WATER ELEMENT

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I. INTRODUCTION

A. Preface

For many years there has been a growing concern about water resources and environmental problems. Allocating water resources, achieving improved water quality and conserving water are very critical issues in the Imperial County. Although new technologies can be useful, solutions to such problems require a broader view combining technical approaches with economic considerations.

The Water Element is a newly drafted non-mandated Element of the County General Plan. It contains information regarding general goals, objectives and policies to help Imperial County conserve and utilize this valuable resource. In addition, an assessment of the water resources and patterns of water use are presented. These features of the Water Element are aimed at guiding the County of Imperial to encourage efficient water use and provide sufficient water demands for long-term availability. The Water Element serves as a benchmark for water management planning and in assisting the decision-making process on various land use issues within the County.

Imperial County has been known for many years as a mecca of raw resources. The County is committed to continue to supply these raw resources in hope of exploring additional available resources and to further diversify its agriculture and manufacturing production capabilities. Through this Water Element, and combined efforts with Federal, State and Local agencies, Imperial County will continue to enhance and utilize its water resources to accommodate future growth and establish a strong economy.

An awareness of the importance of a sound Water Element is important in recognizing that water in California is becoming a scarce resource. Land use decisions based in part upon water resources have significant effects on the physical, social, and economic character of the county. Although the Water Element is concerned with long range goals and objectives, attention should also be given to currently existing conditions and issues. This approach will enable the County of Imperial to face important issues today, thereby avoiding problems in the future.

B. Purpose of the Water Element

The purpose of this document is to identify and analyze the types of water resources within Imperial County and to assure that goals and policies are adopted that preserve and enhance resource availability and quality. It has been prepared to assure that water resources are conserved and utilized to enhance long-term availability, while providing for current supplies and demands. In addition, this document has been prepared to improve the use and distribution of water in Imperial County, including the extension of current water conservation programs. Through this document the County provides leadership, information and advisory services to help users increase efficiencies in their water consumption within the county.

California Government Code, Section 65300, requires all cities and counties in the state to prepare and adopt comprehensive, long-term general plans and update each of the elements which direct the development of the community. As an official document of the County of Imperial, the Water Element provides goals, objectives and policies to guide the development, utilization and preservation of water resources in the County.

In addition to the statement of goals, objectives and policies, the Water Element includes discussions, data, and water conservation programs which provide for the prudent and conscientious management and utilization of water resources for future development in the County.

The implementation of the Water Element is meant to assure that water resources are conserved and utilized as possible, and to provide for the long-term viability and availability of this precious resource. The goals and objectives of the Water Element of the Imperial County General Plan are designed to help the County play an important role in the management of future water demands due to future expansion of urban and non-urban developments.

II. EXISTING CONDITIONS AND TRENDS

A. Preface

The geographic center of the Imperial Valley is one of the finest agricultural areas in the world, in spite of the fact that it is in a very arid region. The general area of the Imperial Valley, better known as the Imperial Unit, is bounded on the north by the south shore of the Salton Sea, on the south by the All-American Canal, on the east by the East Highline Canal, and on the west by the Westside Main Canal.

The causes of the agricultural success of this region are two-fold: the rich soils which have accumulated on the valley floor over thousands of years; and the large quantity of water that is transported from many miles east via the All-American Canal, and subsequently distributed to farmlands by a complex system of smaller canals.

A significant geographical feature in the County is the Salton Trough, which contains the Salton Sea and the Imperial Valley, and has been evolving for millions of years. It is a "rift" in the earth's crustal plates. The East Pacific Rise is the boundary between the Pacific and North American Plates. It extends up the Gulf of California by a series of "spreading centers" with strike slip faults. The thinning of the crust from the slow but continuous widening of the Salton Trough causes the earth's magma to rise closer to the surface and generates abnormally high heat flow, which in turn heats deep ground waters.

The trough is a structural extension of the Gulf of California. In prehistoric times it contained the ancient Lake Cahuilla (not to be confused with the present Lake Cahuilla which is located at the terminus of the Coachella Branch of the All-American Canal).

The Imperial Valley was created when the Colorado River formed a delta that isolated the Salton Trough from the Gulf of California. Subsequently, under desert conditions, the inland sea dried up. Later, the trough was occupied by lakes for various periods, and deposition into these lakes gave the valley its characteristic flat lands and fertile soils.

Further background information on prehistoric and historic water use and development in Imperial Valley is provided in Appendix A.

B. Existing Conditions

1. Water Rights

The water of the Colorado River is used by both the Upper Basin States (Colorado, New Mexico, Utah, Wyoming) and the Lower Basin States (Arizona, California, and Nevada), as well as by Mexico. In accordance with the Colorado River Compact of 1922, the Upper and Lower Basin States are each entitled to the exclusive beneficial consumptive use of 7.5 million acre-feet (MAF) of Colorado River water each year, in perpetuity. In addition, an option is granted to the Lower Basin States for the use of an additional 1.0 MAF for beneficial consumptive use. The 1929 California Limitation Act limits California's annual consumptive usage to 4.4 MAF, plus not more than one-half of any excess or surplus water unapportioned by the Compact.

By treaty signed on February 3, 1944, Mexico is entitled to 1.5 MAF of the Colorado River water each year. In years of low flow, any shortfall required to meet Mexican treaty rights will be made in equal quantities by the Upper and Lower Basin States. This treaty takes precedence over the Colorado River Compact of 1922.

In 1928, The Boulder Canyon Project Act was passed by Congress which authorized the construction of Hoover Dam and Power Plant and the All-American Canal to Imperial and Coachella valleys. The Act also required that the District and other water users to enter into water delivery contracts with the Secretary of Interior. Finally, the Act authorized lower basin states to enter into a water apportionment agreement. The proposal was as follows: of the 7.5 MAF of water annually apportioned to the states, Nevada would receive 0.3 MAF, Arizona would receive 2.8 MAF, plus one-half of any excess water unapportioned by the Colorado River Compact, and California would receive 4.4 MAF, plus one-half of any excess water unapportioned by the Colorado River Compact.

The proposed apportionment was never settled upon by the Lower Basin States. In 1964, the United States Supreme Court Case of *Arizona v. California (373 U.S. at 546)* concluded that an agreement was not necessary because the Project Act authorized the Secretary of Interior to deliver water in accordance with the apportionment.

To complete the apportionment in California, the Secretary of Interior requested the State of California to prioritize water rights among the major water users. There were seven major water users which included the Palo Verde Irrigation District, the Yuma Project, the Imperial Irrigation District, the Coachella Valley Water District, the Metropolitan Water District, the City of San Diego, and the County of San Diego. On August 18 of 1931 the California Seven Party Agreement was signed by all the water users and went into effect. Table 1 shows the water apportionment priorities. Note: that the first four California priorities total 4.4 MAF annually, of which the agricultural agencies are entitled to 3.85 MAF. As a result of the Colorado River Basin Project Act of September 30, 1968, the 4.4 MAF are also the quantities accorded priority over the Central Arizona Project.

After the California Seven Party Agreement, a draft contract for water delivery was submitted to the District by the Secretary of Interior. The draft contract called for extension of boundaries of the Imperial Irrigation District to include the Coachella Valley. The Coachella Valley desired to maintain its own organization.

The District and the Secretary of Interior negotiated another contract which was approved by the District and the voters. Following approval, the District filed an action in the Supreme Court to validate the contract. The Coachella Valley objected to the validation. Following judgement in favor of the District and during Coachella Valleys period of appeals, Imperial Valley and

TABLE 1
PRIORITY ESTABLISHED BY THE
SEVEN PARTY AGREEMENT FOR WATER APPORTIONMENT

	Priority/User	**Apportionment**	
1.	Palo Verde Irrigation District (For use exclusively upon 104,500 acres of valley land in and adjoining district)		
2.	Yuma Project (For use on California Division, not exceeding 25,000 acres of land)		
3a.	Imperial Irrigation District and Coachella Valley Water District (Lands served by All-American Canal in Imperial and Coachella Valleys)	3.85 MAF	
3b.	Palo Verde Irrigation District (For use exclusively on an additional 16,000 acres of mesa lands)		4.4 MAF[2]
4.	Metropolitan Water District (For use on Southern California Coastal Plain)	0.55 MAF	
5a.	Metropolitan Water District (For use on Southern California Coastal Plain)	0.55 MAF	
5b.	City and County of San Diego[1]	0.112 MAF	0.962 MAF When Available
6a.	Imperial Irrigation District and Coachella Valley Water District		
6b.	Palo Verde Irrigation District (For 16,000 acres of mesa lands)	0.3 MAF	
	Total within California	**5.362 MAF**	

[1] Apportionment merged with those of MWD in 1946.
[2] Quantity is the Basic Entitlement for California.
Source: Water Conservation Plan, Imperial Irrigation District, 1985.

Coachella Valley negotiated in what came to be the Compromise Agreement of 1934. The result of this Agreement was that the District would have priority over Coachella in times of water shortage.

2. Surface Water Quality

The surface waters of the Imperial Valley are quite different from what would be expected in a natural desert climate. The existence of most surface waters in the area is dependent primarily upon the inflow of irrigation water from the Colorado River via the All-American Canal. The use of this water for irrigation and other purposes has a significant effect on the quality of surface water.

There are three general categories which describe the surface water in Imperial County. These are freshwater, brackish water, and saline water. The freshwater (with TDS generally less than 1,000 ppm) include the All-American Canal and other canals and laterals which deliver irrigation water to the agricultural fields within the County. The brackish waters (with TDS in the range of 2,000 to 4,000 ppm) include the Alamo River, New river and the agricultural drains that flow into these rivers or directly into the Salton Sea.

The Salton Sea represents the saline water category. Salinity concentrations are currently slightly higher than ocean water (the Salton Sea's current TDS is approximately 44,000 ppm). The surface waters in Imperial County thus pass through a salinity gradient from the Colorado River to the Salton Sea.

This regional salinity gradient exists because of the high evaporation of the Imperial Valley, high temperatures, low annual rainfall, and continual leaching of salts from irrigated areas. Evapotransporation is water transported and evaporated from plants and surrounding soil surfaces. Although water is continually evaporated from the major canals, this evaporation represents a relatively minor increase in dissolved solids concentration because of the short residence times within the water conveyance system.

High evaporation rates from the irrigated fields substantially reduce the amount of water and increase the concentration of salt entering the drainage system. A 300% to 500% increase in total dissolved solids concentration is normal within the valley as water moves from the All-American Canal to the New and Alamo Rivers.

The change in salinity through the valley is extremely important because it affects the aquatic ecosystems and other beneficial uses of the surface waters. However, salinity is not the only water quality issue. The intensive irrigation in the valley presents the potential for the introduction of agricultural chemicals, such as pesticides and herbicides, into downstream waters. Field erosion and dredging activities also result in siltation in the New and Alamo Rivers and the Salton Sea. The bacteriological quality of these waters is also a concern because these streams receive locally generated municipal waste discharges, in addition to the waste load entering the United States from Mexico.

Additional information on surface water quality is provided in Appendix B.

3. Groundwater Quality

The shallow aquifers beneath the Imperial Valley are affected by the inflow of Colorado River waters, the rate of evaporation, the depth of the agricultural tile drains beneath farm lands, and seepage from drains and rivers. The Colorado River is probably the most important source of recharge into shallow ground water aquifers; approximately ten percent percolated to underlying aquifers. Canals, such as the All-American and the East Highline, contribute to recharge because they are unlined; they are sometimes up to 200 feet wide; the All-American Canal flows across many miles of sandy terrain; and the water surface of the canals are higher than the general groundwater levels.

Drainage from agricultural fields has resulted in local high salinity because of the leaching of salts from these fields. In other areas, mounds of good quality fresh water have resulted from seepage from irrigation canals. This has occurred significantly in the unlined major canals and the All-American, East Highline, and Coachella canals.

Recharge by underflow from tributary areas is small compared to recharge that comes from the Colorado River. Direct recharge from rainfall is very minor, however on higher alluvial slopes of the southwestern mountains, precipitation can be sufficient for recharge by direct infiltration. This also occurs from runoff, mainly in washes and drainages which discharge to the central part of the valley and the Salton Sea.

Waters within the shallow aquifers of the Salton Trough generally move at right angles to contours lines, and towards the Salton Sea. Based on pumping data and water studies on various wells, groundwater is from six to eight feet below the ground surface level throughout most of the Imperial Valley. Shallow groundwater quality is best on the eastern and western sides of the County. Significant groundwater of good quality can also be found in the Ocotillo-Coyote Wells Groundwater Basin.

The deep water reservoir underlying Imperial Valley has been estimated at 1.1 billion to 3.0 billion acre feet, with total recoverable water estimated to be about twenty percent of the water in storage. Annual recharge is about 400,000 acre feet from various sources.

The deepest groundwater is in some cases believed to be moderately altered ocean water. Above this level, the water may consist of residuals from prehistoric fresh water lakes that filled the Salton Trough. Waters at this level vary from low to moderate salinity. The next higher layers are high temperature, and in places highly saline waters.

In the central part of the Imperial Valley, the groundwater is of a higher salinity. Most wells had total dissolved solids concentrations of between 1,000 and 3,000 mg/L. The ionic composition of the water in the central part of the valley is similar to that of the East Mesa. However, as the total dissolved solids concentration increases, the ionic composition becomes more dominated by sodium chloride. The pH of these waters is usually slightly basic, with an occasional value less than seven.

In the western section of the valley, water quality varies widely. Almost all of the wells in Coyote Valley had total dissolved solids concentrations below 500 mg/L; however, West Mesa wells had levels between 1,800 and 5,200 mg/L.

For planning and reporting purposes, the Colorado River Basin Region has been divided into seven major planning areas by the Regional Water Quality Control Board. The basis for this division is due to the fact that each areas has different economic and hydrologic characteristics. The seven planning areas are:

1. Lucerne Valley
2. Hayfield
3. Coachella Valley
4. Anza-Borrego
5. Imperial Valley
6. Salton Sea
7. Colorado River Basin (East)

Of the seven planning areas, portions of the latter four lie within Imperial County. Each of these planning areas are further discussed in Appendix B in relation to groundwater hydrology and quality.

4. Water Pollution

In order for an area to develop, it has to have sufficient resources. One of the most important and valuable resources is water. Water attracts people to develop where this resource is abundant and is put to beneficial use. However, not all water can be put to beneficial use if it is contaminated. A major problem with water quality that concerns many people is that of water pollution. There are a variety of issues that cause, or have potential to cause water pollution. In Imperial County, these issues include pesticide and fertilizer contamination of agricultural drains, geothermal developments, discharge from Mexico, and landfills in the County.

