SANTA ANA WATERSHED PROJECT AUTHORITY

Santa Ana Watershed Salinity Management Program

Phase 2 SARI Planning Technical Memorandum

May 2010

CDM

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WILDERMUTH™ ENVIRONMENTAL INC.

CDM

92220 Cleveland Avenue, Suite 100
Rancho Cucamonga, CA 91730
tel: 909.579.3500
fax: 909.980.5185

May 14, 2010

Mr. Richard Haller, Project Manager
Executive Manager of Engineering & Operations
Santa Ana Watershed Project Authority
11615 Sterling Ave.
Riverside, CA 92503

Subject: Santa Ana Watershed Salinity Management Program
Phase 2 SARI Planning Technical Memorandum

Dear Rich:

The enclosed document presents the information and findings resulting from the CDM team's work on Phase 2 of the subject program. The document incorporates comments received on the draft Technical Memorandum.

We look forward to completing subsequent phases of the study.

Very truly yours,

Donald J. Schroeder, P.E.
Vice President
Camp Dresser & McKee Inc.

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List of Acronyms

AF	acre-foot
AFY	acre-foot per year
BOD	biochemical oxygen demand
CF	concentration factor
CIW	California Instute for Women
COD	carbonaceuos oxygen demand
CWTP	Corona Wastewater Treatment Plant
DOC	dissolved organic carbon
EDC	endocrine disruptive chemicals
EMWD	Eastern Municipal Water District
EVMWD	Elsinore Valley Municipal Water District
GWRS	Groundwater Replenishment System
HDPE	high density polyethylene
IEUA	Inland Empire Utility Authority
IPR	Indirect Potable Reuse
IX	Ion Exchange
JCSD	Jurupa Community Services District
LOC	Lewis Operating Company
MF	microfiltration
mg/L	milligrams per liter
mgd	million gallons per day
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
OCSD	Orange County Sanitation District
OCWD	Orane County Water District
RO	reverse osmosis
RWC	recycled water contribution
SARI	Santa Ana Regional Interceptor
SAWPA	Santa Ana Watershed Project Authority
SBVMWD	San Bernardino Valley Municipal Water District
TDS	total dissolved solids
TM	Technical Memorandum
TOC	total organic carbon
TSS	total suspended solids
VSS	volatitle suspended solids
WMWD	Western Municipal Water District
WRCRWA	Western Riverside County Regional Wastewater Authority
WRCRWTF	Western Riverside County Regional Wastewater Treatment Facility
WWTP	wastewater treatment plant

Section 1
Introduction

1.1 Background

The Santa Ana Watershed Project Authority (SAWPA) owns and operates the Santa Ana Regional Interceptor (SARI) line within San Bernardino and Riverside Counties, California, accepting brine and other wastewater discharges within the Santa Ana Watershed. The SARI Line is a regional brine line designed to convey 30 million gallons per day (mgd) of non-reclaimable wastewater from the upper Santa Ana River basin to the Orange County Sanitation District (OCSD) system, where the water is treated and ultimately discharged through an ocean outfall. The interceptor was initially constructed to provide disposal of highly saline discharges from groundwater desalination facilities, power plants, and industrial users, in order to protect the inland water quality in the upper Santa Ana River Watershed. Due to the initially low flows of these higher salinity wastewaters, the SARI line has temporarily accommodated lower salinity domestic wastewaters to provide revenue and maintain higher system flows. Removal of salts from the watershed keeps the dischargers from degrading the water quality within the watershed, thereby allowing better use of groundwater resources and expanding the ability to reclaim water. The long-term goal of achieving salt balance within the region depends on the ability to export salt via the SARI system.

The SARI system, the fundamental link for exporting salts from the basin has been subjected to various physical, institutional and economic challenges. While much has been accomplished, more needs to be done. This Salinity Management study is intended to assist the SAWPA staff and Commission and other stakeholders to identify additional actions that can be taken on a watershed basis to achieve the desired salt balance in an effective and cost-efficient manner.

Camp Dresser & McKee Inc., in conjunction with Wildermuth Environmental Inc. and Carollo Engineers is performing this Salinity Management Study under a Task Order issued by SAWPA. The study is divided into three phases:

- Phase 1 – Salt Management Program
- Phase 2 - SARI Planning
- Phase 3 – SARI Operations

At the end of each phase of the study, the consulting team will prepare a draft Technical Memorandum (TM), assist SAWPA staff to present the information in a briefing to the SAWPA Commission, and prepare a final Technical Memorandum based on comments received. In Phase 3, a final Executive Summary report will also be prepared based on the three completed Technical Memoranda.

This Technical Memorandum presents the results of Phase 2 of the study.

1.2 Scope of Work

The Scope of Work for this second phase of the Salt Management Study is summarized as follows:

Task 2-1 Impacts of Future Technology

- Evaluate the possible range of impacts from technology advances such as "zero liquid discharge" to the expected volume of flow and chemistry of the brine discharged to the SARI.
- Evaluate impacts to the SARI's ability to support salt balance and Operations and Maintenance (O&M) of the SARI (e.g., generation of solids, formation of scale in the pipeline).

Task 2-2 System Configuration Changes

- Evaluate the following system configuration alternatives and compare the changes to "status quo" operation:
- Direct Ocean Discharge
- Alternate Discharge Points – existing ocean outfalls or the Salton Sea
- In-line Concentrating Plant(s) with an intermediate to long term goal of "zero liquid discharge"
- Relocation outside of the Prado Dam Water Conservation Pool
- Include required facilities, order of magnitude costs (capital, O&M), hurdles to implement, regulatory/permitting requirements, ability to accommodate salt removal requirements and advantages/disadvantages.

Task 2-3 Industrial Discharges

- Evaluate the advantages and disadvantages of including industrial dischargers which contain total dissolved solids (TDS), biochemical oxygen demand (BOD) and total suspended solids (TSS) in the SARI.
- Evaluate whether limits on BOD and TSS should be considered for the "status quo" system configuration.
- Evaluate the compatibility of industrial discharges and Stringfellow with the system configuration changes considered in Task 2-2.

Task 2-4 Temporary Domestic Discharges

- Summarize the current connections to the SARI containing reclaimable wastewater, associated agreements, the facilities required to remove the connection, and any plan/timing for implementing the required infrastructure.

- Evaluate the compatibility of temporary domestic discharges with the system configuration changes considered in Task 2-2.

Task 2-5 Fail Safe Connections

- Summarize permitted fail safe connections including purpose, expected maximum flow rate/volume, water quality when utilized, and use history.
- Identify alternatives to the fail safe connection.
- Evaluate the ability of the system to accommodate fail safe connections over the long term and the compatibility with the system configuration changes considered in Task 2-2.

Task 2-6 Indirect Discharges (Truck Disposal Stations)

- Summarize the operation of the four existing truck disposal stations including existing facilities, staffing, and current use.
- Estimate the likely "maximum capacity" of the current facility and expansion capability.
- Evaluate the future needs for truck disposal stations using the flow projections developed under Phase 1.
- Evaluate the impact of truck disposal stations on the O&M of the SARI, particularly on the creation of solids/scale.

Task 2-7 Technical Memorandum and Workshop

- Summarize data, information, and results in a Technical Memorandum. Conduct one workshop with a stakeholder group and aid SAWPA staff in presenting a summary to the Commission. Prepare a final summary report incorporating comments received from the stakeholder group and Commission under Task 4.

1.3 Organization of Technical Memorandum

This Phase 2 Technical Memorandum is organized in four sections as follows:

Section 1 – Introduction

Section 2 – SARI Flow Dischargers and Water Quality

Section 3 – SARI System Configuration Changes

Section 4 – Summary and Recommendations for Future Work

Section 2
SARI Flow Dischargers and Water Quality

2.1 General Facility Description

The SARI Line currently exports over 130,000 tons of salt per year from the Santa Ana River Watershed and has a nominal hydraulic capacity of 30 mgd. The SARI line consists of approximately 93 miles of 16-inch to 84-inch gravity pipeline and extends east of Colton and Lake Elsinore. Of the 93 miles of pipeline, the 72 miles of pipeline in the upper watershed are referred to as Reaches IV, IV-A, IV-B, IV-D, IV-E, and V. The lower 21 mile long SARI line is owned and operated by OCSD. In addition, there are approximately 9 miles of line that connects Lake Elsinore to the Menifee area. This portion of the line is owned by Eastern Municipal Water District (EMWD). The SARI line discharges to the OCSD Reclamation Facility (Plant #1) located in Fountain Valley where it is diverted to the OCSD Treatment Facility (Plant #2) in Huntington Beach for treatment. Figure 2-1 illustrates the SARI System.

Four of the five SAWPA member agencies, EMWD, Inland Empire Utilities Agency (IEUA), San Bernardino Valley Municipal Water District (SBVMWD), and Western Municipal Water District (WMWD) all have capacity rights in the line and have customers connected to the line. Orange County Water District (OCWD), the fifth SAWPA member agency, does not own any capacity in the SARI line.

There are four truck dump station connections to the SARI line. Each truck dump station is operated by the member agency where the station is located. The truck dump stations are located at EMWD's Perris/Menifee Desalter, upstream of IEUA's Regional Plant 2, at the City of San Bernardino's Wastewater Treatment Plant (WWTP), and at the City of Corona's WWTP.

The customers discharging to the SARI line currently consist of direct dischargers (those with actual lateral connections to the SARI line), and indirect dischargers (those that utilize the truck dump stations). The direct dischargers either own or lease the pipeline, treatment, and disposal capacity in the SARI system. The direct dischargers can be broadly categorized into desalter brine, industrial wastewater, and domestic wastewater dischargers. In addition to the direct dischargers, SAWPA also has agreements with a number of agencies that have fail-safe connections to the SARI system for use in case of an emergency. Table 2-1 summarizes the SARI capacity right ownership.

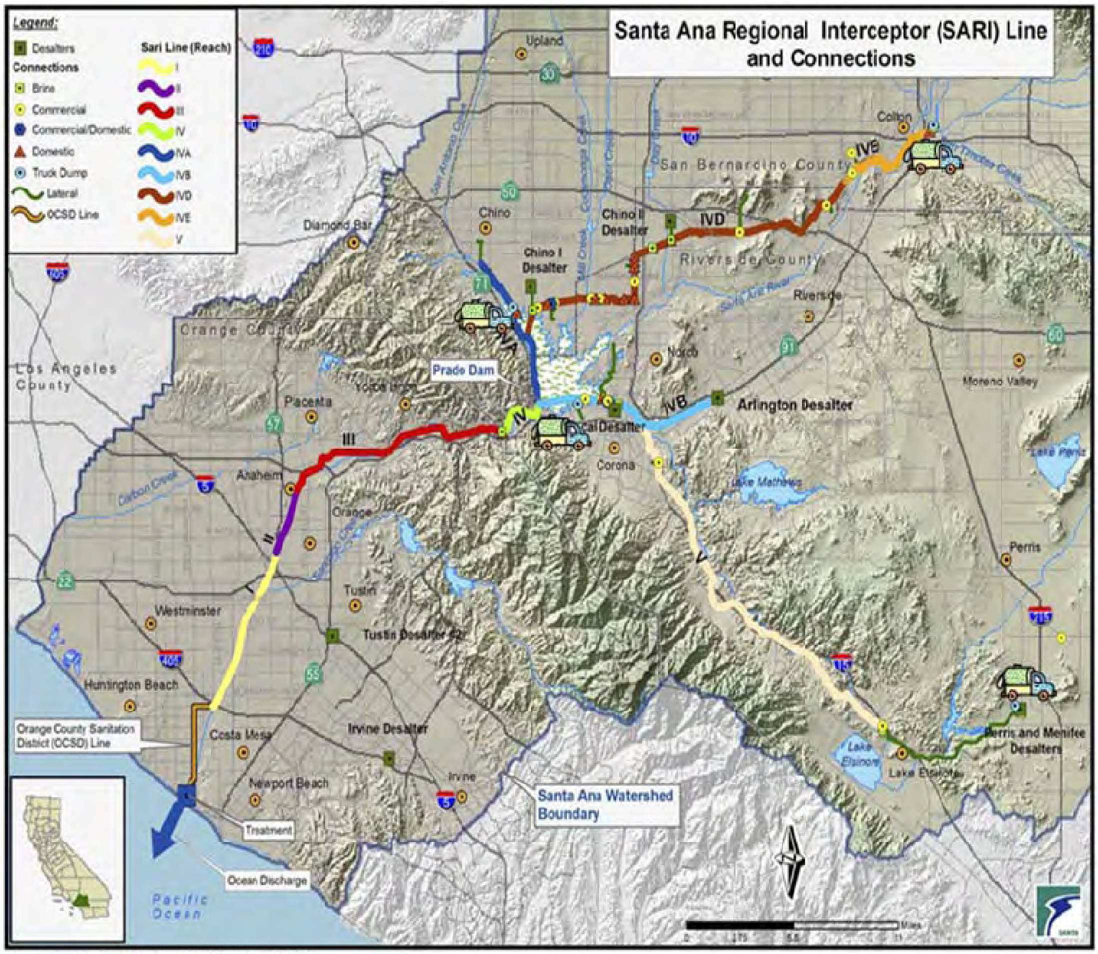

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Figure 2-1
SARI System Map

Table 2-1
SARI Capacity Right Ownership SAWPA Salinity Management Study TM2

Agency	Pipeline Capacity Right (mgd)	OCSD Treatment Capacity Right (mgd)
SAWPA	0.000	0.295
SBVMWD	7.198	0.804
EMWD	5.946	3.548
IEUA	4.130	2.250
WMWD	11.624	6.753
Chino Desalter Authority	3.67	3.35
Total Capacity (mgd):	**32.568**	**17.000**

2.2 Current Discharger Flow and Water Quality

2.2.1 Flow

As of July 2009, only 11.78 mgd (averaged monthly flow from July 2008 to October 2009) of the current SARI capacity was utilized by the direct and indirect dischargers. The list of dischargers and their typical discharge volumes are listed in Table 2-2.

Fail-safe connections, which are discharges that if and when used on an intermittent basis, consist of domestic wastewater in the event of an emergency resulting from failure of a pump station or other system component, are not accounted for in Table 2-2 because the flows are neither regular nor representative on a monthly basis. From 2007 to 2009, the average cumulative monthly flow from these discharges was 0.2516 million gallons. Entities with current permits to discharge on an emergency basis into the SARI system are:

- Sun City Lift Station
- Regional Reclamational Facility – Perris and Moreno Valley
- Reach 4 Railroad Canyon Pipeline
- City of Corona – WWTP 1
- Corona Green River Sewer Connection
- Jurupa Community Services District (JCSD) Chandler
- JCSD Harrison
- JCSD Hamner Lift Station
- JCSD Archibald
- JCSD Cleveland
- Western Riverside County Regional Wastewater Authority (WRCRWA)
- San Bernardino Municipal Water Department - RIX

Table 2-2
Current SARI Dischargers and Flow[1]
SAWPA Salinity Management Study TM2

Agency	Site Name	Typical Discharge Volume
		Desalters and Ion Exchange (IX) Plants: 8.70 MGD
WMWD	City of Corona – Temescal Desalter	1.82
WMWD	Arlington Desalter Facility	1.08
WMWD	RCSD (IX) – Anita Smith	0.01
WMWD	Chino II Desalter - Etiwanda	1.28
WMWD	Chino II Desalter – Wineville	0.08

Table 2-2 (continued)
Current SARI Dischargers and Flow[1]
SAWPA Salinity Management Study TM2

Agency	Site Name	Typical Discharge Volume
		Desalters and Ion Exchange (IX) Plants: 8.70 MGD
WMWD	Corona Energy Partners	0.07
IEUA	Chino Desalter Facility	2.00
EMWD	Menifee Desalter	1.01
EMWD	Perris Desalter	0.74
EMWD	Inland Empire Energy Center	0.22
SBVMWD	Mountainview Power Plant	0.37
SBVMWD	Inland Empire Colton Power Plant	0.02
		Industrial Dischargers: 1.45MGD
IEUA	IEUA Master Meter	0.26
WMWD	Dart Container Corporation	0.05
WMWD	DFA Distilled Water Plant	0.04
WMWD	Stringfellow Pretreatment Facility Center	0.09
WMWD	UBF Food Solutions	0.00
WMWD	JCSD Wineville (IX)	0.09
WMWD	JCSD Etiwanda	0.86
SBVMWD	Enertech Environmental California	0.05
		Domestic Wastewater Dischargers: 1.36 MGD
WMWD	California Rehabilitation Center	0.64
WMWD	JCSD Celebration Metering Station	0.10
WMWD	JCSD Hamner	0.05
IEUA	California Institute for Women	0.32
IEUA	Bonview – Lewis Homes	0.24
IEUA	Green River Golf Course	0.01
		Indirect Dischargers / Wastehaulers: 275,756 GPD
IEUA	Clement Pappas	28,417
IEUA	CC Graber Olives	821
IEUA	ICL	74
IEUA	Ludfords	328
IEUA	Mizkan	1,491
IEUA	RMS	3,859
IEUA	R&M Ranch	2,351
IEUA	Shaw Pipe	122

Table 2-2 (continued)
Current SARI Dischargers and Flow[1]
SAWPA Salinity Management Study TM2

Agency	Site Name	Typical Discharge Volume
		Indirect Dischargers / Wastehaulers: 275,756 GPD
IEUA	Ventura Foods	23,020
WMWD	Sierra Aluminum Company	1,496
WMWD	Corona Regional Medical Center	1,304
WMWD	Gene Belk Fruit Packers	2,791
WMWD	CA School for the Deaf	27
WMWD	Decra Roofing	1,688
WMWD	Prudential Overall Supply	516
WMWD	VA Medical Center	18
WMWD	Rancho Springs Medical Center	89
WMWD	Qualified Mobile, Inc	288
WMWD	Triple H Food Processors	90
WMWD	Norco Egg Ranch	37,599
WMWD	Aramark Uniform Services	673
WMWD	Fresh & Easy Neighborhood Market, Inc	1,610
WMWD	Flavor Specialties	2,057
WMWD	Food For Life Baking Co	10,187
WMWD	Frontier Aluminum	175
WMWD	Hexfet	429
WMWD	TRM Manufacturing	15,000
WMWD	La Sierra University	91
WMWD	Giuliano & Sons Briners	80,000
EMWD	Hexfet	46,794
SBVMWD	Loma Linda East Valley Campus	12
SBVMWD	Angelica Textile	1,387
SBVMWD	Aztec Uniform	205
SBVMWD	Best Brands Corp	130
SBVMWD	Doane / Mars Pet Care	1,853
SBVMWD	East Valley Water District Well 27	1,894
SBVMWD	East Valley Water District Well 107	2,287
SBVMWD	Far West Meats	199
SBVMWD	Farmdale Creamery	72
SBVMWD	Glen Helen Rehabilitation Center	257
SBVMWD	Juice Heads	27

Table 2-2 (continued)
Current SARI Dischargers and Flow[1]
SAWPA Salinity Management Study TM2

Agency	Site Name	Typical Discharge Volume
		Indirect Dischargers / Wastehaulers: 275,756 GPD
SBVWMD	Loma Linda Power Plant	1,046
SBVMWD	National Concrete Washout	8
SBVMWD	Patton	56
SBVMWD	Rayne Water Conditioning	2,918
	Total SARI Flow (MGD):	**11.78**

Notes:
1. *The flow information is based on data from July 2008 to October 2009*
2. *Indirect Discharger / Wastehauler Flow is reported in GPD*

2.2.2 Water Quality

Although the SARI line was constructed to provide disposal of high salinity discharges to outside of the upper Santa Ana River watershed, the pipeline has historically accepted many domestic wastewater and low salinity flows, which made up the majority of the SARI line flow as recently as 2005. During more recent years, with the completion of several brackish water desalters and the removal of several domestic wastewater connections, the percent of water coming from low salinity flows has steadily declined. By early 2009, over 75 percent of the SARI line flow came from municipal desalination facilities and power plants, with only 12 percent from low salinity dischargers with total dissolved solids (TDS) less than 1,000 milligrams per liter (mg/L). The overall water quality for biochemical oxygen demand (BOD), total suspended solids (TSS), volatile suspended solids (VSS), silica, and TDS concentrations based on flows discharged to the SARI line are summarized in Table 2-3, showing the change in quality from 2005 to the present.

As the flows to the SARI line have changed, problems have begun to be observed with the formation of suspended solids within the pipeline that cannot be accounted for based on the quality of the discharges into the system. As a result, SAWPA initiated two phases of Water Quality Studies and a Solids Control Study. The studies concluded that large quantities of TSS were being generated within the pipeline from the interactions of desalination brine and high BOD wastewaters.

This solids generation was found to result in TSS loadings at the downstream end of the SARI line at the Orange County line that were more than double the loadings of TSS entering the pipeline from the dischargers. This increase in TSS between what entered the pipeline (TSS of dischargers) and what exited (TSS at county line) is referred to as a TSS imbalance. Data that illustrates this condition is presented in Figure 2-2 over the period February 2005 – October 2009. As noted, there has been sharp recent increase in the imbalance that is continuing into early 2010.

Table 2-3
Current and Past SARI Water Quality[1]
SAWPA Salinity Management Study TM2

Parameter	2005 Average Concentration	2009 Average Concentration
BOD (mg/L)	163	128
TSS (mg/L)	333	276
VSS (mg/L)	--[(2)]	115
Silica (mg/L)	--[(2)]	132
TDS (mg/L)	3,568	5,102
Hardness (mg/L as $CaCO_3$)	--[(2)]	2,015

Notes:
1. ***Annual average water quality as recorded at the county line master meter (S01)***
2. ***VSS, silica, and hardness monitoring began March 2007***

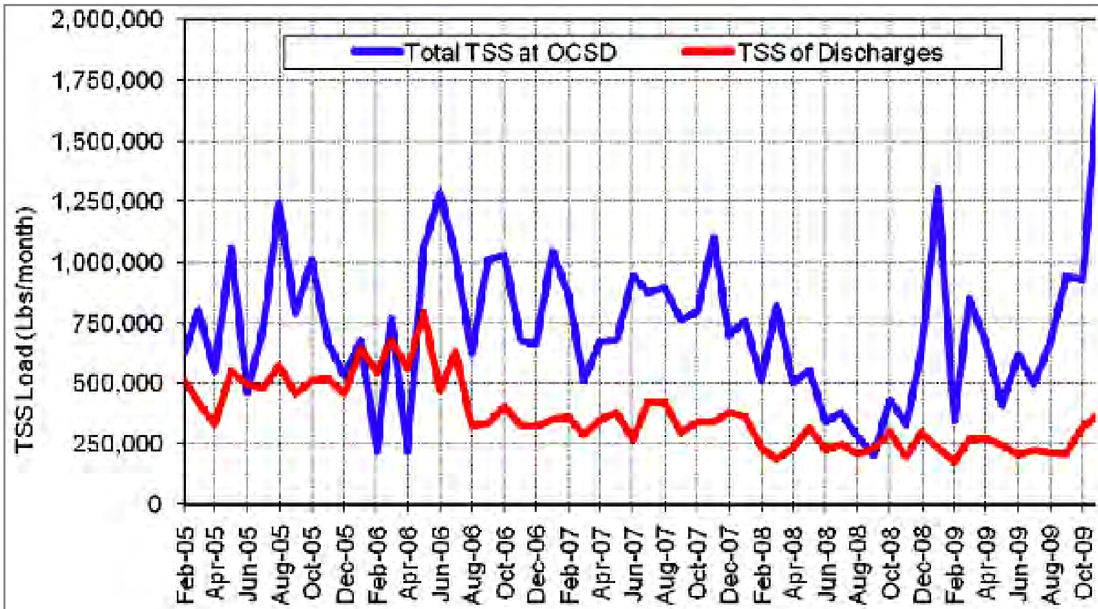

Figure 2-2
TSS Imbalance

While early analyses suggested that some of this TSS imbalance could be attributed to biogrowth within the pipeline, converting dissolved BOD to TSS, it was ultimately concluded that the two primary sources of solids generation were precipitation of inorganic solids and coagulation of organic solids. Precipitation of inorganic solids appears to be caused by supersaturated conditions of sparingly soluble salts (primarily calcium, magnesium, and silica).

These were found to be the largest contributors to scaling and solids deposition within the SARI line, accounting for more than 90 percent of the accumulated solids in several portions of the SARI. However, inorganic precipitates contributed to less than 30 percent of the TSS imbalance measured at the county line (S01). Hardness and silica have been measured for all dischargers since March 2007. Review of these data indicates a consistent loss of hardness within the SARI line. Figure 2-3 shows a portion of the EMWD SARI extension encrusted with inorganic scale.

Figure 2-3
EMWD Pipe with Encrusted Scale

Coagulation of organic solids appears to be caused by the blending of flows containing high dissolved organic constituents with high TDS flows. The high TDS in the SARI line is thought to promote the coagulation of dissolved organics by compressing the double layer around the organic compounds, reducing their repulsive forces and allowing them to coagulate into suspended solids, reflected as VSS and TSS concentrations. VSS has been found to be responsible for around 70 percent of the TSS generated in the SARI line.

SAWPA is continuing to study the formation of VSS to identify the conditions under which it is most likely to form and to identify the water quality parameters needed to predict its formation. While BOD has been used as the primary parameter for monitoring organic material in the SARI line, other parameters, such as carbonaceous oxygen demand (COD), total organic carbon (TOC), and dissolved organic carbon (DOC), are being evaluated.

2.2.3 Effect of Discharge Type on Overall Water Quality

To qualitatively evaluate the impact on overall water quality of combined SARI flow from different types of dischargers, mathematical projections were made using a water quality spreadsheet model and then removing each type of discharger and evaluating the calculated changes. The current water quality and overall flow was considered as a baseline case. Figure 2-4 summarizes the changes in BOD and TDS, reflecting the removal of different types of discharger.

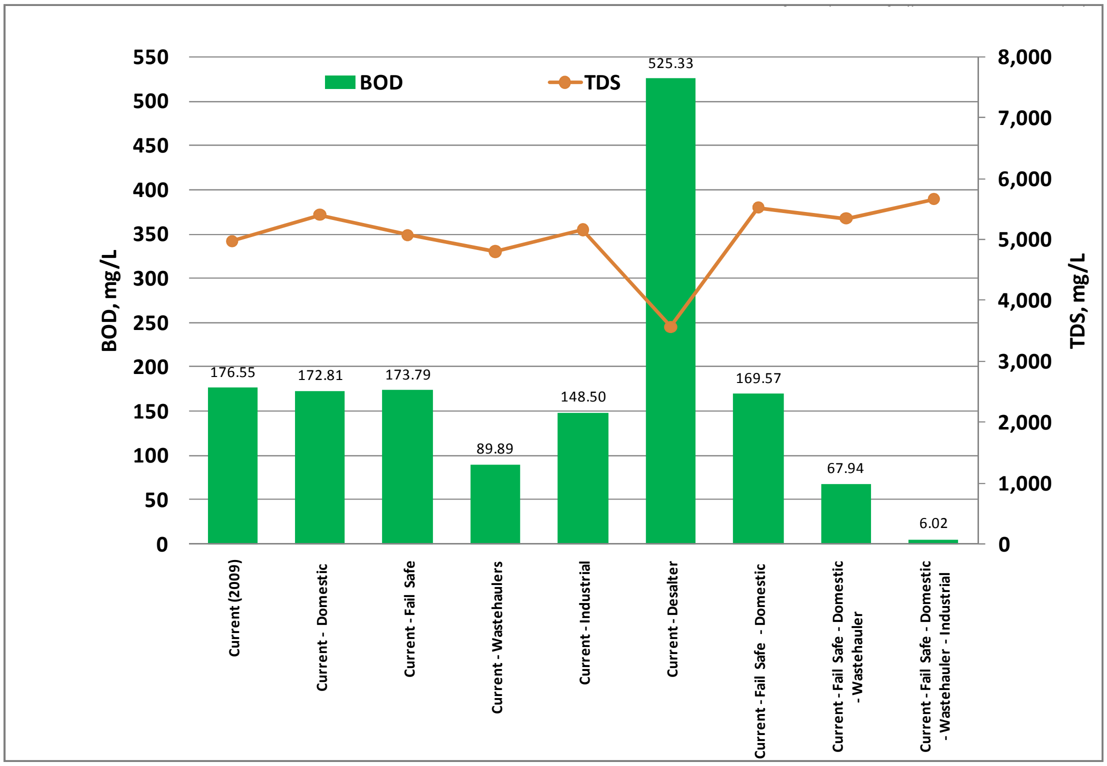

Figure 2-4
Impact on Discharger Type Connection on Overall SARI Water Quality

Six case scenarios are illustrated:

- Current situation or "baseline" case

  This scenario accounts for the average water quality data for all the direct and indirect dischargers, plus the effect of fail-safe connection utilized between 2007 and 2009.

- Current – Domestic

  This scenario accounts for the average water quality data for desalter/Ion Exchange (IX)/power plant brines, industrial and wastehauler dischargers, plus the fail-safe connections, without the domestic dischargers.

- Current – Fail-Safe Connections

  This scenario accounts for the average water quality data for desalter/IX/power plant brines, industrial, domestic and wastehauler dischargers, without contribution from the fail-safe discharges.

- Current –Wastehaulers

  This scenario accounts for the average water quality data for desalter/IX/power plant brines, industrial and domestic wastewater, plus the fail-safe connections, without flows from indirect dischargers/wastehaulers entering at truck dump stations.

- Current –Industrial

  This scenario accounts for the average water quality data for desalter/IX/power plant brines, wastehauler and domestic wastewaters, plus the fail-safe connections, without contributions from directly discharged industrial flows.

