dimensional images of electron density within a crystalline sample, which further shows the positions and bond types of atoms in the sample. Every mineral has a unique chemical composition, or range of compositions, and the relationship of atoms (in terms of position and bond types) reveals its mineralogy. Figure B-1 is an example of typical output data from the XRD System.

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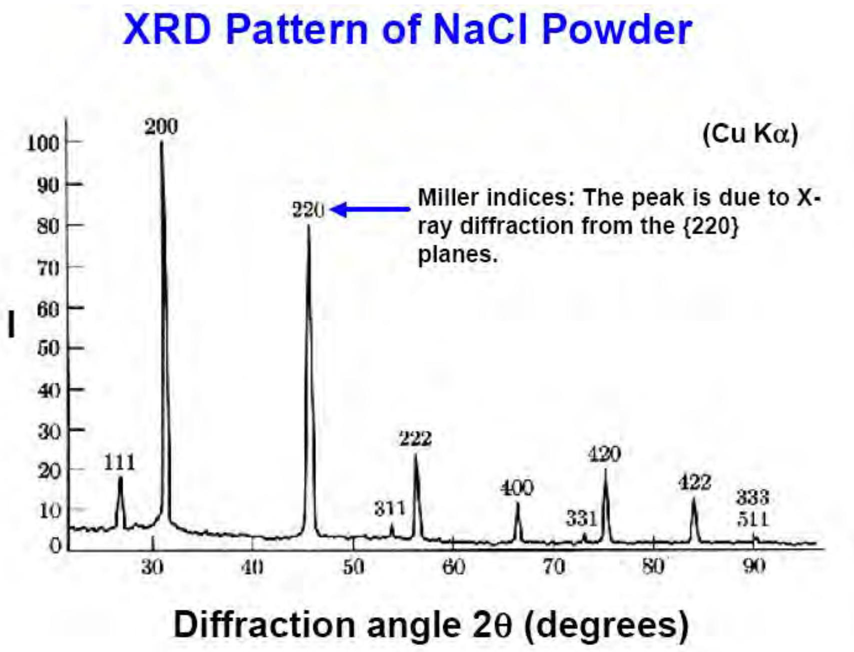
Figure B-1. Example Output from a TERRA Portable XRD System



Salt crust samples will be collected at PI-SWERL sampling locations (see Section B.1.3.2.1.2 for sampling locations). Samples will be collected with a stainless-steel hand trowel and gloved (nitrile) hands. Samples will be processed in the field by pulverizing the salt crust (with tools included with the XRD System) and placing the sample into the sample chamber for analysis with the XPowder software. Remaining sample material will be reserved for possible additional analysis, pending mineralogy results.

Analysis results will be compared to the American Mineralogist Crystal Structure Database (AMCSD) to determine mineralogy. The AMCSD is a crystal structure database that contains each mineral structure published in the American Mineralogist, The Canadian Mineralogist, the European Journal of Mineralogy and Physics and Chemistry of Minerals, as well as selected data sets from other journals (Downs and Wallace, 2003). The XRD System data will then be used to correlate salt mineralogy to potential PM_{10} emissivity based on the PI-SWERL results.

Groundwater Chemistry

Playa salt crust mineralogy characteristics are controlled by the evaporation of shallow groundwater (Buck et al., 2011). Specifically, loosely cemented sodium sulfate salts are known to have higher emission rates than sodium chloride salts (Buck et al., 2011). Therefore, shallow groundwater will be sampled and analyzed to quantify groundwater chemistry characteristics at each PI-SWERL sample location. Groundwater chemistry data will serve as the basis for predicting the minerals that will precipitate from solution as a result of evaporation. This analysis includes four main steps:

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1. **Sample Groundwater**. Representative groundwater samples will be collected at each of the five salt crust study sites, which include Bombay Beach, Alamo River, New River South, Poe Road and the Salton City Club House (Figure B-2). Groundwater will be sampled from one access tube installed in the near-surface aquifer system at each of the salt crust study sites. One round of groundwater samples will be conducted in 2016 in support of the emissions inventory. Additional sampling events at selected sites may be conducted, as needed.

   Prior to groundwater sampling, manual groundwater level measurements will be collected from the access tubes completed at the salt crust study sites. Groundwater samples and water level measurements will be collected in accordance with SOP No. 4, *Groundwater Sampling and Water Level Measurements* (Appendix D5). Groundwater will be sampled using a peristaltic pump and dedicated tubing unless the depth to water is too great in which case an alternative purge method will be used. Groundwater samples will be collected using one of the methods described in SOP No. 4, *Groundwater Sampling and Water Level Measurements* (Appendix D5). It is likely that the low-flow sampling method will be used. All non-dedicated sampling equipment will be decontaminated between each sample location in accordance with SOP No. 7, *Equipment Decontamination* (Appendix D6). Immediately following sample collection, samples will be appropriately labeled, placed in resealable plastic bags, and placed in a cooler with wet ice in accordance with SOP No. 2, *Sample Custody, Packaging and* Shipment (Appendix D7).

2. **Analyze Groundwater Samples**. Samples will be analyzed for laboratory and field parameters, including major minterals. Field water quality parameters include temperature, pH, specific conductance, dissolved oxygen (DO), and oxidation reduction potential (ORP). Field parameters will be measured in accordance with SOP No. 4, *Groundwater Sampling and Water Level Measurements* (Appendix D5). Prior to the collection of field water quality parameters, the water quality meters will be calibrated in accordance with SOP No. 31, *Water Quality Meter Calibration* (Appendix D8). All groundwater field parameters will be measured using a flow-through cell to ensure representative groundwater measurements from the aquifer.

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Figure B-2. Representative Groundwater Monitoring Locations

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3. **Review Lab Results**. A review of laboratory data quality indicators, including data completeness, quality and validation, will be performed upon receipt of the data reports prepared by the laboratory. Any data quality issues will be identified before the data are accepted for use in geochemical modeling.

4. **Simulate Evaporation and Mineral Precipitation Reactions**. Lab data will be used to develop aqueous complexation and chemical-reaction models. The aqueous models will be based on site-specific and empirical data. The Geochemist's Workbench® will be used to simulate evaporation and the resulting mineral precipitation reactions. Input data will be entered into The Geochemist's Workbench® computer code. The Geochemist's Workbench® can access thermodynamic data from a number of widely used databases, including the Lawrence Livermore National Laboratory (LLNL 1995) and MINTEQA2 (EPA 2006) databases. It also accomodates the Debye-Hückel and Harvie-Moller-Weare activity models to allow for modeling of solutions with a wide range of dissolved solids content.

   The resulting aqueous complexation models will be evaluated to identify the types of open-system reactions (e.g., mineral precipitation due to oversaturation in solution) that are predicted to take place in situ, as well as the potential for sorption of groundwater constituents to, or desorption from, aquifer solids. For the mineral solids that are predicted to precipitate from solution, their stability and solubility will be evaluated for the range of measured redox and pH conditions.

B.1.3.1.1.3 Reporting

Results of mapping and characterizing current exposed playa surfaces will be reported as outlined in Table B-2. Table B-2, Summary of Reporting for Playa Emissions Inventory, is located at the end of Appendix B.

B.1.3.1.2 Future Exposed Playa

This section describes the objectives, methods, and reporting for mapping and characterizing future exposed playa surfaces.

B.1.3.1.2.1 Objectives

The objective of this effort is to assess the physical characteristics of the inundated playa soils using available data sets and analyses related to Salton Sea floor bathymetry and sediment characteristics. This information will be used to quantify the types of soils and surfaces that will be exposed as the Sea recedes and develop "analoges" with playa already exposed. This information will also be used to stratify PI-SWERL sampling locations and then extrapolate that information to estimate the range in emissive conditions of the future exposed playa. In addition, results also provide insight into the types of dust control measures that may work well in specific regions of future exposed playa.

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B.1.3.1.2.2 Methods

Acoustic sonar data collected by the Bureau of Reclamation were analyzed to provide planning-level information on surface soil characteristics of the currently inundated playa. These data were combined with ground-truth data of soil sediment characteristics. The combination of these data sets was used to generate surface soil sediment characteristics on the playa. The resulting spatial maps predict surface sediment texture, soft sediment depth, surface roughness/complexity, and barnacle bed locations. The following sections detail the methods used to characterize the subsurface characteristics of the inundated Salton Sea playa.

Data Collection

Acoustic sonar data were collected on behalf of the Bureau of Reclamation by Quester Tangent (QTC) between October and December 2004. Simultaneously, surface grab samples were also collected by the Salton Sea Authority. A total of 24 survey days were required to collect all the data. Over 3 million 200 kHz echoes and over 3 million 50 kHz echoes were logged by each system. The systems digitally acquired each raw echo at a rate of approximately four per second and logged the waveform for post-processing. Both the full waveform (FWF) and envelope data were logged by the system. The sonar data were stored in a QTC proprietary format.

GPS navigation data were simultaneously logged as comma-delimited ASCII (American Standard Code for Information Interchange) records (as a National Marine Electronics Association Global Positioning System Fix Data [NMEA GPGGA] string). The GPS system was a CSI Wireless Inc. DGPS MAX, with an OmniSTAR subscription to improve positioning accuracy. OmniSTAR is a "sub-meter" level of service. A typical 24-hour sample of Virtual Base Station will show a 2-sigma (95 percent) of significantly less than 1-meter horizontal position error, and the 3-sigma (99 percent) horizontal error will be close to 1 meter. It operates in real time, and without the need for local base stations or telemetry links. In post-processing, the sonar and navigation records were merged based on a high-resolution time-stamp tagged to each record at the time of logging.

Classification and Processing

The amplitude and shape of an acoustic signal reflected from the sea floor is determined by the sea bottom roughness, the contrast in acoustic impedance between water and sea floor, and perturbations caused by inhomogeneities in the substrate's volume. Remote seabed classification requires an acoustic data acquisition system, an algorithm set to analyze the data, an implementation method to determine the seabed type, and ground-truth data to relate the acoustic classification to seabed features.

The QTC VIEW seabed classification system by Quester Tangent was used to process the echo trace, and filtering algorithms were used to suppress noise. Echo description was accomplished using several algorithms to extract 166 echo shape features, known as full feature vectors (FFVs), from each trace. Multivariate statistical analysis then identified the best feature combinations to distinguish groups of

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echoes representing different seabed surface characteristics. The feature combinations are reduced to three primary values, known as Q-values, which describe each echo.

Echo classification is accomplished using the three Q-values; it is assumed that the acoustic response from like seabed surfaces will be similar. When Q1, Q2, and Q3 are plotted in orthogonal Q-space, seabed surfaces with similar acoustic responses will form clusters. An echo was classified using its position in Q-space with respect to the clusters generated from calibration data—the echo being classified the same as the closest cluster.

The echo classification in Q-space was done without prior knowledge of the sediment at the sites. Therefore, without a catalogue associating clusters to sediment type, unsupervised classification was used to statistically generate clusters from Q-values alone. Final Q-values for each frequency were appended to each echo location to generate a spatial point map of values.

Generation of Sediment Maps

Point Q-values for each frequency were further processed using geostatistical techniques to spatially interpolate between point values and create a spatially continuous map (Figure B-3). The sea floor depths calculated by the two different frequencies were also used to generate complexity calculations and soft sediment depth (Figure B-3).

Sediment grab samples collected by the Salton Sea Authority were statistically compared to the interpolated acoustic Q-values to create spatial maps of sediment depth, soil texture, surface roughness/complexity, and barnacle bed locations.

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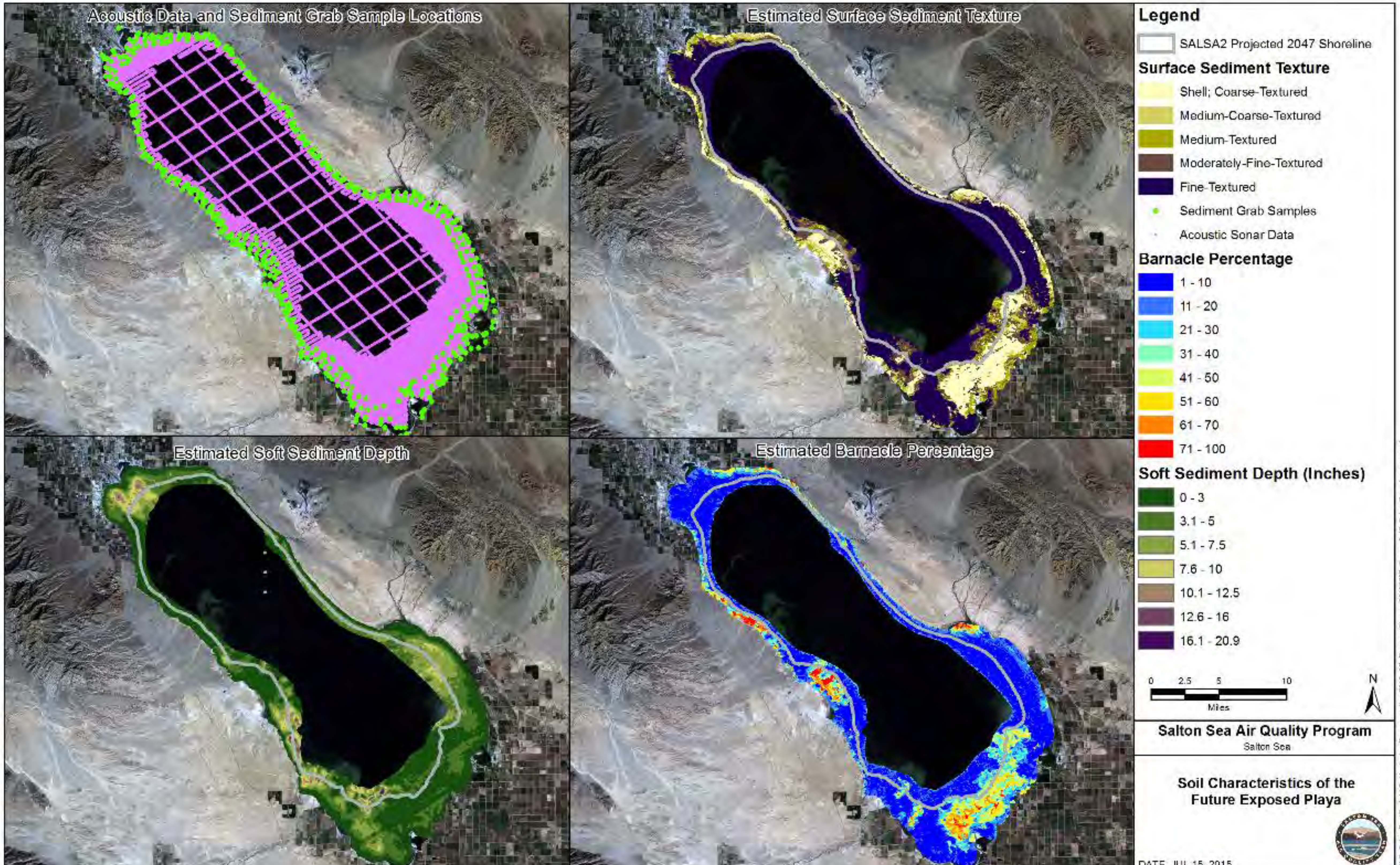
Figure B-3. Soil Characteristics of Future Exposed Playa from Acoustic Sonar Data



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Uncertainty

Due to the nature of the acoustic sonar and grab samples, there is significant uncertainty in the final sediment maps. In addition, wave action, currents, and other disturbances since the time of the acoustic survey could have significant impacts on the spatial structure of the sea floor sediments. That said, this layer provides the best available information for understanding the range of surface sediment characteristics of the future Salton Sea playa.

B.1.3.1.2.3 Reporting

Results of mapping and characterizing future exposed playa surfaces will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

B.1.3.2 Aerometric Data

This section describes the aerodynamic data collection activities that will occur as part of the design of the PM_{10} inventory for the exposed Salton Sea playa.

B.1.3.2.1 PI-SWERL Sampling

The PI-SWERL sampling objectives, locations and frequency, instrumentation, operation and maintenance procedures, analysis, and reporting activities for the exposed Salton Sea playa PM_{10} inventory are described in the following sections.

B.1.3.2.1.1 Objectives

The primary objective of PI-SWERL sampling is to characterize the PM_{10} emission potential for distinct surface types on exposed Salton Sea playa. A secondary objective is to gain a more complete understanding of the "dust season" on the playa (assumed to be January through February). The vulnerability of various playa surfaces to wind erosion is a function of salt mineralogy and crystal habit, both of which are influenced by climate variables: precipitation, relative humidity, and ambient temperature (Buck et al. 2011). For the remainder of the year (i.e., March through December), the playa surfaces are thought to have a more durable crust and are therefore more resistant to wind erosion and PM_{10} emissions. The PI-SWERL sampling will help to verify whether this is the case.

B.1.3.2.1.2 Sampling Locations and Frequency

PI-SWERL sampling will be performed on seven distinct surface types found around the Salton Sea (Section B.1.3.1.2). They are:

- Types 1-3, Coarse-textured soils with barnacles:
  - 0-30% barnacle cover
  - 31-60% barnacle cover

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    - >60% barnacle cover

- Type 4, Medium-coarse-textured soils
- Type 5, Medium-textured soils
- Type 6, Moderately fine-textured soils
- Type 7, Fine-textured soils

Forty-two sampling sites will be selected in the field for the initial PI-SWERL investigation, including: seven surface types, two "treatments" (i.e., undisturbed crust and disturbed crust), and three replications for each combination of surface type and treatment (7 x 2 x 3 = 42 sampling sites). The sampling sites will be selected from within relatively large, uniform areas with the target surface conditions. However, much of the current exposed shoreline is a mosaic of various surface types. For these areas, emission potential will be assessed by taking the area-weighted average of the component types over a suitably large characteristic area; for example, 160 acres. Maps of preliminary sampling locations are shown in Figure B-4, Figure B-5, and Figure B-6.

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Figure B-4. Preliminary PI-SWERL Sampling Locations, Surface Type 1 (Torres-Martinez)

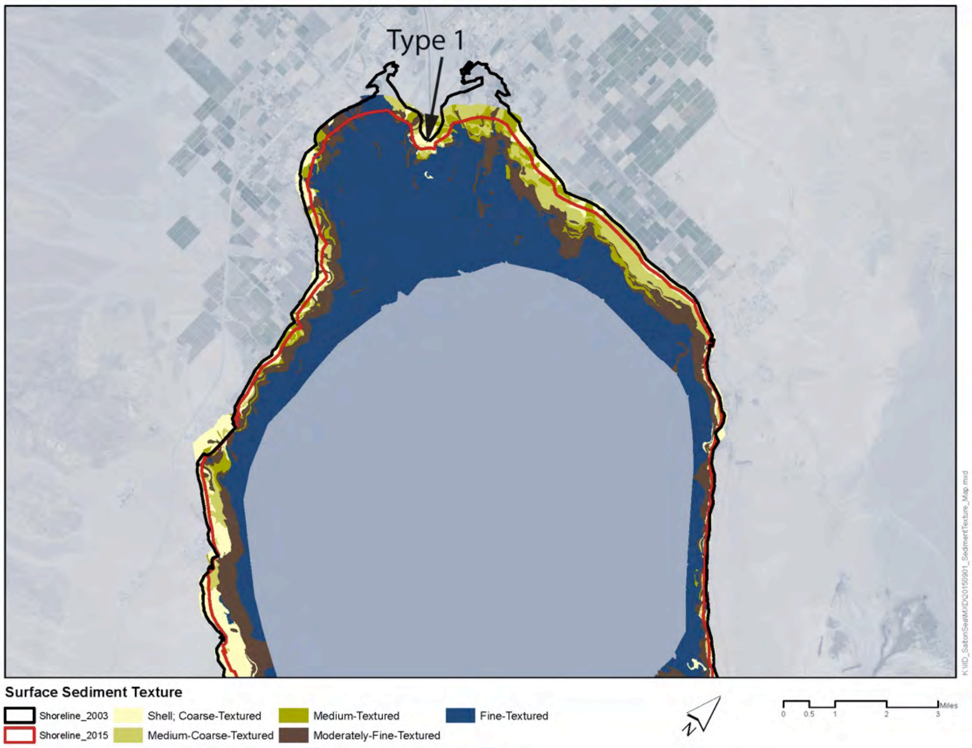


Figure B-5. Preliminary PI-SWERL Sampling Locations, Surface Types 2 and 3 (Bombay Beach) and Surface Types 4 and 5 (Salton City)

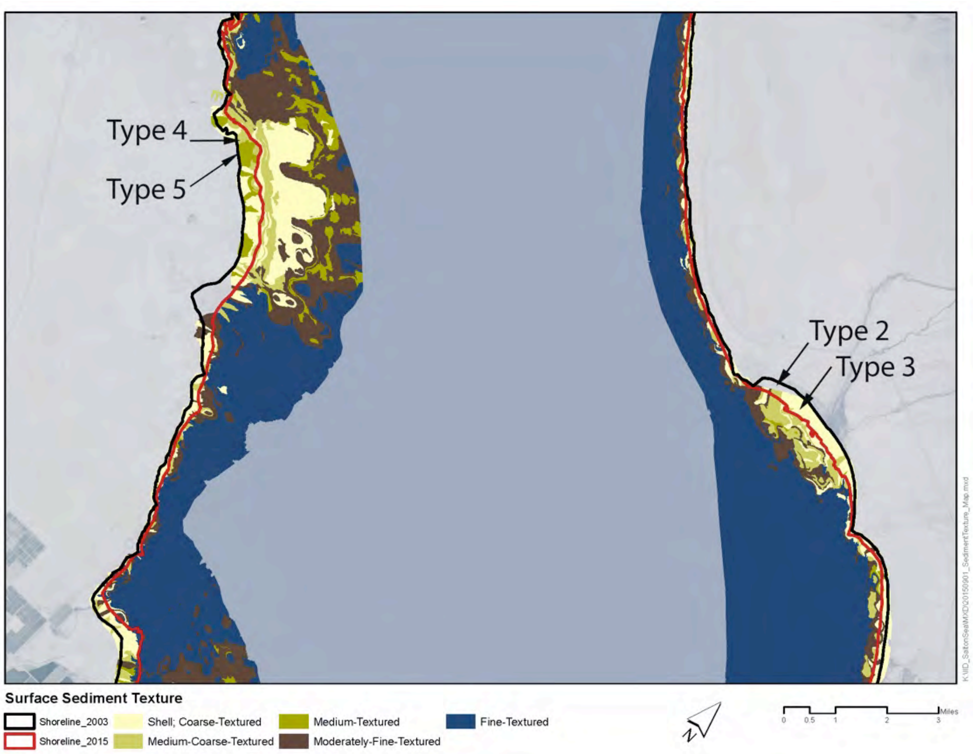
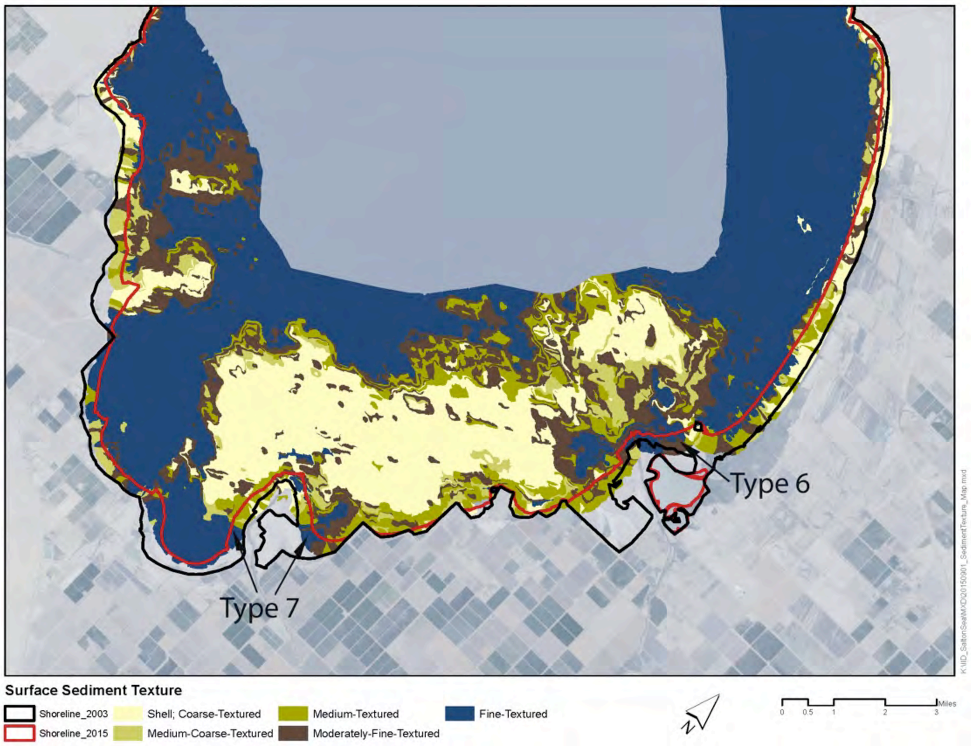


Figure B-6. Preliminary PI-SWERL Sampling Locations, Surface Types 6 and 7 (New River)



Eleven sampling times (events) are planned for the first year of operation. PI-SWERL sampling events are estimated for the following dates:

- Two events in November (1st and 15th, 2015)
- Two events in December (1st and 15th, 2015)
- Two events in January (1st and 15th, 2016)
- Two events in February (1st and 15th, 2016)
- Three events in March (1st, 15th, and 31st, 2016)

These sampling events bracket the assumed January-through-February dust season by at least one month. Bracketing will help to gain a better understanding of the true length of the dust season.

A soil scientist will accompany the PI-SWERL team to characterize the PI-SWERL sample locations as well as the surrounding playa. It is important to characterize the spatial variability of surface types because surfaces are not as uniform as they sometimes appear on maps.

Only the first six months of PI-SWERL sampling have been budgeted (November 2015 through April 2016). Future sampling events will be budgeted as needed. The timing and intensity of sampling events will be dictated by the areal extent of playa exposure and the desire to learn more about how the playa emission potential changes over time.

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B.1.3.2.1.3 Instrumentation

Required instrumentation includes the PI-SWERL apparatus, described below. Labeled diagrams of the PI-SWERL apparatus are found in Appendix D.1, Standard Operating Procedures: PI-SWERL.

Development of the PI-SWERL (Figure B-7) by Victor Etyemezian and others at the Desert Research Institute (DRI) in Reno, Nevada, was motivated by a need for a portable device to test and measure the potential for wind erosion and dust emissions from real-world surfaces. Large wind tunnels, the conventional mode of measurement prior to the PI-SWERL, required long setup times and often a team of people to operate. In comparison, the PI-SWERL is easy to move, requires minimal setup time, and can be operated by a single person.[2] A prototype was developed in 2000 and tested alongside the University of Guelph's large wind tunnel in Guelph, Ontario, Canada. This testing provided early indication of the feasibility of the PI-SWERL concept. Since then, several models have been used in many field investigations, including measuring emission potential on Owens Lake and Salton Sea playas.

Figure B-7. PI-SWERL Apparatus

The PI-SWERL uses a tri-wheeled buggy to transport the instrument and all supporting components. This photograph shows an Air Sciences Inc. crew member sampling surface emission potential at Area T23 on the Owens Lake playa, California.

The PI-SWERL comprises an open-bottomed, cylindrical chamber operated by a direct-current motor that spins an annular metal ring about 2.5 inches above and parallel to the soil surface. Principles of fluid mechanics allow simulation of high winds and ground-level turbulence that typically produce dust

[2] For safety and efficiency, two-person teams are recommended.

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emissions. The spinning ring creates known wind shear, lofting soil and dust particles and passing them through particulate monitors. The PI-SWERL electronically measures the number and size of entrained particles over the duration of a test cycle, typically less than 10 minutes. By controlling the speed of the ring to simulate varying wind speeds, the potential for a soil surface to produce PM_{10} dust emissions can be determined under a range of simulated wind conditions.

The PI-SWERL-derived PM_{10} and sand flux compared favorably to standard laboratory measurements in two separate calibration studies sponsored by the Los Angeles Department of Water and Power (LADWP). In 2011, the PI-SWERL PM_{10} flux using a DustTrak was calibrated against the gravimetric PM_{10} flux at DRI's laboratory in Reno, Nevada (Gillies and Zhou 2012). Overall, the DustTrak-to-gravimetric PM_{10} flux relationships were excellent with regression coefficients (R^2) between 0.85 and 0.99.

In a separate investigation in 2012, PI-SWERL particle counts based on an Optical Gate Sensor (OGS) were calibrated against the measured sediment flux at the University of Guelph's 1.2-meter wind tunnel (Nickling 2012). Very strong ($R^2 > 0.93$) linear relationships were found between the measured sediment flux and the OGS counts for laboratory sand and for two of the Owens Lake soils (located at Study Area 3 and Lizard Tail). A much lower ($R^2 = 0.4256$), but still statistically significant, linear relationship at the 95 percent confidence level was associated with Cottonwood soils.

B.1.3.2.1.4 Operation and Maintenance Procedures

Appendix D.1, Standard Operating Procedures: PI-SWERL, describes the PI-SWERL operation and maintenance activities (including precautions), start-up and operating procedures, periodic cleaning and maintenance procedures, and records management (including use of the SWERLView software).

B.1.3.2.1.5 Analysis

This section summarizes the process for transforming the PI-SWERL data to graphs and tables of PM_{10} emission flux versus surface friction velocity. These output graphs and tables are later used to calculate maximum hourly and annual PM_{10} emission rates (see Section B.2).

<u>Data Output from PI-SWERL</u>

Each PI-SWERL run will consist of a ten-minute cycle. Each cycle consists of a 60-second cleaning step at the onset of the test (friction velocity of zero) and five incremental steps with a constant friction velocity (Figure B-8). The cleaning step purges the test chamber from any residual particulate matter that might be left in the system from prior tests. The five incremental steps are based on stable blade rotations (RPM, or rotations per minute) and represent known friction velocities (through an internal instrument calibration) that can be compared to those observed in the meteorological monitoring network around the Sea (for example, Table B-3). Based on this comparison, the highest friction velocities evaluated in the PI-SWERL will be similar to or exceed those observed around the Salton Sea (depending on the location).

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Figure B-8. Example Output from PI-SWERL Test Cycle

Periods of constant (target) friction velocity, are indicated by the gray bars. The gold line represents surface friction velocity (m s^{-1}). The blue line is the normalized PM_{10} emission rate (dimensionless). The green line is the normalized horizontal sand motion (dimensionless).

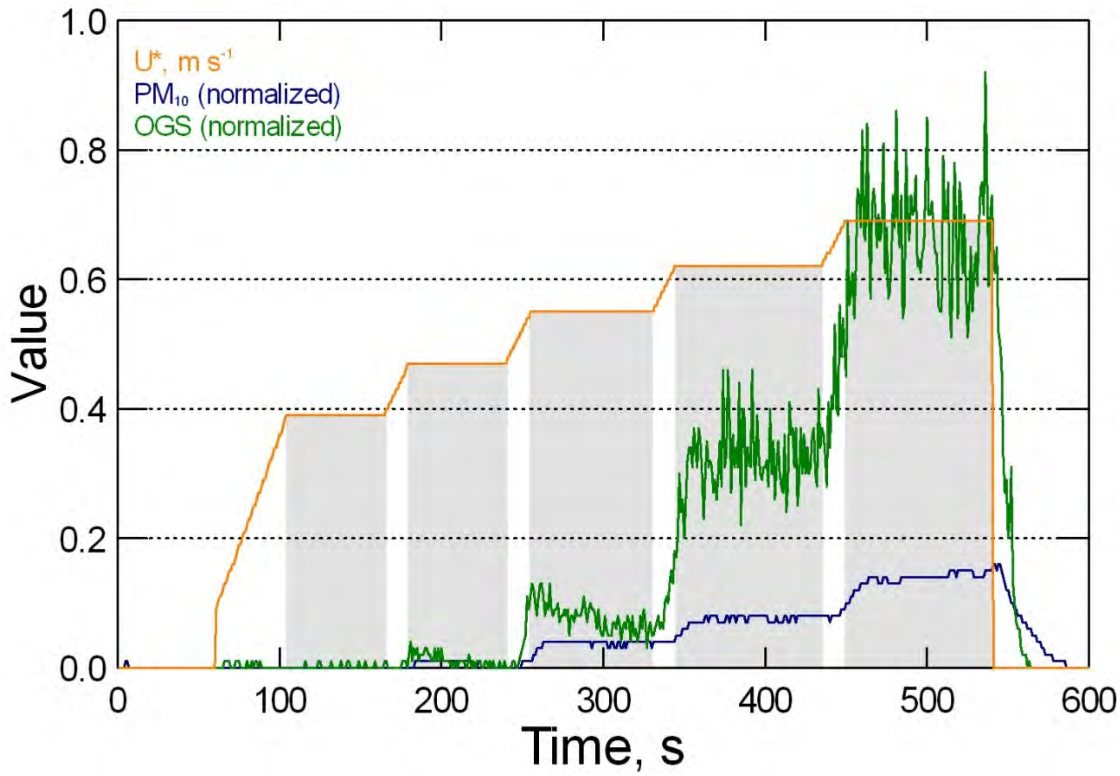

Table B-3. Meteorological Parameters Associated with Different PI-SWERL Rotation Rates

Rotation Rate (RPM)	Surface Friction Velocity (cm s^{-1})	Wind Speed at 10 Meters Above Ground † (m s^{-1})	(mph)
2000	39	11	25
2500	47	13	30
3000	55	15	34
3500	62	17	39
4000	69	19	43

† Assumes a roughness length (z_0) of 0.1 mm representative of smooth playa conditions

Over the course of each test, the PI-SWERL generates several data streams, which are electronically saved on a one-second basis. A portion of the output describes test characteristics (for example, test ID, GPS coordinates, etc.), another portion is primarily used in the data validation step (for example, air flow rate, actual versus targeted RPM), and a third portion of the data is used to characterize the emissions from the evaluated surface. Of the latter, the following data fields are used in the data analysis (see Figure B-8):

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- Friction velocity, u_*: Calculated from RPM, which varies stepwise within each test. The same RPM steps are used across all PI-SWERL tests.
- PM_{10}: Measured as a concentration (mg m^{-3}) but converted to vertical emission flux ($\mu g\ m^{-2}\ s^{-1}$).
- OGS: Measures the intensity of sand motion within the PI-SWERL chamber; expressed as number of particle counts per second.

Identification of Emission Flux "Regime"

Sand motion and PM_{10} emission profiles vary with soil type and surface conditions. This section summarizes five examples covering the range of surface conditions, from low sand motion/low PM_{10} emissions to high sand motion/ high PM_{10} emissions. An overview of the associated surface characteristics is given in Table B-4. Photographs are shown in Figure B-9. All of these examples are based on measurements on sandy soils at the Owens Lake playa (June 2015). A similar spectrum of soil and surface conditions can be found on exposed Salton Sea playa.