Agricultural Drains

Water pollution can be defined as any contamination of water that lessens its value to humans and nature. In the context of ecosystem function, pollution represents an imbalance of one or more elemental cycles. There are two broad classes of water pollution. One is point pollution which has its source in a well defined location, such as the pipe through which a factory discharges waste into a stream. The other is non-point pollution which has its source spread over large areas such as farms, grazing lands, construction sites, and the gardens, lawns, streets, and parking lots of cities.

There are two particularly disturbing aspects of groundwater pollution. One is that is can take years for some pollutants to move from the earth's surface into groundwater supplies. The other is that once the pollutants are in the ground, they can remain at problem concentrations for many decades. Studies performed by the Regional Board and U.S. Geological Survey indicate that drainage water in the Imperial Valley contains pesticides in quantities which often exceed the Environmental Protection Agency's criteria for protection of fish and wildlife. High levels of sediments and nutrients were also found.

For many years groundwater was assumed to be safe from chemical pollution because contaminant movement was thought to be restricted to the top few inches of the earth's surface. During the late 1970's, scientists realized that certain kinds of pesticides, such as Dibromochloropropanes (DBCP), are capable of moving through the soil and mixing with groundwater. DBCP is a soil fumigant used to kill nematodes in the soil before planting a certain crop. In the Imperial Valley, the agricultural fields of lettuce, carrots, and tomatoes are sprayed with DBCP. There is potential for groundwater contamination from this process.

Water quality problems in drains have been attributed to discharge of irrigation surface runoff, such as tail water containing pesticide residues, fertilizers, and silt to receiving waters; drift of pesticides into adjacent waterways from aerial application; and mechanical dredging of drains, which in some reaches results in depletion of dissolved oxygen and suspension of chlorinated hydrocarbon pesticides.

Numerous governmental programs have been established to identify and correct existing pollution problems, as well as to prevent further groundwater contamination. Many of these programs are only a few years old and need to be continued for many years to be effective. If these programs are effective, water resources would be free of most pollutants detrimental not only to the environment but to the population as well.

Geothermal Developments

Extensive geothermal resources have been identified in several areas of the Imperial Valley. These are identified as Known Geothermal Resource Areas (KGRAs). Power plants are currently generating electricity from the hot water resources in the Salton Sea, the Heber KGRA, and the East Mesa KGRA. The fifteen existing power plants can generate about 300 megawatts, and it is estimated that the Imperial Valley resource could support approximately 2,750 megawatts of power production on a sustained basis.

Geothermal fluids in the largest and hottest field, the Salton Sea KGRA, contain about twenty-five percent dissolved solids by weight. These fluids also contain marginally hazardous levels of arsenic, antimony, lead, mercury, zinc, and a large amount of other potential pollutants, including ammonia, boron, copper, lithium, selenium, strontium, and manganese.

The Heber and East Mesa KGRA's have fluids that are much cleaner by comparison, and contain less than two percent dissolved solids. Drilling has identified additional potential resources in the Brawley, Westmorland, and Salton City areas.

Geothermal power plants extract hot water through large wells drilled from 2,000 to 12,000 feet below the surface. The hot water is either allowed to boil to produce stream or passed through heat exchangers. Return flows of hot water from both processes are injected back into the geothermal reservoirs through separate wells. The problems of contaminating the surface waters or nearby non-geothermal groundwaters exists if the return flows are not injected to a significant depth; if they are injected under too much pressure; if they are injected into faults or fractures than connect to the surface; or if the injection wells leak. The potential for surface spills exists from pipeline failures or well blowouts.

In addition, land subsidence is a potential effect of geothermal developments. Currently, most of the extracted fluid is returned to the reservoir by injection, with the remainder being vented to the atmosphere as steam. This problem can be expected to increase as more power plants are built, although the natural subsidence of the Imperial Valley occurs at a rate of about one inch in ten years.

Discharges from Mexico

Mexico is probably the largest contributing factor to increasing water pollution in the Imperial Valley via the New River. The New River originates in Mexico, and flows northward across the International Boundary into Imperial County, California. The flow continues through the Imperial Valley and ultimately discharges into the Salton Sea. The primary purpose of the New River is to convey agricultural drainage in the Imperial and Mexicali valleys to the Salton Sea. A corollary use of the New River is to convey treated community and industrial wastewaters. This corollary use is strictly controlled in the Imperial Valley by waste discharge requirements prescribed and enforced by the California Regional Water Quality Control Board. However, Mexico's corollary use of the New River is largely ignored and uncontrolled.

Mexico discharges raw and inadequately treated sewage, toxic industrial wastes, garbage and other solid wastes, animal wastes, and geothermal wastewaters out of the Mexicali area of Mexico and into the Imperial Valley. This process has continued for over forty years, resulting in the on-going pollution of the New River at the International Boundary. As Mexico's industry and population continue to grow, these problems have a high potential to increase if corrective measures are not taken.

Until August of 1983, the problem of Mexico polluting the New River had been the responsibility of United States Section of the International Boundary and Water Commission (IBWC), a joint United States/Mexico federal agency with responsibility for dealing with border water and sanitation problems between the two nations.

For over thirty years, the California Regional Water Quality Control Board has made several representations to the United States Commissioner on the IBWC to obtain corrections to the problem. Since 1975, the California Regional Water Quality Control Board has been monitoring water pollution of the New River to identify the pollutants actually coming from Mexico. This information has been presented to the United States Commissioner to aid and encourage Mexico in implementing corrective measures.

In August of 1980, Minute No. 264 to the Mexico-American Water Treaty was signed, which specified time schedules for completing work that was to result in a full cleanup of the river. In addition, minimum water quality standards were specified for New River water quality at the International Boundary. Mexico has been in violation of practically all of the specified schedules and standards since Minute No. 264 went into effect in December of 1980. There is no evidence that Minute No. 264 has had any influence on actions in Mexico to clean up the river.

In July of 1983, the California Regional Water Quality Control Board conducted an investigation. The purpose of the investigation was to determine the type(s) and extent of waste discharges into the New River and its tributaries from Mexico so that possible corrective action could be considered and pursued. The investigation identified problems that must be addressed to obtain adequate corrections. These problems included:

1. City sewer lines which are not connected to the City's main sewer system discharging raw sewage to the river;

2. Breakdowns in the sewer system resulting in the discharge of raw sewage to the river;

3. Discharge of wastes to the river by septic tank pumpers;

4. Discharge of wastes to the river from adjacent unsewered residences;

5. Discharge of untreated industrial wastes to the river including highly toxic chemicals wastes, many of which are on the Environmental Protection Agency's list of 129 priority pollutants and some of which are carcinogens;

6. Inadequate treatment of sewage and industrial wastes by Mexicali, whose sewage treatment plant consists of nothing more than raw sewage lagoons;

7. Location of the City's garbage dump such that refuse is disposed of directly into the river water;

8. Discharges of untreated wastes from a slaughterhouse, dairy, and hog farms;

9. Discharges from residential hog and cattle pens located adjacent to the river and its tributaries; and

10. Discharge of geothermal wastes to the river.

In August of 1983, a United States/Mexican Agreement for protection and improvement of the environment in the border area was signed by the Presidents of Mexico and the United States. Under this agreement, responsibility for border environmental problems, including the New River pollution problem, was transferred from the International Boundary and Water Commission to the United States Environmental Protection Agency for the United States, and to the Mexican Secretarial de Desarollo Urbano y Ecologia (SDUE) for Mexico. Since this transfer of responsibility, progress has been slow and it is questionable if the agreement has served any useful purpose in controlling pollution in the New River.

In April of 1987, Minute No. 274 to the Mexican-American Water Treaty was approved by the United States and Mexico. The minute provided for a $1.2 million United States/Mexico jointly funded project to construct certain works in Mexico to reduce pollution in the New River. Although this project is just a step towards resolving the pollution problems of the New River, it sets a precedent for the involvement of the United States in the implementation of corrective actions within Mexicali.

According to the International Boundary and Water Commission of the United States, additional projects are needed to help reduce water pollution from Mexico. Mexico and the United States are currently negotiating measures to solve the problem. Upon agreement between both governments, a new Minute will be approved and added to the Mexican-American Treaty to supersede Minute No. 274. The main goal of the new Minute would be to establish a long-term solution to the water pollution problem.

Aside from the New River, the Alamo River is polluted with contaminants as well. The Alamo River flows into Imperial County from Mexico and has low pollutant concentrations. Presently, the Alamo River is very small as it crosses into the United States and carries agricultural water coming from agricultural fields in Mexico. The main pollutants in the water are pesticides which get drained into the Alamo River during irrigation. However, the potential for polluting the Alamo River could increase not only from the pesticides contained in the water but from potential development at or near the Alamo River at the International Boundary. A new border crossing is to constructed at or near the Alamo River as it crosses into the United States. This new border crossing could create an "urban sprawl" effect in this area of Imperial County, which would increase drainage into the Alamo River. The Alamo River currently has a small concrete culvert that passes underneath the All-American Canal which drains water coming from Mexico and eventually into the Salton Sea. Additional flows could clog the culvert and present a financial burden to Imperial County and lead to environmental health problems.

An option proposed by the California Regional Water Quality Control Board has been to shunt the Alamo River into a drainage system which would eventually drain into the New River before it crosses into the United States. In order for this to happen both governments must agree. Presently, nothing has been settled but further negotiations are currently being reviewed between the United States and Mexico, in hopes to minimize potential problems that could result from the development of the new border crossing.

Landfills

Another potential problem that may contribute to the pollution or contamination of groundwater is landfills. There are three different types of landfills within the County. These are classified as Class I, Class II, and Class III. A Class I landfill site is for the sole purpose of dumping hazardous wastes, a Class II landfill site is for dumping designated and/or special waste, and a Class III landfill site is for dumping non-hazardous wastes such as municipal waste.

Currently there are ten County-operated Class III disposal sites throughout Imperial County which accept non-hazardous wastes (Figure 3). Four of the County landfills, near Brawley, Hot Mineral Spa, Imperial, and Calexico, are under the ownership or control of the County; five, Holtville, Niland, Salton City, Ocotillo, and Palo Verde, are on Bureau of Land Management (BLM) property; and one, the Picacho landfill, serves the Winterhaven/Bard area and is located on land owned by the Quechan Indian Reservation.

In addition to the public sites, Imperial Republic Acquisitions operates a private Class III waste disposal facility in the unincorporated area northwest of the City of Imperial; Laidlaw Environmental Services operates a Class I facility west of the City of Westmorland; and Desert Valley Company operates a Class II solid waste disposal/storage site northwest of the City of Westmorland.

For more detailed information on solid and hazardous waste disposal sites, please refer to the Health Department, Imperial County Hazardous Waste Management Plan. The Imperial County Integrated Waste Management Plan is being prepared by the Department of Public Works, with a draft to be presented to the State Integrated Waste Management Board in January 1994.

5. Water Use Patterns

Agricultural Water Use

There are over 120 types of crops grown in the Imperial Valley. Most relevant to the Water Element is an examination of the various crop types, the acreage dedicated to each and the demand for irrigation water generated by each crop per acre of cultivation. Water demand is provided below on a "net consumption" basis and is based upon historical acreage and water use data. Major water consuming crops include alfalfa (5.20 ac.ft./acre), asparagus (4.12 ac.ft./acre), cotton (3.45 ac.ft./acre), and tomatoes (2.23 ac.ft/acre). More efficient crops include carrots (1.21 ac.ft./acre), squash (1.58 ac.ft./acre), and barley (1.64 ac.ft./acre). The historical trend indicates that approximately 525,000 acres are in cultivation over the year and that crops grown on this acreage consume approximately 1,771,000 acre feet per year. Table 2 shows the historical average of individual crop acreage and water use in Imperial Valley over a ten year period.

TABLE 2
CROP ACREAGE AND WATER USE IN IMPERIAL VALLEY
HISTORICAL AVERAGE

Crop	Area (Acres)	Water Use (af)
Garden Crops		
Broccoli	7,000	11,480
Carrots	12,000	14,540
Lettuce	35,000	47,017
Cantaloupes	15,000	33,213
Watermelons	5,000	10,929
Other Melons	4,000	8,903
Onions	10,000	17,725
Squash	1,000	1,578
Tomatoes	3,000	6,695
Vegetables (misc.)	5,000	8,083
Field Crops		
Alfalfa	185,000	961,692
Barley	1,000	1,650
Bermuda Grass	15,000	52,125
Cotton	40,000	137,900
Rye Grass	4,000	9,500
Sorghum	3,000	7,330
Sudan Grass	20,000	47,500
Sugar Beets	35,000	122,208
Wheat	105,000	204,488

	Miscellaneous	2,000	4,695
Permanent Crops			
	Asparagus	3,000	12,355
	Citrus Fruits	2,000	7,163
	Duck Ponds (feed)	8,000	24,000
	Jojoba	3,000	10,745
	Trees and Vines	1,000	3,582
	Miscellaneous	1,000	3,982
Source:	Water Requirements and Availability Study. Prepared by Parsons Water Resources, Inc. for the IID. November 1985.		

Agriculture is the most highly water consumptive use in Imperial County. Approximately ninety-eight percent of the water diverted to Imperial County from the Imperial Irrigation District is used for agricultural purposes. Imperial Irrigation District supplies more than 2,500,000 acre-feet of water annually for primarily agricultural purposes to its customers in Imperial County, which contains over 500,000 acres of irrigated farmland.

In addition to the water being diverted to the Imperial Valley by the Imperial Irrigation District, five other water districts supply water to other areas in Imperial County outside the Imperial Irrigation District boundaries. These are the Palo Verde Irrigation District, the Palo Verde County Water District, the Bard Water District, the Winterhaven Water District, and the Coachella Valley Water District.

The Palo Verde Irrigation District supplies water to approximately 9,000 acres of agricultural lands in Palo Verde. The water is strictly for irrigation purposes and is taken from the Colorado River. All water drained from these agricultural fields drain back into the Colorado River. Currently, the Palo Verde Irrigation District has an unlimited allocation for water as long as it is used for beneficial uses in agriculture. The Palo Verde County Water District is responsible for supplying water to residents of the community of Palo Verde for domestic purposes. This is further discussed in the following section under the sub-heading "Urban Water Use".