- Current – Desalter/IX

  This scenario accounts for the average water quality data for industrial, wastehaulers and domestic wastewaters, plus the fail safe connections, without desalter, ion exchange and power plant brine flows.

- Current –Fail-Safe Connections - Domestic

  This scenario accounts for the average water quality data if all the fail-safe connections and the domestic wastewater dischargers were disconnected. The remaining contributors to the SARI line would be industrial, wastehauler, and desalters/IX/power plant brine dischargers.

- Current – Fail-Safe Connections – Domestic - Wastehaulers

  This scenario accounts for the average water quality data for industrial and desalters/IX/power plant brine dischargers only.

- Current – Fail-Safe Connections – Domestic – Wastehaulers - Industrial

  This scenario accounts for the average water quality data for desalters/IX/power plant brine dischargers only, disconnecting everything else.

As seen in Figure 2-4, the complete phase-out of all current domestic dischargers does not have a significant impact on the overall BOD concentration in the SARI Line flow. Flow volumes were based on actual data from January 2007 to December 2009, instead of permitted flow. Domestic dischargers contribute 1.45 out of 11.78 mgd flow, constituting about 12 percent of the total flow. Typical domestic dischargers have a range of BOD concentrations from 150 to 346 mg/L. The reduction in total flow volume from removal of domestic discharges only resulted in 4 mg/L reduction of the overall BOD.

Similarly, when the contribution from fail-safe connections is removed, the overall BOD concentration will remain high. Fail-safe connections averaged about 0.25 million gallons per month for the period 2007 to 2009, and the slight reduction in overall volume will have negligible impact. Fail-safe connection wastes have a range of BOD concentrations from 130 to 442 mg/L.

Indirect discharges from wastehaulers make up a total flow of 0.28 mgd, and the BOD concentrations range from 4 to 33,000 mg/L. The removal of indirect dischargers/wastehaulers from the SARI system, as seen in Figure 2.4, could potentially reduce the BOD levels to about 90 mg/L.

Although desalters/IX/power plant brine flows and industrial discharger flows are unlikely to be disconnected, Figure 2-4 shows the theoretical impact of removing these two types of dischargers. Industrial discharger flows currently account for 1.45 mgd, with BOD concentrations ranging from 13 to 3,700 mg/L. If the current industrial dischargers were disconnected from the SARI system, the overall BOD level would decrease by approximately 28 mg/L.

Desalter, IX and power plant brine flows make up the largest volume of SARI flows at 8.70 mgd, and the flow serves to dilute the overall organic concentrations in the SARI line. Desalter and IX brines have BOD concentrations ranging from 3 to 41 mg/L (the high end from RCSD Anita Smith IX Facility). Mountainview Power Plant had a large spike in BOD values in October 2007 that ranged from 580 to 5,000 mg/L and the samples from this month was discounted from the overall water quality projection. Normally, BOD concentrations from Mountainview Power Company are much lower and averaged 4.70 mg/L from 2007 to 2009. The wastewater from the power plant facilities, such as Corona Energy Partners and the Agua Mansa, has very low organic and suspended solids content, as reflected in the wastewater BOD and TSS concentrations. However, wastewater from power plant facilities has significant levels of inorganic dissolved solids, as reflected in the TDS concentrations. The dissolved inorganic ions in the power plant effluent appear to include approximately 350 to 880 mg/l of hardness.

Interestingly, if all domestic wastewater contributions were removed by disconnecting both fail safe connections and domestic dischargers, approximately 5 percent BOD reduction would be observed in the SARI line. If the wastehaulers were disconnected in addition to the domestic and the fail safe connections, the BOD level would drop by 61 percent. If the only flow that were to be left in the SARI line were brines from desalters and ion exchange users, and power plants, BOD level would drop to 6.0 mg/L. From this exercise, it is evident that the largest contributors to the BOD level in the SARI line are the wastehaulers, even though the flow volume is only approximately 0.28 mgd.

2.3 Anticipated Future Discharged Flows and Water Quality Changes

In Section 6 of the Phase 1 TM, planned short-term (2010 to 2015), intermediate term (2015-2025) and long term (beyond 2025) projects were identified. Future projects can be categorized as water and wastewater supply desalting projects.

2.3.1 Water Quality Assumptions for Planned Projects

EMWD and WMWD have conducted pilot testing for brine minimization in the past on their respective primary reversed osmosis (RO) desalter brines and were able to achieve 70-75 percent and 70 percent recovery, respectively. For both agencies, the overall process constituted a primary RO process, followed by an intermediate chemical softening step to remove inorganic scaling precursors, and a high recovery RO process. The overall recovery achieved ranged from 90-92 percent.

For the purpose of developing projections of future water quality within the SARI system, BOD concentrations for planned water supply desalting projects were assumed to be similar to current (2009) values for the respective desalters. For future desalters where BOD data is unavailable, a 10 mg/L BOD concentration was assumed. This is an average value for all desalters currently discharging into the SARI line.

For wastewater supply desalting projects, which are mainly Indirect Potable Reuse (IPR) projects, an assumed BOD concentration of 13 mg/L was utilized. This value is derived from OCWD's groundwater replenishment system (GWRS) microfiltration (MF) influent, combined with an assumed subsequent RO recovery of 85 percent. The resulting IPR brine entering the SARI line would have a BOD concentration of 87 mg/L.

The following values for future water and wastewater supply desalting projects were assumed:

- 10 mg/L BOD for future desalters where water quality data is unavailable
- 13 mg/L BOD for influent MF for future IPR projects
- 85 percent recovery for RO for future IPR projects
- 70 percent overall recovery for secondary RO in future desalter brine minimization projects
- All temporary domestic wastewater dischargers will be removed by 2015.
- Future fail-safe connection flows will not be accounted for, since their usage cannot be predicted.

The assumed values were used to develop an overall mass balance model to predict the effect of planned projects on the overall water quality in the SARI line.

Given the lack of data concerning future TSS and VSS concentrations, predicting the amount of suspended solids that will be generated in-line is not possible with any degree of accuracy. Discussions on the future water quality are limited to BOD and TDS.

2.3.2 Flow

Table 2-4 summarizes the planned projects and their associated flow volumes to the SARI line. Table 2-5 summaries all flows including current and future planned projects to provide a total flow volume in the long-term (beyond 2025) time frame.

Figure 2-5 illustrates the future planned water and wastewater supply desalting projects and the anticipated discharge locations along the SARI reaches.

Based on discussions with SAWPA staff, the flows from JCSD Wineville and JCSD Etiwanda will remain as industrial flow instead of being removed from the SARI line with domestic flows. This is because these sources are primarily industrial wastewater.

For the industrial dischargers with direct connections, it was assumed that there is no peaking factor to their flow. It is assumed that if there are bottlenecks in the SARI line, the direct connectors will need to equalize flow. For the waste haulers, a peaking factor of 3 was used. This was an increase on the "Aggressive Case" from the *Brine Line Demand (Industrial/Commercial) Analysis* report, dated December 2009.

2.3.3 Future Water Quality Changes

Existing water quality data and future water quality data assumptions (as summarized in Table 2-4) were used to predict the impact of future projects on the BOD and TDS concentrations of the wastewater discharged to the SARI line.

The case scenarios include:

- Current – Fail-Safe Connections - Domestic

  This scenario accounts for the average BOD and TDS data for industrial, indirect wastehauler and current desalter/IX/power plant flows that enter SARI line.

- Planned – Domestic

  This scenario accounts for the average BOD and TDS data for industrial, indirect wastehauler, current desalter/IX/power plant, and planned future water and wastewater supply desalting flows. Brine minimization at Arlington Desalter is not included.

- Planned –Fail-Safe Connections

This scenario accounts for the average BOD and TDS data for industrial, indirect wastehaulers, current desalter/IX/power plants, and planned future water and wastewater supply desalting flows, with 1 mgd brine minimization at Arlington Desalter included.

Table 2-4
Planned Water and Wastewater Supply Desalting Projects
SAWPA Salinity Management Study TM2

Water Supply Desalting Projects	Timeline	Future TDS (mg/L)	Brine Flow (mgd)
Perris II Desalter, EMWD	2015-2025	6,000	1.00
Menifee, Perris I and Perris II Desalter, EMWD	2015-2025	18,605	-1.00
Chino II Desalter Expansion, IEUA	2010-2015	3,700	1.40
Arlington Desalter Expansion, WMWD	2010-2015	3,900	1.40
Arlington Desalter[1], WMWD	2010-2015	13,500	-1.00
Rincon Groundwater Treatment Project, WMWD	2015-2025	3,500	1.00
Riverside South Desalter, WMWD	2015-2025	3,500	1.00
Lake Matthews WTP, WMWD	2015-2025	3,500	2.00
IPR, EMWD	2015-2025	3,500	3.00
RCWD Ag Demineralization, WMWD	2015-2025	3,500	2.8
Riverside Regional Water Quality C.P., WMWD	2015-2025	3,500	0.5
Riverside Pierce St. Sewer Lift Station, WMWD	2015-2025	3,500	0.15
Pellissier Rancho Groundwater Recharge, WMWD	2015-2025	3,500	1.80
Colombia Basin Groundwater Recharge, WMWD	2015-2025	3,500	0.50
San Bernardino IPR, SBVMWD	2015-2025	3,500	2.30
Yucaipa Valley IPR, SBVMWD	2010-2015	3,500	0.80
Beaumont WWTP IPR, SBVMWD	2015-2025	8,000	0.50

Notes:
1. Brine flow decrease of 1 mgd is expected from planned brine minimization project

Table 2-5
Summary of Current and Future Flows Into SARI Line
SAWPA Salinity Management Study TM2

Project	Brine Flow (mgd)				
	Current	2010-2015	2015-2025	Beyond 2025	Total
Water Supply Desalting	10.55	+ 0.32	+ 5.00		**15.88**
Wastewater & Recycled Water Desalting	1.20	+ 0.8	+ 11.55		**13.55**
Unspecified Desalting[1]				+ 3.74	**3.74**
Other					
Domestic Wastewater	2.27		Remove (-2.27)		**0.00**
Direct Industrial Connection & Wastehaulers[2]	1.59	+ 0.50	+ 1.00	+ 0.60	**3.69**
Total	**15.61**	**1.62**	**15.28**	**4.34**	**36.85**

Notes:
1. ***Based on future projected volume f brine to meet the salt "gap" from Table 5-3 in Phase 1 TM less brine associated with future wastewater desalting projects.***
2. ***From 12-02-09 Draft Brine Line (Industrial/Commercial) Demand Analysis.***

The potential addition of over 15 mgd of water supply desalting projects and over 13 mgd of wastewater supply desalting projects significantly dilutes the BOD and TDS concentrations of the combined overall flow in the SARI line. Note that each SARI reach is unique in terms of its dischargers. Some of the reaches do not convey domestic wastewater, such as upper Reach IV-B and Reach V, so there could be no dilution of TDS. Even with the implementation of 1 mgd of planned brine minimization using high recovery RO at Arlington Desalter, which would result in a higher TDS brine discharge to the SARI line, the difference between the two latter case scenarios is minimal.

The salt load transported out of the upper Santa Ana watershed by the SARI would be expected to increase from approximately140,000 tons/year currently by over 130,000 tons year in the future, resulting in over 270,000 tons/year of salt export.

By 2025, a large majority of the flow to the SARI line would be from desalting facilities as additional groundwater desalting facilities are constructed and more flows are accepted from advanced treatment facilities producing highly treated recycled water from wastewater effluent (IPR projects). Domestic discharges are expected to be removed from the system. While some fail-safe connections may be removed over time based on member or local agency project implementation, others may stay and provide and provide an important benefit to member agencies.

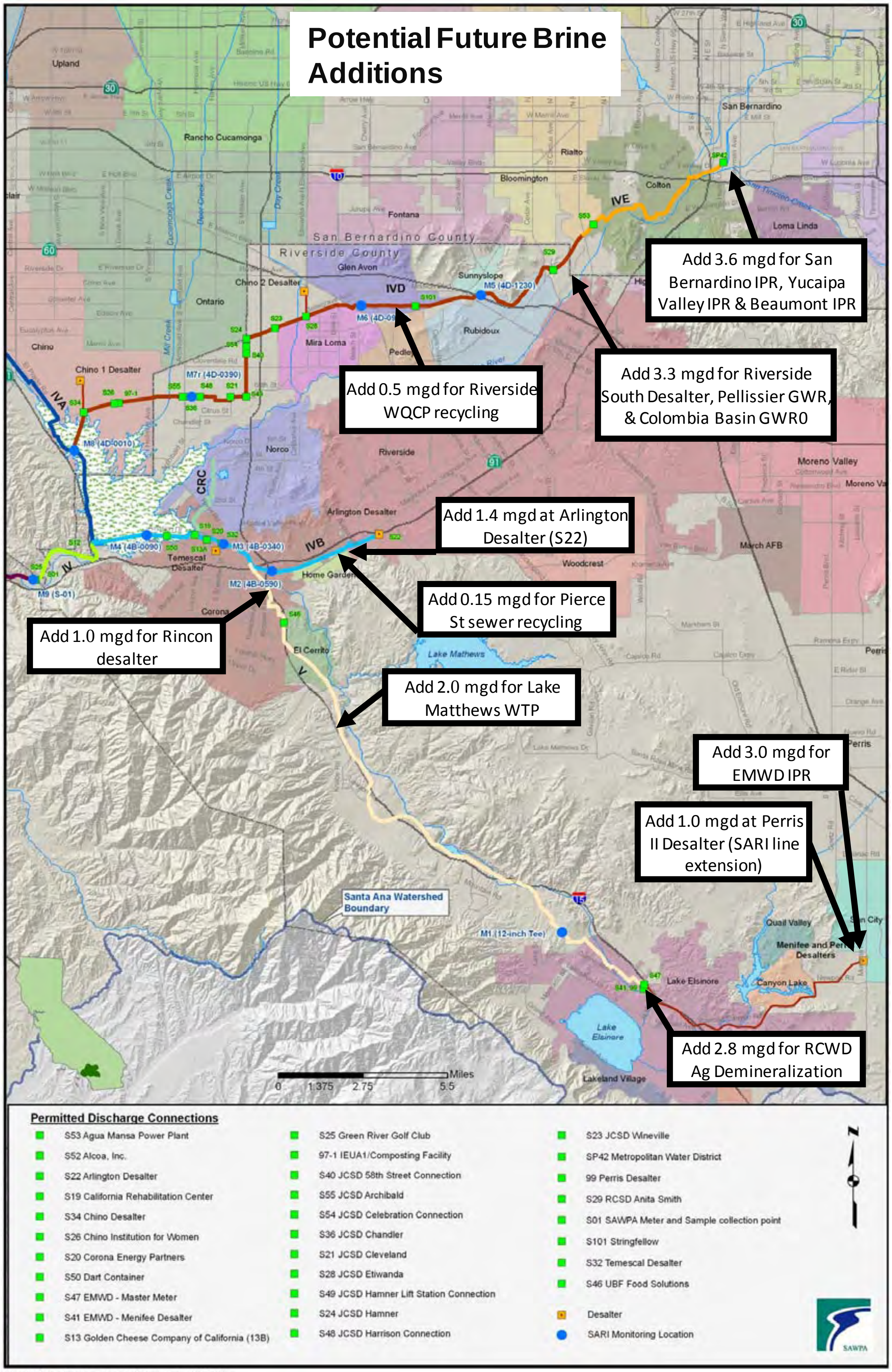

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Figure 2-5
Potential Future Brine Additions

The results are presented in Figure 2-6.

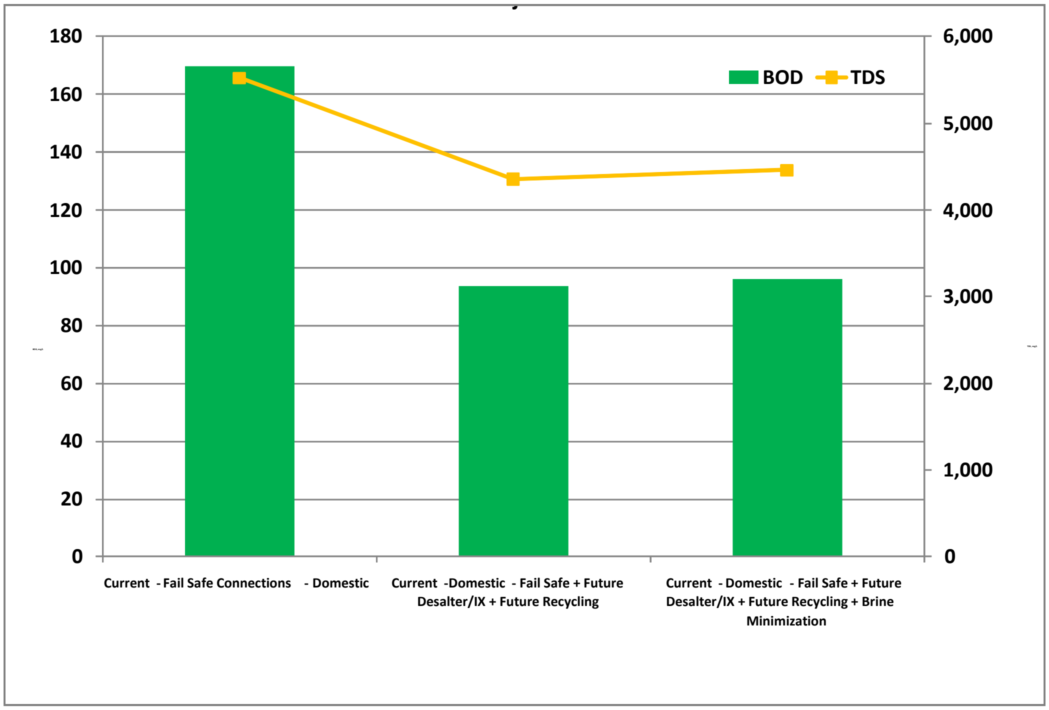

Figure 2-6
BOD and TDS for Planned Water and Wastewater Supply Desalting Projects

The concentrate from the IPR projects is anticipated to have approximately 87 mg/L average BOD, based on average concentrations of the Orange County Groundwater Recharge project. Water quality in the SARI line in the future would be expected to have lower average BOD due to the increased flow from desalters and discontinuance of domestic discharges.

As summarized previously (March 23, 2009 Santa Ana Regional Interceptor Sediment and Solids Control Study memorandum), the presence of certain inorganic dissolved solids, particularly calcium, magnesium, and silica in combination with bicarbonate alkalinity, in concentrations higher than the saturation concentrations of insoluble inorganic compounds results in precipitation of material in the SARI line. The primary materials found in samples of deposited precipitate from some sections of the SARI line were calcium and silica.

In addition, diagnostic testing and evaluation of the BOD and VSS concentration data at different sampling locations indicates organic volatile suspended solids are being created with the SARI line. This may be a result of biological activity and coagulation of organic material present in discharges in the saline inorganic matrix within the SARI line. While dissolved organic constituents may represent the primary causative agent for VSS creation, suspended organic material may also contribute to the VSS growth in the pipeline. The suspended organic particulates likely degrade in transit while the pipeline and promote increased biological microbial degradation.

The discharges most potentially problematic for continued issues in the future with inorganic precipitation and generation of VSS are the industrial discharges containing high concentrations of BOD, TSS and TDS. Solids generation of both types in the SARI pipeline would be promoted by allowing continued discharge of these wastewaters.

Discharge of the wastewaters containing low concentrations of organic material such as those from power plants, commercial entities, and industrial entities discharging ancillary utility flows with low organic and high TDS levels would presumably contribute less to VSS creation, however, would likely result in contribution to inorganic precipitation within the pipeline.

Effluent discharge limits on BOD and TSS/VSS should be considered by SAWPA to minimize organic concentrations in the wastewater accepted for discharge. Effluent limits would require dischargers to conduct source reduction programs or pretreat wastewater to the specified levels. Target effluent limitations could potentially be identified through evaluation of the effects of lowered organic concentrations in pilot trials conducted in certain reaches of the SARI line.

To minimize the solids precipitation problem currently plaguing the SARI pipelines due to the chemical reaction between high TDS brines and high BOD wastes, it is becoming increasingly clear that in the future brine flows and high BOD wastewater flows should not be comingled.

Precipitation associated with the combination of organic constituents in the industrial discharges with the dissolved inorganics in the desalter flows remains a significant issue to be addresses when considering industrial discharges. The commercial and industrial discharges with higher organic constituent concentrations have levels of TDS similar to the effluent wastewater from desalters in many cases, however, the mix of constituents may be different and in some cases concentrations are much higher. While the flows of industrial wastewater are smaller in volume, SAWPA may wish to consider surcharges on some inorganic ions such as calcium and silica to help recover a share of the maintenance costs associated with pipeline cleaning necessary due to solids precipitation. Limiting TDS levels in industrial wastewater to levels similar to those in desalter flows may be considered, however, this would likely create disincentives for industrial operations.

2.4 Impacts of Future Technology

Based on the planned projects that will develop in the short-, intermediate, and long-term within the Santa Ana watershed, potential impacts of the technologies that will most likely would be implemented to minimize brine flows will be discussed in this section.

2.4.1 Desalter Brine Minimization

The selection of a desalter brine minimization technology is typically dictated by the water quality of the primary RO desalter reject or "brine". For brine that contains high concentrations of calcium, a chemical softening step is usually required to minimize scaling in the subsequent high recovery RO steps. The choice of the chemicals for softening is in turn dictated by the anionic species in the water.

Brine that contains high calcium and bicarbonate/carbonate can usually be treated using lime at a pH level of approximately 9.5 to precipitate the inorganic species. If there is a significant amount of non-carbonate species such as sulfates and chlorides present in the water, soda-ash addition will be needed to supplement the lime-softening. Through chemical addition to increase the water's pH, magnesium and silica will usually precipitate above pH 10.5. Through chemical softening, calcium, magnesium and silica concentrations under supersaturated conditions can be reduced to levels similar to those of the feed. Subsequently, a high recovery treatment (e.g., RO) processes can be implemented to recover additional water. An estimate of the resulting brine concentration produced by the high recovery RO process can be calculated using a Concentration Factor (CF). This is strictly an estimate made in the absence of RO membrane rejection properties, concentration polarization factors and scaling associated with membranes in the desalting process.

By definition, CF is the degree that feedwater dissolved solids are concentrated in the brine. It is expressed by

$$CF = 1/\ (1-Y) \qquad \text{Equation 2.1}$$

where Y is the percent recovery as a decimal.

For a 75 percent recovery, the constituents in the water will increase by 4-fold, and for an 80 percent recovery, the concentration will increase by 5-fold.

Pilot testing of brine minimization technologies has been conducted by EMWD and WMWD over the last few years. At EMWD, the primary desalter brine from Menifee Desalter's RO process contains high levels of calcium, magnesium and silica. Through caustic soda and lime-soda ash softening, the softened brine was treated with a subsequent high recovery RO process operation at 70 to 75 percent recovery. In addition to reducing the calcium, magnesium and silica levels in the primary desalter brine, another indirect benefit of chemical softening includes reduced concentrations of micro constituents such as iron, manganese, arsenic and selenium. Although these constituents were present in relatively small concentrations and not specifically targeted by chemical softening, they were precipitated out of solution at higher pH values. The overall desalter plant recovery with the addition of chemical softening and high recovery RO can potentially reach 90 to 92 percent. EMWD could potentially increase their potable water production by 30 percent, and retain up to 3,800 AF/year of water in the basin. Even though re-concentration by the high recovery RO increases the TDS of the RO influent stream, operation of the downstream RO stages at 70 percent recovery will likely maintain the brine discharged into the SARI system below supersaturated concentrations of calcium, magnesium, and silica.

Brine minimization testing at the WMWD Arlington Desalter Facility evaluated a pellet-softening reactor where the inorganic salts precipitation takes place on sand particles. This results in easily settleable pellets. Furthermore, no additional dewatering is needed prior to disposal. Through the use of lime in the softening process, calcium and silica levels in the brine from Arlington Desalter's primary RO process were reduced significantly and the subsequent high recovery RO process achieved a 70 percent recovery. Overall TDS of the resultant brine to increased from 5,300 mg/L to 18,000 mg/L.

In both cases, scaling precursors including calcium, magnesium, and silica were reduced significantly by the chemical softening process. In light of the inorganic and organic chemical reactions in the SARI system resulting in solids precipitation within SARI pipelines, chemical softening should be implemented in the design of future brine minimization to help minimize the inorganic component of the solids precipitation process. In general, the overall TDS of the flows in the SARI line will increase over time to the extent that brine minimization projects are brought on line. Provided that chemical softening processes are included in the projects, the incremental increase in TDS resulting from these projects should not have a significant adverse impact on the overall operations of the SARI system.

2.4.2 Wastewater Recycling Technologies

All of the planned wastewater desalting projects for the Santa Ana watershed discussed in Section 2.3 is water-recycling projects that would create recycled water for non-potable end uses, principally for groundwater recharge. Considering climate change, population growth and water scarcity, there is a growing need to manage water resources in a sustainable manner. Recycling municipal wastewater is an area that has advanced, largely as a result of advances in treatment technology that enables the production of high quality recycled water at increasingly competitive cost and reduced energy input. In California, recycled water cannot currently be used for potable purposes.

As in drinking water treatment, the multiple barrier approach is also used in wastewater recycling. The approach includes source control, use of multiple water treatment processes, use of environmental buffers and conventional drinking water treatment. The basis of this approach is to ensure that there are several independent steps in place to remove contaminants given that no single barrier is able to removal all contaminants from wastewater.

In California, recycled water regulations for groundwater recharge of potable aquifers require secondary treatment, filtration, disinfection, and advanced wastewater treatment. RO is required for all recycled water injection projects and the minimum retention time in the aquifers is set at 12 months for direct injection and 6 months for infiltration of recycled water through soil. For surface recharge projects, the need for and extent of advanced wastewater treatment is a function of the ratio of recycled water recharge compared to native water recharged in the same location (or the recycled water contribution (RWC), and the need to meet Regional Board Basin Plan Objectives, particularly with respect to TDS and nitrate. All of the proposed IPR projects anticipated using RO treatment and the brine projections are based on the agencies'' reported plans.

2.5 Industrial Dischargers

Currently, a range of wastewater flows from non-municipal or industrial operations are discharged to the SARI line, either as individual, permitted connections or via waste hauler discharge at the four "truck dump" stations. The truck dump stations include facilities located at:

- San Bernardino wastewater treatment plant (SBVMWD agency)
- Proximate to the Menifee and Perris desalters (EMWD)
- At the RP2 in Reach IVA (IEUA)
- At the Corona wastewater treatment plant (WMWD)

The dischargers considered as industrial include the following categories:

- Industrial facilities holding individual permit connections for direct discharge to the SARI line
- Groundwater/leachate treatment systems discharging treated effluent (Stringfellow)
- Industrial or commercial facilities generating waste that haulers deliver to the truck dump stations

Individual Industrial Discharges
Based on analytical results for samples collected during the period 2008 through 2009 made available by SAWPA, the effluent wastewater from these facilities represents a wide range of characteristics.

Among the direct discharges from industrial facilities, several contain low concentrations of BOD and TSS combined with significant levels of TDS, some of which is hardness. These include discharges from Dart Container Corporation and Dairy Farmers of America that are likely comprised of flows from ancillary utility operations, such as water softener regeneration, blow-down of boilers and cooling towers, or streams from water treatment operations such as the RO concentrate reject. Other direct industrial discharges, such as that effluent from UCF Food Solutions, contain significant amounts of organic material and suspended solids along with significant TDS. Typical concentrations for this discharge are 3,400 mg/l of BOD and 1,500 mg/l of TSS. Based on the VSS concentrations observed in samples of this wastewater, a significant fraction of the suspended solids in the discharge are organic in nature. This discharge likely represents a combination of ancillary utility effluent streams and wastewater from the food processing operations. Recent discharges from Enertech Environmental, a biofuels manufacturer, have significant organic, TSS and hardness levels. One other industrial entity, Golden Cheese Company, no longer operates and discharges to the SARI system, however, was required by SAWPA to implement pretreatment due to issues associated with the high concentrations of both organic and inorganic constituents in the process wastewater.

The single discharge of treated groundwater into the SARI system, from the Stringfellow site, contains low organic concentrations, very low suspended solids levels, and significant TDS levels. Approximately half of the dissolved inorganic ions in Stringfellow's discharge are calcium and magnesium (hardness).

2.6 Temporary Domestic Dischargers

The temporary domestic dischargers connected to the SARI are listed in Table 2-6.

There is currently no set timeline for the phase-out of the domestic wastewater dischargers with the exception of contract expiration in 2015 for the Bonview – Lewis Home discharge. However, it is generally agreed that in the future, all temporary domestic waste dischargers will remove their connections to the SARI line.

Based on proximity, a list of possible alternate flow routing for the SARI domestic dischargers is summarized in Table 2-7.

The Western Riverside County Regional Wastewater Treatment Facility (WRCRWTF) is located just northwest of the City of Norco. This facility is administered by the Western Riverside County Regional Wastewater Authority (WRCRWA) which is a Joint Powers Authority of WMWD, the City of Norco, Home Gardens Sanitary District, Jurupa Community Services District (JCSD) and SAWPA. The WRCRWTF is a tertiary-level treatment facility capable of providing reclamated water for reuse or for discharge through an outfall to the Santa Ana River. It has a design capacity of 8 mgd, expandable up to 32 mgd. From the November 2009 *Draft Environmental Impact Report* published for *WRCRWTF Enhancement and Expansion Project*, the existing ownership of the plant is based on projected flows at the existing design capacity of 8.0 mgd. JCSD and WMWD combined own 5.18 mgd of the capacity at the WRCRWTF.

