APPENDIX C

Preliminary Geotechnical and GeoHazards Report

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April 11, 2011

Mr. Tom Buttgenbach
88FT 8ME, LLC
10100 Santa Monica Blvd, Suite 300
Los Angeles, CA 90067

Technical Memo
Preliminary Geological and Geotechnical Hazard Evaluation
Calexico Solar Farm I (88FT)
SEC Brockman Road and Hwy 98
Calexico, California
LCI Project No. LE11082

Dear Mr. Buttgenbach:

The purpose of this technical memo is to augment the preliminary geotechnical report and geologic hazards study report. The preliminary geotechnical report and geologic hazards study report analyzed the Calexico Solar Farm I project as being constructed in one phase and under one conditional use permit. However after completing the preliminary geotechnical report and geologic hazards study report, the project's construction plan was modified to reflect a second conditional use permit that would allow the project to be constructed in more than one phase.

We have reviewed and analyzed this modification and have determined that the conclusions in the preliminary geotechnical report and geologic hazards study report remain unchanged. In other words, the development of the project in more than one phase or CUP does not change the conclusions in the preliminary geotechnical report and geologic hazards study report.

Sincerely Yours;
Landmark Consultants, Inc.

Steven K. Williams, PG, CEG
Senior Engineering Geologist`

Jeffrey O. Lyon, PE
President

Preliminary Geotechnical and GeoHazards Report

Calexico Solar Farm I

SEC Brockman Road and Hwy 98

Calexico, California

Prepared for:

88FT 8ME, LLC
142 S. Hayworth Avenue
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April 5, 2011

Mr. Tom Buttgenbach
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Los Angeles, CA 90048

Preliminary Geological and Geotechnical Hazard Evaluation
Calexico Solar Farm I
SEC Brockman Road and Hwy 98
Calexico, California
LCI Project No. LE11082

Dear Mr. Buttgenbach:

This preliminary geotechnical report and geologic hazards study is provided for preliminary site evaluation and permitting of the photo-voltaic solar farm located on four (4) separate parcels located at the southeast corner of Brockman Road and State Hwy 98 approximately 7 miles west of Calexico, California.

Scope of Work

The scope of work consisted of a geologic and geotechnical hazards evaluation of the project site which addresses the following items:

1. Site location in relation to mapped earthquake faults and seismic zones.
2. Review of published geologic literature and maps.
3. Intensity of ground shaking at the site determined by probabilistic methods (10% probability of occurrence in 50 years).
4. Potential for liquefaction, ground failure, and landslides at the site.
5. Potential for expansive soil hazards at the site including methods for mitigation.
6. Potential for flooding at the site from man-made facilities (dams, canals, etc.) and from natural storms.
7. Ability of site soils to support individual or community sewage disposal system leach fields.

Site Description

The project site is composed of four separate parcels totaling approximately 1,350 acres. The first parcel is comprised of four (4) agricultural fields (approximately 240 acres) located at the southeast corner of Brockman Road and Hwy 98. The second parcel is composed of two (2) 80-acre agricultural fields located at the northwest corner of Brockman and Anza Roads. The third parcel is comprised of four (4) agricultural fields (approximately 440 acres) located at the southeast corner of Brockman and Anza Roads. The fourth parcel is comprised of five (5) agricultural fields (approximately 400 acres) located at the northeast corner of Rockwood and Anza Roads. The agricultural fields are currently in crop production.

Agricultural fields are located around the perimeter of each of the project parcels. Dirt field roads and irrigation canals are located along the margins and also cross the parcels. The adjacent properties are approximately the same elevation as the project sites. The All American Canal and the International Border with the Republic of Mexico is located south of the project site.

Site Geological Conditions

Site Geology: The project site is located in the Imperial Valley portion of the Salton Trough physiographic province. The Salton Trough is a topographic and geologic structural depression resulting from large scale regional faulting. The trough is bounded on the northeast by the San Andreas Fault and Chocolate Mountains and the southwest by the Peninsular Range and faults of the San Jacinto Fault Zone. The Salton Trough represents the northward extension of the Gulf of California, containing both marine and non-marine sediments since the Miocene Epoch. Tectonic activity that formed the trough continues at a high rate as evidenced by deformed young sedimentary deposits and high levels of seismicity. Figure 1 shows the location of the site in relation to regional faults and physiographic features.

The Imperial Valley is directly underlain by lacustrine deposits, which consist of interbedded lenticular and tabular silt, sand, and clay. The Late Pleistocene to Holocene lake deposits are probably less than 100 feet thick and derived from periodic flooding of the Colorado River which intermittently formed a fresh water lake (Lake Cahuilla).

Older deposits consist of Miocene to Pleistocene non-marine and marine sediments deposited during intrusions of the Gulf of California. Basement rock consisting of Mesozoic granite and Paleozoic metamorphic rocks are estimated to exist at depths between 15,000 - 20,000 feet.

Based on Unified Soil Classification System, the permeability of these soils is expected to be low to very low.

Groundwater: The groundwater in the site area is brackish and typically encountered at a depth of 5 to 10 feet below ground surface in the vicinity of the project site. There is uncertainty in the accuracy of short-term water level measurements, particularly in fine-grained soil. Groundwater levels may fluctuate with precipitation, irrigation of adjacent properties, drainage, and site grading. The groundwater level noted should not be interpreted to represent an accurate or permanent condition.

Onsite Wastewater Disposal: The near surface soils at the project site generally consist of silty clays and clays having a very low to low infiltration rate. The near surface soils are considered poor in supporting onsite septic systems and leach fields for wastewater disposal. Site specific studies will be required to determine that state health standards are met in regard to soil percolation rates and separation of leach fields from groundwater.

Geological Hazards

Landsliding: The hazard of landsliding is unlikely due to the relatively planar topography of the project site. No ancient landslides are shown on geologic maps of the region and no indications of landslides were observed during our site investigation.

Volcanic hazards: The site is not located proximal to any known volcanically active area and the risk of volcanic hazards is considered very low.

Tsunamis, seiches, and flooding: The site does not lie near any large bodies of water, so the threat of tsunami, seiches, or other seismically-induced flooding is considered unlikely. The All American Canal is located south of the project site (abuts the southern-most parcel). The water level in the All American Canal is at or slightly below the site elevation.

Expansive soil: In general, much of the near surface soils within the project site consist of silty clays and clays having a high to very high expansion potential. The clay is expansive when wetted and can shrink with moisture loss (drying). Development of building foundations, concrete flatwork, and asphaltic concrete pavements should include provisions for mitigating potential swelling forces and reduction in soil strength, which can occur from saturation of the soil.

Liquefaction/Seismic Settlements: Liquefaction is a potential design consideration because of possible saturated sandy substrata underlying the site. Liquefaction occurs when granular soil below the water table is subjected to vibratory motions, such as produced by earthquakes. With strong ground shaking, an increase in pore water pressure develops as the soil tends to reduce in volume. If the increase in pore water pressure is sufficient to reduce the vertical effective stress (suspending the soil particles in water), the soil strength decreases and the soil behaves as a liquid (similar to quicksand). Liquefaction can produce excessive settlement, ground rupture, lateral spreading, or failure of shallow bearing foundations.

Four conditions are generally required for liquefaction to occur:

(1) the soil must be saturated (relatively shallow groundwater);
(2) the soil must be loosely packed (low to medium relative density);
(3) the soil must be relatively cohesionless (not clayey); and
(4) groundshaking of sufficient intensity must occur to function as a trigger mechanism.

All of these conditions may exist to some degree at this site.

Seismic Hazards

The project site is located in the seismically active Imperial Valley of southern California and is considered likely to be subjected to moderate to strong ground motion from earthquakes in the region.

Groundshaking. The primary seismic hazard at the project site is the potential for strong groundshaking during earthquakes along the Imperial, Brawley, Laguna Salada, Cerro Prieto, and Superstition Hills Faults (Figure 1).

Deterministic horizontal peak ground accelerations (PGA) from maximum probable earthquakes on regional faults have been estimated and are included in Table 1.

Ground motions are dependent primarily on the earthquake magnitude and distance to the seismogenic (rupture) zone. Accelerations also are dependent upon attenuation by rock and soil deposits, direction of rupture and type of fault; therefore, ground motions may vary considerably in the same general area.

CBC Seismic Coefficients: The 2010 California Building Code (CBC) general ground motion parameters are based on the Maximum Considered Earthquake for a ground motion with a 2% probability of occurrence in 50 years. The U.S. Geological Survey "Earthquake Ground Motion Tool", version 5.0.9a (USGS, 2009) was used to obtain the site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters shown in Table 2. The site soils have been classified as Site Class D (stiff soil profile). Design earthquake ground motions are defined as the earthquake ground motions that are two-thirds (2/3) of the corresponding MCE ground motions. Design earthquake ground motion data are provided in Table 2.

A ground motion value of 0.37g (S_{DS}/2.5) was determined for liquefaction and seismic settlement analysis in accordance with ASCE 7-05 Section 11.8.3. The parameter S_{DS} is derived from the maximum considered earthquake spectral response acceleration for short periods (CBC Section 1613.5.4).

Surface Rupture: The project site does not lie within a State of California, Alquist-Priolo Earthquake Fault Zone. Surface fault rupture at the project site is considered to be low. Ground failures (lateral spreading) were noted along the embankments of the All American Canal after the April 4, 2010 magnitude 7.2M_w El Mayor-Cucapah earthquake.

Other Hazards

Hazardous Materials: The site is not located in proximity to any known hazardous materials (methane gas, tar seeps, hydrogen sulfide gas), and the risk of hazardous materials is considered very low.

Radon 222 Gas: Radon gas is not believed to be a potential hazard at the site. A report titled "California Statewide Radon Survey-Screening Results", dated November 1990 and published by the California State Department of Health Services, notes that Southern California showed a low risk of elevated radon levels, based on 2-day tests conducted from January through April 1990. Some of the reported testing was performed in Imperial County; however, no data was observed as being at or near the project site.

Naturally occurring asbestos: The site is not located in proximity to any known naturally occurring asbestos, and the risk of naturally occurring asbestos is considered very low.

Hydrocollapse: The site is dominantly underlain by clays that are not expected to collapse with the addition of water to the site. The risk of hydrocollapse is considered very low.

Regional Subsidence: Regional subsidence has not been documented in the area west of Calexico; therefore, the risk of regional subsidence is considered low.

Conclusion

This preliminary report was prepared according to the generally accepted *geotechnical engineering standards of practice* that existed in Imperial County at the time the report was prepared. No express or implied warranties are made in connection with our services.

Our research did not reveal conditions that would preclude implementation of the proposed project provided site specific geotechnical investigations are conducted prior to site development to provide recommendations for the design and construction of this project.

Sincerely Yours;
Landmark Consultants, Inc.

PROFESSIONAL GEOLOGIST — STEVEN K. WILLIAMS — CERTIFIED ENGINEERING GEOLOGIST — CEG 2261 — STATE OF CALIFORNIA

Steven K. Williams, PG, CEG
Senior Engineering Geologist`

REGISTERED PROFESSIONAL ENGINEER — JEFFREY O. LYON — No. 31921 — EXPIRES 12-31-12 — CIVIL — STATE OF CALIFORNIA

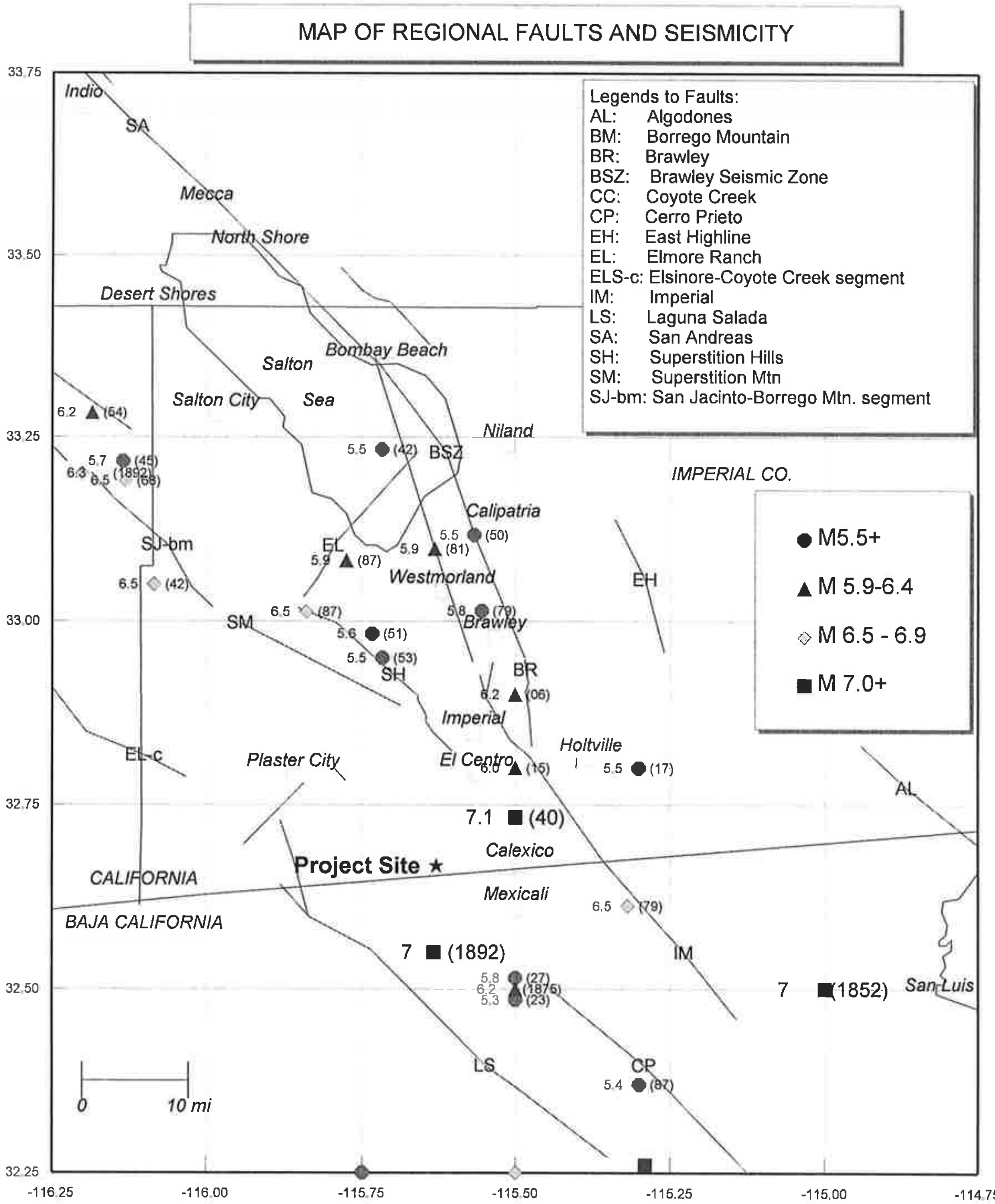
Jeffrey O. Lyon, PE
President

Table 1
FAULT PARAMETERS & DETERMINISTIC
ESTIMATES OF PEAK GROUND ACCELERATION (PGA)

Fault Name or Seismic Zone	Distance (mi) & Direction from Site		Fault Type		Fault Length (km)	Maximum Magnitude Mmax (Mw)	Avg Slip Rate (mm/yr)	Avg Return Period (yrs)	Date of Last Rupture (year)	Largest Historic Event >5.5M	(year)	Est. Site PGA (g)
Reference Notes: (1)			(2)	(3)	(2)	(4)	(3)	(3)	(3)	(5)		(6)
Imperial Valley Faults												
Imperial	13	NE	A	B	62	**7.0**	20	79	1979	7.0	1940	**0.21**
Brawley	14	NE	B	B	14	**7.0**	20	----	1979	5.8	1979	**0.20**
Cerro Prieto	15	SE	A	B	116	**7.2**	34	50	1980	7.1	1934	**0.21**
Brawley Seismic Zone	19	NNE	B	B	42	**6.4**	25	24		5.9	1981	**0.12**
East Highline Canal	29	NE	C	C	22	**6.3**	1	774				**0.08**
San Jacinto Fault System												
- Superstition Hills	11	N	B	A	22	**6.6**	4	250	1987	6.5	1987	**0.20**
- Superstition Mtn.	15	NNW	B	A	23	**6.6**	5	500	1440 +/-			**0.15**
- Elmore Ranch	28	NNW	B	A	29	**6.6**	1	225	1987	5.9	1987	**0.10**
- Borrego Mtn	32	NW	B	A	29	**6.6**	4	175		6.5	1942	**0.09**
- Anza Segment	50	NW	A	A	90	**7.2**	12	250	1918	6.8	1918	**0.09**
- Coyote Creek	51	NW	B	A	40	**6.8**	4	175	1968	6.5	1968	**0.07**
- Whole Zone	15	NNW	A	A	245	**7.5**	---	---				**0.25**
Elsinore Fault System												
- Laguna Salada	10	SW	B	B	67	**7.0**	3.5	336		7.0	1891	**0.26**
- Coyote Segment	25	WNW	B	A	38	**6.8**	4	625				**0.12**
- Julian Segment	51	WNW	A	A	75	**7.1**	5	340				**0.08**
- Earthquake Valley	54	WNW	B	A	20	**6.5**	2	351				**0.06**
- Whole Zone	25	WNW	A	A	250	**7.5**	---	---				**0.17**
San Andreas Fault System												
- Coachella Valley	47	N	A	A	95	**7.4**	25	220	1690+/-	6.5	1948	**0.10**
- Whole S. Calif. Zone	47	N	A	A	458	**7.9**	---	---	1857	7.8	1857	**0.13**
Algodones	42	ENE	C	C	74	**7.0**	0.1	20,000				**0.09**

Notes:

1. Jennings (1994) and CDMG (1996)
2. CDMG (1996), where Type A faults -- slip rate >5 mm/yr and well constrained paleoseismic data
   Type B faults -- all other faults.
3. WGCEP (1995)
4. CDMG (1996) based on Wells & Coppersmith (1994)
5. Ellsworth Catalog in USGS PP 1515 (1990) and USBR (1976), Mw = moment magnitude,
6. The deterministic estimates of the Site PGA are based on the attenuation relationship of:
   Boore, Joyner, Fumal (1997)



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Faults and Seismic Zones from Jennings (1994), Earthquakes modified from Ellsworth (1990) catalog.

Figure 1. Map of Regional Faults and Seismicity

Table 2
2010 California Building Code (CBC) and ASCE 7-5 Seismic Parameters

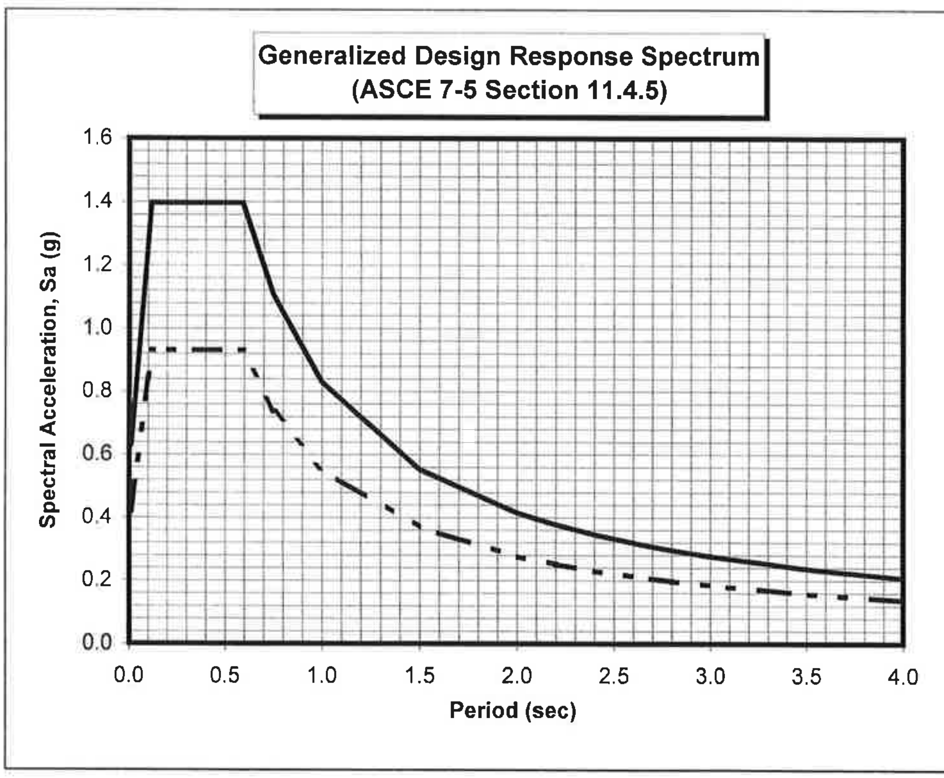
		CBC Reference
Site Class:	**D**	Table 1613.5.2
Latitude:	32.6685 N	
Longitude:	-115.6292 W	

Maximum Considered Earthquake (MCE) Ground Motion

Short Period Spectral Response	S_s	1.40 g	Figure 1613.5(3)	
1 second Spectral Response	S_1	0.55 g	Figure 1613.5(4)	
Site Coefficient	F_a	1.00	Table 1613.5.3 (1)	
Site Coefficient	F_v	1.50	Table 1613.5.3 (2)	
Adjusted Short Period Spectral Response	S_{MS}	1.40 g	$= F_a * S_s$	Equation 16-36
Adjusted 1 second Spectral Response	S_{M1}	0.83 g	$= F_v * S_1$	Equation 16-37

Design Earthquake Ground Motion

Short Period Spectral Response	S_{DS}	0.93 g	$= 2/3*S_{MS}$	Equation 16-38
1 second Spectral Response	S_{D1}	0.55 g	$= 2/3*S_{M1}$	Equation 16-39
	To	0.12 sec	$=0.2*S_{D1}/S_{DS}$	
	Ts	0.59 sec	$=S_{D1}/S_{DS}$	

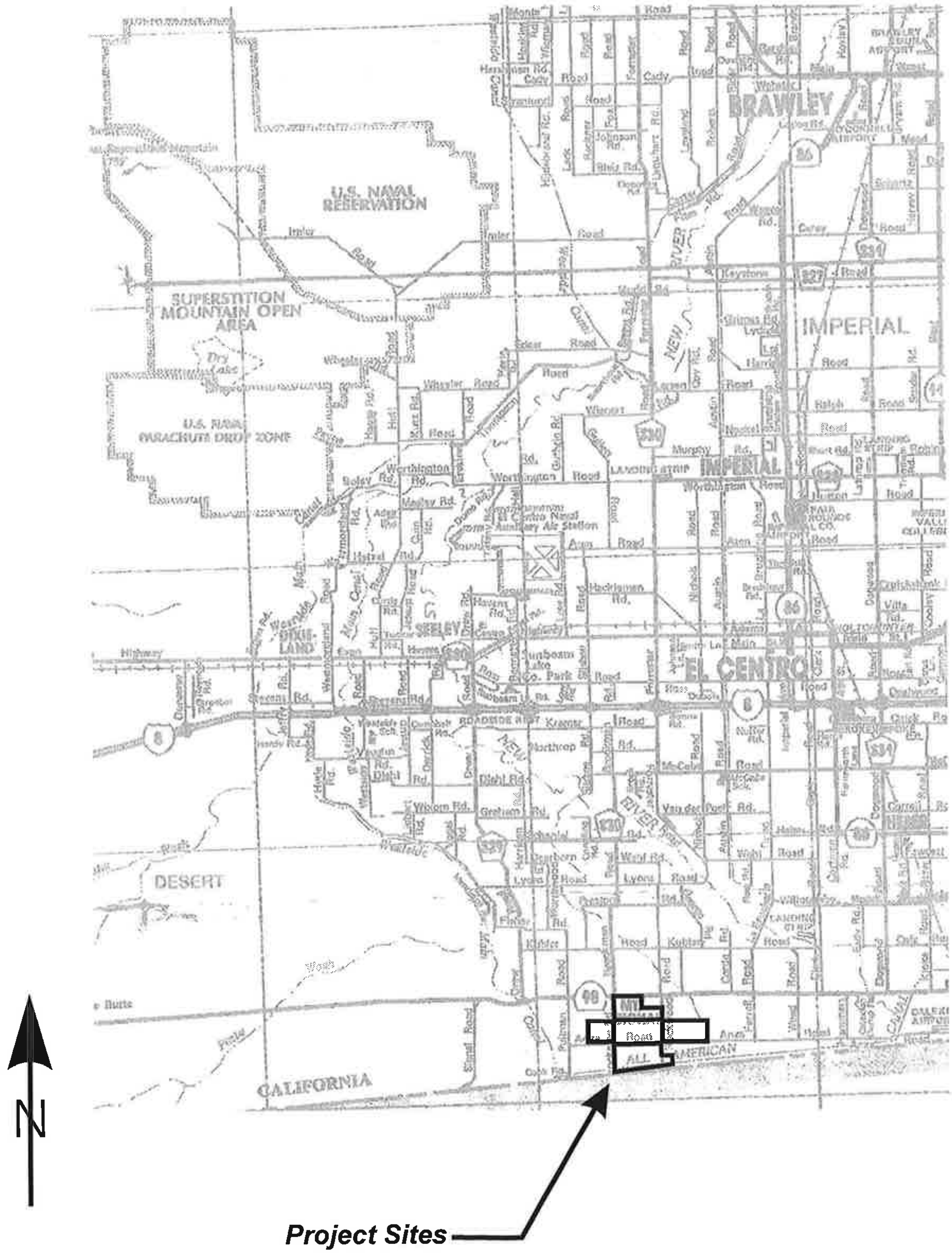


2010 CBC

Period T (sec)	Sa (g)	MCE Sa (g)	80% Sa (g)
0.01	0.42	0.63	0.34
0.03	0.51	0.77	0.41
0.10	0.84	1.26	0.67
0.12	0.93	1.40	0.74
0.15	0.93	1.40	0.74
0.20	0.93	1.40	0.74
0.30	0.93	1.40	0.74
0.40	0.93	1.40	0.74
0.50	0.93	1.40	0.74
0.59	0.93	1.40	0.74
0.75	0.74	1.11	0.59
1.00	0.55	0.83	0.44
1.50	0.37	0.55	0.29
2.00	0.28	0.41	0.22
2.20	0.25	0.38	0.20
2.40	0.23	0.35	0.18
2.60	0.21	0.32	0.17
2.80	0.20	0.30	0.16
3.00	0.18	0.28	0.15
3.50	0.16	0.24	0.13
4.00	0.14	0.21	0.11

Design Response Spectra
MCE Response Spectra

APPENDIX A



LANDMARK Geo-Engineers and Geologists **Project No.: LE11082**	**Vicinity Map**	**Plate** **A-1**