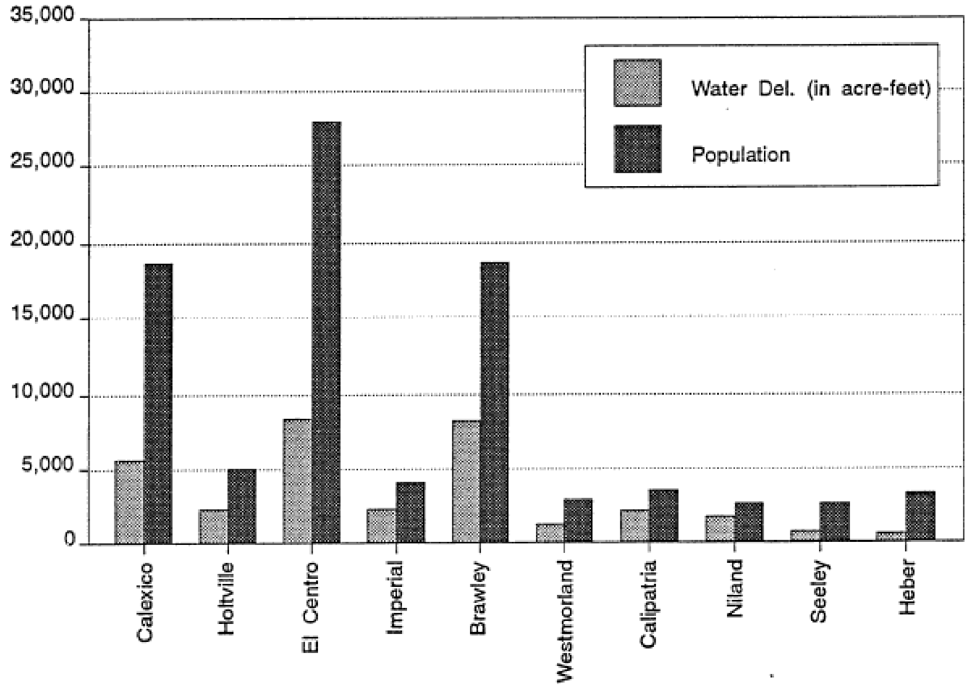
The Bard Valley is located at the southeastern corner of Imperial County, better known as the Reservation Division of the Bureau of Reclamation. The Bard Water District serves approximately 175 landowners and supplies approximately 90,000 acre-feet of water per year for approximately 15,000 acres of agricultural land. The water is used for irrigation purposes only and is taken from the Colorado River, via the All-American Canal. All drainage from the irrigation fields is drained back into the Colorado River. Domestic water uses in Bard are further discussed in the following section.

Urban Water Use

Domestic water uses account for approximately two percent (2%) of the total water use in the County. There are ten communities in Imperial County that receive water for domestic purposes from the Imperial Irrigation District, Calexico, Holtville, El Centro, Imperial, Brawley, Westmorland, Calipatria, Niland, Seeley, and Heber. Each city and unincorporated community has its own water treatment facilities for treating and distributing water to the users of each jurisdiction. Table 3 shows the average water use per capita for each jurisdiction from 1984 to 1990.

The chart represents an averaging of the population in each community over the 1984-90 period, as well as the averaging of the water deliveries to each of these communities over the same period. The graph helps to illustrate the population/water demand relationship for each of these communities, and the averaging of several years data to smooth some of the anomalies in the year to year data.

TABLE 3
AVERAGE YEARLY POPULATION/WATER DELIVERY
1984-1990 BY COMMUNITY



As mentioned earlier, five additional water districts supply water to other areas in Imperial County. Of these, the Palo Verde County Water District (PVCWD), Winterhaven Water District (WWD), and the Coachella Valley Water District (CVWD) distribute treated water for domestic use. The PVCWD is responsible for supplying water to approximately 162 customers for domestic purposes. The PVCWD has a deep water well in the community of Palo Verde which extracts water from the ground water basin, is then treated at a plant before it is distributed to its customers. The well extracts approximately 45,000 gallons per day and the quality of water is fairly good. In addition, sufficient water supplies exist to accommodate growth of the community of Palo Verde in the future.

The WWD supplies water to approximately 1,000 people in Winterhaven. The WWD uses two wells, one of which is a standby well, to extract approximately 150,000 gallons of water per day from the groundwater basin for domestic purposes. The groundwater basin is recharged by the Colorado River, which passes just south of Winterhaven. The community of Winterhaven has two 100,000 gallon storage tanks for storing domestic water. A sewage system serves Winterhaven and also a few developments within the Indian Reservation lands adjacent to the community of Winterhaven. A water treatment facility in Winterhaven treats sewage and then is discharged and piped to Yuma, Arizona. This is a joint venture between the community of Winterhaven and the Indian Reservation lands under a grant from the Federal Government. The pipeline is approximately sixteen inches in size and decreases to a ten inch line at the bridge crossing to Yuma.

The community of Winterhaven presently holds a perfected right to divert 780 acre-feet per year from the Colorado River. This perfected right was granted by the United States Supreme Court supplemental decree in *Arizona v. California*, dated January 9, 1979.

In the community of Bard, wells are used to extract ground water for certain domestic purposes such as watering landscapes and taking baths. Drinking water sources are supplied by 100 gallon tanks which are filled periodically by private water companies.

The Salton City and Hot Mineral Spa/Bombay Beach communities are provided water for domestic use from the Coachella Valley Water District. The CVWD, which primarily operates in Riverside County, receives Colorado River water via the Coachella Canal.

The communities of Ocotillo, Nomirage, and Yuha Estates rely on groundwater from the Ocotillo-Coyote Wells groundwater basin. The County of Imperial commissioned a study of the groundwater basin by the USGS, known as the Skrivan Report, which was released in November of 1977. The report states that an annual overdraft of 500 acre feet exists and warns of possible saline intrusion. The County also employed Dr. David Huntley, a geohydrology consultant, to review the report and the basin. His 1979 report titled "The Magnitude and Potential Effect of Declining Ground Water Elevations in the Ocotillo-Coyote Wells Basin" projects even greater overdraft of between 1608 and 2410 acre feet per year. He also projects saline intrusion. Future growth in Ocotillo/Nomirage is therefore expected to consist primarily of infill on existing lots, rather than expansion of community boundaries, except at very low densities.

Other areas that use wells to extract water from the groundwater basin are the East Mesa Unit and the West Mesa Unit within the Imperial Irrigation District boundaries. The East Mesa Unit has four wells that are approximately six hundred feet deep. Scattered residential development occurs in the East Mesa Unit along with some mines. As mentioned earlier, there are some geothermal developments in the East Mesa Unit that may have potential to cause water pollution.

The West Mesa Unit is primarily land that is owned or regulated by the Bureau of Land Management. A portion of the land in the West Mesa Unit is used by a Naval Air Facility for bombing practices and exercises. Water delivered to the Naval Air Facility comes from the Elder Lateral Canal. From June 1, 1986 to October 23, 1991, the NAF has used approximately 3,714 acre-feet of water, with a daily average water use of 2.0 acre-feet.

The lining of the Coachella Canal has reduced water losses due to seepage, however it has not affected the wells in the area. The Coachella Canal is approximately 123 miles long and all but approximately thirty-two miles are lined. The goal of the Coachella

Valley Water District is to completely line the Coachella Canal. Currently, no date has been set for when this project is to take place.

Recreational Water Use

Some of the waterways throughout the County also provide recreational activity, with the Colorado River being the most widely used. In addition, Ferguson, Martinez and Squaw Lakes along with Sender Reservoir, provide recreational activity as well. A variety of recreational activities take place along the Colorado River and lakes, including fishing, boating, water skiing, jet skiing and campgrounds. These recreational areas are owned and operated by a number of Federal, State and Local agencies, such as the United States Bureau of Reclamation, the United States Fish and Wildlife Service, the Bureau of Land Management, Riverside and Imperial Counties.

The Salton Sea is another area that provides recreational activities. The Salton Sea has been a popular recreation and marine sport fishery area. Several commercial marinas, residential recreational communities, and public parks are now located around the sea. Also, the Salton Sea State Recreation Area lies along twenty miles of its northeastern shoreline.

C. Trends

1. Water Conservation

The Imperial Irrigation District (IID) has initiated many water conservation programs in Imperial County. They have also participated in various programs in cooperation with governmental agencies. In addition, the District has offered public education programs and has encouraged innovative on-farm practices in the Imperial Valley. Its commitment to efficient regional water use management was most clearly demonstrated by the Water Conservation Agreement between Imperial Irrigation District and the Metropolitan Water District of Southern California.

Past water conservation efforts using innovative and creative programs have also helped Imperial Irrigation District to reduce water consumption. Some of these programs include structural, operational, administrative, educational, cooperative, and on-farm programs. Each of these programs is discussed in more detail below.

Water Conservation Agreement

This Agreement provided for the implementation of water conservation projects, to be funded by the Metropolitan Water District, during a five year period. The projects are to result in an estimated conservation of 106,110 acre-feet of water annually. The funding from the Metropolitan Water District covers the costs of construction, operation, and maintenance of projects. In return for funding these projects, and subject to conditions contained in the approved agreement, the Metropolitan Water District is eligible to divert additional water, equivalent to the amount of water conserved, through its Colorado River Aqueduct, which has its headworks at Lake Havasu, created by Parker Dam along the Colorado River.

Eighteen projects were selected for inclusion in the water conservation program based on individual cost-effectiveness, and as a reflection of the need to have a well-balanced overall program. The average amortized cost for the projects was estimated at $128 per acre-foot in 1988 dollars. Construction of the projects began in February of 1990, and is scheduled for completion in December of 1994. Table 4 shows the water conservation projects that had been completed as of December 28, 1990. In addition, the estimated water conserved is also shown for each project.

TABLE 4
WATER CONSERVATION PROJECTS AND ESTIMATED WATER CONSERVED AS OF DECEMBER 28, 1990

Project Description	Annualized Water Conserved
Carter Reservoir	4,930 af
South Alamo Canal-Phase I	1,180 af
South Alamo Canal-Phase II	848 af
Lateral Canal Lining	6,706 af
12-Hour Delivery	12,000 af
Vail Supply Canal Lining	79 af
Non-Leak Gates	125 af
System Automation	324 af
Westside Main Canal Lining	508 af
Total Water Conserved	**26,700 af**

Source: "IID/MWD Water Conservation Agreement." Issue paper by Robert Lang, Assistant Manager, Imperial Irrigation District, February, 1991.

To fully understand the effort that the Imperial Irrigation District has expended in achieving their water conservation goals, the following is an update on the status of the water conservation projects:

Trifolium (Carter) Reservoir

The completion of this project in 1988 utilized a Clean Water Bond, and consisted of a 340 acre-foot regulating reservoir. The project was to eliminate operational discharge at the end of the Westside Main Canal. The project is to conserve 4,930 acre-feet of water annually.

South Alamo Canal Lining-Phase I

Two miles of this large supply canal were lined and completed in August of 1989 with the assistance of a Clean Water Bond. Seepage of water was reduced and 1,180 acre-feet of water has been conserved.

South Alamo Canal Lining-Phase II

In addition to the first phase of this project, Phase II consisted of concrete lining the remaining 1.2 miles, and was completed in June of 1991. To date, the

Imperial Irrigation District has conserved over 1,425 acre feet of water annually from this project.

Lateral Interceptor

This project consists of utilizing a header canal and 283 pond leveling gates to create a virtual demand system for eight lateral canals. The project will cost $5.7 million and construction is currently underway.

"Z" Reservoir

The District has a total of five regulating reservoirs. Four have been built since 1975 at a total cost of $3.3 million and provide a total storage capacity of 1,570 AF. It is estimated that 6,200 AF of water is conserved annually through the use of these reservoirs, which help reduce operational spills from the canal systems they serve. The fifth reservoir is presently under construction and consists of a 400 AF capacity regulating reservoir. The project carries a cost of $2.8 million and will conserve water by eliminating operational spills at the end of East Highline Canal.

Lateral Canal Lining

Between February and December of 1990, the Imperial Irrigation District concrete lined over 62 miles of lateral canals. The District is to concrete line 265 miles by December of 1994. This project will reduce seepage and increase efficiency of the canal delivery system. The project is projected to cost $50 million and has, to date, conserved over 6,846 acre-feet of water annually.

Trifolium Interceptor

This project is similar to the Lateral Interceptor, in that its main purpose is to use a header canal and pond leveling gates to eliminate operational spills and minimize tailwater. The project encompasses thirteen large lateral canals and is projected to cost $10 million. Research and design of this project are still underway.

Twelve-Hour Delivery

In the past, water delivery to farmers of the Imperial Valley was on a fixed 24-hour basis. In February of 1991, the Imperial Irrigation District initiated a new program which allows farmers to order small delivery heads (up to 7 cubic feet per second) on a fixed 12-hour basis. The program also allows for cutoff of the delivery within the last four hours, if the canal capacity permits. The farmers in the Imperial Valley have widely accepted this program. The program is estimated to conserve approximately 12,000 acre-feet annually.

Non-Leak Gates

This project consists of replacing the old wooden canal check gates with non-leaking aluminum gates. These types of gates were installed in June of 1990. This project has enhanced the operation of canals and also prevented water leakage. The five gates have conserved an estimated 125 acre-feet of water per year. The installation of all remaining gates is expected to be completed by the end of 1992.

Lowline Interceptor

This project is another lateral interceptor which will collect operational discharge and minimize spill from approximately sixteen other lateral canals. The project will cost $5.3 million, and construction is scheduled to begin in 1993. The project is currently in the research phase of development.

Irrigation Water Management

Funds are used for this project to construct water conservation systems on farms. The purpose is to educate farmers on the most advanced irrigation management techniques by providing training and support. Agricultural engineers from Imperial Irrigation District plan to implement this program onto 10,000 acres of farmland. Pump back, drip irrigation and other systems, along with updated irrigation planning techniques, are used for water conservation. Thirty-four on-farm systems are currently in development.

System Automation

This project is by far the most innovative water conservation program. The cost is $15 million, and it will radically improve Imperial Irrigation District's control of water delivery. Computers will be located on fields and will control the water gates to manage the delivery of water more accurately. The monitoring of the computer will be done by a radio-microwave system from a master water control center.

This will centralize water management and monitoring for Imperial Irrigation District. Approximately 200 field sites will provide data and be utilized to allow water control never pursued before. The program is composed of over 60 projects and has already seen the automation of five canal headings and the installation of the radio-microwave communications network. A new Water Control Center will be added to the system and is scheduled to be operational by December of 1991. Other water conservation programs include land leveling, tailwater pump back systems, low water-use crop selection, and low water-demand irrigation methods.