Table 2-6
Summary of Temporary Domestic Dischargers SAWPA Salinity Management Study TM2

Discharger	Monthly Avg Flow[1] (mgd)	Water Quality Parameters			
		BOD	TSS	VSS	TDS
California Rehabilitation Center (WMWD)	0.6364	155.27	152.32	142.45	525.18
JCSD Celebration (WMWD)	0.1047	226.38	167.48	151.08	534.45
JCSD Hamner (WMWD)	0.0541	213.06	407.15	380.95	570.14
JCSD Etiwanda (WMWD)	0.8625	120.42	138.95	113.28	4546.67

Table 2-6 (continued)
Summary of Temporary Domestic Dischargers SAWPA Salinity Management Study TM2

Discharger	Monthly Avg Flow[1] (mgd)	Water Quality Parameters			
		BOD	TSS	VSS	TDS
California Institute for Women (IEUA)	0.3196	213.05	351.34	305.10	564.67
Bonview – Lewis Home (IEUA)	0.2444	295.68	290.60	252.67	657.26
Green River Golf Course (IEUA)	0.0118	232.64	276.36	206.50	748.73
EVMWD Alberhill Connection (WMWD)	1.0000	-	-	-	-

Notes:
1. ***Based on October 2009 data provided by SAWPA***

Table 2-7
Possible Alternate Flow Routing for Domestic Dischargers SAWPA Salinity Management Study TM2 Santa Ana Watershed Project Authority

Dischargers	Flow (mgd)	Alternate Site
Reach IV-B Dischargers		
California Rehabilitation Center	0.64	City of Norco 15-inch sewer line to be treated at WRCRWTF[1]
Reach IV Dischargers		
Green River Golf Club	0.01	Construct holding tank Truck haul to CWTP No. 1
JCSD Hamner, Celebration and Etiwanda	1.02	Relocate to WRCRWTF. Note that this may require a plant expansion since there is no remaining capacity at the plant. For Etiwanda, need to separate Chino II brine and other industries
California Institute for Women[2]	0.32	Pine Avenue Interceptor to IEUA Regional System (RP-5)
Bonview – Lewis Home[2]	0.24	Pine Avenue Interceptor to IEUA Regional System (RP-5)
Reach V Dischargers		
EVMWD Alberhill Connection	1.00	Terminate connection by Dec 31, 2012

Notes:
1.WRCRWTF – Western Riverside County Regional Wastewater Treatment Facility
2.IEUA Operating and Capital Program Budget Fiscal Year 2009/10, Volume II – 10 Year Capital CIP.

The sum of all WMWD Domestic Discharger flows total 1.67 mgd, which can be accommodated by the wastewater treatment plant.

IEUA has entered into an agreement with Lewis Operating Company (LOC) to lease a portion of the SARI capacity for their Chino Preserve Expansion (Bonview – Lewis Homes). The lease is available to LOC until City of Chino has completed the design and construction of the Pine Ave. interceptor sewer. In lieu of building the Pine Avenue sewer, the City of Chino is considering building a new sewer lift station on the existing Prado lift station site. Once these permanent sewer facilities are completed, the California Institute for Women (CIW) will divert their discharge from SARI to the new Interceptor, which will flow to RP-5.

The Green River Golf Course has very low discharge flows, ranging from 0 to 0.002 mgd. Due to the relatively low volume of flow, it may be possible to build facilities on site for the collection and storage of wastewater for subsequent truck hauling to a wastewater treatment facility such as Corona Wastewater Treatment Plant No.1 (CWTP).

The Elsinore Valley Municipal Water District (EVMWD) Alberhill future connection would be a temporary connection scheduled to be disconnected by December 31 2012. The temporary connection agreement between EVMWD, WMWD and SAWPA was instituted for emergency discharge purposes only while the Permanent Sewer Facilities are under construction. WMWD is responsible for installing valve(s) to shut off domestic wastewater flow to the temporary discharge connection, and SAWPA will then take responsibility for physically disconnecting the domestic wastewater flow.

2.7 Fail-Safe Connections

Table 2-8 presents the 10 existing fail-safe connections to the SARI system reserved for emergency or overflow purposes.

The two connections permitted to EMWD will expire by November 2010 and May 2011.

The Reach 4 Railroad Canyon is intended to provide discharge tertiary recycled water to EMWD's non-reclaimable wasteline through six outfall/sample stations. The stations are listed below:

- Blow Off Station near Skylink Drive
- Blow Off Station between Skylink Drive and Canyon Lake Drive
- Blow off Station near Big Tee Drive
- Blow off Station between Black Horse Road and Sorrel Lane
- Blow off Station near the intersection of Railroad Canyon and Goetz Road
- Emergency Dump Station near the fire station access.

Table 2-8
Summary of Fail-Safe Connections SAWPA Salinity Management Study TM2

Facility	Permittee	Permit No.	Nature of Flow	Permitted Flow (mgd)	Expiration Date
Reach 4 Railroad Canyon Pipeline Brine Line	EMWD	544	Tertiary recycled water	1.41	November 16, 2010
Sun City Lift Station	EMWD	545	Untreated sewage	5.00	May 1, 2011
Regional Reclaim Facility	EMWD	550	Domestic wastewater	3.0	Not Available
Chandler	JCSD	4D-01-S36	Domestic wastewater	-	July 5, 2011
Archibald Metering Station	JCSD	4D-04-S55	Domestic wastewater	-	August 13, 2011
Harrison Avenue	JCSD	4D-02-S48	Domestic wastewater	0.20	July 28, 2010
Hamner Lift Station	JCSD	4D-02-S49	Domestic wastewater	0.48	September 27, 2010
WRCRWRP	JCSD	04-00-S21	Domestic wastewater	-	May 31, 2011
City of San Bernardino Wastewater Treatment Plant	City of San Bernardino Municipal Water Department	4E-05-S57	Tertiary recycled water	2.00	July 12, 2011
WRCRWA South Regional Pumping Station	WRCRWA	4D-06-S61	Untreated wastewater	4.20	May 31, 2011
Green River Sewer Connection	City of Corona	4B-93-S12	Domestic wastewater	0.35	July 28, 2010
City of Corona Wastewater Treatment Plant No.1	City of Corona	4B-06-SP59	Secondary wastewater	-	June 7, 2010
IEUA Regional WWTP No. 2	IEUA	4A-05-SP58	Runoff wastewater from EQ pond	-	Not Available

The permit dictates a limit per station and, the 1.41 mgd shown in the table represents the worst case scenario when all the stations are in use.

Sun City Lift Station allows untreated sewage to be pumped directly to the SARI line in the event of a force main failure between the lift station and the Perris Valley Regional Water Reclamation Facility

The four connections permitted to JCSD will expire by August 2011. The connections were originally made to provide JCSD with the ability to discharge directly to the SARI. In 2007, JCSD constructed direct connections to WRCRWTF and the fail-safe permits were established. Permits for these connections were obtained to facilitate discharge to the SARI line in the event that the WRCRWA pump station is out of service. To date, JSCD has not been forced to use the connections.

With the exception of the Harrison Avenue connection and Hamner Lift Station, none of the other JCSD fail-safe connections have discharge limits. Instead, the permits allow them to discharge flow as required.

The single connection owned by the City of San Bernardino Municipal Water Department -- the San Bernardino Wastewater Treatment Plant, is authorized to discharge a maximum 2.0 mgd of tertiary recycled water.

The connection permitted by West Riverside County Regional Wastewater Authority (WRCRWA) is located at the South Regional Pumping Station and authorizes WRCRWA to temporarily discharge up to 4.2 mgd of untreated wastewater for approximately 10 days on two separate occasions:

- When connections are severed at WRCRWA's existing South Regional Force Main and new connections made to the County of Riverside's Road Bridge Project. The project is anticipated to be completed within the next year.
- Scheduled shutdown of the pumping station for maintenance and/or repairs.

The final two connections are permitted to the City of Corona Water Utilities Department. Based on discussions with the City staff, the connections have not been used for at least 4 years.

The Green River Sewer Connection is permitted to allow a maximum of 0.35 mgd of flow.

City of Corona Wastewater Treatment Plant No. 1 permit does not provide for a maximum flow, and the City is required to receive approval from WMWD before discharging. If the connection is removed, and the City needs an alternate disposal point, it would need to use an existing diversion structure that could route the discharge to WRCRWTF. However, this structure does not have sufficient capacity for the maximum flow conditions of 11.5 mgd.

2.8 Indirect Dischargers/Wastehaulers

Similar to the situation with the direct dischargers, discharges to the SARI system via wastehaulers differ in character. Wastewater from many of the commercial entities, such as California School for the Deaf, the VA Medical Center, Corona Regional Medical Center, Loma Linda East Campus and La Sierra University, contains low organic and suspended solids concentrations (<20 mg/l) and significant concentrations of TDS and hardness. Effluent from the Loma Linda Power Plant, currently the only power plant discharging via hauling to the San Bernardino Valley truck dump, has a discharge consistent with other power plant facilities in quality; very low in BOD and TSS.

A number of the industrial wastewater discharges entering the SARI system via hauling, such as Farmdale Creamery, Juice Heads, Inc., Aramark Uniform Services, Prudential Overall Supply, Rayne Water Conditioning, and National Concrete Washout, Inc., contain very low BOD and TSS. In some cases, these discharges contain significant TDS concentrations, indicative of ancillary utility streams. Discharge from International Rectifier's two facilities (Hexfet) is low in organic and suspended solids, however, high in TDS due to dissolved sulfate concentrations.

Several discharges, such as those from Decra Roofing and Frontier Aluminum, have moderate levels of organic material, suspended solids and TDS.

Other entities' discharges have significant levels of BOD, TSS and TDS. Typical BOD levels for some of the discharges range from 5,000 to 69,000 mg/l and typical TSS levels range from 1,065 to 25,140 mg/l. In many cases, the organic solids present in these discharges, as reflected in VSS content, appears to account for a significant fraction of the overall TSS. These include discharge from Clement Pappas, CC Graber Olives, Ludfords, Mizkan, Doane/Mars Pet Care Company, Far West Meats, Norco Egg Ranch, Inc., Triple H Food Processors, Giuliani & Sons Briners, Ventura Foods, Flavor Specialties, Inc., and Food for Life Baking, Inc.

Section 3
System Configuration Changes

By attempting to account for all planned or potential projects and future sources of discharges to the SARI system for the current, near term, intermediate, and long-term conditions as detailed in Section 2.3, it is apparent that the total SARI flow rate could potentially be greater than 36 mgd at some point in the future. This would exceed the nominal hydraulic design capacity of 30 mgd. The implication of these potential flows on the SARI interceptor system is discussed in Technical Memorandum 3. SAWPA currently owns 17 mgd of treatment capacity in the OCSD system, and has the contractual right to purchase up to 30 mgd. OCSD has indicated that they are not obligated to provide any additional capacity beyond this amount under the terms of the agreement. Under this condition, SAWPA would have to attempt to negotiate new agreement terms with OCSD and there is no guarantee that this could be achieved. Given this circumstance as well as other driving factors, this section will address various system configuration changes to accommodate projects planned for the future and to evaluate alternative solutions for managing future discharges to the system.

3.1 Potential Future Configuration Options

Six possible broad system configuration changes were considered and evaluated under this study. A description for each configuration option and the included assumptions are listed in Table 3-1.

Option 1: Baseline Condition – continued discharge to OCSD

The baseline condition assumes all current flows (except domestic dischargers and fail-safe connections), and all brine from future water and wastewater desalting planned projects as well as other projected sources would continue to be discharged to the SARI system. This would result in a potential ultimate flow of as much as 37 mgd in the SARI interceptor system. This presumes that additional capacity rights could be negotiated with OCSD.

Option 2a: SARI flow reduction via a centralized treatment, concentration, and reclamation plant

This configuration assumes that all of the ultimate flow in the SARI pipeline is collected and diverted to a centralized treatment facility for biological pretreatment, followed by chemical softening, a high recovery RO process and disinfection process. The concentrate produced from the centralized treatment plant would be put back in the SARI pipeline and to OCSD. A wide range of possible variations of flow reduction configuration are conceivably possible, but evaluating this option serves to frame the maximum volume of water that could be reclaimed and the maximum reduction in flows to OCSD.

Table 3-1
SARI System Configuration Changes

SARI System Configuration Changes		Description	Maximum projected SARI Flow Rate (MGD)	Ultimate Disposal Location	Pros	Cons or Challenges
Baseline Condition - Continue to discharge to OCSD, no brine minimization		Assumes continue with current configuration with all future expansion activities in the watershed	37	All flow to OCSD for treatment with ocean discharge	No new separate treatment facility or paralell interceptor needed	- Would need to purchase up to 20 mgd of additional treatment and disposal capacity and up to 7 mgd of additional interceptor capacity - No assurance that OCSD would accept more than 30 MGD flow - SAWPA may need to cap the dischargers at 30 MGD (i.e. not fully meeting water quality objectives to remove salt from the watershed) and may lose potential revenue
Continue Discharge to OCSD, Reduced flow through Brine Minization	Centralized In-line Plant Brine Minimization	Assumes all SARI flows will be diverted from the line at a centralized facility where the total volume undergoes biological treatment, followed by chemical softening, MF/RO and a disinfection step. Concentrate waste from centralized treatment plant will go back to SARI pipeline.	37	12 MGD of concentrated waste flow to OCSD for treatment with ocean discharge; remainder available for reuse in watershed	- Near-term need to purchase additional temporary capacity from OCSD up to 37 mgd through approximately 2025, but could then sell back both new temporary and exsiting capacity down to 12 mgd. - Potentially 24 MGD of recoverred water avaiable to reuse in watershed - Reduce O&M costs to OCSD by reducing overall SARI flow volume	- Recovered water from future wastewater recycling flow contributions is unsuitable for direct potable reuse applications - 25 mgd produced may not be near points of use - Very high capital and O&M costs for new treatment facility, major siting challenges - Major increase in SAWPA responsibilities
	Decentralized Brine Minimization at groundwater desalters	Assumes all groundwater desalters will implement further concentrate management via a secondary RO process to reduce discharges into SARI	26	26 MGD flow to OCSD for treatment (5 MGD of desalter brine + 21 MGD of all other discharger wastes)	- 10 MGD of potable water can be used directly from recovered desalter brine - Maximum flows are below 30 MGD - SAWPA does not have responsibility for additional treatment plant if concentration plants are owned/operated by desalter agencies - Scaling precursors (Ca/Mg/Si) will be reduced and minimize inorganic/organic co-precipitation within pipeline - Water is created where it is needed/used - Reduce O&M costs to OCSD by reducing overall SARI volume	- Requires member agency buy-in and participation with local brine concentration facilities SAWPA will need to purchase additional 9 MGD of treatment capacity from OCSD
Direct Ocean Discharge	With Brine Minimization	- Assume all groundwater desalters will concentrate their respective brines before discharging to the parallel ocean discharge pipeline. - Assume SAWPA will require all BOD dischargers to pretreat the BOD concentration to below 30 mg/L. This meets the ocean discharge permit limits.	26	26 MGD to Ocean Outfall	- 10 MGD of potable water can be used directly from recovered desalter brine - SAWPA would not need to rely on OCSD for treatment, could sell capacity back, but will continue to use the OCSD outfall - Inorganic scaling precursors will be reduced decreasing solids generation in the pipeline	- Major additional regulatory requirements and hurdles for ocean discharge permits and new pipeline alignment - SAWPA will need to require all their BOD dischargers to pre-treat their waste, or else all discharged flows containing BOD will still need to go to OCSD - No additional potable water recovered from desalters for the watershed - SARI pipeline continue to be susceptible to solids generation and accumulation - New 25 mile pipeline required from below Prado to the Outfall
	Without Brine Minization	- Assume all groundwater desalters will discaharger their respective brines without further concentrating. - Assume SAWPA will require all BOD dischargers to pretreat the BOD concentration to below 30 m/L. This meets the ocean discharge permit limits.	37	37 MGD to Ocean Outfall	- Member agency desalters would not need to further concentrate their respective brine streams - SAWPA would not need to rely on OCSD for treatment, could potentially sell capacity back (assuming BOD wastes are pretreated), but will continue to use the OCSD outfall - Inorganic scaling precursors will be reduced decreasing solids generation in the pipeline	- Major additional regulatory requirements and hurdles for ocean discharge permits and new pipeline alignment - SAWPA will need to require all their BOD dischargers to pre-treat their waste, or else all discharged flows containing BOD will still need to go to OCSD - No additional potable water recovered from desalters for the watershed - SARI pipeline continue to be susceptible to solids generation and accumulation - New 25 mile pipeline required from below Prado to the Outfall
Salton Sea Alternate Discharge		- Eliminate discharge to OCSD treatment by routing all SARI flow to Salton Sea Assumes 125 miles of linear pipeline from south of Prado to Salton Sea	30-37	Salton Sea	- SAWPA would bypass OCSD completely - Additional water with low TDS provided to Salton Sea	- Very large new infrastructure costs and maintenance - Major Permitting requirements and issues relative to treatment requirements for discharge - Crossing various jurisdictions will require extensive negotiations - Major mitigation and regulatory requirements

Option 2b: SARI flow reduction via decentralized brine minimization projects installed at each groundwater desalter

This configuration assumes that the total volume of desalter brine will be reduced in the future, and that brine reduction projects will be implemented at each of the current and future groundwater desalters. Additional high recovery RO projects for future wastewater/recycled water projects were not included in this configuration because the secondary concentration of recycled wastewater brine has not been demonstrated, and this step would not be needed to maintain total flows below 30 mgd. However, this option can always be explored in the future for any of the planned IPR projects which would further reduce brine flow. The collective brine from the groundwater desalters will combine with all other discharger flows and be sent to OCSD.

Option 3a: Direct ocean discharge of SARI brine without brine minimization

This configuration is similar to the baseline condition at the downstream end of the SARI pipeline system at the County line. However SARI flows would be discharged via a new pipeline to tie into an ocean outfall with potential options as described below. Dischargers that dispose of high BOD/TSS wastes would be required to pre-treat the waste before discharging to the SARI pipelines.

Option 3b: Direct ocean discharge of SARI brine with brine minimization projects as described under Alternative 2b

This configuration includes the brine minimization projects included in Option 2b but more concentrated brine and other SARI discharger flows will discharge into a new pipeline to an ocean outfall as in Option 3a. Dischargers that dispose of high BOD/TSS wastes would be required to pre-treat the waste before discharge to the SARI pipelines.

Option 4: Rerouting all SARI system flows for discharge to Salton Sea

This configuration assumes that all of the flow in the SARI system would be collected just below Prado, and a separate pipeline would be constructed to transport the flow to Salton Sea, bypassing OCSD treatment completely. Treatment of the flow if/as needed would also be included prior to discharge.

Each configuration will be discussed subsequently in more detail in the following subsection including order-of-magnitude level cost estimates for capital and operations and maintenance costs as applicable.

3.2 Evaluation of Configuration Options

3.2.1 Cost Evaluation

3.2.1.1 Cost Analysis Assumptions

Because the range of options is very broad, the comparison is at a screening level only to help determine whether there are any viable options in addition to the Baseline Option. A cost analysis was conducted on an order-of-magnitude level. The primary cost factors and assumptions used in developing the cost estimates for the various configurations are summarized below. Discussions of the elements of each of the configurations and the cost estimates developed for each are contained in the following subsections.

Table 3-2 lists the general assumptions used for capital and O&M cost assumptions.

Table 3-2
System Configuration Cost Analysis Assumptions – OCSD Rates

OCSD Rates[1]	Description	Value
OCSD Treatment Capacity	Capital Cost for Additional Flow with Average BOD and TSS Concentrations	$11,332,000 / MGD
Capital Inflation Rate (CIR)	Annual escalation of costs to purchase treatment capacity. Current SAWPA owned capacity is 17 mgd and it is assumed that the agency will begin purchasing capacity before its flows exceed this level.	17.6%
Treatment O&M Rates	Annual treatment costs based on flow, TSS and BOD loading. Loading assumed fixed at year 2009 levels of 102 mg/L BOD and 312 mg/L TSS.	$407/1000 lb TSS $274/1000 lb BOD $179/ MGD flow
O&M Treatment Inflation Rate (IR1)[2]	Annual escalation for treatment costs based on flow, TSS and BOD loading.	2010-2013: 10% 2013-2014: 8% 2014-2015: 7% 2015-2020: 5.4% >2020: 0%[3]
Maintenance O&M	Annual OCSD maintenance costs (2009 dollars)	$142,900
O&M Maintenance Inflation Rate (IR2)	Based on annual escalation of OCSD maintenance costs.	10% annual inflation
OCSD CIP Sinking Fund	Cost based on OCSD Sinking Fund Rate Study for 30 mgd purchased capacity. Cost already includes inflation.	$1,696,607

Notes:

1. ***OCSD charges two O&M rates – treatment and maintenance. Treatment cost is based on flow, BOD and TSS loading. Maintenance cost is independent of flows or water quality.***
2. ***O&M Treatment Inflation Rate obtained from 2008 OCSD Revenue Program and Rate Update.***
3. ***Per OCSD Rate Study (Carollo, 2008?)***

Table 3-3
System Configuration Cost Analysis Assumptions – Separate Treatment Plant Rates

Separate Treatment Plant Rates[1]	Description	Value
Treatment Plant Capital Costs (TCIR)	Based on assumed annual escalation in cost to build a brine minimization plant	5% ($11,332,000 / MGD)
Treatment Plant O&M Inflation Rate (IR1)	Based on assumed annual escalation of treatment costs at the plant	10%[2]
Water Resale Value	Revenue earned by SAWPA/member agencies through sale of water produced. For centralized plant, the water is assumed to be non-agricultural, tertiary treated, filtered and disinfected recycled water. For decentralized plants, the water is assumed potable.	Potable: $645/AF (Feb 2009 EMWD resale rates.) Recycled: $288/AF (2009 EMWD reclaimed water rates.)
Pipeline Costs	To build new pipelines to discharge directly to the ocean or Salton Sea.	Ocean Discharge: 25 miles Salton Sea: 125 miles

Notes:

1. ***Treatment plant includes centralized inline plant and decentralized plants.***
2. ***Per OCSD Rate Study (Carollo, 2008?)***

Table 3-4 states the assumptions used in brine minimization plant cost development.

Table 3-4
Brine Minimization Plant Cost Development Assumptions

Parameter	Unit Cost
Capital Costs[1,2]	
Precipitative Softening	$1,000,000/mgd
Microfiltration	$4,500,000/mgd
Reverse Osmosis	$6,500,000/mgd
Biological Pretreatment	$8,000,000/mgd
AOP Post Treatment	$1,000,000/mgd
O&M Costs	
Caustic Soda[3]	$0.38/lb
Acid[4]	$0.33/lb
Threshold Inhibitor[5]	$1.00/lb
Annual MF Cleaning	$1,850/mgd
Annual RO Cleaning	$3,700/mgd
Electrical Power	$0.125/kwh

Table 3-4 (continued)
Brine Minimization Plant Cost Development Assumptions

Parameter	Unit Cost
Sludge Disposal[6]	$65/ton
Operations Labor	10% of total of all other O&M costs

Notes:
1. ***Planning level capital costs include 30 % contingency on construction costs. Interest rate of 6% for a 20-year loan period is assumed for annual capital costs.***
2. ***No building, land, finished water distribution costs included.***
3. ***Caustic soda dose of 650 mg/L assumed, based on EMWD brine minimization pilot studies.***
4. ***Acid dose of 20 mg/L assumed, based on EMWD brine minimization pilot studies.***
5. ***Threshold inhibitor dose of 4 mg/L assumed, based on EMWD brine minimization pilot studies.***
6. ***Sludge disposal includes a 50% contingency for dewatering.***

3.2.1.2 Baseline Option

The baseline option assumes that eventually all domestic dischargers will be disconnected. The remaining flows in the system will be comprised of water and wastewater desalter brine from both identified and unidentified projects, industrial discharges, and wastehauler dumps identified in the Phase 1 TM. Under this baseline condition all flow (approximately 35 mgd) within the SARI pipelines is assumed to continue to be treated at OCSD’s Plant No 2. As discussed above, this would require a willingness by OCSD to negotiate a new agreement with SAWPA to accept more than 30 mgd of flow. For this analysis, the capital and O&M costs to acquire and use additional capacity in the OCSD system beyond 30 mgd have been extended at the same rates as the costs derived from the current rate structure up to 30 mgd. However, this would require willingness from OCSD to negotiate a new agreement and likely re-evaluate the basis for costs to accept larger flows. Therefore there is significant uncertainty as to actual future capital costs beyond 30 mgd.

Based on data in Table 2-4 and the potential locations sited in Figure 2-5, a preliminary hydraulic analysis was conducted by SAWPA staff to incorporate the maximum flow rates for the planned future flows at potential locations along the SARI reaches and to verify SARI pipeline handling capacity. The results of the hydraulic run are discussed in the Task 3 Technical Memorandum.

As presented in that Technical Memorandum, most of the pipe segments in the SARI reaches can handle the projected maximum flows at or below 75 percent full pipe, but there are some segments that would be at or over capacity. As presented in TM-3, the potential cost to address all of the future segments that would exceed the criteria, under the maximum baseline condition flows, is about $16M.

SAWPA would also need to purchase approximately 20 mgd of additional treatment and interceptor capacity from OCSD to supplement the existing 17 mgd of treatment capacity. If this entire capacity could be obtained, it is assumed that SAWPA would start purchasing additional capacity in 2015 when the flows would be close to the current capacity allocation of 17 mgd, and would continue to buy capacity in annual increments throughout the period 2015 to 2025 up to approximately 33 mgd, buying the remaining capacity up to 37 mgd by 2030.

Figure 3-1 illustrates the cumulative present worth analysis for 30 years for the 20 mgd treatment capacity buy-in cost. Details of the cost estimate are provided in Appendix A. As shown in the Figure, annual costs would potentially increase significantly during the period from 2015 to 2025 due to the fact that additional capacity would have to be acquired in the OCSD system to accommodate the growth in brine associated with all of the projects proposed to come on line during this period. The scenario was developed to spread the capacity increase and costs uniformly over a number of years assumed to be roughly on pace with the development of needs so that SAWPA would not have to pre-purchase all of the additional capacity up front. However this also significantly increase cost is later years and total costs based on the projected inflation rate of capacity charges by OCSD.

3.2.1.3 Brine Volume Reduction Option

As noted above, two very different options were evaluated for reducing the SARI line flow to be treated by OCSD:

- Volume reduction through downstream "in-line" treatment of the combined flow within the pipeline, with all treated flow available for non-potable or indirect potable reuse and only residual brine and waste streams returned to the OCSD interceptor for treatment and discharge; or

- Reduction or minimization of the desalter brine flows reaching the SARI line via decentralized treatment (softening and additional membrane stages) at each of the current and future desalting facilities. While there is a wide range of possibilities as to how many of these existing or potential projects might actually be constructed for brine minimization, this option assumes implementation of secondary brine concentration projects at all existing and proposed groundwater desalting projects to bracket the maximum potential achievable.

Substantial additional SARI line and OCSD treatment capacity would be required in the interim until an in-line a plant was on line, but the maximum would be less than 30 mgd.

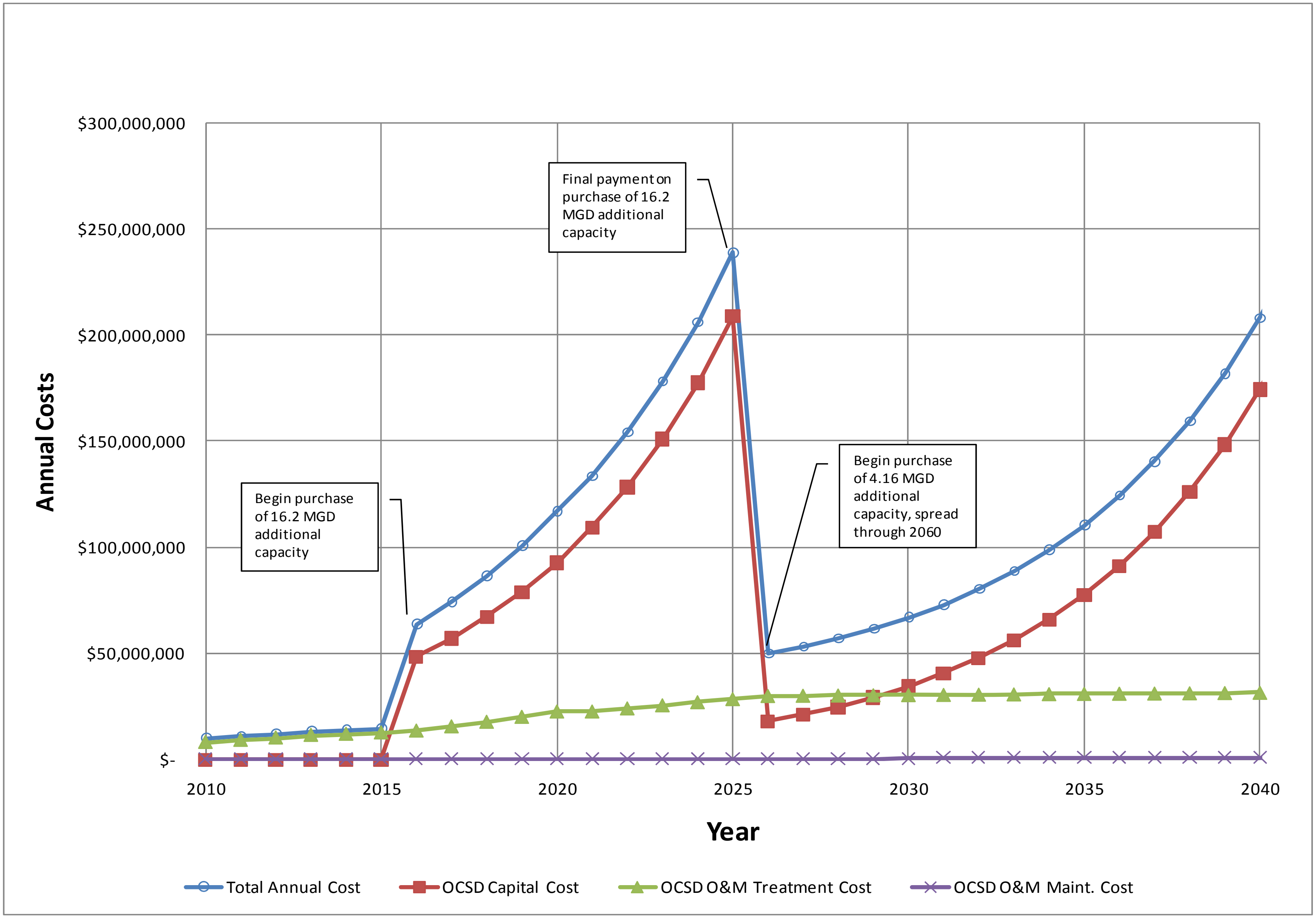

Figure 3-1
Baseline Condition – 30 Year Annual Cost

Figure 3-2 summarizes the projected SARI flow that would still be discharged to OCSD under the baseline and the two brine volume reduction conditions.