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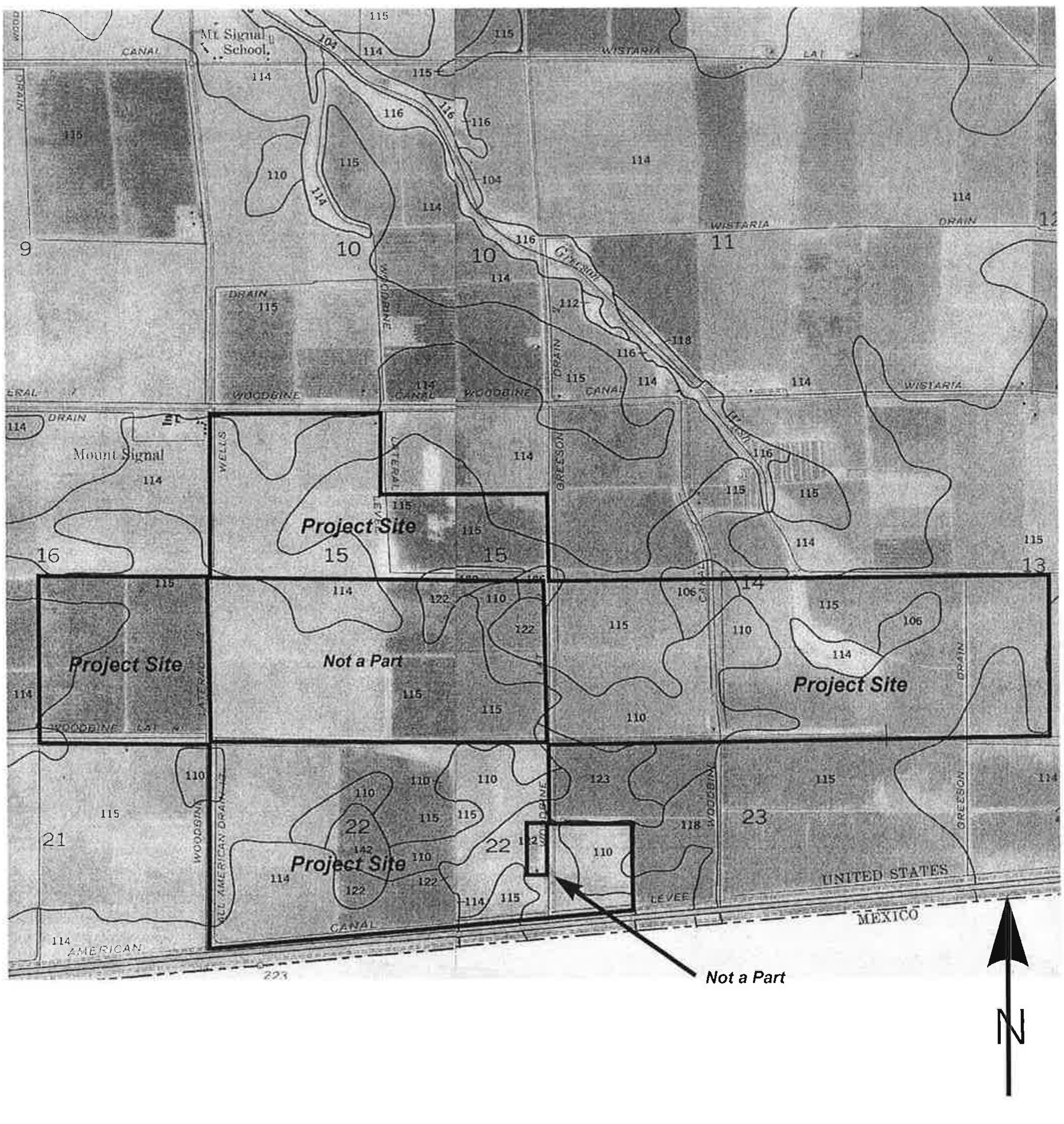
Geo-Engineers and Geologists

Project No.: LE11082

Site Map

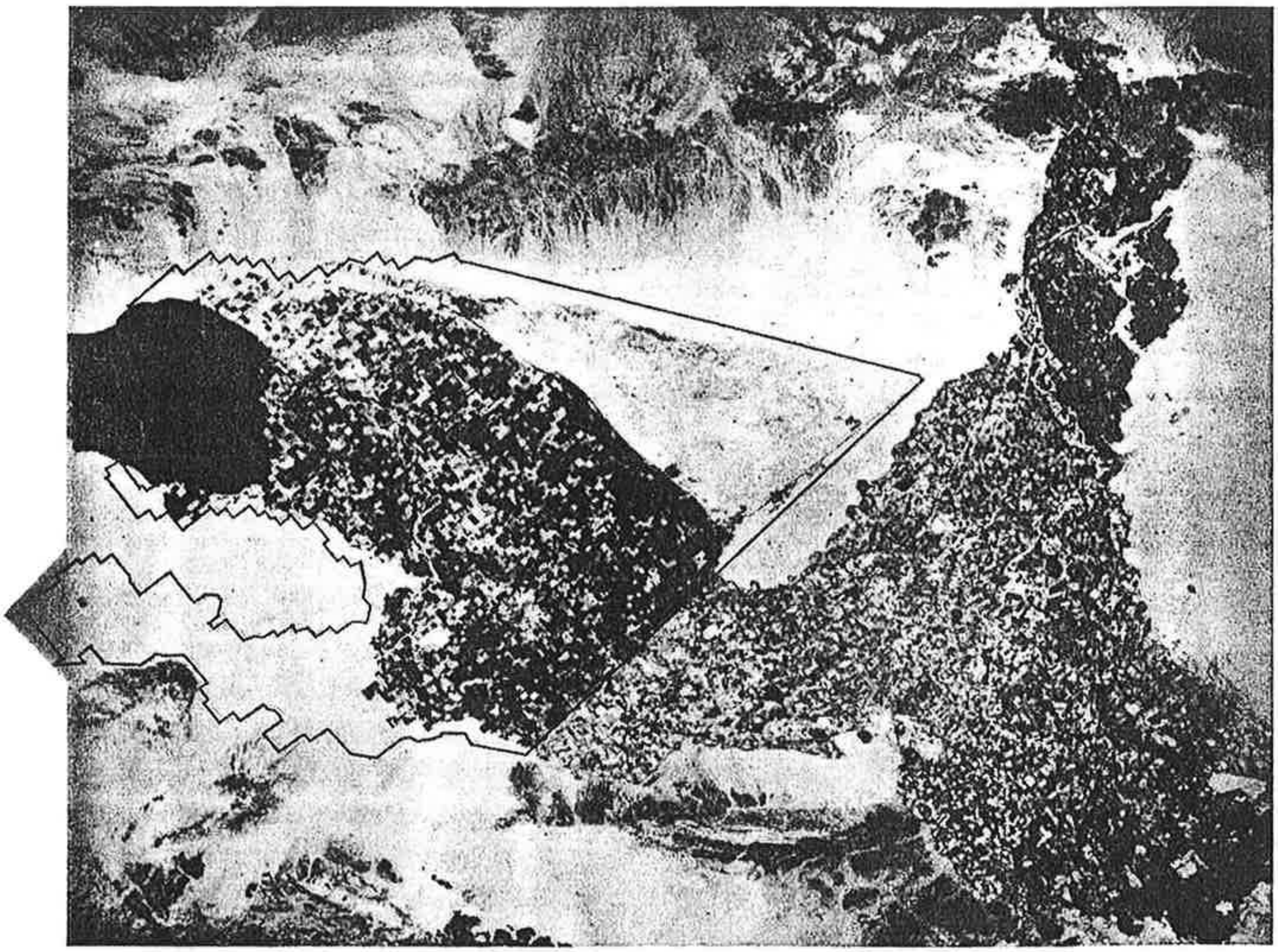
Plate A-2



LANDMARK Geo-Engineers and Geologists Project No.: LE11082	Soil Survey Map	Plate A-3

Soil Survey of

IMPERIAL COUNTY
CALIFORNIA
IMPERIAL VALLEY AREA



United States Department of Agriculture Soil Conservation Service

in cooperation with

University of California Agricultural Experiment Station

and

Imperial Irrigation District

TABLE 11.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
100---------------- Antho	0-13	Loamy fine sand	SM	A-2	0	100	100	75-85	10-30	---	NP
	13-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	90-100	75-95	50-60	15-40	---	NP
101*:											
Antho-------------	0-8	Loamy fine sand	SM	A-2	0	100	100	75-85	10-30	---	NP
	8-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	90-100	75-95	50-60	15-40	---	NP
Superstition------	0-6	Fine sand-------	SM	A-2	0	100	95-100	70-85	15-25	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	95-100	70-85	15-25	---	NP
102*. Badland											
103---------------- Carsitas	0-10	Gravelly sand---	SP, SP-SM	A-1, A-2	0-5	60-90	50-85	30-55	0-10	---	NP
	10-60	Gravelly sand, gravelly coarse sand, sand.	SP, SP-SM	A-1	0-5	60-90	50-85	25-50	0-10	---	NP
104* Fluvaquents											
105---------------- Glenbar	0-13	Clay loam-------	CL	A-6	0	100	100	90-100	70-95	35-45	15-30
	13-60	Clay loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-95	35-45	15-30
106---------------- Glenbar	0-13	Clay loam-------	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
	13-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
107*--------------- Glenbar	0-13	Loam------------	ML, CL-ML, CL	A-4	0	100	100	100	70-80	20-30	NP-10
	13-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	75-95	35-45	15-30
108---------------- Holtville	0-14	Loam------------	ML	A-4	0	100	100	85-100	55-95	25-35	NP-10
	14-22	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	22-60	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	65-85	25-35	NP-10
109---------------- Holtville	0-17	Silty clay------	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	17-24	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	24-35	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	65-85	25-35	NP-10
	35-60	Loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	100	100	75-100	20-55	---	NP
110---------------- Holtville	0-17	Silty clay------	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-35
	17-24	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-35
	24-35	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	55-85	25-35	NP-10
	35-60	Loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	100	100	75-100	20-55	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
111*:											
Holtville---------	0-10	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	10-22	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	22-60	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	65-85	25-35	NP-10
Imperial----------	0-12	Silty clay loam	CL	A-7	0	100	100	100	85-95	40-50	10-20
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
112--------------- Imperial	0-12	Silty clay------	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
113--------------- Imperial	0-12	Silty clay------	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay, clay, silty clay loam.	CH	A-7	0	100	100	100	85-95	50-70	25-45
114--------------- Imperial	0-12	Silty clay------	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
115*:											
Imperial----------	0-12	Silty clay loam	CL	A-7	0	100	100	100	85-95	40-50	10-20
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
Glenbar-----------	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
	13-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
116*:											
Imperial----------	0-13	Silty clay loam	CL	A-7	0	100	100	100	85-95	40-50	10-20
	13-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
Glenbar-----------	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
	13-60	Clay loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-95	35-45	15-30
117, 118---------- Indio	0-12	Loam------------	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	12-72	Stratified loamy very fine sand to silt loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
119*:											
Indio-------------	0-12	Loam------------	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	12-72	Stratified loamy very fine sand to silt loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
Vint--------------	0-10	Loamy fine sand	SM	A-2	0	95-100	95-100	70-80	25-35	---	NP
	10-60	Loamy sand, loamy fine sand.	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
120*-------------- Laveen	0-12	Loam------------	ML, CL-ML	A-4	0	100	95-100	75-85	55-65	20-30	NP-10
	12-60	Loam, very fine sandy loam.	ML, CL-ML	A-4	0	95-100	85-95	70-80	55-65	15-25	NP-10

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

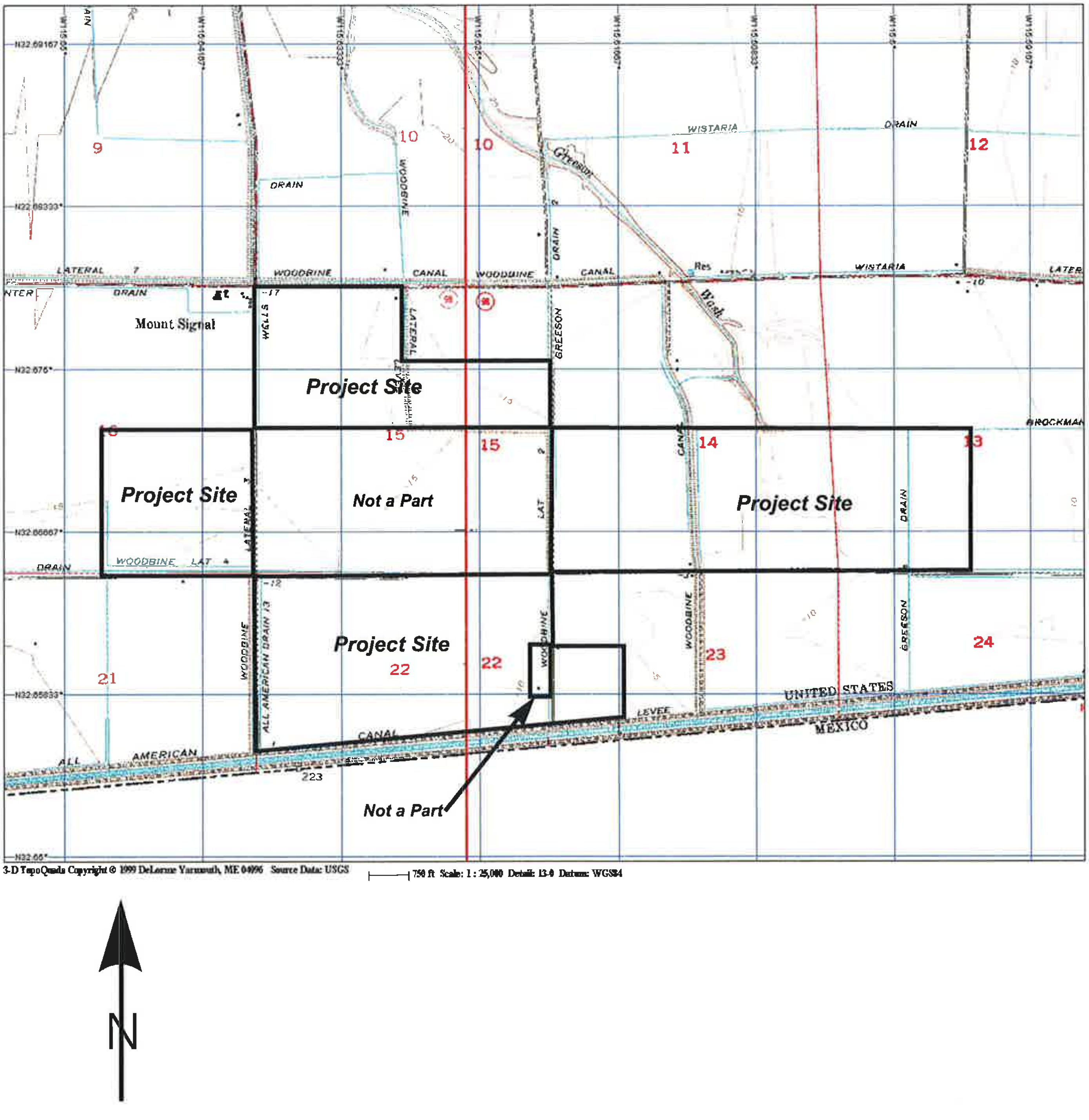
Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
121----------------- Meloland	0-12	Fine sand--------	SM, SP-SM	A-2, A-3	0	95-100	90-100	75-100	5-30	---	NP
	12-26	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	90-100	50-65	25-35	NP-10
	26-71	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
122----------------- Meloland	0-12	Very fine sandy loam.	ML	A-4	0	95-100	95-100	95-100	55-85	25-35	NP-10
	12-26	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	90-100	50-70	25-35	NP-10
	26-71	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
123*:											
Meloland-----------	0-12	Loam-------------	ML	A-4	0	95-100	95-100	95-100	55-85	25-35	NP-10
	12-26	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	90-100	50-70	25-35	NP-10
	26-38	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
	38-60	Stratified silt loam to loamy fine sand.	SM, ML	A-4	0	100	100	75-100	35-55	25-35	NP-10
Holtville----------	0-12	Loam-------------	ML	A-4	0	100	100	85-100	55-95	25-35	NP-10
	12-24	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-35
	24-36	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	55-85	25-35	NP-10
	36-60	Loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	100	100	75-100	20-55	---	NP
124, 125------------ Niland	0-23	Gravelly sand---	SM, SP-SM	A-2, A-3	0	90-100	70-95	50-65	5-25	---	NP
	23-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	100	100	85-100	80-95	40-65	20-40
126----------------- Niland	0-23	Fine sand--------	SM, SP-SM	A-2, A-3	0	90-100	90-100	50-65	5-25	---	NP
	23-60	Silty clay-------	CL, CH	A-7	0	100	100	85-100	80-95	40-65	20-40
127----------------- Niland	0-23	Loamy fine sand	SM	A-2	0	90-100	90-100	50-65	15-30	---	NP
	23-60	Silty clay-------	CL, CH	A-7	0	100	100	85-100	80-95	40-65	20-40
128*:											
Niland-------------	0-23	Gravelly sand---	SM, SP-SM	A-2, A-3	0	90-100	70-95	50-65	5-25	---	NP
	23-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	100	100	85-100	80-100	40-65	20-40
Imperial-----------	0-12	Silty clay-------	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
129*: Pits											
130, 131------------ Rositas	0-27	Sand-------------	SP-SM	A-3, A-1, A-2	0	100	80-100	40-70	5-15	---	NP
	27-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
132, 133, 134, 135- Rositas	0-9	Fine sand	SM	A-3, A-2	0	100	80-100	50-80	10-25	---	NP
	9-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
136 Rositas	0-4	Loamy fine sand	SM	A-1, A-2	0	100	80-100	40-85	10-35	---	NP
	4-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
137 Rositas	0-12	Silt loam	ML	A-4	0	100	100	90-100	70-90	20-30	NP-5
	12-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
138*:											
Rositas	0-4	Loamy fine sand	SM	A-1, A-2	0	100	80-100	40-85	10-35	---	NP
	4-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
Superstition	0-6	Loamy fine sand	SM	A-2	0	100	95-100	70-85	15-25	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	95-100	70-85	15-25	---	NP
139 Superstition	0-6	Loamy fine sand	SM	A-2	0	100	95-100	70-85	15-25	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	95-100	70-85	15-25	---	NP
140*:											
Torriorthents											
Rock outcrop											
141*:											
Torriorthents											
Orthids											
142 Vint	0-10	Loamy very fine sand.	SM, ML	A-4	0	100	100	85-95	40-65	15-25	NP-5
	10-60	Loamy fine sand	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
143 Vint	0-12	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	100	100	75-85	45-55	15-25	NP-5
	12-60	Loamy sand, loamy fine sand.	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
144*:											
Vint	0-10	Very fine sandy loam.	SM, ML	A-4	0	100	100	85-95	40-65	15-25	NP-5
	10-40	Loamy fine sand	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
	40-60	Silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
Indio	0-12	Very fine sandy loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	12-40	Stratified loamy very fine sand to silt loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	40-72	Silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35

* See description of the map unit for composition and behavior characteristics of the map unit.



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

750 ft Scale: 1 : 25,000 Detail: 13-0 Datum: WGS84

LANDMARK
Geo-Engineers and Geologists

Project No.: LE11082

Topographic Map

Plate A-4

APPENDIX C

Preliminary Geotechnical and GeoHazards Report

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April 11, 2011

Mr. Tom Buttgenbach
89MA 8ME, LLC
10100 Santa Monica Blvd, Suite 300
Los Angeles, CA 90067

Technical Memo
Preliminary Geological and Geotechnical Hazard Evaluation
Calexico Solar Farm II (89MA)
Hwy 98 at Ferrell and Hammers Roads
Calexico, California
LCI Project No. LE11083

Dear Mr. Buttgenbach:

The purpose of this technical memo is to augment the preliminary geotechnical report and geologic hazards study report. The preliminary geotechnical report and geologic hazards study report analyzed the Calexico Solar Farm II project as being constructed in one phase and under one conditional use permit. However after completing the preliminary geotechnical report and geologic hazards study report, the project's construction plan was modified to reflect a second conditional use permit that would allow the project to be constructed in more than one phase.

We have reviewed and analyzed this modification and have determined that the conclusions in the preliminary geotechnical report and geologic hazards study report remain unchanged. In other words, the development of the project in more than one phase or CUP does not change the conclusions in the preliminary geotechnical report and geologic hazards study report.

Sincerely Yours;
Landmark Consultants, Inc.

Steven K. Williams, PG, CEG
Senior Engineering Geologist`

Jeffrey O. Lyon, PE
President

Preliminary Geotechnical and GeoHazards Report

Calexico Solar Farm II
NWC Ferrell Road and Hwy 98 and SWC Hammers Road and Hwy 98
Calexico, California

Prepared for:

89MA 8ME, LLC
142 S. Hayworth Avenue
Los Angeles, CA 90048

LANDMARK
Geo-Engineers and Geologists

Prepared by:

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April 2011

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April 5, 2011

Mr. Tom Buttgenbach
88FT 8ME, LLC
142 S. Hayworth Avenue
Los Angeles, CA 90048

Preliminary Geological and Geotechnical Hazard Evaluation
Calexico Solar Farm II
Hwy 98at Ferrell and Hammers Roads
Calexico, California
LCI Project No. LE11083

Dear Mr. Buttgenbach:

This preliminary geotechnical report and geologic hazards study is provided for preliminary site evaluation and permitting of the photo-voltaic solar farm located on two (2) separate parcels (1,477 total acres) located at the northwest corner of Ferrell Road and Hwy 98 and the southwest corner of Hammers Road and Hwy 98 approximately 3 miles west of Calexico, California.

Scope of Work

The scope of work consisted of a geologic and geotechnical hazards evaluation of the project site which addresses the following items:

1. Site location in relation to mapped earthquake faults and seismic zones.
2. Review of published geologic literature and maps.
3. Intensity of ground shaking at the site determined by probabilistic methods (10% probability of occurrence in 50 years).
4. Potential for liquefaction, ground failure, and landslides at the site.
5. Potential for expansive soil hazards at the site including methods for mitigation.
6. Potential for flooding at the site from man-made facilities (dams, canals, etc.) and from natural storms.
7. Ability of site soils to support individual or community sewage disposal system leach fields.

Site Description

The project site is composed of western parcels and eastern parcels. The western parcels are comprised of seven (7) agricultural fields (536 total acres) located at the northwest corner of Hwy 98 and Ferrell Road that are currently in crop production. The eastern parcels are comprised of several agricultural fields (941 total acres) located at the southwest corner of Hwy 98 and Hammers Road that are currently in crop production. Both parcels are irregular in plan view.

Agricultural fields are located around the perimeter of each of the project parcels. Dirt field roads and irrigation canals are located along the margins and also cross the parcels. The adjacent properties are approximately the same elevation as the project sites. The All American Canal and the International Border with the Republic of Mexico is located south of the project site.

Site Geological Conditions

Site Geology: The project site is located in the Imperial Valley portion of the Salton Trough physiographic province. The Salton Trough is a topographic and geologic structural depression resulting from large scale regional faulting. The trough is bounded on the northeast by the San Andreas Fault and Chocolate Mountains and the southwest by the Peninsular Range and faults of the San Jacinto Fault Zone. The Salton Trough represents the northward extension of the Gulf of California, containing both marine and non-marine sediments since the Miocene Epoch. Tectonic activity that formed the trough continues at a high rate as evidenced by deformed young sedimentary deposits and high levels of seismicity. Figure 1 shows the location of the site in relation to regional faults and physiographic features.

The Imperial Valley is directly underlain by lacustrine deposits, which consist of interbedded lenticular and tabular silt, sand, and clay. The Late Pleistocene to Holocene lake deposits are probably less than 100 feet thick and derived from periodic flooding of the Colorado River which intermittently formed a fresh water lake (Lake Cahuilla).

Older deposits consist of Miocene to Pleistocene non-marine and marine sediments deposited during intrusions of the Gulf of California. Basement rock consisting of Mesozoic granite and Paleozoic metamorphic rocks are estimated to exist at depths between 15,000 - 20,000 feet.

Based on Unified Soil Classification System, the permeability of these soils is expected to be low to very low.

Groundwater: The groundwater in the site area is brackish and typically encountered at a depth of 5 to 10 feet below ground surface in the vicinity of the project site. There is uncertainty in the accuracy of short-term water level measurements, particularly in fine-grained soil. Groundwater levels may fluctuate with precipitation, irrigation of adjacent properties, drainage, and site grading. The groundwater level noted should not be interpreted to represent an accurate or permanent condition.

Onsite Wastewater Disposal: The near surface soils at the project site generally consist of silty clays and clays having a very low to low infiltration rate. The near surface soils are considered poor in supporting onsite septic systems and leach fields for wastewater disposal. Site specific studies will be required to determine that state health standards are met in regard to soil percolation rates and separation of leach fields from groundwater.

Geological Hazards

Landsliding: The hazard of landsliding is unlikely due to the relatively planar topography of the project site. No ancient landslides are shown on geologic maps of the region and no indications of landslides were observed during our site investigation.

Volcanic hazards: The site is not located proximal to any known volcanically active area and the risk of volcanic hazards is considered very low.

Tsunamis, seiches, and flooding: The site does not lie near any large bodies of water, so the threat of tsunami, seiches, or other seismically-induced flooding is considered unlikely. The All American Canal is located south of the project site (abuts the southern-most parcel). The water level in the All American Canal is at or slightly below the site elevation.

Expansive soil: In general, much of the near surface soils within the project site consist of silty clays and clays having a high to very high expansion potential. The clay is expansive when wetted and can shrink with moisture loss (drying).

Development of building foundations, concrete flatwork, and asphaltic concrete pavements should include provisions for mitigating potential swelling forces and reduction in soil strength, which can occur from saturation of the soil.

Liquefaction/Seismic Settlements: Liquefaction is a potential design consideration because of possible saturated sandy substrata underlying the site. Liquefaction occurs when granular soil below the water table is subjected to vibratory motions, such as produced by earthquakes. With strong ground shaking, an increase in pore water pressure develops as the soil tends to reduce in volume. If the increase in pore water pressure is sufficient to reduce the vertical effective stress (suspending the soil particles in water), the soil strength decreases and the soil behaves as a liquid (similar to quicksand). Liquefaction can produce excessive settlement, ground rupture, lateral spreading, or failure of shallow bearing foundations.

Four conditions are generally required for liquefaction to occur:

(1) the soil must be saturated (relatively shallow groundwater);
(2) the soil must be loosely packed (low to medium relative density);
(3) the soil must be relatively cohesionless (not clayey); and
(4) groundshaking of sufficient intensity must occur to function as a trigger mechanism.

All of these conditions may exist to some degree at this site.

Seismic Hazards

The project site is located in the seismically active Imperial Valley of southern California and is considered likely to be subjected to moderate to strong ground motion from earthquakes in the region.