Structural Programs

Structural programs to conserve water include physical changes to the water conveyance and usage system that will bring about benefits independently of user practices. These programs consist of such projects as canal lining to reduce seepage losses; construction of regulating reservoirs to reduce canal spill; construction of seepage recovery lines to collect water to be pumped back into the canal for delivery to farms; farm delivery and outlet structures to provide for better water control and measurement of farm deliveries and to facilitate measurement of tailwater runoff; automatic controls and remote monitoring facilities to be operated manually in case of power outages; and construction of evaporation ponds to reduce inflow into the Salton Sea.

Operational Programs

Operational Programs refer to changes in operational procedures that have been initiated to promote water conservation. Operational programs include radio equipment and personnel training. Communication among personnel permits greater operational flexibility in switching water deliveries from one farmer to another, thereby reducing operational spills.

As newer methods are used and more structures are built, water department employees must be trained to manage and operate them. Daily on-the-job training is an integral part of the program. In addition, specialized training in water measurement and management is given to the new hydrographers. Keeping up on the latest methods of water management and operations can help in conserving water for Imperial County.

Administrative Programs

These programs are options that are available to public distributors of water. An example of this would be the establishment of incremental water rates to encourage water conservation. The IID Board of Directors, recognizing the need to continue to expand water conservation efforts, appointed a Water Conservation Advisory Board made up primarily of farmers in 1979. The purpose of the Advisory Board is to make recommendations to the District Board regarding the implementation of additional water conservation measures.

The District approved a water conservation program called the "13 Point Program" in 1976. The overall goal of this program was to improve water use efficiency within the District and reduce inflow into the Salton Sea. Another program, the "21 Point Program", was recommended by the Water Conservation Advisory Board and adopted by the District.

Educational Programs

Educational programs have been implemented to encourage water conservation within the Imperial Valley. These programs range from public meetings to get input from the property owners themselves, to full-scale demonstrations so that others can see how new irrigation techniques and methods are used.

Cooperative Programs

The District has been involved in various cooperative studies and programs to research innovative water conservation methods. Different levels of involvement have been required of the District. For example, the District has helped the USDA Research Station in Brawley by constructing a lysimeter to determine crop water consumption; helped to construct an underground soil column laboratory, a reservoir, and a pumping station; installed four evaporation and weather stations; and provided labor, equipment, and materials for a five year irrigation efficiency study.

The District has also cooperated with the University of California Irrigation Management Information System and mobile laboratory programs sponsored by the University in conjunction with the California Department of Water Resources (DWR).

On-Farm Irrigation Programs

Farmers have been practicing on-farm irrigation methods to conserve water. Agricultural lands must be tiled, graded, and prepared for the application of water. Tile drains have been installed and, in addition, head ditches have been lined to reduce water loss due to seepage. This program is still in effect.

2. Miscellaneous Programs to Reduce Salton Sea Inflow

Water conservation is designed to reduce losses, most of which contribute to the inflow to the Salton Sea. Assuming that other inflow elements remain unchanged, the level of the Sea is expected to decline. However, recognizing that conservation programs take time to implement, whether the time is five years or twenty years, other alternative programs need to be considered that can be applied in a shorter time period.

The following are several proposals that could be looked into to help reduce inflows into the Salton Sea.

a. The continued use of spreading drain water on available idle land by ponding, flooding or sprinkling.

b. Constructing storm detention basins on the East and West Mesas.

c. Irrigation with free drain water (through the cooperation of landowners) and alternating with canal water.

d. Pumping water from the Salton Sea to shallow ponds adjacent to the Sea.

e. Pumping water from drains to shallow ponds on the East and West Mesas (or other available lands) for wildlife ponds/marshes or other uses.

f. Supporting the continued investigation of diverting the New River at or south of the Mexican Border to Laguna Salada in Mexico.

g. Separating tile drain flows from tailwater to reuse surface runoff.

3. Environmental Management

In accordance with the California Environmental Quality Act (CEQA), IID has by resolution adopted the State CEQA guidelines. These guidelines provide that certain programs are exempt from preparing environmental assessments. Programs in this category include concrete lining existing District canals, installing pipelines for portions of laterals and drains, installing road crossings and replacing existing water system structures.

The District has prepared a declaration of negative impact for each regulating reservoir, and it will continue to file this type of environmental review for similar projects. As major projects in the Water Conservation Plan of 1985 have been prepared for implementation, an environmental assessment as required by the CEQA guidelines will also be prepared. The major environmental issues expected to be of concern with local water system projects are:

a. Reduction of flows in drains.
b. Reduction of inflow to Salton Sea.
c. Increase of salinity of drain waters.
d. The impact of these three factors on fish and wildlife, recreation and aesthetic values.

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III. GOALS AND OBJECTIVES

A. Preface

Many of the major water resource issues faced by the County now and in coming years include the threat of continued deterioration of surface and groundwater resources, the possible reduction of available Colorado River water caused by increased demand and adverse climatic conditions, as well as the balancing of urban and agricultural needs with those of plants and wildlife.

Pollution of surface waters from urban development primarily in the Republic of Mexico, but also in the County, continue to pose a serious threat to groundwater and surface water resources in the County. These issues also include the continued increase in salinity of the Salton Sea, as well as the high agrichemical and suspended solids load draining into the Sea, which have an adverse impact on sport fishing and other recreational uses associated with this important resource.

The Water Element goals are developed as broad based statements reflecting the County's values, aims, and aspirations for management of this vital resource. These goals address the physical development of the County as well as the wise use and preservation of the County's important water resources. The programs set forth herein have been developed to implement the goals and objectives of the Water Element. The policies set forth specific performance requirements for the various plans which relate to water issues in Imperial County.

The goals and objectives are not to be inclusive and are general in nature. They are not to be considered as a means to regulate a specific area. Their main intent is for them to be implemented only to the extent that such implementation is achieved by reasonable regulations or rights therein. The goals and objectives may change at any time to accommodate appropriate growth within the County.

B. Goals and Objectives

Adequate Domestic Water Supply

Goal 1: The County will secure the provision of safe and healthful sources and supplies of domestic water adequate to assure the implementation of the County General Plan and the long-term continued availability of this essential resource.

> Objective 1.1 The efficient and cost-effective utilization of local and imported water resources through the development and implementation of urban use patterns.
>
> Objective 1.2 Cooperation between the Cities and County for the need to maintain, upgrade, and expand domestic water and sewage treatment facilities of the communities within the County, the need for the implementation of appropriate development fees, and the raising of service fees to off-set limited public financial resources.
>
> Objective 1.3 The efficient regulation of land uses that economizes on water consumption, enhances equivalent dwelling unit demand for domestic water

resources, and that makes available affordable resources for continued urban growth and development.

Protection of Surface Waters

Goal 2: Long-term viability of the Salton Sea, Colorado River, and other surface waters in the County will be protected for sustaining wildlife and a broad range of ecological communities.

Objective 2.1 The continued viability of the agricultural sector as an important source of surface water for the maintenance of valuable wildlife and recreational resources in the County.

Objective 2.2 A balanced ecology associated with the riparian and ruderal biological communities important as breeding and foraging habitats for native and migratory birds and animals occurring within the County.

Objective 2.3 Preservation of riparian and ruderal habitats as important biological filters as breeding and foraging habitats for native and migratory birds and animals.

Adequate Agricultural Irrigation Water Supply

Goal 3: The County will secure the provision of safe and healthful sources and supplies of agricultural irrigation water adequate to assure the continuation of agricultural land uses as established by the County General Plan and the long-term continued availability of this essential resource.

Objective 3.1 The efficient and cost-effective utilization of local and imported water resources through the development and implementation of innovative agricultural use patterns.

Protection of Water Resources from Hazardous Materials

Goal 4: The County will adopt and implement ordinances, policies, and guidelines that assure the safety of County ground and surface waters from toxic or hazardous materials and wastes.

Objective 4.1 The development and implementation of infrastructure and regulatory policies in the Republic of Mexico, which reduce contamination of the New River, Alamo River, and the Salton Sea.

Objective 4.2 The provision of safe and efficient community wastewater treatment facilities which adequately service the present and future needs of residential, commercial, and industrial development within the Imperial Irrigation District service area.

Coordinated Water Management

Goal 5: Water Resources shall be managed effectively and efficiently through inter-agency and inter-jurisdictional coordination and cooperation.

Objective 5.1 Encourage and provide for the management and wise use of water resources for contact and non-contact recreation, groundwater recharge, hydroelectric energy production, and wildlife habitat as well as for domestic and irrigation use.

Objective 5.2 Aid in the protection and enhancement of limited water resources so as to provide for the indefinite use and maximum enjoyment.

C. Relationship to Other General Plan Elements

State law mandates seven Plans or "Elements" for local government General Plans. Although the Water Element is not mandatory, it must comply with requirements that are requisite to all parts within a General Plan. Legislative intent must be fulfilled as set forth in Government Code, Section 65300.5: "....the General Plan and the parts thereof comprise an integrated, internally consistent and compatible statement of policies for the adopting agency."

The Water Element Policy Matrix (Table 5) identifies the relationship between the Water Element Goals and Objectives to other Elements of the Imperial County General Plan. The Issue Area identifies the broader goals of the Element and the "Xs" identify that related objectives are contained in the corresponding Elements.

TABLE 5
WATER ELEMENT POLICY MATRIX

Issue Area	Land Use	Housing	Circulation	Noise	Seismic/ Public Safety	Agricultural	Open Space Conservation	Geothermal
Adequate Domestic Water Supply	X	X						
Protection of Surface Waters						X	X	
Adequate Agricultural Irrigation Water Supply						X		
Protection of Water Resources from Hazardous Materials	X				X			

IV. IMPLEMENTATION PROGRAMS AND POLICIES

A. Preface

Imperial County is seen as one of the most, if not the most, agriculturally productive regions in the world. In order to continue the deserved reputation of supplying the world with high quality food crops, the County must appreciate and conserve its vital resources which enable the production of such valuable crops. One of these important vital resources is water. The County must recognize and consider the future of its economy and agriculture is the primary sector. Obviously, the continued urban growth in the County is equally dependent upon receiving adequate water resources.

Through water conservation measures, programs, and policies, the County and the District will continue to efficiently utilize this valuable resource as it has done in the past. Also, water conservation projects with other agencies such as the "Water Conservation Agreement between Imperial Irrigation District and the Metropolitan Water District of Southern California" will enhance the availability of water within the County and encourage additional water conservation projects. With continued monitoring of the surface waters in Imperial County by the Imperial Irrigation District and others, any increase in salt concentrations can be addressed in order to enhance water quality.

Recognizing that water is a vital resource, continued cooperation and coordination between Imperial County and other Local, State, and Federal agencies, water resources can be conserved and used for all approved beneficial purposes, including continued growth and development in all economic sectors. Also, continued planning and coordination efforts by the County can assure that future developments will not only enhance the economy, but may also encourage various industries to relocate and create a more broad based economy in the County.

Overall, Imperial County has great potential to wisely utilize its water resources and enhance the quality of water for all beneficial uses. Strategies should be carefully planned and incorporated into the decision making process of the County to assure adequate conservation of its water resources and the availability of water in the future.

B. Policies and Programs

The following policies are statements of purpose and/or direction that are meant to help guide decision makers in making judgements on issues concerning water resources in the County. These policies specifically address the Objective of the Water Element, which in turn accomplish the Goals of the Element. The Policy is presented first for each sub-heading, followed by more specific program statements.

1. Adequate Domestic Water Supply

Policy

The efficient regulation of land uses that economizes on water consumption, enhances equivalent dwelling unit demand for domestic water resources, and that makes available affordable resources for continued urban growth and development.

Programs

- The County of Imperial shall regulate and encourage the economical use of domestic water resources through the implementation of applicable State codes and the promotion of drought resistant native and non-native desert landscaping in all types of urban development.

- The County of Imperial shall encourage the distribution of water conservation literature and signage in public restaurants, hotels, and motels as a means of preserving domestic water treatment and wastewater treatment facility capacities.

- The County of Imperial shall encourage the distribution of low cost water conservation technologies and literature to all households in the County as a means of assuring an affordable quality of life and of preserving the capacities of domestic water treatment and wastewater treatment facilities.

- The County of Imperial shall encourage the metering of agricultural and urban water use, including encouraging municipalities to initiate water metering programs to promote more thoughtful and economical use of domestic water.

- The County of Imperial shall assure the enforcement and implementation of Section 17921.3 of the Health and Safety Code, Title 20, California Administrative Code Section 1601(b), and applicable sections of Title 24 of the State Code through the development and building permit process.

- The County of Imperial shall study the appropriateness of and need for impact and/or development fees, which can be used to preserve important water resources and assure their long-term availability.

2. Protection of Surface Waters

Policy

Preservation of riparian and ruderal habitats as important biological filters, and as breeding and foraging habitats for native and migratory birds and animals.

Programs

- The County of Imperial shall take an active role in soliciting the support of State and Federal agencies, particularly the California Water Quality Control Board and the U.S. Environmental Protection Agency, in the cleanup of the New River at the International Border.

- The County of Imperial Health Department, Parks and Recreation Department, and other responsible agencies shall maintain programs and regulations to assure safe and healthful water resources for sport, recreation, and wildlife uses.

- The County of Imperial, also with the Imperial Irrigation District, the California Department of Fish & Game, and the U.S. Fish & Wildlife Service, shall cooperate and coordinate the use of water resources to protect and enhance valuable wildlife communities and habitats of the region.

- The County of Imperial shall take an active role in encouraging the development of infrastructure and a regulatory environment in the Republic of Mexico which addresses the chronic pollution of the New River and Alamo River from agricultural, industrial, and urban development.

- The County Health Department shall report annually to the Board of Supervisors on the conditions of the New River at the International Border and within the County, and the progress made by State and Federal agencies in reducing the level of contaminants being carried to the Salton Sea.

- As part of the effort to protect and enhance wildlife and their habitat, the County of Imperial shall actively pursue the preservation, maintenance of breeding and foraging habitat for native and migratory birds and animals, preserving these biological systems as indicators of environmental integrity, and as a source of sport and recreation.

- The County of Imperial shall monitor, coordinate, and cooperate with State and Federal agencies to assure the protection of the Colorado River resource from over utilization and excessive export to protect urban and agricultural interests and to assure the health of the various biological habitats of the Colorado River.

3. Adequate Agricultural Irrigation Water Supply

Policy

The efficient and cost-effective utilization of local and imported water resources through the development and implementation of appropriate and separate agricultural and urban use areas.

Programs

- The County of Imperial shall play a pro-active role in encouraging the use of efficient and cost-effective methods of water conservation in all aspects of urban development as well as agriculture.