From 2010 to 2015, cumulative SARI flow is projected to remain below 17 mgd and therefore SAWPA would not need to purchase additional treatment capacity from OCSD until 2015-2016, when the cumulative SARI flows are projected to increase above 17 mgd. The concept of a major new full treatment and reuse plant under the downstream, in-line option would be a very large commitment requiring extensive planning, siting studies, environmental evaluation, evaluation of institutional and legal issues, and cost analyses, if a site could even be located. The planning needed for the brine minimization treatment facilities (both inline and decentralized) would require up to 10 years, with final design and construction assumed to begin in 2020. Assuming a five year period for detailed design, construction and start-up, the centralized treatment plant would be completed by 2024 (5 year construction period), and the resulting flows to OCSD would drop significantly from 2025 forward. It is also assumed that this option would only be considered if at the end of this period, SAWPA could sell back excess treatment capacity to OCSD. For the inline centralized treatment plant, the resultant reduced SARI flows to OCSD would be reduced to approximately 12 mgd capacity, thereby freeing up approximately 25 mgd of capacity.

Conversely, for decentralized facilities, it is assumed that they could be started sooner as there are fewer challenges and constraints to implementing them on a project level. It is assumed that these facilities would be constructed either as add-ons to existing desalters or in conjunction with new projects over the period 2015-2025 such that only enough OCSD capacity would need to be purchased incrementally beyond the current 17 mgd to reach the maximum projected need of approximately 26 mgd.

3.2.1.3.1 Centralized In-line Plant Brine Minimization

This configuration assumes that all SARI flows would be diverted from the interceptor downstream of Prado Dam and routed to a centralized inline treatment facility where the cumulative flows would undergo biological pretreatment, followed by chemical softening, MF-RO, and disinfection. This would produce a large source of water that could be reused and would leave only residual waste streams and concentrated brine to return to the SARI line, minimizing the wastewater flow delivered to OCSD. The total influent into the inline plant would be approximately 37 mgd, assuming no additional upstream concentration of flows. The biological pretreatment would remove suspended solids, organics (BOD and COD), and reduce nitrogen. Note that there could be less biological treatment required if indirect dischargers with high BOD and TSS are redirected. However, there will still be elevated BOD and TSS from desalters at POTWs. It may be possible to optimize and reduce the costs of the TSS and BOD treatment, but it will likely not be eliminated completely.

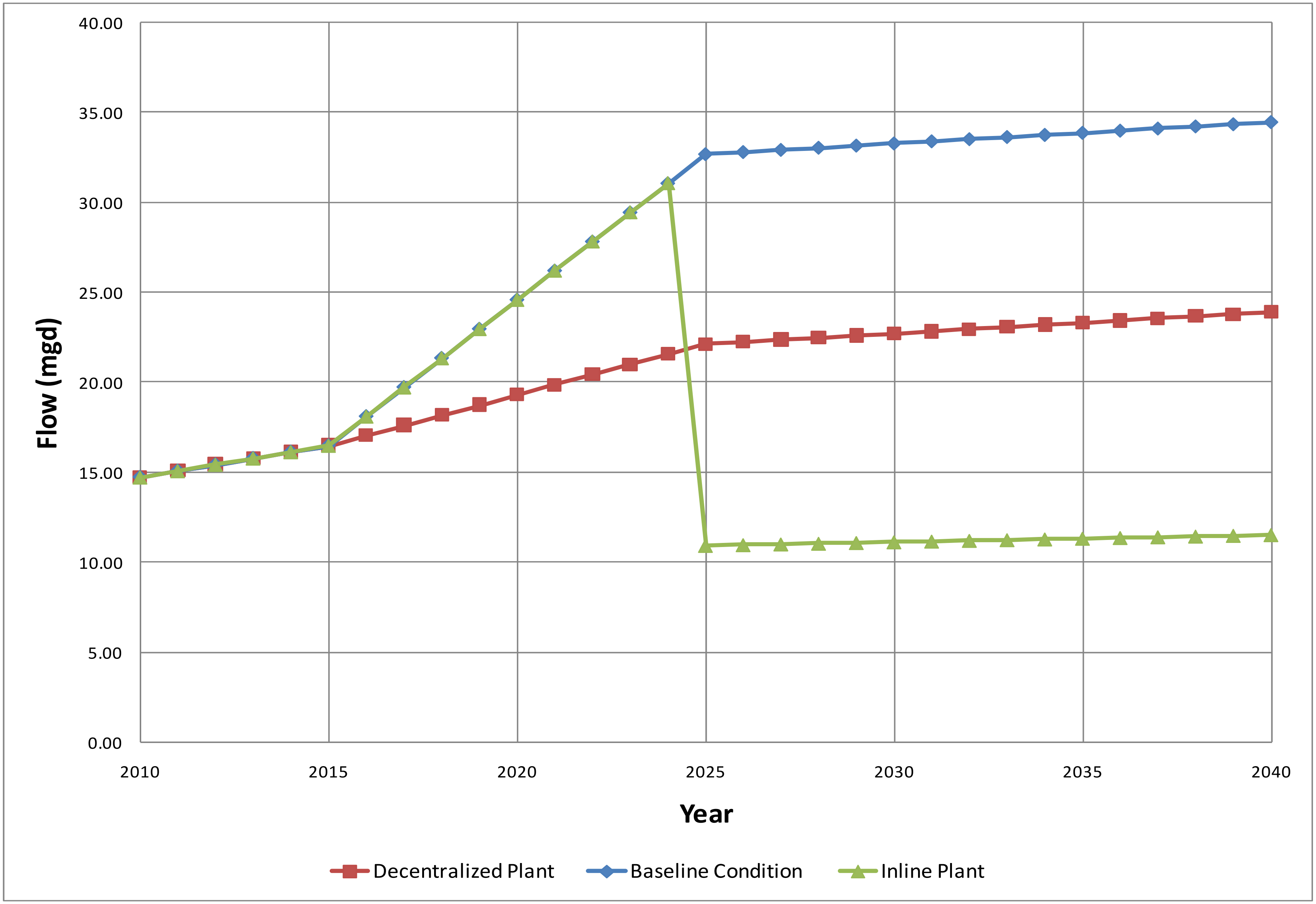

Figure 3-2
SARI Flow to OCSD under Different Configuration 30-Year Analysis

The treated effluent would undergo chemical softening to remove hardness, silica, strontium, selenium, iron and manganese. Microfiltration, at an assumed 95 percent recovery, would remove turbidity, bacteria and protozoa. Reverse osmosis, at an assumed 70 percent recovery would remove inorganics, bacteria, protozoa, viruses and some organics. RO permeate would be disinfected via advanced oxidation to remove organics, bacteria, viruses, protozoa and endocrine disruptive chemicals (EDCs). Up to 25 mgd of water could be reclaimed for indirect potable (groundwater recharge) reuse or non-potable reuse and the resulting brine flow returned via the SARI line to OCSD would be reduced to approximately 12 mgd.

This configuration would allow SAWPA to eventually sell back capacity and substantially reduce operation and maintenance costs with OCSD, but also incur the large cost of building and maintaining a centralized treatment facility. The planning level costs do not account for finished water distribution and reuse facilities as it is unclear at this point where the reclaimed water could be distributed or reused. Due to the nature of the water source (e.g., including substantial wastewater treatment IPR brine), the recovered water from the inline facility cannot be classified as potable water. Labor hours for manning the plant are also not included for the initial planning level cost estimates. If these were included, the cost differential with other alternatives, as presented later, would even be greater. If a centralized treatment facility were to be constructed, SAWPA could also potentially sell up to 20 mgd of the treatment capacity that it currently owns plus what SAWPA would need to temporarily acquire in the interim back to OCSD. This is based on the reduction of flow from OCSD from 31 MGD in 2024 to 11 MGD in 2025, assuming that the inline plant is operational starting in 2025.

There are no published studies available presently to predict the outcome of concentrating a blend of wastewater/recycled water brine and desalter brine. Interactions between the constituents of the concentrated wastewater treatment plant reject and the desalter brine would require further studies to prove that the proposed configuration is operable. Pilot testing and demonstration studies for proof-of-concept confirmation would be required prior to the design and implementation of this facility.

As noted above, a 10-year planning period for the inline treatment plant is assumed from 2010 to 2019. Detailed design, construction and start-up of the in-line treatment facility is projected to occur over the period 2020 to 2024, allowing the facility to be online in 2025. Figure 3-3 illustrates the cumulative present worth that SAWPA would potentially incur over 30 years for the construction and operation of the centralized inline plant.

As seen in Figure 3-3, the costs are shown without and with the net effect of assigning a value to the recycled water, assuming a rate of $288/AF in current dollars, to anticipate a revenue stream that could be generated from selling the reclaimed water. This starts to make a significant impact beyond 2030.

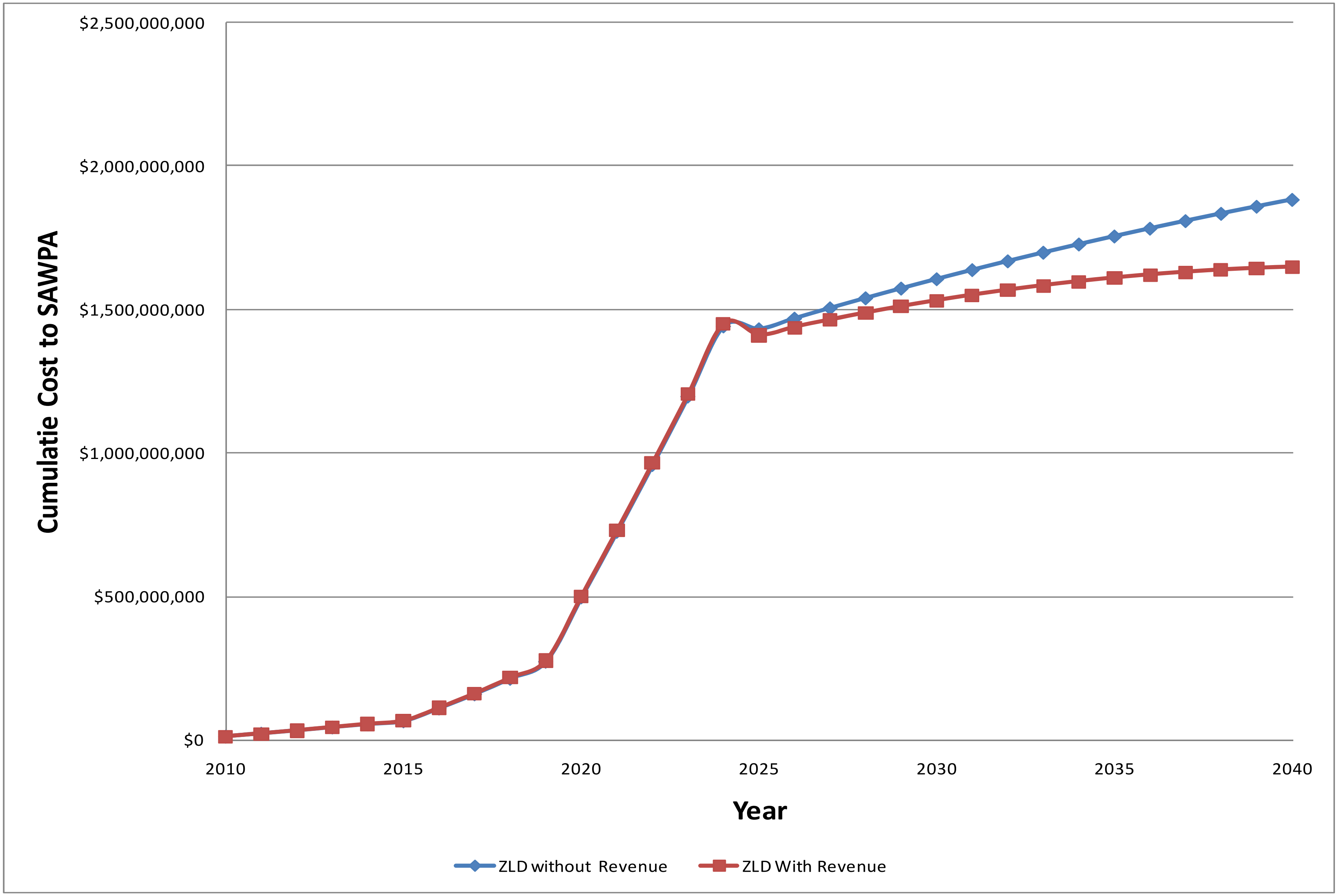

Figure 3-3
Centralized Inline Brine Treatment Plant 30-Year Present Worth Analysis

3.2.1.3.2 Decentralized Brine Minimization at Groundwater Desalters

An alternative to reduce the volume of brine delivered to OCSD is to have individual desalters in the watershed further concentrate brine. This configuration is termed "Decentralized Brine Minimization." There are two major advantages of this option compared to the "Centralized Brine Minimization." First, the overall configuration of the SARI system is largely retained, and new projects, while somewhat complex, are limited to local "add-on" facilities at groundwater desalter sites, rather than a large new treatment plant at a new location. Second, and equally important is that recovered water from the second concentration process is considered potable and the value of the water would be significantly higher (using, for example, $645/AF per EMWD's February 2009 Rates) compared to replenishment water value used for groundwater recharge with recycled water (assumed at $288/AF). Of the approximately 16 mgd of desalter brine flow projected by 2025, 10 mgd of this amount could become recovered water by brine minimization and be used as additional potable supply in the watershed. The remaining projected SARI flow would consist of brine flow (approximately 21 mgd of concentrated desalter brine and wastewater IPR project brine), and approximately 5 mgd of flow contributed by the industrial dischargers, and wastehaulers, to make up a total of 26 mgd flow into the OCSD system. Under this configuration, SAWPA would need to purchase and retain approximately 9 mgd of additional treatment capacity from OCSD to accommodate the ultimate projection of 26 mgd of total SARI flow.

If the member agencies agree to pursue this configuration individually, SAWPA would not have to take on the additional responsibilities of maintaining the individual desalter facilities. Note that the cost to SAWPA associated with the decentralized brine minimization option would be reduced if the costs are borne by those operating agencies. Conversely, the revenues associated with the additional potable water produced would accrue to the operating agencies and not to SAWPA. With limited pipeline capacity ownership by many agencies, increasing brine minimization is likely to occur due to agencies seeking to maximize their available SARI capacity. Due to the potential high cost of SARI disposal and limits on pipeline capacity, the viability of the decentralized brine minimization may be increased.

Also, a major benefit to this approach is that through desalter brine minimization, inorganic scaling precursors such as calcium and magnesium would be reduced. That in turn would minimize the inorganic/organic co-precipitation in the pipelines from the chemical softening process. The planning level cost estimate for this configuration assumes a 15-year implementation period. The planning and construction of brine minimization plants at existing desalters would be completed by or before 2025, and future groundwater desalter projects would incorporate brine minimization. By 2025, the overall brine minimization plant capacity achieved by the groundwater desalters will total almost 16 mgd. As the SARI accepts more flows from other dischargers, SAWPA would need to increase treatment capacity at OCSD as required up to 26 mgd. Figure 3-4 illustrates the 30-Year Present Worth Analysis for the decentralized brine minimization configuration.

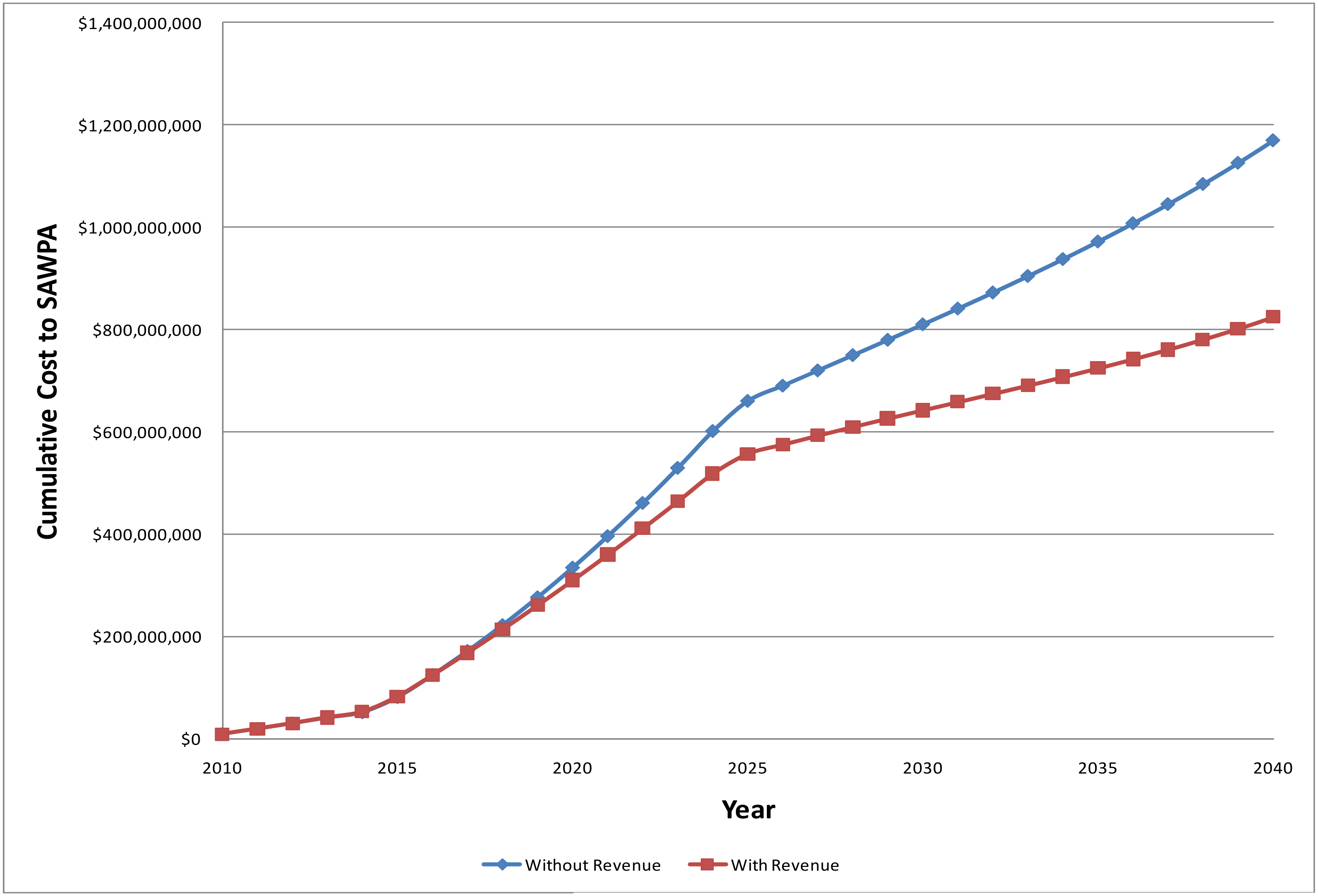

Figure 3-4
Decentralized Brine Minimization Plant 30-Year Present Worth

As seen in Figure 3-4, at a potable water resale rate of $645/AF, the anticipated revenue that will be generated from selling the potable water to customers starts to make a significant impact by 2025.

The water resale accounts for about 2 percent in 2025 to about 23 percent cost savings in 2040. This is the equivalent of saving $284,900,000 in the 15 years after the groundwater desalters come online.

3.2.1.4 Direct Ocean Discharge Option

In order to discharge to the ocean, OCSD effluent must be in compliance with the current National Pollutant Discharge Elimination System (NPDES) permit (No. CA0110604) issued by the U.S. EPA under Section 301(h) of the Clean Water Act. The permit includes discharge specifications that include water quality objectives previously established as a part of the California Ocean Plan. OCSD's current NPDES discharge permit for secondary effluent to the ocean lists a discharge limit of 30 mg/L for BOD and TSS respectively, over a 30-day average period.

From the water quality analysis conducted as described in Section 2, it is apparent that several dischargers (industrial and wastehaulers) exceed this limit. Remaining domestic discharges also clearly exceed this limit, but would be expected to be totally removed from the SARI in order to implement this system. For SARI flows to discharge directly to the ocean, SAWPA would have to place BOD restrictions on individual dischargers and dumpers in order to comply with ocean discharge permit requirements.

In order to consider an independent SARI discharge directly to either of the ocean outfalls, the exact composition of the SARI wastewater would need to be determined and compared to the Water Quality Objectives of the California Ocean Plan, including compliance with the regulations implementing AB-411, which established an extensive beach water quality monitoring program. The SARI flow composition would then need to be evaluated for level of required treatment and the amount of dilution that is expected at the discharge point in the ocean. It can be expected that the permitting process would require rigorous analyses and studies to specifically characterize the quality of the SARI flows and the expected blended quality of the combined discharge to insure that there would be no adverse impacts to the ocean environment or that would cause unacceptable conditions in the OCSD permit. In addition to satisfying the permit requirements, a significant public outreach and education program might be needed. Fortunately, since an existing outfall is in use by OCSD to discharge similar wastewaters, the hurdles to be overcome will probably be less compared to initiating a discharge permit for a brand new outfall. Some parameters that will require monitoring will include turbidity (< 75 NTU), pH (between 6-9), BOD and TSS of less than 30 mg/L, residual chlorine (< 0.36 mg/L), radioactivity, toxicity and an optimum dilution ratio of 180:1. There is a potential risk with emerging contaminants that could require pre-treatment in the future.

This scenario would involve design, permitting and construction of a parallel pipeline from the end of the existing SARI line to confluence with an existing Pacific Ocean outfall. There are two existing outfalls owned by OCSD; the 78- or 120-inch outfall lines. The OCSD treatment plants both discharge through the 5-mile long, 120-inch diameter ocean outfall. The 78-inch outfall is an older 1.5-mile long pipe which has not been used since the 120-inch outfall came into operation in 1971. Since the outfall facilities are already in place, the construction of facilities for ocean discharge only accounts for new pipelines to route to the outfall facilities for tie-ins. There is a third ocean outfall in the vicinity at the AES power plant in Huntington Beach, however, it is further from the pipeline alignment and there would be much greater challenges to investigate whether this could even be considered. For this TM, discharge into the 120-inch outfall is assumed.

The current agreement with OCSD includes outfall capacity for SARI flows equal to the existing or future contracted interceptor and treatment plant flows at least up to 30 mgd. Thus if SAWPA were to consider a direct ocean discharge option which would eliminated the need for capacity in the interceptor and treatment facilities, the potential recovery of costs as discussed later would need to take into account maintaining sufficient capacity in the outfall.

Similar to the centralized brine minimization option discussed previously, a 10-year planning period is assumed to account for the planning, environmental and technical studies, route investigations, institutional and contractual negotiations and permitting steps before actual detailed design and construction could begin for the 36-mile ocean discharge pipeline. Construction will begin in 2020 and complete by the end of 2022. The infrastructure will be operational by 2023.

3.2.1.4.1 Direct Ocean Discharge without Brine Minimization

By discharging directly to the ocean, SAWPA could move away from treatment capacity restrictions imposed under the current OCSD agreement and the treatment costs imposed by OCSD and allow all future flow in the SARI pipeline. This configuration, shown in Figure 3-5, would include the construction of 25 linear miles of 36 inch pipeline (assumed for planning purposes to be high density polyethylene) (HDPE) from below Prado Dam to connect into the existing 120-inch Ocean Outfall in Huntington Beach. A manhole would be installed every 1,000 ft.

The 120-inch outfall is an existing outfall currently used by OCSD Plants #1 and #2 for discharge of secondary effluent and GWRS brine. The outfall has a maximum capacity of 480 mgd, of which 127 mgd is currently utilized. Modifying the discharge permit for an existing outfall would require numerous permitting and environmental activities. The studies in support of the permitting activities would require assurances that there would not be constituents in the combined effluent that would result in issues associated with aquatic toxicity or present in levels above the NPDES discharge limits that would be adversely impact the ability for OCSD to meet permit requirements.

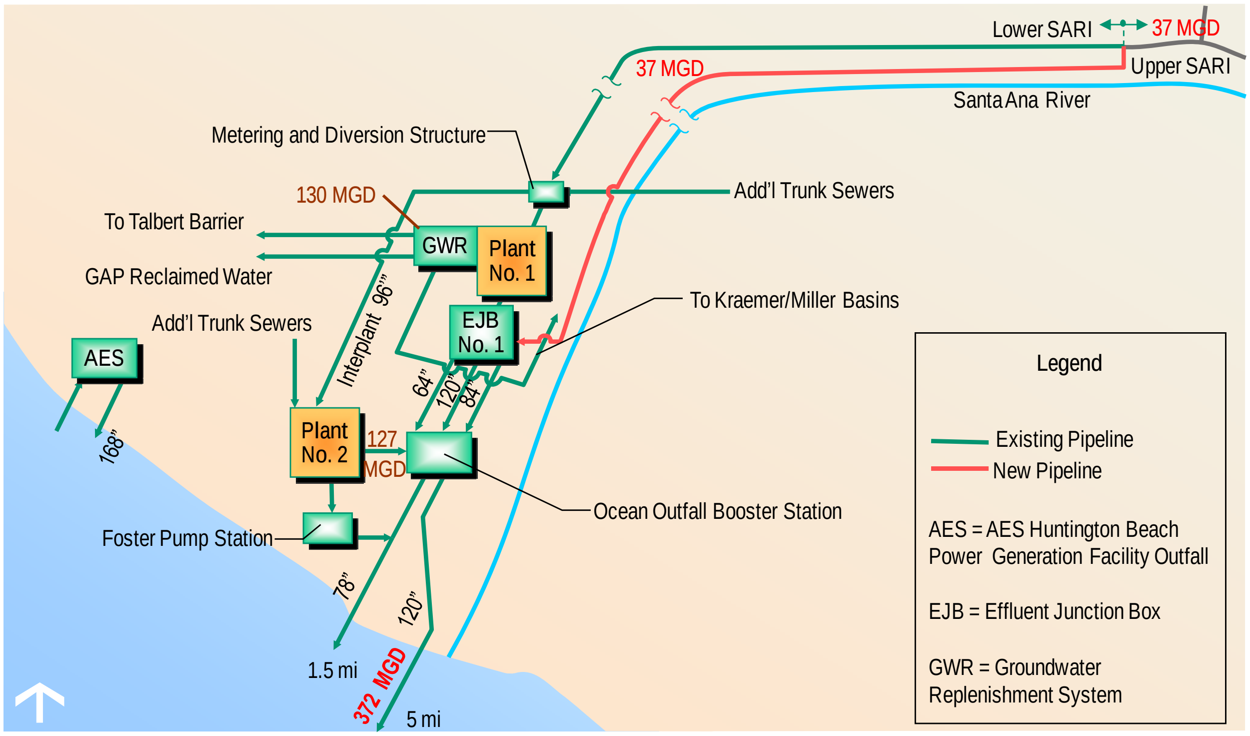

Figure 3-5
Pipeline Schematic for Direct Ocean Discharge without Brine Minimization

It should be noted that this option would not be increasing the flow through the outfall beyond the baseline project; the only change is the nature and quality of the combined effluent. Desalter discharges and recycled water effluent (reduced to organic levels, if necessary) together with pre-treated industrial discharges, where necessary, could be accepted into the system for direct discharge. SAWPA will obtain a credit for sellback of capacity to OCSD. The current sellback is assumed to be the same as the cost of treatment plant capacity. However, there may be a slightly lower less sellback value since SAWPA will still utilize the outfall owned and operated by OCSD. At this point, the amount of reduction in payback cannot be estimated. Assuming it represents potentially 10 percent to 20 percent of the total capital cost value which is relatively conservative; there would be no significant difference in overall outcome of the evaluation based on the current assumptions.