Groundshaking. The primary seismic hazard at the project site is the potential for strong groundshaking during earthquakes along the Imperial, Brawley, Laguna Salada, Cerro Prieto, and Superstition Hills Faults (Figure 1). Deterministic horizontal peak ground accelerations (PGA) from maximum probable earthquakes on regional faults have been estimated and are included in Table 1.

Ground motions are dependent primarily on the earthquake magnitude and distance to the seismogenic (rupture) zone. Accelerations also are dependent upon attenuation by rock and soil deposits, direction of rupture and type of fault; therefore, ground motions may vary considerably in the same general area.

CBC Seismic Coefficients: The 2010 California Building Code (CBC) general ground motion parameters are based on the Maximum Considered Earthquake for a ground motion with a 2% probability of occurrence in 50 years. The U.S. Geological Survey "Earthquake Ground Motion Tool", version 5.0.9a (USGS, 2009) was used to obtain the site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters shown in Table 2. The site soils have been classified as Site Class D (stiff soil profile). Design earthquake ground motions are defined as the earthquake ground motions that are two-thirds (2/3) of the corresponding MCE ground motions. Design earthquake ground motion data are provided in Table 2.

A ground motion value of 0.37g ($S_{DS}/2.5$) was determined for liquefaction and seismic settlement analysis in accordance with ASCE 7-05 Section 11.8.3. The parameter S_{DS} is derived from the maximum considered earthquake spectral response acceleration for short periods (CBC Section 1613.5.4).

Surface Rupture: The project site does not lie within a State of California, Alquist-Priolo Earthquake Fault Zone. Surface fault rupture at the project site is considered to be low. Ground failures (lateral spreading) were noted along the embankments of the All American Canal after the April 4, 2010 magnitude $7.2M_w$ El Mayor-Cucapah earthquake.

Other Hazards

Hazardous Materials: The site is not located in proximity to any known hazardous materials (methane gas, tar seeps, hydrogen sulfide gas), and the risk of hazardous materials is considered very low.

Radon 222 Gas: Radon gas is not believed to be a potential hazard at the site. A report titled "California Statewide Radon Survey-Screening Results", dated November 1990 and published by the California State Department of Health Services, notes that Southern California showed a low risk of elevated radon levels, based on 2-day tests conducted from January through April 1990.

Some of the reported testing was performed in Imperial County; however, no data was observed as being at or near the project site.

Naturally occurring asbestos: The site is not located in proximity to any known naturally occurring asbestos, and the risk of naturally occurring asbestos is considered very low.

Hydrocollapse: The site is dominantly underlain by clays that are not expected to collapse with the addition of water to the site. The risk of hydrocollapse is considered very low.

Regional Subsidence: Regional subsidence has not been documented in the area west of Calexico; therefore, the risk of regional subsidence is considered low.

Conclusion

This preliminary report was prepared according to the generally accepted *geotechnical engineering standards of practice* that existed in Imperial County at the time the report was prepared. No express or implied warranties are made in connection with our services.

Our research did not reveal conditions that would preclude implementation of the proposed project provided site specific geotechnical investigations are conducted prior to site development to provide recommendations for the design and construction of this project.

Sincerely Yours;
Landmark Consultants, Inc.

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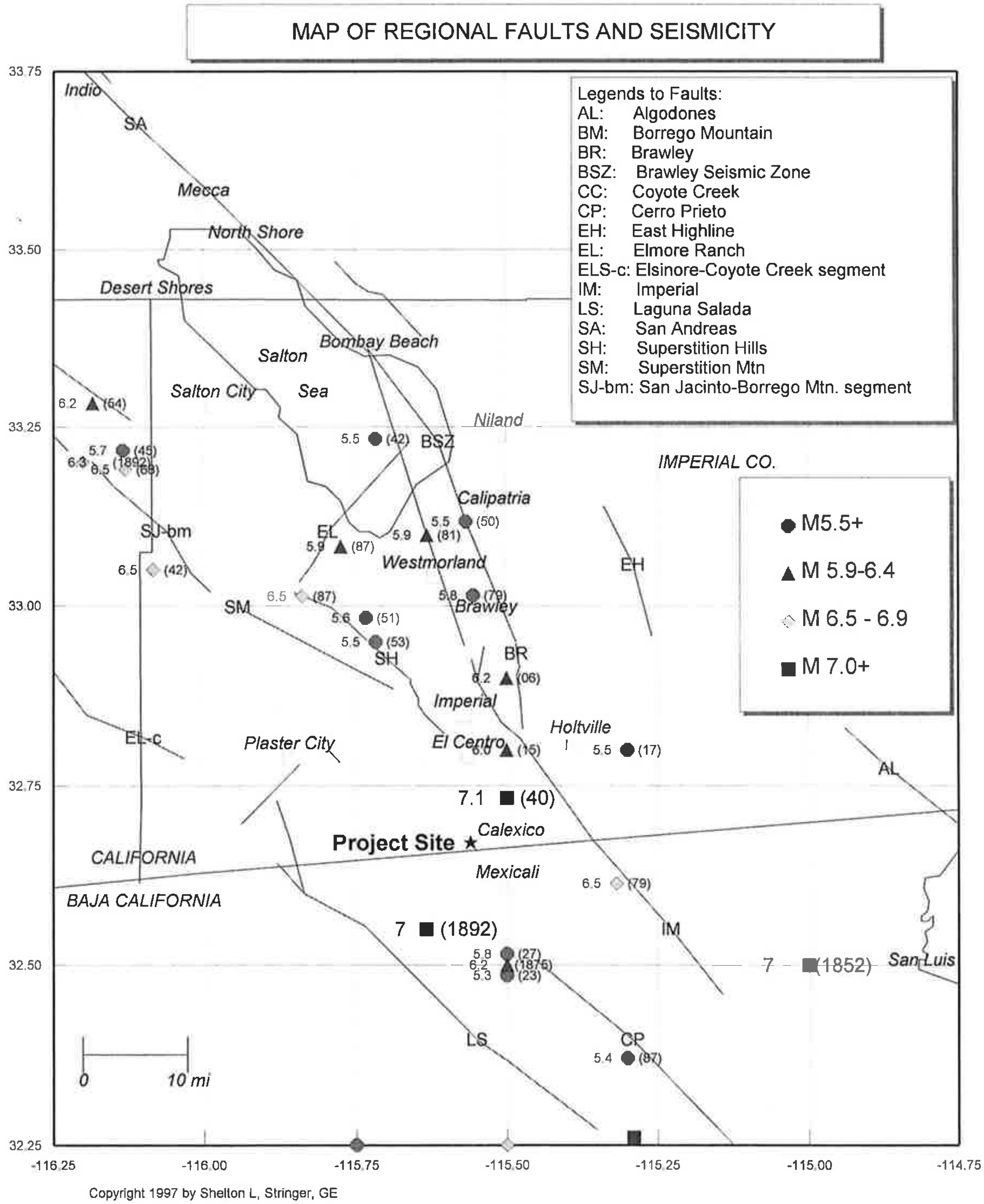
President



Faults and Seismic Zones from Jennings (1994), Earthquakes modified from Ellsworth (1990) catalog.

Figure 1. Map of Regional Faults and Seismicity

Table 1
FAULT PARAMETERS & DETERMINISTIC ESTIMATES OF PEAK GROUND ACCELERATION (PGA)

Fault Name or Seismic Zone	Distance (mi) & Direction from Site	Fault Type		Fault Length (km)	Maximum Magnitude Mmax (Mw)	Avg Slip Rate (mm/yr)	Avg Return Period (yrs)	Date of Last Rupture (year)	Largest Historic Event >5.5M	(year)	Est. Site PGA (g)
Reference Notes: (1)		(2)	(3)	(2)	(4)	(3)	(3)	(3)	(5)		(6)
Imperial Valley Faults											
Imperial	9.8 NE	A	B	62	**7.0**	20	79	1979	7.0	1940	**0.26**
Brawley	12 NNE	B	B	14	**7.0**	20	---	1979	5.8	1979	**0.23**
Cerro Prieto	13 SSE	A	B	116	**7.2**	34	50	1980	7.1	1934	**0.24**
Brawley Seismic Zone	19 N	B	B	42	**6.4**	25	24		5.9	1981	**0.12**
East Highline Canal	26 NE	C	C	22	**6.3**	1	774				**0.09**
San Jacinto Fault System											
- Superstition Hills	11 NNW	B	A	22	**6.6**	4	250	1987	6.5	1987	**0.20**
- Superstition Mtn.	17 NNW	B	A	23	**6.6**	5	500	1440 +/-			**0.15**
- Elmore Ranch	30 NW	B	A	29	**6.6**	1	225	1987	5.9	1987	**0.09**
- Borrego Mtn	35 NW	B	A	29	**6.6**	4	175		6.5	1942	**0.08**
- Anza Segment	52 NW	A	A	90	**7.2**	12	250	1918	6.8	1918	**0.08**
- Coyote Creek	54 NW	B	A	40	**6.8**	4	175	1968	6.5	1968	**0.07**
- Whole Zone	17 NNW	A	A	245	**7.5**	---	---				**0.23**
Elsinore Fault System											
- Laguna Salada	13 WSW	B	B	67	**7.0**	3.5	336		7.0	1891	**0.21**
- Coyote Segment	29 WNW	B	A	38	**6.8**	4	625				**0.11**
- Julian Segment	55 WNW	A	A	75	**7.1**	5	340				**0.08**
- Earthquake Valley	57 WNW	B	A	20	**6.5**	2	351				**0.05**
- Whole Zone	29 WNW	A	A	250	**7.5**	---	---				**0.15**
San Andreas Fault System											
- Coachella Valley	48 NNW	A	A	95	**7.4**	25	220	1690+/-	6.5	1948	**0.10**
- Whole S. Calif. Zone	48 NNW	A	A	458	**7.9**	---	---	1857	7.8	1857	**0.13**
Algodones	38 ENE	C	C	74	**7.0**	0.1	20,000				**0.10**

Notes:

1. Jennings (1994) and CDMG (1996)
2. CDMG (1996), where Type A faults -- slip rate >5 mm/yr and well constrained paleoseismic data
   Type B faults -- all other faults.
3. WGCEP (1995)
4. CDMG (1996) based on Wells & Coppersmith (1994)
5. Ellsworth Catalog in USGS PP 1515 (1990) and USBR (1976), Mw = moment magnitude,
6. The deterministic estimates of the Site PGA are based on the attenuation relationship of:
   Boore, Joyner, Fumal (1997)

Table 2
2010 California Building Code (CBC) and ASCE 7-5 Seismic Parameters

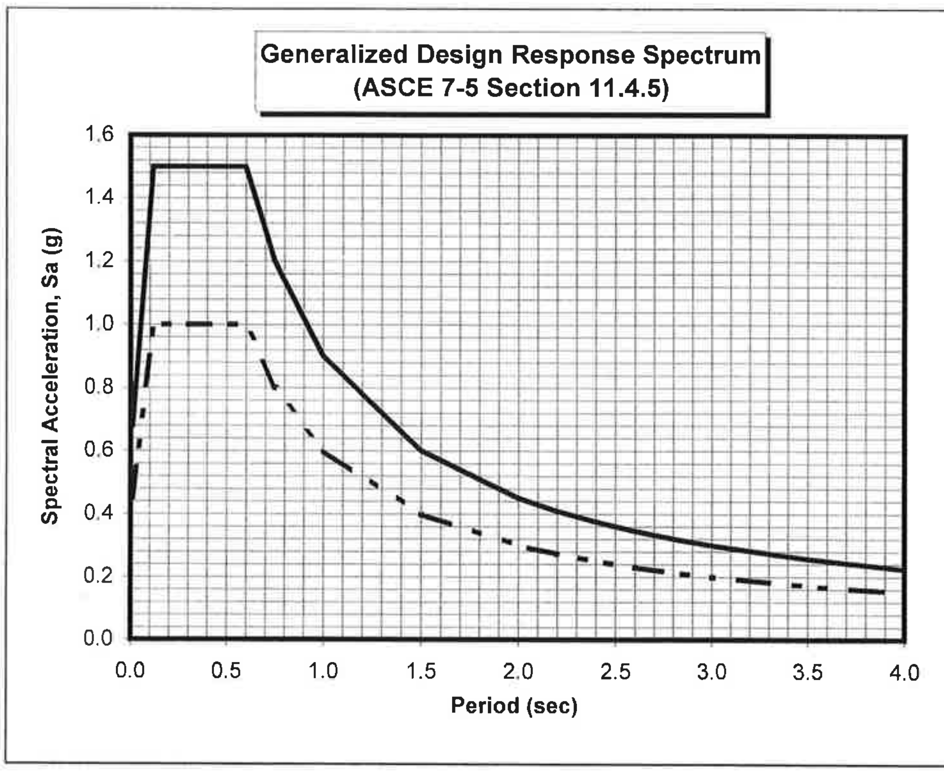
		CBC Reference
Site Class:	**D**	Table 1613.5.2
Latitude:	32.6712 N	
Longitude:	-115.5596 W	

Maximum Considered Earthquake (MCE) Ground Motion

Short Period Spectral Response	S_s	1.50 g	Figure 1613.5(3)	
1 second Spectral Response	S_1	0.60 g	Figure 1613.5(4)	
Site Coefficient	F_a	1.00	Table 1613.5.3 (1)	
Site Coefficient	F_v	1.50	Table 1613.5.3 (2)	
Adjusted Short Period Spectral Response	S_{MS}	1.50 g	$= F_a * S_s$	Equation 16-36
Adjusted 1 second Spectral Response	S_{M1}	0.90 g	$= F_v * S_1$	Equation 16-37

Design Earthquake Ground Motion

Short Period Spectral Response	S_{DS}	1.00 g	$= 2/3*S_{MS}$	Equation 16-38
1 second Spectral Response	S_{D1}	0.60 g	$= 2/3*S_{M1}$	Equation 16-39
	To	0.12 sec	$=0.2*S_{D1}/S_{DS}$	
	Ts	0.60 sec	$=S_{D1}/S_{DS}$	

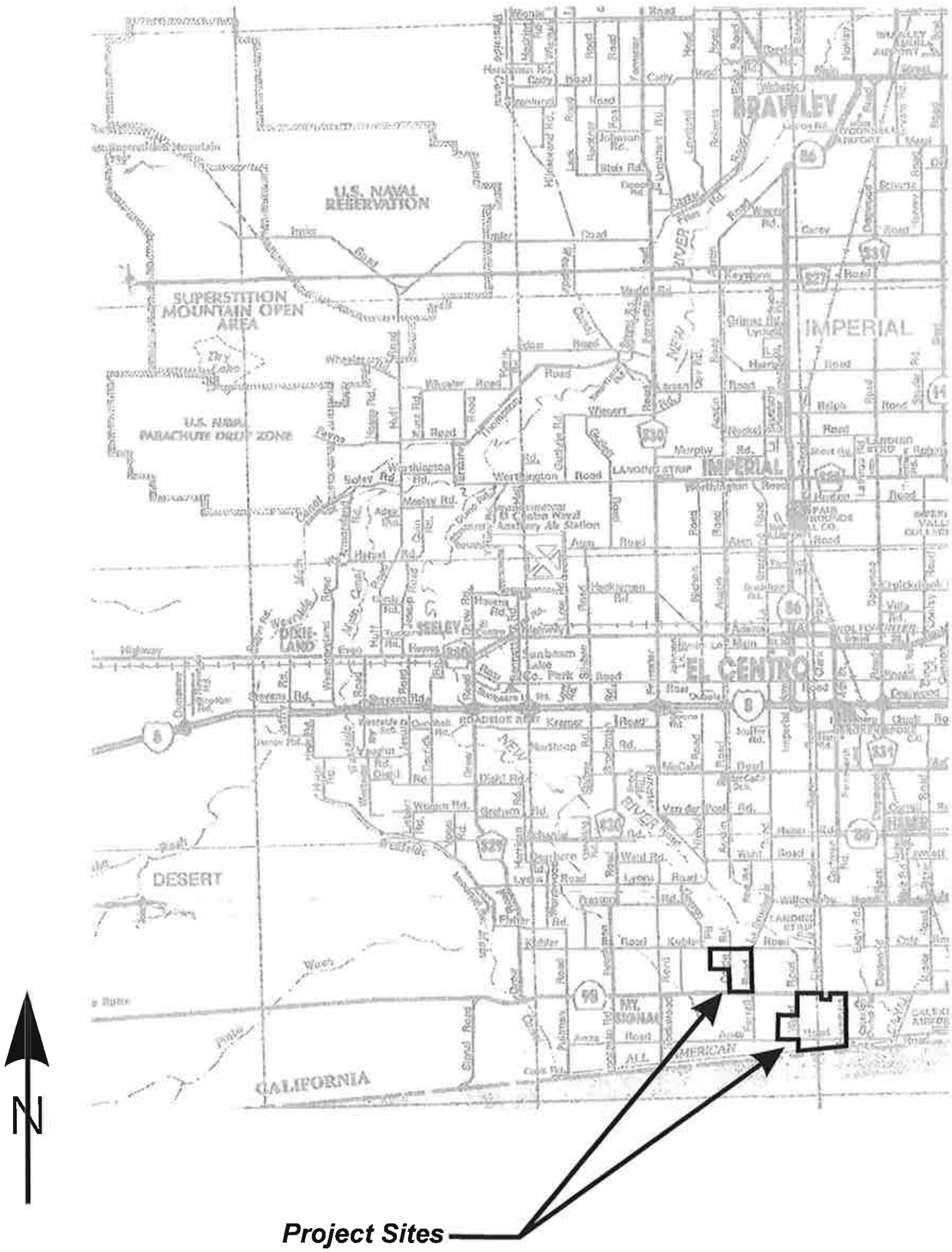


2010 CBC

Period T (sec)	Sa (g)	MCE Sa (g)	80% Sa (g)
0.01	0.45	0.68	0.36
0.03	0.55	0.83	0.44
0.10	0.90	1.35	0.72
0.12	1.00	1.50	0.80
0.15	1.00	1.50	0.80
0.20	1.00	1.50	0.80
0.30	1.00	1.50	0.80
0.40	1.00	1.50	0.80
0.50	1.00	1.50	0.80
0.60	1.00	1.50	0.80
0.75	0.80	1.20	0.64
1.00	0.60	0.90	0.48
1.50	0.40	0.60	0.32
2.00	0.30	0.45	0.24
2.20	0.27	0.41	0.22
2.40	0.25	0.38	0.20
2.60	0.23	0.35	0.18
2.80	0.21	0.32	0.17
3.00	0.20	0.30	0.16
3.50	0.17	0.26	0.14
4.00	0.15	0.23	0.12

Design Response Spectra
MCE Response Spectra

APPENDIX A



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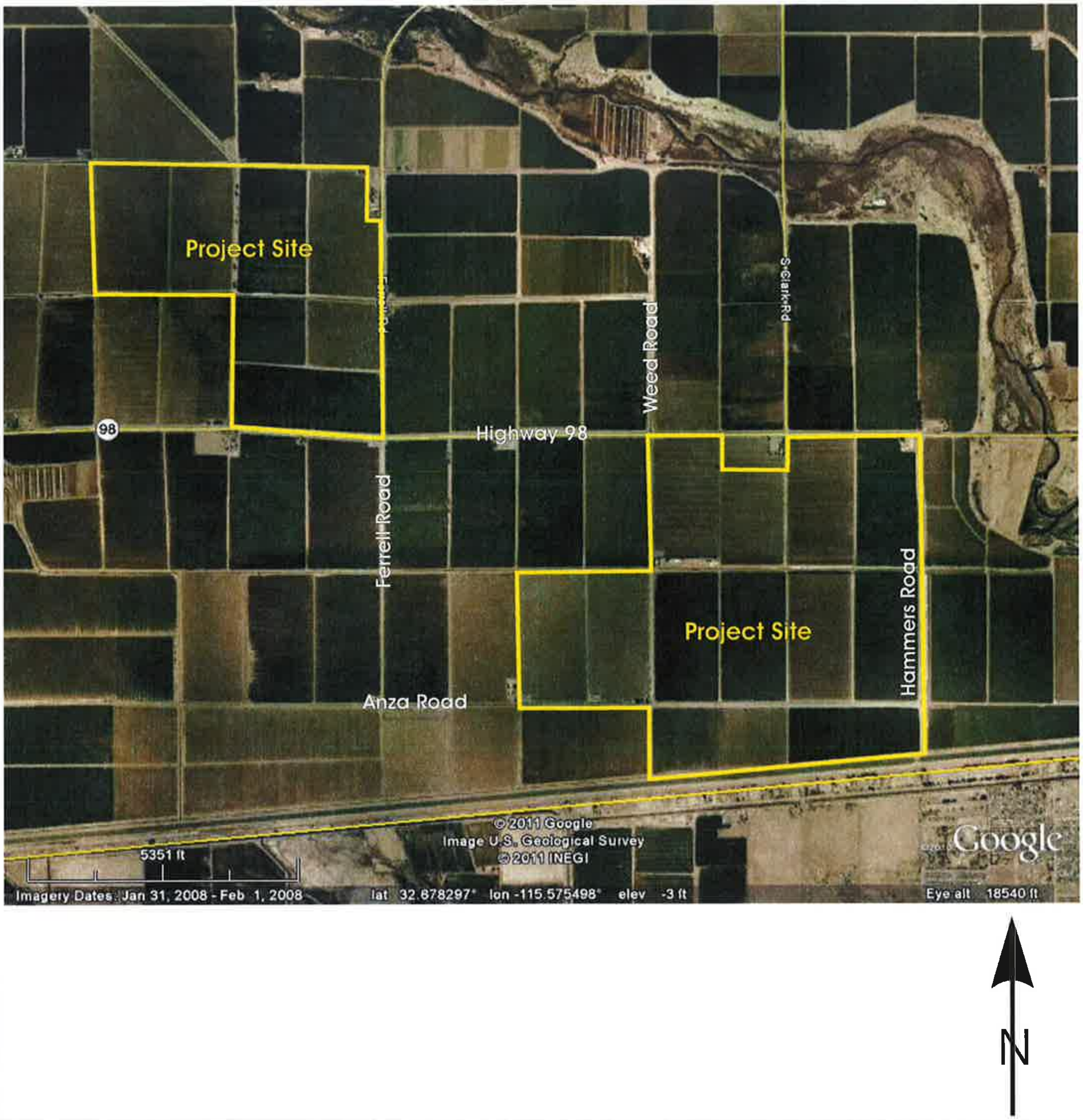
Vicinity Map

Plate
A-1



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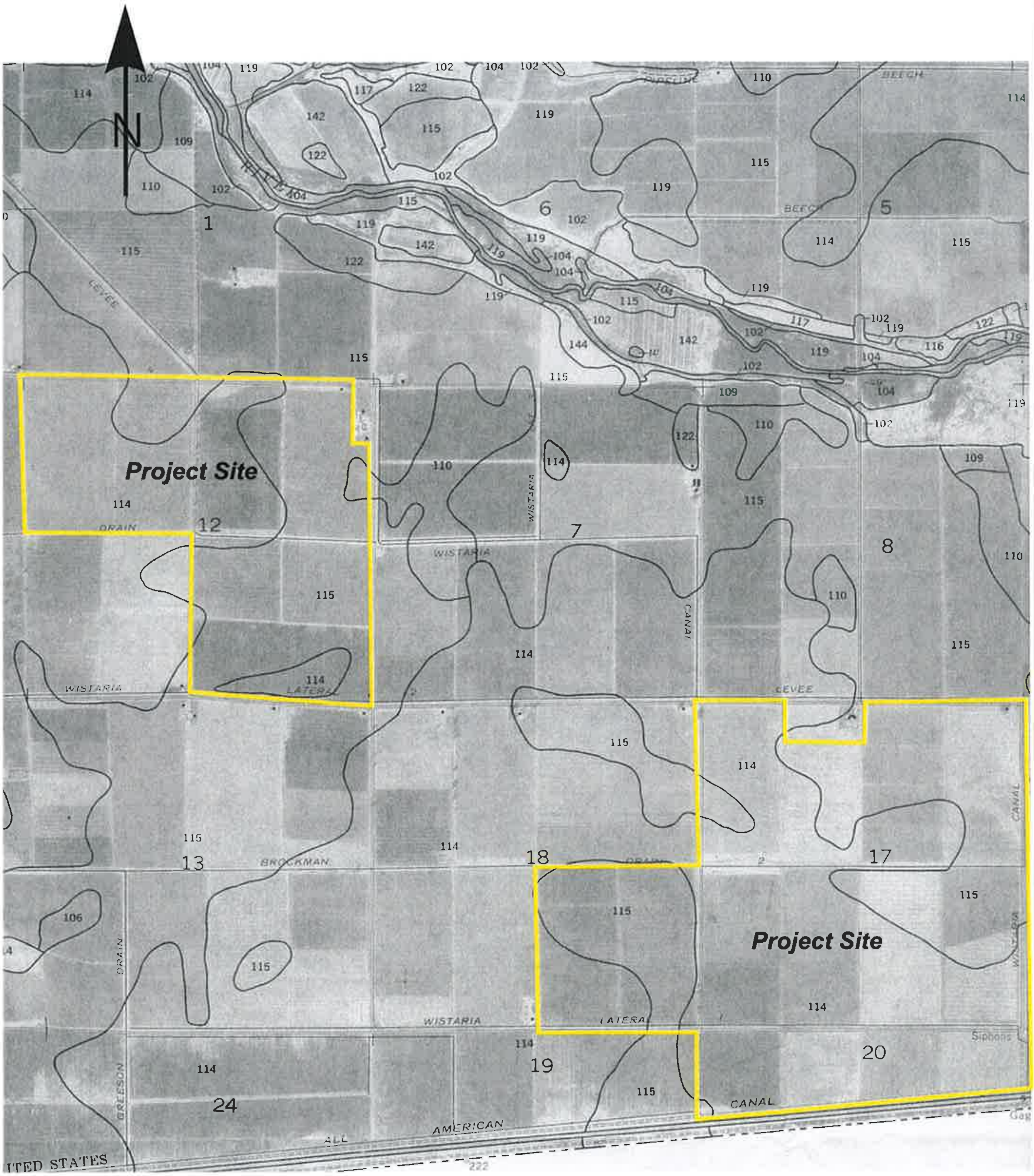
Site Map