- The County of Imperial shall encourage the reclamation and use of agricultural and urban wastewaters in urban landscaping, golf courses, and wildlife habitat areas wherever practical.

- The County of Imperial shall play a pro-active role in encouraging the efficient use and conservation of the Colorado River resource, and in maintaining an adequate allocation for local agricultural use in Imperial Valley.

4. Protection of Water Resources from Hazardous Materials

Policy

Adoption and implementation of ordinances, policies, and guidelines which assure the safety of County ground and surface waters from toxic or hazardous materials and/or wastes.

Programs

- The County of Imperial shall make every reasonable effort to limit or preclude the contamination or degradation of all groundwater and surface water resources in the County.

- All development proposals brought before the County of Imperial shall be reviewed for potential adverse effects on water quality and quantity, and shall be required to implement appropriate mitigation measures for any significant impacts.

- The County of Imperial shall coordinate with the California Regional Water Quality Control Board and incorporated cities is to assure that discharge from community wastewater treatment plants meet or exceed applicable State and Federal standards.

- The County of Imperial shall play an active role in assuring the advance planning necessary to provide community and/or industrial wastewater treatment facilities which keep pace with continued urbanization in the County.

- The County of Imperial shall support the investigation of innovative methods of wastewater treatment which reduces discharge of contaminants into County surface waters, while enhancing the ruderal and riparian habitats of the County.

- The County of Imperial shall direct staff of the County Health Department, Planning/Building Department, and other appropriate departments, as well as the County Agricultural Commissioner, to review existing ordinances, policies, and guidelines and determine their adequacy in protecting groundwater and surface water from contamination by hazardous materials and/or waste.

- The Imperial County Health Department, as the Local Enforcement Agency, shall continue monitoring operations at the various landfills across the County and shall periodically report on the impacts or potential impacts of these landfills on ground and surface water resources in the County.

- The County of Imperial shall confer and coordinate with the California Department of Health, Regional Water Quality Control Board, and the U.S. Environmental Protection Agency to assure that these agencies are taking active steps to protect and reclaim groundwater and surface waters from contamination.

5. Coordinated Water Management

Policy

Encourage and provide inter-agency and inter-jurisdictional coordination and cooperation for the management and wise use of water resources for contact and non-contact recreation, groundwater recharge, hydroelectric energy production, and wildlife habitat as well as for domestic and irrigation use.

Programs

- The County of Imperial shall confer and consult with the Imperial Irrigation District and incorporated communities of the County to assure a coordinated and coherent water policy for all interested parties in the County.

- The County of Imperial shall actively consult and confer with IID and other Districts, and the incorporated communities of the County regarding the limitation or elimination of impacts to surface and groundwater resources due to agricultural and urban development.

- The County of Imperial shall lend its support to programs and policies of the State Water Resources Control Board, Regional Water Quality Control Board, and other agencies which promote the wise and efficient use of water resources. Particular attention shall be given to the State Water Resources Control Board's regulations pertaining to water quality control and land development.

- The County of Imperial shall regulate land development and natural resource management to protect the limited but important areas of the County which contribute to groundwater recharge.

- The County of Imperial shall support the continuance and development of hydroelectric resources in the County in conjunction with compatible resource protection and management policies.

- The County of Imperial shall encourage the fair and appropriate assessment of fees and charges for the deliveries of urban and agricultural waters, and for water treatment capacity.

- The County of Imperial shall take an active role in maintaining and enhancing river, sea, ruderal, and riparian habitats, as well as other biotic systems in the County which contribute to enhance water resource protection and maintenance.

- The County of Imperial shall cooperate and coordinate with the Regional Water Quality Control Board and other responsible agencies to investigate the potential for the creation of additional wetlands as a means of providing tertiary waste treatment while expanding and enhancing wetlands habitat.

- All County of Imperial departments with responsibility for regulation or jurisdiction for oversight of issues of water resource management shall make every effort to coordinate activities and share information and resources to assure protection of this vital resource.

- The County of Imperial shall act in a pro-active, cooperative, and coordinated manner with Local, State, Federal and International agencies responsible for maintenance of minimal standards for local surface and groundwater resources.

APPENDIX A

HISTORY OF IMPERIAL VALLEY WATER

The majority of land in Imperial County was, at one point, vacant desert. It was not until the aboriginal inhabitants settled in the area and made use of the land near the waterfront to produce agricultural crops to provide food which improved the soils of the area. The population then was largely Yuman-speaking. In historic, times, the Mohave, Quechan, and Halchidhoma tribes all probably lived in the area at various times. The Colorado River Basin Region was home to the Halchidhoma until about 1826, when the combined attack of the Quechan and Mohave resulted in more than 250 casualties to the resident tribe.

The survivors fled to the Gila River where they joined the Maricopa tribe and lost their identity. Their vacated territory was soon filled by a division of the desert-dwelling, Shoshonean-speaking Chemehuevi, an off-shoot of the Southern Pauite. Today, the Fort Mojave, Chemehuevi, Colorado River, and Yuma Indian Reservations are located along the Colorado River.

Subsistence along the river mainly on intensive collection of wild plant foods and flood water farming, supplemented by hunting and fishing. Mesquite was unquestionably the most important of the indigenous plants, but various cacti in the nearby plants were also important. The probable casual flood plain farming included such crops as corn, beans, squash and, in historic times, wheat, barley, and melons.

Villages were located near the river bank and houses were usually flat-topped ramada-like in design. As now, the river was capable of supporting large populations of aboriginal inhabitants, however, unfavorable floods meant fewer crops, and at such times full-time hunting, fishing, and gathering were required to sustain the tribe. At these times, tribes required more living space, and this led to competition for resources, theft of food, petty conflicts, and sometimes outright war. The warfare pattern was chronic, brutal, and always involved neighboring groups.

It is believed that the first European visitors came in 1776, traveling up the Colorado River looking for a better interior route from Yuma, Arizona to Monterey, California. They began settling and exploiting better agricultural practices that eventually led to the early development of small urban areas. However, there was still very limited development of urban areas, since riverfront agriculture continued to be the most dominant form of the area's economy.

The continued expansion of agriculture and the arid desert climate also created additional wildlife habitats. The Imperial Valley provides a dramatic mix of arid desert and water oriented habitat areas, which support a broad range of native and introduced year-round and migrant species of plants and animals. The sizable areas in active cultivation also provide important foraging habitat for numerous birds and small mammals. Important habitat areas include the Colorado River, agriculture related canals and drains, the Salton Sea and desert wash and flat-land areas. These diverse and occasionally highly specialized communities constitute an important and valuable resource, which will require protection if their long-term value is to be preserved.

The idea of diverting the Colorado River to irrigate the desert lands of the Imperial Valley was conceived before the Civil War. In 1849, Dr. O.M. Wozencroft was probably the first to recognize this possibility as he crossed the Colorado Desert in route to San Francisco in search of gold. Though he died in 1887, several water appropriations were filed in 1895 by individuals to divert Colorado River water to irrigate lands in "that portion of San Diego County known as New River Country."

In 1896 the California Development Company was formed by C.R. Rockwood. Rockwood and his associates decided to call the area by various names, including Colorado Desert, Salton Basin and New River Country; the name we know today is Imperial Valley. Just prior to the turn of the century, Rockwood, an irrigation engineer, and his partner George Chaffey, sought to redirect Colorado River water to irrigate the potentially fertile soils of the Imperial Valley.

In 1900, excavation of a canal and construction of headworks on the Colorado River near Pilot Knob began, and in 1901, the first diversions of water were made to serve about 1,500 acres of crops. About 40 miles of the Imperial Canal, also known as the Alamo Canal, ran through Mexico before crossing into the United States east of present day Calexico. Within three years, silting of the headworks and upper reaches of the Canal led to the excavation of a temporary bypass channel about four miles downstream in Mexico.

For a few years the system worked well, however, in the fall of 1904, unseasonable flood waters on the Colorado and Gila Rivers broke into the bypass and down the Alamo Canal. For about two years the entire flow of the Colorado River poured into the Salton Sink forming the Salton Sea, an impressive salt water body created by a combination of natural and man-made events. The newly created sea was enormous in size (approximately 35 miles long and 15 miles wide).

In 1907, the Southern Pacific Company bought out the California Development Company and was successful in returning the Colorado River to its original channel. During the next several years, physical, financial and international complications, and legal problems plagued the project. The settlers decided to form a local agency which resulted in the formation of the Imperial Irrigation District (the District), a public corporation organized in 1911 under the California Irrigation District Act, California Water Code, Sections 20500 et. seq.

The District was to perform three chief functions: diversions and delivery of Colorado River water for agriculture and domestic purposes; operation and maintenance of drainage canals and facilities; and generation, transmission and distribution of electric power.

It was not until 1916 that financial and legal problems were settled so that the District could acquire the properties of the California Development Company and the Southern Pacific Company.

The All-American Canal and the Coachella Canal were constructed as unlined canals in the 1940's to bring Colorado River water into the Imperial and Coachella Valleys. Construction of the All-American Canal began in August 1934 and was completed in 1940. Water deliveries to the East Highline Canal began in October of 1940. In

February of 1942, all Colorado River water diverted to the Imperial Valley was delivered via the All-American Canal.

The Coachella Canal was completed in 1948 and began diverting water from the All-American Canal to the Coachella Valley. Soon after construction of both canals, leakage from the unlined canals began creating mounds of ground water beneath the canals. To prevent significant loss of water from the Coachella Canal, the United States Bureau of Reclamation reconstructed the first 49 miles with a new concrete lined canal. The new canal is located east of the older reach and was completed in 1980. Gradual improvements took place during the three decades from 1950 to 1980. Today, Imperial County has a complex system of irrigation and drainage canals that serve communities with water for various agricultural and domestic purposes.

In addition to the Imperial and Coachella Valleys, the south end of the Palo Verde Valley lies at the northeast corner of Imperial County. The Palo Verde Water District supplies water to this area from the Colorado River.

APPENDIX B

RESOURCE ASSESSMENT

I. Surface Waters

A description of the water quality of the major surface waters is discussed below. The discussion will focus on each type of surface water such as the Colorado River, the All-American Canal, the New River, Alamo River and other drains, and the Salton Sea.

The Colorado River

Excessive salinity concentrations have long been recognized as one of the major quality problems of the Colorado River, which provides municipal and industrial water to nearly fourteen million people, and irrigates approximately 700,000 acres of farmland. The Colorado River's heavy salt load is derived from both natural and human activities, each contributing about half the total amount. An estimated nine million tons of dissolved salts pass Hoover Dam each year, causing California water users an estimated $100 million in annual damages. Without measures to control it, salinity in the lower reaches of the river will continue to cause major water quality problems.

In 1975, the seven Colorado River Basin States (California, Arizona, Nevada, Utah, Wyoming, Colorado and New Mexico), with the Environmental Protection Agency's approval, adopted water quality standards for river salinity at three stations: 723 mg/L below Hoover Dam; 747 mg/L below Parker Dam; and 879 mg/L at Imperial Dam. Current studies show that, without control measures, salinity could reach 1,000 milligrams per liter (mg/L) at Hoover Dam by the year 2010.

Although Colorado River water still has a relatively high total of dissolved solids when compared to its headwaters, the water quality of the Imperial Valley is fairly good, with the exception of the minor quantity of rainfall it receives. As the water flows through the Colorado system it is used for agriculture and other beneficial uses, resulting in salt buildup. In addition, the erosion of the Colorado and its tributaries results in a large sediment load. Between 1980 and 1983 the total annual amount of sediments removed from the desalting basins at Imperial Dam was 5,135,168 tons. This seems relatively high but it was caused by extreme high river releases.

A summary of the water quality of the Colorado River water reaching Imperial Dam and other surface waters is shown in Table B-1. The water quality of Colorado River water reaching Imperial Dam is moderately basic (pH 8.0) and has good dissolved oxygen concentrations. The average 1980 concentration for TDS of 760 mg/L represents good quality water for irrigation use. This total is well below the criterion of 879 mg/L set by the Environmental Protection Agency for TDS at Imperial Dam. Although this value is high for drinking water, it is still within acceptable limits. Other water quality parameters such as nitrate, phosphate, and biological oxygen demand are well within acceptable limits.

Data received from the California Regional Water Quality Control Board for annual average water quality of the Colorado River at Imperial Dam between 1988 and 1990 is shown on Table B-2 to show differences from 1980 data.

The water continues to be moderately basic with good dissolved oxygen concentrations. Total dissolved solids of the Colorado River at Imperial Dam have risen from 685 mg/L in 1988 to 731 mg/L in 1990. This figure is lower than the 1980 reading of 760 mg/L shown in Table B-2 and is still well below the criterion of 879 mg/L set by the Environmental Protection Agency.

TABLE B-1
SUMMARY OF 1980 WATER QUALITY DATA*
COLORADO RIVER AT IMPERIAL DAM AND OTHER SURFACE WATERS

Factor	Colorado River at Imperial Dam	Alamo River Near Intl. Border	Alamo River at Salton Sea	New River at Salton Sea	Salton Sea at State Park
1. Temperature (C°)	18	19	21	21	22
2. pH	8.0	7.9	7.9	7.7	8.3
3. Dissolved O_2 (mg/L)	8.4	8.0	7.5	6.6	6.9
4. Turbidity (NTU's)	18	77	232	188	9
5. Specific Conductance (umhos/cm)	1,400	5,300	4,000	5,800	42,900
6. Total Dissolved Solids (mg/L)	760**	3,396	2,817	3,496	35,845
7. Phosphate, PO_4 (mg/L)	0.08	0.31	0.77	0.75	0.15
8. Nitrate, NO_3-N (mg/L)	0.12	0.32	7.5	5.3	0.23
9. Nitrate, NO_2 (mg/L)	<0.01	0.09	0.14	0.16	0.05
10. Ammonia NH_3/NH_4+-N (mg/L)	<0.01	1.3	0.5	1.0	0.6
11. Suspended Solids (mg/L)	70	120	337	262	285
12. Volatile Suspended Solids (mg/L)	42	96	278	217	233
13. MBAS (mg/L)	<0.1	<0.1	<0.1	0.1	0.3
14. COD (mg/L)	8	25	23	26	---
15. BOD 5, 20°C (mg/L)	<2	4	4	8	16
16. Fecal Coliform (MPN/100ML)	8	800	3,600	4,000	1

* Mean Value Data
** Modified Based on United State Bureau of Reclamation, 1985c.
BOD 5 = Five Day Biological Oxygen Demand
COD = Chemical Oxygen Demand
MBAS = Mephylene Blue Active Substance
Source: California Regional Water Quality Control Board, 1984.