Without brine minimization, inorganic scale precursors would continue to remain in the SARI system and could still pose a problem with pipeline scaling and deposition due to supersaturated conditions of the inorganic constituents. Equally important would be the need to have a long term solution to the current TSS/BOD imbalance conditions that are occurring in the system. Under the existing configuration, in-line increases in TSS or BOD have created major economic issues for SAWPA but the OCSD treatment plant provides reduction to allow the discharge permit to be met. Without the additional treatment at OCSD, the flows in the SARI line cannot be subject to the wide fluctuations in TSS that are occurring under current conditions.

Disconnecting from OCSD's treatment facilities would still provide an equivalent amount of salt to be transported out of the watershed.

3.2.1.4.2 Direct Ocean Discharge with Brine Minimization

With brine minimization implemented at the groundwater desalters, the scaling precursors will be significantly reduced and thereby, lower the potential for deposition, scaling and/or increases in TSS within the pipelines. Potable water recovered from the high recovery desalting will remain in the watershed where it can be reused, while still transporting salts out of the watershed and eliminating the requirements for treatment and the associated costs at OCSD. As discussed in Section 3.2.1.3, 10 mgd of potable water would be recovered from brine minimization, while the remaining 26 mgd of the SARI flow would be routed to the 120-inch Outfall.

3.2.1.5 Discharge to Salton Sea Option

The concept of using the Salton Sea as a possible discharge location for brine from desalter water recovery processes has been suggested in the last few years. Salton Sea is California's largest lake at 360 square miles, with a surface elevation at 229 feet below sea level. The annual inflow into the lake is nearly 1.3 million AF. The lake is less than 50 feet deep, and the only outflow from the Salton Sea is by evaporation only (nearly 6 feet per year). The salinity of the water in the lake is over 46,000 mg/L, compared to typical 35,000 mg/L salinity for sea water. Salton Sea has had its share of environmental issues, with its continually rising salinity, toxic levels of selenium in the water, and eutrophication due to its high nutrient loadings (nitrogen, sulfur and phosphorus). It is no longer able to sustain marine life, and is, in essence, a dead sea.

If the brine flow in the SARI line could be introduced into the Salton Sea, it could be an additional source of lower salinity water that might have some beneficial impacts by replacing water lost to evaporation.

However, the concept would obviously be a radical departure from the current basis for the SARI system and would require extensive feasibility studies if this were to be explored further. Under this report, a very high level, cursory review was conducted of the potential challenges and costs just to redirect and convey future SARI line flows to the vicinity of the Salton Sea and an order-of magnitude cost estimate was prepared for this portion of such a project. However, any investigation of the feasibility of introducing the water in the Salton Sea, including possible pre-treatment, permitting environmental requirements is beyond the scope of this effort. Therefore this option was not developed to the same level as other options. Only an extremely conceptual level evaluation of potential conveyance facilities was developed.

For this exercise it was assumed that all flow in the system would be diverted near the downstream end of the SARI line below Prado Dam to collect the flow and an entirely new conveyance system constructed to route it to Salton Sea. This configuration would allow SAWPA to eliminate the need for treatment at OCSD, but as noted above, other pre-treatment would likely be required before discharge to the Sea. The preliminary estimate for the length of pipeline needed is 125 linear miles. The cost estimate assumes that a 36-inch pipe would be constructed with manholes at every

1,000 feet, based on 30 mgd flow rate at 7 fps. A 30 mgd pump station is also included in the planning level cost estimate to lift the flow over the high point in Banning. A 50 percent construction contingency and an additional 35 percent Engineering, Legal, Administration and Construction Management contingency is included in the cost estimates.

The cumulative present worth for the pipeline, including capital cost and O&M, through 2040 is $900,000,000.

In addition to the costs associated with building new infrastructure to transport the SARI flow from the Orange County line to Salton Sea, the anticipated regulatory permitting hurdles to consider this project would require extensive interactions with the public and the private sectors. In 2006, a 29-member Salton Sea Advisory Committee was formed that included the following agencies to restore the ecosystem of Salton Sea.

Federal Agencies:
Bureau of Reclamation, Fish and Wildlife Service and Geological Survey

State Agencies:
State Water Resources Control Board and Regional Water Quality Control Board

Local Government Agencies:
County of Imperial, County of Riverside, Imperial County Air Pollution Control District, and Coachella Valley Association of Governments.

Indian Tribes:
Torres-Martinez Desert Cahuilla Indians and Cabazon Band of Mission Indians.

Water Agencies:
San Diego County Water Authority, Imperial Irrigation District, Coachella Valley Water District, and Metropolitan Water District.

Non-Government Environmental Advocacy Organizations:
Imperial County Farm Bureau, Planning and Conservation League, Defenders of Wildlife, California Waterfowl Association, Pacific Institute, United Anglers of Southern California, Audubon California and Sierra Club.

Any further consideration of directing SARI system flows to the Salton Sea would have to demonstrate that there are water quality and ecological benefits to discharging flows to the Sea.

3.2.1.6 Present Worth Cost Comparison of the System Configuration Options

Table 3-5 and 3-6, and Figures 3-6 and 3-7, illustrate the comparative total cost components of each of the options expressed as an increasing net present worth value, to allow a comparison of the previously described system configuration options based on a 30-year present worth analysis from 2010 to 2040. The only difference between the two cases is the assumed future inflation rate of purchasing capacity in the OCSD system.

Table 3-5
Estimates of 30-Year Cumulative Costs at SARI Build-out
Assumed OCSD Capital Inflation Rate = 17.6%)

Cost Components (present worth of 2040 cumulative cost)	Baseline Condition	Brine Minimization		Direct Ocean Discharge	
		Centralized Inline Plant	Decentralized Ground Desalter	Without Brine Minimization	With Brine Minimization
SARI Disposal Flow	37 MGD	12 MGD	26 MGD	37 MGD	26 MGD
Additional Interceptor Capacity Needed	-	-	-	5 MGD	-
Additional Treatment Capacity Needed	20 MGD	(5 MGD)	9 MGD	-	-
Additional Water Recovered	-	25 MGD	10 MGD	-	10 MGD
OCSD Treatment Plant Costs					
OCSD CIP Sinking Fund	$53,000,000	$53,000,000	$53,000,000	$22,000,000	$22,000,000
OCSD Treatment Capacity	$814,000,000	$483,000,000	$442,000,000	$334,000,000	$334,000,000
OCSD O&M Treatment Costs	$290,000,000	$204,000,000	$229,000,000	$132,000,000	$132,000,000
OCSD O&M Maintenance Costs	$4,000,000	$4,000,000	$4,000,000	$2,000,000	$2,000,000
One time capacity sell back	-	$69,000,000	-	$345,000,000	$345,000,000
OCSD Subtotal	***$1,161,000,000***	***$675,000,000***	***$728,000,000***	***$145,000,000***	***$145,000,000***
SAWPA Member Agencies Plant Treatment Costs					
Treatment Plant Capital Costs	-	$781,000,000	$181,000,000	-	$181,000,000
O&M Treatment Costs	-	$461,000,000	$252,000,000	-	$252,000,000
Treatment Plant Subtotal	**-**	***$1,242,000,000***	***$433,000,000***	**-**	***$433,000,000***
Revenue					
Water Resale Value	**-**	**$270,000,000**	**$337,000,000**	**-**	**$337,000,000**
New Pipeline Costs					
Pipeline Capital Cost	-	-	-	$116,000,000	$116,000,000
Pipeline Maintenance Cost	-	-	-	$15,000,000	$15,000,000
Pipeline Subtotal	**-**	**-**	**-**	***$131,000,000***	***$131,000,000***
Cumulative SAWPA Expense in 2040	**$1,161,000,000**	**$1,647,000,000**	**$824,000,000**	**$276,000,000**	**$372,000,000**

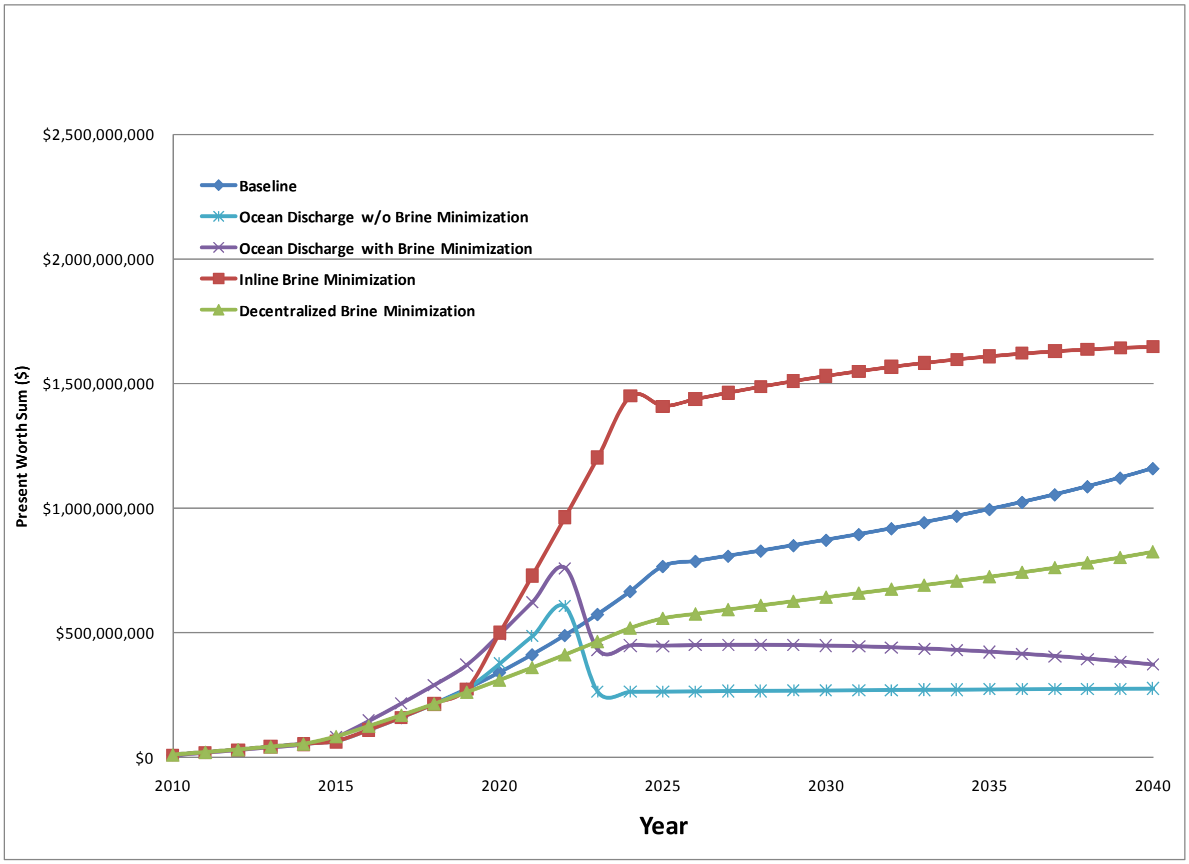

Figure 3-6
30-Year Present Worth Analysis Comparison for Proposed System Configuration Changes (Capital Inflation Rate=17.6%)

The current rate structure is based on an annual increase of 17.6 percent which substantially increases the future cost of acquiring capacity relative to other costs and the results shown in Table 3-5 and Figure 3-6. It is anticipated that a continuous rate increase at 17.6 percent/year is most likely not sustainable and therefore an alternate interest rate of 5 percent was selected to test the sensitivity of the costs to a lower escalation rate. This result is shown in Table 3-6 and Figure 3-7.

The only exception to these table and figures is that the Salton Sea option is not presented here since as noted above there is insufficient information at this time on which to develop a total cost analysis for that option.

The analysis was carried this far out to extend beyond the vast majority of growth in flows and anticipated project implementation time lines for any of the options. The salt projection tool and salt export needs were extended to 2060 under TM-1, but the incremental needs beyond 2040 are small and it is assumed that the required infrastructure would be implemented by or before 2040.

Table 3-6
Estimates of 30-Year Cumulative Costs at SARI Build-out
(Assumed OCSD Capital Inflation Rate=5%)

Cost Components (present worth of 2040 cumulative cost)	Baseline Condition	Brine Minimization: Centralized Inline Plant	Brine Minimization: Decentralized Ground Desalter	Direct Ocean Discharge: Without Brine Minimization	Direct Ocean Discharge: With Brine Minimization
SARI Disposal Flow	37 MGD	12 MGD	26 MGD	37 MGD	26 MGD
Additional Interceptor Capacity Needed	-	-	-	5 MGD	-
Additional Treatment Capacity Needed	20 MGD	(5 MGD)	9 MGD	-	-
Additional Water Recovered	-	25 MGD	10 MGD	-	10 MGD
OCSD Treatment Plant Costs					
OCSD CIP Sinking Fund	$53,000,000	$53,000,000	$53,000,000	$22,000,000	$22,000,000
OCSD Treatment Capacity	$182,000,000	$150,000,000	$74,000,000	$118,000,000	$118,000,000
OCSD O&M Treatment Costs	$290,000,000	$204,000,000	$229,000,000	$132,000,000	$132,000,000
OCSD O&M Maintenance Costs	$4,000,000	$4,000,000	$4,000,000	$2,000,000	$2,000,000
One time capacity sell back	-	-$69,000,000	-	-$345,000,000	-$345,000,000
OCSD Subtotal	***$529,000,000***	***$342,000,000***	***$360,000,000***	***-$71,000,000***	***-$71,000,000***
SAWPA Member Agencies Plant Treatment Costs					
Treatment Plant Capital Costs	-	$781,000,000	$181,000,000	-	$181,000,000
O&M Treatment Costs	-	$461,000,000	$252,000,000	-	$252,000,000
Treatment Plant Subtotal	**-**	***$1,242,000,000***	***$433,000,000***	**-**	***$433,000,000***
Revenue					
Water Resale Value	**-**	**$270,000,000**	**$337,000,000**	**-**	**$337,000,000**
New Pipeline Costs					
Pipeline Capital Cost	-	-	-	$116,000,000	$116,000,000
Pipeline Maintenance Cost	-	-	-	$15,000,000	$15,000,000
Pipeline Subtotal	**-**	**-**	**-**	***$131,000,000***	***$131,000,000***
Cumulative SAWPA Expense in 2040	**$529,000,000**	**$1,314,000,000**	**$456,000,000**	**$60,000,000**	**$156,000,000**

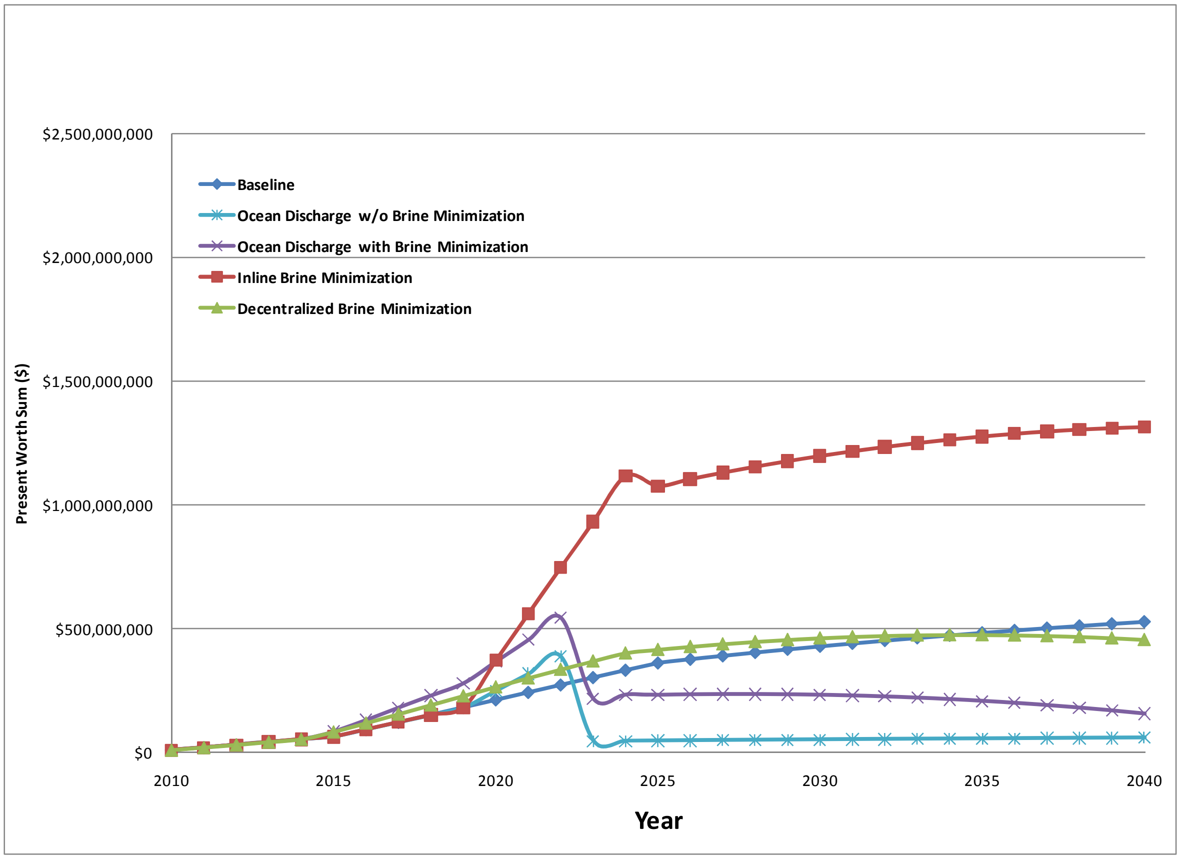

Figure 3-7
30-Year Present Worth Analysis Comparison for Proposed System Configuration Changes

Several important observations can be drawn from this comparison as follows:

- The in-line brine minimization concept would require a far greater total investment than any of the other options

- The least cost option would be to construct a new bypass pipeline to direct SARI system flows directly to the Ocean Outfall with or without any upstream brine minimization projects. However, there is a potential risk with emerging contaminants that may require pre-treatment. This unknown has not been accounted for in this evaluation.

- The net present worth of the baseline and brine minimization options are highly dependent upon the future escalation rate that would be applied to future purchase of treatment capacity at OCSD. If the rate increase is extended indefinitely at the current 17.6 percent value, the net present worth of either option would be almost twice as much as if the rate of inflation was at 5 percent. Furthermore, using the higher escalation rate, the brine minimization option has a substantially lower net present worth value as it relies on purchasing less capacity. At the lower escalation rate, the brine minimization option would still have a lower value, but the relative difference would not be nearly as great. At full build-out and operation of all assumed projects, the net present worth would be slightly lower for the brine minimization option. Finally, at a lower inflation rate, the differences between remaining in the OCSD system, rather than pursuing a direct ocean discharge option are much smaller.

3.2.2 Other Factors

While there are some fairly clear differences in the costs of implementing the different options, there are also a number of other significant issues that SAWPA must consider when deciding on a future path to accommodate the expected large increase in salt and flows to be managed. Key factors for consideration are summarized in the following subsections.

3.2.2.1 Option 1a - Baseline Condition

This option continues the present approach in which SAWPA accepts new discharges of various types into the SARI line within member agencies and negotiates and obtains additional capacity from OCSD in the downstream interceptor system and at OCSD's Plant No. 1. Up to 30 mgd of flow, this option could be implanted within the framework of the existing agreement and would therefore face fewer new implementation issues compared to other options. However, if all of the forecasted future flows were ultimately realized, there could be a major impediment to continuing this course of action if OCSD could not accommodate any flows beyond 30 mgd and would not be willing to entertain such discussions. Under that circumstance, this option would be untenable as configured. Either SAWPA would eventually have to start restricting flows that could be accepted in the line, which would reduce the maximum salt export capacity of the system, or would have to pursue one of the other options.

Another consideration is that this option as configured would eventually require paralleling of certain sections of the SARI line that could have significant permitting, environmental, and operational issues to accomplish the needed improvements.

3.2.2.2 Option 2a SARI Flow Reduction via a Centralized Treatment, Concentration and Reclamation Plant

Planning and constructing the infrastructure needed to implement this option would require not only a major capital outlay as noted in the preceding section, but would face major hurdles just in planning such a facility. Finding a site to accommodate a large, complex treatment plant would be extremely difficult given the very limited available land, the proximity to the flood plain and residential areas, and other constraints. Even if a site could be located, gaining environmental clearance and public acceptance could be very challenging. Unlike the baseline condition, this option would not require negotiating new permanent capacity rights in the OCSD system. In addition, while this option would theoretically produce a substantial new source of high quality reclaimed water. There could be major infrastructure required to make the water available for use. One possible approach would be to explore whether OCWD would consider purchasing all or some of the water for an additional replenishment supply returned to the base flow in the SAR for groundwater recharge similar to the arrangement that OCWD and SAWPA had for many years for discharging product water from the Arlington Desalter to Temescal Wash that then added to base flow in the Santa Ana River.

3.2.2.3 Option 2b - SARI Flow Reduction through Decentralized Brine Concentration Projects at Groundwater Desalters

This option would not require the need to negotiate with OCSD for additional capacity beyond what is anticipated in the current agreement. The extent of site-specific implementation and environmental issues for constructing and operating brine concentration facilities may vary somewhat from site to site, but are not expected to be any more significant than those required for the base desalter project itself. In many, if not most cases, it is expected that the additional facilities could be accommodated on or near the site of the first stage desalter plant, with a relatively small footprint. Thus the incremental impacts of adding brine concentration are expected to be much less than those that would be associated with a larger centralized facility at a new site.

One key consideration is determining which agency (ies) would initiate, construct and own and operate the facility. The most likely scenario is that the brine concentration projects would be implemented at the project level, with ownership and operation retained by the agency (or Authority) that owns and operates the primary desalter project. However, other configurations could be considered including a potential role for SAWPA.

3.2.2.4 Options 3a and 3b - Direct Ocean Discharge of Brine

Some of the major challenges to implementing this alternative were noted above. These include conducting sufficient studies to demonstrate that introducing the brine into the outfall downstream of treatment would not adversely impact the receiving water or cause a permit violation when mixing the brine flow with OCSD secondary effluent and GWRS brine. This would require reduction of higher TSS/BOD discharges into the SARI line by requiring pre-treatment, as well as gaining long term control over the conditions that cause the current tendency for solids increase in the SARI line. Also, there is a risk with future ocean plan changes, including the potential future regulation of emerging contaminants that might be in the SARI line discharge Note that this would affect the outcome only if the blend of the SARI line flows with the OCSD flows in the outfall would result in the combined outfall flows exceeding a future contaminant regulatory level. Furthermore, some emerging contaminants might not be removed effectively at the existing OCSD treatment facilities and could therefore pose a potential concern regardless of the method of discharge.

Another major challenge would be the siting and construction of a new separate parallel pipeline presumably through or near the SAR corridor. There would be some significant implementation and environmental constraints that would have to be overcome for the project to be able to move forward.

3.2.2.5 Option 4 – Discharge to Salton Sea

As described earlier, there would have to be extensive studies of a wide range of issues to determine what would be required to consider this option further, in addition to the challenges inherent just in constructing a pipeline to convey the brine flows all the way to the Salton Sea.

3.2.3 Summary

Based on the above cost evaluation and other considerations, the following direction is suggested:

- Moving forward with the "base case" or business as usual option could eventually run into a major impediment to implementing and/or much higher costs when the flows in the line exceeded 30 mgd. In addition, if all future flows came on line, the base case would require significant replacement or paralling of segments of the SARI line to increase capacity.

- Development and implementation of secondary concentration projects on as many existing or future groundwater desalting project offers multiple benefits. These include keeping total future flows to be managed by the SARI system below 30 mgd; being less dependent on, and having less of an impact on OCSD; providing additional supplemental potable water supply from the secondary recovery flows; and avoiding the need to replace or construct parallel segments of the existing pipeline for capacity purpose.

- There are potential advantages to considering a direct ocean outfall approach including the possibility of the lowest overall cost of any of the options, and minimizing the dependency on OCSD for treating flows. However there are several significant challenges that would have to be successfully met. The potential financial benefit of this option relative to other options depends to a large extent the future rate of increase in the cost to acquire capacity in the OCSD system and pay future OCSD's O&M costs.
- Due to the substantially higher estimated present worth cost and other major implementation hurdles, a downstream, in-line brine concentration approach is not feasible compared to other options SAWPA can pursue.
- There would have to be extensive studies to determine specific issues and identify whether there is any benefit to introducing the brine flows into the Salton Sea and what would be needed for pre-treatment. This would need to be addressed in order to determine whether the large investment and major potential implementation and environmental issues associated with conveying brine that far should be considered any further.

3.3 Relocation Outside of Prado Dam Water Conservation Pool

One other identified need for the SARI system is the replacement of pipelines in SARI Reach IV-A, and a portion of Reach IV-B. These pipelines were installed in the 1980's and were constructed of unlined sacrificial reinforced concrete pipe (RCP). Figure 3-8 illustrates the area of interest.

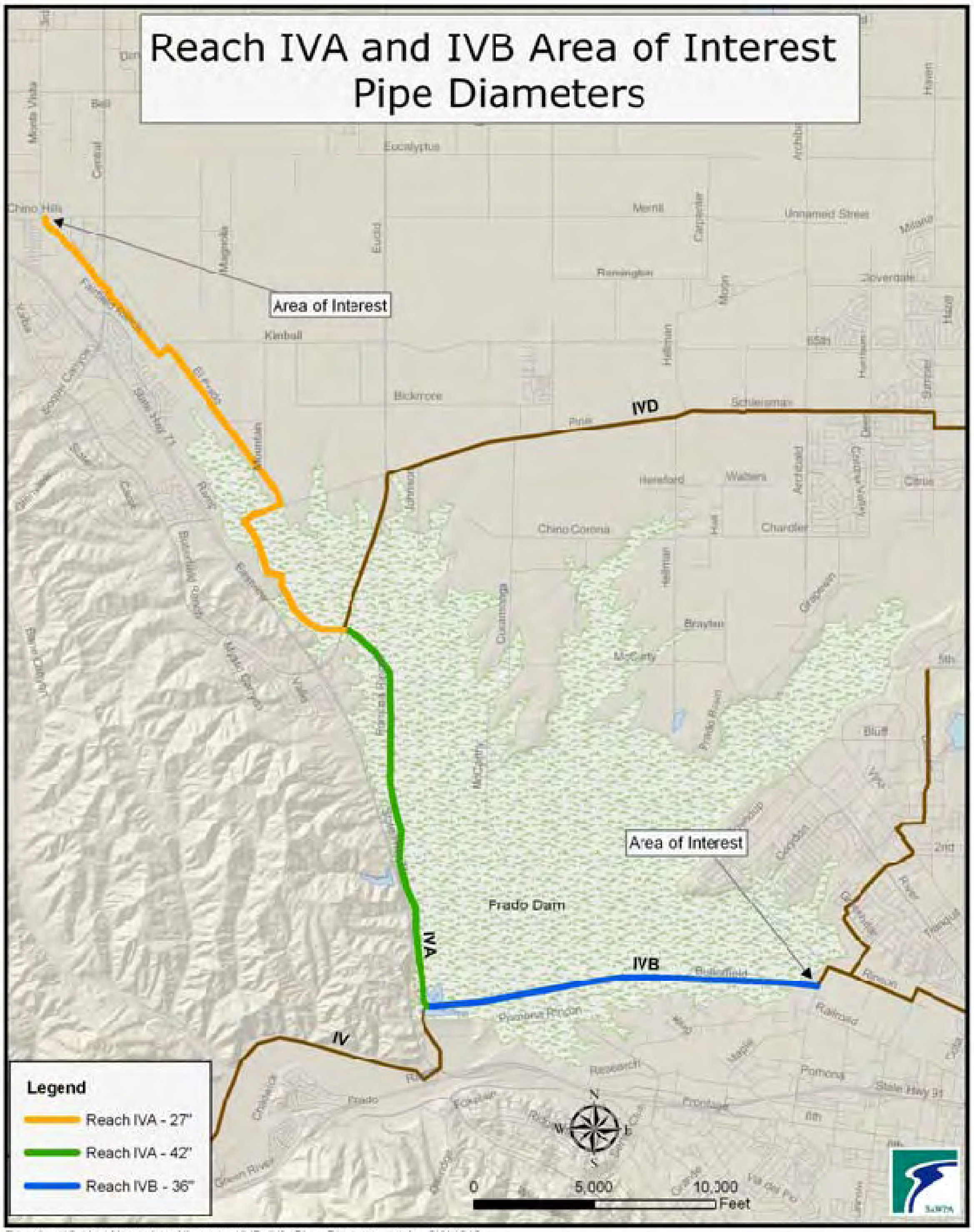

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Figure 3-8
Reach IV-A and IV-B in the Prado Dam Inundation Zone

The upper portion of Reach IV-A begins at the junction of Reach IV-D at manhole IV-A-0180 and continues north to manhole IA-A-0680, a distance of approximately 24,669 linear feet. This section of pipe is 27-inches in diameter and is located beyond the limits of the Prado Dam inundation area, mostly within city streets. The lower portion of Reach IV-A begins at Prado Dam at manhole IV-A-0010 and extends north to the junction of Reach IV-D at manhole IV-A-0180, a distance of approximately 16,814 linear feet. This section is 42 inches in diameter and is mostly located within the water conservation pool impact area. The section of Reach IV-B also begins at Prado Dam at manhole IV-B-0010 and extends to manhole IV-B-0150, a distance of approximately 16,188 linear feet. This section of pipe is 36 inches in diameter, and manholes IV-B-0010 through IV-B-0070 are within the water conservation pool impact area.