Plate A-2



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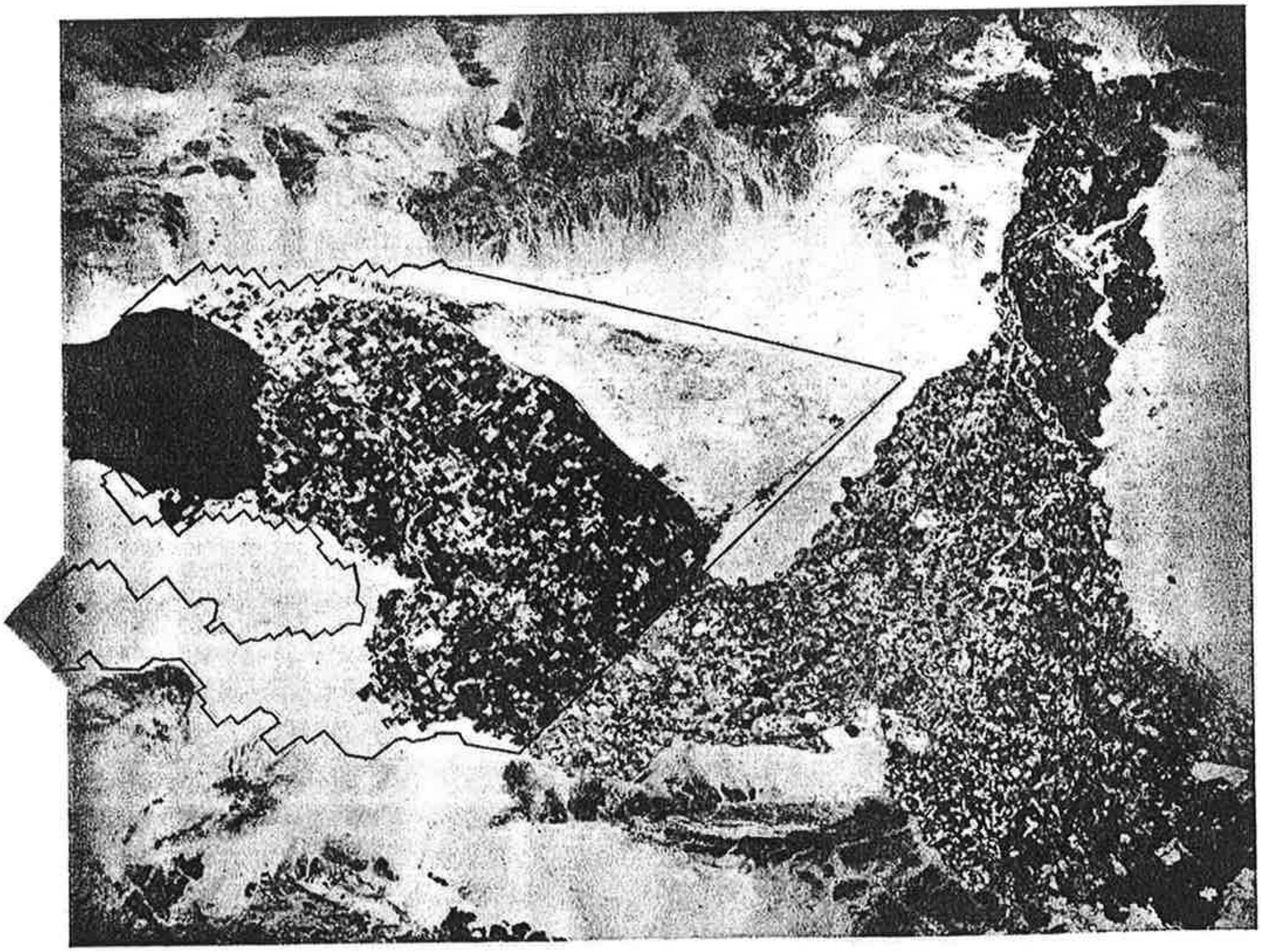
Soil Survey Map

Plate
A-3

Soil Survey of

IMPERIAL COUNTY CALIFORNIA IMPERIAL VALLEY AREA



United States Department of Agriculture Soil Conservation Service
in cooperation with
University of California Agricultural Experiment Station
and
Imperial Irrigation District

TABLE 11.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
100----------------- Antho	0-13	Loamy fine sand	SM	A-2	0	100	100	75-85	10-30	---	NP
	13-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	90-100	75-95	50-60	15-40	---	NP
101*:											
Antho---------------	0-8	Loamy fine sand	SM	A-2	0	100	100	75-85	10-30	---	NP
	8-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	90-100	75-95	50-60	15-40	---	NP
Superstition-------	0-6	Fine sand--------	SM	A-2	0	100	95-100	70-85	15-25	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	95-100	70-85	15-25	---	NP
102*. Badland											
103----------------- Carsitas	0-10	Gravelly sand---	SP, SP-SM	A-1, A-2	0-5	60-90	50-85	30-55	0-10	---	NP
	10-60	Gravelly sand, gravelly coarse sand, sand.	SP, SP-SM	A-1	0-5	60-90	50-85	25-50	0-10	---	NP
104* Fluvaquents											
105----------------- Glenbar	0-13	Clay loam--------	CL	A-6	0	100	100	90-100	70-95	35-45	15-30
	13-60	Clay loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-95	35-45	15-30
106----------------- Glenbar	0-13	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
	13-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
107*---------------- Glenbar	0-13	Loam-------------	ML, CL-ML, CL	A-4	0	100	100	100	70-80	20-30	NP-10
	13-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	75-95	35-45	15-30
108----------------- Holtville	0-14	Loam-------------	ML	A-4	0	100	100	85-100	55-95	25-35	NP-10
	14-22	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	22-60	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	65-85	25-35	NP-10
109----------------- Holtville	0-17	Silty clay-------	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	17-24	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	24-35	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	65-85	25-35	NP-10
	35-60	Loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	100	100	75-100	20-55	---	NP
110----------------- Holtville	0-17	Silty clay-------	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-35
	17-24	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-35
	24-35	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	55-85	25-35	NP-10
	35-60	Loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	100	100	75-100	20-55	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
111*:											
Holtville	0-10	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	10-22	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	22-60	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	65-85	25-35	NP-10
Imperial	0-12	Silty clay loam	CL	A-7	0	100	100	100	85-95	40-50	10-20
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
112 Imperial	0-12	Silty clay	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
113 Imperial	0-12	Silty clay	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay, clay, silty clay loam.	CH	A-7	0	100	100	100	85-95	50-70	25-45
114 Imperial	0-12	Silty clay	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
115*:											
Imperial	0-12	Silty clay loam	CL	A-7	0	100	100	100	85-95	40-50	10-20
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
Glenbar	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
	13-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
116*:											
Imperial	0-13	Silty clay loam	CL	A-7	0	100	100	100	85-95	40-50	10-20
	13-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
Glenbar	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
	13-60	Clay loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-95	35-45	15-30
117, 118 Indio	0-12	Loam	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	12-72	Stratified loamy very fine sand to silt loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
119*:											
Indio	0-12	Loam	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	12-72	Stratified loamy very fine sand to silt loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
Vint	0-10	Loamy fine sand	SM	A-2	0	95-100	95-100	70-80	25-35	---	NP
	10-60	Loamy sand, loamy fine sand.	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
120* Laveen	0-12	Loam	ML, CL-ML	A-4	0	100	95-100	75-85	55-65	20-30	NP-10
	12-60	Loam, very fine sandy loam.	ML, CL-ML	A-4	0	95-100	85-95	70-80	55-65	15-25	NP-10

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

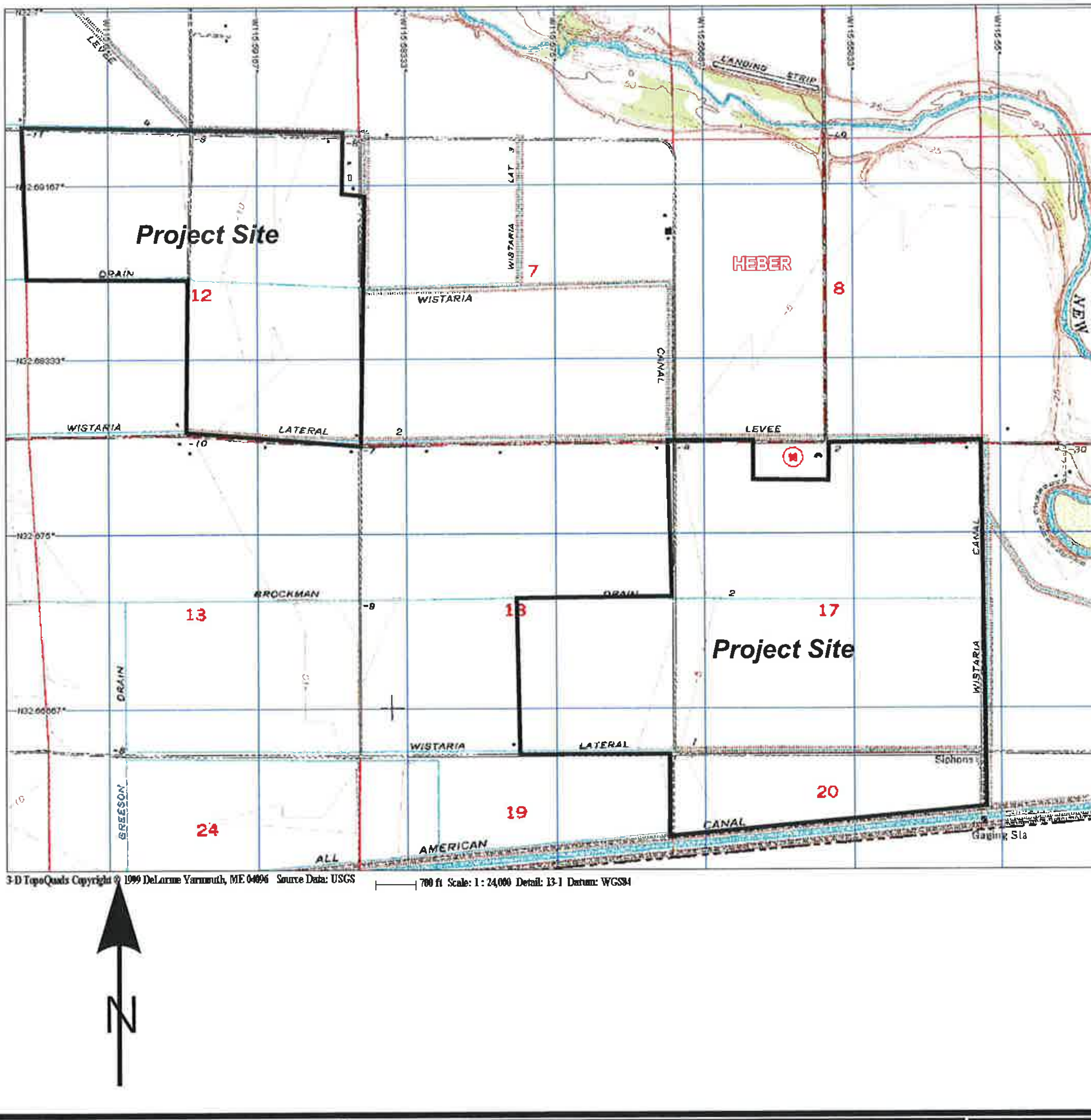
Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
121----------------- Meloland	0-12	Fine sand--------	SM, SP-SM	A-2, A-3	0	95-100	90-100	75-100	5-30	---	NP
	12-26	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	90-100	50-65	25-35	NP-10
	26-71	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
122----------------- Meloland	0-12	Very fine sandy loam.	ML	A-4	0	95-100	95-100	95-100	55-85	25-35	NP-10
	12-26	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	90-100	50-70	25-35	NP-10
	26-71	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
123*:											
Meloland-----------	0-12	Loam-------------	ML	A-4	0	95-100	95-100	95-100	55-85	25-35	NP-10
	12-26	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	90-100	50-70	25-35	NP-10
	26-38	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
	38-60	Stratified silt loam to loamy fine sand.	SM, ML	A-4	0	100	100	75-100	35-55	25-35	NP-10
Holtville----------	0-12	Loam-------------	ML	A-4	0	100	100	85-100	55-95	25-35	NP-10
	12-24	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-35
	24-36	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	55-85	25-35	NP-10
	36-60	Loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	100	100	75-100	20-55	---	NP
124, 125----------- Niland	0-23	Gravelly sand---	SM, SP-SM	A-2, A-3	0	90-100	70-95	50-65	5-25	---	NP
	23-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	100	100	85-100	80-95	40-65	20-40
126----------------- Niland	0-23	Fine sand--------	SM, SP-SM	A-2, A-3	0	90-100	90-100	50-65	5-25	---	NP
	23-60	Silty clay-------	CL, CH	A-7	0	100	100	85-100	80-95	40-65	20-40
127----------------- Niland	0-23	Loamy fine sand	SM	A-2	0	90-100	90-100	50-65	15-30	---	NP
	23-60	Silty clay-------	CL, CH	A-7	0	100	100	85-100	80-95	40-65	20-40
128*:											
Niland-------------	0-23	Gravelly sand---	SM, SP-SM	A-2, A-3	0	90-100	70-95	50-65	5-25	---	NP
	23-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	100	100	85-100	80-100	40-65	20-40
Imperial-----------	0-12	Silty clay-------	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
129*: Pits											
130, 131----------- Rositas	0-27	Sand-------------	SP-SM	A-3, A-1, A-2	0	100	80-100	40-70	5-15	---	NP
	27-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
132, 133, 134, 135-- Rositas	0-9	Fine sand-------	SM	A-3, A-2	0	100	80-100	50-80	10-25	---	NP
	9-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
136---------------- Rositas	0-4	Loamy fine sand	SM	A-1, A-2	0	100	80-100	40-85	10-35	---	NP
	4-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
137---------------- Rositas	0-12	Silt loam-------	ML	A-4	0	100	100	90-100	70-90	20-30	NP-5
	12-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
138*:											
Rositas-----------	0-4	Loamy fine sand	SM	A-1, A-2	0	100	80-100	40-85	10-35	---	NP
	4-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
Superstition------	0-6	Loamy fine sand	SM	A-2	0	100	95-100	70-85	15-25	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	95-100	70-85	15-25	---	NP
139---------------- Superstition	0-6	Loamy fine sand	SM	A-2	0	100	95-100	70-85	15-25	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	95-100	70-85	15-25	---	NP
140*:											
Torriorthents											
Rock outcrop											
141*:											
Torriorthents											
Orthids											
142---------------- Vint	0-10	Loamy very fine sand.	SM, ML	A-4	0	100	100	85-95	40-65	15-25	NP-5
	10-60	Loamy fine sand	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
143---------------- Vint	0-12	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	100	100	75-85	45-55	15-25	NP-5
	12-60	Loamy sand, loamy fine sand.	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
144*:											
Vint--------------	0-10	Very fine sandy loam.	SM, ML	A-4	0	100	100	85-95	40-65	15-25	NP-5
	10-40	Loamy fine sand	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
	40-60	Silty clay------	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
Indio-------------	0-12	Very fine sandy loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	12-40	Stratified loamy very fine sand to silt loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	40-72	Silty clay------	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35

* See description of the map unit for composition and behavior characteristics of the map unit.



LANDMARK
Geo-Engineers and Geologists

Project No.: LE11083

Topographic Map

Plate A-4

Final

ELECTROMAGNETIC FIELD (EMF) TECHNICAL REPORT

Calexico, CA 92231

Prepared by:

URS

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8minutenergy RENEWABLES

10100 Santa Monica Boulevard
Los Angeles, CA 90067

URS Job Project Number: 16170699.00100

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This Electromagnetic Field (EMF) Technical Report was prepared by URS Corporation (URS) to address the comments of the Law Offices of Stephen C Volker; to present background literature information on EMF, public health, and power facilities; and to address the scientific principles behind the Exhibits presented with Volker's comments.

URS has addressed Volker's comments, and specifically discussed the following points:

1. EMF levels are not expected to be above background levels outside the fenced in area of the Project.

2. EMF will not interfere with airport operations.

3. EMF levels within the Project are expected to be below ICNIRP levels.

4. ICNIRP levels already have a safety factor built into the recommended levels for both magnetic and electric fields.

URS has also addressed the Exhibits, and specifically discussed the following points:

1. All three Exhibits are from the same author, Samuel Milham.

2. Mr. Milham's work has serious scientific deficiencies and is not accepted as sound work by the scientific community.

URS has recommended that the Project conduct at least one of the following studies to verify that EMF levels are within existing guidelines:

1. Prior to building the facility, a simulation of EMF levels within the vicinity of the transmission lines and substation should be conducted.

2. Once the facility is built and operational, an EMF study of the area, including around solar collection devices, transmission lines, and substations should be conducted.

2.1 PURPOSE AND SCOPE

This Electromagnetic Field (EMF) Technical Report was prepared by URS Corporation (URS) to addressing the comments and concerns raised by the Law Office of Stephan C Volker (Volker) in their December 23, 2011 letter referencing "Amended and Expanded Comments of The Protect Our Communities Foundation, Backcountry Against Dumps and Danny Robinson on the Draft Environmental Impact Report for the Mount Signal and Calexico Solar Farm Projects." It is URS' understanding that 8minuteenergy is planning to build the Mount Signal and Calexico Solar Farm Projects (the Project), a solar power facility. This facility will include arrays of solar panels for energy collection as well as power substations and transmission lines.

This report includes a brief review of EMFs, a summary of current literature research on the subject of EMF exposure to human beings, and EMFs within context of the comments raised by Volker. The objectives of the technical research included addressing Volker's comments regarding EMF issues associated with the solar farm projects. URS addresses the following points:

1. Scientific literature findings on EMF, including the context behind the conclusions and a comparison of reputable versus questionable published sources.
2. Regulatory status of EMF limits, especially concerning 60 Hz fields. This will include federal, state, and international limits.
3. A scientific discussion of EMF with respect to distance. This discussion will address population densities in the immediate vicinity as well as the potential interaction with the nearby airport.
4. A discussion of the Exhibits presented in Volker's letter from a scientific standpoint.

2.2 SITE LOCATION

The Project consists of 4,228 acres of land, encompassing a series of solar farms, electrical substation(s), and 230 kilovolt (kV) off-site transmission line(s). The Project is located in California, along the United States (US) and Mexico border, in the town of Calexico in Imperial County. The entire project, once completed, would use 4.8 million photovoltaic panels, placed approximately 15 feet off the ground, to generate 600 megawatts ("MW") of power for a period of at least 40 years.

3.1 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

3.1.1 State and National

Several organizations have developed guidelines for EMF exposure, including individual states, the Federal Communications Commission (FCC), the Institute of Electrical and Electronics Engineers (IEEE), and the American Conference of Governmental Industrial Hygienists (ACGIH).

Neither the California government nor the United States government has regulations limiting EMF exposure from power transmission lines. However, the California EMF Program has been established by the California Public Utilities commission (CPUC) Decision 93-11-013. The goal of the California EMF Program is "…to research and provide education and technical assistance on the possible health effects of exposure to electric and magnetic fields from powerlines and other uses of electricity" (CaEMF, 2012).

At the national level, the IEEE standard C95.6 outlines public and occupational exposure limits for magnetic fields (B Field). The IEEE standard is outlined in Table 1 below (IEEE 2002), with the areas for 60 Hz EMF highlighted in red text. Because electric power within the United States is provided at 60 Hz, the EMF limits at 60 Hz are of most importance. (Note that harmonics of 60 Hz, such as 120 Hz, 180 Hz, may also have elevated EMF levels. However, the highest EMF levels are expected at 60 Hz.) Note that the IEEE levels are recommendations only, not regulations.

Table 1. IEEE Magnetic Field Exposure Levels for the General Public

Body Part	Frequency Range (Hz)	B Field (mG)
Head & Torso	**20 – 759**	**9.04×10^3**
	759 – 3,000	$6.87 \times 10^6/f$
Arms or Legs	< 10.7	3.53×10^6
	10.7 – 3,000	$3.79 \times 10^7/f$
	60 Hz	**632,000**

Notes: /f = divide by the frequency, mG = milliGauss, Hz = hertz

The FCC standards are mandatory for occupational exposure to EMFs for FCC-licensees and grantees and only cover the frequency range from 300 kHz to 100 GHz (FCC, 1999).

The ACGIH provides that occupational exposures should not exceed 10 Gauss (G) (10,000 mG), which corresponds to 1 milliTesla (mT). ACGIH additionally recommends that workers with pacemakers should not exceed 1,000 mG (0.1 µT). The ACGIH 10,000 mG guideline level is intended to prevent effects, such as induced currents in cells or nerve stimulation. However, the ACGIH guidelines are for occupational exposure, not general public exposure (Patterson, 1998).

3.1.2 International

Internationally, many countries have developed their own EMF guidelines. Most of these regulations are based on the International Commission on Non-Ionizing Radiation Protection (ICNIRP) recommendations, including the European Union (EU).

The ICNIRP has made a series of recommendations for limiting EMF exposure to humans based on the epidemiological data available from verifiable research studies (ICNIRP 1998). Based on ICNIRP's work, the EU has adopted these same standards for EMF exposure (Council Recommendation 1999). These standards are summarized in Table 2. While the guidelines are voluntary, the levels are designed to prevent undue health risks associated with EMF exposure. The United States does not have any regulations on EMF exposure. Also note that the magnetic fields associated with transmission lines are less than the ACGIH and ICNIRP limits.

Table 2. Summary of ICNIRP EMF Exposure Limits

FREQUENCY	ELECTRIC FIELD STRENGTH (V/M)	MAGNETIC FIELD (µT)
Occupational: 0.025 to 0.82 kHz	500 / f	25 / f
Occupational: 60 Hz	8,333	416
Public: 0.025 to 0.82 kHz	250 / f	5 / f
Public: 60 Hz	**4,167**	**200µT or 2,000 mG**

V/m = volts per meter, µT = microTesla, f = frequency

In 2010, the ICNIRP updated their recommendations, as outlined in Table 3 below.

Table 3. Summary of 2010 ICNIRP Electric Field Exposure Limits

FREQUENCY	ELECTRIC FIELD STRENGTH (V/M)	MAGNETIC FIELD (µT)
Occupational: 60 Hz	10,000	1
Public: 60 Hz	**5,000**	**200**

V/m = volts per meter, f = frequency in Hertz

Thus, the ICNIRP has increased the electric field limit for public exposure slightly over the 1998 levels.

4.1 EMF HEALTH OVERVIEW

All EMFs have the potential to interact with the human body in three different ways, each of which will be discussed in further detail below:

- Electric field interactions
- Magnetic field interactions
- Magnetic field energy transfer

4.1.1 Electric Field Interactions

Time-varying electric fields may cause ions (either positively or negatively charged molecules or atoms within the human body) to flow, may cause the reorientation of polar molecules within the body, and may cause the formation of polar molecules that would otherwise be non-polar. The magnitude of the effects depends on the part of the body that is exposed (for example, the brain and blood contain a large number of ions), the frequency of the EMFs, and the magnitude of the electric field (ICNIRP 1998).

Certain chemical reactions within the body generate charged molecules, called free radicals, which are susceptible to electric fields. The electric fields may affect how many free radicals are generated, the orientation of the free radicals in space, or the orientation of the electrons within the free radical. These phenomena may, in turn, affect the amount or type of biochemical that result from a chemical reaction within the body (ICNIRP 1994).

4.1.2 Magnetic Field Interactions

Time-varying magnetic fields couple with the human body and result in induced electric fields, which in turn result in electric currents within the body. The magnitude of the effect depends on the strength of the magnetic field, the size of the person, and the type of tissue exposed (ICNIRP 1998).

Certain portions of the body are more susceptible to magnetic fields. Blood, for example, is made up of many charged particles, called electrolytes, flowing through the body. These electrolytes can interact with a magnetic field, thereby causing an electric current within the body as the blood flows. The effect is compounded when human beings move within the magnetic fields, which causes more variation of the magnetic field strength, which in turn causes variations of the induced electric current (ICNIRP 1994). A review of recent research by the ICNIRP (2010) has resulted in a shift in their recommendations regarding the biological effects of EMF. The new ICNIRP recommendations for EMF exposure are based on induced internal electric fields, not on induced current density. Previous recommendations were based on the current density, but induced electric fields have been identified as the value that determines the biological effect. Note that the strength of the induced electric field, and hence the strength of the time-varying magnetic field, has to be relatively high in order to observe biological effects, on the order of 10,000 mG (several milliTesla) (ICNIRP 1998). Such high levels will not be present in the transmission lines associated with this Project.

4.1.3 Magnetic Field Energy Transfer

When exposed to stationary magnetic fields (magnetic fields that do not vary with time), the human body can absorb energy from the fields, causing an increase in body temperature. The energy is absorbed as the ions within the human body attempt to align themselves with the magnetic field, much as a compass needle attempts to orient itself with the Earth's magnetic field (ICNIRP 1994). However, this effect is only significant for EMFs with frequencies above 100 kHz (ICNIRP 1998). For this Project, EMF frequencies will be approximately 60 Hz, which is substantially lower than the 100 kHz threshold required to increase body temperature.

4.2 HEALTH EFFECTS OF EMFS

Scholarly journals and the Internet are replete with studies reporting the health effects of EMFs. URS has attempted to supply a representative, although not exhaustive, list of articles illustrating the many research studies that have been published in the past 20 years. Because this research was focusing on the ramifications of locating power facilities, transmission lines and substations, the rest of the report will focus specifically on ELF EMF, which is the region of the EMF spectrum that power lines and substations generate.

The publications can be classified in several different ways:

4.2.1 Based on Positive or Negative Impacts

Some research on ELF EMFs has concluded that negative health effects may be linked to exposure to ELF EMFs (Genuis 2008; Hamza *et al*. 2005; Kheifets *et al*. 2006; Raz 2006;). However, the research is not in agreement on what type(s) of negative health effects may result from EMF exposure. In addition, the research has found a weak association between any health effects and EMF exposure.

Several recent studies have focused on the potential medical treatment benefits of using EMFs under controlled conditions (Zorzi *et al.* 2007; Selvam *et al.* 2007). These research papers claim that localized use of specific EMFs can result in beneficial anti-inflammatory results, especially post-surgery.

4.2.2 Based on Location/Country

Many studies have been conducted within the United States and are summarized by ICNIRP (2001). The ICNIRP was very discriminating in their selection of published articles considered for review. Namely, the ICNIRP accepted only those papers published in peer-reviewed, scholarly articles with sufficiently large sample sizes to calculate an effect. The ICNIRP did not accept anecdotal evidence, case studies, or research that had questionable controls or scientific methods. Based on these criteria, the ICNIRP has concluded that a potential exists for adverse health effects from both adult and childhood exposure to high level ELF EMFs. As a result, the ICNIRP has set forth guidelines for EMF exposure, which were discussed previously in this report. The ICNIRP focused on health effects that had a high correlation to incidence of disease, such as leukemia and cardiovascular disease. Adult cancer, however, was not as thoroughly discussed in the ICNIRP paper. Reasons cited for questioning EMF cancer studies include the following:

1. Cancer can manifest itself years after exposure, making cancer difficult to directly correlate to EMF exposure.
2. Many other confounding variables within a person's lifetime may increase the likelihood for cancer (i.e., chemical exposure, smoking, or exposure to ionizing radiation).
3. Cancer has many forms. Usually, one variable (i.e., chemical exposure to benzene) results in a specific, identifiable type of manifesting cancer. However, studies that attempted to draw a link between EMF exposure and cancer were not consistent in the type of cancer that EMF exposure allegedly increased.