TABLE B-2
COLORADO RIVER AT IMPERIAL DAM
SUMMARY OF AVERAGE ANNUAL WATER QUALITY DATA
(1988-90)

Factor	Year		
	1988	**1989**	**1990**
1. Temperature (C°)	26	21	20
2. pH	8.0	7.2	8.1
3. Dissolved O_2 (mg/L)	8.25	7.37	7.77
4. Turbidity (NTU's)	5.2	4.5	2.2
5. Specific Conductance (umhos/cm)	1,079	1,052	1,113
6. Total Dissolved Solids (mg/L)	685	706	731
7. Phosphate, PO_4 (mg/L)	17.4	12.7	21.7
8. Nitrate, NO_3-N (mg/L)	1.3	10.0	4.0
9. Nitrate, NO_2 (mg/L)	.09	.03	.03
10. Ammonia NH_3/NH_4+-N (mg/L)	.20	.19	.28
11. Suspended Solids (mg/L)	<.01	<.02	NA
12. Volatile Suspended Solids (mg/L)	.09	.43	.60
13. MBAS (mg/L)	<.07	<.07	.06
14. COD (mg/L)	3.25	20	<4.75
15. BOD 5, 20°C (mg/L)	<1.0	1.45	<1.25
16. Fecal Coliform (MPN/100ML)	<20	<19	<35

BOD 5 = Five Day Biological Oxygen Demand
COD = Chemical Oxygen Demand
MBAS = Mephylene Blue Active Substance
Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly. Regional Surface Water Quality Monitoring Program, 1988-1990.

Fecal coliforms in the Colorado River at Imperial Dam have risen since 1980. In 1980, an average of only 8 MPN/100ML of fecal coliforms were recording as compared to an average of 35 MPN/100ML in 1990. This could be due to increased recreational uses along the Colorado River such as RV parks or other activities taking place.

The All-American Canal

At Imperial Dam, water is diverted to the All-American Canal, which conveys water in California to the Bard Valley, and to the agricultural areas of the Imperial and Coachella Valleys. Table B-3 and B-4 summarize water salinity, from 1960 to 1984, on the All-American Canal below Drop No. 1, which diverts water to Coachella via the Coachella Canal. The salinity of the water in the All-American Canal would be expected to follow fairly closely that of the Colorado River. However, there is a fluctuation from a low of 737 ppm (1.00 ton/AF) to a high of 958 ppm (1.30 tons/AF). Without salinity control projects in the Colorado basin, the salt concentration of this water would be expected to increase. This increase is partly a result of increased diversion and use of the Colorado River water in other parts of its reach.

Data collected in 1978 and 1979 illustrates relatively little variation in water quality through the All-American Canal and Pilot Knob to the East Highline Canal. The effects of the seepage and evaporation on water quality as it passes through this part of the system are apparently minor. Additional data shows a marked increase in dissolved solids between Imperial Dam and delivered irrigation water, and also demonstrates the relatively high sulfate concentrations in the Colorado water salt composition.

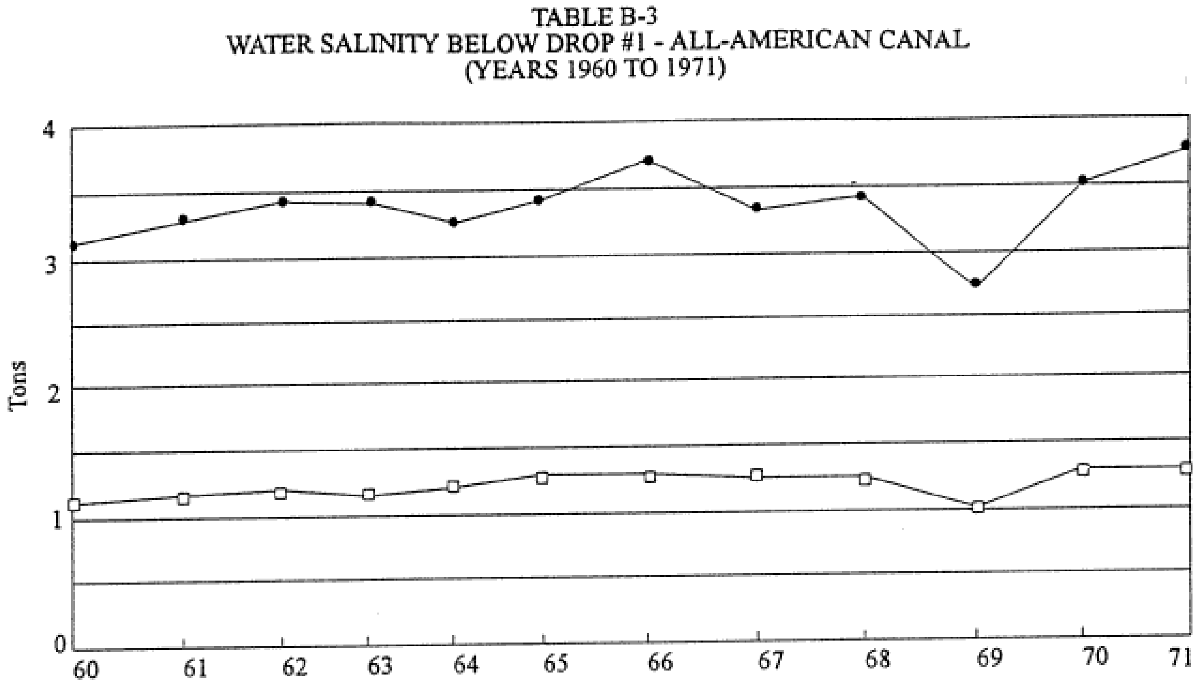
Water quality data for the All-American Canal from monthly monitoring samples conducted by Imperial Irrigation District (IID) in 1983-1984, illustrated that the water had held relatively low salinity, with an average TDS of 754 mg/L, well below the criterion of 879 mg/L for delivery of Colorado River water at Imperial Dam. The quality of this water corresponds to that of the Colorado River with a basic pH ranging from 7.9 to 8.6, and low values for sodium absorption ratio (SAR). The low SAR is indicative of the fairly high concentrations of calcium and magnesium relative to the total concentration of cations (a positively charged ion), and it shows a quality of water very suitable for continued agricultural use.

The New River, Alamo River, and Drains

The New River flows into the Imperial Valley from Mexico with a significantly high waste load. The New River at the International Boundary has a sizable flow, the 1983 mean flow measured at 325 ft^3/second. Seasonal variations in contaminant loads correspond to a late winter planting and irrigation, and a fallow fall season. As this drainage flows through the County, the flow increases dramatically as a result of drainage from the agricultural lands in the Imperial Valley. Tables B-5 and B-6 show 1983-1984 water quality data for the New River at the International Boundary and at the outlet to the Salton Sea, respectively.

As shown, the New River is polluted as it enters the United States. In 1983, TDS averaged 3,737 mg/L with a 5-day Biological Oxygen Demand (BOD) of 14 mg/L and fecal coliforms of 750,000 MPN/mL. This total indicates the intensive use of this water for irrigation in Mexico and the presence of municipal wastewater from Mexicali. To be safe for use as potable water, a source should be free of fecal coliforms.

Table B-3 and B-4 - Water Salinity Below Drop #1 - All-American Canal
(Note: Table Labeling error The Bottom Table B-3 should be Labeled Table B-4)



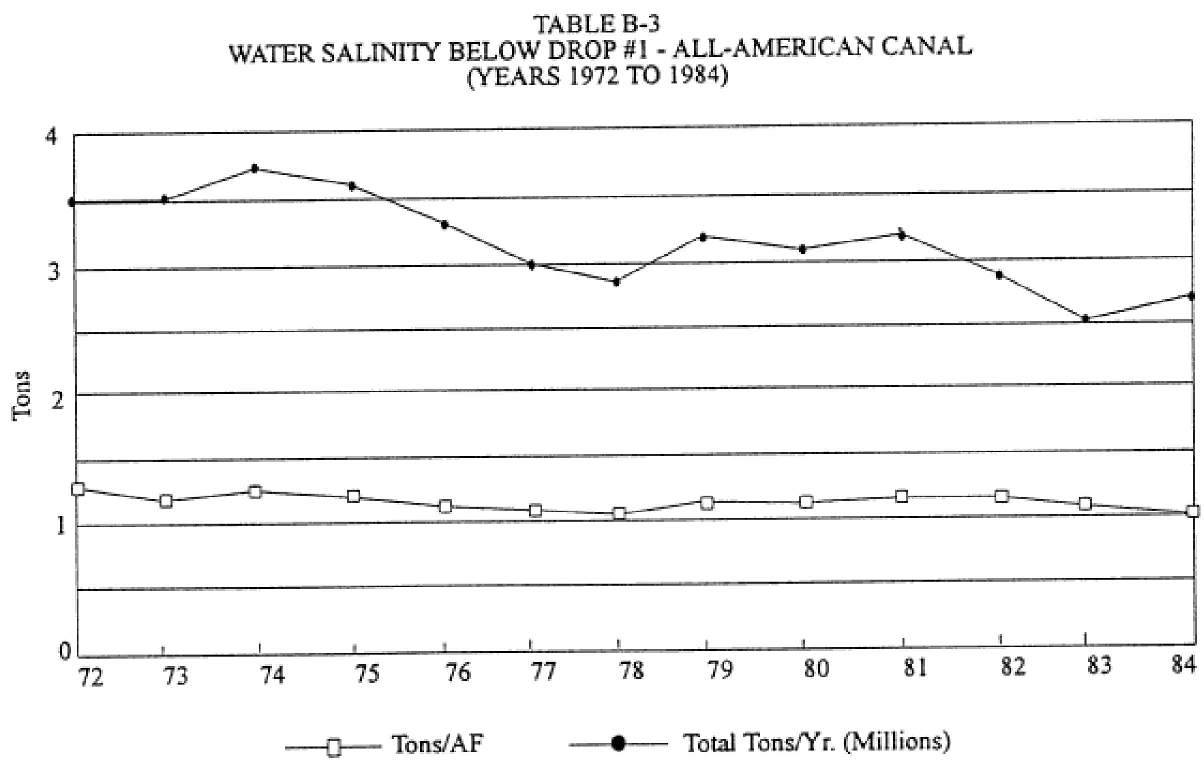


TABLE B-5
NEW RIVER WATER QUALITY AT CALEXICO
(MONTHLY, 1983-1984)

Date	Flow (ft^3/sec)	TDS (mg/L)	Conductivity ($Kx10^6$)	pH	SAR	NA (epm)	Ca+Mg (epm)
Jan 83	199	4,182	6,440	-----	12.79	44.67	24.40
Feb 83	429	4,250	5,140	-----	12.72	45.62	25.73
Mar 83	324	4,266	5,980	-----	10.54	39.80	28.53
Apr 83	319	4,554	6,640	-----	14.03	50.20	25.60
May 83	390	4,070	5,530	-----	09.88	35.70	26.13
Jun 83	324	4,578	5,180	7.90	13.41	49.21	29.94
Jul 83	361	4,988	6,450	7.80	14.13	51.60	26.67
Aug 83	378	3,296	5,070	8.10	0.26	31.26	22.80
Sep 83	411	2,846	5,000	8.00	08.99	28.42	20.00
Oct 83	416	3,036	4,620	7.70	08.66	28.28	21.33
Nov 83	338	3,156	5,370	7.60	08.97	29.84	22.14
Dec 83	313	3,270	5,085	7.80	09.78	09.78	33.21
Jan 84	347	3,880	5,370	7.80	11.01	38.05	23.87
Feb 84	387	3,994	5,640	8.00	11.25	40.14	25.47
Mar 84	384	3,258	5,240	8.10	06.56	24.12	27.07
Apr 84	414	3,246	5,130	8.20	07.21	26.63	27.26
May 84	419	3,628	5,130	8.60	07.77	29.63	29.07
Jun 84	329	3,424	5,000	8.10	13.70	41.65	18.48
Jul 84	333	3,234	5,040	8.50	11.04	33.50	18.40
Aug 84	403	3,838	6,030	8.00	14.65	44.05	18.08
Sep 84	371	3,192	4,860	8.60	10.90	33.52	18.93
Oct 84	425	2,644	4,090	8.40	08.49	25.35	17.84
Nov 84	355	2,722	3,750	8.40	08.09	24.59	18.49
Dec 84	430	3,513	6,000	8.00	10.59	33.30	19.76
Average	367	3,628	5,350	8.08	10.60	-----	-----

Note: Ca+Mg = Calcium plus Magnesium
epm = equivalents per million
K = Potassium Na = Sodium
SAR = Sodium Adsorption Rate TDS = Total Dissolved Solids
Source:Imperial Irrigation District Water Quality Data, 1983-1984.

TABLE B-6 NEW RIVER WATER QUALITY AT THE OUTLET INTO THE SALTON SEA (1983-1984)							
Date	**Flow (ft^3/sec)**	**TDS (mg/L)**	**Conductivity ($Kx10^6$)**	**pH**	**SAR**	**NA (epm)**	**Ca+Mg (epm)**
Jan 83	494	4,100	5,720	-----	10.15	38.23	28.40
Feb 83	1,147	4,000	4,110	-----	09.86	37.40	28.80
Mar 83	1,231	2,942	4,230	-----	05.26	19.16	26.53
Apr 83	777	3,320	4,980	-----	08.78	30.16	23.60
May 83	780	3,274	4,770	-----	08.84	30.00	23.06
Jun 83	665	3,408	4,940	8.00	08.73	30.32	24.14
Jul 83	665	3,800	6,450	7.40	10.81	37.19	23.67
Aug 83	675	3,202	4,100	8.40	08.31	27.88	22.53
Sep 83	733	3,188	4,770	7.50	08.05	27.89	24.00
Oct 83	755	3,090	4,620	7.70	07.09	25.24	25.33
Nov 83	664	3,238	5,670	7.40	07.71	28.09	26.53
Dec 83	618	3,258	5,080	7.60	07.65	28.16	27.07
Jan 84	657	3,454	5,370	7.60	07.09	26.91	28.80
Feb 84	721	3,302	5,979	7.80	07.75	28.23	26.53
Mar 84	835	3,042	4,740	7.80	06.02	21.71	26.00
Apr 84	893	3,036	4,660	8.10	06.23	22.74	26.67
May 84	842	3,200	4,460	8.20	06.85	25.01	26.67
Jun 84	698	3,164	4,750	8.20	12.19	35.99	17.43
Jul 84	658	3,084	4,800	8.50	07.41	25.25	23.20
Aug 84	787	3,424	5,400	8.20	10.57	34.10	20.80
Sep 84	726	3,178	4,860	8.40	07.54	26.11	24.00
Oct 84	795	2,894	4,440	8.50	08.49	26.03	18.80
Nov 84	707	3,044	4,220	8.70	08.34	26.05	19.52
Dec 84	690	3,570	6,500	8.00	10.89	36.21	22.12
Average	759	3,301	4,957	8.00	08.36	-----	-----

Note: Ca+Mg = Calcium plus Magnesium
epm = equivalents per million K = Potassium Na = Sodium
SAR = Sodium Adsorption Rate TDS = Total Dissolved Solids

Source:Imperial Irrigation District Water Quality Data, 1983-1984.