Table B-4. Representative Surface Types for Salton Sea

Representative Surfaces	Crust Moisture	Crust Condition	"Free" Surface Sand	PM_{10} Emission Potential	Sustained PM_{10} Emissions?
A	Dry	Undisturbed	Negligible	Low	No
B	Moist	Undisturbed	Negligible	Low	No
C	Dry	Undisturbed	Abundant	Intermediate	Yes, Intermediate
D	Dry	Disturbed	Minimal	Intermediate	No
E	Dry	Disturbed	Abundant	High	Yes, High

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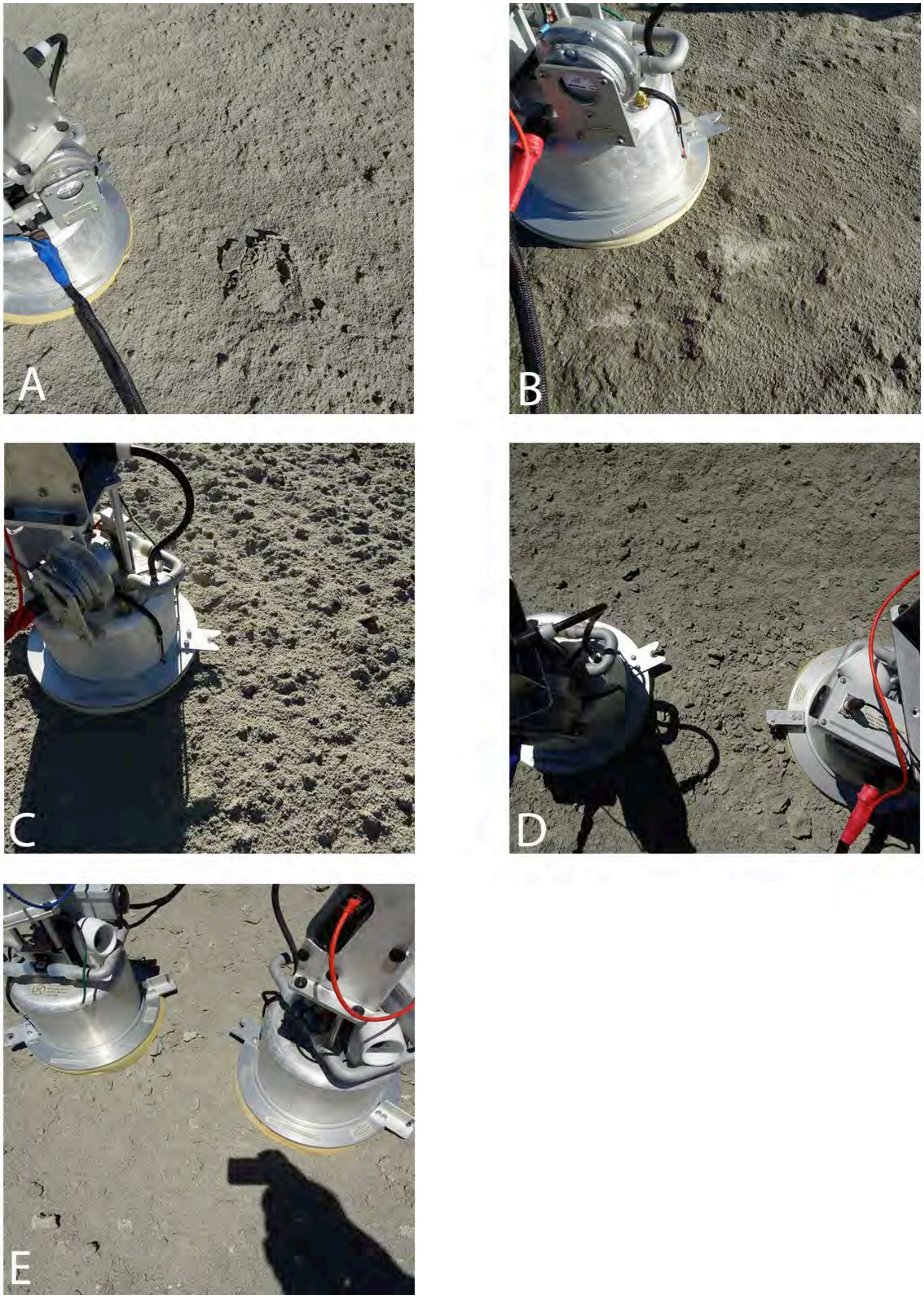
Figure B-9. Photographs of Representative Surface Types

The identification letters (shown in lower left-hand corner of each panel) correspond to those used in Table B-4 and in later summary figures.



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Sand motion and PM_{10} flux profiles for each of the representative surfaces are presented in Figure B-10 through Figure B-14. Note that the sand motion and PM_{10} flux profiles are both normalized and therefore dimensionless.

Figure B-10 shows the sand motion and PM_{10} flux profiles for a dry, stable (that is, hard) salt crust (see Figure B-9, Surface Type A). Sand motion and PM_{10} flux are both low for this surface, with values lying close to the x-axis for all RPM levels. The OGS readings are within the instrument noise range, and the PM_{10} concentrations within the PI-SWERL chamber are at ambient levels.

A similar pattern exists on the surface characterized by a moist, stable salt crust (Figure B-11, Surface Type B). As with the dry salt crust example (Surface Type A), the OGS readings are within the instrument noise range, but in this case a small amount of superficial PM_{10} is available for entrainment at high RPMs. The PI-SWERL is capable of recording these low emission rates but they are insignificant in their contribution to the 24-hour average PM_{10} concentrations.

Surface Type C (Figure B-12) is an example of a dry salt crust with abundant free sand on the surface, generating sustained high sand motion with sustained intermediate PM_{10} emissions with increasing RPM.

Stable salt crusts have the potential to protect surfaces from erosion, especially if there is little to no erodible material on the surface to accelerate erosion and crust degradation. This was the case with Surface Types A, B, and C above. However, once the crust is broken, the PM_{10} emission rates increase significantly. In future PI-SWERL sampling events, sand motion and PM_{10} flux profiles will be generated for both disturbed and undisturbed salt crusts.

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Figure B-10. Example Surface Type A, Profile: Undisturbed Dry Crust, Negligible Free Sand, Low Sand Motion, Low PM_{10} Emissions

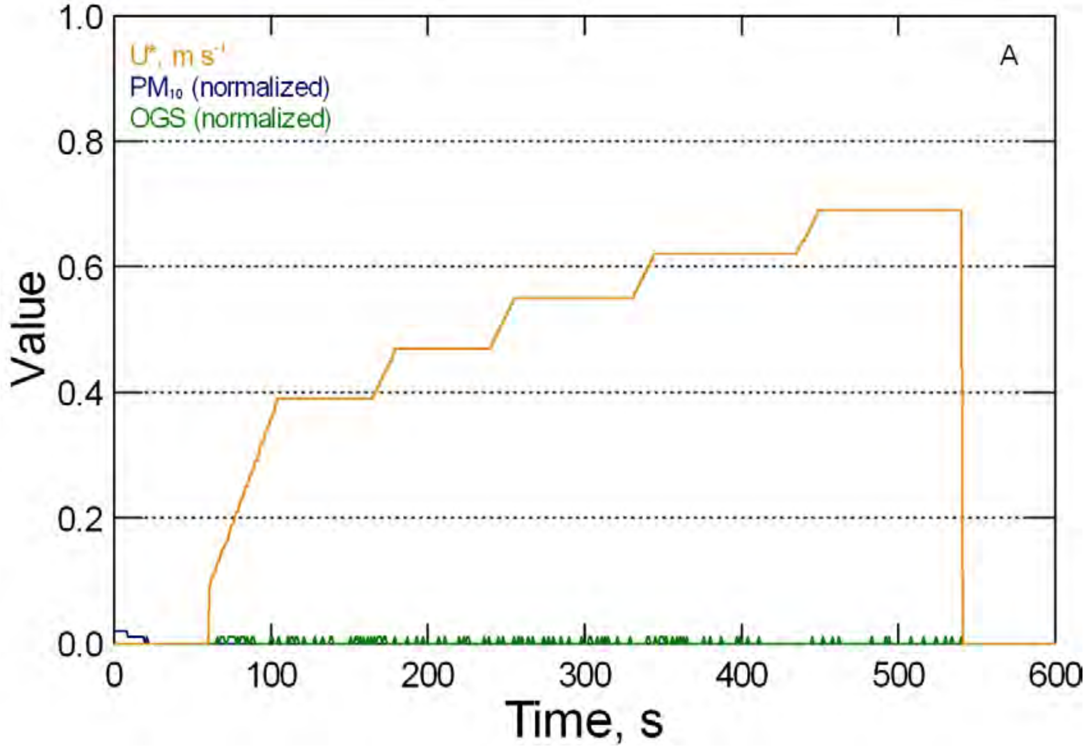


Figure B-11. Example Surface Type B, Profile: Undisturbed Moist Crust, Negligible Free Sand, Low Sand Motion, Low PM_{10} Emissions

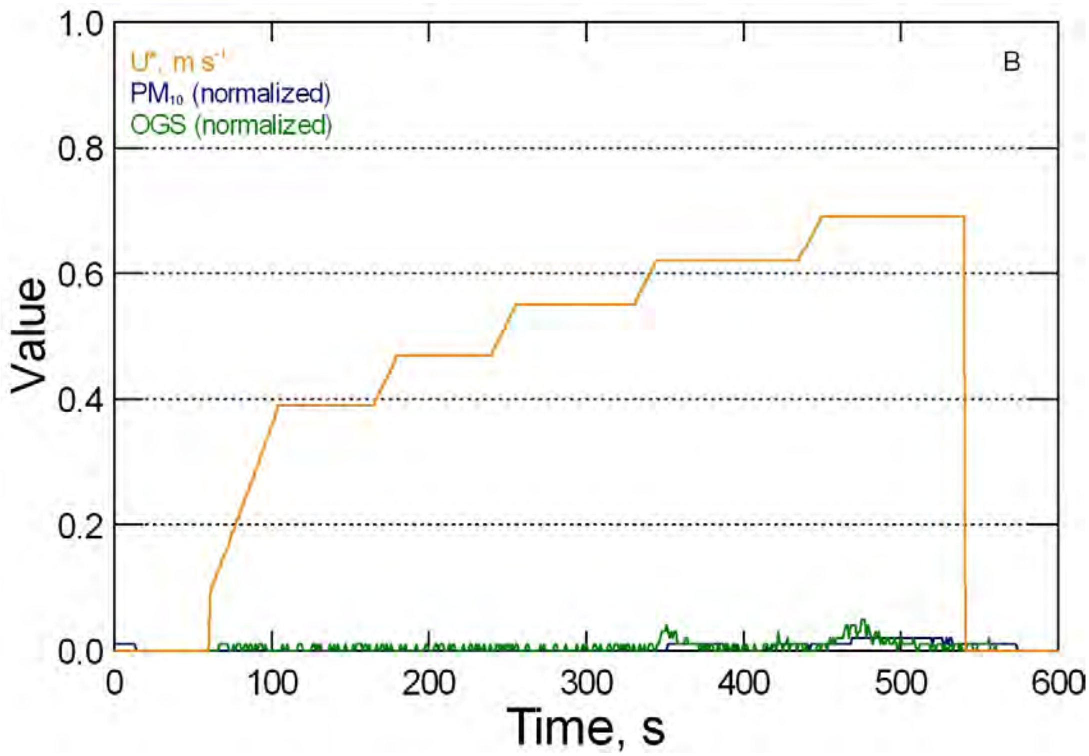
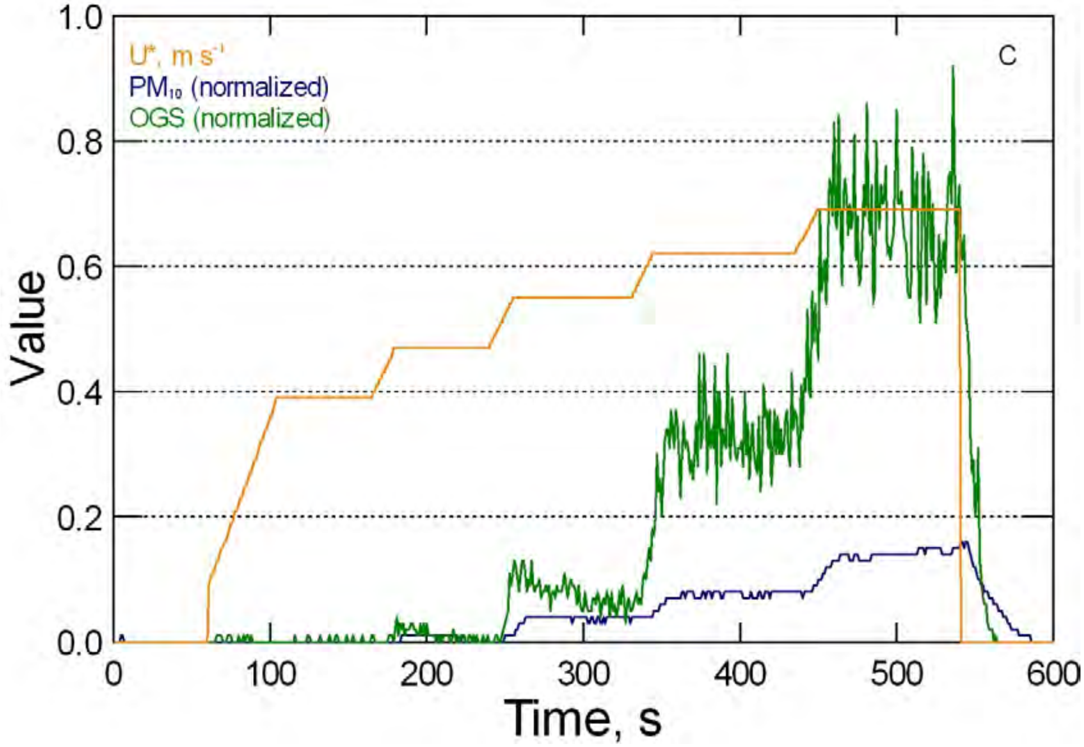


Figure B-12. Example Surface Type C, Profile: Undisturbed Dry Crust, Abundant Free Sand, High Sand Motion, Intermediate PM_{10} Emissions



Surface Type D (Figure B-13) is one with a disturbed crust, but little free sand on the surface to act as an abrasive agent. Sand motion and PM_{10} emissions both spiked at higher RPMs, but the increase lasted only about a minute before plummeting back to background levels. As with Surface Type C, the higher PM_{10} emissions are unlikely to contribute significantly to 24-hour PM_{10} concentrations.

Surface Type E (Figure B-14) is characterized by a disturbed crust with abundant free sand on the surface acting as an abrasion agent. The lack of durable crust produced a virtually unlimited supply of sand, causing sustained high sand motion with very high sustained PM_{10} emissions—the highest of any surface tested. Under this scenario, the higher PM_{10} emissions are expected to contribute significantly to ambient concentrations over extended periods of time (see discussion below regarding temporal and spatial averaging).

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Figure B-13. Example Surface Type D, Profile: Disturbed Dry Crust, Minimal Free Sand, Low Sand Motion, Spikes in PM_{10} Emissions

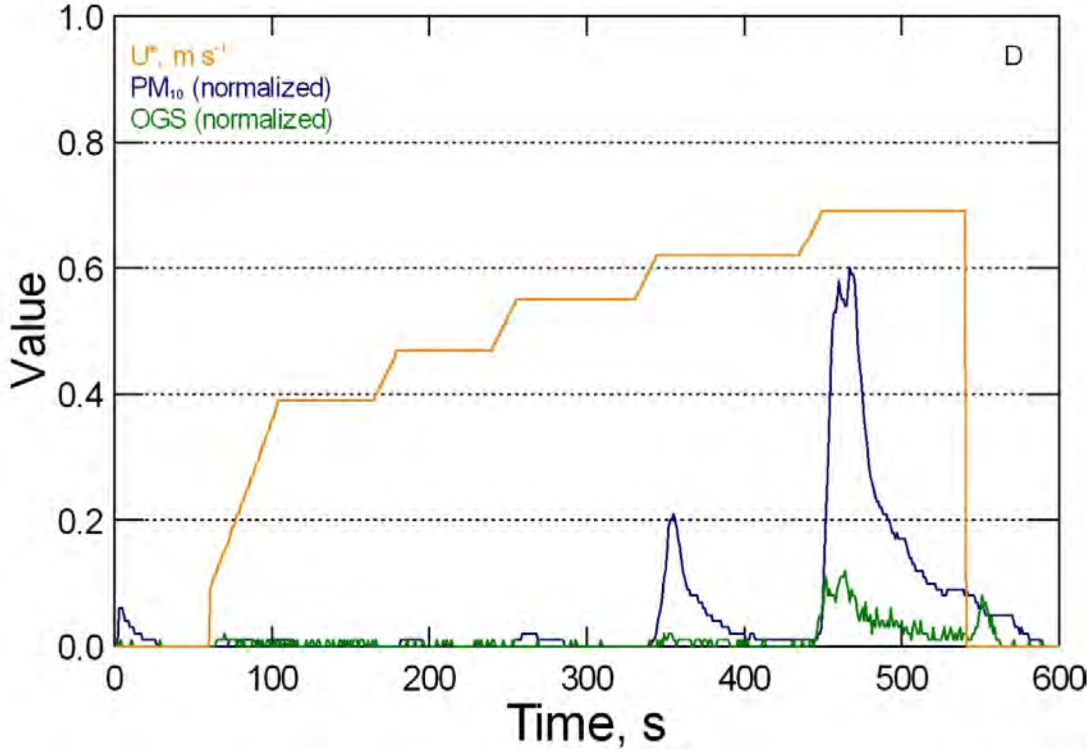
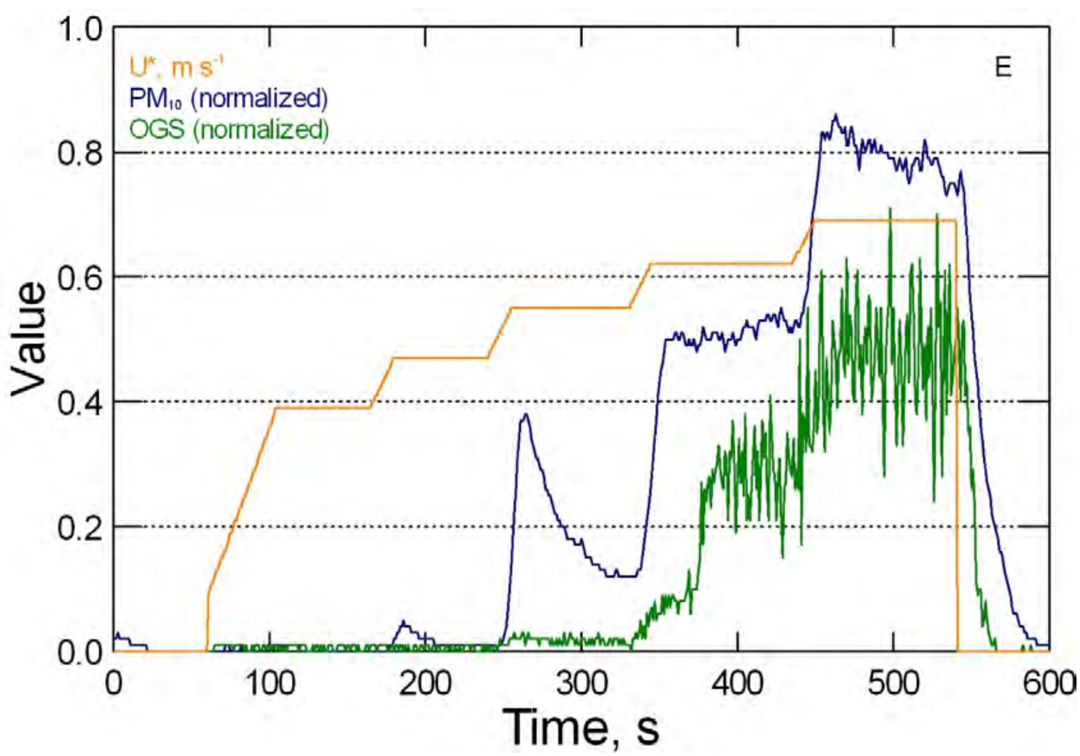


Figure B-14. Example Surface Type E, Profile: Disturbed Dry Crust, Abundant Free Sand, Sustained High Sand Motion, Sustained High PM_{10} Emissions



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Generation of Emission Flux Versus Friction Velocity Curves

In the next step, PM_{10} emissions and sand motion are expressed as a function of the surface friction velocity, allowing for estimating the potential PM_{10} emissions at a given wind speed in the field. The PM_{10} emission rates are geometrically averaged over each time step characterized by constant RPM (therefore, constant friction velocity; see Figure B-8), and then geometrically averaged over the replicate runs within a specific surface type (Figure B-15). Several features become apparent from these relationships:

1. PM_{10} emission rates vary strongly by u_* and surface type (top panel, Figure B-15).

2. Threshold friction velocities[3] vary by surface type (middle panel, Figure B-15).

3. K-factors[4] vary by u_* and surface type for all sand fluxes above background levels (surface types C and E) (bottom panel, Figure B-15).

4. Several surface types (A, B, D) have PM_{10} emissions rates and sand activity that do not exceed background (instrument noise) levels. These surfaces are considered non-emissive under all wind speeds that would occur under normal conditions on the Salton Sea playa.

Some of the surface types are characterized by PM_{10} emission rates that are above background levels (top panel, Figure B-15), but the PM_{10} emissions are short-lived (spikes) and not supported by sustained sand motion. Examples include surface types A, B, and D across all u_* values, and surface types C and E at low u_* values. In these cases, the surfaces are highly resistant and/or sand fluxes are not high enough to generate significant, sustained PM_{10} emissions (compare the middle panel of Figure B-15 with Figure B-10 through Figure B-14).

The duration of PM_{10} emissions is important when extrapolating the PI-SWERL emission rates to longer time periods; that is, 24 hours and above. For this reason, a persistence factor has been imposed to calculate longer-term PM_{10} emission rates:

$$ER_{LT} = \overline{ER_{ST}} \cdot PF \quad \textbf{Equation B-1}$$

where ER_{LT} is the long-term average PM_{10} emission rate (g m^{-2} event^{-1}), $\overline{ER_{ST}}$ is the geometric-mean emission rate (g m^{-2} s^{-1}) for each RPM level within a PI-SWERL run, and PF is a persistence factor (s event^{-1}) defined as follows:

$$PF = \left(\frac{1}{60}\right)\left(\frac{1}{5}\right) = 3.3\ x\ 10^{-3} \quad \textbf{Equation B-2}$$

---

[3] The friction velocity at which sand particles begin to move.

[4] Vertical PM_{10} flux divided by horizontal sand flux.

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This approach assumes that when PM_{10} fluxes are not stable but rather short-duration *spikes*, the spike duration is typically one minute in the PI-SWERL chamber (for example, see Figure B-13 and Figure B-14). Significant PM_{10} emissions, on the other hand, are generated by high-wind events lasting more than five hours.[5] The five-hour-equivalent PM_{10} emission rates in Equation B-1 are calculated by dividing the one-minute-average PI-SWERL PM_{10} emission rates by 60 s hr^{-1} to yield PM_{10} emissions per hour, and again by 5 hr $event^{-1}$ to yield PM_{10} emissions for a five-hour event.

The persistence factor is only applied to surface types and RPM levels that spike and drop to zero or near-zero within the one-minute to 90-second RPM run. The persistence factor is not applied to surface types and RPM levels with PM_{10} emission rates that do not drop to zero.

Adjusting all non-sustained emission rates in Figure B-15 by the five-hour persistence factor reduces most of the surface-type emissions to very low levels (Figure B-16; filled symbols), leaving only PM_{10} emissions sustained by sand motion as significant for longer-term emission calculations (Figure B-16; open symbols).

[5] Supported by analysis of high-wind events at Bombay Beach from 2010 to 2015.

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Figure B-15. Relationship between PM_{10} Emission Rate (Upper Panel) and Sand Motion (Lower Panel) versus Surface Friction Velocity [Log_{10}-transformed scale] by Surface Types (A-E)

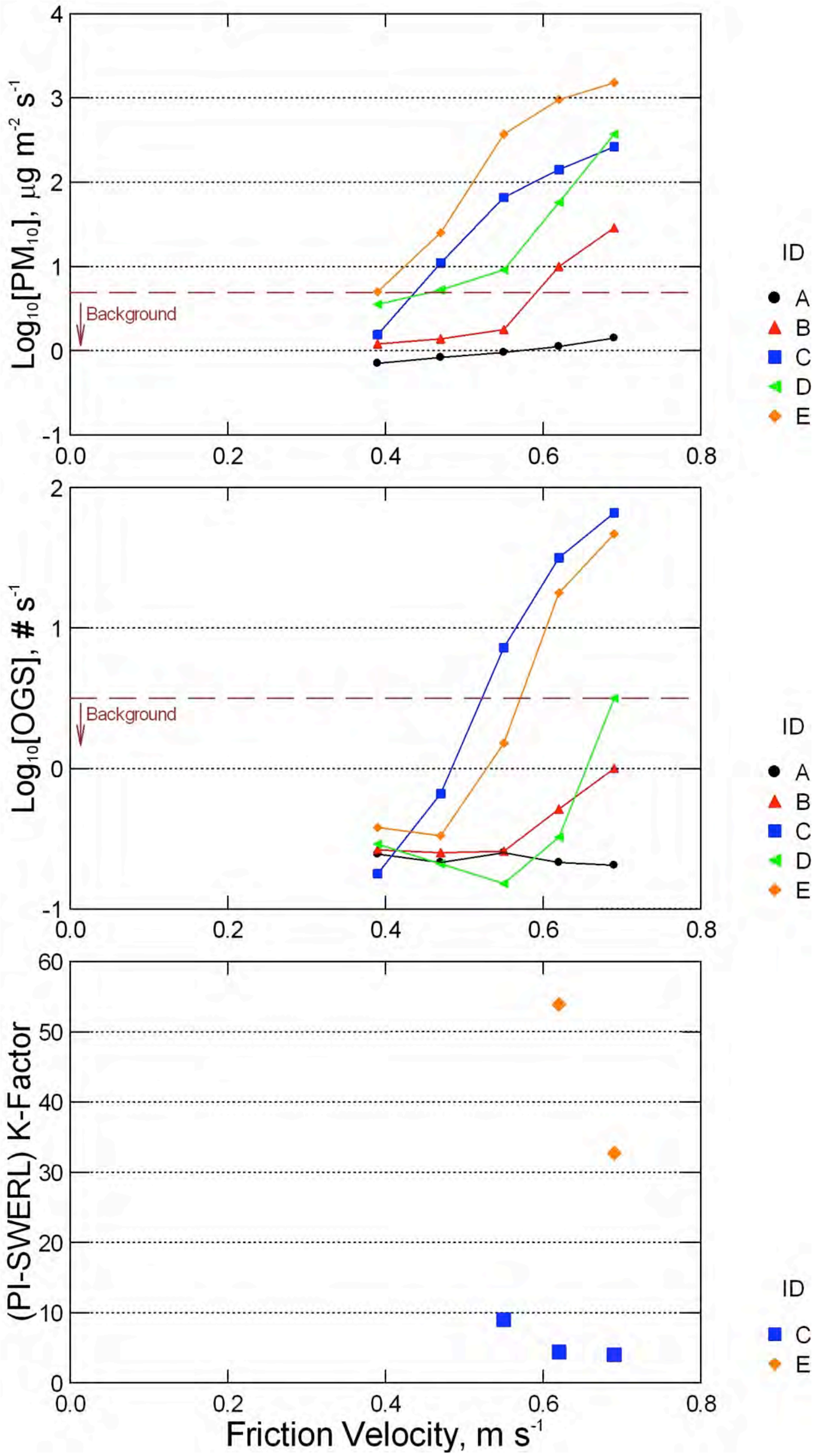
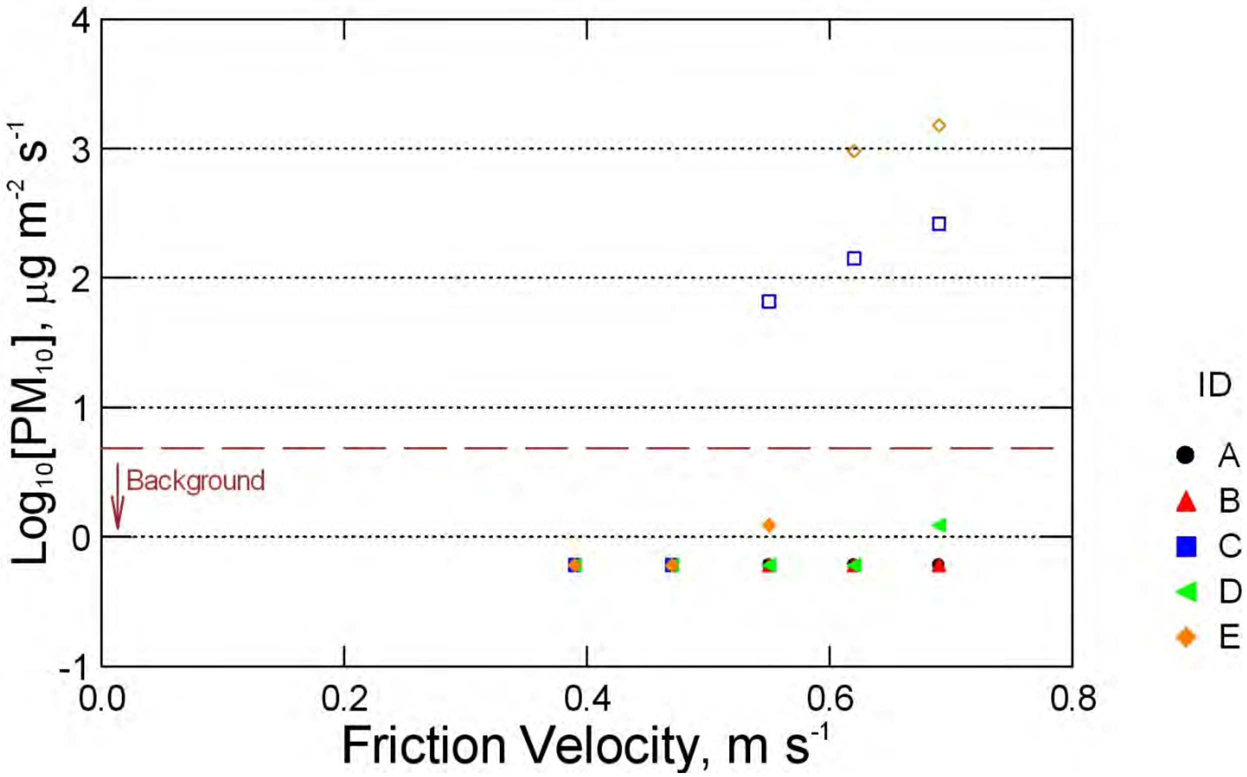


Figure B-16. Relationship between PM_{10} Emission Rate and Friction Velocity Adjusted for Persistence Factor in Equation B-2

Sustained and non-sustained (temporary) emissions are shown as open and filled symbols, respectively.



<u>Generation of Mathematical Relationships between PM_{10} and Friction Velocity</u>

Mathematical relationships between PM_{10} emission flux and u_* will be determined by fitting curves to the data points using SYSTAT 13 or equivalent statistical and graphical software. The form of the fitted equations is not yet known.

B.1.3.2.1.6 Reporting

PI--SWERL results will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

B.1.3.2.2 Meteorological Monitoring

This section describes the exposed Salton Sea playa emission inventory meteorological monitoring objectives, instrumentation, sampling locations and times, instrument operation and maintenance, analysis, and reporting.

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B.1.3.2.2.1 Objectives

Meteorological data will be used in the Salton Sea playa emission inventory in one of two ways: (1) estimating PI-SWERL-generated PM_{10} emission rates, with friction velocity as the independent variable, or (2) input to the CALMET meteorological modeling analysis, used in the CALPUFF dispersion modeling analysis to evaluate potential impacts at Salton Sea PM_{10} compliance monitors.

B.1.3.2.2.2 Instrumentation

Meteorological sensors will be mounted on a tripod with a 6-meter-tall mast (Figure B-17). Cup anemometers will be mounted on the mast at three heights above ground: at 1, 2, and 6 meters. Met One Instruments (Met One) model 014A mini wind speed sensors will be installed at the 1-meter height; standard Met One model 014A wind speed sensors will be installed at the 2- and 6-meter heights. A Met One 024A wind direction sensor will also be mounted at the 6-meter height. Other required instrumentation includes: a solar panel, a deep-cycle marine battery, a datalogger, a radio modem, radio antennae, and a grounding rod.

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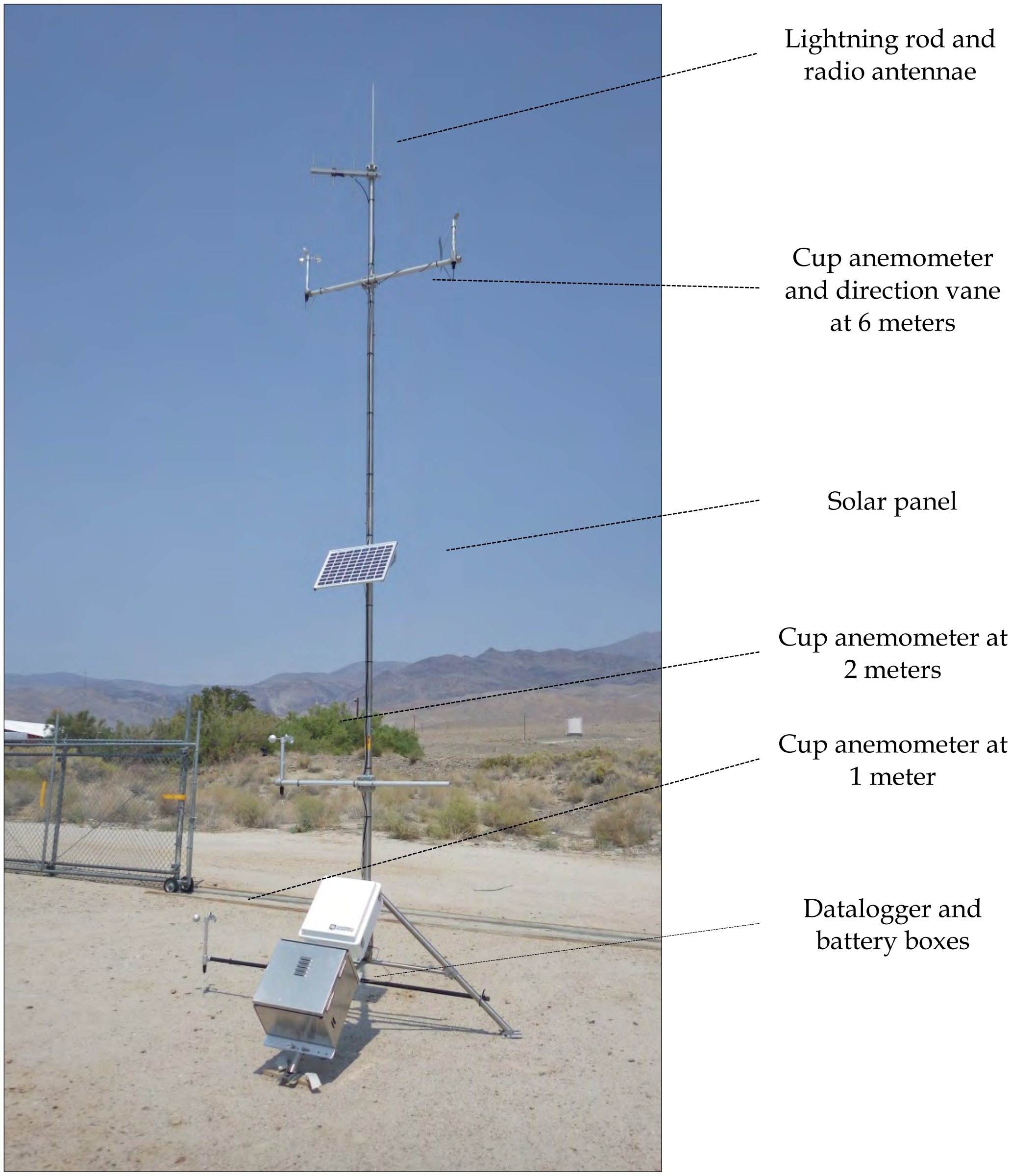
Figure B-17. Salton Sea Portable Meteorological Tower with Cup Anemometers at 1, 2, and 6 Meters above Ground



B.1.3.2.2.3 Sampling Locations

A total of six meteorological monitoring locations will be chosen on the playa for assessing hourly values of surface friction velocity, u_*. The sampling locations will be distributed relatively evenly along the eastern, southern, and western portions of the playa as the Sea recedes. Sites will be chosen that are well away from any natural or human-made obstructions that would affect surface roughness, including fences, buildings, vegetation, and dunes.

Friction velocity is a *reference* wind velocity generally applied to motion near the ground where the *shear stress* (i.e., frictional force of wind acting parallel to the surface) is often assumed to be

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independent of height and approximately proportional to the square of the mean velocity (the "Square Law"):[6]

$$u_* \simeq \sqrt{shear\ stress} = \sqrt{\frac{\tau}{\rho}}$$ **Equation B-3**

where τ is the Reynolds number and ρ is air density. Here, u_* is the velocity for which the Square Law applies.

B.1.3.2.2.4 Sampling Times

The portable meteorological stations will be operated continuously from November 2015 (planned commencement date of monitoring) through the end of project. Mean hourly wind speeds will be calculated by the datalogger for each sensor height at each site.

B.1.3.2.2.5 Operation and Maintenance Procedures

Operation and maintenance of the meteorological instruments are described in Appendix D.2, Standard Operating Procedures: Sand Flux and Meteorological Monitors. Appendix D.2 includes: site check and audit forms, data processing and quality assurance/quality control (QAQC) procedures, and calibration and audit procedures for the Met One 014A wind speed and Met One 024A wind direction sensors.

B.1.3.2.2.6 Analysis

Friction velocity (u_*) and roughness length (z_0) are derived by fitting the hourly average wind velocity (x axis) against height above ground (y axis) on a log-log scale. The slope of the line is u_*; the y-intercept is z_0.

As stated previously, hourly u_* values will be used to calculate hourly vertical PM_{10} emission fluxes using the relationship between PM_{10} emission flux and u_* derived from the PI-SWERL.

B.1.3.2.2.7 Reporting

Reports summarizing, among other things, hourly wind speed and wind direction data, and collection statistics and results of the quality control review will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

[6] Sutton, O. G. 1953. Micrometeorology. p. 76.

B.1.3.2.3 Video Monitoring

This section describes the Salton Sea playa video monitoring objectives, equipment and monitoring locations, image collection rates, operation and maintenance procedures, image analysis procedures, and reporting.