SAWPA plans to rehabilitate Reach IV-A and IV-B to extend their service life. The rehabilitation of the pipeline is also necessary to meet the new loading conditions created by raising the height of Prado Dam by 28 feet. The conservation pool behind the dam will be set at an elevation of 505 feet msl, which will periodically inundate the SARI pipelines near the dam with approximately 30 feet of water. Over the next 30 years, the sediment deposition behind the dam is expected to rise 20 feet.

Pipe rehabilitation work at these two reaches is currently underway due to pipes showing signs of erosion. The two reaches will be slip-lined, which consists of installing a new HDPE pipe inside the existing pipe, and have built in access points required every 2,500 linear feet. No flow bypassing is required and the repairs will provide a 50 year life span. In the short term, the pipeline remains within the conservation pool, and new access will be required for operations and maintenance. The construction costs for slip-lining Reach IV-A and IV-B are summarized in Table 3-7. The general location of the rehabilitation work is shown in Figure 3-9.

Table 3-7
Costs of Slip-lining Reach IV-A and IV-B1
SAWPA Salinity Management Study TM3

Pipe	Linear Feet	Direct Cost[2]	[3]Unit Price / ft
Upper Reach IV-A			
27” Cured-In-Place Pipe	21,100	$ 3,526,650	$206/ft
Lower Reach IV-A			
36” RPM Pipe	16,555	$ 8,263,485	$624/ft
Reach IV-B			
30” RPM Pipe	15,945	$ 7,702,960	$553/ft
Direct Cost Total		$19,493,095	

Notes:
1. ***November 2009 RBF Consulting Construction Cost Estimate***
2. ***Direct cost includes material, equipment, labor.***
3. ***The following construction cost additions are included: 8.75% sales tax, 6% Prime Contractor’s Home Office, 8% Prime Contractor’s Profit, and 5 % contingency.***

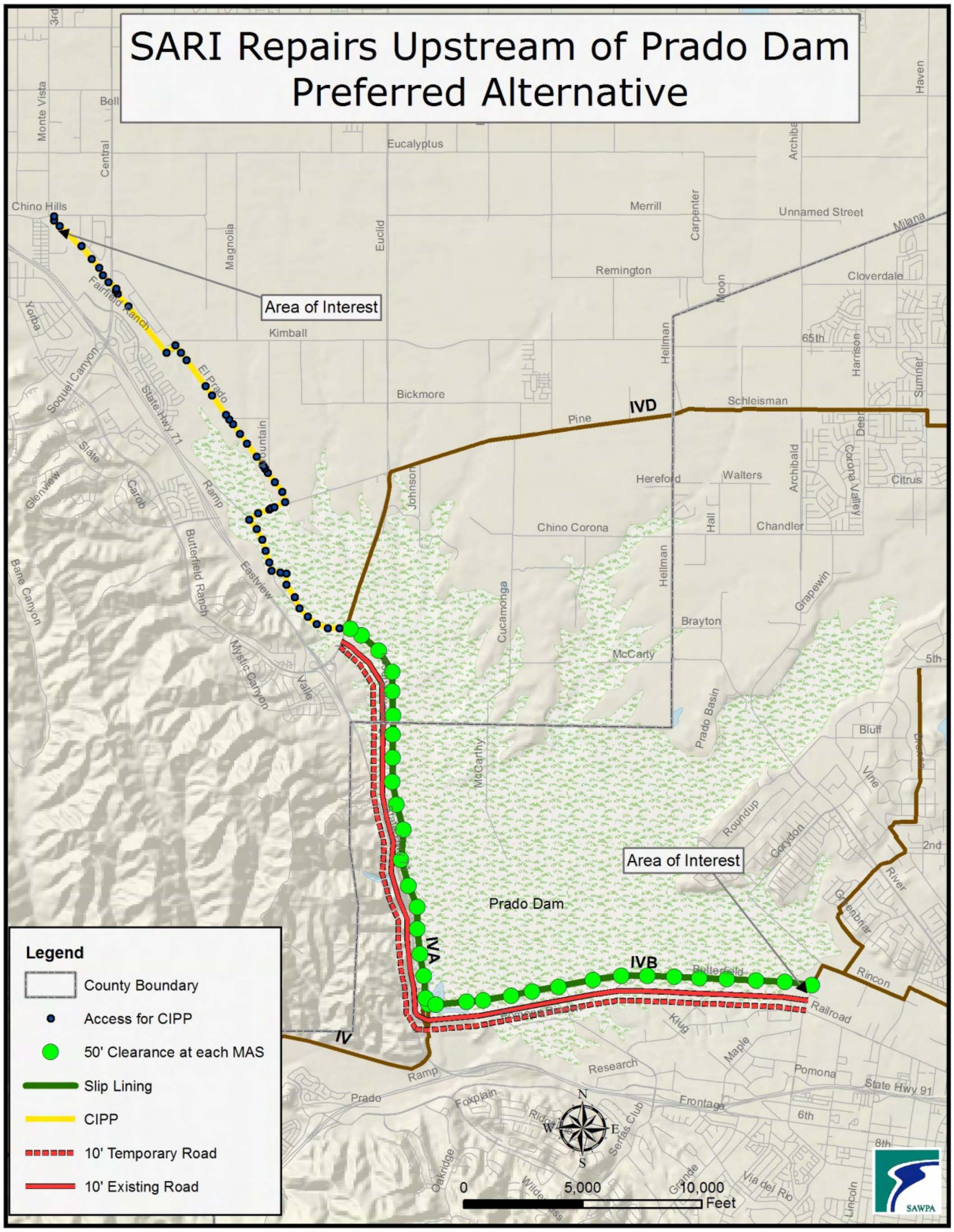

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Figure 3-9
Slip Lining of Lower Reach IV-A and Reach IV-B

Section 4 Conclusions

As a result of the evaluations presented in previous sections, the following conclusions can be made.

- This Technical Memorandum addresses long-range planning options for SAWPA and the member agencies to consider accommodating the future growth in probable demand for export of salt. These long range options assume that the type and nature of flows expected can be conveyed to the point of discharge or reused without major impacts within the SARI pipeline system itself. Therefore, it is extremely important that causes and solutions be developed soon to address the current problems that SAWPA is experiencing with solids imbalance, precipitation and scaling. This study does not focus on identifying these near term solutions, but the outcome investigations currently being conducted could potentially affect the type, quality and/or location of flows that are accepted into the system.

- It is assumed that essentially all of the remaining domestic discharges including emergency connections into the SARI system will be eliminated and re-directed to local wastewater treatment facilities over time. This is important primarily to free up capacity that is projected to be needed for the growth in brine flows for which the SARI system was planned. In addition, this will be essential pre-requisite if SAWPA were to consider the direct ocean discharge option.

- The SARI system can continue to accommodate high TDS industrial discharges into the system. However, there may need to be changes and or more significant restrictions on the quality of discharges with respect to TSS, BOD, or other precursor indicators that may contribute to the TSS imbalance problem. Also, as noted above for domestic discharges, if SAWPA were to consider the direct ocean discharge option in the future, it would be necessary to place limits on the quality of the discharges in addition to whatever outcomes may result from addressing the TSS imbalance issue. It should be noted that at ultimate projected conditions, the dominant flow in the SARI system will be from water supply and wastewater reuse desalting projects, which accomplish the primary goal of exporting salts. Therefore, long term planning decisions should be driven primarily by accommodating these desalting flows in the most cost-effective and implementable approach.

- Among the long-range options for managing the projected future flows in the SARI line, the most straightforward to implement would be to continue to direct flows into the OCSD system. However, SAWPA and the member agencies should actively pursue the implementation of secondary brine concentration processes at both existing and future groundwater desalting projects. At a minimum, sufficient projects need be implemented to reduce the total growth in discharges to the SARI line to maintain future flows below the 30 mgd capacity allowance. This would avoid the need to negotiate with OCSD for more capacity in the OCSD system, which may not even be possible, as well as avoid the possible need for replacing or paralleling sections of the interceptor that would be under capacity at maximum flows. SAWPA and the member agencies should develop a joint implementation approach as to how to facilitate and encourage these projects.

- The other potentially viable and possibly more cost-effective long-term option still appears to be to considering building a bypass pipeline in Orange County and re-directing SARI line flows to the OCSD outfall system. There is a number of challenging permitting, environmental and institutional issues that would need to be solved for this option to be feasible. In addition, the economic incentive for SAWPA to consider advancing in this direction is highly dependent on future costs for acquiring additional OCSD capacity even up to 30 mgd within the general framework of existing agreements. If the cost of acquiring additional capacity over the next 10-15 years escalates at a high rate, this option would become even more economically viable. Also, if this option were pursued, SAWPA would need to negotiate with OCSD for eventual sellback of treatment capacity that could be returned to OCSD

- At this time, there is insufficient information to indicate whether considering a complete shift to re-direct brine flows to the Salton Sea could even be possible or in the range of feasibility. The conveyance infrastructure alone would be very large undertaking and costs for this part of the conveyance infrastructure alone are in the range of the total cost of some of the other options. Nonetheless, SAWPA could decide undertake some additional investigation of the major issues including potential impacts, both positive and negative, potential treatment requirements, and other consideration to decide whether to pursue this concept any further.

- If SAWPA elects to continue with the current course of relying on the SARI line and OCSD for treatment and disposal, activities and actions can move forward on a year-by-year basis. However, over the next 10 years, SAWPA will need to closely monitor new discharges and increasing flows to the SARI line, strongly encourage or participate in brine concentration projects and ensure that the total projected future flows would stay below the 30 mgd maximum flow rate.

Appendix A
Cost Estimate Details

Estimates of 30-Year Cumulative Costs at SARI Build-out
(Assumed OCSD Capital Inflation Rate = 5%)

Cost Components (present worth of 2040 cumulative cost)	Baseline Condition	Brine Minimization		Direct Ocean Discharge	
		Centralized Inline Plant	Decentralized Ground Desalter	Without Brine Minimization	With Brine Minimization
SARI Disposal Flow	37 MGD	12 MGD	26 MGD	37 MGD	26 MGD
Additional Interceptor Capacity Needed	-	-	-	5 MGD	-
Additional Treatment Capacity Needed	20 MGD	(5 MGD)	9 MGD	-	-
Additional Water Recovered	-	25 MGD	10 MGD	-	10 MGD
OCSD Treatment Plant Costs					
OCSD CIP Sinking Fund	$53,000,000	$53,000,000	$53,000,000	$22,000,000	$22,000,000
OCSD Treatment Capacity	$182,000,000	$150,000,000	$74,000,000	$118,000,000	$118,000,000
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One time capacity sell back	-	-$69,000,000	-	-$345,000,000	-$345,000,000
OCSD Subtotal	***$529,000,000***	***$342,000,000***	***$360,000,000***	***-$71,000,000***	***-$71,000,000***
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O&M Treatment Costs	-	$461,000,000	$252,000,000	-	$252,000,000
Treatment Plant Subtotal	**-**	***$1,242,000,000***	***$433,000,000***	**-**	***$433,000,000***
Revenue					
Water Resale Value	**-**	**$270,000,000**	**$337,000,000**	**-**	**$337,000,000**
New Pipeline Costs					
Pipeline Capital Cost	-	-	-	$116,000,000	$116,000,000
Pipeline Maintenance Cost	-	-	-	$15,000,000	$15,000,000
Pipeline Subtotal	**-**	**-**	**-**	***$131,000,000***	***$131,000,000***
Cumulative SAWPA Expense in 2040	**$529,000,000**	**$1,314,000,000**	**$456,000,000**	**$60,000,000**	**$156,000,000**

Cumulative Present Worth for Capital and O&M Costs for All SARI Configuration Alternatives

Year	Status Quo Option 1	Inline Brine Minimization Plant Option 2a	Decentralized Brine Minimization Plant Option 2b	Direct Ocean Discharge with ZLD Option 3a	Direct Ocean Discharge Without ZLD Option 3b	Salton Sea Option 4
2010	$9,752,000	$9,752,000.00	$9,751,700.00	$9,752,000	$9,752,000	$ 9,752,000
2011	$19,952,000	$19,999,000.00	$19,998,200.00	$19,952,000	$19,952,000	$ 19,952,000
2012	$30,752,000	$30,767,000.00	$30,765,700.00	$30,752,000	$30,752,000	$ 30,752,000
2013	$42,052,000	$42,083,000.00	$42,081,400.00	$42,052,000	$42,052,000	$ 42,052,000
2014	$53,252,000	$53,264,000.00	$53,262,300.00	$53,252,000	$53,252,000	$ 53,252,000
2015	$64,352,000	$64,387,000.00	$83,290,600.00	$83,257,600	$64,352,000	$ 64,352,000
2016	$92,952,000	$92,969,000.00	$119,242,700.00	$131,054,400	$92,952,000	$ 92,952,000
2017	$122,152,000	$122,150,000.00	$155,595,100.00	$179,687,900	$122,152,000	$ 122,152,000
2018	$151,952,000	$151,949,000.00	$192,169,200.00	$228,993,200	$151,952,000	$ 151,952,000
2019	$182,352,000	$182,378,000.00	$228,774,800.00	$278,733,100	$182,352,000	$ 182,352,000
2020	$213,352,000	$372,531,000.00	$265,338,200.00	$366,152,300	$250,652,800	$ 329,452,000
2021	$243,452,000	$561,123,000.00	$301,091,700.00	$453,630,000	$319,471,700	$ 480,052,000
2022	$273,452,000	$748,025,000.00	$335,954,800.00	$541,914,200	$389,676,500	$ 635,052,000
2023	$303,352,000	$933,299,000.00	$369,674,900.00	$215,340,200	$ 45,794,600	$ 794,652,000
2024	$333,052,000	$1,116,891,000.00	$402,150,800.00	$232,771,500	$46,829,000	$ 958,952,000
2025	$362,552,000	$1,077,363,000.00	$416,078,400.00	$231,925,600	$47,834,100	$ 603,556,200
2026	$377,252,000	$1,104,840,000.00	$428,093,500.00	$233,979,300	$48,810,800	$ 608,356,200
2027	$391,352,000	$1,130,601,000.00	$438,740,700.00	$235,038,300	$49,759,800	$ 612,956,200
2028	$404,752,000	$1,154,690,000.00	$448,004,200.00	$235,106,300	$50,682,000	$ 617,456,200
2029	$417,652,000	$1,177,087,000.00	$455,946,300.00	$234,193,800	$51,578,100	$ 621,856,200
2030	$430,052,000	$1,197,821,000.00	$462,570,000.00	$232,289,400	$52,448,800	$ 626,156,200
2031	$441,952,000	$1,216,898,000.00	$467,887,400.00	$229,391,400	$53,294,800	$ 630,256,200
2032	$453,252,000	$1,234,336,000.00	$471,836,700.00	$225,452,600	$54,116,900	$ 634,256,200
2033	$464,152,000	$1,250,108,000.00	$474,484,700.00	$220,497,600	$54,915,700	$ 638,156,200
2034	$474,552,000	$1,264,257,000.00	$475,823,700.00	$214,506,600	$55,691,900	$ 641,956,200
2035	$484,652,000	$1,276,736,000.00	$475,884,200.00	$207,475,000	$56,446,200	$ 645,656,200
2036	$494,352,000	$1,287,585,000.00	$474,614,800.00	$199,364,500	$57,179,100	$ 649,256,200
2037	$503,652,000	$1,296,792,000.00	$472,005,700.00	$190,154,600	$57,891,300	$ 652,756,200
2038	$512,552,000	$1,304,357,000.00	$468,082,900.00	$179,840,900	$58,583,300	$ 656,156,200
2039	$521,152,000	$1,310,259,000.00	$462,806,300.00	$168,393,800	$59,255,700	$ 659,456,200
2040	$529,452,000	$1,314,496,000.00	$456,191,900.00	$155,802,300	$59,909,100	$ 662,656,200
2041	$537,452,000	$1,317,047,000.00	$448,216,900.00	$142,036,000	$60,544,000	$ 665,756,200
2042	$545,152,000	$1,317,926,000.00	$438,860,900.00	$127,067,300	$61,160,900	$ 668,756,200
2043	$552,552,000	$1,317,086,000.00	$428,123,400.00	$110,888,700	$61,760,400	$ 671,656,200
2044	$559,752,000	$1,314,505,000.00	$415,975,300.00	$93,450,300	$62,342,900	$ 674,456,200
2045	$566,652,000	$1,310,196,000.00	$402,383,100.00	$74,726,700	$62,908,900	$ 677,256,200
2046	$573,352,000	$1,304,098,000.00	$387,347,100.00	$54,699,500	$63,458,900	$ 679,956,200
2047	$579,852,000	$1,296,204,000.00	$370,825,400.00	$33,321,900	$63,993,300	$ 682,556,200
2048	$586,152,000	$1,286,481,000.00	$352,800,800.00	$10,571,800	$64,512,600	$ 685,056,200
2049	$592,252,000	$1,274,899,000.00	$333,245,100.00	($13,583,500)	$65,017,200	$ 687,556,200
2050	$598,152,000	$1,261,416,000.00	$312,122,900.00	($39,193,700)	$65,507,500	$ 689,956,200
2051	$603,852,000	$1,245,997,000.00	$289,396,000.00	($66,300,400)	$65,984,000	$ 692,256,200
2052	$609,452,000	$1,228,608,000.00	$265,035,000.00	($94,936,300)	$66,447,000	$ 694,556,200
2053	$614,852,000	$1,209,210,000.00	$238,993,500.00	($125,151,300)	$66,896,900	$ 696,756,200
2054	$620,052,000	$1,187,754,000.00	$211,229,800.00	($156,990,400)	$67,334,000	$ 698,856,200
2055	$625,152,000	$1,164,178,000.00	$181,716,800.00	($190,491,100)	$67,758,800	$ 700,956,200
2056	$630,152,000	$1,138,449,000.00	$150,397,700.00	($225,712,700)	$68,171,500	$ 702,956,200
2057	$634,952,000	$1,110,504,000.00	$117,228,800.00	($262,701,300)	$68,572,600	$ 704,956,200
2058	$639,652,000	$1,080,280,000.00	$82,153,500.00	($301,522,000)	$68,962,300	$ 706,856,200
2059	$644,252,000	$1,047,717,000.00	$45,126,400.00	($342,221,900)	$69,341,000	$ 708,756,200
2060	$648,752,000	$1,012,754,000.00	$6,085,100.00	($384,865,100)	$69,709,000	$ 743,856,200

ZLD Inline Plant

Cost Assumptions		OCSD
OCSD Capital Costs	Units	
- Treatment and Disposal Rights	$/MGD	$ 10,017,500.00
- Pipeline Capacity	$/MGD	$ 3,750,000.00
- BOD Capacity	$/lb BOD over 124 mg/L	$ 2,631.00
- TSS Capacity	$/lb TSS over 255 mg/L	$ 1,613.00
- Brine Only	$/MGD	$ 4,547,250.00
- Retail Value of Reclaimed Water	$/AF	$ 600.00
- Retail Value of Potable Water	$/AF	
Potable Water Production		
- Assumed MF Recovery	95%	
- Asumed RO Recover	70%	
ZLD Treatment Capital Costs (based on water produced, NOT treated)		
- Preciptative Softening	$/MGD	$ 1,000,000.00
- Microfiltration	$/MGD	$ 4,500,000.00
- Reverse Osmosis	$/MGD	$ 6,500,000.00
- Biological Pretreatment	$/MGD	$ 8,000,000.00
- AOP Post Treatment	$/MGD	$ 1,000,000.00
Chemical Costs		
- Cost of caustic soda	$/ton	$ 200.00
- Cost of caustic soda	$/lb	$ 0.38
- Cost of Soda Ash	$/lb	$ 1.08
- Cost of Acid -93% pure	$/lb	$ 0.33
- Cost of Threshold Inhibitor - 100% p	$/lb	$ 1.00
- RO Cleaning (Annual)	$/mgd	$ 3,700.00
- MF Cleaning (Annual)	$/mgd	$ 1,850.00
Electrical Power	$/kWh	$ 0.125
Sludge Disposal Cost	$/ton	$65
Sludge Generated According to Softening Chemicals Used		
- Lime Alone	tons/MG	15
- Lime + Soda Ash	tons/MG	20
- Caustic + Soda Ash	tons/MG	10

Brine Minimization Alternatives		Centralized Plant			
- Flow to concentration plant	mgd	**14.74**	**16.5**	**32.69**	**36.85**
Chemicals:					
- Caustic:					
- Caustic Soda Dose	mg/L	650	650	650	650
Caustic Soda Usage	lb/d	79,906	89,447	177,212	199,764
Cost of Caustic Soda	$/lb	**0.38**	**0.38**	**0.38**	**0.38**
Annual cost of Caustic	$	**$ 11,082,898.40**	**$ 12,406,229.55**	**$ 24,579,372.36**	**$ 27,707,246.00**
- Soda Ash:					
- Soda Ash Dose	mg/L	0	0	0	0
Soda Ash Usage	lb/d	-	-	-	-
Cost of Soda Ash	$/lb	**1.08**	**1.08**	**1.08**	**1.08**
Annual Cost of Soda Ash	$	**$ -**	**$ -**	**$ -**	**$ -**
- Acid:					
- Acid Dose	mg/L	20	20	20	20
Acid Usage	lb/d	2458.632	2752.2	5452.692	6146.58
Cost of Acid	$/lb	**0.33**	**0.33**	**0.33**	**0.33**
Annual Cost of Acid	$	**$ 296,142.22**	**$ 331,502.49**	**$ 656,776.75**	**$ 740,355.56**
- Threshold Inhibitor:					
- Threshold Inhibitor Dose	mg/L	4	4	4	4
- TI Usage	lb/day	491.7264	550.44	1090.5384	1229.316
- Cost of Threshold Inhinitor	$/lb	**1.00**	**1.00**	**1.00**	**1.00**
- Annual Cost of TI	$	**$ 179,480.14**	**$ 200,910.60**	**$ 398,046.52**	**$ 448,700.34**
- Cleaning Chemicals					
- MF Flow	mgd	14.7	16.5	32.7	36.9
- Annual MF Cleaning Costs	$/mgd	**1,850.00**	**1,850.00**	**1,850.00**	**1,850.00**
- RO Permeate	mgd	9.8021	10.9725	21.73885	24.50525
- Annual RO Cleaning Costs	$/mgd	**3,700.00**	**3,700.00**	**3,700.00**	**3,700.00**
- Annual Membrane Cleaning Cost	$	**$ 63,536.77**	**$ 71,123.25**	**$ 140,910.25**	**$ 158,841.93**
- **Total Annual Cost of Chemicals**		**$ 11,622,057.53**	**$ 13,009,765.89**	**$ 25,775,105.88**	**$ 29,055,143.82**
Sludge Disposal:					
- Raw Brine Flow Rate	mgd	14.74	16.5	32.69	36.85
- Sludge Generated/MG brine	tons	10	10	10	10
- Estimated Mass of Sludge generate	tons/day	147.4	165	326.9	368.5
- Cost of Sludge Processing + Dispos	tons/day	**$65**	**$65**	**$65**	**$65**
- Annual Cost of Sludge Disposal	$	**$ 3,497,065.00**	**$ 3,914,625.00**	**$ 7,755,702.50**	**$ 8,742,662.50**
Treatment Process:					
RO Power Cost					
- RO Feed Flow Rate	mgd	**14.74**	**16.5**	**32.69**	**36.85**
- RO Feed Flow Rate	gpm	10235.456	11457.6	22699.936	25588.64
- Average Operating Pressure	psi	215	215	215	215
- Overall Pump Efficiency	%	70%	70%	70%	70%
- Pumping Power	hp	1833.85	2052.82	4067.07	4584.63
- Power Consumed	kWh	1366.220137	1529.3509	3029.968541	3415.550343
- Annual RO Power Consumption	kWh/yr	11968088.4	13397113.88	26542524.42	29920221.01
- Power Cost	$/kWh	**0.16**	**0.16**	**0.16**	**0.16**
- Annual RO Power Cost	$	**$ 1,914,894.14**	**$ 2,143,538.22**	**$ 4,246,803.91**	**$ 4,787,235.36**
MF Power Cost					

-	MF Feed Flow Rate	mgd		14.74	16.5	32.69	36.85
-	Annual Power Cost per MGD	$		20000	20000	20000	20000
-	Annual MF Power Cost			**$ 294,800.00**	**$ 330,000.00**	**$ 653,800.00**	**$ 737,000.00**
	Membrane Replacement						
-	Assume typical RO life	$/1000 gal		0.16	0.16	0.16	0.16
-	Annual Cost for RO Membranes	$		$ 860,816.00	$ 963,600.00	$ 1,909,096.00	$ 2,152,040.00
-	Annual Cost for MF Membranes	$		$ 516,489.60	$ 578,160.00	$ 1,145,457.60	$ 1,291,224.00
-	Annual Mem Repl Cost	$		**$ 1,377,305.60**	**$ 1,541,760.00**	**$ 3,054,553.60**	**$ 3,443,264.00**
	Annual O&M Costs for Brine Minimization						
-	Power + Membrane Replacement			**$ 3,586,999.74**	**$ 4,015,298.22**	**$ 7,955,157.51**	**$ 8,967,499.36**
-	Chemical Costs			**$ 11,622,057.53**	**$ 13,009,765.89**	**$ 25,775,105.88**	**$ 29,055,143.82**
-	Sludge Disposal			**$ 3,497,065.00**	**$ 3,914,625.00**	**$ 7,755,702.50**	**$ 8,742,662.50**
	O&M LABOR			**$ 1,870,612.23**	**$ 2,093,968.91**	**$ 4,148,596.59**	**$ 4,676,530.57**
-	Total Annual Costs			**$ 20,576,734.50**	**$ 23,033,658.02**	**$ 45,634,562.47**	**$ 51,441,836.25**
	Capital Cost:						
-	Volume Water Generated by Soften	mgd		14.74	16.50	32.69	36.85
-	Volume Produced by MF	mgd		14.00	15.68	31.06	35.01
-	Volume Produced by RO	mgd		9.80	10.97	21.74	24.51
-	Installed Cost for Softener	$		$ 14,740,000.00	$ 16,500,000.00	$ 32,690,000.00	$ 36,850,000.00
-	Installed Cost for MF System	$		$ 63,013,500.00	$ 70,537,500.00	$ 139,749,750.00	$ 157,533,750.00
-	Installed Cost for RO System	$		$ 63,713,650.00	$ 71,321,250.00	$ 141,302,525.00	$ 159,284,125.00
-	Intalled Cost for Biological Pretreatn	$		$ 117,920,000.00	$ 132,000,000.00	$ 261,520,000.00	$ 294,800,000.00
-	Installed Cost for AOP Treatmetn	$		$ 9,802,100.00	$ 10,972,500.00	$ 21,738,850.00	$ 24,505,250.00
-	Engineering and Contingency		30%	$ 80,756,775.00	$ 90,399,375.00	$ 179,100,337.50	$ 201,891,937.50
-	Estimated ZLD Capital Cost	$		**$ 349,946,025.00**	**$ 391,730,625.00**	**$ 776,101,462.50**	**$ 874,865,062.50**
-	ZLD Cost Per MGD	$/MGD		**$ 23,741,250.00**	**$ 23,741,250.00**	**$ 23,741,250.00**	**$ 23,741,250.00**
	Annual Cost of Capital:						
-	Average Annual Interest Rate	%		6%	6%	6%	6%
-	Loan Period	years		20	20	20	20
-	Annual Payment	$		$30,509,889.16	$34,152,860.99	$67,664,062.18	$76,274,722.89
Revenue from New Water Production							
-	Assumed MF Recovery	%		95%	95%	95%	95%
-	Assumed RO Recovery	%		70%	70%	70%	70%
-	Reclaimed Water Produced	mgd		9.80	10.97	21.74	24.51
-	Reclaimed Water Produced	AF/Y		10,981	12,292	24,352	27,451
-	Selling Price of Reclaimed Water	$/AF		$288.00	$288.00	$288.00	$288.00
-	Annual Revenue	$		**$ 3,162,386.97**	**$ 3,539,985.42**	**$ 7,013,462.01**	**$ 7,905,967.43**

Cost Assumptions

			OCSD
OCSD Capital Costs	Units		
- Treatment and Disposal Rights	$/MGD	$	10,017,500.00
- Pipeline Capacity	$/MGD	$	3,750,000.00
- BOD Capacity	$/lb BOD over 124 mg/L	$	2,631.00
- TSS Capacity	$/lb TSS over 255 mg/L	$	1,613.00
- Brine Only	$/MGD	$	4,547,250.00
- Retail Value of Reclaimed Water	$/AF	$	600.00
- Retail Value of Potable Water	$/AF		
Potable Water Production			
- Assumed MF Recovery		95%	
- Asumed RO Recover		70%	

ZLD Decen Plant

ZLD Treatment Capital Costs (based on water produced, NOT treated)			
- Preciptative Softening	$/MGD	$	1,000,000.00
- Microfiltration	$/MGD	$	4,500,000.00
- Reverse Osmosis	$/MGD	$	6,500,000.00
Chemical Costs			
- Cost of caustic soda	$/ton	$	200.00
- Cost of caustic soda	$/lb	$	0.38
- Cost of Soda Ash	$/lb	$	1.08
- Cost of Acid -93% pure	$/lb	$	0.33
- Cost of Threshold Inhibitor - 100% p	$/lb		1
- RO Cleaning	$/mgd	$	3,700.00
- MF Cleaning	$/mgd	$	1,850.00
Electrical Power	$/kWh	$	0.125
Sludge Disposal Cost	$/ton		$65
Sludge Generated According to Softening Chemicals Used			
- Lime Alone	tons/MG		15
- Lime + Soda Ash	tons/MG		20
- Caustic + Soda Ash	tons/MG		10