It can be seen from the averages of Tables B-5 and B-6 that the pH balance of the New River remained fairly constant. Average flows of the New River at the International Boundary were 367 cubic feet per second and 759 cubic feet per second at the outlet into the Salton Sea, and increase of 392 cubic feet per second over a two year period. Average total dissolved solids decreased from 3,628 mg/L to 3,302 mg/L for the same time period.

Table B-7 shows the water quality of the New River, as it passes through the City of Calexico, which was monitored on three different days between December of 1990 and May of 1991 by the California Regional Water Quality Control Board. The average of the data is summarized in Table B-7.

The average pH balance of the water is 7.6. Between December 3, 1990 and May 14, 1991, total dissolved solids increased by 364 mg/L, however, other water parameters such as phosphate, nitrate and nitrite have decreased. In addition, fecal coliforms decreased from 725,000 (MPN/100ML) in December, 1990 to 240,000 (MPN/100ML) in May, 1991. This is probably due to an increase in water flow in the month of May due to higher water demands based on warmer temperatures. Increases in water levels causes fecal coliforms to dilute in the water, thus reducing their abundance. Table B-8 summarizes the average annual water quality data for the New River near the outlet to the Salton Sea.

The average pH balance of the New River decreased slightly at the outlet between 1988-90 compared to the 1983-84 data of Table B-6 which showed a pH of 8.0. Total dissolved solids has remained relatively constant between 1988-90. Fecal coliforms have decreased by a large margin between 1989 and 1990, a difference of 19,300 (MPN/100ML).

Tables B-9 and B-10 show 1983-84 water quality data for the Alamo River at the International Boundary and at the outlet, respectively. The Alamo River has a very low flow at the International Boundary, being typically less than 5 ft^3/second. Water quality data at this location as shown in Table B-9 indicates that the water already has very high "Total Dissolved Solids" as it enters the Valley, from agricultural lands in Mexico. The data also shows the limited presence of other contaminants, given the limited urban development in this portion of the Alamo River drainage area.

As Table B-10 indicates, agricultural runoff, community wastewater runoff and other contributions to the Alamo River in Imperial County act to dilute the total suspended solids and other contaminants. This results in a reduced pollutant load being discharged into the Salton Sea than that entering the County from Mexico.

Table B-11 shows average annual water quality data for the Alamo River near the International Boundary between 1988-90. Total dissolved solids have increased slightly over the past three years. However, total dissolved solids at the outlet decrease as shown in Table B-12. Phosphate, nitrate, nitrite, and ammonia fluctuated slightly, while fecal coliform averages in 1990 decreased incredibly to 950 MPN/100ML from the average of 18,975 in 1989.

TABLE B-7
NEW RIVER AT CALEXICO
SUMMARY OF AVERAGE WATER QUALITY DATA
FOR SPECIFIC DATES
(1990-91)

Factor	12/3/90	Monitoring Dates 3/14/91	5/14/91 - 5/15/91
1. Temperature (C°)	12	15	21
2. pH	7.6	7.5	7.7
3. Dissolved O_2 (mg/L)	4.0	1.5	2.1
4. Turbidity (NTU's)	24	NA	32
5. Specific Conductance (umhos/cm)	4,703	4,795	5,067
6. Total Dissolved Solids (mg/L)	2,780	2,946	3,196
7. Phosphate, PO_4 (mg/L)	2.06	1.8	1.6
8. Nitrate, NO_3-N^4 (mg/L)	.47	3.4	0.3
9. Nitrate, NO_2-N (mg/L)	.21	0.05	0.03
10. Ammonia NH_3/NH_4+-N (mg/L)	3.8	6.8	4.5
11. Suspended Solids (mg/L)	33	60	22
12. Volatile Suspended Solids (mg/L)	23	2.8	NA
13. MBAS (mg/L)	4.6	4.2	1.02
14. COD (mg/L)	81	68	95
15. BOD 5, 20°C (mg/L)	13	13	1.02
16. Fecal Coliform (MPN/100ML)	725,000	200,000	240,000

Note: For 12/3/90 and 3/14/91 data, items 1-5 are averages of the readings taken between 6:00 a.m. and 3:00 p.m. Items 6-10 are total concentration readings taken between the same time period. For 5/14/91 and 5/15/91 data, items 1-5 are averages of the readings taken between 8:00 a.m. on 5/14 and 7:00 a.m. on 5/15. Items 6-10 are total concentration readings taken between the same time period. Item 16 for all three dates is the average of past years median data.

BOD 5 = Five Day Biological Oxygen Demand
COD = Chemical Oxygen Demand
MBAS = Mephylene Blue Active Substance
Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Quality Monitoring Program, 1990-1991.

TABLE B-8
NEW RIVER NEAR THE OUTLET TO SALTON SEA
SUMMARY OF AVERAGE ANNUAL WATER QUALITY DATA
(1988-90)

Factor	Year		
	1988	1989	1990
1. Temperature (C°)	20	21	21
2. pH	7.8	7.3	7.6
3. Dissolved O_2 (mg/L)	6.2	7.0	4.5
4. Turbidity (NTU's)	86	84	104
5. Specific Conductance (umhos/cm)	4,050	4,153	3,898
6. Total Dissolved Solids (mg/L)	2,774	2,825	2,566
7. Phosphate, PO_4 (mg/L)	0.82	1.11	0.80
8. Nitrate, NO_3-N (mg/L)	6.08	8.90	3.90
9. Nitrate, NO_2-N (mg/L)	0.81	0.91	0.63
10. Ammonia NH_3/NH_4+-N (mg/L)	1.59	1.12	3.23
11. Suspended Solids (mg/L)	236	344	333
12. Volatile Suspended Solids (mg/L)	25	117	31
13. MBAS (mg/L)	0.36	0.52	0.77
14. COD (mg/L)	37	91	30
15. BOD 5, 20°C (mg/L)	9	10	9
16. Fecal Coliform (MPN/100ML)	14,225	25,700	6,400

BOD 5 = Five Day Biological Oxygen Demand
COD = Chemical Oxygen Demand
MBAS = Mephylene Blue Active Substance
Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Monitoring Program, 1988-1990.

TABLE B-9
ALAMO RIVER
WATER QUALITY AT THE INTERNATIONAL BOUNDARY
(1983-84)

Date	Flow (ft^3/sec)	TDS (mg/L)	Conductivity ($Kx10^6$)	pH	SAR	NA (epm)	Ca+Mg (epm)
Jan 83	1	3,888	5,720	-----	08.50	32.42	29.07
Feb 83	1	3,800	5,710	-----	08.73	32.99	28.54
Mar 83	3	3,982	5,350	-----	09.49	34.55	26.53
Apr 83	3	4,294	5,860	-----	10.84	40.75	28.26
May 83	3	4,678	6,560	-----	12.13	45.37	28.00
Jun 83	3	4,400	5,810	7.80	10.91	41.19	28.53
Jul 83	2	3,690	4,690	7.80	10.27	36.45	25.20
Aug 83	3	3,796	4,440	8.10	10.13	35.14	25.54
Sep 83	3	3,658	5,000	8.50	08.47	30.92	26.66
Oct 83	2	3,660	5,650	7.80	08.29	31.31	28.53
Nov 83	2	3,848	4,860	7.60	08.11	30.79	28.28
Dec 83	2	4,120	5,640	7.80	07.29	30.58	35.20
Jan 84	3	3,714	5,100	7.80	05.64	24.03	26.27
Feb 84	3	4,112	5,980	7.80	08.22	33.10	32.40
Mar 84	3	4,180	6,230	8.10	09.22	34.83	28.54
Apr 84	3	3,212	5,700	8.20	11.15	41.73	28.00
May 84	4	4,222	5,700	8.20	10.10	39.05	29.87
Jun 84	1	2,609	3,700	8.30	10.50	29.58	15.87
Jul 84	2	4,180	5,600	8.60	11.36	39.77	24.53
Aug 84	4	2,578	3,950	8.20	07.15	21.68	18.40
Sep 84	2	4,302	6,380	8.60	11.42	40.42	25.07
Oct 84	2	4,296	6,390	8.50	10.91	39.33	26.00
Nov 84	3	3,402	4,050	8.60	08.88	31.78	25.60
Dec 84	3	3,954	6,500	8.10	10.86	40.34	27.58
Average	3	3,857	5,440	8.13	09.52	-----	-----

Note: Ca+Mg = Calcium plus Magnesium
epm = equivalents per million
K = Potassium Na = Sodium
SAR = Sodium Adsorption Rate TDS = Total Dissolved Solids
Source:Imperial Irrigation District Water Quality Data, 1983-1984.

TABLE B-10
ALAMO RIVER
WATER QUALITY AT THE OUTLET INTO THE SALTON SEA
(1983-84)

Date	Flow (ft^3/sec)	TDS (mg/L)	Conductivity ($Kx10^6$)	pH	SAR	NA (epm)	Ca+Mg (epm)
Jan 83	567	2,726	3,960	-----	5.18	17.95	24.00
Feb 83	994	2,832	3,950	-----	4.99	17.70	25.20
Mar 83	1,439	2,568	3,500	-----	4.35	15.03	23.87
Apr 83	1,075	2,456	3,440	-----	3.81	13.34	24.54
May 83	919	2,800	3,180	-----	7.32	24.35	22.13
Jun 83	802	2,522	3,530	8.00	4.28	15.31	25.60
Jul 83	687	2,710	3,680	7.80	6.65	21.78	21.46
Aug 83	666	2,738	3,810	8.30	4.50	16.19	25.86
Sep 83	850	2,822	3,750	7.50	5.70	19.75	24.00
Oct 83	872	2,860	3,910	7.80	5.50	19.54	25.20
Nov 83	760	3,054	4,250	7.40	6.23	22.47	26.00
Dec 83	592	3,234	4,620	7.60	5.56	22.07	31.47
Jan 84	649	2,930	3,640	7.60	5.68	20.84	26.93
Feb 84	773	2,654	3,910	7.80	3.26	12.52	29.47
Mar 84	910	2,334	3,430	8.00	3.10	10.85	24.53
Apr 84	1,142	2,354	3,420	8.20	3.29	11.65	25.06
May 84	978	2,420	3,420	8.20	3.56	12.67	25.33
Jun 84	696	2,449	3,600	8.30	8.31	23.23	15.62
Jul 84	670	2,584	3,730	8.50	5.18	17.32	22.40
Aug 84	626	2,856	4,100	8.40	6.64	21.83	21.60
Sep 84	698	2,900	4,250	8.40	6.06	20.41	22.67
Oct 84	889	2,774	3,930	8.50	6.60	21.34	20.88
Sep 84	838	2,866	3,610	8.80	6.57	21.58	21.60
Dec 84	483	3,442	5,000	8.00	7.03	26.13	27.66
Average	816	2,745	3,818	8.06	5.39	-----	-----

Note: Ca+Mg = Calcium plus Magnesium
epm = equivalents per million
K = Potassium Na = Sodium
SAR = Sodium Adsorption Rate TDS = Total Dissolved Solids

Source:Imperial Irrigation District Water Quality Data, 1983-1984.

TABLE B-11
ALAMO RIVER
AVERAGE ANNUAL WATER QUALITY
NEAR INTERNATIONAL BOUNDARY

Factor	Year		
	1988	**1989**	**1990**
1. Temperature (C°)	20	21	20
2. pH	8.0	7.1	8.0
3. Dissolved O_2 (mg/L)	7.3	6.3	8.1
4. Turbidity (NTU's)	24	31	31
5. Specific Conductance (umhos/cm)	4,088	4,480	4,638
6. Total Dissolved Solids (mg/L)	2,751	3,246	3,251
7. Phosphate, PO_4 (mg/L)	52	76	56
8. Nitrate, NO_3-N (mg/L)	9	20	13
9. Nitrate, NO_2-N (mg/L)	.45	.41	.27
10. Ammonia NH_3/NH_4+-N (mg/L)	1.92	1.96	1.10
11. Suspended Solids (mg/L)	<.20	.21	.26
12. Volatile Suspended Solids (mg/L)	.55	1.31	.47
13. MBAS (mg/L)	<.07	<0.10	.11
14. COD (mg/L)	27	101	32
15. BOD 5, 20°C (mg/L)	6.0	6.9	7.0
16. Fecal Coliform (MPN/100ML)	10,175	18,975	950

BOD 5 = Five Day Biological Oxygen Demand
COD = Chemical Oxygen Demand
MBAS = Mephylene Blue Active Substance
Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Quality Monitoring Program, 1988-1990.

In Table B-12, the average pH balance has decreased from the average of the 1983-1984 data shown on Table B-7. Total dissolved solids remains relatively constant between 1988-90. Fecal coliform concentrations increased tremendously from 11,625 MPN/100ML in 1988 to 63,375 MPN/100ML in 1990, an increase of 51,750.

TABLE B-12
ALAMO RIVER AT THE OUTLET TO SALTON SEA
SUMMARY OF AVERAGE ANNUAL WATER QUALITY DATA
(1988-90)

Factor	Year		
	1988	1989	1990
1. Temperature (C°)	19	20	21
2. pH	7.9	7.4	7.8
3. Dissolved O_2 (mg/L)	7.8	8.6	6.6
4. Turbidity (NTU's)	170	96	143
5. Specific Conductance (umhos/cm)	3,113	3,297	3,038
6. Total Dissolved Solids (mg/L)	2,162	2,159	2,144
7. Phosphate, PO_4 (mg/L)	.52	.57	.34
8. Nitrate, NO_3-N (mg/L)	8.5	13.0	5.6
9. Nitrate, NO_2-N (mg/L)	.97	.97	.46
10. Ammonia NH_3/NH_4+-N (mg/L)	.96	1.45	1.25
11. Suspended Solids (mg/L)	347	396	411
12. Volatile Suspended Solids (mg/L)1	39	123	35
13. MBAS (mg/L)	<.05	.09	.06
14. COD (mg/L)	29	71	30
15. BOD 5, 20°C (mg/L)	6	7	4
16. Fecal Coliform (MPN/100ML)	11,625	20,775	5,600

BOD 5 = Five Day Biological Oxygen Demand
COD = Chemical Oxygen Demand
MBAS = Mephylene Blue Active Substance
Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Quality Monitoring Program, 1988-1990.