B.1.3.2.3.1 Objectives

Video monitoring, in the form of time-lapse panoramic images from two locations at opposite ends of the Sea, serves several valuable purposes:

1. To document general visibility conditions within the Salton Sea airshed from vantage points located well above the sea elevation. Special focus will be given to days on which one or more Imperial Valley meteorological stations record wind speeds that are above the threshold required to generate dust.

2. To document the location, frequency, and relative intensity of dust plumes originating on exposed Salton Sea playa.

3. To document the location, frequency, and relative intensity of dust plumes traveling across the Salton Sea from sources *not* associated with the Salton Sea playa (including a mixture of playa and off-Sea emissions).

B.1.3.2.3.2 Equipment and Monitoring Locations

Two types of visual monitoring systems will be installed around the Salton Sea: a set of fixed-location, scanning cameras designed to provide high-resolution panoramic images of the Imperial Valley airshed, and a set of six portable video monitoring cameras deployed around playa emission *hotspots*.

The fixed location scanning sites will use Roundshot 360-degree panoramic scanning camera equipment (Figure B-18) and software with a Web interface for remote viewing.[7] The camera systems will be mounted in a camouflaged all-weather enclosure and surrounded by a 10-foot by 10-foot by 10-foot cyclone fence enclosure with a locking gate for added security.

Figure B-19 shows the proposed locations for the scanning cameras. The north camera location will be centered eastward and scan 195° between NNW and SSE to capture the north and western playas, as well as the easternmost off-Sea areas on the west side of the Sea. The south camera will be centered northwestward and scan 225° between SSW and ENE to capture the southern and western playas. A set of example time-lapse panoramic images (compressed horizontal scale) is presented in Figure B-20 to illustrate the output from the cameras.

[7] http://www.roundshot.com/xml_1/internet/de/intro.cfm

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Figure B-18. Roundshot Livecam D2 360° Scanning Equipment with Weatherproof Case

Figure B-19. Proposed Sites for Roundshot Scanning Cameras

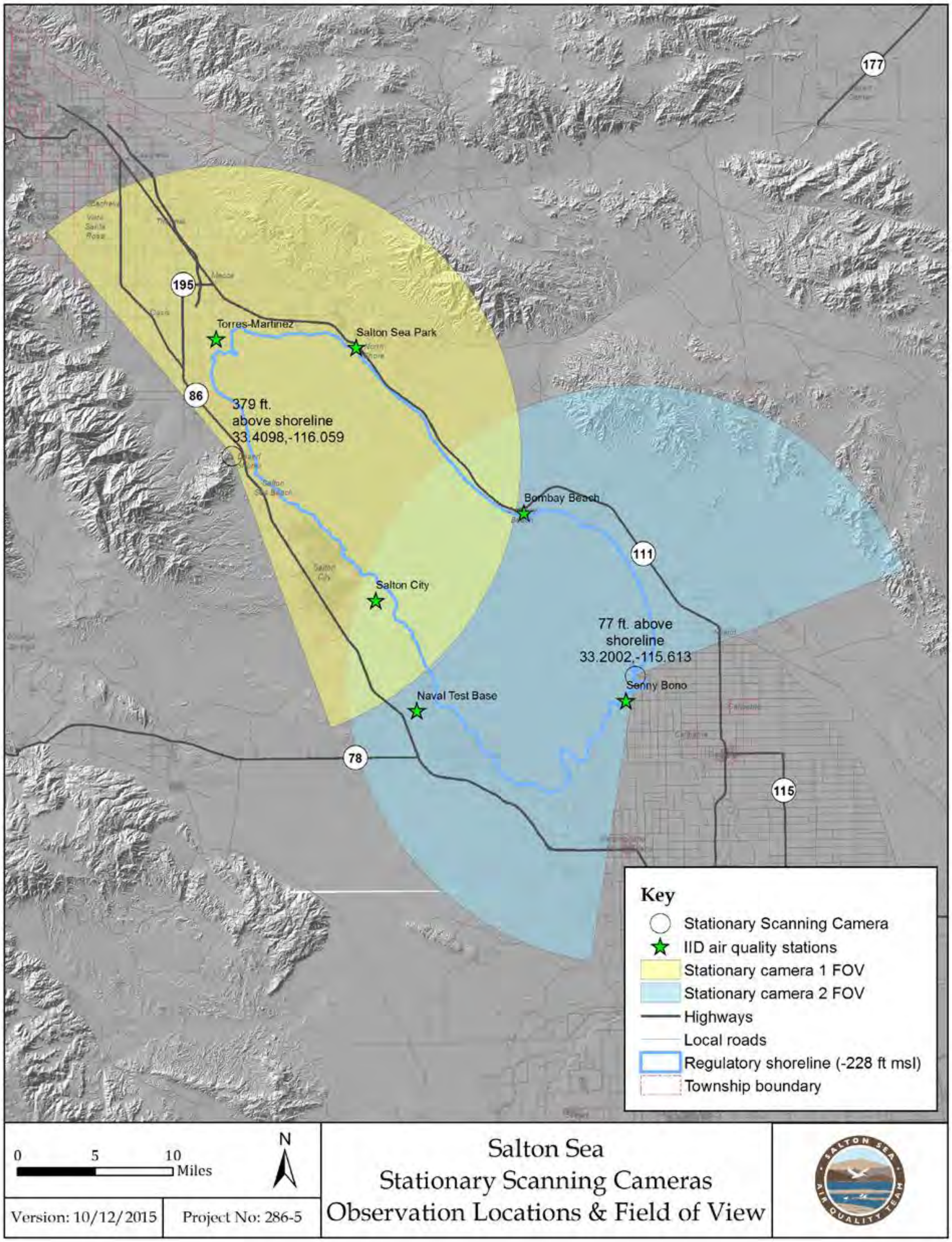

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Figure B-20. Time-Lapse Panoramic Images Taken with Roundshot Livecam D2 360° Scanning Camera (El Paradiso, St. Moritz, Switzerland)

The photographs have been compressed horizontally, producing a "fish eye" effect that doesn't exist in the original images.

The portable video camera systems will be equipped with the StarDot Corporation 10-megapixel (MP) H.264d Special Bundle, which includes a StarDot 10MP SC day/night camera (Figure B-21) with Dotworkz ST-BASE outdoor enclosure, a Veracity Power-over-Ethernet (PoE) injector, and a Tripp Lite outdoor-rated 100-foot patch cable.[8] In addition, each site will be equipped with an 8–48-millimeter vari-focal lens, providing a 4.5°–45° field of view (FOV) that may be adjusted according to specific site conditions. The StarDot camera will be mounted at the 2-meter height on a tripod (similar to the one shown in Figure B-17). Siting of the video camera stations will occur later, when and if dust emission hotspots are observed on the playa.

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[8] http://californiapc.com/IP-Cameras-Enclosures-Lenses-Accs/StarDot-NetCam-Bundles/

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Figure B-21. StarDot Technologies SC H.264 Camera

B.1.3.2.3.3 Image Collection Rates

Both camera systems will operate continuously during daylight hours. The collection rate on the Roundshot scanning camera depends on the scanning angle and available bandwidth (a full 360° panorama is approximately 250 MB). The scan duration for a 180° panoramic image is on the order of three seconds. One Roundshot panoramic image and one StarDot still-frame image will be captured and stored at least every 15 minutes.

B.1.3.2.3.4 Operation and Maintenance Procedures

Operation and maintenance of the video monitoring stations are described in Appendix D.3, Standard Operating Procedures: Roundshot Livecam D2 and in Appendix D.4, Standard Operating Procedures: StarDot Technologies SC H.264. Each of these appendices includes installation and operation procedures, and site check forms, for the Roundshot camera system (fixed stations) and the StarDot camera system (portable stations), respectively.

B.1.3.2.3.5 Image Analysis Procedures

In the laboratory, the images will be filtered to include those taken on days when wind speeds exceed the threshold for dust generation (nominally, more than four hours with average wind speeds greater than 5 meters per second at a height of 10 meters above ground). All of the captured images will be securely stored, backed up, and available for viewing on a secure website.

Filtered images will be reviewed by an analyst to qualitatively identify and track areas of playa that display dust activity. This review will inform any subsequent decisions to site portable StarDot cameras near emissions hotspots.

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B.1.3.2.3.6 Reporting

Reports summarizing, among other things, days with 10-meter wind speeds above the threshold for dust generation, and a qualitative description of images showing evidence of dust plumes will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

B.1.3.3 Delineating Dust Plumes and Active Source Areas

This section describes the objectives, methods, and reporting for delineating dust plumes and active source areas on the currently exposed Salton Sea playa.

B.1.3.3.1 Objectives

The objective is to quickly and reliably map and delineate active dust plumes and source areas over the vast areas of exposed Salton Sea playa during the dust season.

B.1.3.3.2 Methods

A combination of visual monitoring, video monitoring, satellite imagery, and field investigations will be used to monitor dust plumes and identify source areas after high wind events. Visual monitoring and video monitoring will be used to identify dust plumes. Mapping and delineation of eroded and emissive sources areas will be completed using a combination of satellite imagery, ultra-high resolution Unmanned Aerial System (UAS) imagery and field investigations immediately after a high wind event. Detailed methods are listed as follows.

B.1.3.3.2.1 Plume Observations

Weather forecasts from the National Weather Service will be evaluated on a daily basis. An example weather forecast is provided in Figure B-22. During times of predicted high wind events, visual observers will be deployed around the playa to specific vantage points. This includes Red Hill Bay in the South, and the Santa Rosa Mountains in the North. Maps and mobile GIS tools will be used to track plumes and identify locations where emissions are occurring from the playa surface. In addition, video monitoring results will be evaluated after these events to help isolate playa locations where emissions occurred. Meteorological data will be evaluated from all available network locations to determine the magnitude of wind conditions around the playa.

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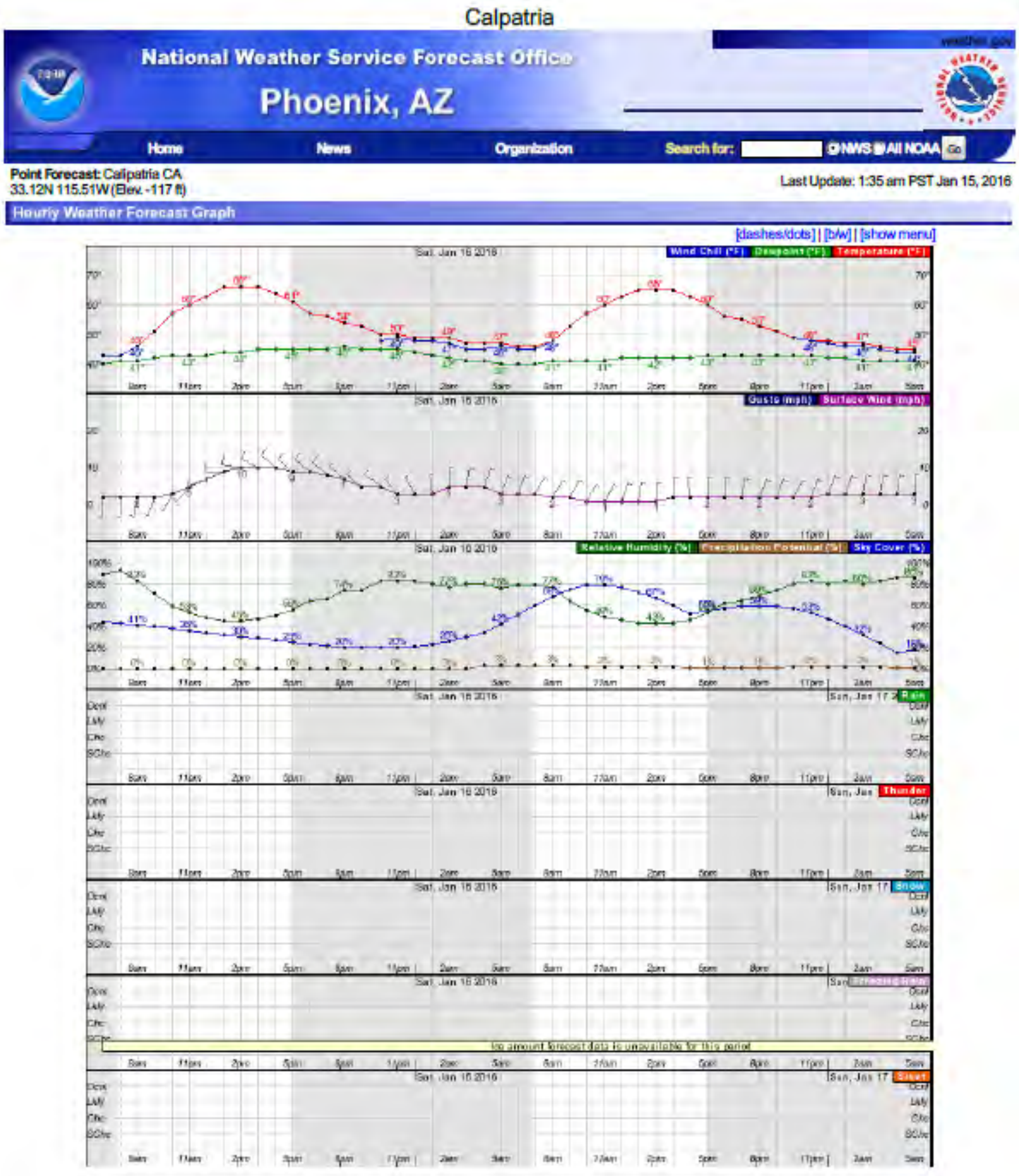
Figure B-22. Example Weather Forecast



B.1.3.3.2.2 Delineating Active Source Areas

Each wind event where visual plume observations occurred on the Playa would also trigger a high-resolution image collection for delineating active source areas. Mapping of specific source areas will be prioritized based on video and/or visual observations of identified plumes. Source areas will be

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identified primarily based on the presence of scoured areas. Scoured surfaces are usually denoted by a topographically low area (in the range of 1-7 cm below surrounding surfaces) with a hard surface.

Routine satellite or UAS imagery will be acquired after high wind events to aid in the field delineation of active source areas. Specifically, imagery will be used as a photo-interpretive base for delineating source areas on the playa. Maps of active source areas will be generated using Collector for ArcGIS with the recently collected imagery in the background. Salt crust units containing large scoured surfaces after high-wind events will be delineated and surface characterization data for those crust types will be recorded in Collector. The surface characterization include: crust type, top crust thickness, top crust hardness, penetration resistance, sub-crust thickness, sub-crust hardness, surface type, boundary type, soil moisture, soil texture, surface sand percent, salt efflorescence, macro-relief, micro-relief, surface erosion and deposition, and vegetative cover (see Table B-1). Photographic evidence will also be collected at each observation point and linked to the GPS location in Collector.

B.1.3.3.3 Reporting

Results of delineating dust plumes and active source areas on exposed playa surfaces will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

B.2 Quantifying PM_{10} Emissions on Exposed Salton Sea Playa

This section describes the procedures used to compute the maximum-day and annual PM_{10} emission estimates for exposed Salton Sea playa.

B.2.1 Maximum-Day PM_{10} Emissions

The Salton Sea playa maximum-day emissions will be computed as follows:

$$E_{Max-Day} = \sum_{n=1}^{N} \left(A_n \cdot \overline{F_{MaxDay,n}} \cdot 9.5\ x\ 10^{-2} \right) \qquad \textbf{Equation B-4}$$

where $E_{Max-Day}$ is the maximum-day mass emissions of PM_{10} (tons per day, tpd) summed for surface types *n=1* through *N* (the maximum number of surface types assigned), A_n is the total area (m^2) within each surface type n, $\overline{F_{MaxDay,n}}$ is an average maximum-day PI-SWERL-derived vertical PM_{10} emission flux ($g\ m^{-2}\ s^{-1}$) by surface type n, and 9.5 x 10^{-2} is a constant of proportionality to convert from seconds to days and from grams to tons of PM_{10}.

The $\overline{F_{MaxDay,n}}$ term in Equation B-4 is parameterized as follows:

1. PI-SWERL sampling is first used to define relationships between the vertical PM_{10} flux, *F*, and u_* for each surface type *n* represented on the exposed playa. The relationships will be determined with curve-fitting algorithms. The form of the equations is not yet known but expected to vary by surface type.

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2. Next, an array of portable, six-meter-tall meteorological stations will be used to produce an array of spatially averaged hourly u_* values by surface type *n* on the playa. The hourly u_* values are then used in the PI-SWERL relationships to derive spatially averaged hourly vertical emission fluxes:

$$\overline{F_{n,h}} = f\left(\overline{u_{*,n,h}}\right) \quad \textbf{Equation B-5}$$

3. Next, the hourly vertical PM_{10} fluxes are averaged over successive 24-hour periods to produce daily average vertical PM_{10} fluxes by surface type *n* (day index denoted by subscript *d*):

$$\overline{F_{n,d}} = \frac{\sum_{h=1}^{24} \overline{F_{n,h}}}{24} \quad \textbf{Equation B-6}$$

4. The array of daily vertical PM_{10} fluxes is then queried to identify the day *d* with the highest average vertical PM_{10} flux (i.e., the "maximum-day" flux) for each surface type *n*:

$$\overline{F_{MaxDay,n}} = max \begin{matrix} 365 \\ d=1 \end{matrix} \bigg| \, \overline{F_{n,d}} \quad \textbf{Equation B-7}$$

5. These values are then used in Equation C-3 to express the maximum-day mass of PM_{10} emissions within the area of interest (AOI).

6. Maximum-day emissions will be computed using PI-SWERL and CALMET meteorological data collected during the period of investigation.

B.2.2 Annual PM_{10} Emissions

The annual mass of PM_{10} emissions from off-Sea sources is calculated as follows:

$$E_{Annual} = \sum_{n=1}^{N} \sum_{h=1}^{8760} \left(A_n \cdot \overline{F_{n,h}} \cdot 3.97 \; x \; 10^{-3}\right) \quad \textbf{Equation B-8}$$

where E_{Annual} is the annual mass emissions of PM_{10} (tons per year, tpy) for all hours in a year from *h*=1 through 8,760, and for all surface types represented on exposed Salton Sea playa from *n=1* through *N*. Here, A_n is the total area (m^2) for surface type n, $\overline{F_{n,h}}$ is the PI-SWERL-derived vertical PM_{10} emission flux (g m^{-2} s^{-1}) for hour *h* and surface type n, and 3.97 x 10^{-3} is a constant of proportionality to convert from seconds to hours and from grams to tons of PM_{10}.

The total area A_n within surface type *n* will be determined using Geographic Information System (GIS) mapping techniques.

The average hourly vertical emission flux, $\overline{F_{n,h}}$, in Equation B-8 is parameterized as follows:

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$$\overline{F_{n,h}} = f\left(\overline{u_{*,n,h}}\right) \text{ for all } h \text{ satisfying } u_{*,n,h} \geq u_{*t,n}$$ **Equation B-9**

where $f\left(\overline{u_{*,n,h}}\right)$ is the PI-SWERL-derived relationship expressing vertical PM_{10} flux (g m^{-2} s^{-1}) as a function of surface friction velocity, u_*, and $u_{*t,n}$ is the threshold friction velocity for surface type *n*. $\overline{u_{*,n,h}}$ is the spatially averaged u_* values located within surface type *n*:

$$\overline{u_{*,n,h}} = \left.\frac{\sum_{s=1}^{S}(a_s \cdot u_{*s})}{\sum_{1}^{S} a_s}\right|_{n,h}$$ **Equation B-10**

where a_s and u_{*s} are the area and u_* values assigned to each portable meteorological station located within surface type *n*.

Annual emissions will be computed using PI-SWERL, u_*, u_{*t}, and active-area data collected during the period of investigation.

B.2.3 Future Emission Inventory Updates

The exposed Salton Sea playa emission inventory will be updated once every three years using the latest standards and best practices available at the time.

B.2.4 Reporting

Results of the emissions inventory will be reported as outlined in Table B-2, Summary of Reporting for Playa Emissions Inventory. Table B-2 is located at the end of Appendix B.

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Table B-2. Summary of Reporting for Playa Emissions Inventory

	Topic	Items to be Reported	Frequency
1	Mapping and Characterizing Playa Surfaces	Results of mapping and characterizing current exposed playa surfaces, and future exposed playa surfaces	Initial report due on or before June 1, 2016. In subsequent years, reports will be generated at the end of each dust season (by June 1st of each year).
2	PI-SWERL Sampling	Results of PI-SWERL monitoring	
3	Meteorological Monitoring	Report summarizing, among other things: hourly wind speed and wind direction data, and collection statistics and results of the quality control review	
4	Video Monitoring	Report summarizing, among other things: days with 10-meter wind speeds above the threshold for dust generation, and a qualitative description of images showing evidence of dust plumes	
5	Delineating Active Plume Areas	Results of active plume delineations	
6	Annual PM10 Emissions	Results summarizing maximum-day and annual PM_{10} emission estimates for exposed playa	

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APPENDIX C – OFF-SEA PM_{10} INVENTORY

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C.1 Experimental Design

This section describes the experimental design of the off-Salton-Sea (off-Sea) PM_{10} (particulate matter less than 10 microns in diameter) emission inventory, including the inventory goal and objectives, approach, data collection and analysis, mapping and characterization of off-Sea surfaces, collection of aerometric data, and delineation of active plume areas.

C.1.1 Goal and Objectives

Similar to the exposed playa PM_{10} emission inventory described in Appendix B, the goal of the off-Sea inventory is to develop a refined estimate of PM_{10} emissions for consideration in the 2016 Revised Imperial County PM_{10} State Implementation Plan (SIP).

The objectives of the off-Sea PM_{10} emission inventory are three-fold:

1. To characterize the magnitude, duration, and frequency of dust emissions from discrete surface strata within the Off-Sea Source Inventory Area of Interest (Off-Sea AOI) shown in Figure 3-14 (main body) of Salton Sea Air Quality Program. The Off-Sea AOI is a 5,805-square-mile area encompassing the Salton Trough and portions of the surrounding mountains, and extending as far south as the United States-Mexico border.
2. To provide greatest focus on the desert areas west of Salton City in and around the Ocotillo Wells State Vehicular Recreation Area (SVRA). PM_{10} roses[9] generated for the period from 2009-2013 show that the highest and most frequent hourly PM_{10} concentrations originate in the desert area west of the Sea. Other parts of the Off-Sea AOI are also important, but of lower priority for this initial inventory effort.
3. To develop a refined estimate of PM_{10} emissions for consideration in the 2016 Revised Imperial County PM_{10} State Implementation Plan (SIP).

Several lines of evidence will be used to establish the location, timing, and magnitude of dust emissions from off-Sea areas, including: (1) PM_{10} roses showing the frequency, magnitude, and direction of the highest PM_{10} concentrations originating in the desert areas west of the Sea; (2) a network of fixed sand motion monitoring instruments placed within various surface types to monitor activity there; (3) video monitoring to provide photographic evidence of dust emissions; and (4) PI-SWERL sampling to characterize the emission potential of various surface types. Element 1 is designed to provide corroborating evidence of emission activity within the Off-Sea AOI. Elements 2 through 4 will be incorporated directly into the maximum-day and annual PM_{10} emission estimates discussed below.

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[9] PM_{10} roses are similar to wind roses but, in the case of the former, the "petals" show the frequency, magnitude, and direction of PM_{10} concentrations rather than wind speed.

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C.1.2 Approach

The approach for assessing PM_{10} emissions from current and future off-Sea desert lands is as follows:

1. Map and characterize the desert areas west of the Salton Sea by landform (e.g., sand dunes, alluvial fans, washes) and surface type (e.g., sand, rock-armored surfaces, Paleolithic lake sediments).
2. Sample with the PI-SWERL to characterize the emission potential of each surface stratum at the beginning and end of the investigation (around November 1, 2015, and May 1, 2016).
3. Prioritize the surface strata in terms of emission potential (from high to low) using the PI-SWERL data collected in step 2, above.
4. Install portable sand motion monitoring instruments (including meteorological instruments) on medium- and high-priority surface strata.
5. Deploy portable video monitoring stations around the highest priority surface strata to record the time and location of dust plumes and/or human activity.
6. Quantify maximum day and total annual emissions from active source areas.

Each of these items is discussed in more detail below.

C.1.3 Data Collection and Analysis

This section describes data collection and analysis for mapping and characterizing off-Sea surfaces, for aerometric data, and for delineating active plume areas.

C.1.3.1 Mapping and Characterizing Surfaces

This section describes the mapping and characterization of off-Sea surfaces.

C.1.3.1.1 Objectives

The objective of the off-sea mapping effort is to quantify the extent and characteristics of the landforms and surface types found within the desert areas west of the Salton Sea. This information will be used to guide and scale the PM_{10} emission potential of distinct landforms sampled with the PI-SWERL (see Section C2).

C.1.3.1.2 Methods

This section described the methods to characterize landform classes and to map landforms.

C.1.3.1.2.1 Landform Classes

A surface type classification system was developed in order to quantify the dominant Off-Sea landforms and their characteristics (surface, vegetation, and armoring). The classification system was created by researching the desert surfaces present in the region, targeted field investigations, and the photointerpretation of satellite imagery. The surface types used in this classification system are detailed in Table C-1 and Figures C-1 through C-4.

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Preliminary field data to develop the classification system was collected using the ESRI Collector App on a ruggedized tablet. Imagery and field domains were pre-loaded onto tablets before use. This interface allowed the seamless collection of geo-referenced field points, photos, and notes. Data collected using the Collector App was then synced to Arc GIS Online (AGOL) and is available to all Team members as documentation of ground truth for further mapping efforts.

Table C-1. Surface Types used to Characterize Off-Sea Landforms

Class	Sub-Class	Description	Erosion Risk
1-Dry Wash Units	Sand Dominated	Ephemeral drainage dominated by well sorted, fine to coarse grained sand.	High
	Silt Dominated	Ephemeral drainage dominated by silt. Undisturbed silt found in dry washes is often present as a fragile thin mud-cracked sheet.	High
	Gravel Dominated	Ephemeral drainage dominated by gravel.	Low
	Gravel and Sand	Ephemeral drainage consisting of gravel evenly distributed among a sandy matrix. Poor to moderately sorted. The upper surface often has been coarsened by wind erosion and/or OHV activity.	Medium
	Gravel and Silt	Ephemeral drainage consisting of gravel evenly distributed among a silty matrix. Poor to moderately sorted. The upper surface often has been coarsened by wind erosion and/or OHV activity.	Medium
2-Alluvial Fan Units	Sand Dominated	Alluvial fan deposits consisting of primarily sand. Typically located near the periphery of the fan.	High
	Sand and gravel	Alluvial sand capped by gravel lag. Typically located near the middle of the fan.	Medium
	Cobbles	Alluvial fan deposits consisting of sand, gravel, and cobbles. Typically located near the top of the fan.	Low
3-Sand Units	Sand Dunes	Active aeolian dune and erosional interdune surface. Large asymmetrical, elongated Transerve dunes are the most common in this region. Dunes are > 1.5 M and typically fine to medium grained.	High
	Sand Sheet	Active aeolian deposit. Flat to low angle, uniform, expansive sand surface. Typically fine to medium grained.	High
	Sand over Alluvium	Sand sheets and coppice dunes < 1.5 m in height superimposed on alluvium. Coppice dunes are small vegetated sand mounds that form when a shrub impedes the flow of air and causes sand grains to settle out on the downwind side of the shrub.	High
4-Paleo Lakebed	Silt-Dominated	Well sorted lacustrine silt deposits from pre-historic Lake Cahuilla.	High
	Cobble over Silt	Large Cobbles regularly distributed among silt situated along the margin of pre-historic Lake Cahuilla. The cobbles serve as armory for the vulnerable underlying silt. The cobbles were deposited by wave action from Lake Cahuilla.	Medium
	Gravel and Sand	A mixture of gravel and sand present on old beach ridges formed by wave action.	Low
6-Rock Units	Sandstone	Highly friable, heavily eroded sandstone. Often taking the form of steep gulleys.	Medium
	Bedrock	Undifferentiated bedrock. A consolidated hard surface that is not emissive.	Very Low

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Class	Sub-Class	Description	Erosion Risk
7-Offshore Playa Unit	Offshore Playa	Independent depressions that once held water and now have formed evaporites among very delicate mud-cracked silt. The underside of the mud cracks has a distinct micaceous sheen.	High

Figure C-1. (A) Sand-Dominated Dry Wash with Heavy OHV Traffic, and (B) Gravel- and Sand-Dominated Alluvial Fan

A. Sand-Dominated Dry Wash with Heavy OHV Traffic

B. Gravel- and Sand-Dominated Alluvial Fan

Figure C-2. (A) Large Sand Sheet, and (B) The Algodones Dune Field

A. Large Sand Sheet

B. The Algodones Dune Field

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Figure C-3. (A) Cobbles Distributed Over Silt-Dominated Paleo Lakebed, and (B) Silt-Dominated Paleo Lakebed

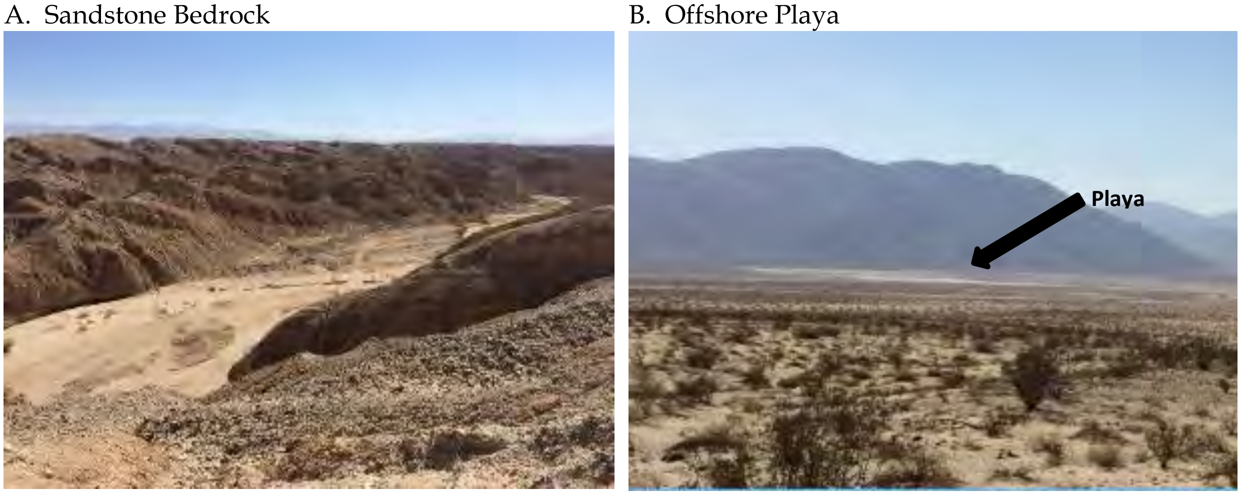
A. Cobbles Distributed over Silt-Dominated Paleo Lakebed

B. Silt-Dominated Paleo Lakebed

Figure C-4. (A) Sandstone Bedrock, and (B) Offshore Playa

A. Sandstone Bedrock

B. Offshore Playa



C.1.3.1.2.2 Landform Mapping

Landforms will be spatially quantified/mapped using a mixture of the field ground truth data mentioned above, photo-interpretation of satellite imagery, and Object Based Imagery Analysis techniques (OBIA). NAIP satellite imagery will be segmented using Trimble eCognition. Pixels within the imagery that share common characteristics will be bundled together to create objects that delineate the landforms. Using the ground truth data, samples will be selected from these objects and classified according to their landform classification (Table C-1). This will be accomplished by consulting the imagery, a Digital Elevetion Model (DEM), and the field ground truth data. Once a reasonable distribution of samples have been collected across the different landforms, they will then be used as training data to inform the random forest data mining classification. The output of the random forest data mining classification is a spatial map depicting the major landforms. This output will be manually reviwed for quality control and additional ground data will be collected to determine the accuracy / uncertainty associated with the final mapping product.

Vegetative cover within the off-sea area will be extracted from a natural color, 1 foot spatial resolution aerial imagery collected in 2011. This will be combined with NAIP high resolution 4 band aerial imagery collected in 2012. The NAIP imagery provides additional detail in the Near Infrared region (which is sensitive to vegetation photosynthesis), while the 1 foot natural color imagery will be used to delineate the edges of the vegetation structure. An example of the vegetation extraction for a portion of the off-sea area is provided in (Figure C-5). Results of the vegetation extraction process will be aggregated to a 1 acre grid to calculate an area weighted average percent cover on a conitinuous scale.

Final results of the landform mapping will be summarized in the final off-Sea inventory documentation.

C.1.3.1.3 Reporting

Results of mapping and characterizing off-Sea surfaces will be computed and reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

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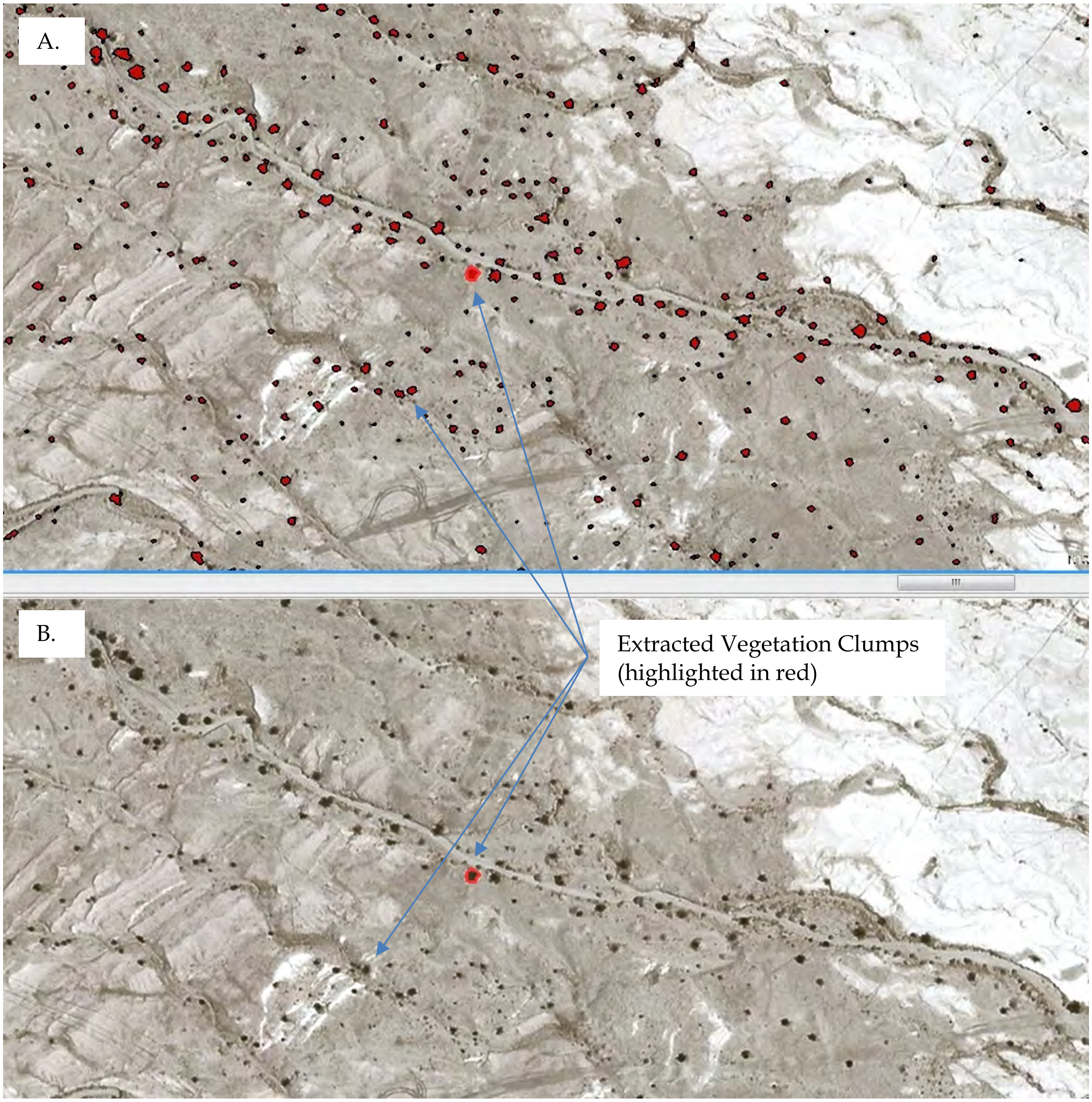
Figure C-5. Example Vegetation Extraction for a Portion of the Off-Sea Area



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C.1.3.2 Aerometric Data

This section describes the aerodynamic data collection activities that will occur as part of the PM_{10} inventory for off-Sea sources.

C.1.3.2.1 PI-SWERL Sampling

The PI-SWERL sampling objectives, sampling locations and frequency, instrumentation, operation and maintenance procedures, analysis, and reporting activities are described in the following sections.