Brine Minimization Alternatives		<u>Decentralized Plants</u>		
- Flow to concentration plant	mgd	**10.55**	**10.87**	**15.87**
<u>Chemicals:</u>				
- Caustic:				
- Caustic Soda Dose	mg/L	650	650	650
Caustic Soda Usage	lb/d	57,192	58,926	86,031
Cost of Caustic Soda	$/lb	**0.38**	**0.38**	**0.38**
Annual cost of Caustic	$	**$ 7,932,467.99**	**$ 8,173,073.65**	**$ 11,932,537.15**
- Soda Ash:				
- Soda Ash Dose	mg/L	0	0	0
Soda Ash Usage	lb/d	-	-	-
Cost of Soda Ash	$/lb	**1.08**	**1.08**	**1.08**
Annual Cost of Soda Ash	$	**$ -**	**$ -**	**$ -**
- Acid:				
- Acid Dose	mg/L	20	20	20
Acid Usage	lb/d	1759.74	1813.116	2647.116
Cost of Acid	$/lb	**0.33**	**0.33**	**0.33**
Annual Cost of Acid	$	**$ 211,960.68**	**$ 218,389.82**	**$ 318,845.12**
- Threshold Inhibitor:				
- Threshold Inhibitor Dose	mg/L	4	4	4
- TI Usage	lb/day	351.948	362.6232	529.4232
- Cost of Threshold Inhinitor	$/lb	**1.00**	**1.00**	**1.00**
- Annual Cost of TI	$	**$ 128,461.02**	**$ 132,357.47**	**$ 193,239.47**
- Cleaning Chemicals				
- MF Flow	mgd	10.6	10.9	15.9
- MF Cleaning Costs	$/mgd	**1,850.00**	**1,850.00**	**1,850.00**
- RO Permeate	mgd	7.01575	7.22855	10.55355
- RO Cleaning Costs	$/mgd	**3,700.00**	**3,700.00**	**3,700.00**
- Annual Membrane Cleaning Cost	$	**$ 45,475.78**	**$ 46,855.14**	**$ 68,407.64**
- **Total Annual Cost of Chemicals**		**$ 8,318,365.46**	**$ 8,570,676.07**	**$ 12,513,029.37**
Sludge Disposal:				
- Raw Brine Flow Rate	mgd	10.55	10.87	15.87
- Sludge Generated/MG brine	tons	10	10	10
- Estimated Mass of Sludge generate	tons/day	105.5	108.7	158.7
- Cost of Sludge Processing + Dispos	tons/day	**$65**	**$65**	**$65**
- Annual Cost of Sludge Disposal	$	**$ 2,502,987.50**	**$ 2,578,907.50**	**$ 3,765,157.50**
Treatment Process:				
RO Power Cost				
- RO Feed Flow Rate	mgd	**10.55**	**10.87**	**15.87**
- RO Feed Flow Rate	gpm	7325.92	7548.128	11020.128
- Average Operating Pressure	psi	215	215	215
- Overall Pump Efficiency	%	70%	70%	70%
- Pumping Power	hp	1312.56	1352.37	1974.44
- Power Consumed	kWh	977.8576967	1007.517835	1470.957502
- Annual RO Power Consumption	kWh/yr	8566033.423	8825856.238	12885587.72
- Power Cost	$/kWh	**0.16**	**0.16**	**0.16**
- Annual RO Power Cost	$	**$ 1,370,565.35**	**$ 1,412,137.00**	**$ 2,061,694.03**
MF Power Cost				
- MF Feed Flow Rate	mgd	**10.55**	**10.87**	**15.87**
- Annual Power Cost per MGD	$	20000	20001	20002

-	Annual MF Power Cost			**$**	**211,000.00**	**$**	**217,410.87**	**$**	**317,431.74**
	Membrane Replacement								
-	Assume typical RO life	$/1000 gal			0.16		0.16		0.16
-	Annual Cost for RO Membranes	$		$	616,120.00	$	634,808.00	$	926,808.00
-	Annual Cost for MF Membranes	$		$	369,672.00	$	380,884.80	$	556,084.80
-	Annual Mem Repl Cost	$		**$**	**985,792.00**	**$**	**1,015,692.80**	**$**	**1,482,892.80**
	Annual O&M Costs for Brine Minimization								
-	Power + Membrane Replacement			**$**	**2,567,357.35**	**$**	**2,645,240.67**	**$**	**3,862,018.57**
-	Chemical Costs			**$**	**8,318,365.46**	**$**	**8,570,676.07**	**$**	**12,513,029.37**
-	Sludge Disposal			**$**	**2,502,987.50**	**$**	**2,578,907.50**	**$**	**3,765,157.50**
	O&M LABOR			**$**	**1,338,871.03**	**$**	**1,379,482.42**	**$**	**2,014,020.54**
-	Total Annual Costs			**$**	**14,727,581.34**	**$**	**15,174,306.67**	**$**	**22,154,225.99**
	Capital Cost:								
-	Volume Water Generated by Soften	mgd			10.55		10.87		15.87
-	Volume Produced by MF	mgd			10.02		10.33		15.08
-	Volume Produced by RO	mgd			7.02		7.23		10.55
-	Installed Cost for Softener	$		$	10,550,000.00	$	10,870,000.00	$	15,870,000.00
-	Installed Cost for MF System	$		$	45,101,250.00	$	46,469,250.00	$	67,844,250.00
-	Installed Cost for RO System	$		$	45,602,375.00	$	46,985,575.00	$	68,598,075.00
-	Contingency and Engineering		30%	$	30,376,087.50	$	31,297,447.50	$	45,693,697.50
-	Estimated ZLD Capital Cost	$		**$**	**131,629,712.50**	**$**	**135,622,272.50**	**$**	**198,006,022.50**
-	ZLD Cost Per MGD	$/MGD		**$**	**12,476,750.00**	**$**	**12,476,750.00**	**$**	**12,476,750.00**
	Annual Cost of Capital:								
-	Average Annual Interest Rate	%			6%		6%		6%
-	Loan Period	years			20		20		20
-	Annual Payment	$			$11,476,078.17		$11,824,167.74		$17,263,067.35
Revenue from New Water Production									
-	Assumed MF Recovery	%			95%		95%		95%
-	Assumed RO Recovery	%			70%		70%		70%
-	Reclaimed Water Produced	mgd			7.02		7.23		10.55
-	Reclaimed Water Produced	AF/Y			7,859		8,098		11,822
-	Selling Price of Reclaimed Water	$/AF			$645.00		$645.00		$645.00
-	Annual Revenue	$		**$**	**5,069,174.19**	**$**	**5,222,931.13**	**$**	**7,625,383.36**

Revenue from Available Capacity

-

YEAR	Decen Plant Flow (influent)	O&M
2015	**0.00**	$ -
2016	1.59	$ 2,215,422.60
2017	3.17	$ 4,430,845.20
2018	4.76	$ 6,646,267.80
2019	6.35	$ 8,861,690.40
2020	7.94	$ 11,077,113.00
2021	9.52	$ 13,292,535.60
2022	11.11	$ 15,507,958.20
2023	12.70	$ 17,723,380.80
2024	14.28	$ 19,938,803.39
2025	15.87	$ 22,154,225.99

Cost Estimate: for Pipeline to Salton Sea (125 miles)

Assuming 125 linear miles of 36" pipe with manholes at 1000feet.

Description	QTY	Unit	Unit Cost	Total
60" diameter manholes	660	EA	$2,500.00	$1,650,000.00
36" Dr11 HDPE Pipeline in Open Trench	660,000	LF	$250.00	$165,000,000.00
Fittings and Valves (assumed 5% of pipeline cost)				$8,250,000.00
Excavation (Medium Digging, 12' deep, 6' wide trench)	3,801,600	CY	$4.00	$15,206,400.00
Pump Station (based on 30 mgd; *Pumping Station Design, Sanks et al.*)	30	mgd	$10,302,355.81	$10,302,355.81
Pump Station (C: 150, Elev: -977', 7 fps = 2,670' TDH)	43,308	hp		
				$200,408,755.81
Construction Contingency			50%	$100,204,377.91
Eng, Env, Legal, Admin, CM			50%	$100,204,377.91
				$400,817,511.62

Cost Estimate: for Pipeline from below Prado Dam to Ocean Outfall (25 miles)

Assuming 25 linear miles of 36" pipe with manholes at 1000 feet.

Description	QTY	Unit	Unit Cost	Total
60" diameter manholes	132	EA	$2,500.00	$330,000.00
36" Dr11 HDPE Pipeline in Open Trench	132,000	LF	$250.00	$33,000,000.00
Fittings and Valves (assumed 10% of pipeline cost, due to urban)				$3,300,000.00
Excavation (Medium Digging, 12' deep, 6' wide trench)	352,000	CY	$4.00	$1,408,000.00
Cleaning SARI line estimated at $10/ft	374,880		$10.00	$3,748,800.00
				$41,786,800.00
Construction Contingency			50%	$20,893,400.00
Eng, Env, Legal, Admin, CM			35%	$14,625,380.00
				$77,305,580.00

Flows in bold taken from CDM Phase I report.

Others, calculated assuming constant yearly incr.

Baseline Analysis

OCSD Rates *(i)*		**Treatment**	
Rate Description		Treatment (mg/L	OCSD Rate ($/1000 lb)
O&M Inflation Rate 1 (IR1):		102 mg/L BOD	$274 /1000 lbs
Rate up to 2013 ($IR1_{2013}$)	10%	312 mg/L TSS	$407 /1000 lbs
Rate at 2014($IR1_{2014}$)	8%	SARI Flow	$179 /MG
Rate at 2015($IR1_{2015}$)	7%	Treatment Capac	$11,332,000
Rate up to 2020($IR1_{2020}$)	5.4%		
Costs unchanged after 2020	0%		
O&M Inflation Rate 2 (IR2):	6%		
Capital Inflation Rate (CIR):	**5.0%**		
Interest Rate (INTR):	6%		

Calendar Year	2010 n	OCSD Treatment Flow (mgd)	OCSD CIP Sinking Fund	OCSD Treatment Capacity Cost 2010 Dollars	Inflated Cost (F/P, CIR,n)	2010 Present Worth (P/F,INTR,n)	OCSD O&M Treatment Cost 2010 Dollars	Inflated Cost (F/P, IR1,n)	2010 Present Worth (P/F,INTR,n)	OCSD O&M Maint. Cost 2010 Dollars	Inflated Cost (F/P, IR2,n)	2010 Present Worth (P/F,INTR,n)	Capital + O&M Costs Per Year	2010 Capital + OM Present Worth	2010 Cumulative Present Worth
2010	0	**14.74**	$ 1,696,607	$ -	$ -	$ -	$ 7,914,842	$7,914,800	$7,914,800	$ 140,290	$ 140,300	$ 140,300	$ 9,751,707	$ 9,752,000	$ 9,752,000
2011	1	15.09	$ 1,696,607	$ -	$ -	$ -	$ 8,103,853	$8,914,200	$8,409,600	$ 140,290	$ 148,700	$ 140,300	$ 10,759,507	$ 10,200,000	$ 19,952,000
2012	2	15.44	$ 1,696,607	$ -	$ -	$ -	$ 8,292,864	$10,034,400	$8,930,600	$ 140,290	$ 157,600	$ 140,300	$ 11,888,607	$ 10,800,000	$ 30,752,000
2013	3	15.80	$ 1,696,607	$ -	$ -	$ -	$ 8,481,875	$11,289,400	$9,478,800	$ 140,290	$ 167,100	$ 140,300	$ 13,153,107	$ 11,300,000	$ 42,052,000
2014	4	16.15	$ 1,696,607	$ -	$ -	$ -	$ 8,670,887	$11,796,600	$9,344,000	$ 140,290	$ 177,100	$ 140,300	$ 13,670,307	$ 11,200,000	$ 53,252,000
2015	5	**16.50**	$ 1,696,607	$ -	$ -	$ -	$ 8,859,898	$12,426,500	$9,285,800	$ 140,290	$ 187,700	$ 140,300	$ 14,310,807	$ 11,100,000	$ 64,352,000
2016	6	18.12	$ 1,696,607	$ 18,346,508	$ 24,600,000	$ 17,342,000.00	$ 9,729,242	$13,339,000	$9,403,500	$ 140,290	$ 199,000	$ 140,300	$ 39,834,607	$ 28,600,000	$ 92,952,000
2017	7	19.74	$ 1,696,607	$ 18,346,508	$ 25,800,000	$ 17,158,500.00	$ 10,598,586	$15,315,500	$10,185,700	$ 140,290	$ 210,900	$ 140,300	$ 43,023,007	$ 29,200,000	$ 122,152,000
2018	8	21.36	$ 1,696,607	$ 18,346,508	$ 27,100,000	$ 17,002,900.00	$ 11,467,929	$17,466,700	$10,958,800	$ 140,290	$ 223,600	$ 140,300	$ 46,486,907	$ 29,800,000	$ 151,952,000
2019	9	22.98	$ 1,696,607	$ 18,346,508	$ 28,500,000	$ 16,869,100.00	$ 12,337,273	$19,805,400	$11,722,800	$ 140,290	$ 237,000	$ 140,300	$ 50,239,007	$ 30,400,000	$ 182,352,000
2020	10	24.60	$ 1,696,607	$ 18,346,508	$ 29,900,000	$ 16,696,000.00	$ 13,206,617	$22,345,900	$12,477,800	$ 140,290	$ 251,200	$ 140,300	$ 54,193,707	$ 31,000,000	$ 213,352,000
2021	11	26.21	$ 1,696,607	$ 18,346,508	$ 31,400,000	$ 16,541,100.00	$ 14,075,961	$22,345,900	$11,771,500	$ 140,290	$ 266,300	$ 140,300	$ 55,708,807	$ 30,100,000	$ 243,452,000
2022	12	27.83	$ 1,696,607	$ 18,346,508	$ 32,900,000	$ 16,350,300.00	$ 14,945,305	$23,816,800	$11,836,200	$ 140,290	$ 282,300	$ 140,300	$ 58,695,707	$ 30,000,000	$ 273,452,000
2023	13	29.45	$ 1,696,607	$ 18,346,508	$ 34,600,000	$ 16,221,800.00	$ 15,814,649	$25,287,800	$11,855,900	$ 140,290	$ 299,200	$ 140,300	$ 61,883,607	$ 29,900,000	$ 303,352,000
2024	14	31.07	$ 1,696,607	$ 18,346,508	$ 36,300,000	$ 16,055,500.00	$ 16,683,993	$26,758,700	$11,835,400	$ 140,290	$ 317,200	$ 140,300	$ 65,072,507	$ 29,700,000	$ 333,052,000
2025	15	**32.69**	$ 1,696,607	$ 18,346,508	$ 38,100,000	$ 15,897,800.00	$ 17,553,337	$28,229,700	$11,779,300	$ 140,290	$ 336,200	$ 140,300	$ 68,362,507	$ 29,500,000	$ 362,552,000
2026	16	32.81	$ 1,696,607	$ 1,346,889	$ 2,900,000	$ 1,141,600.00	$ 17,617,159	$29,700,600	$11,691,500	$ 140,290	$ 356,400	$ 140,300	$ 34,653,607	$ 14,700,000	$ 377,252,000
2027	17	32.93	$ 1,696,607	$ 1,346,889	$ 3,100,000	$ 1,151,200.00	$ 17,680,981	$29,808,600	$11,069,900	$ 140,290	$ 377,800	$ 140,300	$ 34,983,007	$ 14,100,000	$ 391,352,000
2028	18	33.05	$ 1,696,607	$ 1,346,889	$ 3,200,000	$ 1,121,100.00	$ 17,744,803	$29,916,600	$10,481,100	$ 140,290	$ 400,400	$ 140,300	$ 35,213,607	$ 13,400,000	$ 404,752,000
2029	19	33.17	$ 1,696,607	$ 1,346,889	$ 3,400,000	$ 1,123,700.00	$ 17,808,625	$30,024,600	$9,923,500	$ 140,290	$ 424,500	$ 140,300	$ 35,545,707	$ 12,900,000	$ 417,652,000
2030	20	33.28	$ 1,696,607	$ 1,346,889	$ 3,600,000	$ 1,122,500.00	$ 17,872,447	$30,132,600	$9,395,500	$ 140,290	$ 449,900	$ 140,300	$ 35,879,107	$ 12,400,000	$ 430,052,000
2031	21	33.40	$ 1,696,607	$ 1,346,889	$ 3,800,000	$ 1,117,800.00	$ 17,936,269	$30,240,600	$8,895,400	$ 140,291	$ 476,900	$ 140,300	$ 36,214,107	$ 11,900,000	$ 441,952,000
2032	22	33.52	$ 1,696,607	$ 1,346,889	$ 3,900,000	$ 1,082,300.00	$ 18,000,090	$30,348,600	$8,421,900	$ 140,292	$ 505,500	$ 140,300	$ 36,450,707	$ 11,300,000	$ 453,252,000
2033	23	33.64	$ 1,696,607	$ 1,346,889	$ 4,100,000	$ 1,073,400.00	$ 18,063,912	$30,456,600	$7,973,500	$ 140,293	$ 535,900	$ 140,300	$ 36,789,107	$ 10,900,000	$ 464,152,000
2034	24	33.76	$ 1,696,607	$ 1,346,889	$ 4,300,000	$ 1,062,000.00	$ 18,127,734	$30,564,500	$7,548,800	$ 140,294	$ 568,000	$ 140,300	$ 37,129,107	$ 10,400,000	$ 474,552,000
2035	25	33.88	$ 1,696,607	$ 1,346,889	$ 4,600,000	$ 1,071,800.00	$ 18,191,556	$30,672,500	$7,146,700	$ 140,295	$ 602,100	$ 140,300	$ 37,571,207	$ 10,100,000	$ 484,652,000
2036	26	34.00	$ 1,696,607	$ 1,346,889	$ 4,800,000	$ 1,055,100.00	$ 18,255,378	$30,780,500	$6,765,900	$ 140,296	$ 638,300	$ 140,300	$ 37,915,407	$ 9,700,000	$ 494,352,000
2037	27	34.12	$ 1,696,607	$ 1,346,889	$ 5,000,000	$ 1,036,800.00	$ 18,319,200	$30,888,500	$6,405,300	$ 140,297	$ 676,600	$ 140,300	$ 38,261,707	$ 9,300,000	$ 503,652,000
2038	28	34.24	$ 1,696,607	$ 1,346,889	$ 5,300,000	$ 1,036,800.00	$ 18,383,022	$30,996,500	$6,063,800	$ 140,298	$ 717,200	$ 140,300	$ 38,710,307	$ 8,900,000	$ 512,552,000
2039	29	34.35	$ 1,696,607	$ 1,346,889	$ 5,500,000	$ 1,015,100.00	$ 18,446,844	$31,104,500	$5,740,500	$ 140,299	$ 760,200	$ 140,300	$ 39,061,307	$ 8,600,000	$ 521,152,000
2040	30	34.47	$ 1,696,607	$ 1,346,889	$ 5,800,000	$ 1,009,800.00	$ 18,510,666	$31,212,500	$5,434,400	$ 140,300	$ 805,800	$ 140,300	$ 39,514,907	$ 8,300,000	$ 529,452,000
2041	31	34.59	$ 1,696,607	$ 1,346,889	$ 6,100,000	$ 1,002,000.00	$ 18,574,488	$31,320,500	$5,144,500	$ 140,301	$ 854,200	$ 140,300	$ 39,971,307	$ 8,000,000	$ 537,452,000
2042	32	34.71	$ 1,696,607	$ 1,346,889	$ 6,400,000	$ 991,700.00	$ 18,638,310	$31,428,400	$4,870,100	$ 140,302	$ 905,400	$ 140,300	$ 40,430,407	$ 7,700,000	$ 545,152,000
2043	33	34.83	$ 1,696,607	$ 1,346,889	$ 6,700,000	$ 979,400.00	$ 18,702,132	$31,536,400	$4,610,200	$ 140,303	$ 959,800	$ 140,300	$ 40,892,807	$ 7,400,000	$ 552,552,000
2044	34	34.95	$ 1,696,607	$ 1,346,889	$ 7,100,000	$ 979,200.00	$ 18,765,954	$31,644,400	$4,364,100	$ 140,304	$ 1,017,300	$ 140,300	$ 41,458,307	$ 7,200,000	$ 559,752,000
2045	35	35.07	$ 1,696,607	$ 1,346,889	$ 7,400,000	$ 962,800.00	$ 18,829,776	$31,752,400	$4,131,200	$ 140,305	$ 1,078,400	$ 140,300	$ 41,927,407	$ 6,900,000	$ 566,652,000
2046	36	35.19	$ 1,696,607	$ 1,346,889	$ 7,800,000	$ 957,400.00	$ 18,893,598	$31,860,400	$3,910,600	$ 140,306	$ 1,143,100	$ 140,300	$ 42,500,107	$ 6,700,000	$ 573,352,000
2047	37	35.30	$ 1,696,607	$ 1,346,889	$ 8,200,000	$ 949,500.00	$ 18,957,420	$31,968,400	$3,701,700	$ 140,307	$ 1,211,700	$ 140,300	$ 43,076,707	$ 6,500,000	$ 579,852,000
2048	38	35.42	$ 1,696,607	$ 1,346,889	$ 8,600,000	$ 939,500.00	$ 19,021,242	$32,076,400	$3,504,000	$ 140,308	$ 1,284,400	$ 140,300	$ 43,657,407	$ 6,300,000	$ 586,152,000
2049	39	35.54	$ 1,696,607	$ 1,346,889	$ 9,000,000	$ 927,500.00	$ 19,085,064	$32,184,400	$3,316,800	$ 140,309	$ 1,361,500	$ 140,300	$ 44,242,507	$ 6,100,000	$ 592,252,000
2050	40	35.66	$ 1,696,607	$ 1,346,889	$ 9,500,000	$ 923,600.00	$ 19,148,886	$32,292,400	$3,139,500	$ 140,310	$ 1,443,200	$ 140,300	$ 44,932,207	$ 5,900,000	$ 598,152,000
2051	41	35.78	$ 1,696,607	$ 1,346,889	$ 10,000,000	$ 917,200.00	$ 19,212,707	$32,400,300	$2,971,700	$ 140,311	$ 1,529,800	$ 140,300	$ 45,626,707	$ 5,700,000	$ 603,852,000
2052	42	35.90	$ 1,696,607	$ 1,346,889	$ 10,500,000	$ 908,500.00	$ 19,276,529	$32,508,300	$2,812,900	$ 140,312	$ 1,621,600	$ 140,300	$ 46,326,507	$ 5,600,000	$ 609,452,000
2053	43	36.02	$ 1,696,607	$ 1,346,889	$ 11,000,000	$ 897,900.00	$ 19,340,351	$32,616,300	$2,662,500	$ 140,313	$ 1,718,900	$ 140,300	$ 47,031,807	$ 5,400,000	$ 614,852,000
2054	44	36.14	$ 1,696,607	$ 1,346,889	$ 11,500,000	$ 885,600.00	$ 19,404,173	$32,724,300	$2,520,100	$ 140,314	$ 1,822,000	$ 140,300	$ 47,742,907	$ 5,200,000	$ 620,052,000
2055	45	36.26	$ 1,696,607	$ 1,346,889	$ 12,100,000	$ 879,100.00	$ 19,467,995	$32,832,300	$2,385,300	$ 140,315	$ 1,931,400	$ 140,300	$ 48,560,307	$ 5,100,000	$ 625,152,000
2056	46	36.37	$ 1,696,607	$ 1,346,889	$ 12,700,000	$ 870,400.00	$ 19,531,817	$32,940,300	$2,257,700	$ 140,316	$ 2,047,300	$ 140,300	$ 49,384,207	$ 5,000,000	$ 630,152,000
2057	47	36.49	$ 1,696,607	$ 1,346,889	$ 13,300,000	$ 860,000.00	$ 19,595,639	$33,048,300	$2,136,800	$ 140,317	$ 2,170,100	$ 140,300	$ 50,215,007	$ 4,800,000	$ 634,952,000
2058	48	36.61	$ 1,696,607	$ 1,346,889	$ 14,000,000	$ 854,000.00	$ 19,659,461	$33,156,300	$2,022,500	$ 140,318	$ 2,300,400	$ 140,300	$ 51,153,307	$ 4,700,000	$ 639,652,000
2059	49	36.73	$ 1,696,607	$ 1,346,889	$ 14,700,000	$ 845,900.00	$ 19,723,283	$33,264,200	$1,914,200	$ 140,319	$ 2,438,400	$ 140,300	$ 52,099,207	$ 4,600,000	$ 644,252,000
2060	50	**36.85**	$ 1,696,607	$ 1,346,889	$ 15,400,000	$ 836,000.00	$ 19,787,105	$33,372,200	$1,811,700	$ 140,320	$ 2,584,700	$ 140,300	$ 53,053,507	$ 4,500,000	$ 648,752,000

s in desalter brine flow (Ph 1 report)

	Cum Flow	Δflow
2010	14.74	14.74
2014	14.74	0
2015	16.5	1.76
2025	32.69	16.19
2030	36.85	4.16

Assumed Cost Components

Decentralized Plant | OCSD Plant

Inline Plant Analysis

Treatment Plant flows in bold taken from Phase I report. Others calculated assuming constant increase
This analysis does not include cost for new infrastructure for distribution of new potable water generated

One-time OCSD Treatment capacity sell back in 2025	4.66	MGD
	$ 52,753,293	2010 Dollars
	$ 116,100,000	Inflation at 2025
	$ 68,719,400	Inflation at 2025

changed inflation (see column M)

OCSD Rates *(i)*		**Treatment**		Revenue Values	
Rate Description		Treatment	OCSD Rate		
O&M Inflation Rate 1 (IR1):		102 mg/L BOD	$274 /1000 lbs	Reclaimed Water	
Rate up to 2013 ($IR1_{2013}$)	10%	312 mg/L TSS	$407 /1000 lbs	$288 /AF	EMWD 2009 Non-Agricultural-Tertiary treated, disinfected, and filtered recycled water rates
Rate at 2014($IR1_{2014}$)	8%	Flow	$179 /MG		
Rate at 2015($IR1_{2015}$)	7%	Treatment Capacity	$11,332,000 /MG		
Rate up to 2020($IR1_{2020}$)	5.4%				
Costs unchanged after 2020	0%				
O&M Inflation Rate 2 (IR2):	6%				
Capital Inflation Rate (CIR):	**5.0%**				
Treatment Plant CIR (TCIR):	5.0%				
Interest Rate (INTR):	6%				
Treatment Plant O&M Inflation (TIR)	**3%**				

One-time sellback		
2010	$ 52,753,293	
2013	$ 77,236,096	
2014	$ 83,414,984	
2015	$ 89,254,033	
2020	$ 116,099,648	$ 89,259,754
2025	$ 116,099,648	