Many studies have been conducted within Europe (Frija *et al*. 2006; San Segundo & Roig 2008; Hamza *et al*. 2005; Ahlbom 2008), largely because the European Council has acknowledged a weak association between childhood leukemia and exposure to ELF EMFs (CSTEE 2001; Council Recommendation 1999). The basis for this decision was largely from research concluding that ELF EMF exposure to children caused a statistically significant increased incidence of childhood leukemia (CSTEE 2001). The result has been a Council Recommendation (1999) that set EMF exposure limits for public exposure to all EMFs. The European Council's recommendations are based on the ICNIRP guidelines for EMF exposure. Note that in 2010, the ICNIRP modified their recommendations for EMF exposure and stance on the link between childhood leukemia and EMF. The ICNIRP (2010) states that the results that came out of the research on childhood leukemia and EMF could be attributed to "a combination of selection bias, some degree of confounding, and chance." Note also that all EMF levels expected for this Project are well below current ICNIRP exposure limits.

4.2.3 Residential Exposure

The largest portion of the published work on EMFs and human health are from studies of the general public (CSTEE 2001; Genuis 2008; Kheifets *et al.* 2006; Raz 2006; SCENIHR 2008; Singh 2008). These studies focused on the health implications to human beings living near high-voltage transmission lines, from 115 kV and above. EMF sources of exposure, however, varied in these studies, from power transmission lines to electric toothbrushes. The adverse health effects reported in these studies varied as well, from headaches to insomnia to behavioral disorders (Genuis 2008). One study published in the British Medical Journal (Draper *et al.* 2005) studied the occurrence of childhood leukemia as a function of distance from power distribution lines. The study concluded that children living within 600 meters (1,800 feet) were statistically more likely to have leukemia than those living father away from the power lines. The study also concluded that children living even closer (200 meters or 600 feet) were at an increased risk of childhood leukemia. One study (Tenenbaum 2000) has postulated that the reason ELF EMF has been implicated in various forms of cancer is because the EMF exposure can induce cancer in cells within the body that have already been mutated by other means. These studies have been called into question based on the scientific design and the magnitude of the statistical significance.

A similar study to the Draper research that was conducted in Russia in 2003 (Tikhonova *et al*. 2003) found no statistically significant adverse health effects linked to living close to power transmission lines. In addition, most EMF research investigating the potential effect of power lines on human beings has been conducted outside the United States, either in Europe or Asia.

Because this research is conducted in regions where 50 Hz power is used (versus 60 Hz power in the US), these studies may not be applicable to the US. Very limited research has been conducted within the United States on power line EMF and health effects.

4.2.4 Based on Type of Health Effects Studied

The literature and Internet contain myriad reports of adverse health effects of EMF exposure. The casual reader can find reports claiming that EMF exposure can cause anything from rashes to cancer, and everything in between. In order to make an informed decision, readers must be aware of certain caveats when reading any literature relating to EMFs.

1. First, consider the source. Anyone can publish anything on the Internet. This makes Internet sources suspect, unless the source is a reputable authority on the subject, such as the World Health Organization (WHO) or the ICNIRP. Likewise, not all scientific journals are of the same caliber. Some journals, such as the *Journal of Physical Chemistry*, have stringent requirements for publication as well as a rigorous peer-review system to ensure the validity and quality of the articles published. Other journals, such as *Electric Power Systems Research*, have different standards.
2. Any research should be based on sound scientific principles, control for all variables, and have an experimental design that includes a study and control group.
3. All reliable research is repeatable. If a study reports findings that cannot be verified by an independent group, the results and conclusions are suspect.
4. A large sample size helps to ensure the applicability of the results. In other words, a small sample size (20 people or less, for example) makes the results and conclusions of the study difficult to generalize to the entire human population. Similarly, anecdotal evidence from one person may be relevant to that one person only, and not to the entire human population. On the other hand, the larger the sample size (300 or more people, for example), the more applicable the results may be to a similar population.

Given these caveats, only reliable literature sources were consulted and sited in this report. Based on a thorough review and evaluation of reliable scientific research, analyses, and reports, the ICNIRP (2001) concluded that a weak association exists between childhood leukemia and exposure to ELF EMF. The ICNIRP also evaluated the current research related to EMF exposure and the following health effects (2001):

1. Childhood cancer
2. Adult leukemia
3. Brain tumors
4. Breast cancer
5. Cardiovascular disease
6. Neurological disorders (depression and suicide)

Based on their review, the ICNIRP (2001) concluded that insufficient reliable research exists to determine if a link is possible between the adverse health effects above and long-term, elevated EMF exposure. The ICNIRP stated that more research is necessary in these areas.

Note that although case studies are not applicable to the entire population, the European Union has acknowledged that a certain portion of the population may be susceptible to a disorder called "EMF hypersensitivity" (WHO 2004). Such individuals appear to suffer adverse health effects from exposure to much smaller EMF doses than the general population. There is much scrutiny of this condition in general, with many scientists suggesting that the root cause of the problem is not EMF, but something else. Because of this, EMF hypersensitivity is not acknowledged within the US.

The U.S. National Institutes of Health tasked the National Institute of Environmental Health Sciences (NIEHS) with studying and making recommendations on EMF and human health. NIEHS has put out a series of reports outlining their interpretations and recommendations (NIEHS 1998, 1999, 2002). The NIEHS concludes that for most health outcomes, there is no evidence that EMF exposures have adverse health effects. The NIEHS calls for more studies and continued education on ways of reducing exposures.

4.3 EMFS IN CONTEXT

Not all EMFs raise health concerns. In fact, the Earth has a natural magnetic field that human beings are constantly exposed to. The strength of the Earth's field ranges from less than 30 μT (0.3 Gauss) to over 60 μT (0.6 Gauss). In Calexico, California, the total magnetic field is approximately 0.47 Gauss (47 μT), according to the National Geophysical Data Center (2012).

In a study that measured EMF exposure in 1,000 homes in the United States, 50% had average EMF levels of 0.6 mG (0.06 μT) or less, and 95% had average EMF levels below 3 mG (0.3 μT) (Connecticut 2008).

Many everyday electrical objects emit relatively high EMFs when turned on, but the ICNIRP has determined that these items are not responsible for causing health problems (2001). Some of these values exceed the ICNIRP standard, but the devices are still considered safe. Table 4 illustrates the magnitude that some common electrical devices are capable of outputting (EMF-Link 2000).

Table 4. Example EMF Sources

SOURCE	MAGNETIC FIELD 6 INCHES AWAY (μT)
Microwave Oven	30
Mixer	60
Hair Dryer	70
Vacuum Cleaner	70
Can Opener	150

4.4 EMFS AND POWER GENERATION

Of particular relevance to this Project is a research study conducted in Arizona of the EMF generated by two existing 69 kV power substations in the Phoenix area for the Salt River Project. The study evaluated EMF levels within the substation as well as in adjacent residential areas. The study (Ma *et al*. 2011) found that all EMF levels were below both IEEE and ICNIRP recommended levels.

The Environmental Law Centre (Wu, 2005) compiled a relevant review and summary of international precedents related to EMFs and power transmission lines. The document was meant as a quick resource for attorneys; however the document is written in “plain English” and, as such, provides a relatively thorough summary of all regulations around the world.

A study of the ELF EMF exposure in residential settings outside the ROW of power transmission lines in Malaysia (Tukimin *et al.* 2007) documented that the ELF EMF strengths for both electric and magnetic fields were well below ICNIRP recommendations: the maximum field strength that the study observed was less than 60 percent of the ICNIRP standard. Similarly, Rahman *et al.* (2009) documented low electric and magnetic fields at the edge of the ROW for a variety of pole configurations in India.

Similarly, a study of EMF strength in power substations in Egypt (Hossum-Eldin 2010) found that EMF values within the substation were generally at or below the public exposure limit, except immediately around the transformers.

Additionally, a study in Kuwait attempted to simulate the ELF EMF experienced by a car travelling near power transmission lines (Al-Sayegh & Qabazard, 2007). The study stated that the EMF level for a car approximately 200 feet from a 260 MW power transmission line was approximately 70 mG. This level was simulated at the lowest sag of the transmission lines. Note that this level is well under the ICNIRP recommended limit. However, the study did note that additional simulation and refinement of the model were needed.

No research on the EMF levels associated with solar power generation facilities could be found. The technology is relatively new, so less information is available specifically about solar power. However, scientifically speaking, EMFs are generated whenever electricity is involved, regardless of the source. Thus, EMF values for a solar powered facility are expected to be similar to EMF levels for a traditional power generation facility.

5.1 EXPECTED EMF LEVELS

While no EMF studies or simulations of the Project have been conducted, the EMF levels measured at other power generation facilities (see previous section) and other power transmission lines indicate that the Project will not generate EMF levels exceeding ICNIRP levels. However, URS does recommend that one or more of the following be conducted:

1. Prior to building the facility, a simulation of EMF levels within the vicinity of the transmission lines and substation.
2. Once the facility is built and operational, an EMF study of the area, including around solar collection devices, transmission lines, and substations.

5.2 VOLKER COMMENTS

In the comments dated December, 23, 2011, the Law Offices of Stephan C. Volker (Volker) raise several concerns about EMF and the Project. Starting on Page 12 of the document under Section 3.D, Volker makes the comments outlined below. Each comment is followed by a discussion of EMF and the Project relative to the comment.

Issue 1. Volker states that there are "sensitive uses in sufficiently close proximity to the Project site to be harmed by EMF radiation."

Response: First, "sensitive" is a specific, scientific term that refers to facilities and/or people that have a scientific reason for requiring low EMF levels at their locals. This includes, for example, medical facilities with MRI equipment, people with pacemakers, police and fire stations with radio communications, and radio and television transmission facilities. No sensitive receptors are known within the vicinity of the Project. People with pacemakers who might inadvertently be present in the vicinity of the Project can be precluded from approaching EMF sources by administrative controls.

Second, "close proximity" does not take into account the EMF Inverse Square Law (see Appendix A). Thus, the EMF strength at 2 feet is half the value measured at 1 foot. Thus, at 200 feet away from any EMF-transmitting entity within the Project, the EMF strength is expected to be below background EMF levels (EMF levels from natural sources) based on previous research on EMF strength at power generation facilities (see Section 4 above). Because the Project will have a fence around the facility, the general public will be restricted from entry and thus will not be exposed to potentially elevated EMF levels.

Issue 2. Volker states that the County is incorrect in their conclusion that "Because there are not conclusive studies on EMF impacts it's too speculative to evaluate further in this EIR."

Response: The County is correct that no conclusive studies on EMF and human health exist, as evidenced by the ICNIRP studies referenced in Section 4 above, the 2010 ICNIRP report being the most recent and comprehensive. This stance is echoed by the National Cancer Institute (2012). In addition, EMF levels at the Project are expected to be below ICNIRP guidelines, based on previous studies of EMF levels at other power generation facilities and other transmission lines (See Section 4 above).

Issue 3. Volker states that "…the Project would expose numerous agricultural workers, pilots, airport employees and Project workers to EMF."

Response: These people would potentially be exposed to EMF. However, the likelihood that these people would be exposed to levels above ICNIRP limits is low. The reason for this is two-fold:

- EMF levels themselves are not expected to be above ICNIRP limits, based on previous studies of EMF levels at power generation facilities and transmission lines (See Section 4 above).
- EMF levels follow the Inverse Square Law (See Appendix A). Thus, a person working more than 200 feet from a power transmission line is expected to experience only background EMF levels from natural sources.

Issue 4. Volker states, "People and wildlife near the many inverter modules for the Project's photovoltaic panel arrays would be particularly susceptible to harm" and cites several articles.

Response: There are several issues here.

- First, people working near the Project would likely be over 18 years old, and thus adults. Previous research linking EMF to leukemia (ICNIRP, 2010) has found a link only with young children, not adults or teenagers. Therefore, based on all reputable research, the scientists at the ICNIRP have concluded that no link is proven between adult EMF exposure and adverse health effects.
- Second, neither of Volker's example citations addresses the risk of adverse health effects to wildlife. While several studies have been conducted on EMF exposure and wildlife (Lin, 2007; Usman, 2011; Mendes, 2008), no EMF exposure limits for wildlife have been established.
- The issues with the citations themselves are discussed in the next topic.

Issue 5. Volker suggested that the crop dusting airstrip, "located directly adjacent to the Project site, just to the east of Weed Road, between Anza Road and California Route 98," would be exposed to elevated EMF levels.

Response: First, EMFs associated with the Project will be at 60 Hz and low-frequency harmonics. The electrical equipment used for radiocommunications at airfields are in the radiofrequency (RF) portion of the electromagnetic spectrum, and have much higher frequencies than the 60 Hz expected at the Project. Thus, the Project will not interfere with normal airstrip operations. Second, because EMF strength follows the Inverse Square Law (See Appendix A), the EMF of people working at the airstrip is expected to be at or below background levels.

Issue 6. Volker states, "…as to whether the available science shows that EMF exposure is harmful, the DEIR relies on outdated research," and "The County impermissibly ignores more recent EMF research, which shows *significant* EMF health impacts with increasing consistency." Volker goes on to cite a study conducted in 2006, addressed below.

Response: The most current conclusion by the ICNIRP, the leading authority on EMF, was issued in 2010 and stated the following: "… epidemiological studies have consistently found that everyday chronic low-intensity (above 0.3– 0.4 μT) power frequency magnetic field exposure is associated with an increased risk of childhood leukemia. IARC has classified such fields as possibly carcinogenic. However, a causal relationship between magnetic fields and childhood leukemia has not been established nor have any other long term effects been established. The absence of established causality means that this effect cannot be addressed in the basic restrictions." The ICNIRP has not concluded that any other long-term, chronic health effects exist with exposure to EMF. Also note that the magnetic levels necessary for chronic exposure to cause childhood leukemia (above 0.3–0.4 μT) are above the 2010 ICNIRP set limit of 200 μT. Further note that these levels are not expected at the Project based on the magnetic field levels measured at other power facilities.

Issue 7. Volker states, "Furthermore, even though there remains some disagreement over the impacts of EMF, many "authors suggest that [this] . . . should not be cause for inaction. Instead, they argue that the precautionary principle should be applied in order to prevent a recurrence of the 'late lessons from early warnings' scenario that has been repeated throughout history." Id."

Response: Indeed, the principle of the ICNIRP has been to build in "safety factors" to their published guidelines. For example, once the ICNIRP determined the level of EMF strength necessary to observe an effect, such as induction of internal currents, the ICNIRP then applied a reduction factor of 5 as a means of arriving at a precautionary value for occupational exposure. The value was reduced by an additional factor of 5 for public exposure, arriving at the extremely cautious values for EMF restriction discussed in Section 3. Thus, the ICNIRP values already have built-in precautionary levels (ICNIRP, 2010).

5.3 DISCUSSION OF EXHIBITS

All three of the exhibits provided in this commentary are by the same author, Samuel Milham. Mr. Milham has been identified as an "alarmist," conducting studies which lack scientific rigor and border on the unethical (EMF & Health, 2009). Mr. Milham has also served as a witness in at least one lawsuit, but the circuit court struck his testimony, as it was determined that his testimony was not based on scientific evidence (Kane v Motorola Inc, 2002).

5.3.1 Exhibit 4: Attention Deficit Hyperactivity Disorder and Dirty Electricity.

The paper does not follow sound scientific principles, as outlined in Section 4.2.4 above. To wit:

1. No "study" or "control" group was defined. The paper consists of anecdotal evidence presented by the author without any comparison of how the intervention, or lack of intervention, affected a control group. There is no way of knowing if the observed effects are due to the EMF filter, or due to other factors. For example, no explanation was provided as to why only one teacher was complaining of hyperactive children, and not the entire school. Were the behavior problems entirely due to EMF, then logically, the entire school would have been affected, which was not the case.

2. Control of variables was not provided. Therefore, logical conclusions at to whether the effects observed are actually due to the intervention or due to other sources cannot be drawn.

3. No statics, nor any empirical data were presented or collected in the study. The study only reports on the teacher's observations, which are qualitative and anecdotal in nature. The study did not measure, for example, cognitive ability of the students, time on task, or any other metric for determining hyperactivity. Determination as to whether the effects observed are due to the intervention or random chance cannot be accomplished.

The paper then suggested that Amish children did not suffer from ADHD because of the lack of EMF in their lives. Variables were not analyzed to determine if other aspects of the Amish way of life, such as lack of preservatives in the diet, lack of processed foods, lack of food colorings, or other environmental factors were relevant. All scientific conclusions must be based on facts, not conjecture. The paper simply suggested that the lack of ADHD observed in the Amish is due to EMF, and does not collect any data nor present any analysis of data that would lead a scientist to conclude that EMF causes ADHD.

5.3.2 Exhibit 5: Historical Evidence that Electrification Caused the 20th Century Epidemic of "Diseases of Civilization."

The report is based on some faulty assumptions, namely:

1. The author's understanding of "dirty energy" is confused.

    a. "Dirty energy" is a misleading term given to the harmonics of 60 Hz energy, such as 120 Hz or 180 Hz. These harmonic frequencies are normally filtered out in the power distribution process using a band pass filter. Those higher frequencies that may be generated and which human being are exposed to, however, are also covered by the ICNIRP EMF exposure limits (see Table 2). Note that the harmonics of 60 Hz will have substantially lower field strengths compared to the field strength at 60 Hz. This is because the primary frequency is at 60 Hz, and the harmonics are like "echos," which are lower energy. Therefore, EMF levels expected from the harmonics of 60 Hz from this Project will be lower than the strength at 60 Hz, and well below ICNIRP recommended levels.

b. The author states, "Among the many devices which generate the dirty electricity are compact fluorescent light bulbs, halogen lamps, wireless routers, dimmer switches, and other devices using switching power supplies. Any device which interrupts current flow generates dirty electricity." What the author has just described is a resistor, which only slows the flow of electrons: resistors do not alter the frequency at which electricity is delivered. The author may be referring to the inductance fields that are created around a resistor, but these fields are very low strength and would not be measurable more than 1 foot from the device in question.

2. The author's understanding of the electromagnetic (EM) spectrum is incorrect. The author states, "With the exception of a small part of the electromagnetic spectrum from infrared through visible light, ultraviolet light and cosmic rays, the rest of the spectrum is man-made and foreign to human evolutionary experience." In reality, infrared through cosmic rays makes up the bulk of the EM spectrum, not a "small portion." In addition, natural sources of EM in the low frequency and extremely low frequency exist and have always existed, including the Earth's magnetic field, lightning strikes, static electricity, and cosmic sources.

3. The design of the study is inherently flawed. The study compared the mortality rates of people living in urban versus rural environments. The study concluded that people living in urban environments had a higher rate of death than people living in rural environments. This study concluded, however, that the cause of the higher death rate, cancer rate, heart disease rate, and depression rate was due to increased exposure to EMF in urban areas compared to rural areas. The many differences between urban and rural populations, including air pollution, degree of physical activity, diet, amount of sleep, and exposure to sunlight were not considered as variables and evaluated during the study. Therefore, the conclusions of this study are not based on sound scientific principles.

5.3.3 Exhibit 6: A New Electromagnetic Exposure Metric: High Frequency Voltage Transients Associated With Increased Cancer Incidence in Teachers in a California School.

While this report could systematically address the lack of scientific rigor in this paper, other experts have conveniently done this already. Dr. John W. Morgan, an epidemiologist with Region 5 of the California Cancer Registry in Loma Linda, wrote a letter to the editor (2009) of the very same journal that Exhibit 6 was published in, the American Journal of Industrial Medicine, addressing the scientific problems with Exhibit 6. To summarize:

1. The number of cancers and types of cancers were not confirmed by the California Cancer Registry.

2. The data presented in the study was deficient and ambiguous.
3. The date of cancer onset sometimes pre-dated employment at the school district.
4. The number of cancers, types of cancers, and date of cancer onset were incorrect.

Thus, this Exhibit also does not have scientific validity and cannot be used as an authoritative reference on EMF and health.

6.1 CLOSING AND RECOMMENDATIONS

URS has addressed Volker's comments, and specifically discussed the following points:

1. EMF levels are not expected to be above background levels outside the fenced in area of the Project.
2. EMF will not interfere with airport operations.
3. EMF levels within the Project are expected to be below ICNIRP levels.
4. ICNIRP levels already have a safety factor built into the recommended levels for both magnetic and electric fields.

URS has also addressed the Exhibits, and specifically discussed the following points:

1. All three Exhibits are from the same author, Samuel Milham.
2. Mr. Milham's work has serious scientific deficiencies and is not accepted as sound work by the scientific community.

URS has recommended that the Project conduct at least one of the following studies to verify that EMF levels are within existing guidelines:

1. Prior to building the facility, a simulation of EMF levels within the vicinity of the transmission lines and substation should be conducted.
2. Once the facility is built and operational, an EMF study of the area, including around solar collection devices, transmission lines, and substations should be conducted.

We appreciate the opportunity to provide our services. Please contact the undersigned if you have any questions regarding this report.

Sincerely,

Gayle Nicoll, PhD

URS CORPORATION

The opinions and judgments expressed in this EMF Technical Report are based on URS's research and interpretations as detailed in Sections 1 through 6 of this report. The report is limited by the amount and type of information provided to URS by 8minutenergy. These conclusions and recommendations may be subject to change if other factors impact the facility.

Ahlbom, S. A. 2008. Exposure to electromagnetic fields and the risk of childhood leukemia: a review. Radiaition Protection Dosimetry, 132(2), p.202-211.

Al-Sayegh, O., and A. Qabazard. 2007. Artificial Neural Networks to Estimate the EMF ELF on Car Travelling Near Power Transmission Line. Proceedings of the 9th IASTED International Conference, Power and Energy Systems, January 3-5, Clearwater, Florida.

CaEMF, 2012. California EMF Program, available at http://www.ehib.org/emf/about.html, accessed February 9, 2012.

Connecticut Department of Public Health. 2008. Electric and Magnetic Fields: Health Concerns. Fact Sheet. April.

Council Recommendation (1999/519/EC). 1999. On the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz). *Official Journal of the European Communities*, July 12.

EMF & Health. 2009. Bad Science: Samuel Milham. Available at http://www.emfandhealth.com/Samuel%20Milham.html.

EMF-Link. 2000. Information Ventures, Inc. http://infoventures.com/private/federal/q&a/qa-envn2.html . January 12.

Federal Communications Commission (FCC), Office of Engineering & Technology, Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields, OET Bulletin 56, 4th Edition, Audust, 1999.

Frija, G., J. Bittoun, G. Krestin, and D. Norris. 2006. European directive on electromagnetic fields. *European Radiology*. December, Vol. 16 Issue 12, pp. 2886-2889.

Genuis, Stephen J. 2008. Fielding a current idea: exploring the public health impact of electromagnetic radiation. *Public Health*, February, Vol. 122, Issue 2, pp. 113-124.

Hamza, A.H., Shaher A. Mahmoud, N.M. Abdel-Gawad, and Samy M. Ghania. 2005. Evaluation of magnetic induction inside humans at high voltage substations. *Electric Power Systems Research*, May, Vol. 74 Issue 2, pp. 231-237.

Hossam-Eldin, A., A. Farag, I. Madi, and H. Karawia. 2010. Extremely low frequency magnetic field survey in indoor distribution substation in Egypt Source: Proceedings of the Universities Power Engineering Conference, 45th International Universities' Power Engineering Conference, August 31-September 3.

IEEE. 2002. IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0–3 kHz, IEEE Standard C95.6-2002, October.

International Commission on Non-Ionizing Radiation Protection (ICNIRP). 1994. Guidelines on Limits of Exposure to Static Magnetic Fields. *Health Physics Society*, January, 66(1), pp. 100-106.

ICNIRP. 1998. Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (Up to 300 GHz). *Health Physics Society*, April, 74(4), pp. 494-522.

ICNIRP. 2001. Review of the Epidemiologic Literature on EMF and Health. *Environmental Health Perspectives*. December, 109(6), pp. 911-933.

ICNIRP. 2010. Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz - 100 kHz). *Health Physics* 99(6), pp. 818-836.

Kane V. Motorola Inc., 2002. Robert C. KANE and Patricia Kane, Plaintiffs-Appellants, v. MOTOROLA, INC., Thomas Hull, Quirino Balzano, and James Phillips, Defendants-Appellees. No. 1-00-2507, Appellate Court of Illinois,First District, Fourth Division, September 6, 2002. Available at http://caselaw.findlaw.com/il-court-of-appeals/1086252.html.

Kheifets, L., A.A. Afifi, and R. Shimkhada. 2006. Public Health Impact of Extremely Low-Frequency Electromagnetic Fields. *Environmental Health Perspectives*, October, Vol. 114, Issue 10, pp. 1532-1537.

Lin, J. C. 2007. Exposure of pregnant dairy heifers to high-tension power lines. *IEEE Microwave Magazine*, 8(6), p. 100-103, December.

Ma, Yan, George G. Karady, James R. Hunt, and Bryce L. Priest. 2011. Measurement of high voltage substation generated electromagnetic field. Conference: 2011 IEEE PES Trondheim PowerTech: The Power of Technology for a Sustainable Society, June 19-23.

Mendes, L. B.; Li, H.; Xin, H. 2008. Evaluation and calibration of a soil moisture sensor for measuring poultry manure or litter moisture content. American Society of Agricultural and Biological Engineers Annual International Meeting, 8, p .4773-4780.

Morgan, J. W. **2009**. RE: A New Electromagnetic Exposure Metric: High Frequency Voltage Transients Associated With Increased Cancer Incidence in Teachers in a California School, May 28, 2008; 51:579–586 Letter to the Editor, American Journal of Industrial Medicine, 52, p 350-351.

National Cancer Institute. 2012. Magnetic Field Exposure and Cancer: Questions and Answers. Available at http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields.

National Geophysical Data Center (NGDC). 2011. Estimated Values of Magnetic Field Properties. http://www.ngdc.noaa.gov/geomagmodels/struts/igrfGridZipE.

NIEHS. 1998. Working Group Report. Assessment of Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields. Portier, C.; Wolfe, M. Brooklyn Park, Minnesota, June 16-24.

NIEHS. 1999. Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields, Olden, K. NIH Publication No. 99-4493, May 4.

NIEHS. 2002. EMF: Electric and Magnetic Fields Associated with the Use of Electric Power. Questions and Answers. June, http://www.niehs.nih.gov/emfrapid.

Patterson, R. M.; Bracken, T. D.; Sahl, J. ACGIH, Assessing EMF in the Workplace: A Guide for Industrial Hygienists, Publication 9853, 1998.

Rahman, Nazaruddin Abdul, and Wan Norliza B. Mahadi. 2009. Measurements and simulations on ELF-EMF magnetic field exposures from multiple electric transmission lines. *International Journal of Emerging Electric Power Systems,* 10(4).

Raz, Amir. 2006. Ask the Brains. *Scientific American Mind*, Vol. 17 Issue 4, p. 82.