C.1.3.2.1.1 Objectives

The objective of PI-SWERL sampling is to characterize the PM_{10} emission potential of distinct landforms and surface types found within the desert areas west of the Salton Sea. These surfaces include, but are not limited to: alluvial fans with flood silt channels and deposits, stably vegetated sand dunes, actively migrating sand dunes, and sand sheets with various degrees of rock armoring, among others. The vulnerability of desert surfaces to wind erosion is not expected to change seasonally, at least not to the extent expected on exposed playa surfaces where salt mineralogy and crystal habit is being influenced by changing temperature and moisture conditions (Buck et al. 2011). Modest seasonal differences may be observed on desert surfaces, particularly after flash flood events on the alluvial fans and flood silt deposition areas, but even in these cases the emission potential is expected to return to earlier, roughly equilibrium conditions after a relatively short period of drying.

The results of the PM_{10} sampling will be used to assign the emission potential of various surfaces. Surfaces with medium to high emission potential will then be targeted for more extensive sand flux and meteorological monitoring.

C.1.3.2.1.2 Sampling Locations and Frequency

PI-SWERL sampling will be performed on up to 17 distinct surface types found in the desert areas west of the Salton Sea. These are presented below in Table C-2 (condensed version of Table 3-4 in the main body of the Salton Sea Air Quality Program).

Of these major surface types, four are considered to be non-emissive and as such will be excluded from the PI-SWERL sampling. The exclusions apply to: Types 3, 8, 14, and 16. These sites are gravel-, cobble-, or bedrock-dominated surfaces with low overall erosion risk. The 13 remaining surface types have a significant component of sand and silt and will be included in the PI-SWERL sampling.

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Table C-2. Major Surface Types Found in Desert Area West of the Salton Sea

Type Number	Description	Erosion Risk*
1	Dry wash, sand dominated	High
2	Dry wash, silt dominated	High
*3***	*Dry wash, gravel dominated*	*Low*
4	Dry wash, gravel and sand	Medium
5	Dry wash, gravel and silt	Medium
6	Alluvial fan, sand dominated	High
7	Alluvial fan, sand and gravel	Medium
*8***	*Alluvial fan, cobbles*	*Low*
9	Sand dunes	High
10	Sand sheet	High
11	Sand over alluvium	High
12	Paleo lakebed sediments, silt dominated	High
13	Paleo lakebed sediments, cobble over silt	Medium
*14***	*Paleo lakebed sediments, gravel and sand*	*Low*
15	Rock, sandstone	Medium
*16***	*Rock, bedrock*	*Very Low*
17	Offshore playa	High

* Overall risk of erosion from wind and water combined with vehicular traffic. This is not the same as the "emission potential" being evaluated with the PI-SWERL.
** Excluded from PI-SWERL sampling because of low expected emission potential.

A total of 130 PI-SWERL sampling sites will be selected in the field for the initial PI-SWERL investigation, including: 13 surface types, 2 separate geographic locations, and 3-5 replications for each combination of surface type and location (13 surface types x 2 locations x 5 replications = 130 samples per event). The estimated sampling time in the field is 40 hours, including site-to-site travel time and assuming a production rate of 36 PI-SWERL samples per day. Individual sampling sites will be selected from relatively large, uniform areas characterized by each of the targeted surface types.

PI-SWERL sampling will be performed twice during the initial study phase: once in November 2015, and again in March 2016.

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C.1.3.2.1.3 Instrumentation

Required instrumentation includes the PI-SWERL apparatus, described below. Labeled diagrams of the PI-SWERL apparatus are found in Appendix D.1, Standard Operating Procedures: PI-SWERL.

Development of the PI-SWERL (Figure C-6) by Victor Etyemezian and others at the Desert Research Institute (DRI) in Reno, Nevada, was motivated by a need for a portable device to test and measure the potential for wind erosion and dust emissions from real-world surfaces. Large wind tunnels, the conventional mode of measurement prior to the PI-SWERL, required long setup times and often a team of people to operate. In comparison, the PI-SWERL is easy to move, requires minimal setup time, and can be operated by a single person.[10] A prototype was developed in 2000 and tested alongside the University of Guelph's large wind tunnel in Guelph, Ontario, Canada. This testing provided early indication of the feasibility of the PI-SWERL concept. Since then, several models have been used in many field investigations, including measuring emission potential on Owens Lake and Salton Sea playas.

Figure C-6. **PI-SWERL Apparatus**

The PI-SWERL uses a tri-wheeled buggy to transport the instrument and all supporting components. This photograph shows an Air Sciences Inc. crew member sampling surface emission potential at Area T23 on the Owens Lake playa, California.

[10] For safety and efficiency, two-person teams are recommended.

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The PI-SWERL comprises an open-bottomed, cylindrical chamber operated by a direct-current motor that spins an annular metal ring about 2.5 inches above and parallel to the soil surface. Principles of fluid mechanics allow simulation of high winds and ground-level turbulence that typically produce dust emissions. The spinning ring creates known wind shear, lofting soil and dust particles and passing them through particulate monitors. The PI-SWERL electronically measures the number and size of entrained particles over the duration of a test cycle, typically less than 10 minutes. By controlling the speed of the ring to simulate varying wind speeds, the potential for a soil surface to produce PM_{10} dust emissions can be determined under a range of simulated wind conditions.

The PI-SWERL-derived PM_{10} and sand flux compared favorably to standard laboratory measurements in two separate calibration studies sponsored by the Los Angeles Department of Water and Power (LADWP). In 2011, the PI-SWERL PM_{10} flux using a DustTrak was calibrated against the gravimetric PM_{10} flux at DRI's laboratory in Reno, Nevada (Gillies and Zhou 2012). Overall, the DustTrak-to-gravimetric PM_{10} flux relationships were excellent with regression coefficients (R^2) between 0.85 and 0.99.

In a separate investigation in 2012, PI-SWERL particle counts based on an Optical Gate Sensor (OGS) were calibrated against the measured sediment flux at the University of Guelph's 1.2-meter wind tunnel (Nickling 2012). Very strong ($R^2 > 0.93$) linear relationships were found between the measured sediment flux and the OGS counts for laboratory sand and for two of the Owens Lake soils (located at Study Area 3 and Lizard Tail). A much lower ($R^2 = 0.4256$), but still statistically significant, linear relationship at the 95 percent confidence level was associated with Cottonwood soils.

C.1.3.2.1.4 Operations and Maintenance Procedures

Appendix D.1, Standard Operating Procedures: PI-SWERL, describes the PI-SWERL operation and maintenance activities (including precautions), start-up and operating procedures, periodic cleaning and maintenance procedures, and records management (including use of the SWERLView software).

C.1.3.2.1.5 Analysis

The analysis procedures for the off-Sea PI-SWERL data are the same as those described earlier in Appendix B for exposed playa surfaces (see Section B.1.3.2.1.5). The relationships developed between vertical PM_{10} flux and surface friction velocity are used in Section C.2 to calculate maximum day and annual PM_{10} emission rates.

C.1.3.2.1.6 Reporting

PI-SWERL results will be computed and reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

C.1.3.2.2 Sand Flux Monitoring

The sand flux monitoring objectives, sampling locations and frequency, instrumentation, operation and maintenance procedures, analysis, and reporting activities are described in the following sections.

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C.1.3.2.2.1 Objectives

Sand flux data will be used in the off-Sea emission inventory to compute the vertical PM_{10} emission rates based on measured horizontal sand fluxes and PI-SWERL-generated K-factors[11] (see Sections C.2.1.1 and C.2.2.1 of this document).

C.1.3.2.2.2 Sampling Locations and Frequency

The numbers and locations of sand flux monitoring sites will be determined after the initial PI-SWERL sampling is complete and the various surfaces have been prioritized in terms of emission potential. For planning purposes, 18 off-Sea sand flux monitoring sites have been budgeted. Once installed, the sand flux instruments will be operated continuously for the duration of the project.

C.1.3.2.2.3 Instrumentation

Sand flux will be estimated using a combination of Cox Sand Catchers (CSCs) and Sensits. CSCs are passive collection instruments that capture windblown sand and sand-sized particles. The CSC is composed of a 6-cm-diameter PVC tube mounted vertically in the ground (Figure C-7 and Figure C-8). CSCs were designed and constructed by the Great Basin Unified Air Pollution Control District as a simple, easy-to-use instrument capable of withstanding the harsh conditions on Owens Lake. CSCs have no moving parts and can collect sand for a month or more without overloading its storage capacity. Field personnel visit CSC sites to measure the mass of the collected sand catch.

[11] $K = F/Q$, where F is the vertical PM_{10} emission flux (g cm^{-2} s^{-1}) and Q is the horizontal sand flux (g cm^{-2} s^{-1}).

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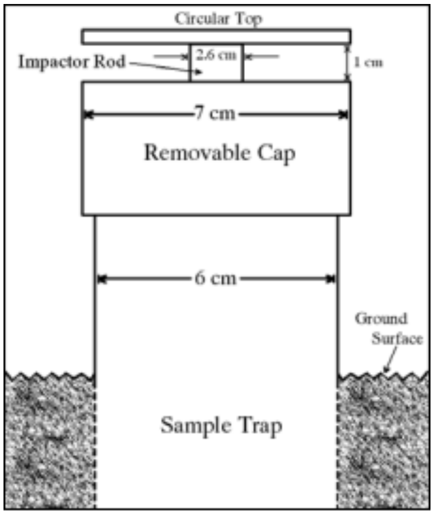
Figure C-7. Schematic Diagram of Cox Sand Catcher



Courtesy of Great Basin Unified Air Pollution Control District

Figure C-8. Photograph of Cox Sand Catcher

Courtesy of Great Basin Unified Air Pollution Control District

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Sensits are passive, real-time electronic sensors that measure the kinetic energy or the particle counts of sand-sized particles as they *saltate*, or leap, across the surface under high winds. Sensits are used to time-resolve the CSC mass (g collection period^{-1}) into estimates of hourly sand flux (g cm^{-2} hr^{-1}). The Sensit collection surface is a highly sensitive piezoelectric ring that records striking particles in one of two ways: as a particle count (PC; total number of particle strikers per unit time), or as kinetic energy (KE; cumulative kinetic energy of striking particles per unit time). In general, PC is more stable and therefore more useful than KE because its signal does not saturate as readily as KE under very high saltation sand masses. For this reason, PC will be the primary basis for apportioning the CSC sand masses into one-hour sand fluxes. KE will be used only if the PC data are not of sufficient quantity to correctly apportion the masses. Several quality control graphs will be generated, including: (1) $\log_{10}$(PC) versus $\log_{10}$(KE); (2) $\log_{10}$(PC) and $\log_{10}$(KE) as a function of time; and (3) $\log_{10}$(PC) and $\log_{10}$(KE) as a function of wind speed.

CSCs and Sensits will be co-located at each site and positioned with their sensing surfaces at 15 cm above the local ground level. This is designed to record the movement of high-energy soil particles moving across the soil surface during high-wind events.

Figure C-9 shows a Sensit suspended above the ground on the right, and a CSC mounted in the ground on the left. A datalogger will record 5-minute Sensit data during active saltation periods. Data collection will be triggered by particle count activity and will continue until particle counts are zero for an hourly period. Each datalogger will have a radio transmitter that will send Sensit data to the IID's field office once a day to provide updates on erosion activity at each site. These daily updates will be used to alert field personnel to active source areas for possible Global Positioning System (GPS) mapping and inspection. Daily transmission of the data may be temporarily suspended if the solar battery power is low due to extended days of cloud cover.

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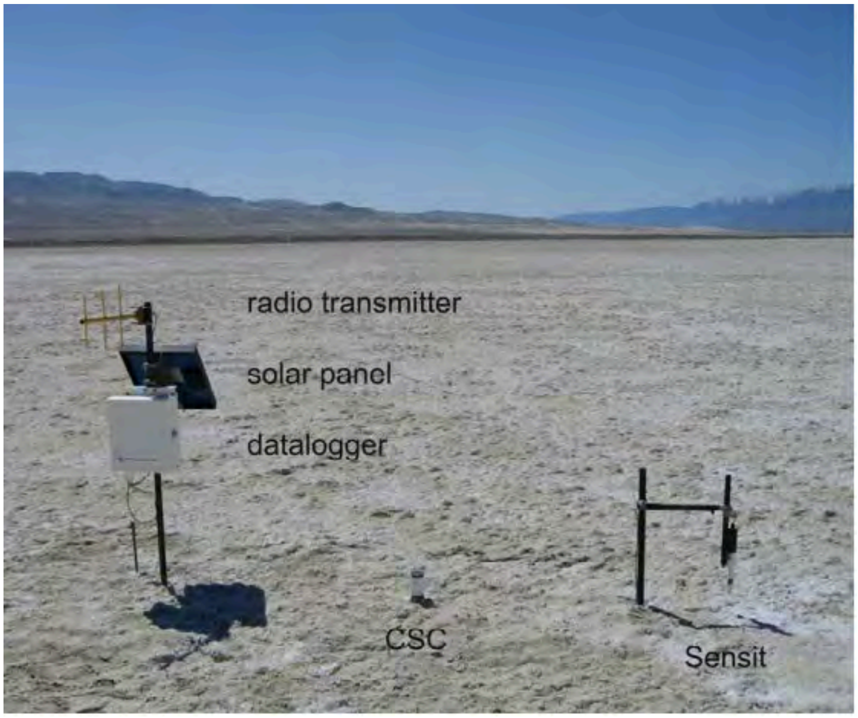
Figure C-9. Example of Sand Flux Monitoring Site



C.1.3.2.2.4 Operation and Maintenance Procedures

Operation and maintenance of the sand flux instruments is described in Appendix D.2, Standard Operating Procedures: Sand Flux and Meteorological Monitors. Topics in Appendix D.2 include: principles of operation, safety precautions, sampling interferences, site location and installation, CSC sample collection procedure, and others.

Sand will be collected from the CSC tubes at least once a month. Additional collections will be made after larger wind events if Sensit activity indicates that the CSC might be close to full.

The tubes will be labeled with the site ID number and date and transported to the IID's Salton City Field Office for drying, weighing, and recording. IID will make the sand mass data available to ICAPCD (or other interested agencies) if requested.

Each Sensit's own datalogger will record sand flux data as one-hour totals via electronic signal. The Sensit dataloggers will be programmed using IID's customized script and equipped with radio modems linked to IID's Salton City Field Office. Within a geographic area, individual Sensits will transmit to a single radio relay modem, which in turn will transmit to the IID field office. At the same time the sand masses are collected, the data from the associated Sensits will be downloaded in the field to a laptop computer. The laptop data will be then uploaded and stored on IID and Air Sciences servers for later quality control checks and data analysis. The raw (i.e., pre-quality control) Sensit data collected during the manual download will be provided to IID as part of the monthly reporting.

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C.1.3.2.2.5 Analysis

Hourly sand fluxes will be calculated for each Sensit/CSC site by multiplying the collection-period ratio of sand mass to Sensit response by the hourly Sensit response (either PC or KE).

If PC is used to time-apportion the CSC sand masses, the hourly sand fluxes (g cm^{-2} hr^{-1}) at site *n* and hour *t* will be calculated as follows:

$$q_{n,t} = (S'_{n,t}) \cdot \left[\frac{CSC_{n,p}}{\sum_{t=1}^{N}(S'_{n,t})}\right] \cdot \frac{1}{1.2}$$ **Equation C-1**

where

$S'_{n,t}$ = Sensit total PC for site *n* and hour *t* (dimensionless)

$CSC_{n,p}$ = CSC mass for site *n* and collection period *p* (grams)

N = Total number of hours in CSC collection period *p*

Note that the hourly sand flux is divided by 1.2 cm^2, which is the CSC equivalent inlet opening size for flux calculation purposes.

If KE is used to time-apportion the CSC sand masses, the hourly sand fluxes (g cm^{-2} hr^{-1}) at site *n* and hour *t* will be calculated as follows:

$$q_{n,t} = (S_{n,t} - S_{n,bg}) \cdot \left[\frac{CSC_{n,p}}{\sum_{t=1}^{N}\left((S_{n,t} - S_{n,bg})\right)}\right] \cdot \frac{1}{1.2}$$ **Equation C-2**

where

$S_{n,t}$ = Sensit total KE reading for site *n* and hour *t* (dimensionless)

$S_{n,bg}$ = Sensit KE background reading for site *n* (dimensionless)

C.1.3.2.2.6 Reporting

Reports summarizing, among other things, the CSC sand mass and Sensit response data, collection statistics and results of the quality control inspection, and calculated hourly sand flux will be reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

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C.1.3.2.3 Meteorological Monitoring

This section describes the off-Sea emission inventory meteorological monitoring objectives, instrumentation, sampling locations and times, instrument operation and maintenance procedures, analysis, and reporting.

C.1.3.2.3.1 Objectives

Meteorological data will be used in the off-Sea emission inventory in two ways: (1) as input data for the CALMET meteorological modeling analysis used to estimate vertical PM_{10} flux as a function of surface friction velocity, and (2) as input data for the CALPUFF dispersion modeling analysis to evaluate "hotspot" impacts at Salton Sea PM_{10} compliance monitors.

C.1.3.2.3.2 Instrumentation

The meteorological instrumentation is the same as that described in Appendix B, Section B.1.3.2.2.2.

C.1.3.2.3.3 Sampling Locations and Frequency

One 6-meter-tall meteorological tower will be installed at each of the 18 proposed off-Sea sand flux monitoring sites described in Section C.1.3.2.2.2 above. The sites will be determined later, after the initial PI-SWERL sampling and subsequent prioritization of surfaces by emission potential is complete.

C.1.3.2.3.4 Operation and Maintenance Procedures

Operation and maintenance of the meteorological instruments is described in Appendix D.2, Standard Operating Procedures: Sand Flux and Meteorological Monitors. Appendix D.2 includes: site check and audit forms, data processing and quality assurance/quality control (QAQC) procedures, and calibration and audit procedures for the Met One 014A wind speed and Met One 024A wind direction sensors.

C.1.3.2.3.5 Analysis

For the playa inventory, the meteorological data will be used to calculate the hourly surface friction velocity (u_*) and roughness length (z_0) by fitting the hourly average wind velocity (x axis) against height above ground (y axis) on a log-log scale. The slope of the line is u_* and the y-intercept is z_0. For the off-Sea inventory, however, the hourly wind speed and wind direction data will be used in the CALMET meteorological model[12] to produce gridded fields of surface friction velocity with inputs of fixed-point meteorological data and gridded inputs of terrain elevation, land use category, and (optionally) surface roughness length, albedo, and vegetation leaf area index, among others.

As discussed later, the gridded hourly u_* values will be used to calculate hourly vertical PM_{10} emission fluxes using the relationships between PM_{10} emission flux and u_* derived from PI-SWERL sampling (see Sections C.2.1.1 and C.2.2.1).

12 http://www.src.com/calpuff/download/CALMET_UsersGuide.pdf

C.1.3.2.3.6 Reporting

Reports summarizing, among other things, hourly wind speed and wind direction data, collection statistics, and results of the quality control review will be reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

C.1.3.2.4 Video Monitoring

This section describes the off-Sea desert area video monitoring objectives, equipment and monitoring locations, image collection rates, operation and maintenance procedures, image analysis procedures, and reporting.

C.1.3.2.4.1 Objectives

Video monitoring serves several useful purposes:

1. To document the locations of active dust sources in the desert areas west of the Salton Sea.
2. To document the location, frequency, and relative intensity of dust plumes originating at those locations.
3. To document the frequency and relative intensity of dust plumes traveling into and across the off-Sea desert area from sources farther upwind.

C.1.3.2.4.2 Equipment and Monitoring Locations

Video monitoring in the off-Sea desert areas will be performed with a network of 8 portable camera systems scattered around the desert area west of the Salton Sea. The cameras will be sited such that each AOI is observed by at least two cameras with fields of view (FOV) perpendicular to each other to facilitate qualitative analysis of plume activity. Historical wind patterns will be employed to ensure that the cameras are sited upwind of the most frequent wind directions with average wind speeds greater than 5 meters per second at a height of 10 meters above ground.

The portable video camera systems will be equipped with the StarDot Corporation 10-megapixel (MP) H.264d Special Bundle, which includes a StarDot 10MP SC day/night camera (see Figure B-21) with Dotworkz ST-BASE outdoor enclosure, Veracity Power-over-Ethernet (PoE) injector, and Tripp Lite outdoor-rated 100-foot patch cable.[13] In addition, each site will be equipped with an 8–48-millimeter vari-focal lens, providing a 4.5°–45° FOV that may be adjusted according to specific site conditions. As many as possible of the 8 cameras will be installed on 30-meter cellular towers to minimize equipment costs. The remaining cameras will be mounted above the permiter fence on a tripod (similar to the 6-meter-tall tower shown in Figure B-17).

For added security, each video monitoring station not mounted on a cellular tower may be surrounded by a 10-foot-square by 10-foot-tall cyclone fence enclosure with a locking gate.

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13 http://californiapc.com/IP-Cameras-Enclosures-Lenses-Accs/StarDot-NetCam-Bundles/

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C.1.3.2.4.3 Image Collection Rates

The StarDot cameras will be operated during daylight hours only. One still-frame image will be captured and stored every 15 minutes, with all cameras on the same collection schedule to facilitate analysis.

C.1.3.2.4.4 Operation and Maintenance Procedures

Operation and maintenance of the video monitoring stations are described in Appendix D.3, Standard Operating Procedures: Roundshot Livecam D2 and in Appendix D.4, Standard Operating Procedures: StarDot Technologies SC H.264. Each of these appendices includes installation and operation procedures, and site check forms, for the Roundshot camera system (fixed stations) and the StarDot camera system (portable stations), respectively.

C.1.3.2.4.5 Image Analysis Procedures

In the laboratory, the folder of still images will be filtered to include those taken on days when wind speeds exceed the threshold for dust generation (nominally, more than four hours with average wind speeds greater than 5 meters per second at a height of 10 meters above ground). The filtered images will then be used to qualitatively assess the location, frequency, and magnitude of dust plumes originating in the desert area west of the Salton Sea.

Since the AOIs will be covered by at least two cameras with perpendicular FOV capturing images simultaneously, an estimate of plume location and height can be determined with triangulation. An azimuth/elevation angle grid will be developed for each camera FOV. An analyst will review an image of interest to determine the azimuth angles of both sides of plumes in the image; the same will be done for an image viewing the same AOI from a different angle. The intersection of the plume extent "rays" from both images will identify the approximate locations and sizes of the plumes. Once the triangulated position is determined, the height of each plume can be determined using the elevation angle.

C.1.3.2.4.6 Reporting

Reports summarizing, among other things, days with 10-meter wind speeds above the threshold for dust generation, and a qualitative description of images showing evidence of dust plumes will be reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

C.2 Quantifying PM_{10} Emissions from Off-Sea Desert Areas

This section describes the procedures used to compute the maximum-day and annual PM_{10} emission estimates for source areas located in the off-Sea desert areas located west of the Salton Sea.

C.2.1 Maximum-Day PM_{10} Emissions

Maximum-day emissions will be computed by one of two methods: surface friction velocity, and horizontal sand flux. Each of these methods is described below.

For both methods, the maximum-day PM_{10} emissions will be computed using the following equation:

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$$E_{Max-Day} = \sum_{n=1}^{N} \left(A_n \cdot \overline{F_{MaxDay,n}} \cdot 9.5\ x\ 10^{-2}\right)$$ **Equation C-3**

where $E_{Max-Day}$ is the maximum-day mass emissions of PM_{10} (tons per day, tpd) summed for surface types *n=1* through *N* (the maximum number of surface types assigned), A_n is the total area (m^2) with each surface type n, $\overline{F_{MaxDay,n}}$ is an average maximum-day PI-SWERL-derived vertical PM_{10} emission flux ($g\ m^{-2}\ s^{-1}$) by surface type n, and 9.5 x 10^{-2} is a constant of proportionality to convert from seconds to days and from grams to tons of PM_{10}.

The two methods differ in how $\overline{F_{MaxDay,n}}$ is parameterized. The surface friction velocity method uses CALMET meteorological modeling to generate gridded u_* estimates across the meteorological domain in conjunction with PI-SWERL-derived relationships expressing vertical PM_{10} emission flux as a function of u_*. The horizontal sand flux method uses PI-SWERL-generated *K*-factors[14] for various surfaces of interest, multiplied by location-specific horizontal sand flux, *Q*, to compute location-specific vertical PM_{10} fluxes.

With either method, the hourly PM_{10} fluxes are summed over time and space to estimate the maximum-day emission estimates for the off-Sea AOI.

C.2.1.1 Surface Friction Velocity Method

The procedure for parameterizing $\overline{F_{MaxDay,n}}$ in Equation C-3 is as follows. First, PI-SWERL sampling is used to define the relationship between *F* and u_* for each of the surface types *n* represented in the AOI. The relationships will be determined later with curve fitting algorithms.

The CALMET meteorological model is then used to produce a three-dimensional array (two spatial variables plus time) of gridded hourly u_* values within the off-Sea AOI. The gridded u_* values are subsequently aggregated by surface type *n* and averaged to produce a two-dimensional array (surface type and time) of $\overline{u_{*,n,h}}$ values. The spatially averaged u_* values are then used in the PI-SWERL relationships to derive spatially averaged hourly vertical emission fluxes:

$$\overline{F_{n,h}} = f\left(\overline{u_{*,n,h}}\right)$$ **Equation C-4**

In the final steps, the hourly values are averaged over successive 24-hour periods to produce daily average vertical PM_{10} fluxes by surface type *n* (day index denoted by subscript *d*):

$$\overline{F_{n,d}} = \frac{\sum_{h=1}^{24} \overline{F_{n,h}}}{24}$$ **Equation C-5**

The array of daily vertical PM_{10} fluxes is then queried to identify the day *d* with the highest average vertical PM_{10} flux (i.e., the "maximum-day" flux) for each surface type *n*:

---

[14] *K = F/Q*, where *F* is the vertical PM_{10} emission flux ($g\ cm^{-2}\ s^{-1}$) and *Q* is the horizontal sand flux ($g\ cm^{-2}\ s^{-1}$).

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$$\overline{F_{MaxDay,n}} = max \begin{matrix} 365 \\ d = 1 \end{matrix} \Big| \overline{F_{n,d}}$$ **Equation C-6**

These values are then used in Equation C-3 to express the maximum-day mass of PM_{10} emissions within the AOI.

Maximum-day emissions will be computed using PI-SWERL and CALMET meteorological input data for a one-year period.

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C.2.1.2 Horizontal Sand Flux Method

With the horizontal sand flux method, the spatially averaged hourly vertical emission flux, $\overline{F}$, is the product of the spatially averaged hourly horizontal sand flux, $\overline{Q}$, and the PI-SWERL-derived K-factor,[15] K_f , for each surface type *n* and hour *h*:

$$\overline{F_{n,h}} = \overline{Q_{n,h}} \cdot \overline{K_{f,n}} \qquad \textbf{Equation C-7}$$

Here, $\overline{Q_{n,h}}$ is the spatially averaged hourly horizontal sand flux for all sand motion monitoring stations within surface type *n* (g m^{-2} s^{-1}), and $\overline{K_{f,n}}$ is the spatially averaged K_f for all PI-SWERL monitoring sites within surface type *n*.

The hourly values are then averaged over successive 24-hour periods to produce daily average (denoted by subscript *d*) vertical PM_{10} fluxes by surface type *n*:

$$\overline{F_{n,d}} = \frac{\sum_{h=1}^{24} \overline{F_{n,h}}}{24} \qquad \textbf{Equation C-8}$$

The maximum-day vertical emission flux, $\overline{F_{MaxDay,n}}$, is then computed by scanning all days to find the maximum value of $\overline{F_{n,d}}$. This procedure will be performed for all days of the year, from *d* = 1 through 365:

$$\overline{F_{Max-Day,n}} = max \begin{matrix} 365 \\ d=1 \end{matrix} \Big| \overline{F_{n,d}} \qquad \textbf{Equation C-9}$$

The total area within surface type *n* will be determined using Geographic Information System (GIS) mapping techniques.

C.2.2 Annual PM10 Emissions

Annual emissions will be computed using the same two methods described in the previous section: the surface friction velocity method, and the horizontal sand flux method.

For both methods, the equation used to compute the annual mass of PM_{10} emissions from off-Sea sources is as follows:

$$E_{Annual} = \sum_{n=1}^{N} \sum_{h=1}^{8760} \left(A_n \cdot \overline{F_{n,h}} \cdot 3.97\ x\ 10^{-3}\right) \qquad \textbf{Equation C-10}$$

where E_{Annual} is the annual mass emissions of PM_{10} (tpy) for all hours in a year from *h*=1 through 8,760, and for all surface types represented with the AOI from *n=1* through *N*. Here, A_n is the total area (m^2)

[15] Wind tunnel calibrations of *F* and *Q* reported in: Nickling, W. G. 2012. 2011 PI-SWERL Research Study, Final Report, Owens Lake Dust Mitigation Program, Agreement No. 300-1-SUB7, Task Order No. 300-10. Prepared for Air Sciences Inc., Golden, CO, by W. G. Nickling, Nickling Environmental Ltd., Cambridge, ON, Canada. 58 pp.

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for surface type n, $\overline{F_{n,h}}$ is the PI-SWERL-derived vertical PM_{10} emission flux (g m^{-2} s^{-1}) for hour *h* and surface type n, and 3.97 x 10^{-3} is a constant of proportionality to convert from seconds to hours and from grams to tons of PM_{10}.

The total area A_n for each surface type *n* will be determined using GIS mapping techniques. For the off-Sea desert region, the A_n values are not expected to change significantly over time but will be periodically updated as necessary.

C.2.2.1 Surface Friction Velocity Method

With the surface friction velocity method, the average hourly vertical emission flux, $\overline{F_{n,h}}$, in Equation C-10 is parameterized as follows:

$$\overline{F_{n,h}} = f\left(\overline{u_{*,n,h}}\right) \text{ for all } h \text{ satisfying } u_{*,n,h} \geq u_{*t,n}$$ **Equation C-11**

where $f\left(\overline{u_{*,n,h}}\right)$ is the PI-SWERL-derived relationship expressing vertical PM_{10} flux (g m^{-2} s^{-1}) as a function of surface friction velocity, u_*, and u_{*t} is the threshold friction velocity for surface type *n*. $\overline{u_{*,n,h}}$ is the area-weighted average of the CALMET gridded u_* values within each surface type *n*:

$$\overline{u_{*,n,h}} = \left.\frac{\sum_{s=1}^{S}(a_s \cdot u_{*s})}{\sum_1^S a_s}\right|_{n,h}$$ **Equation C-12**

where a_s and u_{*s} are the area and u_* values assigned to CALMET grid cell *s*.

Annual emissions will be computed using PI-SWERL, u_{*t} , and CALMET meteorological data collected during the period of investigation.

C.2.2.2 Horizontal Sand Flux Method

With the horizontal sand flux method, the average hourly vertical emission flux, $\overline{F_{n,h}}$, in Equation C-10 is parameterized as follows:

$$\overline{F_{n,h}} = \overline{Q_{n,h}} \cdot \overline{K_{f,n}}$$ **Equation C-13**

where $\overline{Q_{n,h}}$ is the spatially averaged hourly horizontal sand flux for all sand motion monitoring stations within surface type *n* (g m^{-2} s^{-1}), and $\overline{K_{f,n}}$ is the spatially averaged K-factor for all PI-SWERL monitoring sites located within surface type *n*.

Annual emissions will be computed using PI-SWERL and sand flux monitoring data collected during the period of investigation.

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C.2.3 Future Inventory Updates

The off-Sea emission inventory will be updated as needed based on changes in conditions

C.2.4 Reporting

Results of the emission inventory will be reported as outlined in Table C-3, Summary of Reporting for Off-Sea Emissions Inventory. Table C-3 is located at the end of Appendix C.

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Table C-3. Summary of Reporting for Off-Sea Emissions Inventory

	Topic	Items to be Reported	Frequency
1	Mapping and Characterizing Off-Sea Surfaces	Results of mapping and characterizing current off-sea surfaces	Initial report due on or before June 1, 2016. In subsequent years, reports will be generated as needed.
2	PI-SWERL Sampling	Results of PI-SWERL monitoring	
3	Sand Flux Monitoring	Report summarizing, among other things: the CSC sand mass and Sensit response data, collection statistics and results of the quality control inspection, and calculated hourly sand fluxes	
4	Meteorological Monitoring	Report summarizing, among other things: hourly wind speed and wind direction data, and collection statistics and results of the quality control review	
5	Video Monitoring	Report summarizing, among other things: days with 10-meter wind speeds above the threshold for dust generation, and a qualitative description of images showing evidence of dust plumes	
6	Emissions Inventory	Report summarizing off-Sea emissions inventory results and supporting data (items 1 through 5, above)	

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APPENDIX D – STANDARD OPERATING PROCEDURES

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APPENDIX D.1.
STANDARD OPERATING PROCEDURES: PI-SWERL

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Standard Operating Procedure
Miniature
PI-SWERL with DustTrak Ver. 1.3a
Dust Monitoring
Revision 3

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1.0 SCOPE AND APPLICABILITY

This document provides procedures for properly operating and maintaining the miniature PI-SWERL with DustTrak. The PI-SWERL is a portable instrument that is used to measure the potential for soil wind erosion and dust suspension (Users Guide Version 1.3a, 2011). It is designed with the intention that minimal personnel can operate it. It should be noted that the description of the standard operating procedures (SOP) are not intended as a comprehensive guide to use of the PI-SWERL. Anyone using the instrument should become sufficiently familiar with the PI-and DustTrak user manuals (see reference section), in order to operate these instrument correctly and safely.

1.1 Principals of Operation

Section 1.2 Overview of the PI-SWERL. Additional information in the instrument can be found in the User's Guide. Figures 1 and 2 provide visual images of the instrument.