TABLE B-13 SALTON SEA MIDPOINT NEAR COUNTY LINE SUMMARY OF AVERAGE ANNUAL WATER QUALITY DATA (1988-90)			
	Year		
Factor	1988	1989	1990
1. Temperature (C°)	23	23	23
2. pH	8.4	8.3	8.6
3. Dissolved O_2 (mg/L)	13.2	11.3	14.2
4. Turbidity (NTU's)	16.0	5.2	10.2
5. Specific Conductance (umhos/cm)	56,412	36,600	41,725
6. Total Dissolved Solids (mg/L)	41,966	40,043	42,421
7. Phosphate, PO_4 (mg/L)	.54	.40	.08
8. Nitrate, NO_3-N (mg/L)	<.03	<.54	.25
9. Nitrate, NO_2-N (mg/L)	<.23	<.03	.13
10. Ammonia NH_3/NH_4+-N (mg/L)	.42	1.14	1.55
11. Suspended Solids (mg/L)	7.9	34.5	25.3
12. Volatile Suspended Solids (mg/L)	5.0	6.2	11.0
13. MBAS (mg/L)	.30	.27	.22
14. COD (mg/L)	166	255	351
15. BOD 5, 20°C (mg/L)	17	4.6	11.3
16. Fecal Coliform (MPN/100ML)	<2	2.5	<2

BOD 5 = Five Day Biological Oxygen Demand
COD = Chemical Oxygen Demand
MBAS = Mephylene Blue Active Substance
Source: California Regional Water Quality Control Board, Colorado River Basin Region, Quarterly Regional Surface Water Quality Monitoring Program, 1988-1990.

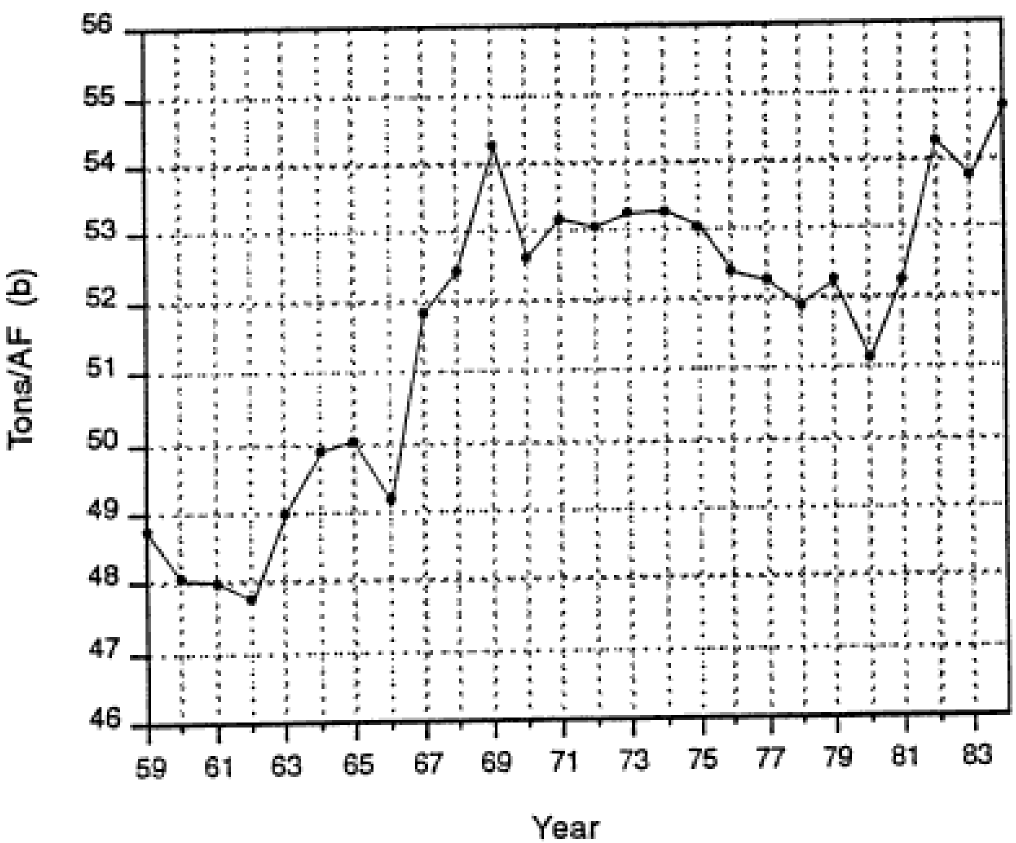
As the New River and Alamo Rivers flow toward the Salton Sea, the water quality does not degrade significantly. About forty-six percent of the inflow comes from the Alamo River and thirty-eight percent comes from the New River. The remainder of the inflow comes from smaller creeks, washes, agricultural drains and ground water seepage. Approximately twelve percent of the total inflow comes from Mexico, carried primarily by the New River. The flows increase dramatically as they receive drainage from irrigated fields which results in high TDS concentrations due to the leaching of salts from this land. Fecal coliform concentrations are reduced, probably due to the dilution effect of these drainage waters which are also contaminated.

The Salton Sea

The historic data on the Salton Sea shows a gradual increase in the concentration of dissolved salts. This increase has resulted from the high evaporation rates and continual inflow of drainage waters with high salt loads from canals and laterals in Imperial Valley and from agricultural activity in Mexico. The Salton Sea has no outlet, occurring in a fault-controlled sub-sea level basin.

At present, the water quality problem facing the Salton Sea continues to be increasing salinity. Approximately five million tons of salt per year are carried into the Salton Sea. The current salinity of the Salton Sea is approximately 45,000 mg/L of total dissolved solids and increases by about 800 mg/L per year. Most of the important species of fish inhabiting the sea were originally from the Gulf of California, where the salinity level is approximately 35,000 mg/L. Previous tests have indicated that spawning of these fish is adversely affected at salinity levels above 40,000 mg/L. When salinity increases to about 45,000 mg/L it is very questionable if a viable fishery can continue to exist. Table B-14 shows the salinity of the Salton Sea from 1959 to 1984.

TABLE B-14
SALTON SEA SALINITY (A)



An analysis of the major ions of Salton Sea water in 1984 shows the dominance of sodium and chloride ions, but with a substantial proportion of calcium and magnesium sulfates. The proportion of calcium, magnesium, and sulfate ions, however, is higher than that found in natural ocean water. Dissolved oxygen concentrations are high in the winter months, and high concentrations of total organic carbon were found. These parameters are indicative of the high productivity of the Salton Sea during the winter season. At other times of the year, anoxic or very low dissolved oxygen concentrations can result from the decay of this biomass.

The salinity of the Salton Sea is expected to increase in the next few years if appropriate measures are not taken. The projections of the rate of increase depend upon changes to the salinity of the Colorado River waster, the effect of water conservation measures on salt loading, and other factors such as the development of industrial water users and salinity control projects.

Assuming an average future inflow of four point seventy-four (4.74) million tons per year (average of 4.44 and 5.04, which are historical salt loading measurements in million tons per year between 1963-80), the salinity of the sea based on its present level would increase at the rate of approximately 480 parts per million per year (ppm/year). The actual salinity will vary depending on the dilution effect of runoff and other factors, such as loading from Mexico.

Total dissolved solids were high in these years. This increase in total dissolved solids can be expected to continue if measures to reduce salinity are not taken. Fecal coliforms are low in this portion of the Sea but higher concentrations are found at the outlet of the New and Alamo Rivers into the Salton Sea. Phosphate, nitrate, nitrite and ammonia are within acceptable limits.

Another problem facing the Salton Sea is that of selenium. The California Regional Water Quality Control Board has provided funds since 1988 for the United States Geological Survey to conduct studies on the levels of selenium in the Salton Sea. The studies have shown that the selenium getting into the Salton Sea is originally from the Colorado River, which contains approximately one to two part per billion (ppb) of selenium. As the Colorado River water is brought into Imperial Valley by various canals, the selenium becomes concentrated due to the evaporation and evapotranspiration that occurs during farming of agricultural fields. The agricultural drains then carry this selenium enriched water into the Salton Sea. The New and Alamo Rivers contain approximately seven to eight parts per billion of selenium (ppb) when they reach the Sea.

The selenium is taken up and concentrated by small organisms, which in turn, are eaten by larger organisms. This process increases selenium concentrations. Fish in the Salton Sea have an average concentration of selenium of approximately ten parts per billion (10 ppb). Birds which feed off these fish have tissue levels of up to forty parts per billion (40 ppb). This has a potential to cause health problems in birds and is currently being studied.

Also, organochlorine pesticides affect the local fish and wildlife in agricultural drains and in the New and Alamo Rivers of Imperial Valley. The concentration levels of these chemicals in the fish of these waterways are higher than the levels found in Salton Sea fish by a factor of ten or more. Birds also have high levels of these chemicals. The United States Department of Fish and Wildlife is currently studying this problem. The California Regional Water Quality Control Board Has focused on efforts to control toxic compounds detected in Agricultural drains in the Imperial Valley.

II. Groundwater

The legal and institutional planning process for water planning is established through a complex arrangement of land use and environmental laws, and agency responsibilities which involve federal, state and local governments. The purpose of the County Water Element is to provide a framework that includes project coordination in the review and approval of any project in Imperial County. The following outline briefly provides, the legal and institutional framework for water management planning.

For planning and reporting purposes, the Colorado River Basin Region has been divided into seven major planning areas by the Regional Water Quality Control Board. The basis for this division is due to the fact that each areas has different economic and hydrologic characteristics. The seven planning areas are:

1. Lucerne Valley
2. Hayfield
3. Coachella Valley
4. Anza-Borrego
5. Imperial Valley
6. Salton Sea
7. Colorado River Basin (East)

Of the seven planning areas, portions of the latter four lie within Imperial County. Each of these planning areas are discussed below in relation to groundwater hydrology and its quality.

Anza-Borrego Planning Area

This planning area includes the Clark, West Salton Sea, and Anza-Borrego hydrologic units. It comprises 1,000 square miles in the southwest corner of the Region, mostly in San Diego and Imperial Counties, with a small segment in Riverside County.

Elevations range from 230 feet below sea level at the Salton Sea to over 6,000 feet along the western boundary. The principal communities in the planning area are Salton City and, in San Diego County, Borrego Springs.

Groundwater is pumped principally from unconsolidated Pleistocene sediments, but some is pumped from low-yield wells that extend to weathered and fractured bedrock. Groundwater flows in the same and general direction as surface water, to Clark Lake, Borrego Sink, and the Salton Sea. However this subsurface flow is affected by pumping and may be impeded by faults. About 10,000 acre feet of subsurface flow reaches the Salton Sea annually. A safe yield of 22,000 acre feet/year is estimated for the planning area. Storage capacity of the groundwater basin is estimated at seven million acre feet.

Imperial Valley Planning Area

This planning area comprises 2,500 square miles in the southern portion of the Region, almost all of it in Imperial County. The easterly and westerly boundaries are contiguous with the westerly and easterly boundaries of the Colorado River Basin and the Anza-Borrego planning areas, respectively. Its northerly boundary is along the Salton Sea and the Coachella Valley planning area; and its southerly boundary follows the International

Boundary with Mexico. The planning area's principal feature is the flat, fertile Imperial Valley. The principal communities are El Centro and Brawley.

Groundwater is stored in the Pleistocene sediments of the Valley floor, the mesas on the west, and the East Mesa and sand hills on the east. However, the fine-grained lake sediments in the principal portion of the Imperial Valley inhibit groundwater movement, and tile-drain systems are required to dewater the sediments to a depth below the root zone of crops and to prevent the accumulation of saline water on the surface.

Few wells have been drilled in these lake sediments because the yield is poor and the water is generally saline. The few wells in the valley are for domestic use only. In the Coyote Wells hydrologic subunit and Davis hydrologic unit, which are at higher elevations, the water yield of the wells is higher and the waters are of lower salt concentration. Groundwater is the source of water supply in those areas.

Factors that diminish groundwater reserves are consumption use, evapotranspiration, evaporation from soils where groundwater is near the surface, and losses through outflow and export.

Salton Sea Planning Area

This planning area consists entirely of the Salton Sea, which is a saline body of water in a natural sink between the Imperial and Coachella Valleys, in Riverside and Imperial counties. The Salton Sea is approximately 360 square miles and its surface elevation, although variable, is approximately 227 feet below mean sea level.

Replenishment of the Salton Sea is predominantly from farm drainage and seepage, and occasional and sometimes significant storm runoff, from the Coachella Valley, Imperial Valley, and the Anza-Borrego area in this Region, and from the Mexicali Valley in Mexico. The gross contributing watershed comprises about 7,500 square miles.

Colorado River Basin (East) Planning Area

This planning area, also referred to as the East Colorado River Basin, encompasses the eastern portion of San Bernardino, Riverside, and Imperial counties. It is bounded on the north by Nevada, on the east by the Colorado River, which generally forms the Arizona-California State Line, on the south by Mexico, and on the west by the drainage division of the California streams directly tributary to the Colorado River. The area is characterized by desert valley and low mountains that are generally less than 4,000 feet above sea level. The Palo Verde and Bard Valleys are also within this planning unit.

Groundwater is generally unconfined in all four hydrologic units of the planning area. However, some confined zones probably exist in the more than 700 feet of alluvial sediments that form the aquifers in three of the units. The main source of water for recharging the groundwater basins is percolation of runoff. However, in localized groundwater basins next to the Colorado River, pumping has reversed the historical hydraulic gradient toward the river, carrying recharge from the river. Also, in irrigated portions of the Colorado River Basin Region, deep percolation of applied water from the Colorado River replenishes the groundwater. An additional source is the deep percolation of seepage from the unlined portion of the All-American Canal.

Subsurface water flows from each hydrologic unit toward the Colorado River, except from those local areas where the normal hydraulic gradient has been reversed by pumping or impeded by a natural barrier such as bedrock. Natural groundwater barriers are known to exist at two locations. These are near West Well in the Chemehuevi hydrologic unit, where subsurface water rises to within five feet of the surface, and in the Arroyo Seco hydrologic subunit, but there are no known wells in these areas.

APPENDIX C

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