San Segundo, H., and V. Fuster Roig. 2008. Reduction of low voltage power cables electromagnetic field emission in MV/LV substations. *Electric Power Systems Research*, June, Vol. 78 Issue 6, pp. 1080-1088.

Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR). 2008. Possible effects of Electromagnetic Fields (EMF) on Human Health - Opinion of the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR). *Toxicology*, April, Vol. 246, Issue 2/3, pp. 248-250.

Scientific Committee on Toxicity, Ecotoxicity and the Environment (CSTEE). 2001. Opinion on Possible effects of Electromagnetic Fields (EMF), Radio Frequency Fields (RF) and Microwave Radiation on human health, Expressed at the 27th CSTEE plenary meeting, Brussels, October 30.

Selvam, R., K. Ganesan, R. Narayana, A.C. Gangadharan, B.M. Manohar, and R. Puvanakrishnan. 2007. Low frequency and low intensity pulsed electromagnetic field exerts its antiinflammatory effect through restoration of plasma membrane calcium ATPase activity. *Life Sciences*, June, Vol. 80, Issue 26, pp. 2403-2410.

Singh, B.K., R.S. Sharma, R. Ajumeera, and A.K. Mathur. 2008. Electromagnetic Fields in Environment and Its Health Hazards. Proceedings of the International Conference on Microwaves, IEEE 978-1-4244-2690-4444, pp. 558-560.

Tenenbaum, D. J. 2000. A New View of ELF-EMFs: Are They Linked With Cancer-Promotion? *Environmental Health Perspectives*, 108(10), October, A469.

Tikhonova, G.I., N.B. Rubtsova, E.A. Novokhatskaya, and A.V. Tikhonov. 2003. Remote effects of occupational and non-occupational exposure to electromagnetic fields of power-line frequency. *Radiatsionnaya Biologiya*. Radioekologiya, 43(5), pp. 555-558.

Tukimin, R., and W.N.L. Mahadi. 2011. A study of extremely low frequency electromagnetic field (ELF EMF) exposure levels at multi story apartment. IFMBE Proceedings, v. 35, pp. 253-257, 5th Kuala Lumpur International Conference on Biomedical Engineering.

Tukimin, R., W.N.L. Mahadi, M.Y.M. Ali, and M.N.M. Thari. 2007. Extremely Low Frequency Electromagnetic Field (ELF EMF) Survey of Residential Areas Around Transmission Lines. Asia-Pacific Conference on Applied Electromagnetics Proceedings, December 4-6, Melaka, Malaysia.

Usman, A.D.; Wan Ahmad, W.F.; Ab Kadir, M.Z.A.; Mokhtar, M.; Ariffin, R. 2011. Microwave effect of 0.9 GHz and 1.8 GHz CW frequencies exposed to unrestrained Swiss albino mice. *Progress In Electromagnetics Research B*, 36, p. 69-87

World Health Organization (WHO). 2004. Electromagnetic Hypersensitivity. Proceedings, International Workshop on EMF Hypersensitivity, Prague, Czech Republic, October 25-27, editors, Kjell Hansson Mild, Mike Repacholi, Emilie van Deventer, and Paolo Ravazzani.

Wu., N. 2005. Environmental Law Centre, Regulating Power Line EMF Exposure: International Precedents, April 22.

Zorzi, C., C. Dall'Oca, R. Cadossi, and S. Setti. 2007. Effects of pulsed electromagnetic fields on patients' recovery after arthroscopic surgery: prospective, randomized and double-blind study. *Knee Surgery, Sports Traumatology, Arthroscopy*, July, 15(7), pp. 830-834.

9.1 ELECTRIC AND MAGNETIC FIELDS

9.1.1 EMF Basics

Electromagnetic (EM) radiation is a term given to a wide range of invisible waves, including X-rays, ultraviolet light, visible light, radio waves, and microwaves. EM radiation is classified based on either the wavelength, measured in meters, or the frequency (how fast the wave is moving), measured in Hertz (also known as cycles per second).

While a familiar form of EM radiation is visible light, visible light is only one part of the entire EM spectrum. Humans also use other forms within the spectrum (e.g., radio waves for communication, infrared [IR] waves for night-vision goggles, and microwaves for cooking food).

For power transmission lines and substations, frequencies are around 60 Hz, primarily because the alternating current (AC) is generated at 60 Hz. These extremely low frequencies (ELF) are the specific region that this report focuses on. ELF spans from 3 Hz to 3,000 Hz (or 3 kHz).

The distinguishing characteristic of EM radiation is that all EM radiation has two components: an electric field and a magnetic field. These components can be thought of as two separate but related waves, which propagate at 90° to each other.

9.1.1.1 The Link Between Electricity and Magnetism

Electricity and magnetism are inherently linked through EM radiation. Electricity is the motion of electrons. Whenever an electron moves, a magnetic field will also be produced. When electrons move through a wire, the electrons generate both electric and magnetic waves. The opposite is also true: electric fields can be generated by magnets. The electromagnet—making a magnet out of a battery, a nail, and some wire—is an example of this principle.

The electric and magnetic fields are generated at right angles to one another. The electric field and magnetic field generated are inclusively classified as electromagnetic fields (EMFs). Extrapolating this concept out to the flow of electrons through a wire, as the electrons flow, carrying the electricity through the wire, a wave of EMFs are generated in all directions that are perpendicular to the flow of electrons. This results in EMFs arranged concentrically around the wire and emanating outward, as shown in Figure 1.

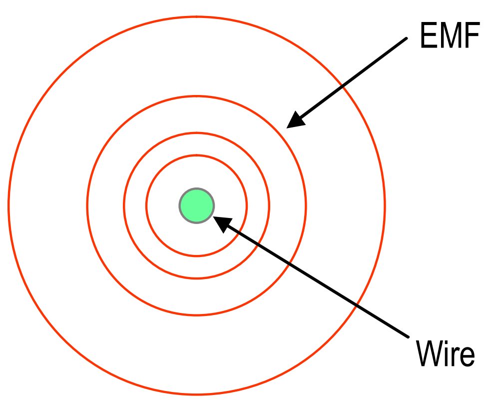

Figure 1: As electrons flow through the wire (out of the page), the EMFs are generated perpendicular to the wire, causing circular planes.

Note that the density of the circles illustrates the strength of the field. The EMF waves emanate out in all directions from the wire, dissipating as the EMF waves move farther away from the wire. Note that the wire itself does not move, although the electrons within the wire do move. As a result, the EMFs associated with the electric current extend the entire length of the wire. The EMF field strength is highest closest to the wire and drops off as a function of the inverse of the square of the distance , called the Inverse Square Law, or $1/r^2$. Thus, the EMF field strength at 2 feet away from the wire is one-quarter of the strength at 1 foot away from the wire.

Note that this is a simplified case for one wire in space. When multiple wires, or other EMF generating sources, are involved, the EMFs generated from each source can interact with each other. The interactions can be either additive, creating larger EMFs, or subtractive, cancelling each other out all or part of the way. Figure 2 illustrates this principle with a simple example of two sinusoidal waves. When the two waves are "in phase," which means that their peaks and troughs line up, the waves add together, and the result is a larger wave. Conversely, when the waves are "out of phase," which means the peaks and troughs are out of alignment, the waves cancel each other out. In most cases, the waves do not exactly overlap as in Figure 2, and the result is an EMF with a complex wave function.

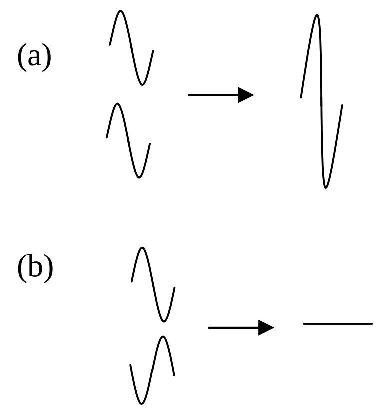

Figure 2: Simplified representation of EMF interactions. (a) Two sinusoidal waves adding together. (b) Two sinusoidal waves cancelling each other out.

Since electricity and magnetism are inherently related, the stronger the electrical current, the stronger the magnetic field. The larger the amount of current, the larger the magnitude of EMFs generated. EMF strength is also proportional to proximity: the closer to the source of the EMFs, the stronger the EMF field.

9.2 MEASURING EMFS

EMFs can be measured in a variety of ways. For a given electric field of strength **E**, the electric field exerts a force on an electric charge. This force is expressed in Volts per meter (V/m). Likewise, magnetic fields can exert a force on a moving electric charge. The magnetic field can be described in two ways: as a magnetic flux density, **B** (expressed in units of Tesla or Gauss), or as a magnetic field strength, **H** (expressed in units of Amps per meter [A/m]).

TESLA (T)	**GAUSS (G)**
1	1 x 10^4

In most EMF studies, the magnetic flux density, **B**, is measured using a special type of detector, called a Gauss meter. The Gauss meter works on the same principles just described, only backwards: the magnetic field induces an electric current in the detector, which is directly proportional to the strength of the field. The strength of the EMF can thus be calculated. Measurements on the Gauss meter are reported in Gauss or Tesla. For conversion purposes, 1 Tesla (T) is equal to 1 x 10^4 Gauss (G). Typically, magnetic fields in the literature are reported in either milliGauss (mG) or microTesla (μT), where 1 G = 1 x 10^3 mG and 1 T = 1 x 10^6 μT.

Within this context, many different instruments are available for measuring the magnetic field of an EMF. These detectors usually have been calibrated for a specific set of frequencies.

Similarly, electric (E) fields are measured in Volts per meter (V/m). While there are a few variations on how electric fields can be detected, the equipment usually consists of an antenna or a series of antennae, which measure the strength of the electric field as a function of frequency.

When the antenna is mounted on a tripod and connected to a detection device, the electric field of an electromagnetic wave induces a voltage in the antenna, which is transferred through a cable to the detector. The induced voltage depends on the electrical field and the conductor length.

APPENDIX D

Preliminary Geotechnical and GeoHazards Report

Preliminary Geotechnical and GeoHazards Report

Mount Signal Solar Farm
Brockman and Ferrell Roads at Anza Road
Calexico, California

Prepared for:

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Mr. Tom Buttgenbach
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Preliminary Geological and Geotechnical Hazard Evaluation
Mount Signal Solar Farm
Brockman and Anza Roads and Ferrell and Anza Roads
Calexico, California
LCI Project No. LE10161

Dear Mr. Buttgenbach:

This preliminary geotechnical report and geologic hazards study is provided for preliminary site evaluation and permitting of the photo-voltaic solar farm located on two separate parcels located on both sides of Brockman Road at Anza Road and on both sides of Ferrell Road at Anza Road approximately 5 miles west of Calexico, California.

Scope of Work

The scope of work consisted of a geologic and geotechnical hazards evaluation of the project site which addresses the following items:

1. Site location in relation to mapped earthquake faults and seismic zones.
2. Review of published geologic literature and maps.
3. Intensity of ground shaking at the site determined by probabilistic methods (10% probability of occurrence in 50 years).
4. Potential for liquefaction, ground failure, and landslides at the site.
5. Potential for expansive soil hazards at the site including methods for mitigation.
6. Potential for flooding at the site from man-made facilities (dams, canals, etc.) and from natural storms.
7. Ability of site soils to support individual or community sewage disposal system leach fields.

Site Description

The project site is composed of western parcels and eastern parcels. The western parcels are comprised of two (2) agricultural fields (a 160-acre parcel located at the northeast corner of Pulliam and Anza Roads and a 320-acre parcel located at the northeast corner of Brockman and Anza Roads) that are currently in crop production. The 160-acre parcel is square and the 320-acre parcel is rectangular.

The eastern parcels are comprised of several agricultural fields (a 515-acre parcel located at the northwest corner of Ferrell and Anza Roads and a 380-acre parcel located on the east side of Ferrell Road at Anza Road) that are currently in crop production. Both parcels are irregular in plan view.

Agricultural fields are located around the perimeter of each of the project parcels. Dirt field roads are located along the margins and also cross the parcels. The adjacent properties are approximately the same elevation as the project sites. The International Border with the Republic of Mexico is located south of the project site.

Site Geological Conditions

Site Geology: The project site is located in the Imperial Valley portion of the Salton Trough physiographic province. The Salton Trough is a topographic and geologic structural depression resulting from large scale regional faulting. The trough is bounded on the northeast by the San Andreas Fault and Chocolate Mountains and the southwest by the Peninsular Range and faults of the San Jacinto Fault Zone. The Salton Trough represents the northward extension of the Gulf of California, containing both marine and non-marine sediments since the Miocene Epoch. Tectonic activity that formed the trough continues at a high rate as evidenced by deformed young sedimentary deposits and high levels of seismicity. Figure 1 shows the location of the site in relation to regional faults and physiographic features.

The Imperial Valley is directly underlain by lacustrine deposits, which consist of interbedded lenticular and tabular silt, sand, and clay. The Late Pleistocene to Holocene lake deposits are probably less than 100 feet thick and derived from periodic flooding of the Colorado River which intermittently formed a fresh water lake (Lake Cahuilla).

Older deposits consist of Miocene to Pleistocene non-marine and marine sediments deposited during intrusions of the Gulf of California. Basement rock consisting of Mesozoic granite and Paleozoic metamorphic rocks are estimated to exist at depths between 15,000 - 20,000 feet.

Based on Unified Soil Classification System, the permeability of these soils is expected to be low to very low.

Groundwater: The groundwater in the site area is brackish and typically encountered at a depth of 5 to 10 feet below ground surface in the vicinity of the project site. There is uncertainty in the accuracy of short-term water level measurements, particularly in fine-grained soil. Groundwater levels may fluctuate with precipitation, irrigation of adjacent properties, drainage, and site grading. The groundwater level noted should not be interpreted to represent an accurate or permanent condition.

Onsite Wastewater Disposal: The near surface soils at the project site generally consist of silty clays and clays having a very low to low infiltration rate. The near surface soils are considered poor in supporting onsite septic systems and leach fields for wastewater disposal. Site specific studies will be required to determine that state health standards are met in regard to soil percolation rates and separation of leach fields from groundwater.

Geological Hazards

Landsliding: The hazard of landsliding is unlikely due to the relatively planar topography of the project site. No ancient landslides are shown on geologic maps of the region and no indications of landslides were observed during our site investigation.

Volcanic hazards: The site is not located proximal to any known volcanically active area and the risk of volcanic hazards is considered very low.

Tsunamis, seiches, and flooding: The site does not lie near any large bodies of water, so the threat of tsunami, seiches, or other seismically-induced flooding is considered unlikely. The All American Canal is located south of the project site (abuts the eastern-most parcel). The water level in the All American Canal is at or slightly below the site elevation.

Expansive soil: In general, much of the near surface soils within the project site consist of silty clays and clays having a high to very high expansion potential. The clay is expansive when wetted and can shrink with moisture loss (drying). Development of building foundations, concrete flatwork, and asphaltic concrete pavements should include provisions for mitigating potential swelling forces and reduction in soil strength, which can occur from saturation of the soil.

Liquefaction/Seismic Settlements: Liquefaction is a potential design consideration because of possible saturated sandy substrata underlying the site. Liquefaction occurs when granular soil below the water table is subjected to vibratory motions, such as produced by earthquakes. With strong ground shaking, an increase in pore water pressure develops as the soil tends to reduce in volume. If the increase in pore water pressure is sufficient to reduce the vertical effective stress (suspending the soil particles in water), the soil strength decreases and the soil behaves as a liquid (similar to quicksand). Liquefaction can produce excessive settlement, ground rupture, lateral spreading, or failure of shallow bearing foundations.

Four conditions are generally required for liquefaction to occur:

(1) the soil must be saturated (relatively shallow groundwater);
(2) the soil must be loosely packed (low to medium relative density);
(3) the soil must be relatively cohesionless (not clayey); and
(4) groundshaking of sufficient intensity must occur to function as a trigger mechanism.

All of these conditions may exist to some degree at this site.

Seismic Hazards

The project site is located in the seismically active Imperial Valley of southern California and is considered likely to be subjected to moderate to strong ground motion from earthquakes in the region.

Groundshaking. The primary seismic hazard at the project site is the potential for strong groundshaking during earthquakes along the Imperial, Brawley, Laguna Salada, Cerro Prieto, and Superstition Hills Faults (Figure 1).

Deterministic horizontal peak ground accelerations (PGA) from maximum probable earthquakes on regional faults have been estimated and are included in Table 1.

Ground motions are dependent primarily on the earthquake magnitude and distance to the seismogenic (rupture) zone. Accelerations also are dependent upon attenuation by rock and soil deposits, direction of rupture and type of fault; therefore, ground motions may vary considerably in the same general area.

The computer program FRISKSP (Blake, 2000) was used to obtain the probabilistic estimate of the site PGA using the attenuation relationship NEHRP D 250 of Boore, Joyner, and Fumal (1997). The PGA estimate for the Design Basis Earthquake (DBE), defined as an event having a 10% probability of being exceeded in 50 years (return period of 475 years) was estimated to be **0.47g**. The PGA estimate for the Maximum Considered Earthquake (MCE), which was defined as an event having a 2% probability of being exceeded in 50 years (return period of 2,500 years), was estimated to be **0.68g**.

2007 CBC (2006 IBC) Seismic Response Parameters: The 2007 California Building Code (CBC) seismic parameters are based on the Maximum Considered Earthquake for a ground motion with a 2% probability of occurrence in 50 years. This follows the methodology of the 2006 International Building Code (IBC). Table 2 lists the site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters given in Chapter 16 of the CBC. The site soils have been classified as Site Class D (stiff soil profile). Design earthquake ground motions are defined as the earthquake ground motions that are two-thirds (2/3) of the corresponding MCE ground motions. Design earthquake ground motion data are provided in Table 2.

Because the project site is within 10 km of an active fault, a site-specific ground motion hazard analysis was prepared in accordance with the 2007 CBC Section 1614A.1.2 (Table 3 and Figure 2). The determination of the site specific ground motions was performed in conformance with the guidelines outlined in ASCE 7-05 Section 21 (21.2.1, 21.2.2, and 21.3).

Surface Rupture: The project site does not lie within a State of California, Alquist-Priolo Earthquake Fault Zone. Surface fault rupture at the project site is considered to be low. Ground failures (lateral spreading) were noted along the embankments of the All American Canal after the April 4, 2010 magnitude $7.2M_w$ El Mayor-Cucapah earthquake.

Other Hazards

Hazardous Materials: The site is not located in proximity to any known hazardous materials (methane gas, tar seeps, hydrogen sulfide gas), and the risk of hazardous materials is considered very low.

Radon 222 Gas: Radon gas is not believed to be a potential hazard at the site. A report titled "California Statewide Radon Survey-Screening Results", dated November 1990 and published by the California State Department of Health Services, notes that Southern California showed a low risk of elevated radon levels, based on 2-day tests conducted from January through April 1990. Some of the reported testing was performed in Imperial County; however, no data was observed as being at or near the project site.

Naturally occurring asbestos: The site is not located in proximity to any known naturally occurring asbestos, and the risk of naturally occurring asbestos is considered very low.

Hydrocollapse: The site is dominantly underlain by clays that are not expected ocollapse with the addition of water to the site. The risk of hydrocollapse is considered very low.

Regional Subsidence: Regional subsidence has not been documented in the area west of Calexico; therefore, the risk of regional subsidence is considered low.

Conclusion

This preliminary report was prepared according to the generally accepted *geotechnical engineering standards of practice* that existed in Imperial County at the time the report was prepared. No express or implied warranties are made in connection with our services.

Our research did not reveal conditions that would preclude implementation of the proposed project provided site specific geotechnical investigations are conducted prior to site development to provide recommendations for the design and construction of this project.

Sincerely Yours;
Landmark Consultants, Inc.

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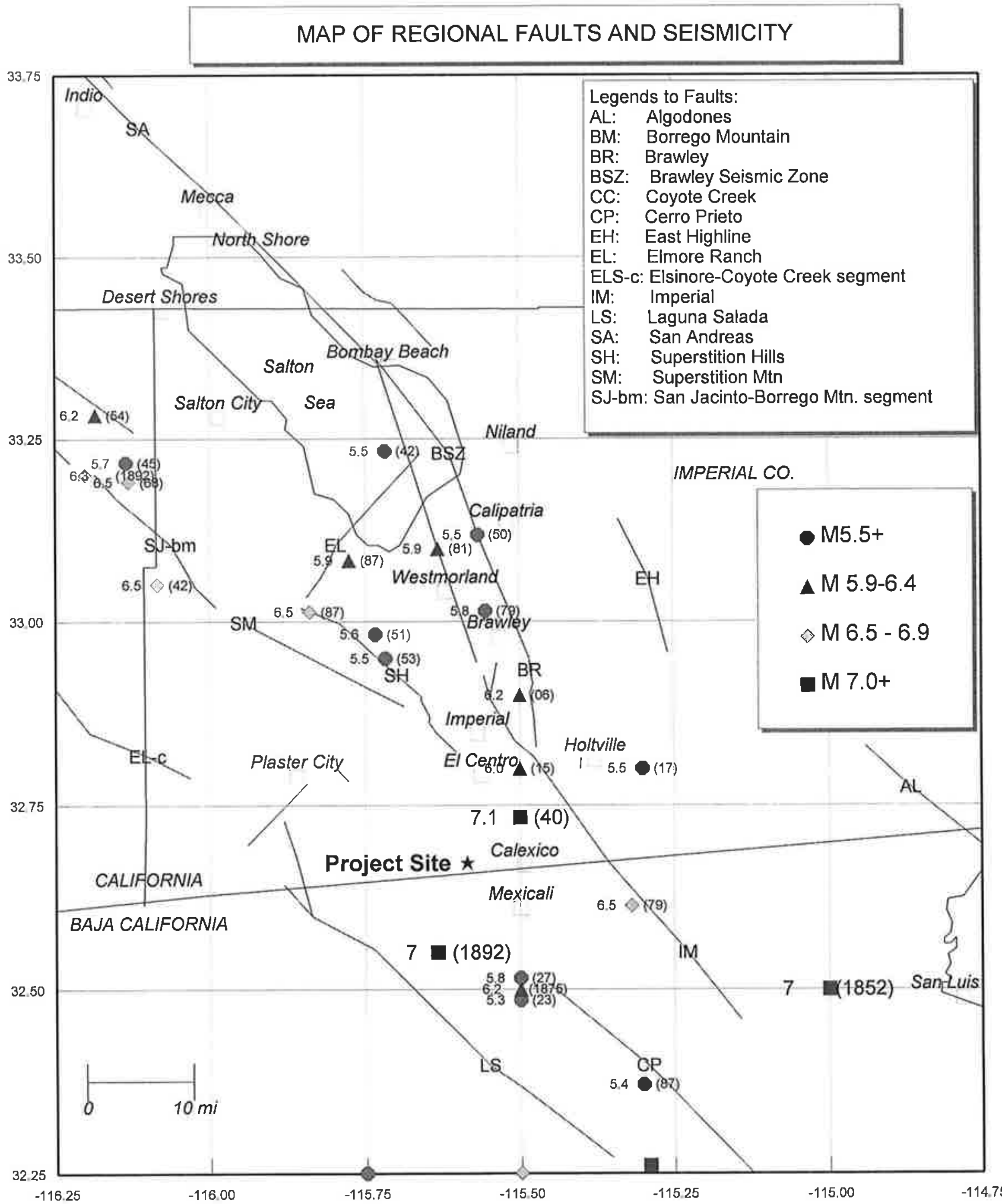


Faults and Seismic Zones from Jennings (1994), Earthquakes modified from Ellsworth (1990) catalog.