Figure 1. PI-SWERL Unit and Carrier

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Figure 2. PI-SERL Unit Details

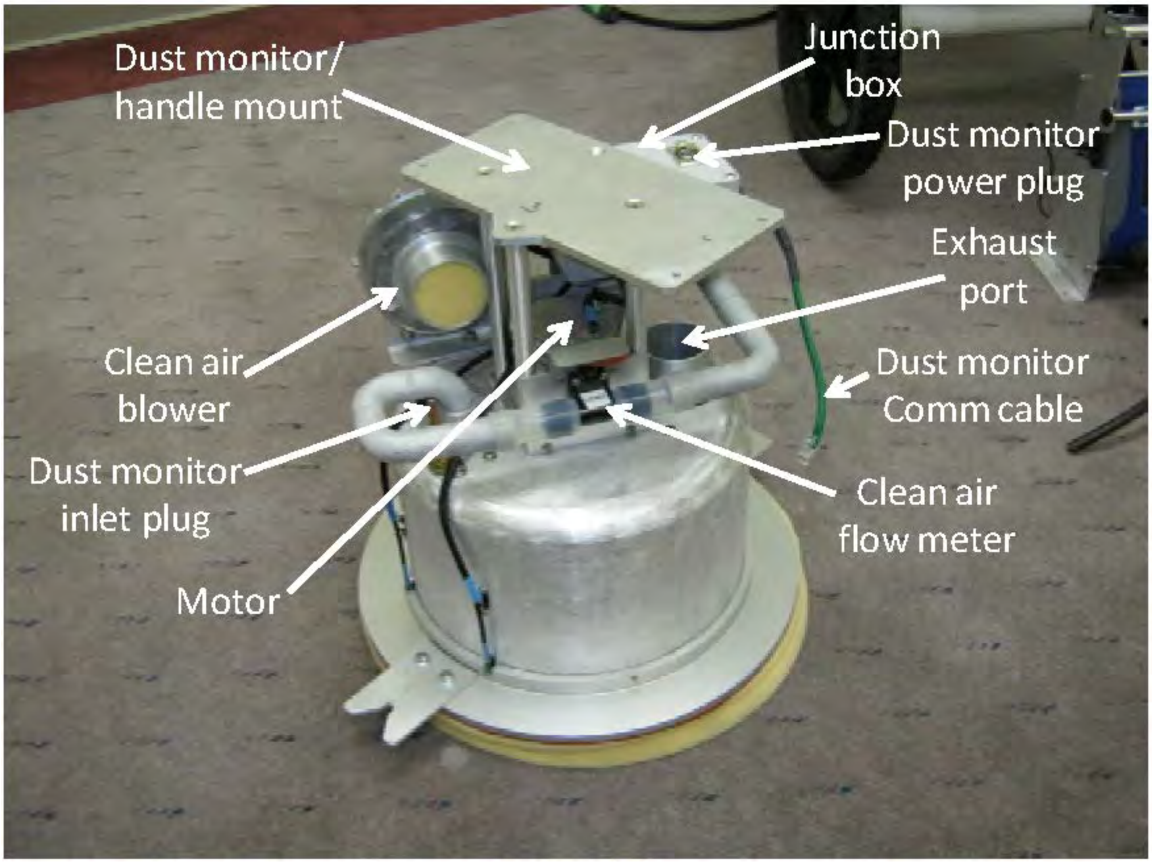
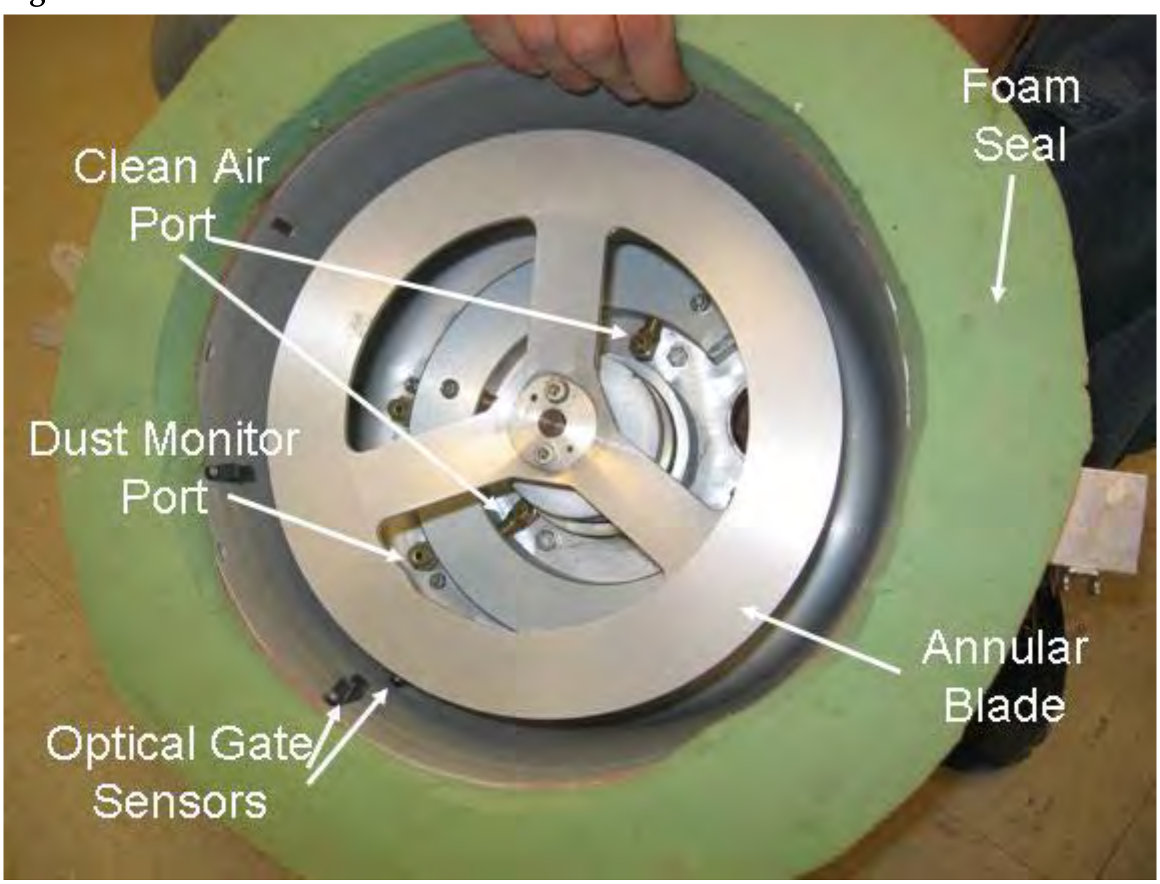


Figure 3. View Inside PI-SWERL Chamber



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1.2 Safety Precautions

Normal precautions should be taken to avoid electrical shock and/or dismemberment of body parts. Disconnect power before working with electrical components. Ensure that all moving parts have come to a complete stop before moving or handling instrument.

Use caution when working on elevated surfaces as to not damage the instrument or risk personal injury (due to loosened objects from fast spinning blade).

1.3 Sampling Interferences/Precautions

- Areas with visible moisture should be avoided.
- Sampler should rest on smoothest part of surface with minimal gaps under foam.
- Sampling surfaces should not be disrupted.
- Vegetation should be cut down if anticipated to interfere with rotating blade, but not completely removed.
- Avoid large rocks that could damage instrument.

1.4 Equipment and Supplies

- DustTrak with holder
- Battery pack and backup battery
- Control and backup cables (10 or 20 foot)
- Trimble (GPS unit)
- Garden shovel
- Air tank with air
- PI-SWERL
- Cart
- Site map

1.5 Sampling Locations

Locations will be selected by the Project and Site Manager. Methods of site selection will depend on type of sampling effort. For repeated systematic sampling efforts the sites to be sampled will be selected prior to sampling, loaded onto the Trimble, and reviewed by field staff at least one day prior to sampling. For exploratory surveys the general areas to be sampled, as well as surface types of interest will be identified by the Project and Site Manager. However, actual sampling locations will be determined in the field.

1.6 Operational Procedures

1.6.1 Introduction

The PI-SWERL and DustTrak units need be checked and cleaned regularly as part of the quality control (QC) program. The DustTrak is used to measure particulate concentrations, specifically,

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particulate matter with an aerodynamic diameter ten micron or less (PM_{10}), in the PI-SWERL chamber. The Optical Gate Sensors (OGS) are a set of four sensors (two sensors at two heights above the surface) that provide a measure of sand motion within the chamber. At this time the PI-SWERL is not an EPA certified instrument, and therefore there are no required calibration protocols. Per recommendation by the manufacturer, the DustTrak will be factory cleaned and calibrated annually by TSI. In addition, if two PI-SWERL units are available on site, periodic co-located testing is recommended to verify that both DustTrak units track each other (and one unit is not systematically skewed up or down).

1.6.2 Initial setup of sampler

Confirm the following before leaving the shop:

1. PI-SWERL will turn on.
2. DustTrak is connecting with the PI-SWERL software.
3. Battery is fully charged.
4. Foam on PI-SWERL is secure.
5. Extra control cable and battery are present.
6. The zero calibration on the DustTrak (DustTrak manual, page 19) has been run.

1.6.3 Steps to be performed to start sampling

1. Locate sampling site and travel to sampling site
   - Use truck to transport PI-SWERL to reasonably close walking distance to sampling location. For safety it recommended to transport the carrier (transport cart) strapped down in the pickup bed, and the actual PI-SWERL instrument in the cab of the pickup.
   - Load PI-SWERL unit onto cart, and locate first sampling location using the coordinate file uploaded onto the Trimble
   - Depending on site access and travel distance to sampling site, the PI-SWERL can be transported to test site using one of two methods:
     - Using the cart that PI-SWERL unit is mounted on
     - Using ATV and trailer, where PI-SWERL and cart securely strapped into cart
2. Turn on the PI-SWERL unit once at sampling site

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- Ensure that the control cable linking the PI-SWERL to the control unit is properly connected and secure at each end. A red LED on the switch will light up to indicate that the power is on.
    - Note: Control cable must be securely connected before the PI-SWERL unit is turned on.
- Ensure that the communications cable linking the monitor to the control unit is properly connected and secure at the control unit.
    - Note: Communications cable must be securely connected before the PI-SWERL unit is turned on.
- Ensure that the battery power cable is properly connected and secure, located inside the control unit housing.
    - Note: Power cable must be securely connected before the PI-SWERL unit is turned on.
- Toggle the main power switch to 'ON' (located at the rear of the control unit).
- Toggle the computer monitor's momentary switch to 'ON' (located below the monitor, facing downward) and confirm that the green LED is illuminated above the monitor screen.
    - Note: Occasionally the cursor will appear to dart wildly about the monitor upon initial start-up. This is a known glitch in the system and is best corrected by briefly pressing the monitor's momentary power switch to reboot the system.

3. Select program a sampling event

Program the sampler to run first test

- From the desktop, double click, SwerlView.
- The Test Specification Panel will appear. Choose the program you wish to run.
    - Note: Evaluation to be run can vary by test and will be coordinated by Project and Site Manager. If new program is developed, onsite staff will verify that test specifications are transferred correctly to PI-SWERL Software.
- The Test Description Panel will appear. Input the Test Description and Comment (for example):

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- Test Description: Bombay Beach
- Comment: Site 45

- Select Run at the bottom. Important: Once Run is selected the test will begin. Ensure that the sampler is properly placed before selecting Run.

- Document site conditions using digital camera, as well as surface information. Surface information forms can either be loaded onto the Trimble, field tablet, or, hardcopy if needed. In addition, maintain brief written field log to aid in data QC.

4. Movement from one site to the next

- Ensure that the test has been completed.
- Confirm that the annular blade has been turned off and stopped running.
- Place sampler on the docking plate.
- Coil control cable around sampler, make sure not to twist it.
- Note: If control cable becomes too twisted, disconnection of the cable and untwisting may need to be performed
    - Note: Do not disconnect the control cable until the monitor has been shut down and the control unit powered off
- Latch toggle clamp on front of docking plate.
    - Note: toggle clamp might come loose during travel. During travel check occasionally to make sure that clamp is still attached. The tension on the clamp may need to be adjusted over time.
- If traveling short distances on the playa (~10 minutes between sites) it is not necessary to power down the PI-SWERL or computer if using the field cart to transport the instrument.

5. Setting up at new sampling site

- Unlatch toggle clamp.
- Uncoil control cable.
- Place sampler onto test area.

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6. If unit was left running, repeat starting step 3 (program should go to prior test by default, if new test desired a different test needs to be selected). If unit was turned off for travel or "uncoiling" the cable, repeat starting step 1.

1.6.4 Cleaning and Maintenance of PI-SWERL and DustTrak

The following procedures are to be performed at end of each sampling day.

1. Cleaning of the PI-SWERL
    - Make sure all power is off on the PI-SWERL. Remove the DustTrak holder. Tilt the PI-SWERL so that it is at a 45˚ or greater angle. Using the air tank and a pressure nozzle blow out the inside of the PI-SWERL. Avoid blowing air directly into the Clean Air Ports.
    - Blow out the exhaust port, and outside of PI-SWERL.
    - Remove air intake filter, and blow out.
    - Wipe computer screen with clean cloth or recommended monitor cleanser.
2. Cleaning of the DustTrak
    - Wipe display screen with clean cloth or recommended monitor cleanser.
    - Blow any visible dust off with air tank.
3. General Instrument Maintenance
    - A description of general maintenance tasks and the recommended frequency is provided in the table 1-1.

Table 1-1. Instrument Maintenance Tasks

Frequency	Maintenance Item
Every Sample Day	Inspect all cables for cracks or abnormal wear. Confirm full charge on batteries. Re-zero DustTrak at the beginning of each sampling day, prior to first measurement
Every 20 sampling events, or as necessary	Run zero flush program. When necessary clean out sampler with compressed air.
After every 2 full days of field use	Clean DustTrak monitor (see DustTrak manual for details)
Every 1 month	Repeat steps from Sample Day.

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Frequency	Maintenance Item
Every 1 to 3 months	Clean DustTrak inlet filter: monthly during dust season,; every 2 to 3 months during non-dust season
Long-term PI-SWERL care	Vacuum dust and sand particles from battery section of control box, vacuum lid. Carefully vacuum electrical connectors. Remove dust from field cart using hand brush or handheld vacuum.

1.7 Data Records and Management

STEPS TO DOWNLOAD RUN DATA:

- Turn on the PI-SWERL unit following the procedures in section 1.6.3.
- Insert a flash drive into one of the open USB ports located below the monitor, facing downward.
- Open the 'Shortcut to Swirlerdata' folder located on the control screen desktop. Alternatively, using Windows Explorer, open folder used to store the data (c:/Swirlerdata/) and find folder with results for that day (for example, all files for June 7, 2011 will be stored in folder named "20110607."
- Select the appropriate files, named for the date of the test event, right-click, and copy over to the flash drive.
- Remove the flash drive from the monitor following safe removal practices, shut down the monitor, then switch the control unit power off.

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2.0 REFERENCES

Dust-Quant LLC. User's Guide for the Miniature Portable In-Situ Wind ERosion Lab (PI-SWERL). Model 8530/8532 DustTrak™ II Aerosol Monitor: Operation and Service Manual. PN6001893, Revision F (January 2011)

Environmental Protection Agency. 2007. Guidance for Preparing Standard Operating Procedures (SOPs). EPA/600/B-07/001. April 2007. Accessed August 27, 2015. http://www.epa.gov/QUALITY/qs-docs/g6-final.pdf.

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APPENDIX D.2.
STANDARD OPERATING PROCEDURES:
SAND FLUX AND METEOROLOGICAL MONITORS

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Standard Operating Procedure
Sand Flux/Meteorological Monitoring Station Installation and Operation at Salton Sea

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Appendices

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1.0 INTRODUCTION

This document describes the procedures for properly locating, installing, and operating a sand flux and meteorological monitoring station for use in the Salton Sea Air Basin. The station is designed to be adaptable, so that any combination of sand flux and meteorological instruments can be used, depending on the measurement scenario. The station consists of a Sensit, Cox Sand Catcher (CSC), three levels of wind speed measurements, a single level of wind direction, a solar power system, and data storage and telemetry equipment. This document has been written specifically for application to Salton Sea project and may not be applicable to other jobsite locations.

This document is in accordance with the Environmental Protection Agency's *Guidance for Preparing Standard Operating Procedures (SOPs)* (EPA 2007).

1.1 Principles of Operation

Windblown dust emissions occur when the force of wind becomes sufficiently strong to initiate the movement of soil particles across an erodible surface, generating particulate matter less than 10 microns in diameter (PM_{10}) from the surface. As the wind speed increases, sand sized particles are lifted by fluid drag force and start hopping across the surface in a process known as saltation (Bagnold, 1941; Shao, 2008). As the sand strikes the surface, it frees fine particles which are entrained into the air stream and are carried downwind. The amount of PM_{10} released is a complex function of environmental conditions (e.g. wind, precipitation, and temperature), soil properties (e.g. soil texture, composition, and aggregation), and land-surface characteristics (e.g. topography, surface disturbance, vegetation cover, and/or other non-erodible elements). It is assumed that the vertical PM_{10} emission rate is proportional to the horizontal sand flux, which is measured at a reference height of 15 cm using a CSC and electronic Sensit. The CSC is a passive sampling device used to collect sand and sand-sized particles being transported across the site by the wind. The Sensit is a cylindrical electronic device that records particle count and kinetic energy of the sand particles that strike the sensing surface. The Sensit data are used to time-resolve the sand mass collected by the CSC, resulting in a horizontal sand flux measurement.

Wind speeds are measured at 6-m, 2-m, and near the ground to resolve the vertical wind profile and provide an estimate of the surface friction velocity at the site. The wind speeds are measured using a Met One 014A anemometer or Met One 014A mini anemometer. These anemometers consist of three aluminum cups mounted on a cup assembly hub and shaft. The shaft includes a magnetic assembly to open and close a reed switch, generating a pulse signal with a frequency that is linear with the wind speed.

The wind direction is measured at 6-m using a Met One 024A Wind Vane. This sensor measures wind direction from 0 to 360 degrees with a 5-degree accuracy specification. The wind vane assembly consists of a counterweighted aluminum arm and vertical air foil mounted to an aluminum hub. The hub is attached to a stainless steel shaft which is connected to a potentiometer. When the shaft is rotated, the

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potentiometer varies the sensor resistance in relation to wind direction, resulting in a linear change in output voltage with wind direction.

1.2 Safety Precautions

- All field staff should carry a working cell phone and wear the appropriate Personal Protective Equipment (PPE).
- Disconnect power before working with electrical components.
- Take normal precautions to avoid electrical shock.

1.3 Sampling Interferences/Precautions

- Check the forecast to ensure safe weather and environmental conditions before visiting a sand flux/meteorological station. Site visits and maintenance should only occur under low wind conditions to avoid operator interferences in the data signal.
- Ensure proper grounding for good performance.
- Avoid using a field vehicle to access the monitoring site. If vehicle access is necessary and unavoidable, the field vehicle must always be parked at a minimum of 10 meters away from the monitoring site.
- All access to the monitoring site should be from the direction that has the lowest frequency of high winds to avoid disturbing the surface upwind of the sensors. At Salton Sea, high winds from the east are extremely rare; therefore, access should be from the east.
- All data should be collected using Pacific Standard Time (PST). Configure all field laptops and tablets devices using PST to prevent accidental datalogger clock updates to Pacific Daylight Savings Time (PDT).
- The site operator needs to confirm that a datalogger program is appropriately configured with the monitoring site ID and the Sensit serial number. Database problems are likely to occur if either the site ID or Sensit serial number is incorrect.

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2.0 SITE LOCATION AND INSTALLATION

2.1 Equipment and Supplies

- CSC assembly and empty sand collection tube
- Sensit Assembly:
  - Sensit model H14-LIN
  - 1″ diameter iron pipe (lengths of ~5′, ~2′, and ~1′) and two 1″x1″ Nurail fittings
  - 1-foot foam pipe insulation
  - PVC tape and cable ties
- One Met-One 024A Wind Vane
- Two Met-One 014A anemometers with 6-m and 3-m cable heights.
- One Met-One 014A mini anemometer with cable
- Two 4-foot cross-arms with support brackets
- Either one 8-foot 1″ pipe or one 10″ support stand for the 014 Mini
- Four 1″x3/4″ Nurail fittings
- Logger and battery enclosure (BBA3):
  - Back plate
  - CR6 Datalogger
  - SunSaver 10 charge regulator
  - 110ah external storage battery
  - Power-Over-Ethernet (POE) Adaptor
- 90 W solar panel with mounting bracket
- NanoBridge M5 Ethernet radio with antenna
- 20 foot tripod with anchors and guy wire kit
- Grounding package, including 6′ copper grounding rod, clamp, cable, and lightning rod
- Various U-bolts
- Portable GPS unit with monitoring site location file pre-loaded
- T-post pounder
- Packing putty
- Soil coring auger (4″ diameter)
- Small straight-bladed screwdriver
- Large Allen keys

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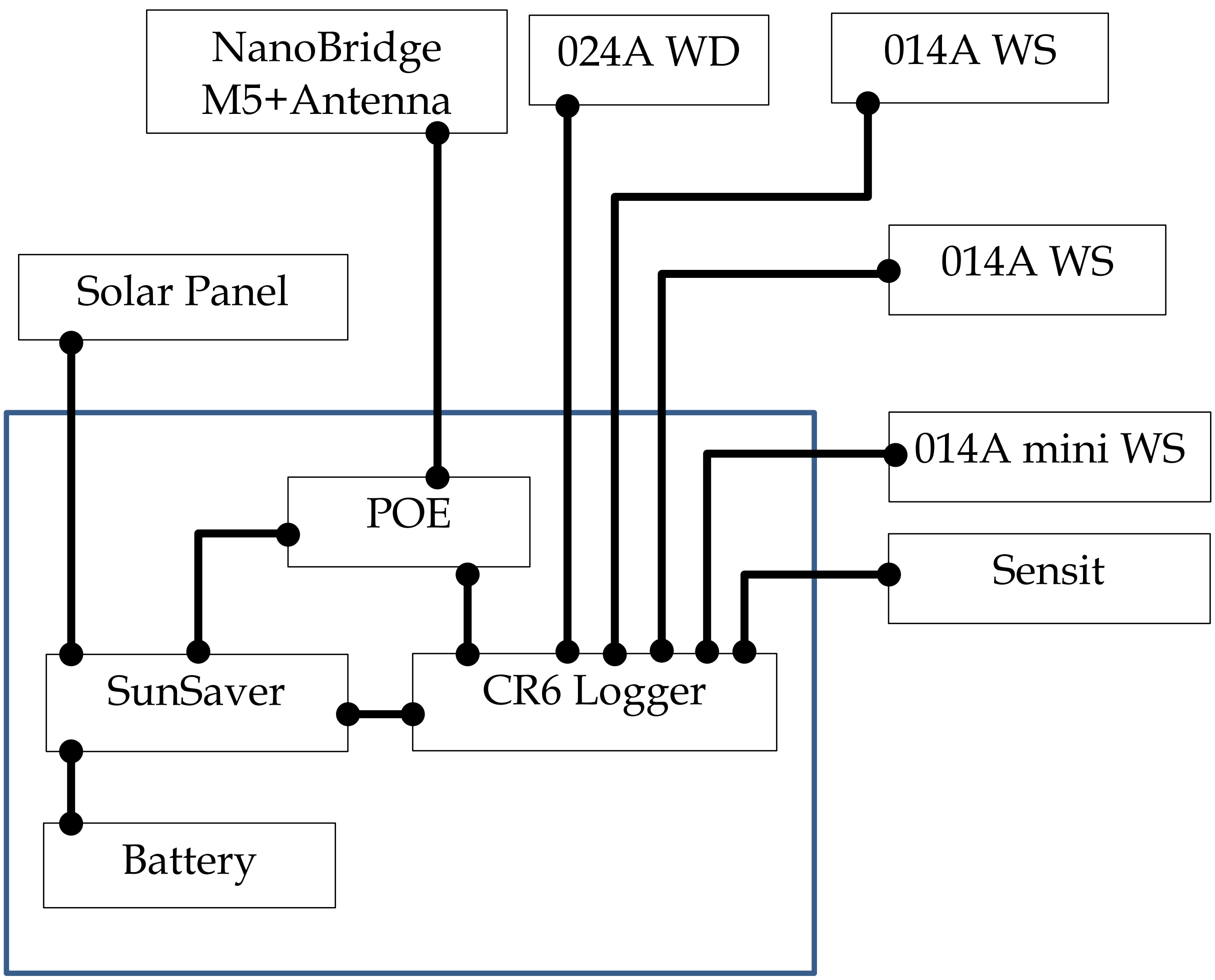
- Keypad for CR6
- Metric measuring tape
- Combination wrench set
- 20-mil PVC pipe wrap tape
- RS-232 cable

2.2 Wiring Diagram

The wiring diagram for the instruments, datalogger and power system is shown below.



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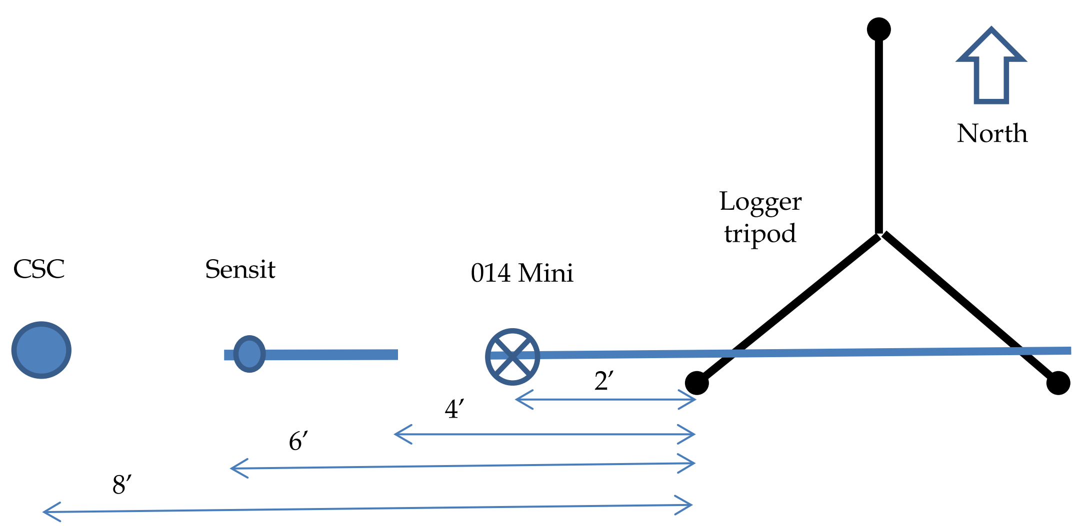
2.3 Monitoring Site Location and Installation

1. Before deploying, prepare the enclosure by installing the back plate on the left side of the back wall. Make sure there is an accessible wiring access port at the left back side of the enclosure. Mount the CR6 datalogger, SunSaver Regulator, and POE Adaptor to the back plate.
2. Prepare the CR6 datalogger by loading the appropriate program and entering the correct Sensit serial number and site ID. Make sure the logger is set to Pacific Standard Time.
3. Using standard navigation procedures and the portable GPS unit, locate the appropriate monitoring site. The site should be approximately 8′ by 10′ and be generally level with minimal obstruction in the predominant wind directions. Instruments are to be installed in a west-to-east alignment, with the CSC on the west, the Sensit in the center and the datalogger tripod on the east as shown below. All access to the monitoring site should be from the direction that has the lowest frequency of high winds to avoid disturbing the surface upwind of the sensors. **Ensure that all field personnel approach the location only from that preferred direction**. At Salton Sea, high winds from the east are extremely rare; therefore, access should be from the east to avoid disturbing the surface upwind of the sensors.
4. Begin by installing the datalogger tripod. Refer to the Tripod Installation Manual Models CM110, CM115, CM120 (Campbell Scientific, Inc. 2015) for detailed tripod installation instructions. Orient the legs so that one leg points north and the other two to the south as shown below. The legs should be placed so the mast tilts to the northeast direction.

Figure 1. Sensit/Met Station Instrumentation Orientation



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5. Place the ground level anemometer support:
    a. If the low-level anemometer is being held by a pole, attach an 8-foot pole to the base of the south facing legs so that the pole extends to the west. The pole should be level and placed at a height of about 4 inches above ground.
    b. If the low level anemometer is being held by a stand, place the center of the stand two feet west of the southwest foot of the tripod.
6. Next, mark a location approximately 4 feet due west of the southwest foot of the tripod and install the ~5′ pipe for the Sensit stand using the post pounder, leaving approximately 24″ above the ground.
7. Continue by marking a location approximately 8′ due west of the southwest foot of the tripod for the CSC. Measure the length of the CSC from the bottom of the gasket to the bottom of the CSC. Using the coring auger, bore a hole at this location for the CSC, with an initial depth equal to this length.
8. Install the CSC into the bored hole until the center of the inlet sits at 15 cm (6″) from the surface. Soil may need to be added or removed at the bottom of the hole to reach this dimension. If soil is added, make sure to pack the soil down firmly before setting the CSC to ensure it will not settle later. Once the height is correct, pack excess soil around the CSC until it is firmly set into the ground. **Carefully distribute remaining loose soil in an area that is away from predominant high wind directions.**
9. Assemble the remainder of the Sensit stand using the 1″ iron pipe and Nu-Rail clamps. The ~2′ horizontal arm should be oriented in a westerly direction, and the bottom of the ~1′ vertical arm should be positioned approximately 25 cm (10″) above the ground level.
10. Wrap the foam insulation around the short vertical arm of the Sensit stand. Trim the foam so it does not extend below the end of the pipe.
11. Position the Sensit on the foam insulation so that the center of the crystal sensor ring is 15 cm (6″) above the ground surface. With the help of an assistant, use the PVC tape to tightly bind the Sensit to the vertical arm of the Sensit stand. Carefully wrap and secure the Sensit cable to the Sensit stand, leaving enough slack for future Sensit height adjustments. Run the Sensit cable along the ground back toward the tripod.
12. Mount the enclosure to the north leg of the tripod, leaving at least a 2″ gap between the enclosure and the surface.
13. Ensure that the external power lead is connected to the correct lugs on the 110ah battery, and then install the battery into the enclosure.
14. Attach the solar panel to the south legs of the tripod so the panel faces south. An angle-iron bracket may be used to securely attach the panel. Make sure the ends of the solar panel cables are taped so the leads do not short out.

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15. Drive the grounding rod into the ground at a convenient location near the enclosure. Attach the grounding clamp and grounding wire to the rod.

16. Mark the 2-m height above ground on the mast. Lower the mast and mark the 5-m height. Attach the lightning rod to the very top of the mast, then attach the NanoBridge M5 radio antenna just below. Aim the dish in the direction of the receiving station. Attach the Ethernet cable to the NanoBridge and cable tie it to the mast.

17. Attach the two cross-arms to the mast for the 2-m and 6-m measurements using the 2-m and 5-m marks as reference. Orient the cross-arms in an east-west direction, using a declination value of 11.5° East for Salton City, with the upper cross arm attached at its midpoint and the lower attached so the pole extends west.

18. Using the 1″x 3/4″ Nu-Rail fittings, attach a 024A vane to the east side of the upper cross arm. Ensure that the stainless steel shoulder screw is installed in the 024A instrument hub.

19. Aided by a compass, align the sensor so that the counter weight is oriented toward true south. When the sensor is properly aligned, remove the stainless steel shoulder screw from the instrument hub and ensure that the vane assembly rotates smoothly. Retain the stainless steel shoulder screw for future audit procedures.

20. Attach the cables to the sensors and label the lead end of the cables so identification on the logger side is easier. Ensure that the connector is properly keyed, and finger-tighten the knurled ring.

21. Using the 1″x3/4″ Nu-Rail fittings, attach a 014A anemometers to the west side of the upper and mid-level cross arms.

22. Attach the sensor cable to the connector on the 014A. Ensure that the connector is properly keyed, and finger-tighten the knurled ring.

23. Secure all cables to the mast using cable ties, allowing slack for adjustment. Raise the mast and collect the cables, securing the cables to the tripod allowing slack at the mast hinge so the mast can be raised and lowered freely.

24. Attach the 014A mini anemometer to the ground level pole or stand, using either a Nu-Rail fitting or threaded rod. Adjust the height based on the application (for example, 15 cm if used with a Sensit). Wire the sensor with a shielded twisted pair cable and run the cable back to the logger, securing with cable ties.

25. Confirm that the SunSaver charge controller has been turned off, pass all loose leads through the access port, and then complete all remaining electrical connections:
    - Charge leads from the solar panel to the charge terminals on the SunSaver
    - External battery lead to the appropriate plug on the SunSaver
    - Connect the wind vane to the CR6 datalogger (U1 and U2).
    - Connect the three anemometers to the CR6 datalogger (6-m in U3, 2-m in U5, and ground level in U7).

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- Attach the Sensit lead to the datalogger, according to the attached example wiring diagram (Appendix A) for the appropriate Sensit model (using C1 and C2).
- Connect the Ethernet cable from the NanoBridge to the POE adaptor.
- Attach a short Ethernet cable from the CR6 logger to the POE adaptor.
- Ground the wire between the ground lug on the underside of the enclosure to the clamp on the ground rod.

26. Firmly pack putty around the wiring access port in the bottom of the enclosure in an effort to prevent moisture and insects from entering the enclosure.
27. Carefully loop and wrap all loose leads to a convenient location on the tripod using the 20-mil PVC tape or cable ties.
28. Turn on the SunSaver. Following the CR6 SOP, confirm that the correct site ID and Sensit serial number have been entered into the datalogger program. Verify that the datalogger clock is set to PST.
29. Check the height of the CSC inlet and the Sensit sensor ring and adjust as necessary.
30. Confirm that the Sensit is responding normally by evaluating its response in real-time. Select **Num Display** from the toolbar, and then select **Display 1** to view the real-time station data. Rub the sensor with a pen or similar object, and view the results in **Display 1**. A properly operating Sensit will display a measurable reading (a non-zero value) for the particle count (PC) and kinetic energy (KE) data fields. If these values are **0** during a manual agitation, the Sensit is not operating properly or is not wired correctly. Inspect the integrity of the Sensit cable, verify the datalogger connections, and check the instrument again. If the Sensit is still not responding normally, notify the project monitoring manager for further instruction.
31. Confirm that the wind speed and direction are responding correctly.
32. Determine the wind direction program multiplier by dividing the sensor's full scale input voltage (FSIV) by 360 degrees. The FSIV is the maximum voltage output from the wind vane. When an instrument's program multiplier is found, it must then be entered into the existing datalogger program, replacing any previously defined value.
33. When all instrumentation is installed and operating, begin a site log entry, either electronically on the field laptop or using hard copy forms provided.
34. Audit the wind speed following the procedures in Section 4.

2.4 Data Records and Management

After the site installation is complete and the station is under stable operating conditions, the field technician must complete the initial Site Check and Audit Form. A hard copy is found in Appendix B if an electronic copy is not available on the field laptop.

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3.0 SITE VISIT PROCEDURES

3.1 CSC Tube Preparation

1. Disassemble empty sample tubes, removing any caps, rubber rings, and rubber stoppers from the clear plastic tube.
2. Clean all parts of the sample tube using soap and water with a bottle brush and tube plunger as necessary. Ensure that all old sample material and residue have been removed from each piece.
3. Using rubbing alcohol, remove any existing notes that have been written on the tube.
4. Allow all pieces to fully dry before reassembly.
5. Reassemble tubes with only a rubber stopper fully inserted into the bottom of the tube. The stopper should be inserted with the larger diameter up and the smaller diameter flush with the bottom of the clear tube. Do not install the rubber ring or cap at this time.
6. Following the operational procedures for the Scientech electronic balance (Appendix C), weigh each sample tube assembly to a resolution of 0.1 grams.
7. Using a permanent marker, write the tare weight of each empty sample tube assembly directly on the sample tube.
8. Insert a cap/stopper on the tube inlet. The sample tube is now ready for installation at a sampling site.

3.2 Field Collection Procedures

Sand flux monitoring sites must only be approached from an easterly direction. It is best to walk to each site; if an ATV is used for access, the vehicle must be parked no closer than 10 m from the monitoring site.

1. Before leaving the field office, ensure that the field computer is configured to PST to prevent an erroneous update of the datalogger to PDT. If the Sensit and meteorological data are being telemetered, then the data set should be checked prior to the site visit to confirm that the instruments are operating and identify possible issues. Sensits with little activity or no activity should have their response checked
2. Once at site, begin by recording the "Start Time" on the electronic Site Check and Audit Form on the most recent "Field_Site_Logger"workbook. Continue by entering data in the appropriate fields on the Site Check and Audit Form.
3. Inspect the station for any obvious damage, alignment issues, excessive dirt build-up, loose wiring connections, frayed or chewed cables, or vandalism. With some soil types and pole materials, the pole may not lock into place and the Sensit assembly may rotate in the wind. This should be noted on the electronic Site Check and Audit Form, and corrective action must be taken to stop further rotations. Record all corrective actions on the Site Check and Audit Form.

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4. Look for evidence of rain splatter. If rain splatter is seen, check the appropriate box in the site log and take a picture of the Sensit and CSC documenting the splatter.
5. Unlock the enclosure and connect the field computer to the datalogger using an RS-232 cable. Following the data collection procedure in the appropriate datalogger SOP, confirm that the datalogger clock setting is correct and collect all data saved for that site.
6. While still connected to the station, select **Num Display** from the toolbar, and then select **Display 1** to view the real-time station data. Here you can check the station battery voltage.
   - Test the Sensit response in real-time, and view the results in **Display 1**. Rub the sensor with a pen or similar object. A properly operating Sensit will display a measurable reading (a non-zero value) for the particle count (PC) and kinetic energy (KE) data fields. If these values are **0** during a manual agitation, the Sensit is not operating properly. For instances of improper Sensit operation, inspect the integrity of the Sensit cable and verify that the datalogger connections are solid. If the problem is not resolved during the field visit, notify the project monitoring manager for further instruction. The Sensits should be tested during each CSC collection event and for Sensit troubleshooting diagnostic visits.
   - If a Sensit needs to be removed from field deployment and replaced with a new instrument, follow these steps:
     - Modify the datalogger program to include the serial number of the new Sensit, and upload the new program to the datalogger. It is imperative that the datalogger program modification be completed accurately. Reference instructions in the appropriate datalogger manual (Campbell Scientific Inc., 2015b) for guidance.
     - Following modification of the datalogger program and its successful upload to the datalogger, manually test the Sensit to verify its appropriate response.
     - Once operation of the Sensit has been verified, wait at least 10 minutes before downloading the data.
     - Open the downloaded **Min05** comma-separated variable DAT data file in Microsoft Excel and verify that the site ID and Sensit serial number are correct. If the values are correct, the Sensit has been successfully changed and the datalogger program appropriately updated.
     - Consult with the monitoring manager on the need to collect the CSC tube and to replace it with a new one, if requested.
     - Take the Sensit to the field office, where it should be bench-tested to verify operation status (working or not).
     - If the Sensit is still not working at the shop, dispose of it.
     - If the Sensit is working at the field shop, test the instrument and system to establish the reason for failure in the field.

7. Confirm that the height from the playa surface to the center of the Sensit's sensor ring is 15 cm ±1 cm. Adjust this height as necessary and record the final dimension and any corrective actions taken on the electronic Site Check and Audit Form.
8. Carefully remove the CSC inlet head and set it aside. Brush any portion of the sand sample that has gathered on the top rim of the sample tube into the tube.
9. Remove the sample tube from the CSC. Remove the rubber top ring. Remove the cap from the tare-weighted "clean" sample tube and place it on the recently removed sample tube. Confirm that the site ID has been written on the sample tube, and, using a permanent marker, write the date of the collection.
10. Install the rubber top ring to the "clean" tube. Using a permanent marker, write the site ID on the "clean" sample tube. Insert the "clean" tube into the CSC and carefully reinstall the CSC inlet head.
11. Confirm that the height from the playa surface to the center of the CSC inlet is 15 cm ±1 cm. Adjust this height as necessary and record the final dimension and any corrective actions taken on the electronic Site Check and Audit Form.
12. Using a field camera, take one or more photos of the sample tube, showing a clear view of the collected sand sample, the site ID, and the collection date as written on the sample tube, as well as the surface conditions immediately adjacent to the sampling location.
13. Verify operation of the wind speed and direction sensors. If an audit is needed, conduct it at this time, following the procedures from Section 4.
14. The field computer may now be disconnected from the station.
15. Finish the field collection by recording the "End Time" on the electronic Site Check and Audit Form prior to leaving the sampling location.
16. Carefully return the samples back to the field office, keeping the tubes upright.

3.2.1 Maintenance and Adjustments

Review the performance of the all sensors and determine what adjustments are required, if any. Follow the maintenance and adjustment guidelines presented in the Instruction Manual (see the Campbell Scientific website for specific instrument manuals).

3.2.2 Post-Adjustment System Checks

If any maintenance or adjustments were performed, the steps listed in the Pre-Adjustment System Checks section of this procedure should be repeated and recorded on the Wind Speed Calibration Form. Results of the post-adjustment checks should be closely evaluated. If the output values do not closely match the expected values, perform troubleshooting, maintenance, and adjustments as needed to correct the sensor response. If the sensor is not deemed repairable, it should be replaced as soon as possible from the stock of back-up sensors for the monitoring project.

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3.3 Post-Collection Procedures

1. After all of the CSC sand mass samples are collected, the tubes are transported in an upright position and delivered to the field office for weighing.
2. Once at the field office, store the sample tubes upright in a secure location. If the samples are wet or damp, remove the caps from each sample tube to allow the samples to dry for several days. This drying process may be expedited by using a small fan to gently blow clean, dry air across the open ends of the sample tubes.
3. Generate a weigh sheet from the Excel based spreadsheet.
4. Prepare the Scientech electronic balance for measuring the mass of each sample.
5. Start the weighing session by verifying the scale accuracy with NIST[1] weights, following the appropriate operational procedures (Appendix C).
6. Record the site ID as written on the sample tube in the appropriate fields on the CSC Weigh Data spread Sheets (Appendix D). Continue to fill out the remaining fields as the data are available.
7. Begin by preparing an empty Ziploc storage bag for each sand sample. Write the site ID and collection date on the bag. Weigh the empty storage bag using the electronic balance. Write this "Empty Bag" weight directly on the empty bag for future reference and also on the Weigh Data Sheets.
8. Carefully pour each sand sample into its previously prepared Ziploc bag, being careful to not lose any remaining portion of the sample. Remove the stopper at the bottom of the sample tube and brush any sample that remains on the bottom stopper into the storage bag. With a clean tube plunger, push any remaining portion of the sand sample through the tube and out the bottom, into the storage bag. Using tweezers, carefully remove any insects or foreign material from the sample. Weigh the bag containing the sample, and record this value on the Weigh Data Sheets as the "Full Bag" weight.
9. Calculate the difference of the "Full Bag" weight and the "Empty Bag" weight, and record this value as the "Sample Weight" on the Weigh Data Sheets.
10. Repeat this process for all sample tubes.

    Note: Every tenth sample "Full Bag" should be re-weighed. The re-weigh data must be recorded in the Re-Weigh Section of the CSC Weigh Data Sheets (Appendix D).
11. Finish weighing by verifying the scale accuracy with NIST weights.
12. All samples should be stored in the laboratory for future reference.
13. Enter the CSC sample weigh data into the spreadsheet. Scan the completed hard-copy CSC Weigh Data Sheets, and archive a digital copy of the hard-copy notes and spreadsheet file to the Air Sciences Cataloger server. Distribute the sand-flux sample weigh data to all interested parties.

[1] National Institute of Standards and Technology

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3.4 Data Records and Management

Field personnel must maintain a thorough and complete set of site visit records. Every maintenance, CSC collection, or data download visit must be recorded on the Site Check and Audit Form. A hard copy of this form is provided in Appendix B if an electronic copy is not available on the field laptop. All hard copy forms must be stored at the project office.

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4.0 AUDIT PROCEDURES

This section provides procedures for properly auditing the performance of the Met One 014A Wind Speed Sensor and the Met One 024A Wind Direction Sensor.

4.1 Equipment and Supplies

- R.M. Young 18811 (or similar model) anemometer drive, motor, and attachment accessories
- R.M. Young 18802 (or similar model) anemometer drive, motor, and attachment accessories
- Met One 050 Torque wheel and black plastic screws (0.1 gm-cm)
- Tripod-mounted, survey-grade compass
- Site log book/audit sheets

4.2 Wind Speed Audit Procedures

Follow the steps below to audit the performance of the Met One 024A Wind Direction Sensor. Refer to the particular manufacture sensor instructions for a more detailed instrument protocol.

1. Remove the three-cup anemometer wheel from the sensor shaft.
2. Place the plastic adapter bushing on top of the wind sensor column assembly.
3. Attach the anemometer drive support bar assembly to the plastic bushing and gently tighten the clamp tension screw.
4. Slide the rubber tubing off the flexible coupling adapter onto the wind sensor shaft.
5. Attach the motor to the bar assembly and carefully align the anemometer and motor coupling, gently tighten the clamp on the motor assembly, and tighten the collar of the flexible coupling adapter to the shaft of the motor.
6. The sensor is then challenged at the speeds specified on the Wind Speed Calibration Form (30 through 1,800 revolutions per minute [RPM]). Note that both the 18802 and 18811 anemometer drives are needed to complete the entire range. The speeds measured by the datalogger for each specific RPM input value are compared to the calculated wind speed values. The equation for calculating wind speed as a function of anemometer drive RPM is provided on the Wind Speed Audit Form.
7. Carefully disassemble the anemometer drive materials upon completion of the testing.

Prior to installing the three-cup anemometer wheel, the sensor shall undergo a starting torque test. Follow these steps to perform the torque test for the 014A wind speed sensor with the torque wheel.

1. Remove the 014A from its mounting hardware and fix it to a horizontally leveled surface.
2. Attach the torque wheel to the anemometer shaft.

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3. Measure the starting torque and record it on the Wind Speed Audit Form. If the starting torque of the sensor is greater than 0.288 g-cm (0.004 in-oz.) clockwise or counterclockwise, the bearings may need to be refurbished.

4.3 Wind Direction Audit Procedures

Follow these steps to audit the performance of the Met One 024A Wind Direction Sensor.

1. Record the audit start time and the site information on the audit form.
2. Measure the orientation of the instrument crossarm using the tripod-mounted compass, taking into account the local magnetic declination (approximately 11.5° East for Salton Sea).
3. To ensure accuracy in this value, when possible, measure the crossarm orientation from a point located on the opposite end of the crossarm to confirm that both measurements are 180° apart.
4. Record the angle of the crossarm orientation as the initial source degree audit point on the audit form. Each consecutive audit point shall be calculated at 90° clockwise from its preceding audit point and recorded on the audit form.
5. Following safe working procedures, carefully lower the meteorological tower until the wind instruments are at a convenient working height.
6. While an assistant monitors the output at the logger display, hold the wind vane in a position that is parallel to the crossarm while recording the angular value as reported by the logger display.
7. Rotate the wind vane 90° clockwise, hold it in this position, and again record the logger display value on the audit form (a small square may be used to confirm that the wind vane is held at 90° to the crossarm). Repeat this step for the final two audit points.
8. The Met One 024A Wind Vane is supplied with a locking shoulder screw. Insert this locking shoulder screw, which will lock the wind vane at 180°. Record the source value and the logger display value on the audit form.
9. Carefully remove the wind vane from the rotational shaft and install the Met One 050 torque wheel on the sensor shaft. Measure the starting torque in both clockwise and counter-clockwise directions and record these values on the audit form. If the starting torque of the sensor is greater than 6.48 g-cm (0.09 in-oz.) clockwise or counterclockwise, the bearings may need to be refurbished.
10. Replace the wind vane on the instrument shaft, install the shoulder screw, and check the potentiometer orientation. If necessary, adjust the potentiometer until the value matches the reading recorded in Step 8.
11. Carefully return the meteorological tower to the upright, operational position.
12. Record the audit end time on the audit form.

4.4 Data Records and Management

At the conclusion of the audit, follow these steps.

1. Complete all audit forms, noting any adjustments made, maintenance performed, and/or corrective actions, if taken.
2. Note the specific time that the audit for the wind speed sensor began and ended.
3. Invalidate the entire time period during which the sensors were compromised or removed.
4. Sign and date the audit form under any comments made.
5. When possible, collect a scanned image of the hard-copy document for electronic archival purposes.

Refer to Appendices B and E for site check and audit forms.

4.5 Troubleshooting

Refer to the instrument specific instruction manuals for troubleshooting guidelines.

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5.0 REFERENCES

Air Sciences Inc. 2015a. *Standard Operating Procedure: Calibration and Audit Procedures for the Met One 024A Wind Direction Sensor*

Air Sciences Inc. 2015b. *Standard Operating Procedure: Calibration and Audit Procedures for the Met One 014A Wind Speed Sensor.*

Air Sciences Inc. 2015c. *Standard Operating Procedure: Configuration and Operation of the Campbell Scientific CR6 Dataloggers*.

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Appendix A: Example Sensit Wiring Conventions

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EXAMPLE SENSIT WIRING CONVENTIONS

H11B Sensit

- White (positive) – 12v
- Black (negative) – Ground
- Red (particle count) – P1
- Brown (kinetic energy) – P2
- Green (kinetic energy power) – Unused
- Blue (particle count power) – Unused

H11-LIN and H14-LIN Sensits

- Red (positive) – 12v
- Black (negative) – Ground
- White (particle count) – P1
- Orange (or occasionally Brown, kinetic energy) – P2
- Blue (PHA output) – Unused
- Green (Gain) – If Sensit response is weak, gain should be connected to 12v

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Appendix B: Site Check and Audit Form

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AIR SCIENCES INC.

AIR MONITORING PROGRAM
SITE CHECK AND AUDIT FORM

Date: Start Time (PST):

Operator(s): End Time (PST):

Site ID: Battery Voltage:

Visual Inspection: ☐ Pass ☐ Fail Observations:

Datalogger Information

Serial #: Type:

☐ Data Download Final Data Record Date/Time:

Maintenance and Operations

☐ Solar Panel Cleaned ☐ Datalogger Clock Check Reset Clock? ☐ Yes ☐ No

☐ Audit Conducted ☐ Ground/Wiring Connection Check Fittings Secure? ☐ Yes ☐ No

Comments:

Sensit/CSC Equipment Check

Sensit Serial Number (e.g., 123):

Radio Tested: ☐ Yes ☐ No Radio Serial Number:

Note: Measurement is from the ground surface to the middle of the sensor ring.

Sensor Height (cm): System Response to Manual Test: ☐ Yes ☐ No

Evidence of Rain Splatter? ☐ Yes ☐ No Photo Taken? ☐ Yes ☐ No

CSC Inlet Height (cm): ☐ Tube Removed for Weighting

Second CSC Inlet Height (cm): ☐ Second Tube Removed for Weighting

Comments:

Note: Measurement is from the ground surface to the middle of the inlet opening.

Estimate and Document the Parameters Below

Parameter	Estimated	Logger	Audit
Speed 6 m (m/s)			
Direction* (deg)			
Speed 2 m (m/s)			
Speed 15 cm (m/s)			

*Direction wind is from

Comments/Unusual Occurrences or Weather

Signature:

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Appendix C: Scientech Electronic Balance Operation

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SCIENTECH ELECTRONIC BALANCE OPERATION

Note: This electronic balance is sensitive to air movement, changes in temperature, vibration, direct sunlight, etc., and should be set up on a solid surface that is free of these conditions.

1. Confirm that the electronic balance is level. If necessary, adjust the feet until the balance is level.
2. Turn on the balance by pressing the **ON/OFF** button. Allow the balance to reach equilibrium for one hour before proceeding.
3. Confirm that the balance is set to measure in grams. Ensure that the balance pan is clean and free of any foreign matter.
4. Allow the balance display to stabilize, and press the **ZERO** button to establish the zero set point.
5. Perform a multipoint verification. One at a time, place each of the six calibration weights (200 mg, 1 g, 10 g, 100 g, 1000 g, and 2000 g) on the balance pan. Allow each reading to stabilize and record the displayed weight on the Scale Weight Calibration Section of the CSC Weigh Data Sheet. Verification weights should be within ±0.1 g from the target, as this is the resolution of the scale.
6. Proceed by weighing each sample. Be careful to allow the display to stabilize before recording any mass data. Confirm that the display returns to zero before proceeding with the next measurement and placing anything on the balance pan.
7. Re-weigh every tenth sample bag to confirm repeatability and record this re-weigh in the Re-Weigh Section of the CSC Weigh Data Sheet.
8. After all samples have been weighed, perform a second multipoint verification. One at a time, place each of the six calibration weights on the balance pan. Allow each reading to stabilize and record the displayed weight on the Scale Weight Calibration Section of the CSC Weigh Data Sheet. Verification weights should be within ±0.1 g from the target, as this is the resolution of the scale.
9. The electronic balance may now be powered off and covered for storage.

Reference

Scientech. 2006. *Scientech Series 12000 Electronic Balance Setup and Operating Procedures PN11756C.* September 21, 2006. http://www.affordablescales.com/pdfs/users_manual_pdf/sm50.pdf. Accessed October 6, 2015.

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Appendix D: Sample CSC Weigh Data Sheets

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Salton Sea Air Monitoring Program **Collection #________________**

CSC SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	EMPTY BAG WT. (g)	FULL BAG WT. (g)	SAMPLE WEIGHT (g)	SCALE OP. & DATE	CATCH FULL (YES/NO)	CATCH WET OR DAMP (WET/DRY)	SPILL OR LEAK (YES/NO)	HEIGHT OF CATCH (cm)	ANY MATERIAL OTHER THAN SAND (YES/NO) If yes, describe other material	COMMENTS

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RE-WEIGH SECTION:

(REWEIGH EVERY 10th Sample WEIGHED)

REWEIGHED CSC SAMPLE LOCATION	COLLECTION DATE	COLLECTION TIME	FULL BAG WT. (g)	SCALE OP. & DATE

SCALE WEIGHT CALIBRATION SECTION:

(check scale before and after every group of measurements)

WEIGHT	DISPLAY	TIME	DATE
200 mg			
1 g			
10 g			
100 g			
1 kg			
2 kg			
200 mg			
1 g			
10 g			
100 g			
1 kg			
2 kg			

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Appendix E: Wind Speed and Direction Audit Forms

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METEOROLOGICAL AUDIT/CALIBRATION DATA

AIR SCIENCES INC.

Client:
Job No.:
Site:

Date:
Time In:
Time Out:

Auditors:

Data Logger Model :
Serial No.:

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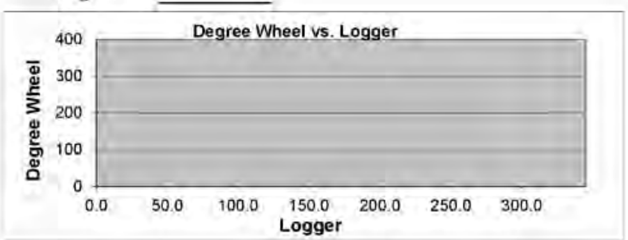
WIND DIRECTION 024A CALIBRATION, Upper: Height = __________ (m)

Model: ____________________ Serial No.: __________

System Linearity Check Declination = ________ East

Orientation	Compass (Degrees)	Target (Degrees)	Logger Reading (Degrees)	Difference (Degrees)	Acceptance Criteria
1. Crossarm (E)			-		±5
2. Crossarm (W)			-		±5
3. Vane (locked)	-				±5

	Initial Logger (Degrees)	Difference (Degrees)	Corrected Logger (Degrees)	Difference (Degrees)	Acceptance Criteria
45					±3
90					±3
135					±3
180					±3
225					±3
270					±3
315					±3
Avg					



WIND DIRECTION 024A AUDIT, Upper Level Height = __________ (m)

Model: ____________________ Serial No.: __________

Performance Audit Declination = ________ East

Orientation	Compass (Degrees)	Target (Degrees)	Logger Reading (Degrees)	Difference (Degrees)	Acceptance Criteria
1. Crossarm (E)					±5
2. Crossarm (W)					±5
3. Vane (locked)	-				±5

	Logger (Degrees)	Difference (Degrees)	Acceptance Criteria
90			±5
180			±5
270			±5
360			±5
Avg			

Bearing Torque Test (Passing 6.48 gm-cm)

Clockwise ________ gm-cm

Counterclockwise ________ gm-cm

WIND SPEED 014A, Upper Height = ___________ (m)

Drive Model Number: ______________ Disk Model Number: ______________

Drive Serial Number: ______________ Disk Serial Number: ______________

System Linearity Check

	Input rpm	Target* m/s	Logger Reading m/s	Difference m/s	Acceptance Criteria (±)
1.	0.0	0.4			0.0
2.	30.0	1.2			0.26
3.	60.0	2.0			0.30
4.	90.0	2.8			0.34
5.	180.0	5.2			0.46
6.	300.0	8.4			0.62
7.	600.0	16.4			1.02
8.	900.0	24.4			1.42
9.	1400.0	37.8			2.09
10.	1800.0	48.4			2.62

Met One
*Target (mps) = (rpm/37.5067)+0.447

Bearing Torque Test (Passing 0.288 gm-cm)

Clockwise ______________ gm-cm

Counterclockwise ______________ gm-cm

WIND SPEED 014A, Mid Level Height = ___________ (m)

Drive Model Number: ______________ Disk Model Number: ______________

Drive Serial Number: ______________ Disk Serial Number: ______________

System Linearity Check

	Input rpm	Target* m/s	Logger Reading m/s	Difference m/s	Acceptance Criteria (±)
1.	0.0	0.4			0.0
2.	30.0	1.2			0.26
3.	60.0	2.0			0.30
4.	90.0	2.8			0.34
5.	180.0	5.2			0.46
6.	300.0	8.4			0.62
7.	600.0	16.4			1.02
8.	900.0	24.4			1.42
9.	1400.0	37.8			2.09
10.	1800.0	48.4			2.62

Met One
*Target (mps) = (rpm/37.5067)+0.447

Bearing Torque Test (Passing 0.288 gm-cm)

Clockwise ______________ gm-cm

Counterclockwise ______________ gm-cm

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WIND SPEED 014A, Lower Level Height = ______________ (m)

Drive Model Number: ______________ Disk Model Number: ______________

Drive Serial Number: ______________ Disk Serial Number: ______________

System Linearity Check

	Input rpm	Target* m/s	Logger Reading m/s	Difference m/s	Acceptance Criteria (±)
1.	0.0	0.4			0.0
2.	30.0	1.2			0.26
3.	60.0	2.0			0.30
4.	90.0	2.8			0.34
5.	180.0	5.2			0.46
6.	300.0	8.4			0.62
7.	600.0	16.4			1.02
8.	900.0	24.4			1.42
9.	1400.0	37.8			2.09
10.	1800.0	48.4			2.62

Met One
*Target (mps) = (rpm/37.5067)+0.447

Bearing Torque Test (Passing 0.288 gm-cm)

Clockwise ______________ gm-cm

Counterclockwise ______________ gm-cm

COMMENTS

Invalidated meteorological data from: ______________

NOTES:

Signature: ______________ **Date:** ______________

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APPENDIX D.3.
STANDARD OPERATING PROCEDURES: ROUNDSHOT LIVECAM D2

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Standard Operating Procedure
Roundshot Livecam D2 Installation and Operation at Salton Sea

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Document Information:

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Title	Name	Date	Signature
Technical Writer/Editor	Jessica Crichfield	09/14/2015	
Data Collections Manager	Kent Norville	09/14/2015	

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Appendices

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1.0 INTRODUCTION

This document describes the procedures for properly locating, installing, and operating a Roundshot Livecam D2 video monitoring station for use in the Salton Sea Air Basin. The station consists of a digital scan unit, lens, motor unit, weatherproof viewing enclosure, and mast holder for the video system; a solar power system; and data storage and telemetry equipment. This document has been written specifically for application to Salton Sea project and may not be applicable to other jobsite locations.

This document is in accordance with the Environmental Protection Agency's *Guidance for Preparing Standard Operating Procedures (SOPs)* (EPA 2007).

1.1 Principles of Operation

Video observations are a critical component of a windblown dust activity monitoring network, providing near-real-time "eyes" that are always on, tracking and recording dust plume activity continuously over large areas. To provide full coverage, video networks routinely consist of several strategically placed stationary cameras surrounding an area, with the collective fields of view (FOV) providing complete observational coverage. There exists a trade-off with a stationary camera site between FOV and resolution: a high FOV will observe a large area at low resolution, and at focal lengths less than 18mm will also introduce distortion. On the other hand, a large focal length (20mm and higher) will increase resolution but narrow the FOV substantially and necessitate more cameras to observe the same area.

The Roundshot Livecam digital camera observation platform alleviates this trade-off by using a motor-driven scanner to create a horizontal FOV of up to 360°. The camera consists of a 3-linear RGB vertical line sensor coupled with a Nikon Nikkor-style lens (up to 70mm focal length) mounted on a motorized turntable. Turning the base while capturing 1-pixel-wide line "images" creates a single panoramic frame. Thus, the horizontal FOV is not diminished when the focal length is increased, allowing a single station to observe a wide area at high resolution.

1.2 Safety Precautions

- All field staff should carry a working cell phone and wear the appropriate Personal Protective Equipment (PPE).
- Disconnect power before working with electrical components.
- Take normal precautions to avoid electrical shock.

1.3 Sampling Interferences/Precautions

- Check the forecast to ensure safe weather and environmental conditions before visiting a video station. Site visits and maintenance should not occur under high wind or stormy conditions to avoid damaging equipment and injury to the operator.
- Ensure proper grounding for good performance.

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- If vehicle access is necessary, the field vehicle must always be parked a minimum of 10 meters away from the monitoring site.
- All data should be collected using Pacific Standard Time (PST). Configure all field laptops, tablets, on-site computers, and other devices (e.g. a GPS) using PST to prevent accidental computer clock updates to Pacific Daylight Savings Time (PDT).
- The site operator needs to confirm that the video capture software is appropriately configured with the monitoring site ID included in the image filenames. Database and website problems are likely to occur if the site ID is incorrect or absent.

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2.0 SITE LOCATION AND INSTALLATION

2.1 Equipment and Supplies

- Roundshot Assembly
  - Waterproof cover ("hat")
  - Cover screws (3)
  - Insulation ring
  - Roundshot D2 digital scan unit
  - Lens (Nikkor AF-S 18-55mm zoom lens or AF-S 70mm telephoto lens)
  - Motor electronics unit (turntable base)
  - Silica gel pack
  - Waterproof power/communications connector
  - Mast holder
  - Power and Ethernet cables with waterproof plugs
- NEMA[1] Enclosure
  - Router
  - Compact PC (eee box PC, fitPC, or similar) with 2 GB RAM and ≥256GB HDD
  - Mimo monitor, flexible rugged keyboard, mini-mouse (for PC operation on-site)
- "Job box" battery enclosure (3 enclosures; only one enclosure will contain the power system)
  - Charge regulator (1)
  - Combiner Box (1)
  - Power-Over-Ethernet (POE) Adapter for the NanoBridge (1)
  - 110ah external storage batteries (8 total, max. 3 per enclosure)
  - Pre-fab 24"–36" cables for joining the batteries in parallel
- 90 W solar panel with mounting bracket
- NanoBridge M5 Ethernet radio with antenna
- 20′ tripod with anchors and guy-wire kit
- Grounding package, including 6′ copper grounding rod, clamp, cable, and lightning rod
- Various U-Bolts
- Portable GPS unit with monitoring site location file pre-loaded
- T-Post pounder

[1] National Electrical Manufacturers Association

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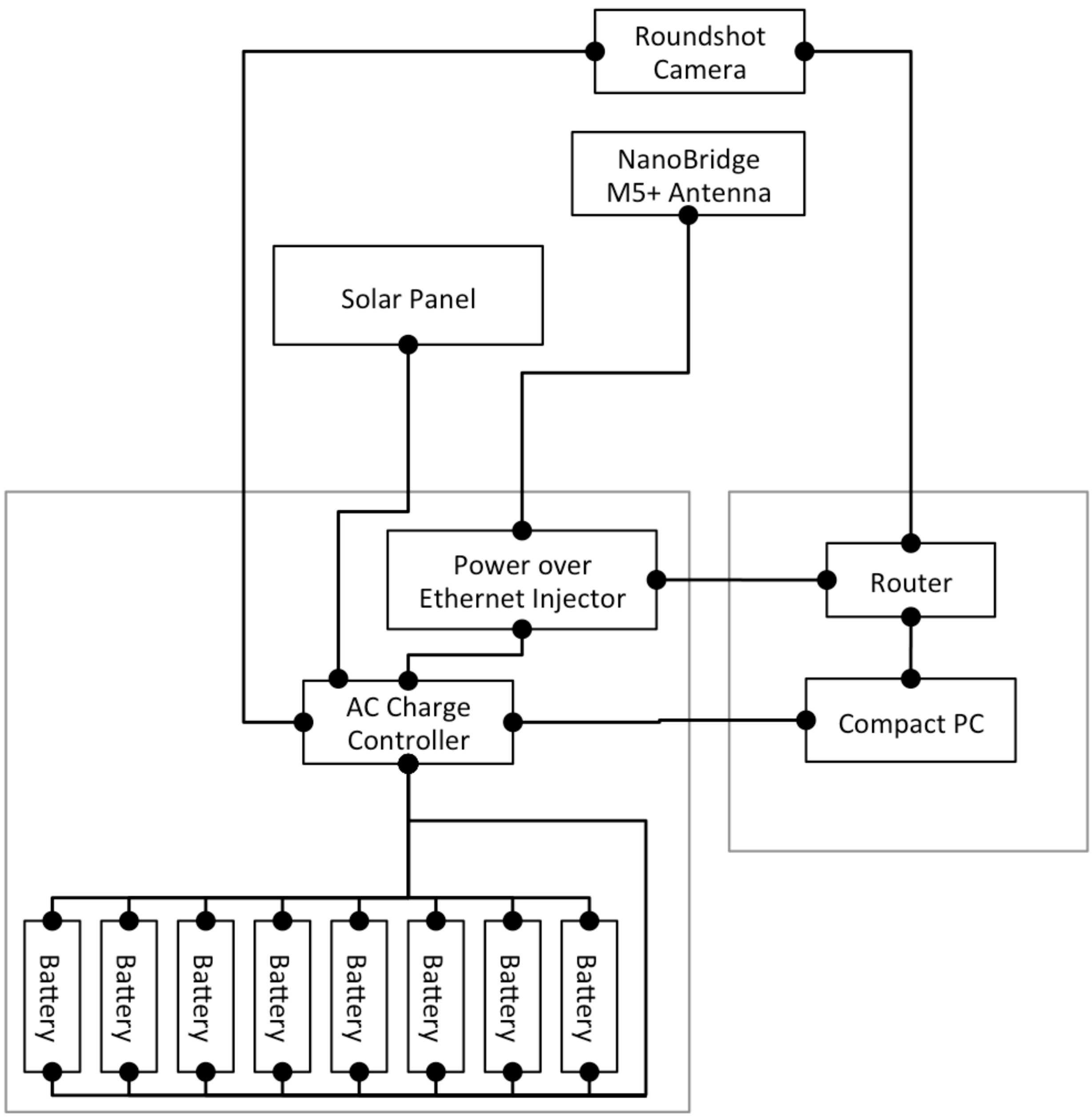
- Packing putty
- Small straight-bladed screwdriver
- Large Allen keys
- Metric measuring tape
- Combination wrench set
- 3″ waterproof tape

2.2 Wiring Diagram

The wiring diagram for the instruments, datalogger, and power system is shown below.



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2.3 Roundshot Monitoring Site Location and Installation

1. Before deploying, prepare the enclosure by installing the back plate on the back wall. Make sure there is an accessible wiring access port at the left back side of the enclosure. Mount the AC charge controller, POE Adaptor, combiner box, and inverter to the back plate.
2. Wire the charge controller, combiner box, and inverter. Refer to TriStar Solar System Controller Installation and Operation Manual pp. 9–18.
3. Prepare the compact PC by loading the Roundshot software and configuring system settings. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), pp. 9–11 for detailed instructions on preparing the PC. Make sure the PC is set to Pacific Standard Time (PST). Configuring the Roundshot camera with the software is done on-site.
4. Prepare the mast holder. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), pp. 7–8 for detailed instructions on mounting the mast holder to the tripod mast. *An adapter may be required match the inner diameter of the mast holder to the outer diameter of the mast.*
5. Using standard navigation procedures and the portable GPS unit, locate the appropriate monitoring site. The site should be approximately 10′ by 10′ and generally level with minimal obstructions. All access to the monitoring site should be from the direction that is out of the FOV of the camera as much as possible. **Ensure that all field personnel approach the location only from that preferred direction**. The FOV will be specific to each site and should be recorded during site installation.
6. Begin by installing the tripod. Refer to the Tripod Installation Manual Models CM110, CM115, CM120 (Campbell Scientific, Inc. 2012) for detailed tripod installation instructions.
7. Mount the NEMA enclosure to the north leg of the tripod, leaving at least a two-inch gap between the enclosure and the surface. Arrange the compact PC inside the enclosure.
8. Arrange the job boxes around the tripod. Place three batteries each into two of the boxes, and two into the third box that will contain the AC power system. Ensure the box with the power system is closest to the NEMA enclosure. Connect the batteries in parallel with the pre-fab power cables, making sure the end leads are taped.
9. Attach the solar panel to the south legs of the tripod so the panel faces south. An angle-iron bracket may be used to securely attach the panel. Make sure the ends of the solar panel cables are taped so the leads do not short out.
10. Drive the ground rod into the ground at a convenient location near the enclosures. Attach the grounding clamp and grounding wire to the rod.
11. Lower the mast. Attach a cross-arm to the mast 0.5m from the top of the mast. Attach the lightning rod to the crossarm, then attach the NanoBridge M5 radio antenna just below the

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crossarm. Aim the dish in the direction of the receiving station. Attach the Ethernet cable to the NanoBridge and cable-tie it to the mast.

12. Mount the Roundshot to the top of the mast with the pre-prepared mast holder. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), p. 69 for instructions on proper camera handling. Attach the power and Ethernet cables with waterproof plugs. Label the lead end of the cables so identification on the PC side is easier.

13. Secure the cables to the cross arm and mast using cable ties, allowing slack for adjustment. Raise the mast and collect the cables, securing the cables to the tripod allowing slack at the mast hinge so the mast can be raised and lowered freely.

14. Confirm that the AC charge controller has been turned off, pass all loose leads through the access port in the job box, and then complete all remaining electrical connections:

    - Charge leads from the solar panel to the charge terminals on the AC charge controller
    - Battery cable lead to the combiner box on the AC charge controller
    - Roundshot power plug and compact PC plug to the inverter included with the AC charge controller
    - Roundshot and compact PC Ethernet cables to the router
    - The Ethernet cable from the NanoBridge to the POE adaptor
    - An Ethernet cable from the router to the POE adaptor
    - Ground wire between the ground lug on the underside of the enclosure to the clamp on the ground rod

15. Firmly pack putty around the wiring access ports in the NEMA enclosure and job boxes in an effort to prevent moisture and insects from entering the enclosures.

16. Carefully loop and wrap all loose leads to a convenient location on the tripod using cable ties.

17. Turn on the AC charge controller and compact PC. Verify that the PC clock is set to PST.

18. Configure the Roundshot camera. Configuration includes adjusting the tilt angle, which will require lowering the mast (potentially several times), and programming the image collection characteristics. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), pp. 12–44 for detailed instructions on camera configuration. To determine the camera degree of rotation, starting point, and end point; the collection frequency; and the image resolution, refer to the monitoring study plan.

19. Once the camera is configured, lower the mast once more and secure the camera dome to the mast assembly. Place a silica gel pack inside the dome, making sure that will not obstruct the camera once the mast is raised, and secure dome with the rubber O-Ring and screws. Finish sealing the dome seam by wrapping it with waterproof tape.

20. When all instrumentation is installed and operating, begin a site log entry, either electronically on a field laptop or using the hard copy forms provided in Appendix A.

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2.4 Data Records and Management

After the site installation is complete and the station is under stable operating conditions, the field technician must complete the initial Site Check Form electronically on the most recent "Field_Site_Logger"workbook. This workbook can be found on the "Salton Sea Field Operations" Dropbox folder.

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3.0 SITE VISIT PROCEDURES

3.1 Field Collection Procedures

If the camera images are being telemetered, the images should be checked prior to the site visit to confirm that the cameras are operating and identify possible issues. Refer to the Roundshot Livecam D2 HD Instruction Manual (Seitz Phototechnik AG, 2013), pp. 69–72 for maintenance and troubleshooting.

It is best to walk to each site; if an ATV is used for access, the vehicle must be parked no closer than 10 m from the monitoring site.

1. Before leaving the field office, ensure that you have extra waterproof tape, silica gel packs, lens cleaner, and a can of compressed air in case the camera dome must be unsealed and cleaned.
2. Begin by recording the "Start Time" on the electronic Site Check Form in the most recent "Field_Site_Logger"workbook. Continue by entering data in the appropriate fields on the Site Check Form.
3. Inspect the station for any obvious damage, alignment issues, excessive dirt build-up, loose wiring connections, frayed or chewed cables, or vandalism. Record all corrective actions on the Site Check Form.
4. Lower the mast, wipe clean the camera dome window, and look for evidence of moisture or dust inside the dome. If moisture/dust is seen, check the appropriate box in the site log and proceed with inspecting and cleaning the camera assembly:
    a. Look for evidence of damage to the dome seal or any other possible entry point for water/dust, noting this in the site log.
    b. Unseal the dome by removing the waterproof tape. Clean the inside of the dome and rest it in a relatively clean spot (such as inside a job box) to prevent damage or dirtying.
    c. Clean the camera assembly by dusting with compressed gas. Clean the camera lens with a lens cleaner. Inspect the assembly for damage (e.g. rusting) and then promptly reseal the dome, applying fresh waterproof tape around the seam.
5. Unlock the job box that contains the charge controller. Check the status (including voltage) of the solar power system by viewing the indicator lights on the front of the charge controller. Anything other than a solid green light may mean a problem with the power system. Refer to TriStar Solar System Controller Installation and Operation Manual Appendix 3 for detailed information on status indicators and troubleshooting. Note any corrective actions in the Site Log.
6. Unlock the NEMA enclosure and connect to the PC with the Mimo monitor, keyboard, and mouse stored on-site. Check the computer clock and adjust if necessary, noting any changes in the Site Log.
7. Finish the field collection by recording the "End Time" on the electronic Site Check Form prior to leaving the sampling location.

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3.2 Data Records and Management

Field personnel must maintain a thorough and complete set of site visit records. Every maintenance or data download visit must be recorded on the Site Check Form electronically in the most recent "Field_Site_Logger." This workbook can be found on the "Salton Sea Field Operations" Dropbox folder.

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4.0 REFERENCES

Air Sciences Inc. 2015a. *Standard Operating Procedure: Calibration and Audit Procedures for the Met One 024A Wind Direction Sensor*

Air Sciences Inc. 2015b. *Standard Operating Procedure: Calibration and Audit Procedures for the Met One 014A Wind Speed Sensor.*

Air Sciences Inc. 2015c. *Standard Operating Procedure: Configuration and Operation of the Campbell Scientific CR6 Dataloggers*.

Campbell Scientific Inc. 2015. *Tripod Installation Manual Models CM110, CM115, CM120*. https://s.campbellsci.com/documents/us/manuals/cm110-cm115-cm120.pdf. Accessed October 6, 2015.

Environmental Protection Agency. 2007. *Guidance for Preparing Standard Operating Procedures (SOPs)*. EPA/600/B-07/001. April 2007. http://www2.epa.gov/sites/production/files/2015-06/documents/g6-final.pdf. Accessed October 6, 2015.

Seitz Phototechnik AG. 2013. *Roundshot Livecam D2 HD Instruction Manual*. Seitz Phototechnik AG Hauptstr. 14 8512 Lustdorf / Switzerland. May 2013.

TriStar Solar. Nd. *Solar System Controller Installation and Operation Manual*. Morningstar Corporation 1098 Washington Crossing Road Washington Crossing, PA 18977 USA.