Figure 1. Map of Regional Faults and Seismicity

Table 1
FAULT PARAMETERS & DETERMINISTIC ESTIMATES OF PEAK GROUND ACCELERATION (PGA)

Fault Name or Seismic Zone	Distance (mi) & Direction from Site		Fault Type		Fault Length (km)	Maximum Magnitude Mmax (Mw)	Avg Slip Rate (mm/yr)	Avg Return Period (yrs)	Date of Last Rupture (year)	Largest Historic Event >5.5M	(year)	Est. Site PGA (g)
Reference Notes: (1)			(2)	(3)	(2)	(4)	(3)	(3)	(3)	(5)		(6)
Imperial Valley Faults												
Imperial	11	NE	A	B	62	**7.0**	20	79	1979	7.0	1940	**0.24**
Brawley	13	NE	B	B	14	**7.0**	20	---	1979	5.8	1979	**0.22**
Cerro Prieto	14	SE	A	B	116	**7.2**	34	50	1980	7.1	1934	**0.23**
Brawley Seismic Zone	19	N	B	B	42	**6.4**	25	24		5.9	1981	**0.12**
East Highline Canal	27	NE	C	C	22	**6.3**	1	774				**0.08**
San Jacinto Fault System												
- Superstition Hills	10	N	B	A	22	**6.6**	4	250	1987	6.5	1987	**0.20**
- Superstition Mtn.	16	NNW	B	A	23	**6.6**	5	500	1440 +/-			**0.15**
- Elmore Ranch	29	NW	B	A	29	**6.6**	1	225	1987	5.9	1987	**0.09**
- Borrego Mtn	33	NW	B	A	29	**6.6**	4	175		6.5	1942	**0.09**
- Anza Segment	51	NW	A	A	90	**7.2**	12	250	1918	6.8	1918	**0.08**
- Coyote Creek	53	NW	B	A	40	**6.8**	4	175	1968	6.5	1968	**0.07**
- Whole Zone	16	NNW	A	A	245	**7.5**	---	---				**0.24**
Elsinore Fault System												
- Laguna Salada	12	SW	B	B	67	**7.0**	3.5	336		7.0	1891	**0.23**
- Coyote Segment	27	WNW	B	A	38	**6.8**	4	625				**0.11**
- Julian Segment	53	WNW	A	A	75	**7.1**	5	340				**0.08**
- Earthquake Valley	56	WNW	B	A	20	**6.5**	2	351				**0.05**
- Whole Zone	27	WNW	A	A	250	**7.5**	---	---				**0.16**
San Andreas Fault System												
- Coachella Valley	48	NNW	A	A	95	**7.4**	25	220	1690+/-	6.5	1948	**0.10**
- Whole S. Calif. Zone	48	NNW	A	A	458	**7.9**	---	---	1857	7.8	1857	**0.13**
Algodones	39	ENE	C	C	74	**7.0**	0.1	20,000				**0.09**

Notes:

1. Jennings (1994) and CDMG (1996)
2. CDMG (1996), where Type A faults -- slip rate >5 mm/yr and well constrained paleoseismic data
   Type B faults -- all other faults.
3. WGCEP (1995)
4. CDMG (1996) based on Wells & Coppersmith (1994)
5. Ellsworth Catalog in USGS PP 1515 (1990) and USBR (1976), Mw = moment magnitude,
6. The deterministic estimates of the Site PGA are based on the attenuation relationship of:
   Boore, Joyner, Fumal (1997)

Table 2
2007 California Building Code (CBC) and ASCE 7-05 Seismic Parameters

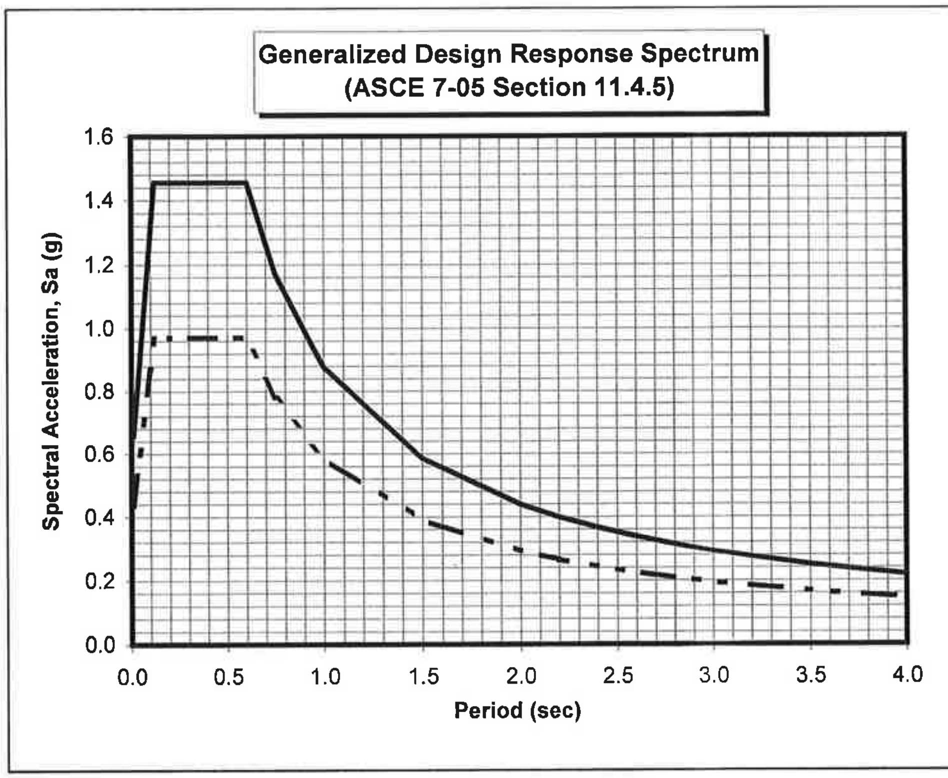
		IBC Reference
Site Class:	**D**	Table 1613.5.2
Latitude:	32.6720 N	
Longitude:	-115.586 W	

Maximum Considered Earthquake (MCE) Ground Motion

Short Period Spectral Response	S_s	1.46 g	Figure 1613.5(3)
1 second Spectral Response	S_1	0.59 g	Figure 1613.5(4)
Site Coefficient	F_a	1.00	Table 1613.5.3 (1)
Site Coefficient	F_v	1.50	Table 1613.5.3 (2)
Adjusted Short Period Spectral Response	S_{MS}	1.46 g	$= F_a * S_s$
Adjusted 1 second Spectral Response	S_{M1}	0.88 g	$= F_v * S_1$

Design Earthquake Ground Motion

Short Period Spectral Response	S_{DS}	0.97 g	$= 2/3*S_{MS}$
1 second Spectral Response	S_{D1}	0.59 g	$= 2/3*S_{M1}$
	To	0.12 sec	$=0.2*S_{D1}/S_{DS}$
	Ts	0.60 sec	$=S_{D1}/S_{DS}$



2007 CBC

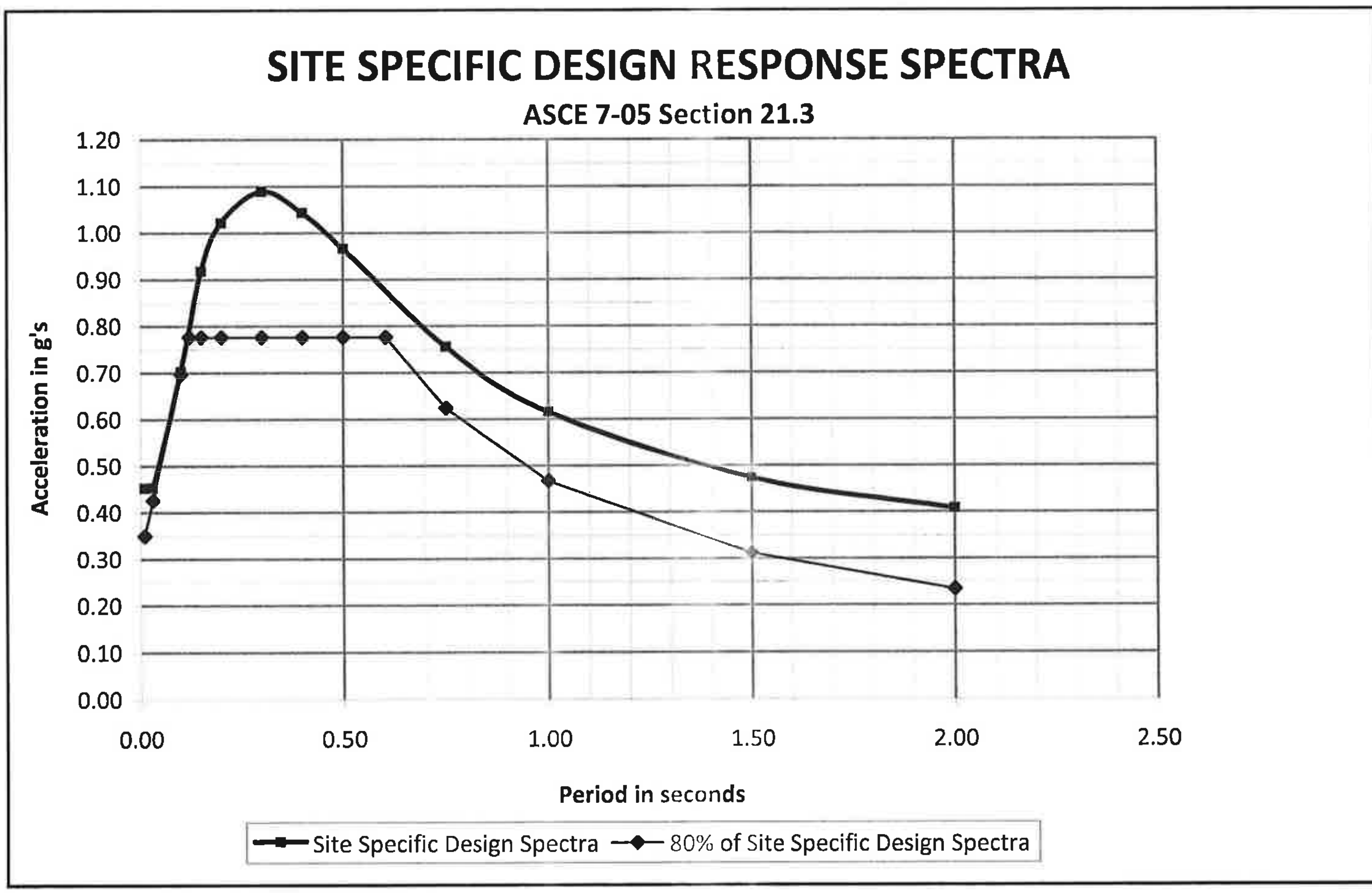
Period T (sec)	Sa (g)	MCE Sa (g)	80% Sa (g)
0.01	0.44	0.65	0.35
0.03	0.53	0.80	0.43
0.10	0.87	1.31	0.70
0.12	0.97	1.46	0.78
0.15	0.97	1.46	0.78
0.20	0.97	1.46	0.78
0.30	0.97	1.46	0.78
0.40	0.97	1.46	0.78
0.50	0.97	1.46	0.78
0.60	0.97	1.46	0.78
0.75	0.78	1.17	0.62
1.00	0.59	0.88	0.47
1.50	0.39	0.59	0.31
2.00	0.29	0.44	0.23
2.20	0.27	0.40	0.21
2.40	0.24	0.37	0.20
2.60	0.23	0.34	0.18
2.80	0.21	0.31	0.17
3.00	0.20	0.29	0.16
3.50	0.17	0.25	0.13
4.00	0.15	0.22	0.12

— · · — · · — Design Response Spectra
——— MCE Response Spectra

SITE SPECIFIC GROUND MOTION
Table 3

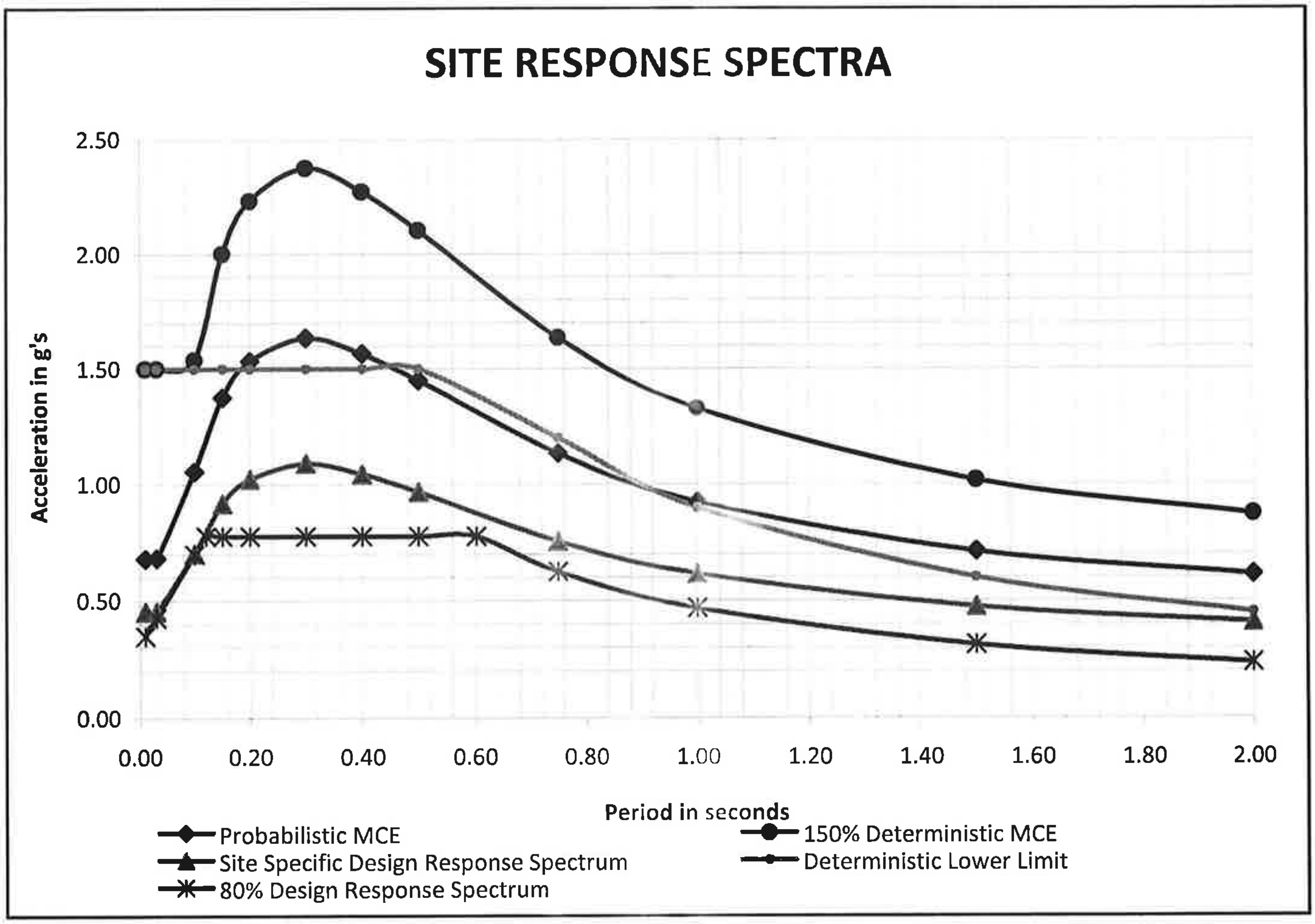
PSHA MCE 2% in 50 years		DETERMINISTIC MCE			DETERMINISTIC LOWER LIMIT		DESIGN RESPONSE SPECTRUM	
Period sec	S_{aM} g's	Period sec	S_{aM} g's	150%S_{aM} g's	Period sec	S_{aM} g's	Period sec	S_a g's
0.01	0.68	0.01	0.66	1.50	0.01	1.50	0.01	0.45
0.03	0.68	0.03	0.66	1.50	0.03	1.50	0.03	0.45
0.10	1.05	0.10	1.03	1.54	0.10	1.50	0.10	0.70
0.15	1.38	0.15	1.33	2.00	0.15	1.50	0.15	0.92
0.20	1.53	0.20	1.49	2.23	0.20	1.50	0.20	1.02
0.30	1.63	0.30	1.58	2.38	0.30	1.50	0.30	1.09
0.40	1.57	0.40	1.51	2.27	0.40	1.50	0.40	1.04
0.50	1.45	0.50	1.40	2.10	0.50	1.50	0.50	0.97
0.75	1.13	0.75	1.09	1.64	0.75	1.20	0.75	0.76
1.00	0.92	1.00	0.89	1.33	1.00	0.90	1.00	0.62
1.50	0.71	1.50	0.68	1.02	1.50	0.60	1.50	0.47
2.00	0.61	2.00	0.58	0.87	2.00	0.45	2.00	0.41

Figure 2. Site specific design response spectra



SITE SPECIFIC DESIGN ACCELERATION PARAMETERS (ASCE 7-05 Section 21.4)			
Short Period Spectral Response (S_{DS})	1.02	Adjusted Short Period Spectral Response (S_{MS})	1.53
1 second Spectral Response (S_{D1})	0.82	Adjusted 1 second Spectral Response (S_{M1})	1.22

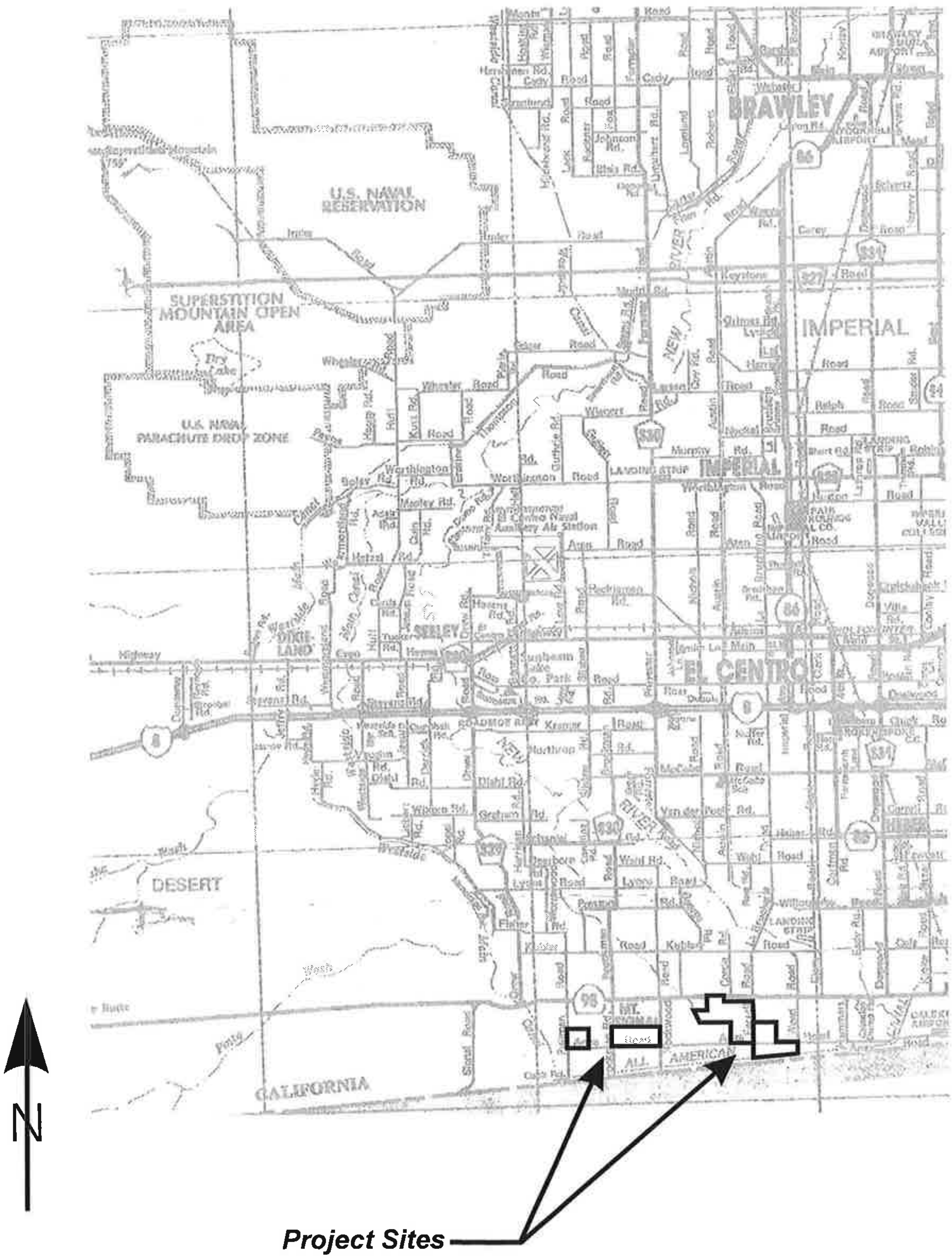
Figure 3. Ground motion hazard analysis



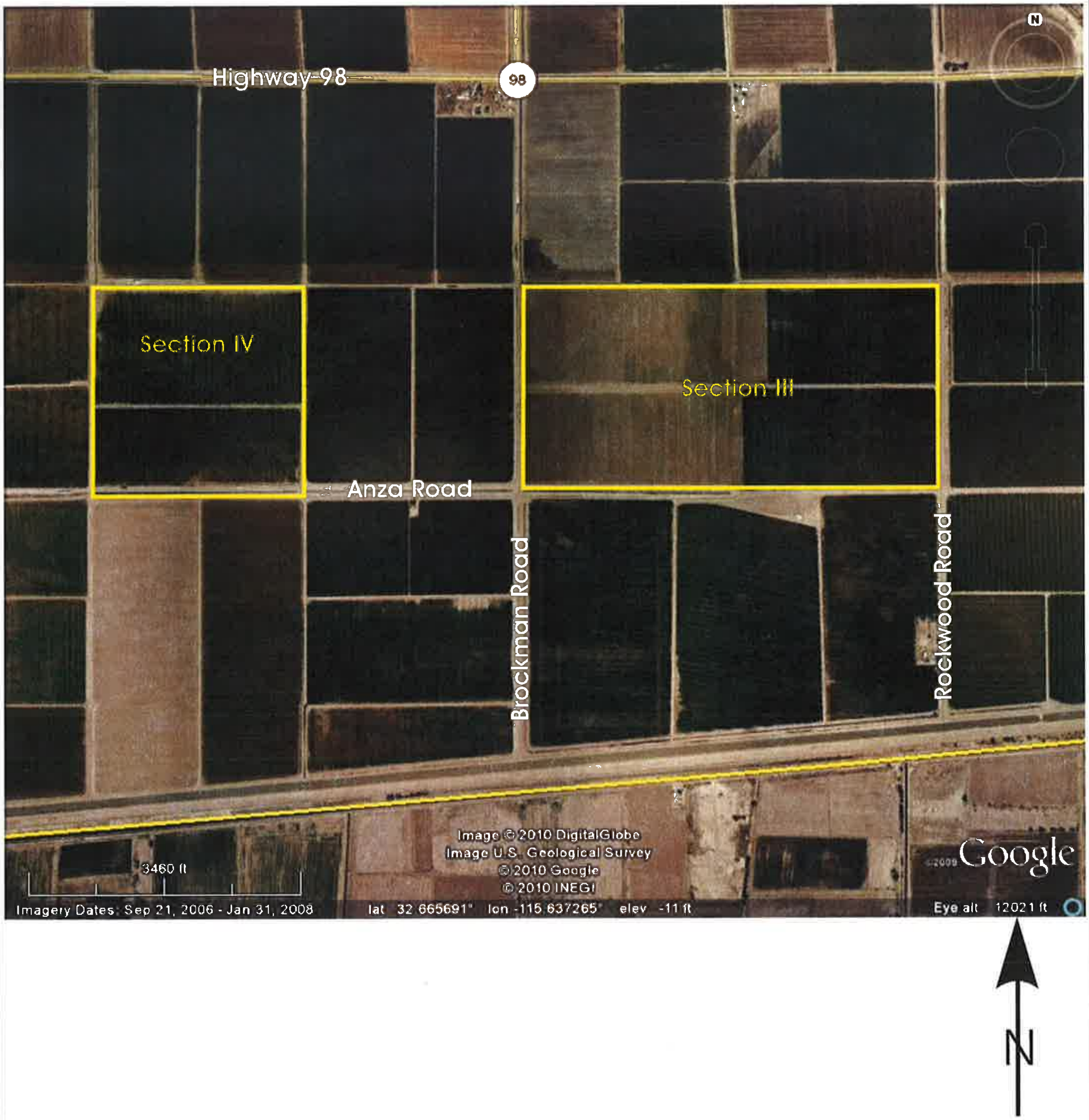
REFERENCES

PROBABILISTIC MCE	2% in 50 years (2,500 year Return Period) ASCE 7-05 Section 21.2.1
150% DETERMINISTIC MCE	150% Sam of Maximum Considered Earthquake ASCE 7-05 Section 21.2.2
DETERMINISTIC LOWER LIMIT	Lower Limit Deterministic ASCE 7-05 Section 21.2.2
DESIGN RESPONSE SPECTRUM	ASCE 7-05 Section 21.2.3 and 21.3
80% GENERAL PROCEDURE SPECTRUM	80% Sa 2007 CBC and ASCE 7-05 Section 21.3

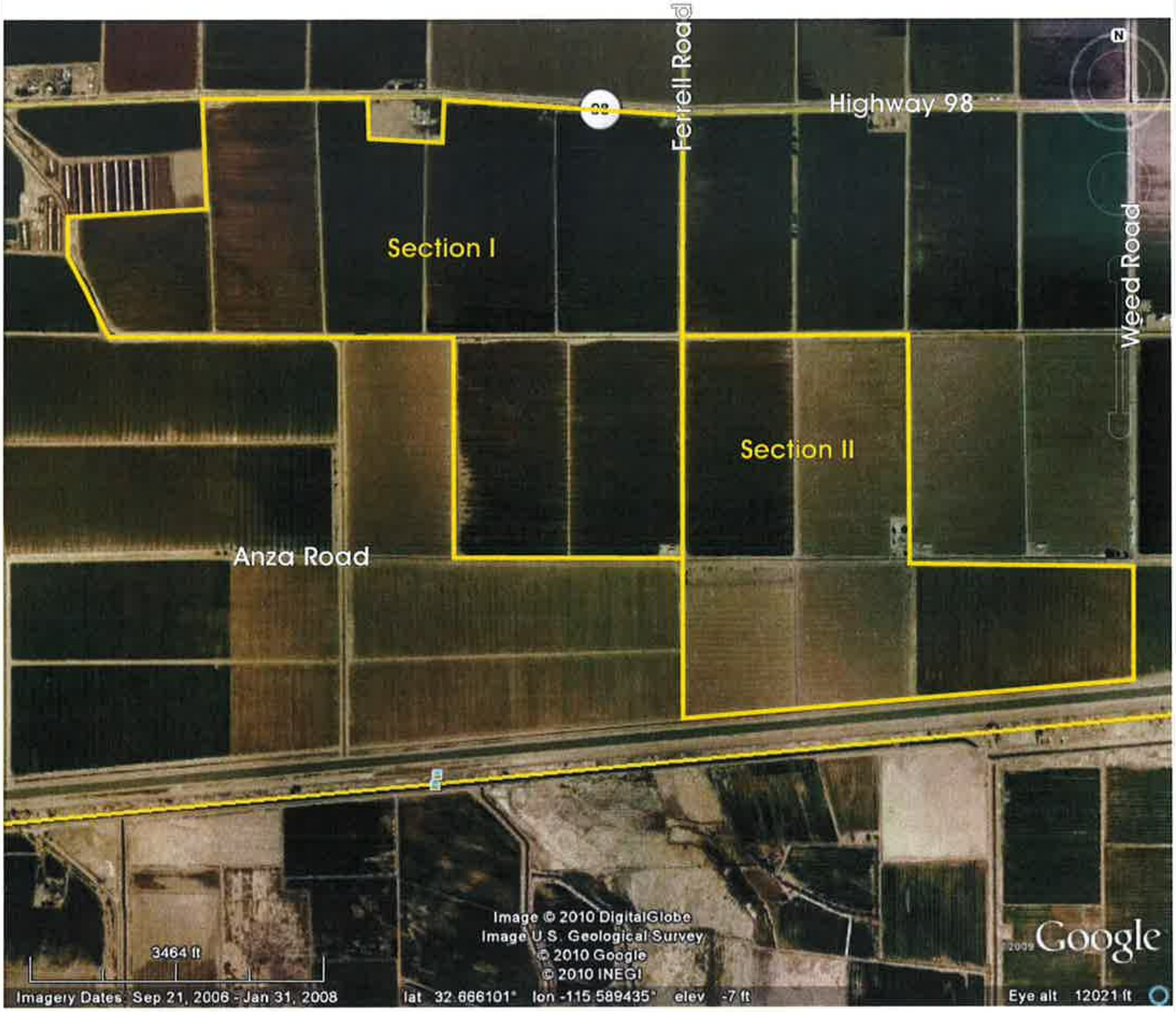
APPENDIX A



LANDMARK Geo-Engineers and Geologists Project No.: LE10161	Vicinity Map	Plate A-1



LANDMARK Geo-Engineers and Geologists **Project No.: LE10161**	**Site Map**	**Plate** **A-2a**