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Appendix A: Site Check Form

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VIDEO MONITORING PROGRAM
SITE CHECK FORM

Date:	Start Time (PST):
Operator(s):	End Time (PST):
Site ID:	Battery Voltage:
Visual Inspection: ☐ Pass ☐ Fail	Observations:

Computer Information

Serial #:	Type:
☐ Data Download	Final Data Record Date/Time:

Maintenance and Operations

☐ Solar Panel Cleaned	☐ Computer Clock Check	Reset Clock? ☐ Yes ☐ No
☐ Camera Dome Window Cleaned	☐ Ground/Wiring Connection Check	Fittings Secure? ☐ Yes ☐ No

Comments:

Video Equipment Check

Camera Serial Number:

Ethernet Bridge Tested? ☐ Yes ☐ No	Ethernet Bridge Serial Number:
Evidence of water/dust intrusion into the dome? ☐ Yes ☐ No	Camera Response to Manual Test? ☐ Yes ☐ No
Evidence of computer reboot? ☐ Yes ☐ No	Silica gel pack inside camera dome replaced? ☐ Yes ☐ No
Evidence of tampering/vandalism? ☐ Yes ☐ No	Solar power system status normal? ☐ Yes ☐ No

Comments:

Unusual Occurrences or Weather:

Signature: ______________________

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Appendix B: Solar Panel Wiring Diagram

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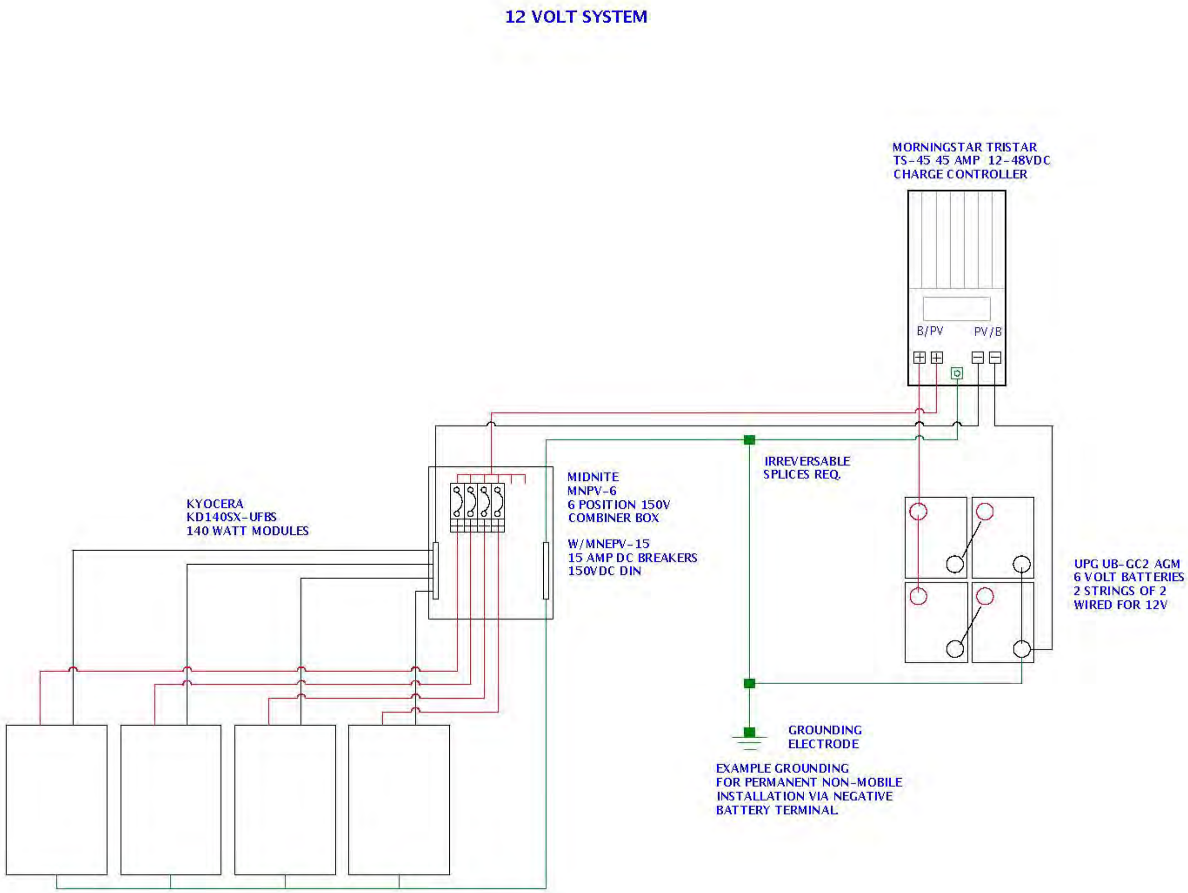

Wholesale Solar
DC Off-Grid Wire Diagram
for Air Sciences

IMPORTANT:

READ ALL MANUALS COMPLETELY PRIOR TO INSTALLATION OF SYSTEM COMPONENTS & WIRING FOR ADDITIONAL & CRITICAL INSTALLATION SEQUENCES, SAFETY INFORMATION, & OPERATION PROCEDURES.

BATTERIES MUST BE CONNECTED TO CHARGE CONTROLLER PRIOR TO PV MODULE CONNECTIONS FOR PROPER SYSTEM FUNCTION.

ALL WIRING MUST COMPLY WITH NEC GUIDELINES AND LOCAL AUTHORITY HAVING JURISDICTION.

THIS DRAWING DEPICTS TYPICAL WIRING PATHS. IT MAY NOT REPRESENT THE ACTUAL LAYOUT OF THE EQUIPMENT OR LOCATION OF WIRING TERMINATION LOCATIONS.

PLEASE REFER TO THE SUPPLIED MANUALS AND LABELS FOR ACTUAL LOCATIONS.

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APPENDIX D.4.
STANDARD OPERATING PROCEDURES: STARDOT TECHNOLOGIES SC H.264

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Standard Operating Procedure
StarDot Technologies SC H.264 Installation and Operation at Salton Sea

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Appendices

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1.0 INTRODUCTION

This document describes the procedures for properly locating, installing, and operating a Roundshot Livecam D2 video monitoring station for use in the Salton Sea Air Basin. The station consists of a digital scan unit, lens, motor unit, weatherproof viewing enclosure, and mast holder for the video system; a solar power system; and data storage and telemetry equipment. This document has been written specifically for application to Salton Sea project and may not be applicable to other jobsite locations.

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1.1 Principles of Operation

Video observations are a critical component of a windblown dust activity monitoring network, providing near-real-time "eyes" that are always on, tracking and recording dust plume activity continuously over large areas. To provide full coverage, video networks consist of several strategically placed stationary cameras surrounding an area, with the collective fields of view (FOV) providing complete observational coverage. There exists a trade-off with a stationary camera site between FOV and resolution: a high FOV will observe a large area at low resolution, and at focal lengths less than 18mm will also introduce distortion. On the other hand, a large focal length (20mm and higher) will increase resolution but narrow the FOV substantially and necessitate more cameras to observe the same area. In addition, high-resolution images require more available bandwidth to transfer data for remote observation.

The StarDot SC H.264 digital camera provides maximum flexibility to achieve optimum FOV and resolution by employing a scalable RGB sensor, up to 10 megapixel (MP) resolution, and allowing the use of vari-focal lenses. The camera IP-ready and is equipped with Power over Ethernet (PoE), with a single Ethernet cable powering the device and transferring data. Image capture is configurable by setting the resolution, saturation, contrast, exposure (shutter speed), and color balance.

1.2 Safety Precautions

- All field staff should carry a working cell phone and wear the appropriate Personal Protective Equipment (PPE).
- Disconnect power before working with electrical components.
- Take normal precautions to avoid electrical shock.

1.3 Sampling Interferences/Precautions

- Check the forecast to ensure safe weather and environmental conditions before visiting a video station. Site visits and maintenance should not occur under high wind or stormy conditions to avoid damaging equipment and injury to the operator.
- Ensure proper grounding for good performance.

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- If vehicle access is necessary, the field vehicle must always be parked a minimum of 10 meters away from the monitoring site.
- All data should be collected using Pacific Standard Time (PST). Configure all field laptops, tablets, on-site computers, and other devices (e.g. a GPS) using PST to prevent accidental camera clock updates to Pacific Daylight Savings Time (PDT).
- The site operator needs to confirm that the video capture software is appropriately configured with the monitoring site ID included in the image filenames. Database and website problems are likely to occur if the site ID is incorrect or absent.

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2.0 SITE LOCATION AND INSTALLATION

2.1 Equipment and Supplies

- StarDot camera Assembly
  - Dotworkz ST-BASE outdoor enclosure
  - StarDot SC H.264 camera
  - StarDot 8–48mm vari-focal lens (LEN-M848MN)
- Tripp Lite outdoor rated 100-ft. patch cable
- Battery Enclosure (3-battery)
  - Veracity Power-over-Ethernet (PoE) injector
  - Sunsaver 10A 12V voltage regulator
  - Campbell Scientific backplate (18826)
  - 100ah external storage batteries (2 total)
  - Battery cables
- 90 W solar panel with mounting bracket
- NanoBridge M5 Ethernet radio with antenna
- 20′ tripod with anchors and guy-wire kit
- One 4-foot cross-arm with support brackets
- 6′ Copper grounding rod, clamp, and cable
- Various U-Bolts
- Portable GPS unit with monitoring site location file pre-loaded
- Field laptop with an Ethernet jack, Ethernet cable, and a standard web browser for configuring camera settings
- T-Post pounder
- Packing putty
- Small straight-bladed screwdriver
- Metric measuring tape
- Combination wrench set

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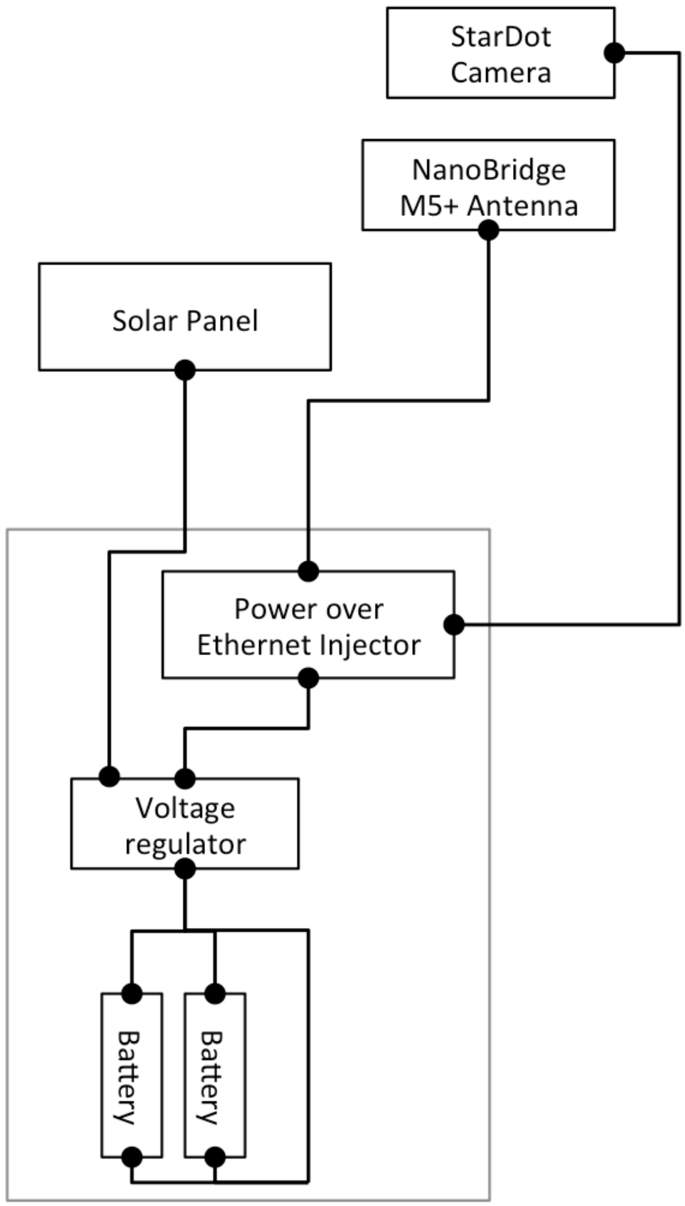
2.2 Wiring Diagram

The wiring diagram for the instruments, communications, and power system is shown below.



2.3 StarDot Monitoring Site Location and Installation

1. Before deploying, prepare the enclosure by installing the back plate on the back wall. Make sure there is an accessible wiring access port at the left back side of the enclosure. Mount the voltage regulator and PoE Adaptor to the back plate.

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2. Make sure the field laptop is set to Pacific Standard Time (PST). Configure the StarDot camera network and assign it an IP address. Refer to the NetCam SC H.264 Mexapixel Hybrid IP Camera User's Manual (StarDot Technologies, 2010), pp. 7–8 for detailed instructions. Bookmark the IP address (e.g. http://192.168.1.5) in the field laptop web browser; the remainder of the camera configuration is done on-site via a web browser.
3. Using standard navigation procedures and the portable GPS unit, locate the appropriate monitoring site. The site should be approximately 10′ by 10′ and generally level with minimal obstructions. All access to the monitoring site should be from the direction that is out of the FOV of the camera as much as possible. **Ensure that all field personnel approach the location only from that preferred direction**. The FOV will be specific to each site and should be recorded during site installation.
4. Begin by installing the tripod. Refer to the Tripod Installation Manual Models CM110, CM115, CM120 (Campbell Scientific, Inc. 2015) for detailed tripod installation instructions.
5. Mount the enclosure to the north leg of the tripod, leaving at least a two-inch gap between the enclosure and the surface. Arrange the batteries inside the enclosure. Connect the batteries in parallel with the power cables, making sure the end leads are taped.
6. Attach the solar panel to the south legs of the tripod so the panel faces south. An angle-iron bracket may be used to securely attach the panel. Make sure the ends of the solar panel cables are taped so the leads do not short out.
7. Drive the ground rod into the ground at a convenient location near the enclosures. Attach the grounding clamp and grounding wire to the rod.
8. Lower the mast and mark the 4-m height. Attach the lightning rod to the very top of the mast, then attach the NanoBridge M5 radio antenna just below. Aim the dish in the direction of the receiving station. Attach an Ethernet cable to the NanoBridge and cable tie it to the mast.
9. Mount the camera enclosure to the mast with a U-Bolt using the 4-m mark as a reference. Place the camera inside the enclosure and connect an Ethernet cable to the NET port on the back of the camera. Seal the enclosure, placing a silica gel pack inside to reduce moisture.
10. Secure the cables to the cross arm and mast using cable ties, allowing slack for adjustment. Raise the mast and collect the cables, securing the cables to the tripod allowing slack at the mast hinge so the mast can be raised and lowered freely.
11. Confirm that the voltage regulator has been turned off, pass all loose leads through the access port in the enclosure, and then complete all remaining electrical connections:
    - Charge leads from the solar panel to the charge terminals on the voltage regulator
    - Battery cable lead to the voltage regulator
    - NanoBridge Ethernet cable and camera Ethernet cable to the PoE adapter
    - Ground wire between the ground lug on the underside of the enclosure to the clamp on the ground rod

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12. Firmly pack putty around the wiring access ports in the enclosure in an effort to prevent moisture and insects from entering the enclosures.
13. Carefully loop and wrap all loose leads to a convenient location on the tripod using cable ties.
14. Turn on the voltage regulator. Unplug the NanoBridge from the PoE adapter and plug in the field laptop.
15. Configure the StarDot camera using the field laptop. Configuration includes adjusting the tilt angle, which will require lowering the mast (potentially several times), and programming the image collection characteristics. Refer to the NetCam SC H.264 Mexapixel Hybrid IP Camera User's Manual (StarDot Technologies, 2010), pp. 12–40 for detailed instructions on camera configuration. Ensure the timezone is set to PST. Leave settings for contrast, exposure, and image quality in the "auto" or default mode. To determine the camera collection frequency; data transfer delay; and the camera resolution, refer to the monitoring study plan.
16. Once configuration is complete, plug the NanoBridge back in to the PoE adapter.
17. When all instrumentation is installed and operating, begin a site log entry, either electronically on a field laptop or using the hard copy forms provided in Appendix A.

2.4 Data Records and Management

After the site installation is complete and the station is under stable operating conditions, the field technician must complete the initial Site Check Form electronically on the most recent "Field_Site_Logger"workbook. This workbook can be found on the "Salton Sea Field Operations" Dropbox folder.

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3.0 SITE VISIT PROCEDURES

3.1 Field Collection Procedures

If the camera images are being telemetered, the images should be checked prior to the site visit to confirm that the cameras are operating and identify possible issues.

It is best to walk to each site; if an ATV is used for access, the vehicle must be parked no closer than 10 m from the monitoring site.

1. Before leaving the field office, ensure that you have extra silica gel packs, waterproof tape, lens cleaner, and a can of compressed air in case the camera enclosure must be unsealed and cleaned.
2. Begin by recording the "Start Time" on the electronic Site Check Form in the most recent "Field_Site_Logger"workbook. Continue by entering data in the appropriate fields on the Site Check Form.
3. Inspect the station for any obvious damage, alignment issues, excessive dirt build-up, loose wiring connections, frayed or chewed cables, or vandalism. Record all corrective actions on the Site Check Form.
4. Lower the mast, wipe clean the camera enclosure window, and look for evidence of moisture or dust inside the dome. If moisture/dust is seen, check the appropriate box in the site log and proceed with inspecting and cleaning the camera assembly:
    a. Look for evidence of damage to the enclosure seal or any other possible entry point for water/dust, noting this in the site log.
    b. Unseal the enclosure. Remove the camera, resting it in a relatively clean spot (such as inside the battery enclosure) to prevent damage or dirtying, and clean the inside of the enclosure.
    c. Clean the camera assembly by dusting with compressed gas. Clean the camera lens with a lens cleaner. Inspect the assembly for damage (e.g. rusting) and then promptly return to enclosure and reseal, applying waterproof tape around the seam if necessary.
5. Unlock the battery enclosure and connect a field laptop to the PoE adapter. Check the camera clock and adjust if necessary, noting any changes in the Site Log.
6. Finish the field collection by recording the "End Time" on the electronic Site Check Form prior to leaving the sampling location.

3.2 Data Records and Management

Field personnel must maintain a thorough and complete set of site visit records. Every maintenance or data download visit must be recorded on the Site Check Form electronically in the most recent "Field_Site_Logger." This workbook can be found on the "Salton Sea Field Operations" Dropbox folder.

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4.0 REFERENCES

Campbell Scientific Inc. 2015. *Tripod Installation Manual Models CM110, CM115, CM120*. https://s.campbellsci.com/documents/us/manuals/cm110-cm115-cm120.pdf. Accessed October 6, 2015.

StarDot Technologies. 2010. NetCam SC H.264 Mexapixel Hybrid IP Camera User's Manual. 6820-H StarDot Technologies. Orangethorpe AveBuena Park, CA 90620 U.S.A.

Environmental Protection Agency. 2007. *Guidance for Preparing Standard Operating Procedures (SOPs)*. EPA/600/B-07/001. April 2007. http://www2.epa.gov/sites/production/files/2015-06/documents/g6-final.pdf. Accessed October 6, 2015.

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Appendix A: Site Check Form

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VIDEO MONITORING PROGRAM
SITE CHECK FORM

Date:	Start Time (PST):
Operator(s):	End Time (PST):
Site ID:	Battery Voltage:

Visual Inspection: ☐ Pass ☐ Fail Observations:

Computer Information

Serial #:	Type:

☐ Data Download Final Data Record Date/Time:

Maintenance and Operations

☐ Solar Panel Cleaned	☐ Camera Clock Check	Reset Clock? ☐ Yes ☐ No
☐ Camera Enclosure Window Cleaned	☐ Ground/Wiring Connection Check	Fittings Secure? ☐ Yes ☐ No

Comments:

Video Equipment Check

Camera Serial Number:

Ethernet Bridge Tested? ☐ Yes ☐ No	Ethernet Bridge Serial Number:
Evidence of water/dust intrusion into the dome? ☐ Yes ☐ No	Camera Response to Manual Test? ☐ Yes ☐ No
Evidence of camera malfunction? ☐ Yes ☐ No	Silica gel pack inside camera enclosure replaced? ☐ Yes ☐ No
Evidence of tampering/vandalism? ☐ Yes ☐ No	Solar power system status normal? ☐ Yes ☐ No

Comments:

Unusual Occurrences or Weather:

Signature: ______________________

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APPENDIX D.5.
STANDARD OPERATING PROCEDURES:
SOP 4, GROUNDWATER SAMPLING AND WATER LEVEL MEASUREMENTS

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FORMATION ENVIRONMENTAL

STANDARD OPERATING PROCEDURE No. 4

GROUNDWATER SAMPLING AND WATER LEVEL MEASUREMENTS

1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) describes the protocol to be followed during measurement of water levels and depths of monitoring wells and piezometers, and for water quality sampling from monitoring wells. The procedures presented herein are intended to be general in nature and are applicable when referenced by site-specific or project-specific planning documents. Appropriate modifications to the procedures may be made to accommodate project-specific protocols when approved in writing or via email by the Project Manager.

The objectives of the groundwater sampling procedures are to minimize changes in groundwater chemistry during sample collection and to maximize the probability of obtaining a representative, reproducible groundwater sample.

2.0 BASIS FOR METHODOLOGY

The methods and procedures described in this SOP were developed from these sources:

- USEPA Standard Operating Procedure for the Standard/Well-Volume Method for Collecting a Ground-Water Sample from Monitoring Wells for Site Characterization.

- USEPA Region 1 (2010) Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells. EQASOP-GW-001. Region 1 Low-Stress (Low-Flow) SOP, Revision Number 3, July 30, 1996, Revised January 19, 2010.

- USEPA (2002) Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers, Ground Water Forum Issue Paper. U.S Environmental Protection Agency, Technology Innovative Office, Office of Solid Waste and Emergency Response, Washington D.C., EPA 542-S-02-001.

- U.S. Geological Survey (USGS) (variously dated) National Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey

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Techniques of Water-Resources Investigations, Book 9, Handbooks for Water-Resources Investigations, Chapters A1-A9.

3.0 WATER LEVEL AND WELL DEPTH MEASURMENT PROCEDURES

Prior to performing water level and well depth measurements, the construction details and previous measurements for each well or piezometer shall be reviewed by the field geologist or other field personnel so any anomalous measurements may be identified. Well construction details and previous measurements shall be available in the field for review.

In general, water-level measurements shall be performed before groundwater is removed from the well by purging or sampling.

3.1 Equipment

Equipment that may be necessary to perform measurements (depending on measurements to be performed):

- Well/piezometer construction details;
- An electronic water-level meter with accuracy of 0.01 foot;
- Water Level Monitoring Record Sheet, Groundwater Sampling Record or field notebook; and
- Weighted surveyor's rope (measured to the nearest 0.1 foot).

3.2 Measuring Point

A measuring point (MP) shall be selected and marked for each monitoring well and piezometer in which water level measurements will be made. Generally, the MP will be on the north side of the top of the well casing. The MP will be permanently marked using an indelible marker or a notch cut into the PVC casing. When the top-of-casing elevation of a monitoring well or piezometer is surveyed, the licensed surveyor shall measure the MP elevation and reference this measurement to an appropriate datum (such as feet above mean sea level).

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3.3 Water Level Measurements

When water levels are measured to describe the groundwater potentiometric surface, the water level will be measured prior to purging. All wells to be gauged during a monitoring event and used to construct the potentiometric surface should have water levels measured within the same 24-hour period, as practical. All water level measurements will be recorded to the nearest 0.01 foot. Instruments used for each measurement will be noted on the Groundwater Sampling Record (attached form or similar). Water levels are measured using the electronic probe method, as discussed below.

An electronic probe consists of a contact electrode attached to the end of an insulated electrical cable, and a reel which houses an ammeter, a buzzer, or other closed circuit indicator. The indicator shows a closed circuit and flow of current when the electrode touches the water surface.

The procedure for measuring water levels with an electric probe is as follows:

1. Switch on and test that the battery is charged and set the sensitivity dial to the middle position.
2. Lower the probe into the well until the ammeter or buzzer indicates a closed circuit. Raise and lower the probe slightly until the shortest length of cable that gives the maximum response on the indicator is found.
3. With the cable in this fixed position, note the depth to water from the Measuring Point (MP).
4. Repeat as necessary until at least two identical duplicate measurements are obtained.

Calibration of the electronic probe will be checked at regular intervals as part of regular maintenance measuring the position of the electrode to check that the calibration marks on the electronic probe correspond to those on a weighted surveyor's rope or other suitable measuring device.

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3.4 Well Depth Measurements

The total depth of a well shall be measured by sounding with a weighted surveyor's rope or other suitable measuring device. For shallow wells, the electronic water-level probe may also be used as a measuring device. Procedures to be followed are specified below.

A. For calibration, measure the distance between the zero mark on the end of the measuring tape and the bottom of the weight to the nearest 0.1 foot at the beginning of each well depth measurement activity day, and whenever the apparatus is altered.

B. To measure well depth, lower a weighted tape into the well until the tape becomes slack or there is a noticeable decrease in weight, which indicates the bottom of the well. Care should be taken to lower the tape slowly to avoid damage to the bottom of the well by the weight. Raise the tape slowly until it just becomes taut, and with the tape in this fixed position, note the tape reading opposite the MP to the nearest 0.1 foot. Add the values from the distance from the end of the tape to the end of the weight together, round this number to nearest 0.1 foot, and record the resulting value as "Total Depth (feet [ft], below measuring point [BMP])" on the Groundwater Sampling Record or field notebook.

3.5 Documentation and Records Management

Water levels observed in wells selected for the groundwater level monitoring program will be tabulated on the Groundwater Sampling Record form during each monitoring period (in print or electronic format – see attached form) or in the field notebook. The date and time of each measurement will also be recorded in the field. All water level measurements shall be recorded to the nearest 0.01 foot, and all depth measurements shall be noted to the nearest 0.1 foot.

Water level data will be recorded as feet BMP so that water level elevations may be calculated from the depth-to-water measurement (from the MP) and the surveyed elevation of the MP at each well or piezometer. The MP will also be described and documented in the Groundwater Sampling Record and/or field notebook (i.e., top of PVC casing, top of protective casing, or below ground surface).

Well depth measurements may also be recorded on the Groundwater Sampling Record.

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4.0 GROUNDWATER SAMPLE COLLECTION PROCEDURES

4.1 Low Flow Sample Collection

For wells that are sampled for regulatory compliance, a low flow sample collection technique shall be employed whenever possible to ensure that representative groundwater samples are collected from each well. Additionally, low flow sampling is to be the preferred method for groundwater sampling unless site specific conditions warrant a volume-based approach or a non-purge approach such as a HydraSleeve™ (as discussed in Sections 4.2 and 4.3, respectively).

A. Measure the depth to water (water level must be measured to nearest 0.01 feet) relative to a reference MP on the well casing with an electronic water level indicator or steel tape and recorded.

B. For wells with non-dedicated equipment (i.e., no dedicated tubing, pump, or docking station), place the pump at the wellhead and slowly lower the pump and tubing down into the well until the location of the pump intake is set to the midpoint of the screened interval, unless otherwise specified in the monitoring plan. Care should be taken to minimize disturbance to the water column during insertion of the pump. A variable rate submersible centrifugal or positive displacement type pump (i.e., bladder or piston pump) will be used for purging and sampling; however, if the water table is less than 20 ft below ground surface (bgs) a peristaltic pump may be employed as long as the constituents measured are not influenced by negative pressures. The pump and associated tubing used shall be constructed of inert materials and compatible with the parameter(s) to be collected. The placement of the pump intake should be positioned with a calibrated sampling pump hose, sounded with a weighted-tape or using a pre-measured hose. Refer to the available well information to determine the depth and length of the screened interval. The pump should be adequately supported once it has been lowered to ensure that it will not shift during purging. Record the depth of the pump intake after lowering the pump into location. For wells with dedicated pumping equipment, pump depth should be confirmed and equipment condition recorded.

C. Measure the water level (nearest 0.01 feet) and record the information on the Groundwater Sampling Record and/or in the field notebook. The water level indicator should remain in the well to allow for periodic measurement of the water level during purging.

D. Connect the discharge line from the pump to a flow-through cell to measure field water quality parameters. If turbidity measurements are to be collected using a separate instrument from that employed to monitor water quality in the flow through cell, a "T" connection is needed prior to the flow-through cell to allow for the collection of water for turbidity measurements. The discharge line from the flow-through cell must be directed to a container to hold the

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purge water during the purging and sampling of the well.

E. Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Adjust pump speed until little or no drawdown is evident (less than 0.33 ft). If the minimal drawdown that can be achieved exceeds 0.33 feet but remains stable, continue purging until field parameters stabilize. Typically flow rates should be within 0.1 L/min to 0.5 L/min; however highly productive aquifers may allow for higher flow rates to be used. Adjustments to the flow rate to achieve stabilization should be made as quickly as possible to minimize agitation of the water column. It should be noted that this goal may be difficult to achieve under some circumstances due to geologic heterogeneities within the screened interval, and may require adjustment based on well-specific conditions and site experience.

F. Measure the discharge rate of the pump using a calibrated discharge volume measurement and stopwatch. Also, measure the water level and record both flow rate and water level on the Groundwater Sampling Record and/or in the field notebook. Continue purging, monitor and record water level and pump rate every three to five minutes during purging.

G. During purging, a minimum of one tubing volume (including the volume of water in the pump and flow-cell) must be purged prior to recording the water-quality indicator parameters. Then monitor and record the water-quality indicator parameters every three to five minutes. The water-quality indicator field parameters are turbidity, dissolved oxygen, specific conductance, pH, ORP, and temperature. The parameters are considered to have stabilized if on three successive readings of the water quality field parameters meet the following criteria:

- pH +/- 0.1 S.U.
- Specific Conductance 3% difference
- Temperature +/- 1ºC
- ORP +/- 10 mV
- Turbidity 10% difference for values greater than 10 NTU
- Dissolved Oxygen 10% difference

H. If a stabilized drawdown in the well can’t be maintained at 0.33 feet and the water level is approaching the top of the screened interval, reduce the flow rate or turn the pump off (for 15 minutes) and allow for recovery. It should be noted whether or not the pump has a check valve. A check valve is required if the pump is shut off. Begin pumping at a lower flow rate, if the water draws down to the top of the screened interval again, turn pump off and allow for recovery. If two tubing volumes (including the volumes of water in the field pump and flow-cell) have been removed during purging, then sampling can proceed next time the pump is turned on. This information should be noted in the field notebook or Groundwater Sampling Record.

I. If specified in the monitoring plan, a clean plastic disposable apron may be placed adjacent to or around the well to prevent equipment and sample containers from coming into contact with surface materials, prior to collecting samples from a well. Alternatively, a clean field table may be set up near the

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well. If used, the table will be cleaned (Section 5.1) before and after use at each well.

J. During sampling, maintain the same pumping rate or reduce slightly for sampling in order to minimize any additional disturbance of the water column. Samples should be collected directly from the discharge port of the pump tubing prior to passing through the flow-cell. The sequence of the sampling is immaterial unless filtered (dissolved) samples are collected which must be done last. All sample containers should be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container. In the event that the groundwater is turbid (greater than 10 NTUs) a filtered metals sample may be collected. If a filtered metals sample is to be collected, then an in-line filter is fitted at the end of the discharge tubing and the sample is collected after the filter.

   Sample bottles that do not contain preservative should be rinsed with the sample water prior to filling.

K. Remove the pump from the well. Decontaminate the pump and tubing if non-dedicated equipment is used.

L. Where more than one well within a specific field or site is to be sampled, the sampling sequence should begin with the well having the lowest suspected level of contamination, if known. Successive samples should be obtained from wells with increasing suspected contamination. If the relative degree of suspected contamination at each well cannot be reasonably assumed, sampling should proceed from the perimeter of the site towards the center of the site. The sampling sequence should be arranged such that wells are sampled in order of increasing proximity to the suspected source of contamination, starting from the wells upgradient of the suspected source.

M. Sampling activity for each monitoring well will be recorded on a Groundwater Sampling Record and the stabilized field parameters may also be recorded in the field notebook.

4.2 Volume-Based Sample Collection

In instances where low-flow sampling is not possible based on site-specific conditions (a minimum and stable drawdown cannot be maintained) samples from wells will be collected using a volume-based approach, if the yield of the well is sufficient, as follows:

A. The depth to water in a well and the total depth will be measured using the procedures discussed in Section 3, above.

B. A positive displacement pump, submersible pump, and/or bailer will be used for removing the groundwater from the monitoring wells (purging). Equipment used for purging and sampling may be permanently installed (dedicated) in

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the monitoring wells. Care must be taken that bailers and/or tubing are constructed from materials that will not affect the sample analyses. The well pump intake is to be set at the midpoint of the screened interval, unless otherwise specified in the monitoring plan in a manner consistent with that specified for the low-flow sampling above. Pumping is to be performed in such manner as to remove stagnant water while trying to minimize exposing the screened interval to atmospheric conditions and obtain the most representative sample.

C. Wells will be pumped or bailed until at least the volume of water removed is equal to three well casing volumes (volume of standing water in the well based upon total depth of well, the depth to water, and the well casing diameter). The purge rate must not reach a point where the recharge water is entering the well in an agitated manner (cascading water over the screen interval) and the water level in the well during purging should not be allowed to drop below the pump intake. During pumping, water level measurements will be collected (as described for low-flow sampling) and the purging rate adjusted to ensure that these conditions do not occur.

D. To ensure that the water samples are representative of the water-yielding zone, periodic measurements of the temperature, pH, dissolved oxygen, ORP, specific conductance and turbidity will be made. A flow-through cell may be used if purging with a pump. Measurements will be recorded for the initial water removed at a minimum following each well volume purged. Note that indicator parameters dissolved oxygen and ORP cannot be accurately measured using discrete samples obtained during bailing (due to exposure to the atmosphere and entrained air becoming trapped in the sampling probe). These parameters will only be collected using a flow-through cell. The sample will be collected only when the indicator parameters have stabilized (as discussed above in Section 4.1). No more than six well volumes should be removed to prevent the effects of over pumping. If the indicator parameters have not stabilized following six well volumes the field instruments will be recalibrated and checked for possible malfunction. If no problems are found, sampling can be conducted; however, the Project Manager will be notified and all information will be recorded in the field notebook and/or Groundwater Sampling Record. If the yield of the well is low such that it can be bailed or pumped dry, then the recharged groundwater in the well will be considered representative regardless of the number of casing volumes of groundwater removed, since all standing water in the well has been replaced by recharge from the water-yielding zone. If a well is purged dry, the well can be sampled upon 90% recovery or after two hours, whichever occurs first.

E. If specified in the monitoring plan, a clean plastic disposable apron may be placed adjacent to or around the well to prevent equipment and sample containers from coming into contact with surface materials, prior to collecting samples from a well. Alternatively, a clean field table may be set up near the well. If used, the table will be cleaned (Section 5.1) before and after use at each well.

F. Sample containers prepared specifically for the required analyses by the analytical laboratory or their supplier will be used for sample collection. Glass

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sample bottles should be filled to near the top. To account for slight expansion due to temperature changes, leave headspace approximately equivalent to the volume of liquid which would fill the bottle's cap. Plastic sample bottles should be filled completely. Splashing of the water in the sample container and exposure to the atmosphere shall be minimized during sampling. The container cap will be screwed on tightly immediately after filling the sample container. Under this protocol, samples should be collected in order of decreasing volatility (i.e., most volatile samples will be collected first). Sample filtration, if necessary, is discussed in Section 4.5 of this SOP.

Sample bottles that do not contain preservative should be rinsed with the sample water prior to filling.

G. Where more than one well within a specific field or site is to be sampled, the sampling sequence should begin with the well having the lowest suspected level of contamination, if known. Successive samples should be obtained from wells with increasing suspected contamination. If the relative degree of suspected contamination at each well cannot be reasonably assumed, sampling should proceed from the perimeter of the site towards the center of the site. The sampling sequence should be arranged such that wells are sampled in order of increasing proximity to the suspected source of contamination, starting from the wells upgradient of the suspected source.

H. Sampling activity for each monitoring well will be recorded on a Groundwater Sampling Record and the stabilized field parameters may also be recorded in the field notebook.

4.3 Non-Purge Sample Collection Using a HydraSleeve™

In monitoring wells with very low yield and/or where low-flow sampling or volume-based purging is not practical, a non-purge method, sampling using a HydraSleeve™, may be used to collect groundwater samples by the following procedure:

A. The depth to water in a well and the total well depth will be measured using the procedures discussed in Section 3, above. This measurement can be used to determine the preferred position of the HydraSleeve within the well screen.

B. Determine the necessary length of HydraSleeves needed for the specific well screen length and/or water column height to recover the necessary sample volume. HydraSleeves are manufactured in standard lengths of 30, 36, and 60 inches. However, up to three 30-inch HydraSleeves may be installed in series on a single tether (using plastic cable ties) to achieve more volume. Alternatively, a TurboSleeve may be used, which is a larger HydraSleeve that allows recovery of more sample volume. Per manufacturer's recommendations, the TurboSleeve should be allowed to equilibrate in the

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well for 24 hours before retrieval to allow for full compression of the sleeve for full sample recovery (see step G below).

C. Measure the correct amount of tether cord needed to suspend the HydraSleeve in the well so the weight will not rest on the bottom of the well and the desired depth is achieved.