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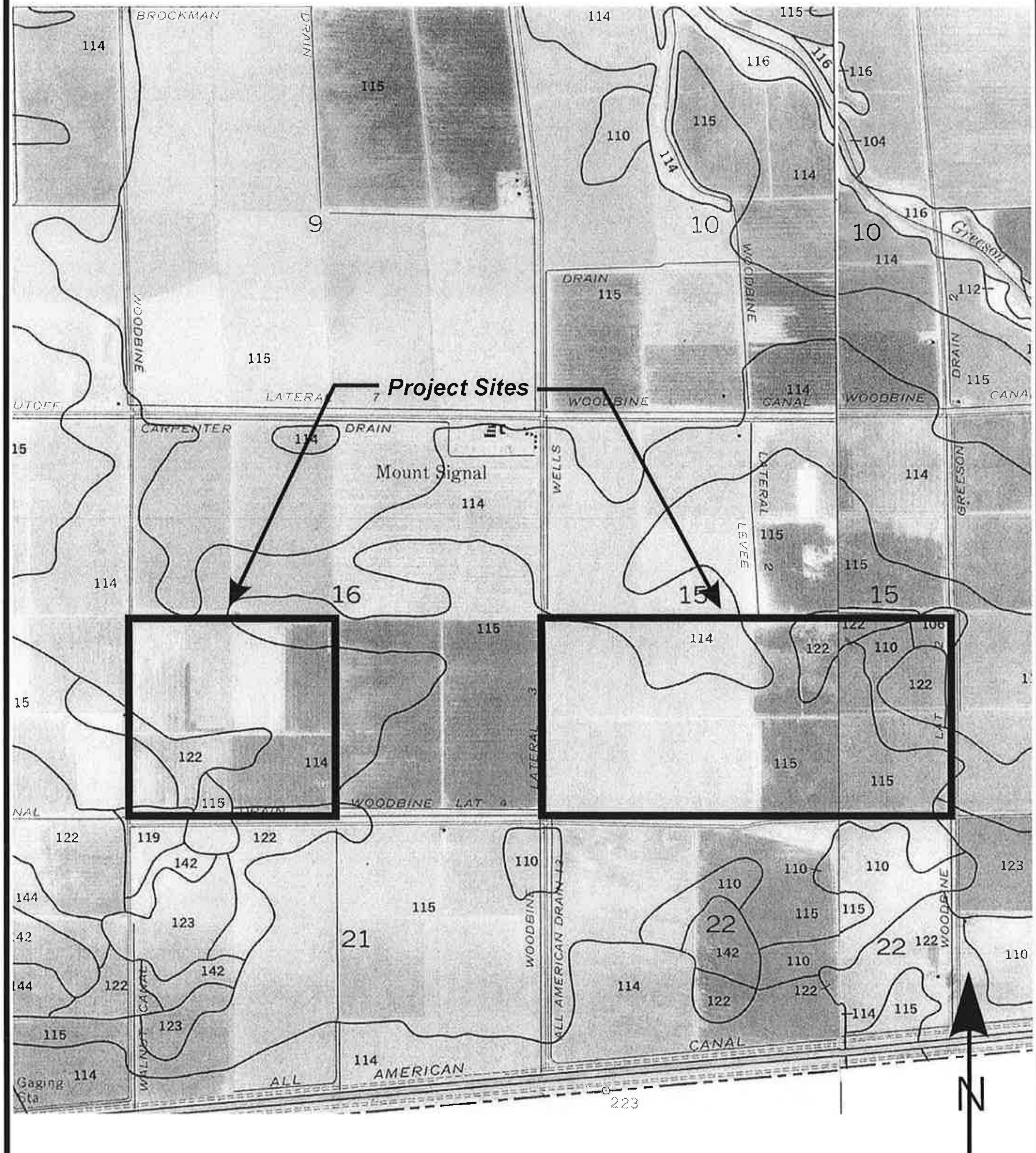
Site Map

Plate A-2b



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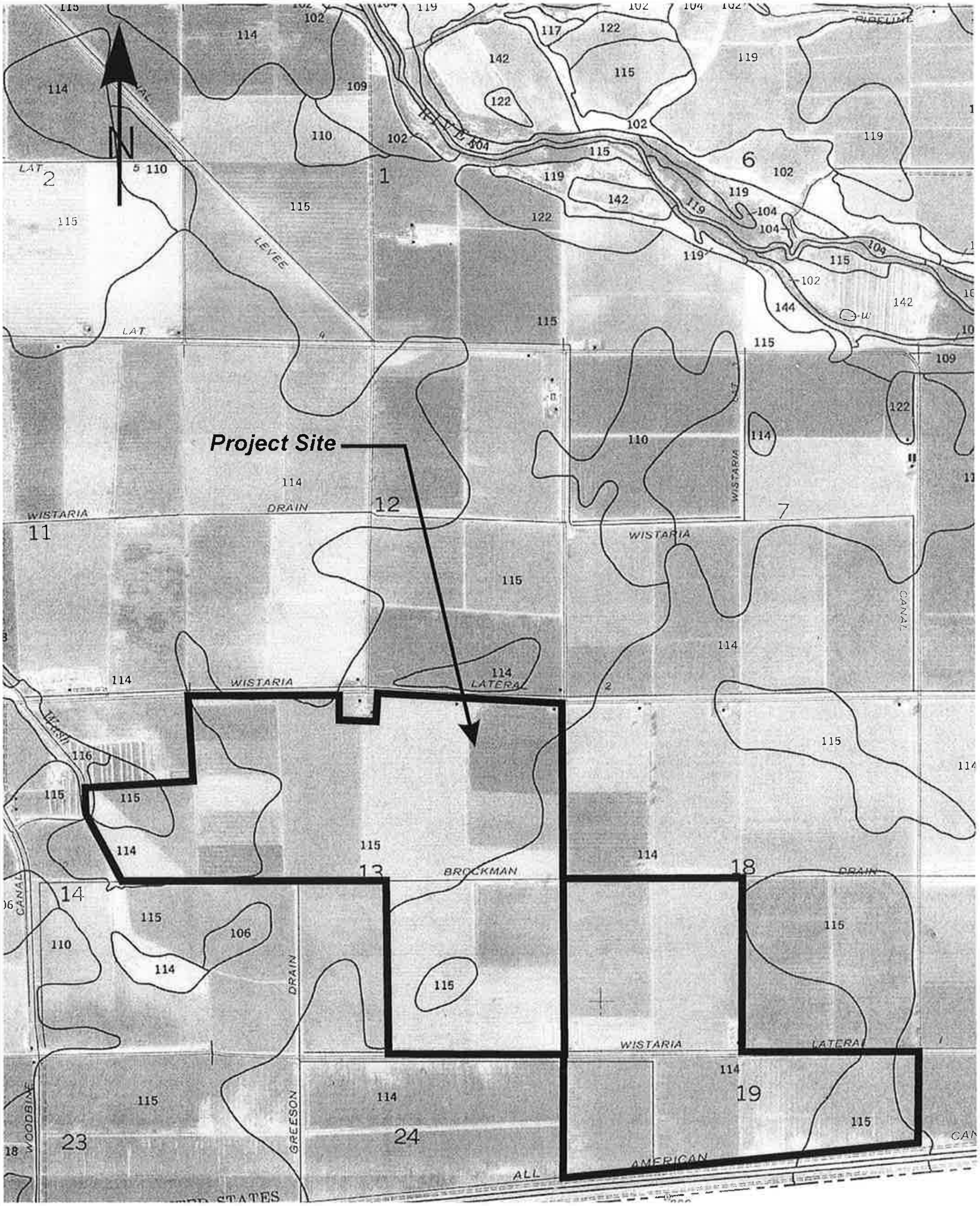
Soil Survey Map

Plate A-3a



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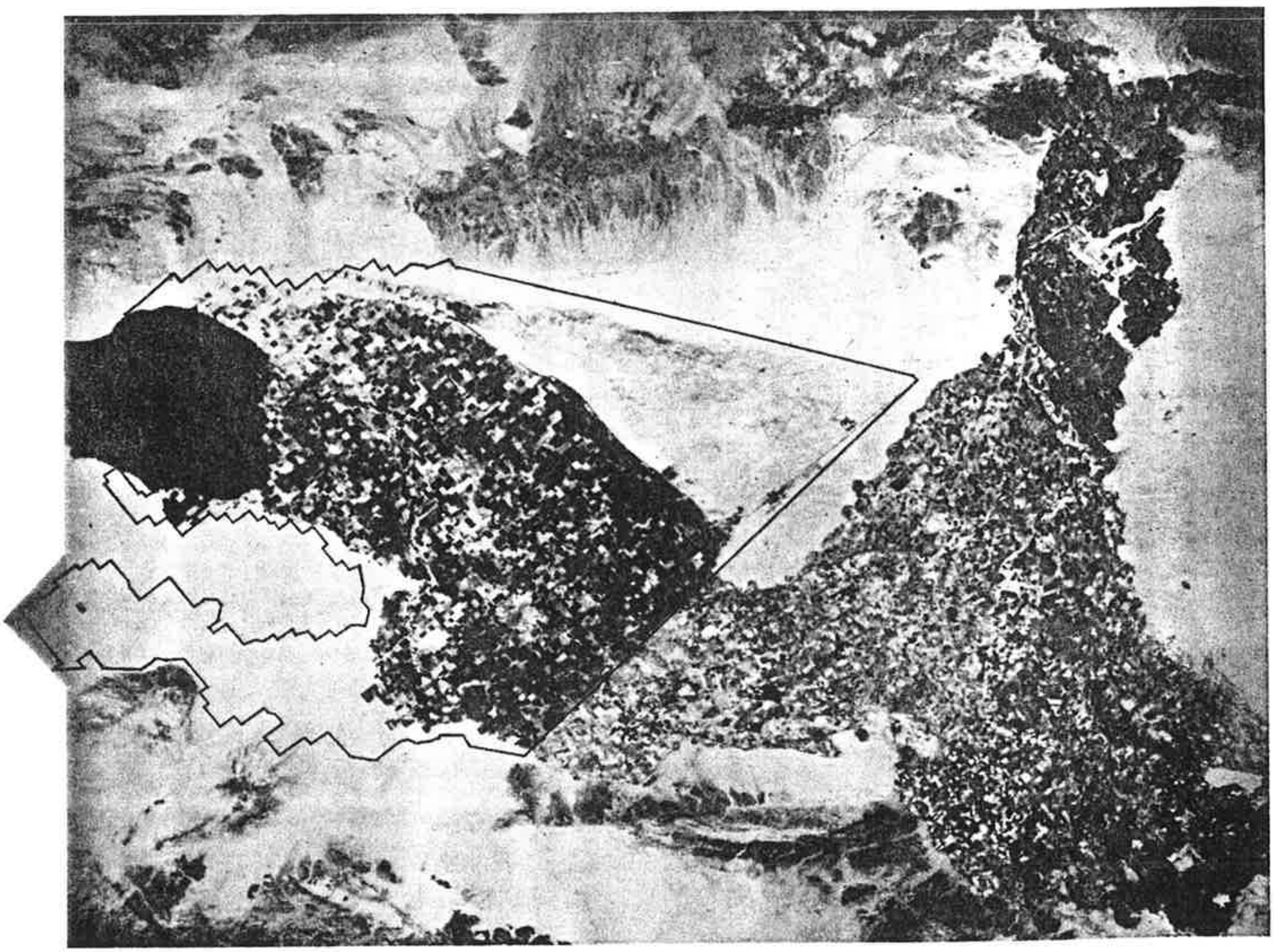
Soil Survey Map

Plate
A-3b

Soil Survey of

IMPERIAL COUNTY CALIFORNIA IMPERIAL VALLEY AREA



United States Department of Agriculture Soil Conservation Service
in cooperation with
University of California Agricultural Experiment Station
and
Imperial Irrigation District

TABLE 11.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
100---------------- Antho	0-13	Loamy fine sand	SM	A-2	0	100	100	75-85	10-30	---	NP
	13-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	90-100	75-95	50-60	15-40	---	NP
101*:											
Antho-------------	0-8	Loamy fine sand	SM	A-2	0	100	100	75-85	10-30	---	NP
	8-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	90-100	75-95	50-60	15-40	---	NP
Superstition------	0-6	Fine sand-------	SM	A-2	0	100	95-100	70-85	15-25	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	95-100	70-85	15-25	---	NP
102*. Badland											
103---------------- Carsitas	0-10	Gravelly sand---	SP, SP-SM	A-1, A-2	0-5	60-90	50-85	30-55	0-10	---	NP
	10-60	Gravelly sand, gravelly coarse sand, sand.	SP, SP-SM	A-1	0-5	60-90	50-85	25-50	0-10	---	NP
104* Fluvaquents											
105---------------- Glenbar	0-13	Clay loam-------	CL	A-6	0	100	100	90-100	70-95	35-45	15-30
	13-60	Clay loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-95	35-45	15-30
106---------------- Glenbar	0-13	Clay loam-------	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
	13-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
107*--------------- Glenbar	0-13	Loam------------	ML, CL-ML, CL	A-4	0	100	100	100	70-80	20-30	NP-10
	13-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	75-95	35-45	15-30
108---------------- Holtville	0-14	Loam------------	ML	A-4	0	100	100	85-100	55-95	25-35	NP-10
	14-22	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	22-60	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	65-85	25-35	NP-10
109---------------- Holtville	0-17	Silty clay------	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	17-24	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	24-35	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	65-85	25-35	NP-10
	35-60	Loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	100	100	75-100	20-55	---	NP
110---------------- Holtville	0-17	Silty clay------	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-35
	17-24	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-35
	24-35	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	55-85	25-35	NP-10
	35-60	Loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	100	100	75-100	20-55	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
111*:											
Holtville	0-10	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	10-22	Clay, silty clay	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
	22-60	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	65-85	25-35	NP-10
Imperial	0-12	Silty clay loam	CL	A-7	0	100	100	100	85-95	40-50	10-20
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
112 Imperial	0-12	Silty clay	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
113 Imperial	0-12	Silty clay	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay, clay, silty clay loam.	CH	A-7	0	100	100	100	85-95	50-70	25-45
114 Imperial	0-12	Silty clay	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
115*:											
Imperial	0-12	Silty clay loam	CL	A-7	0	100	100	100	85-95	40-50	10-20
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
Glenbar	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
	13-60	Clay loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
116*:											
Imperial	0-13	Silty clay loam	CL	A-7	0	100	100	100	85-95	40-50	10-20
	13-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
Glenbar	0-13	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	35-45	15-25
	13-60	Clay loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-95	35-45	15-30
117, 118 Indio	0-12	Loam	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	12-72	Stratified loamy very fine sand to silt loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
119*:											
Indio	0-12	Loam	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	12-72	Stratified loamy very fine sand to silt loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
Vint	0-10	Loamy fine sand	SM	A-2	0	95-100	95-100	70-80	25-35	---	NP
	10-60	Loamy sand, loamy fine sand.	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
120* Laveen	0-12	Loam	ML, CL-ML	A-4	0	100	95-100	75-85	55-65	20-30	NP-10
	12-60	Loam, very fine sandy loam.	ML, CL-ML	A-4	0	95-100	85-95	70-80	55-65	15-25	NP-10

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

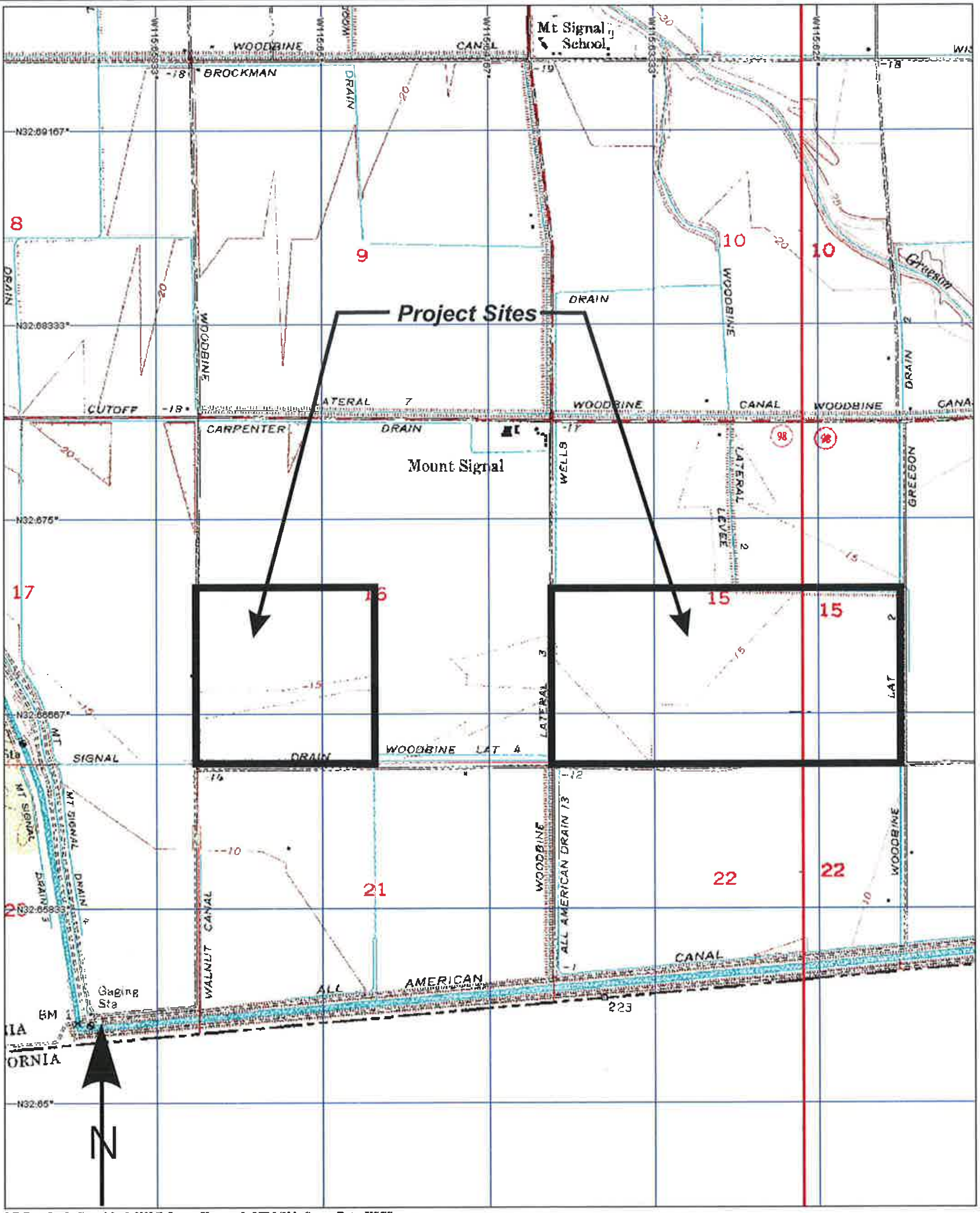
Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
121---------------- Meloland	0-12	Fine sand-------	SM, SP-SM	A-2, A-3	0	95-100	90-100	75-100	5-30	---	NP
	12-26	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	90-100	50-65	25-35	NP-10
	26-71	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-40
122---------------- Meloland	0-12	Very fine sandy loam.	ML	A-4	0	95-100	95-100	95-100	55-85	25-35	NP-10
	12-26	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	90-100	50-70	25-35	NP-10
	26-71	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
123*: Meloland----------	0-12	Loam------------	ML	A-4	0	95-100	95-100	95-100	55-85	25-35	NP-10
	12-26	Stratified loamy fine sand to silt loam.	ML	A-4	0	100	100	90-100	50-70	25-35	NP-10
	26-38	Clay, silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-40
	38-60	Stratified silt loam to loamy fine sand.	SM, ML	A-4	0	100	100	75-100	35-55	25-35	NP-10
Holtville---------	0-12	Loam------------	ML	A-4	0	100	100	85-100	55-95	25-35	NP-10
	12-24	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-65	20-35
	24-36	Silt loam, very fine sandy loam.	ML	A-4	0	100	100	95-100	55-85	25-35	NP-10
	36-60	Loamy very fine sand, loamy fine sand.	SM, ML	A-2, A-4	0	100	100	75-100	20-55	---	NP
124, 125----------- Niland	0-23	Gravelly sand---	SM, SP-SM	A-2, A-3	0	90-100	70-95	50-65	5-25	---	NP
	23-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	100	100	85-100	80-95	40-65	20-40
126---------------- Niland	0-23	Fine sand-------	SM, SP-SM	A-2, A-3	0	90-100	90-100	50-65	5-25	---	NP
	23-60	Silty clay------	CL, CH	A-7	0	100	100	85-100	80-95	40-65	20-40
127---------------- Niland	0-23	Loamy fine sand	SM	A-2	0	90-100	90-100	50-65	15-30	---	NP
	23-60	Silty clay------	CL, CH	A-7	0	100	100	85-100	80-95	40-65	20-40
128*: Niland------------	0-23	Gravelly sand---	SM, SP-SM	A-2, A-3	0	90-100	70-95	50-65	5-25	---	NP
	23-60	Silty clay, clay, clay loam.	CL, CH	A-7	0	100	100	85-100	80-100	40-65	20-40
Imperial----------	0-12	Silty clay------	CH	A-7	0	100	100	100	85-95	50-70	25-45
	12-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	100	85-95	50-70	25-45
129*: Pits											
130, 131----------- Rositas	0-27	Sand------------	SP-SM	A-3, A-1, A-2	0	100	80-100	40-70	5-15	---	NP
	27-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
132, 133, 134, 135-- Rositas	0-9	Fine sand-------	SM	A-3, A-2	0	100	80-100	50-80	10-25	---	NP
	9-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
136--------------- Rositas	0-4	Loamy fine sand	SM	A-1, A-2	0	100	80-100	40-85	10-35	---	NP
	4-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
137--------------- Rositas	0-12	Silt loam-------	ML	A-4	0	100	100	90-100	70-90	20-30	NP-5
	12-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
138*:											
Rositas-----------	0-4	Loamy fine sand	SM	A-1, A-2	0	100	80-100	40-85	10-35	---	NP
	4-60	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2, A-1	0	100	80-100	40-85	5-30	---	NP
Superstition------	0-6	Loamy fine sand	SM	A-2	0	100	95-100	70-85	15-25	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	95-100	70-85	15-25	---	NP
139--------------- Superstition	0-6	Loamy fine sand	SM	A-2	0	100	95-100	70-85	15-25	---	NP
	6-60	Loamy fine sand, fine sand, sand.	SM	A-2	0	100	95-100	70-85	15-25	---	NP
140*:											
Torriorthents											
Rock outcrop											
141*:											
Torriorthents											
Orthids											
142--------------- Vint	0-10	Loamy very fine sand.	SM, ML	A-4	0	100	100	85-95	40-65	15-25	NP-5
	10-60	Loamy fine sand	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
143--------------- Vint	0-12	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	100	100	75-85	45-55	15-25	NP-5
	12-60	Loamy sand, loamy fine sand.	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
144*:											
Vint--------------	0-10	Very fine sandy loam.	SM, ML	A-4	0	100	100	85-95	40-65	15-25	NP-5
	10-40	Loamy fine sand	SM	A-2	0	95-100	95-100	70-80	20-30	---	NP
	40-60	Silty clay------	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35
Indio-------------	0-12	Very fine sandy loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	12-40	Stratified loamy very fine sand to silt loam.	ML	A-4	0	95-100	95-100	85-100	75-90	20-30	NP-5
	40-72	Silty clay------	CL, CH	A-7	0	100	100	95-100	85-95	40-65	20-35

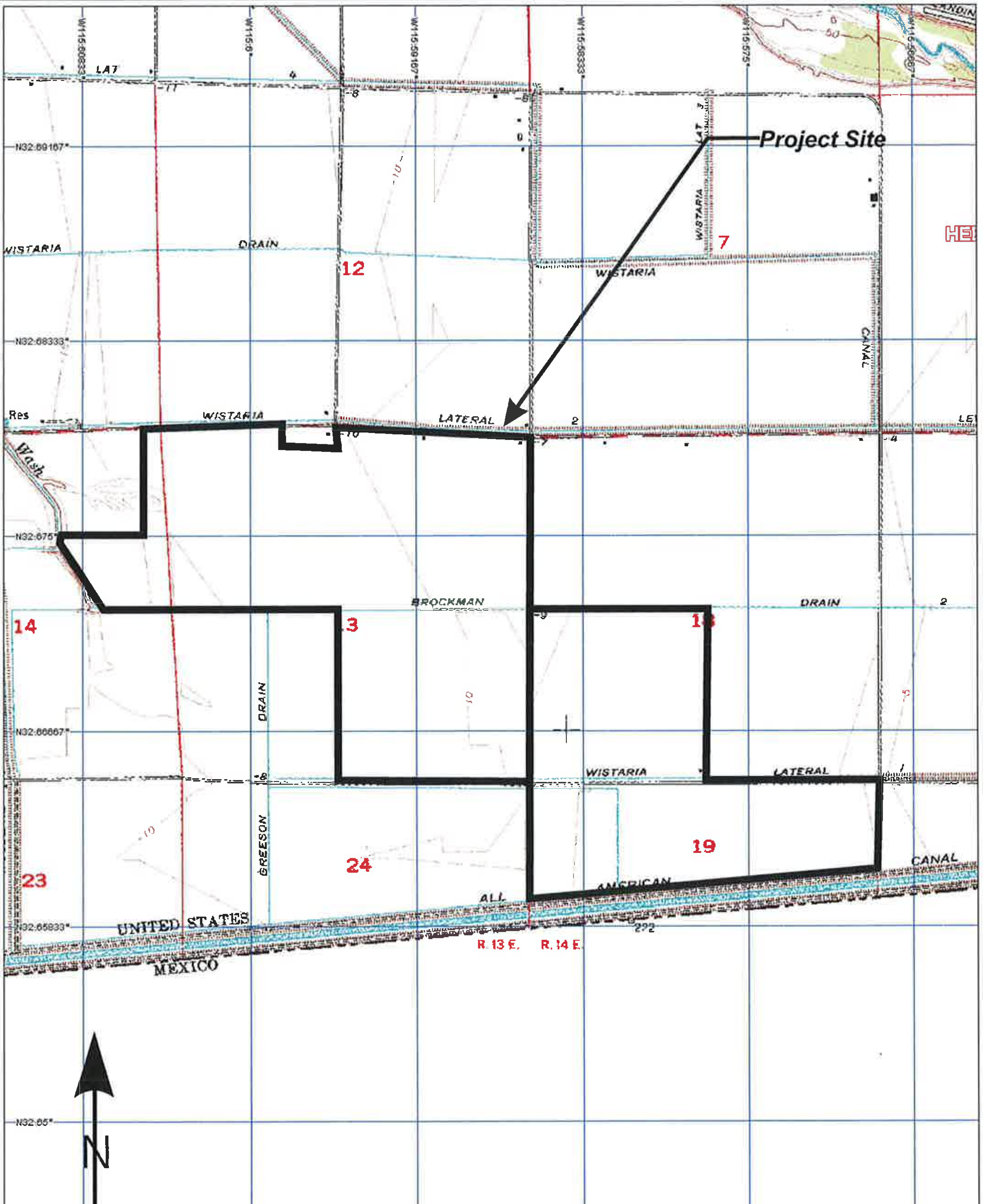
* See description of the map unit for composition and behavior characteristics of the map unit.



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

700 ft Scale: 1 : 24,000 Detail: 13-1 Datum: WGS84

LANDMARK Geo-Engineers and Geologists **Project No.: LE10161**	**Topographic Map**	**Plate A-4a**



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700 ft Scale: 1 : 24,000 Detail: 13-1 Datum: WGS84

LANDMARK
Geo-Engineers and Geologists

Project No.: LE10161

Topographic Map

Plate A-4b