D. Remove the HydraSleeve from its packaging, unfold and hold it by its top. Crimp the top of the HydraSleeve by folding the hard polyethylene reinforcing strips at the holes.

E. Attach the spring clip to the holes to ensure the top of the HydraSleeve will remain open until the sampler is retrieved. Attach the tether to the spring clip with a strong knot (or tether can be attached to one of the holes at the top of the HydraSleeve).

F. Fold the flaps with the two holes at the bottom of the HydraSleeve together and slide the weight clip through the holes. Attach the weight to the bottom of the weight clip to ensure the HydraSleeve will descend to the desired depth.

G. To deploy the HydraSleeve, carefully lower the HydraSleeve on its tether to the desired depth in the water column. Hydrostatic pressure will keep the self-sealing check valve at the top of the HydraSleeve closed and ensure that it remains flat and empty and will only fill with groundwater from the desired interval when it is retrieved.

H. To retrieve the HydraSleeve to collect groundwater samples, pull up the tether 30 to 45 inches (36 to 54 inches for longer HydraSleeves) in one smooth motion at a rate of about one inch per second or faster. This motion will open the top check valve and allow the HydraSleeve to fill. When the HydraSleeve is full, the top check valve will close and the full weight of the HydraSleeve can be felt by the sampler. Continue to pull the HydraSleeve upward to the top of the well to retrieve. Two persons are needed to retrieve a TurboSleeve, if used, due to its length and flexibility.

I. Once recovered, decant and discard the small volume of water trapped in the HydraSleeve above the top check valve.

J. To fill sample bottles, remove the discharge tube from its sleeve. While holding the HydraSleeve at the check valve, puncture the HydraSleeve just below the check valve with the pointed end of the discharge tube. Discharge the water into the sample bottles as needed.

K. Any leftover water from the HydraSleeve can be poured into a separate vessel for the measurement of groundwater field parameters as needed.

L. Dispose each used HydraSleeve after use at an individual well.

4.4 Non-Purge Sample Collection by Bailer

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In monitoring wells with very low yield where low-flow sampling or volume-based purging is not practical and sampling with HydraSleeves^{TM} is not feasible, sampling by bailer without purging the well may be used to collect groundwater samples.

Sampling by bailer may be used by the following procedure:

A. The depth to water in a well and the total depth will be measured using the procedures discussed in Section 3, above. This measurement can be used to determine the height of water and the volume of groundwater within the well screen.

B. A clean, sufficiently weighted PVC or polyethylene bailer will be used attached to a pre-measured length of either coated stainless steel cable or nylon rope tether for each well to be sampled by bailing.

C. The bailer will be slowly lowered through the water column to the well screen interval on the pre-measured tether. Slow and consistent movement of the bailer downward through the well allows the water within the well to pass through the bailer.

D. When the desired depth within the well screen interval is reached, the downward movement of the bailer will immediately be reversed and the bailer slowly retrieved to the surface. This action allows the bailer to collect water representative of conditions within the well screen interval while minimizing generation of turbid conditions within the well.

E. Steel cable or rope will not be allowed to touch the ground surface during retrieval. A reel, tub, tarp, or plastic sheeting can be used to prevent contact with the ground.

F. Upon retrieval of the bailer, sample bottles for total and dissolved metals analysis will be filled first, followed by the remaining sample bottles for other parameters. If more sample volume is needed, the bailer will again be slowly lowered to the screen interval and retrieved as necessary until required sample bottles have been filled.

G. If a filtered metals sample is to be collected, the necessary volume can be filtered from one clean, non-preserved sample bottle as needed.

H. Field parameters will be measured in the instrument cup or other rinsed container following collection of sample bottles. A small aliquot of sample volume will be poured from the bailer for the collection of field parameters.

I. If the well bails dry but additional sample volume is required, the volume will be removed from the well via bailer if such recharge occurs in the well within 24 hours.

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4.5 Sample Filtration

When required, a field-filtered water sample will be collected using a disposable, in-line 0.45 micron (μm) filter. The water sample will be pumped through the filter attached directly to the discharge tubing. A peristaltic pump and a clean section of Tygon (polyvinylchloride) tubing, silicone tubing, or other appropriate method may be used if the sample is collected via bailer. The filter cartridge will be rinsed according to the manufacturer's recommendations. If there are no recommendations available, for rinsing pass through a minimum aliquot of 100 ml of sample water prior to collection of sample in to the containers. Both the filter and tubing will be disposed between samples.

4.6 Sample Containers and Volumes

The sample containers will be appropriate to the analytical method and will be obtained from the water analysis laboratory or other approved source. Different containers will be required for specific groups of analytes in accordance with USEPA Methods, project-specific requirements, and/or other local jurisdictional guidance. The sampler will confirm with the laboratory performing the analyses that appropriate bottleware and preservatives are used and ensure that a sufficient volume of sample is collected.

4.7 Sample Labeling

Sample containers will be labeled with self-adhesive tags. Each sample will be labeled with the following information using waterproof ink:

- Project identification;
- Lab Name;
- Sample identification;
- Date and time samples were obtained;
- Matrix;
- Requested analyses and method;
- Bottle type;
- Treatment (preservative added, filtered, etc.);
- Lab QC (if applicable); and
- Initials of sample collector(s).

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4.8 Sample Preservation and Storage

If required by the project or analytical method, water samples submitted for chemical analysis will be stored at 4 ºC in ice-cooled, insulated containers immediately after collection. Preservation and storage methods depend on the chemical constituents to be analyzed and should be discussed with the laboratory prior to sample collection. USEPA and/or other local jurisdictional requirements and/or the requirements of a project-specific plan (e.g., sampling and analysis plan, work plan, quality assurance project plan, etc.) shall be adhered to in preservation and storage of water samples.

4.9 Sample Custody

Samples shall be handled and transported according to the sample custody procedures discussed in JRS SOP No. 2 (SAMPLE CUSTODY, PACKAGING, AND SHIPMENT). Sampling personnel shall document each sample on the Chain-of-Custody Record

4.10 Field Measurements

Specific conductance, pH, dissolved oxygen, ORP, temperature, and turbidity measurements will be performed on water samples at the time of sample collection. The only exceptions will be for DO and ORP when the samples are collected via bailer or in those instances where a flow-through cell cannot be used. Data obtained from these (or other) field water quality measurements will be recorded on the appropriate sampling records or in the field notebook. Separate aliquots of water shall be used to make field measurements (i.e., sample containers for laboratory analysis shall not be reopened).

For groundwater samples, field measurement intervals will be as presented above. If the parameters have not stabilized, check to insure that the field instruments are operating correctly and remain calibrated. Recalibrate the instruments if needed, if an instrument cannot be calibrated it will be labeled needing repair and removed from service. Field measurements and purging will continue until three consecutive readings have stabilized to within the following limits or until a maximum of six casing volumes have been removed:

- pH +/- 0.1 S.U.;

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- Specific Conductance 3% difference;
- Temperature +/- 1ºC;
- ORP +/- 10 mV;
- Turbidity 10% difference for values greater than 10 NTU; and
- Dissolved Oxygen 10% difference.

4.10.1 Temperature Measurement

Temperature will be measured directly from the water source or from a separate sample aliquot. Temperature measurements will be made with a mercury-filled thermometer, bimetallic-element thermometer, or electronic thermistor. All measurements will be recorded in degrees Celsius (°C). When a flow-through cell is used the temperature can be measured directly via a multi-parameter instrument as per the manufacturer's instructions.

4.10.2 pH Measurement

A pH measurement will be made by dipping the probe directly into the water source or into a separate sample aliquot. Prior to measurement, the container in which the field parameter sample will be collected will be acclimated to the approximate temperature of the sample. This can be accomplished by immersing the container in water removed from a well during the purging process. The pH measurement will be made as soon as possible after collection of the field parameter sample, preferably within a few minutes, using a pH electrode. The value displayed on the calibrated instrument will be recorded after the reading has stabilized. If the value falls outside of the calibrated range, then the pH meter will be recalibrated using the appropriate buffer solutions. When a flow-through cell is used, the pH can be measured directly via a multi-parameter instrument as per the manufacturer's instructions.

4.10.3 Dissolved Oxygen

Dissolved oxygen (DO) will be measured by using a suitable multi-parameter meter that can be placed into a flow-through cell and sealed such that exposure to the atmosphere is prevented. DO measurements will be reported in milligrams per liter (mg/L). The instrument will be calibrated in accordance with JRS SOP No. 31 (WATER QUALITY METER CALIBRATION).

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4.10.4 Oxidation Reduction Potential

Oxidation Reduction Potential (ORP) will be measured by using a suitable multi-parameter meter that can be placed into a flow-through cell and sealed such that exposure to the atmosphere is prevented. ORP measurements will be reported in mV. The instrument will be calibrated in accordance with JRS SOP No. 31 (WATER QUALITY METER CALIBRATION).

4.10.5 Specific Conductance Measurement

Specific conductance will be measured by dipping the probe directly into the water source or into a separate sample aliquot. The probe must be immersed to the manufacturer's recommended depth. Specific conductance will be reported in micromhos/cm or microsiemens/cm at 25 ºC. If the meter is not equipped with an automatic temperature compensation function, then the field value will be adjusted at a later time using the temperature data and the following formula:

$$SC_{25} = SC_T / [1 + \{(T - 25) \times 0.025\}]$$

where: SC_{25} = specific conductance at 25 ºC
SC_T = specific conductance measured at temperature T (ºC)
T = sample temperature (ºC)

The value displayed on the calibrated instrument will be recorded after the reading has stabilized. If the value falls outside of the calibrated "range" set by the range dial on the instrument, then the range setting will be changed to a position that gives maximum definition. If the specific conductance value falls outside of the calibrated range of the conductivity standard solution, then the instrument will be recalibrated using the appropriate standard prior to measurement. When a flow-through cell is used the specific conductance can be measured directly via a multi-parameter instrument as per the manufacturer's instructions.

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4.10.6 Turbidity

Turbidity will be measured by using a field portable nephlometer separate from the multi-parameter meter used for DO and ORP and capable of reading down to 0.1 NTU. Turbidity will be measured directly from the water source or from a separate sample aliquot. The instrument will be calibrated at least daily prior to initiating field activities and periodically throughout the day or as recommended by the instrument manufacturer. Turbidity measurements will be reported in nephlometric turbidity units (NTU). When a flow-through cell is used, the turbidity can be measured directly via a multi-parameter (e.g., YSI Sonde 6920) instrument, if so equipped, as per the manufacturer's instructions.

4.10.7 Equipment Calibration

Equipment used to measure field parameters will be calibrated daily in the field in accordance with JRS SOP No. 31 (WATER QUALITY METER CALIBRATION) prior to any measurements being taken.

5.0 DOCUMENTATION

5.1 Groundwater Sampling Record

Each sampling event for each monitoring well will be recorded on a Groundwater Sampling Record form (which may be in paper or electronic format) or in the field notebook.

The documentation should include the following:

- Project identification;
- Location identification;
- Sample identification(s) (including quality control samples);
- Date and time of sampling;
- Purging and sampling methods;
- Sampling depth;
- Name(s) of sample collector(s);
- Inventory of sample bottles collected including sample preservation (if any), number, and types of sample bottles;
- Total volume of water purged;

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- Results of field measurements and observations (time, cumulative purge volume, temperature, pH, specific conductance, turbidity, sediment, color, purge rate);
- Equipment cleaning record;
- Description and identification of field instruments and equipment; and
- Equipment calibration record; and
- Number of photos (if any were taken).

When the sampling activity is completed, the Groundwater Sampling Record (whether in print or electronic format) will be checked by the Project Manager or his/her designee, and the original record will be placed in the project file.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

6.1 Equipment Decontamination/Cleaning

Steel surveyor's tapes, electric well probes, and other measuring tapes shall be cleaned prior to use and after measurements in each well are completed. Cleaning shall be accomplished by either: (1) washing with a laboratory-grade detergent/water solution, rinsing with clean, potable, municipal water, final rinsing with distilled or deionized water, or (2) steam cleaning followed by rinsing with distilled or deionized water.

Sample bottles and bottle caps will be pre-cleaned and prepared by the analytical laboratory or their supplier using standard USEPA-approved protocols. Sample bottles and bottle caps will be protected from dust or other contamination between time of receipt by the sampler(s) and time of actual usage at the sampling site.

Groundwater sampling equipment may be dedicated to a particular well at a project site. Prior to installation of this equipment, all equipment surfaces that will be placed in the well or may come in contact with groundwater will be cleaned to prevent the introduction of contaminants.

Sampling equipment that will be used at multiple wells or sampling locations will be cleaned after sampling at each location is completed in accordance with the SOP entitled EQUIPMENT DECONTAMINATION (JRS SOP No. 7).

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Equipment such as submersible electric pumps, which cannot be disassembled for cleaning, will be cleaned by circulating a laboratory-grade detergent (e.g., Alconox) and potable water solution through the assembly, followed by clean potable water from a municipal supply, and then by distilled or deionized water. Equipment cleaning methods will be recorded on the Groundwater Sampling Record.

6.2 Technical and Records Reviews

The Project Manager or designated reviewer will check and verify that documentation has been completed and filed per this procedure.

In addition, all calculations of water-level elevations must be reviewed before they are submitted to the project file and used to describe site conditions. The calculation review should be performed by technical personnel familiar with this procedure. Evidence of the completed review and any necessary corrections to calculations should also be submitted to the project file.

7.0 REFERENCES

U.S. Environmental Protection Agency (USEPA), Region 9. Standard Operating Procedure for the Standard/Well-Volume Method for Collecting a Ground-Water Sample from Monitoring Wells for Site Characterization. Available online at: www.epa.gov/region9/qa/pdfs/finalgwsamp_sop.pdf.

USEPA, 2010. Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells._EQASOP-GW-001 Region 1 Low-Stress (Low-Flow) SOP, Revision Number 3, July 30, 1996, Revised January 19, 2010. http://www.epa.gov/region1/lab/qa/pdfs/EQASOP-GW001.pdf

USEPA, 2002, Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers, Ground Water Forum Issue Paper. U.S Environmental Protection Agency, Technology Innovative Office, Office of Solid Waste and Emergency Response, Washington D.C., Douglas Yeskis, EPA Region 5, Chicago IL, and Bernard Zavala, EPA Region 10, Seattle, WA, EPA 542-S-02-001. May 2002. http://www.epa.gov/superfund/remedytech/tsp/download/gw_sampling_guide.pdf

U.S. Geological Survey (USGS), variously dated. National Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, Chapters A1-A9. Available online at http://pubs.water.usgs.gov/twri9A.

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APPENDIX D.6.
STANDARD OPERATING PROCEDURES:
SOP 7, EQUIPMENT DECONTAMINATION

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STANDARD OPERATING PROCEDURE No. 7

EQUIPMENT DECONTAMINATION

1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) describes the methods to be used for decontamination of all reusable field equipment that could become contaminated during use and/or sampling. Field equipment may include split spoons, reusable bailers, trowels, scissors, shovels, hand augers, or any other type of equipment used during field activities. Decontamination is performed as a quality assurance measure and a safety precaution; it prevents cross contamination between samples and also helps to maintain a clean working environment. The procedures presented herein are intended to be general in nature and are applicable when referenced by site-specific or project-specific planning documents. Appropriate revisions may be made to accommodate site-specific conditions or project-specific protocols when approved in writing or via email by the Project Manager.

Decontamination is achieved primarily by rinsing with liquids which may include: steam, soap and/or detergent solutions, potable water, distilled weak acid solution, and/or methanol or other solvent. Equipment may be allowed to air dry after being cleaned or may be wiped dry with chemical-free towels or paper towels if immediate re-use is necessary.

At most project sites, decontamination of equipment that is re-used between sampling locations will be accomplished between each sample collection point. Waste produced by decontamination procedures, including waste liquids, solids, etc., will be discharged to the land surface and will not be allowed to runoff into any water body.

2.0 BASIS FOR METHODOLOGY

The methods and procedures described in this SOP were developed from these sources:

- ASTM D5088. Standard Practice for Decontamination of Field Equipment

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Used at Waste Sites. American Society for Testing and Materials (ASTM) International, West Conshohocken, PA, 2008.

- Parker and Ranney, 1997a. Decontaminating Ground Water Sampling Devices, CRREL Special Report 97-25, U.S. Army Engineer Cold Regions Research and Engineering Laboratory, Hanover, NH.
- Parker and Ranney, 1997b. Decontaminating Materials Used in Ground Water Sampling Devices, CRREL Special Report 97-24, U.S. Army Engineer Cold Regions Research and Engineering Laboratory, Hanover, NH.

3.0 PROCEDURES

3.1 Responsibilities

It is the responsibility of the field sampling supervisor to ensure that proper decontamination procedures are followed and that all waste materials produced by decontamination are properly managed. It is the responsibility of the project safety officer to draft and enforce safety measures that provide the best protection for all persons involved directly with sampling and/or decontamination.

It is the responsibility of any subcontractors (e.g., drilling contractors) to follow the proper, designated decontamination procedures that are stated in their contracts and outlined in the Site-Specific Health and Safety Plan. It is the responsibility of all personnel involved with sample collection or decontamination to maintain a clean working environment and ensure that any contaminants are not negligently introduced to the environment.

3.2 Supporting Materials

Materials needed for equipment decontamination include:

- Cleaning liquids: laboratory grade soap and/or detergent solutions (Alconox, etc.), potable water, distilled water, methanol, weak nitric acid solution, etc.
- Personal protective safety gear as defined in the Site-Specific Health and Safety Plan
- Chemical-free towels or paper towels

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- Disposable nitrile gloves
- Cleaning containers: plastic and/or stainless steel pans and buckets
- Cleaning brushes
- Steam cleaner

3.3 Methods

The extent of known contamination will determine the degree of decontamination required. If the extent of contamination cannot be readily determined, cleaning should be done according to the assumption that the equipment is highly contaminated. Decontamination procedures should account for the types of contaminants known or suspected to be present. In general, high levels of organic contaminants should include an organic solvent wash step, and high levels of metals contamination should include a weak acid rinse step.

The procedures listed below constitute the full field decontamination procedure. If different or more elaborate procedures are required for a specific project, they may be specified in the project planning documents. Such variations in decontamination protocols may include all, part, or an expanded scope of the decontamination procedure stated herein.

1. Remove gross contamination from the equipment by dry brushing, and rinse with potable water.
2. Wash with laboratory-grade detergent solution or steam cleaner.
3. Rinse with potable water or steam cleaner.
4. Rinse with methanol (optional, for equipment potentially contaminated by organic compounds).
5. Rinse with acid solution (optional, for equipment potentially contaminated by metals).
6. Rinse with distilled or deionized water or steam cleaner.
7. Repeat entire procedure or any parts of the procedure as necessary.
8. Air dry.

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4.0 DOCUMENTATION

Field notes will be kept describing the decontamination procedures followed. The field notes will be recorded according to procedures described in SOP No. 1 (FIELD DOCUMENTATION).

5.0 QUALITY CONTROL

To assess the adequacy of decontamination procedures, field rinsate blanks may be required. The specific number of field rinsate blanks will be defined in the project-specific Sampling and Analysis Plan (SAP) or Quality Assurance Project Plan (QAPP).

Rinsate blanks with elevated or detected contaminants will be evaluated by the Project Manager, who will relay the results to the field personnel. Such results may be indicative of inadequate decontamination procedures that require corrective actions (e.g., retraining).

6.0 REFERENCES

ASTM D5088-02 (2008). Standard Practice for Decontamination of Field Equipment Used at Waste Sites. American Society for Testing and Materials (ASTM) International, West Conshohocken, PA, 2008. Available online at http://www.astm.org/

Parker and Ranney, 1997a. Decontaminating Ground Water Sampling Devices, CRREL Special Report 97-25, U.S. Army Engineer Cold Regions Research and Engineering Laboratory, Hanover, NH.

Parker and Ranney, 1997b. Decontaminating Materials Used in Ground Water Sampling Devices, CRREL Special Report 97-24, U.S. Army Engineer Cold Regions Research and Engineering Laboratory, Hanover, NH.

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APPENDIX D.7.
STANDARD OPERATING PROCEDURES:
SOP 2, SAMPLE CUSTODY, PACKAGING, AND SHIPMENT

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STANDARD OPERATING PROCEDURE No. 2

SAMPLE CUSTODY, PACKAGING, AND SHIPMENT

1.0 SCOPE AND APPLICABILITY

The following Standard Operating Procedure (SOP) describes the protocol for sample custody and packaging and shipment of samples. The procedures presented herein are intended to be general in nature and are applicable when referenced by site-specific or project-specific planning documents. Appropriate modifications to the procedures may be made when approved in writing or via email by the Project Manager.

This SOP applies to any liquid or solid sample that is being transported by the sampler, a courier, or an overnight delivery service.

2.0 BASIS FOR METHODOLOGY

The methods and procedures described in this SOP were developed from these sources:

- 49 CFR 173. Shippers – Shippers – General Requirements for Shipping. United States Code of Federal Regulations available online at http://www.gpoaccess.gov/cfr/index.html
- 49 CFR 178. Specifications for Packaging. United States Code of Federal Regulations available online at http://www.gpoaccess.gov/cfr/index.html
- ASTM D 4220-95 (2000). Standard Practices for Preserving and Transporting Soil Samples, American Society for Testing and Materials available online at http://www.astm.org/
- ASTM D 4840-99 (2010). Standard Guide for Sampling Chain-of-Custody Procedures. American Society for Testing and Materials available online at http://www.astm.org/

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3.0 PROCEDURES

The objectives of this packaging and shipping SOP are to minimize the potential for sample breakage, leakage, or cross contamination; to provide for preservation at the proper temperature; and to provide a clear record of sample custody from collection to analysis.

3.1 Packaging Materials

The following is a list of materials that will be needed to facilitate proper sample packaging:

- Chain-of-Custody (COC)/Request for Analysis (RA) forms;
- Analyte List;
- Coolers (insulated ice chests) or other shipping containers as appropriate to sample type;
- Transparent packaging tape;
- Duct tape or similar (for sealing cooler drain);
- Zip-lock type bags (note: this is used as a generic bag type, not a specific brand name);
- Large garbage bags;
- Protective wrapping and packaging material;
- Contained ice (packaged and sealed to prevent leakage when melted) or "Blue Ice"; and
- Chain-of-Custody seals.

3.2 Sample Custody from Field Collection to Laboratory

After samples have been collected, they will be maintained under chain-of-custody procedures. These procedures are used to document the transfer of custody of the samples from the field to the designated analytical laboratory. The same chain-of-custody procedures will be used for the transfer of samples from one laboratory to another, if required.

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The field sampling personnel will complete a COC/RA form and provide an Analyte List for each separate container of samples to be shipped or delivered to the laboratory for chemical or physical (geotechnical) analysis. Information contained on the form will include:

1. Project identification;
2. Date and time of sampling;
3. Sample identification;
4. Sample matrix type;
5. Sample preservation method(s);
6. Number and types of sample containers;
7. Sample hazards (if any);
8. Requested analysis(es);
9. Method of shipment;
10. Carrier/waybill number (if any);
11. Signature of sampling personnel;
12. Name of Project Manager;
13. Signature, name and company of the person relinquishing and the person receiving the samples when custody is being transferred;
14. Date and time of sample custody transfer;
15. Condition of samples upon receipt by laboratory; and
16. Chain of Custody identification number.

The samples will be carefully packaged into shipping containers/ice chests.

The sampling personnel whose signature appears on the COC/RA form is responsible for the custody of a sample from the time of sample collection until the custody of the sample is transferred to a designated laboratory, a courier, or to another employee for the purpose of transporting a sample to the designated laboratory. A sample is

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considered to be in their custody when the custodian: (1) has direct possession of it; (2) has plain view of it; or (3) has securely locked it in a restricted access area.

Custody is transferred when both parties to the transfer complete the portion of the COC/RA form under "Relinquished by" and "Received by." Signatures, printed names, company or organization names, and date and time of custody transfer are required. Upon transfer of custody, the sampling personnel who relinquished the samples will retain a copy of the COC/RA form.

3.3 Sample Custody within Laboratory

The designated laboratory will assume sample custody upon receipt of the samples and COC/RA form. Sample custody within the analytical laboratory will be the responsibility of designated laboratory personnel. The laboratory will document the transfer of sample custody and receipt by the laboratory by signing the correct portion of the COC/RA form. Upon receipt, the laboratory sample custodian will note the condition of the samples, by checking the following items:

1. Agreement of the number, identification and description of samples received by comparison with the information on the COC/RA form; and
2. Condition of samples (any bottle breakage; leakage, cooler temperature, etc.).

If any problems are discovered, the laboratory sample custodian will note this information on the "Laboratory Comments/Condition of Samples" section of the COC/RA form, and will notify the sampling personnel or Project Manager immediately. The Project Manager will decide on the final disposition of the problem samples.

The laboratory will retain a copy of the COC/RA form and return an electronic copy to the originator with the final laboratory report of analytical results. The original of the COC/RA form will be retained as part of the permanent documentation in the project file. A record of the history of the sample within the laboratory containing sample status and storage location information will be maintained in a logbook, or a computer sample tracking system, at the laboratory. The following information will be recorded for every sample access event:

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1. Sample identification;
2. Place of storage;
3. Date(s) and time(s) of sample removal and return to storage;
4. Accessor's name and title;
5. Reason for access; and
6. Comments/observations (if any).

The laboratory will provide a copy of the logbook or computer file information pertaining to a sample upon request.

3.4 Sample Custody during Inter-Laboratory Transfer

If samples must be transferred from one laboratory to another, the same sample custody procedures described above will be followed. The designated laboratory person (sample custodian) will complete a COC/RA form and sign as the originator. The laboratory relinquishing the sample custody will retain a copy of the completed form. The laboratory receiving sample custody will sign the form, indicating transfer of custody, retain a copy, and return the original record to the originator with the final laboratory report of analytical results. The COC/RA form will be retained as part of the permanent documentation in the project file.

3.5 Packaging and Shipping Procedure

All sample containers will be properly labeled and all samples will be logged on the COC/RA form in accordance with the procedures explained.

All samples will be packed in the cooler so as to minimize the possibility of breakage, cross-contamination, and leakage. Before placing the sample containers into the cooler, all sample bottle caps will be checked and tightened if necessary. A large garbage bag will be placed as a liner inside the cooler and duct tape (or similar) will be used to seal off any drain openings on the inside and/or outside of the cooler. Bottles made of breakable material (e.g., glass) will also be wrapped in protective material (e.g., bubble wrap, plastic gridding, or foam) prior to placement in the cooler. Each sample set or soil

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tube liner (for a California, Shelby Tube or Split-spoon Sampler) will be placed into a zip-lock bag to protect from cross-contamination and to keep the sample labels dry. Sample containers will be placed upright in the cooler. Stacking glass sample bottles directly on top of each other will be avoided.

If required by the method, samples will be preserved to 4°C prior to the analysis. Water ice or "blue ice" will be used to keep the sample temperatures at 4°C. The ice will be placed in two zip-lock bags if the samples are to be transported by someone other than the sampler (e.g., a courier or overnight delivery service). The zip-lock bags of ice will be placed in between, on the bottom, and/or on top of the sample containers so as to maximize the contact between the containers and the bagged ice. If the sampler is transporting the samples to the laboratory shortly after sample collection, the water ice may be poured over and between the sample bottles in the cooler.

If there is any remaining space at the top of the cooler, packing material (e.g., Styrofoam pellets or bubble wrap) will be placed to fill the open space of the cooler. After filling the cooler, the garbage bag will be sealed, a copy of the COC/RA form and Analyte List will be placed in a zip-lock bag and taped to the inside of the cooler lid, the top of the cooler will be closed, and the cooler will be shaken to verify that the contents are secure. Additional packaging material will be added if necessary.

When transport to the laboratory by the sampler is not feasible, sample shipment will occur via courier or overnight express shipping service that guarantees shipment tracking and next morning delivery (e.g., Federal Express Priority Overnight or UPS Next Day Air). The same procedures will be followed to pack and fill the cooler and provide the COC/RA form and Analyte List, as if the sampler were transporting the samples to the laboratory. The cooler will be taped shut with packaging tape. Packaging tape will completely encircle the cooler, and chain-of-custody seals will be signed and placed across the front and side of the container opening.

Copies of all shipment records provided by the courier or overnight delivery service will be retained and maintained in the project file.

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4.0 DOCUMENTATION AND RECORDS MANAGEMENT

Daily Field Records or a field notebook with field notes will be kept describing the packaging procedures and the method of shipment. Copies of all shipping records and chain-of-custody records will be retained in the project file.

5.0 QUALITY ASSURANCE

The Project Manager or designated reviewer will check and verify that documentation has been completed and filed per this procedure.

6.0 REFERENCES

49 CFR 173. Shippers – General Requirements for Shipments and Packagings. United States Code of Federal Regulations. Available online at http://www.gpoaccess.gov/cfr/index.html

49 CFR 178. Specifications for Packaging. United States Code of Federal Regulations. Available online at http://www.gpoaccess.gov/cfr/index.html

ASTM D 4220-95 (2000). Standard Practices for Preserving and Transporting Soil Samples, ASTM International, West Conshohocken, PA, 2000. Available online at http://www.astm.org/

ASTM D 4840-99 (2010). Standard Guide for Sampling Chain-of-Custody Procedures, ASTM International, West Conshohocken, PA, 2010. Available online at http://www.astm.org/

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ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name:	Address:
Company:	
E-mail:	Telephone:

Copy of Report to:

Name:	E-mail:
Company:	Telephone:

Invoice to:

Name:	Address:
Company:	
E-mail:	Telephone:

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? **Yes** ☐ **No** ☐

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: ______________ **Sampler's Site Information** **State**______________ **Zip code**__________ **Time Zone**________

***Sampler's Signature:** ____________________

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION — **ANALYSES REQUESTED** ***(attach list or use quote number)***

Quote #:

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers								
				☐	☐	☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐	☐	☐
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Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Level 4B reporting requested

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

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APPENDIX D.8.
STANDARD OPERATING PROCEDURES:
SOP 31, WATER QUALITY METER CALIBRATION

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STANDARD OPERATING PROCEDURE No. 31

WATER QUALITY METER CALIBRATION

1.0 SCOPE AND APPLICABILITY

This Standard Operating Procedure (SOP) describes the protocol to be followed for calibration of the field water quality sampling multi-parameter instrument used during environmental monitoring and sampling activities. The procedures presented herein are intended to be general in nature and are applicable when referenced by site-specific or project-specific planning documents. Appropriate modifications to the procedures may be made to accommodate project-specific protocols when approved in writing or via email by the Project Manager or detailed in a project work plan, sampling plan, or quality assurance project plan.

The objective of calibrating field instruments is to establish the accuracy and reliability of the instrument and to ensure that field readings are consistent with other measurements.

2.0 BASIS FOR METHODOLOGY

The methods and procedures described in this SOP were developed from this source:

- U.S. Geological Survey (USGS) (variously dated) National Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, Handbooks for Water-Resources Investigations, Chapters A1-A9.

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3.0 EQUIPMENT AND SUPPLIES

3.1 Multi-Parameter Sensors

Multi-parameter sensors can vary between manufacturers of instruments and as technology advances. The following are the sensors generally used on multi-parameter instruments for collecting water quality parameters: water temperature, pH, specific electrical conductance (SC), oxidation-reduction potential (ORP), and dissolved oxygen (DO). Turbidity is generally measured using a separate meter, but there are some instruments for which the turbidity sensor is included with the multi-meter sensor cluster.

- pH – sensor has a range between 2 to 12, or 0 to 14 pH units
- Water Temperature – sensor has a range of at least -5 to +45 degrees Celsius
- SC – sensor is temperature compensating, and measures in microsiemens per centimeter (uS/cm) or mS/cm
- DO – 2 types of sensors (polarographic and optical) both sensors range from 0.05 to 20 milligrams per liter (mg/L)
- ORP – sensor uses a platinum electrode, and measures in millivolts (mV)

3.2 Calibration Supplies

The following supplies are needed to calibrate a multi-parameter instrument: specific sensor buffers, standards, and calibration solutions, field notebooks, deionized water, bucket(s), disposable gloves, scrub brushes, and paper tissues.

4.0 CALIBRATION PROCEDURE

The multi-parameter instrument will be calibrated in the field once daily by personnel according to manufacturer's instructions prior to the collection of any samples. All calibration details will be recorded in a field notebook including, but not limited to: instrument type, instrument serial number, readings prior to calibration, buffers used, readings after calibration, names of personnel calibrating, and date and time of calibration. The following are general guidelines to follow when calibrating a multi-parameter instrument:

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A. Follow the manufacturer instructions;

B. Set the meter to the correct measurement units;

C. Allow the meter to warm up (at least 10 minutes or according to manufacturer recommendation);

D. Calibrate the instrument in a temperature-stable environment;

E. Use the calibration cup for calibration;

F. Use the recommended volume of calibration solution during calibration;

G. Do not over tighten the calibration cup;

H. Rinse the sensor with deionized water prior to the use of calibration solution, then rinse with a small amount of the calibration solution to be used before calibrating; and

I. Calibrate the meter sensors in the following order: water temperature, SC, DO, pH, and ORP.

4.1 Multi-Point Calibration

4.1.1 Water Temperature

Check to ensure the accuracy of the temperature sensor at least every 3 months if the multi-parameter instrument is in frequent use or according to the manufacturer's recommendations. The accuracy of the temperature sensor will be verified against a certified NIST-traceable digital or liquid-in-glass thermometer. Completely submerge the multi-parameter meter temperature sensor and allow at least 1 minute for the temperature to equilibrate and stabilize. Record the temperature value in degrees Celsius (°C). If the difference between the readings does not fall within the manufacturer-specified accuracy, contact the supplier or manufacturer for the next steps.

4.1.2 Specific Conductance (SC)

Calibration for SC is performed using a one-point calibration. Use the standard recommended by the manufacturer or a standard that is similar in conductivity to the sample water. The calibration cup and sensor will first be rinsed using a small amount of calibration solution prior to the start of calibration. Next the calibration cup will be filled with the recommended volume of calibration solution and the sensor completely

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submerged. When the readings stabilize save the calibration point and record in the field notebook the readings before and after calibration in uS/cm.

4.1.3 Dissolved Oxygen (DO)

Follow the manufacturer's guidelines for care, proper setup, and calibration of the DO sensor for the instrument in use. Whenever possible, ensure that the DO sensor has been appropriately calibrated by the instrument supplier or party responsible for maintenance prior to using the instrument in the field.

4.1.4 pH

Calibration of the pH sensor is performed using a two-point calibration. Select the pH 7 buffer as well as a second pH buffer (pH 4 or pH 10) that brackets the expected range of sample water pH. A calibration check using a third buffer can be performed at the end of calibration. To start, the calibration cup and sensor will be rinsed with deionized water and then with a small amount of the first buffer. Next the calibration cup will be filled with enough of the first buffer to completely cover the pH and temperature sensors (the pH value is temperature dependent). Wait for the pH and temperature sensors to equilibrate to the temperature of the buffer and record the temperature reading after stabilization. Adjust the calibration reading (to the true pH value at that temperature) using the chart provided by the buffer manufacturer. Record the temperature and pH readings before and after calibration of the first buffer in the field notebook. Follow the same steps starting with the rinsing of the calibration cup and sensor for the second buffer. If a third buffer is used to check the calibration, follow the same steps, but do not lock in a calibration point.

4.1.5 Oxidation-Reduction Potential (ORP)

Calibration of the ORP sensor is generally performed using a one-point calibration at a known temperature. The manufacturer's recommendation will be followed for calibration. The calibration cup and sensor will first be rinsed with a small amount of the solution. Next fill the calibration cup with enough of the solution to completely submerge the ORP sensor. Wait for the readings to stabilize and then enter the correct value of

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the solution at the current temperature. Record the ORP readings before and after calibration in mV, as well as the solution values used in the field notebook.

4.2 One-Point Calibration

Calibration may be performed using the In-Situ Quick Cal Solution when an In-Situ smarTROLL™ MP handheld water quality meter is used. The Quick Cal Solution performs a one-point calibration of all smarTroll™ MP sensors (pH, ORP, SC, and DO) at the same time. The manufacturer's recommendations will be followed for calibration as well as the following use and storage guidelines:

- Shake well before use;
- Allow to warm to room temperature before using;
- Store in refrigerator (needs to be stored in dark and cool environment);
- Use within three weeks after opening (document on bottle and calibration records when opened);
- Unopened shelf life is six months (check and document expiration date of bottle); and
- One-time use only (i.e. solution should not be re-used following single calibration).

5.0 DOCUMENTATION

The Project Manager or designated reviewer will check and verify that documentation of instrument calibration has been completed and the calibration records are filed in the project records.

6.0 REFERENCES

U.S. Geological Survey (USGS), variously dated. National Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, Handbooks for Water-Resources Investigations, Chapters A1-A9. Available online at http://pubs.water.usgs.gov/twri9A.

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