Calendar Year	2010 n	Treatment Plant Capacity (mgd)	Water Produced (mgd)	Brine Flow (mgd)	Treatment Plant Capital Cost: 2010 Dollars	Treatment Plant Capital Cost: Inflated Cost (F/P, TCIR,n)	Treatment Plant Capital Cost: 2010 Pres Worth (P/F, INTR,n)	Treatment Plant O&M Costs: 2010 Dollars	Treatment Plant O&M Costs: Inflated Cost (F/P, TIR,n)	Treatment Plant O&M Costs: 2010 Pres Worth (P/F, INTR,n)	OCSD Treatment Flow (No ZLD) (mgd)	OCSD Treatment Flow (after ZLD) (mgd)	OCSD CIP Sinking Fund	OCSD Treatment Capacity Cost: 2010 Dollars	OCSD Treatment Capacity Cost: Inflated Cost (F/P, CIR,n)	OCSD Treatment Capacity Cost: 2010 Pres Worth (P/F, INTR,n)
2010	0	**14.74**			$ -	$ -	$ -				14.74	14.74	$ 1,696,607	$ -	$ -	$ -
2011	1	15.09			$ -	$ -	$ -				15.09	15.09	$ 1,696,607	$ -	$ -	$ -
2012	2	15.44			$ -	$ -	$ -				15.44	15.44	$ 1,696,607	$ -	$ -	$ -
2013	3	15.80			$ -	$ -	$ -				15.80	15.80	$ 1,696,607	$ -	$ -	$ -
2014	4	16.15			$ -	$ -	$ -				16.15	16.15	$ 1,696,607	$ -	$ -	$ -
2015	5	**16.50**			$ -	$ -	$ -				16.50	16.50	$ 1,696,607	$ -	$ -	$ -
2016	6	18.12			$ -	$ -	$ -				18.12	18.12	$ 1,696,607	$ 18,346,508.00	$ 24,600,000.00	$ 17,342,000.00
2017	7	19.74			$ -	$ -	$ -				19.74	19.74	$ 1,696,607	$ 18,346,508.00	$ 25,800,000.00	$ 17,158,500.00
2018	8	21.36			$ -	$ -	$ -				21.36	21.36	$ 1,696,607	$ 18,346,508.00	$ 27,100,000.00	$ 17,002,900.00
2019	9	22.98			$ -	$ -	$ -				22.98	22.98	$ 1,696,607	$ 18,346,508.00	$ 28,500,000.00	$ 16,869,100.00
2020	10	24.60			$ 174,973,012.50	$ 285,000,000.00	$ 159,142,500.00				24.60	24.60	$ 1,696,607	$ 18,346,508.00	$ 29,900,000.00	$ 16,696,000.00
2021	11	26.21			$ 174,973,012.50	$ 299,300,000.00	$ 157,667,500.00				26.21	26.21	$ 1,696,607	$ 18,346,508.00	$ 31,400,000.00	$ 16,541,100.00
2022	12	27.83			$ 174,973,012.50	$ 314,200,000.00	$ 156,147,800.00				27.83	27.83	$ 1,696,607	$ 18,346,508.00	$ 32,900,000.00	$ 16,350,300.00
2023	13	29.45			$ 174,973,012.50	$ 329,900,000.00	$ 154,670,000.00				29.45	29.45	$ 1,696,607	$ 18,346,508.00	$ 34,600,000.00	$ 16,221,800.00
2024	14	31.07			$ 174,973,012.50	$ 346,400,000.00	$ 153,213,100.00				31.07	31.07	$ 1,696,607	$ 18,346,508.00	$ 36,300,000.00	$ 16,055,500.00
2025	15	**32.69**	21.74	10.95	$ -	$ -	$ -	$ 51,441,836.25	$ 80,100,000	$ 35,428,300	32.69	10.95	$ 1,696,607	$ -	$ -	$ -
2026	16	32.81	21.82	10.99	$ -	$ -	$ -	$ 51,441,836.25	$ 82,500,000	$ 34,424,400	32.81	10.99	$ 1,696,607	$ -	$ -	$ -
2027	17	32.93	21.90	11.03	$ -	$ -	$ -	$ 51,441,836.25	$ 85,000,000	$ 33,459,900	32.93	11.03	$ 1,696,607	$ -	$ -	$ -
2028	18	33.05	21.98	11.07	$ -	$ -	$ -	$ 51,441,836.25	$ 87,600,000	$ 32,531,500	33.05	11.07	$ 1,696,607	$ -	$ -	$ -
2029	19	33.17	22.06	11.11	$ -	$ -	$ -	$ 51,441,836.25	$ 90,200,000	$ 31,601,000	33.17	11.11	$ 1,696,607	$ -	$ -	$ -
2030	20	33.28	22.13	11.15	$ -	$ -	$ -	$ 51,441,836.25	$ 92,900,000	$ 30,704,700	33.28	11.15	$ 1,696,607	$ -	$ -	$ -
2031	21	33.40	22.21	11.19	$ -	$ -	$ -	$ 51,441,836.25	$ 95,700,000	$ 29,839,700	33.40	11.19	$ 1,696,607	$ -	$ -	$ -
2032	22	33.52	22.29	11.23	$ -	$ -	$ -	$ 51,441,836.25	$ 98,600,000	$ 29,003,700	33.52	11.23	$ 1,696,607	$ -	$ -	$ -
2033	23	33.64	22.37	11.27	$ -	$ -	$ -	$ 51,441,836.25	$ 101,500,000	$ 28,166,800	33.64	11.27	$ 1,696,607	$ -	$ -	$ -
2034	24	33.76	22.45	11.31	$ -	$ -	$ -	$ 51,441,836.25	$ 104,600,000	$ 27,384,000	33.76	11.31	$ 1,696,607	$ -	$ -	$ -
2035	25	33.88	22.53	11.35	$ -	$ -	$ -	$ 51,441,836.25	$ 107,700,000	$ 26,599,600	33.88	11.35	$ 1,696,607	$ -	$ -	$ -
2036	26	34.00	22.61	11.39	$ -	$ -	$ -	$ 51,441,836.25	$ 110,900,000	$ 25,839,500	34.00	11.39	$ 1,696,607	$ -	$ -	$ -
2037	27	34.12	22.69	11.43	$ -	$ -	$ -	$ 51,441,836.25	$ 114,300,000	$ 25,124,300	34.12	11.43	$ 1,696,607	$ -	$ -	$ -
2038	28	34.24	22.77	11.47	$ -	$ -	$ -	$ 51,441,836.25	$ 117,700,000	$ 24,407,200	34.24	11.47	$ 1,696,607	$ -	$ -	$ -
2039	29	34.35	22.85	11.51	$ -	$ -	$ -	$ 51,441,836.25	$ 121,200,000	$ 23,710,400	34.35	11.51	$ 1,696,607	$ -	$ -	$ -
2040	30	34.47	22.92	11.55	$ -	$ -	$ -	$ 51,441,836.25	$ 124,900,000	$ 23,051,100	34.47	11.55	$ 1,696,607	$ -	$ -	$ -
2041	31	34.59	23.00	11.59	$ -	$ -	$ -	$ 51,441,836.25	$ 128,600,000	$ 22,390,600	34.59	11.59	$ 1,696,607	$ -	$ -	$ -
2042	32	34.71	23.08	11.63	$ -	$ -	$ -	$ 51,441,836.25	$ 132,500,000	$ 21,763,800	34.71	11.63	$ 1,696,607	$ -	$ -	$ -
2043	33	34.83	23.16	11.67	$ -	$ -	$ -	$ 51,441,836.25	$ 136,400,000	$ 21,136,200	34.83	11.67	$ 1,696,607	$ -	$ -	$ -
2044	34	34.95	23.24	11.71	$ -	$ -	$ -	$ 51,441,836.25	$ 140,500,000	$ 20,539,200	34.95	11.71	$ 1,696,607	$ -	$ -	$ -
2045	35	35.07	23.32	11.75	$ -	$ -	$ -	$ 51,441,836.25	$ 144,800,000	$ 19,969,600	35.07	11.75	$ 1,696,607	$ -	$ -	$ -
2046	36	35.19	23.40	11.79	$ -	$ -	$ -	$ 51,441,836.25	$ 149,100,000	$ 19,398,700	35.19	11.79	$ 1,696,607	$ -	$ -	$ -
2047	37	35.30	23.48	11.83	$ -	$ -	$ -	$ 51,441,836.25	$ 153,600,000	$ 18,853,000	35.30	11.83	$ 1,696,607	$ -	$ -	$ -
2048	38	35.42	23.56	11.87	$ -	$ -	$ -	$ 51,441,836.25	$ 158,200,000	$ 18,318,500	35.42	11.87	$ 1,696,607	$ -	$ -	$ -
2049	39	35.54	23.64	11.91	$ -	$ -	$ -	$ 51,441,836.25	$ 162,900,000	$ 17,795,000	35.54	11.91	$ 1,696,607	$ -	$ -	$ -
2050	40	35.66	23.71	11.95	$ -	$ -	$ -	$ 51,441,836.25	$ 167,800,000	$ 17,292,700	35.66	11.95	$ 1,696,607	$ -	$ -	$ -
2051	41	35.78	23.79	11.99	$ -	$ -	$ -	$ 51,441,836.25	$ 172,800,000	$ 16,800,000	35.78	11.99	$ 1,696,607	$ -	$ -	$ -
2052	42	35.90	23.87	12.03	$ -	$ -	$ -	$ 51,441,836.25	$ 178,000,000	$ 16,326,000	35.90	12.03	$ 1,696,607	$ -	$ -	$ -
2053	43	36.02	23.95	12.07	$ -	$ -	$ -	$ 51,441,836.25	$ 183,400,000	$ 15,869,100	36.02	12.07	$ 1,696,607	$ -	$ -	$ -
2054	44	36.14	24.03	12.11	$ -	$ -	$ -	$ 51,441,836.25	$ 188,900,000	$ 15,419,800	36.14	12.11	$ 1,696,607	$ -	$ -	$ -
2055	45	36.26	24.11	12.15	$ -	$ -	$ -	$ 51,441,836.25	$ 194,500,000	$ 14,978,300	36.26	12.15	$ 1,696,607	$ -	$ -	$ -
2056	46	36.37	24.19	12.19	$ -	$ -	$ -	$ 51,441,836.25	$ 200,400,000	$ 14,559,100	36.37	12.19	$ 1,696,607	$ -	$ -	$ -
2057	47	36.49	24.27	12.23	$ -	$ -	$ -	$ 51,441,836.25	$ 206,400,000	$ 14,146,200	36.49	12.23	$ 1,696,607	$ -	$ -	$ -
2058	48	36.61	24.35	12.27	$ -	$ -	$ -	$ 51,441,836.25	$ 212,600,000	$ 13,746,400	36.61	12.27	$ 1,696,607	$ -	$ -	$ -
2059	49	36.73	24.43	12.30	$ -	$ -	$ -	$ 51,441,836.25	$ 218,900,000	$ 13,352,600	36.73	12.30	$ 1,696,607	$ -	$ -	$ -
2060	50	**36.85**	24.51	12.34	$ -	$ -	$ -	$ 51,441,836.25	$ 225,500,000	$ 12,976,500	36.85	12.34	$ 1,696,607			$ -

OCSD O&M Treatment Cost			OCSD O&M Maint. Cost			Capital + O&M	2010	2010	Revenue from Reclaimed Water			2010	2010
						Not Including Resale Value of Potable Water			Present Worth Including Revenue from Sale of Potable Water				
2010 Dollars	Inflated Cost (F/P, IR1,n)	2010 Pres Worth (P/F, INTR,n)	2010 Dollars	Inflated Cost (F/P, IR2,n)	2010 Pres Worth (P/F, INTR,n)	Costs Per Year	Present Worth (P/F, INTR, n)	Cumulative Present Worth	2010 Dollars	Inflated Revenue (F/P,IR1,n)	2010 Pres Worth (P/F,INTR,n)	Capital + OM Present Worth	Cumulative Present Worth
$ 7,914,842	$7,914,800	$7,914,800	$ 140,290	$ 140,300	$ 140,300	$ 9,751,707	$9,800,000	$9,800,000	$ -	$ -	$ -	$9,752,000	$9,752,000
$ 8,103,853	$8,914,200	$8,409,600	$ 140,290	$ 148,700	$ 140,300	$ 10,759,507	$10,200,000	$20,000,000	$ -	$ -	$ -	$10,247,000	$19,999,000
$ 8,292,864	$10,034,400	$8,930,600	$ 140,290	$ 157,600	$ 140,300	$ 11,888,607	$10,600,000	$30,600,000	$ -	$ -	$ -	$10,768,000	$30,767,000
$ 8,481,875	$11,289,400	$9,478,800	$ 140,290	$ 167,100	$ 140,300	$ 13,153,107	$11,000,000	$41,600,000	$ -	$ -	$ -	$11,316,000	$42,083,000
$ 8,670,887	$11,796,600	$9,344,000	$ 140,290	$ 177,100	$ 140,300	$ 13,670,307	$10,800,000	$52,400,000	$ -	$ -	$ -	$11,181,000	$53,264,000
$ 8,859,898	$12,426,500	$9,285,800	$ 140,290	$ 187,700	$ 140,300	$ 14,310,807	$10,700,000	$63,100,000	$ -	$ -	$ -	$11,123,000	$64,387,000
$ 9,729,242	$13,339,000	$9,403,500	$ 140,290	$ 199,000	$ 140,300	$ 39,834,607	$28,100,000	$91,200,000	$ -	$ -	$ -	$28,582,000	$92,969,000
$ 10,598,586	$15,315,500	$10,185,700	$ 140,290	$ 210,900	$ 140,300	$ 43,023,007	$28,600,000	$119,800,000	$ -	$ -	$ -	$29,181,000	$122,150,000
$ 11,467,929	$17,466,700	$10,958,800	$ 140,290	$ 223,600	$ 140,300	$ 46,486,907	$29,200,000	$149,000,000	$ -	$ -	$ -	$29,799,000	$151,949,000
$ 12,337,273	$19,805,400	$11,722,800	$ 140,290	$ 237,000	$ 140,300	$ 50,239,007	$29,700,000	$178,700,000	$ -	$ -	$ -	$30,429,000	$182,378,000
$ 13,206,617	$22,345,900	$12,477,800	$ 140,290	$ 251,200	$ 140,300	$ 339,193,707	$189,400,000	$368,100,000	$ -	$ -	$ -	$190,153,000	$372,531,000
$ 14,075,961	$23,816,800	$12,546,400	$ 140,290	$ 266,300	$ 140,300	$ 356,479,707	$187,800,000	$555,900,000	$ -	$ -	$ -	$188,592,000	$561,123,000
$ 14,945,305	$25,287,800	$12,567,300	$ 140,290	$ 282,300	$ 140,300	$ 374,366,707	$186,000,000	$741,900,000	$ -	$ -	$ -	$186,902,000	$748,025,000
$ 15,814,649	$26,758,700	$12,545,500	$ 140,290	$ 299,200	$ 140,300	$ 393,254,507	$184,400,000	$926,300,000	$ -	$ -	$ -	$185,274,000	$933,299,000
$ 16,683,993	$28,229,700	$12,486,000	$ 140,290	$ 317,200	$ 140,300	$ 412,943,507	$182,600,000	$1,108,900,000	$ -	$ -	$ -	$183,592,000	$1,116,891,000
$ 5,880,368	$9,949,700	$4,151,700	$ 140,290	$ 336,200	$ 140,300	$ (24,017,493)	($10,000,000)	$1,098,900,000	$ 7,013,462	$ 29,300,000	$ 12,225,900	-$39,528,000	$1,077,363,000
$ 5,901,748	$9,985,900	$3,930,900	$ 140,290	$ 356,400	$ 140,300	$ 94,538,907	$37,200,000	$1,136,100,000	$ 7,038,962	$ 32,300,000	$ 12,714,800	$27,477,000	$1,104,840,000
$ 5,923,129	$10,022,100	$3,721,900	$ 140,290	$ 377,800	$ 140,300	$ 97,096,507	$36,100,000	$1,172,200,000	$ 7,064,462	$ 35,700,000	$ 13,257,700	$25,761,000	$1,130,601,000
$ 5,944,509	$10,058,200	$3,523,800	$ 140,290	$ 400,400	$ 140,300	$ 99,755,207	$34,900,000	$1,207,100,000	$ 7,089,962	$ 39,400,000	$ 13,803,500	$24,089,000	$1,154,690,000
$ 5,965,889	$10,094,400	$3,336,300	$ 140,290	$ 424,500	$ 140,300	$ 102,415,507	$33,800,000	$1,240,900,000	$ 7,115,463	$ 43,500,000	$ 14,377,300	$22,397,000	$1,177,087,000
$ 5,987,270	$10,130,600	$3,158,800	$ 140,290	$ 449,900	$ 140,300	$ 105,177,107	$32,800,000	$1,273,700,000	$ 7,140,963	$ 48,000,000	$ 14,966,600	$20,734,000	$1,197,821,000
$ 6,008,650	$10,166,800	$2,990,600	$ 140,290	$ 476,900	$ 140,300	$ 108,040,307	$31,800,000	$1,305,500,000	$ 7,166,463	$ 53,000,000	$ 15,590,200	$19,077,000	$1,216,898,000
$ 6,030,030	$10,202,900	$2,831,400	$ 140,290	$ 505,500	$ 140,300	$ 111,005,007	$30,800,000	$1,336,300,000	$ 7,191,963	$ 58,500,000	$ 16,234,000	$17,438,000	$1,234,336,000
$ 6,051,411	$10,239,100	$2,680,600	$ 140,290	$ 535,900	$ 140,300	$ 113,971,607	$29,800,000	$1,366,100,000	$ 7,217,463	$ 64,600,000	$ 16,912,100	$15,772,000	$1,250,108,000
$ 6,072,791	$10,275,300	$2,537,800	$ 140,290	$ 568,000	$ 140,300	$ 117,139,907	$28,900,000	$1,395,000,000	$ 7,242,963	$ 71,300,000	$ 17,609,600	$14,149,000	$1,264,257,000
$ 6,094,171	$10,311,500	$2,402,600	$ 140,290	$ 602,100	$ 140,300	$ 120,310,207	$28,000,000	$1,423,000,000	$ 7,268,464	$ 78,800,000	$ 18,360,300	$12,479,000	$1,276,736,000
$ 6,115,552	$10,347,700	$2,274,500	$ 140,290	$ 638,200	$ 140,300	$ 123,582,507	$27,200,000	$1,450,200,000	$ 7,293,964	$ 86,900,000	$ 19,101,500	$10,849,000	$1,287,585,000
$ 6,136,932	$10,383,800	$2,153,300	$ 140,290	$ 676,500	$ 140,300	$ 127,056,907	$26,300,000	$1,476,500,000	$ 7,319,464	$ 96,000,000	$ 19,907,300	$9,207,000	$1,296,792,000
$ 6,158,312	$10,420,000	$2,038,500	$ 140,290	$ 717,100	$ 140,300	$ 130,533,707	$25,500,000	$1,502,000,000	$ 7,344,964	$ 105,900,000	$ 20,717,200	$7,565,000	$1,304,357,000
$ 6,179,693	$10,456,200	$1,929,800	$ 140,290	$ 760,100	$ 140,300	$ 134,112,907	$24,800,000	$1,526,800,000	$ 7,370,464	$ 116,900,000	$ 21,574,700	$5,902,000	$1,310,259,000
$ 6,201,073	$10,492,400	$1,826,800	$ 140,290	$ 805,800	$ 140,300	$ 137,894,807	$24,000,000	$1,550,800,000	$ 7,395,964	$ 129,100,000	$ 22,477,600	$4,237,000	$1,314,496,000
$ 6,222,453	$10,528,500	$1,729,400	$ 140,290	$ 854,100	$ 140,300	$ 141,679,207	$23,300,000	$1,574,100,000	$ 7,421,464	$ 142,500,000	$ 23,406,300	$2,551,000	$1,317,047,000
$ 6,243,834	$10,564,700	$1,637,100	$ 140,290	$ 905,300	$ 140,300	$ 145,666,607	$22,600,000	$1,596,700,000	$ 7,446,965	$ 157,200,000	$ 24,359,300	$879,000	$1,317,926,000
$ 6,265,214	$10,600,900	$1,549,700	$ 140,290	$ 959,700	$ 140,300	$ 149,657,207	$21,900,000	$1,618,600,000	$ 7,472,465	$ 173,500,000	$ 25,363,300	-$840,000	$1,317,086,000
$ 6,286,595	$10,637,100	$1,467,000	$ 140,290	$ 1,017,200	$ 140,300	$ 153,850,907	$21,200,000	$1,639,800,000	$ 7,497,965	$ 191,600,000	$ 26,423,800	-$2,581,000	$1,314,505,000
$ 6,307,975	$10,673,200	$1,388,600	$ 140,290	$ 1,078,300	$ 140,300	$ 158,248,107	$20,600,000	$1,660,400,000	$ 7,523,465	$ 211,400,000	$ 27,504,200	-$4,309,000	$1,310,196,000
$ 6,329,355	$10,709,400	$1,314,500	$ 140,290	$ 1,143,000	$ 140,300	$ 162,649,007	$20,000,000	$1,680,400,000	$ 7,548,965	$ 233,400,000	$ 28,647,700	-$6,098,000	$1,304,098,000
$ 6,350,736	$10,745,600	$1,244,300	$ 140,290	$ 1,211,600	$ 140,300	$ 167,253,807	$19,400,000	$1,699,800,000	$ 7,574,465	$ 257,600,000	$ 29,828,300	-$7,894,000	$1,296,204,000
$ 6,372,116	$10,781,800	$1,177,800	$ 140,290	$ 1,284,300	$ 140,300	$ 171,962,707	$18,800,000	$1,718,600,000	$ 7,599,966	$ 284,300,000	$ 31,056,600	-$9,723,000	$1,286,481,000
$ 6,393,496	$10,817,900	$1,114,800	$ 140,290	$ 1,361,300	$ 140,300	$ 176,775,807	$18,200,000	$1,736,800,000	$ 7,625,466	$ 313,700,000	$ 32,328,500	-$11,582,000	$1,274,899,000
$ 6,414,877	$10,854,100	$1,055,300	$ 140,290	$ 1,443,000	$ 140,300	$ 181,793,707	$17,700,000	$1,754,500,000	$ 7,650,966	$ 346,300,000	$ 33,668,000	-$13,483,000	$1,261,416,000
$ 6,436,257	$10,890,300	$998,800	$ 140,290	$ 1,529,600	$ 140,300	$ 186,916,507	$17,100,000	$1,771,600,000	$ 7,676,466	$ 382,200,000	$ 35,055,000	-$15,419,000	$1,245,997,000
$ 6,457,637	$10,926,500	$945,400	$ 140,290	$ 1,621,300	$ 140,300	$ 192,244,407	$16,600,000	$1,788,200,000	$ 7,701,966	$ 421,800,000	$ 36,497,300	-$17,389,000	$1,228,608,000
$ 6,479,018	$10,962,600	$894,900	$ 140,290	$ 1,718,600	$ 140,300	$ 197,777,807	$16,100,000	$1,804,300,000	$ 7,727,466	$ 465,500,000	$ 37,998,600	-$19,398,000	$1,209,210,000
$ 6,500,398	$10,998,800	$847,000	$ 140,290	$ 1,821,700	$ 140,300	$ 203,417,107	$15,700,000	$1,820,000,000	$ 7,752,967	$ 513,700,000	$ 39,559,600	-$21,456,000	$1,187,754,000
$ 6,521,778	$11,035,000	$801,700	$ 140,290	$ 1,931,000	$ 140,300	$ 209,162,607	$15,200,000	$1,835,200,000	$ 7,778,467	$ 567,000,000	$ 41,192,600	-$23,576,000	$1,164,178,000
$ 6,543,159	$11,071,200	$758,800	$ 140,290	$ 2,046,900	$ 140,300	$ 215,214,707	$14,800,000	$1,850,000,000	$ 7,803,967	$ 625,700,000	$ 42,884,100	-$25,729,000	$1,138,449,000
$ 6,564,539	$11,107,300	$718,200	$ 140,290	$ 2,169,700	$ 140,300	$ 221,373,607	$14,300,000	$1,864,300,000	$ 7,829,467	$ 690,500,000	$ 44,646,600	-$27,945,000	$1,110,504,000
$ 6,585,919	$11,143,500	$679,700	$ 140,290	$ 2,299,900	$ 140,300	$ 227,740,007	$13,900,000	$1,878,200,000	$ 7,854,967	$ 762,100,000	$ 46,486,900	-$30,224,000	$1,080,280,000
$ 6,607,300	$11,179,700	$643,300	$ 140,290	$ 2,437,900	$ 140,300	$ 234,214,207	$13,500,000	$1,891,700,000	$ 7,880,467	$ 841,000,000	$ 48,395,900	-$32,563,000	$1,047,717,000
$ 6,628,680	$11,215,900	$608,900	$ 140,290	$ 2,584,200	$ 140,300	$ 240,996,707	$13,100,000	$1,904,800,000	$ 7,905,967	$ 928,100,000	$ 50,385,000	-$34,963,000	$1,012,754,000

$1,314,496,000

esalter brine flow (Ph 1 report, Table 6-4)

	Cum Flow	Δflow
2010	10.55	10.55
2014	10.55	0
2015	10.87	0.32
2025	15.87	5
2030	15.87	0

Assumed Cost Components

Decentralized Plant OCSD Plant

Decentralized Plant Analysis

Treatment Plant flows in bold taken from Phase I report. Others calculated assuming constant increase
This analysis does not include cost for new infrastructure for distribution of new potable water generated

OCSD Rates *(i)*		**Treatment**	
Rate Description		Treatment	OCSD Rate
O&M Inflation Rate 1 (IR1):		102 mg/L BOD	$274 /1000 lbs
Rate up to 2013 ($IR1_{2013}$)	10%	312 mg/L TSS	$407 /1000 lbs
Rate at 2014($IR1_{2014}$)	8%	Flow	$179 /MG
Rate at 2015($IR1_{2015}$)	7%		
Rate up to 2020($IR1_{2020}$)	5.4%		
Costs unchanged after 2020	0%	Treatment Capacity	$11,332,000
O&M Inflation Rate 2 (IR2):	6%		
Capital Inflation Rate (CIR):	**5.0%**		
Treatment Plant CIR (TCIR):	5.0%		
Interest Rate (INTR):	6%		
Treatment Plant O&M Inflation (TIR)	**3%**		

Revenue Rates		
Potable Water	$645 /AF	EMWD Feb 2010 new rate to residential customers (Indoor Tier 1)

Calendar Year	2010 n	Decen (Brine Min) Treatment Plant Capacity (mgd)	Water Produced (mgd)	Brine Flow (mgd)	Decen (Brine Min) Treatment Plant Capital Cost: 2010 Dollars	Inflated Cost (F/P, TCIR,n)	2010 Pres Worth (P/F, INTR,n)	Decen (Brine Min) Treatment Plant O&M Costs: 2010 Dollars	Inflated Cost (F/P, TIR,n)	2010 Pres Worth (P/F, INTR,n)	OCSD Treatment Flow (No ZLD) (mgd)	OCSD Treatment Flow (after ZLD) (mgd)	OCSD CIP Sinking Fund	OCSD Treatment Capacity Cost: 2010 Dollars	Inflated Cost (F/P, CIR,n)	2010 Pres Worth (P/F, INTR,n)
2010	0					$ -	$ -				14.74	14.74	$ 1,696,607	$ -	$ -	$ -
2011	1				$ -	$ -	$ -				15.09	15.09	$ 1,696,607	$ -	$ -	$ -
2012	2				$ -	$ -	$ -				15.44	15.44	$ 1,696,607	$ -	$ -	$ -
2013	3				$ -	$ -	$ -				15.80	15.80	$ 1,696,607	$ -	$ -	$ -
2014	4				$ -	$ -	$ -				16.15	16.15	$ 1,696,607	$ -	$ -	$ -
2015	5	**0.00**	0.00	0.00	$ 19,800,602	$ 25,300,000.00	$ 18,905,600.00	$ -	$ -	$ -	16.50	16.50	$ 1,696,607	$ -	$ -	$ -
2016	6	1.59	1.06	0.53	$ 19,800,602	$ 26,500,000.00	$ 18,681,500.00	$ 2,215,422.60	$ 3,600,000	$ 1,502,200	18.12	17.06	$ 1,696,607	$ 6,387,225.14	$ 8,600,000	$ 6,062,700.00
2017	7	3.17	2.11	1.06	$ 19,800,602	$ 27,900,000.00	$ 18,555,100.00	$ 4,430,845.20	$ 7,300,000	$ 2,873,600	19.74	17.63	$ 1,696,607	$ 6,387,225.14	$ 9,000,000	$ 5,985,500.00
2018	8	4.76	3.17	1.59	$ 19,800,602	$ 29,300,000.00	$ 18,383,200.00	$ 6,646,267.80	$ 11,300,000	$ 4,196,400	21.36	18.19	$ 1,696,607	$ 6,387,225.14	$ 9,400,000	$ 5,897,700.00
2019	9	6.35	4.22	2.13	$ 19,800,602	$ 30,700,000.00	$ 18,171,300.00	$ 8,861,690.40	$ 15,500,000	$ 5,430,300	22.98	18.75	$ 1,696,607	$ 6,387,225.14	$ 9,900,000	$ 5,859,800.00
2020	10	7.94	5.28	2.66	$ 19,800,602	$ 32,300,000.00	$ 18,036,200.00	$ 11,077,113.00	$ 20,000,000	$ 6,610,300	24.60	19.32	$ 1,696,607	$ 6,387,225.14	$ 10,400,000	$ 5,807,300.00
2021	11	9.52	6.33	3.19	$ 19,800,602	$ 33,900,000.00	$ 17,858,100.00	$ 13,292,535.60	$ 24,700,000	$ 7,701,600	26.21	19.88	$ 1,696,607	$ 6,387,225.14	$ 10,900,000	$ 5,742,000.00
2022	12	11.11	7.39	3.72	$ 19,800,602	$ 35,600,000.00	$ 17,692,100.00	$ 15,507,958.20	$ 29,700,000	$ 8,736,400	27.83	20.45	$ 1,696,607	$ 6,387,225.14	$ 11,500,000	$ 5,715,100.00
2023	13	12.70	8.44	4.25	$ 19,800,602	$ 37,300,000.00	$ 17,487,700.00	$ 17,723,380.80	$ 35,000,000	$ 9,712,700	29.45	21.01	$ 1,696,607	$ 6,387,225.14	$ 12,000,000	$ 5,626,100.00
2024	14	14.28	9.50	4.78	$ 19,800,602	$ 39,200,000.00	$ 17,338,200.00	$ 19,938,803.39	$ 40,500,000	$ 10,602,800	31.07	21.57	$ 1,696,607	$ 6,387,225.14	$ 12,600,000	$ 5,573,000.00
2025	15	**15.87**	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 46,400,000	$ 11,459,800	32.69	22.14	$ 1,696,607	$ 6,387,225.14	$ 13,300,000	$ 5,549,600.00
2026	16	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 35,600,000	$ 14,854,600	32.81	22.26	$ 1,696,607	$ 1,346,889.14	$ 2,900,000	$ 1,141,600.00
2027	17	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 36,600,000	$ 14,407,500	32.93	22.37	$ 1,696,607	$ 1,346,889.14	$ 3,100,000	$ 1,151,200.00
2028	18	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 37,700,000	$ 14,000,400	33.05	22.49	$ 1,696,607	$ 1,346,889.14	$ 3,200,000	$ 1,121,100.00
2029	19	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 38,800,000	$ 13,593,300	33.17	22.61	$ 1,696,607	$ 1,346,889.14	$ 3,400,000	$ 1,123,700.00
2030	20	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 40,000,000	$ 13,220,500	33.28	22.73	$ 1,696,607	$ 1,346,889.14	$ 3,600,000	$ 1,122,500.00
2031	21	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 41,200,000	$ 12,846,400	33.40	22.85	$ 1,696,607	$ 1,346,889.14	$ 3,800,000	$ 1,117,800.00
2032	22	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 42,400,000	$ 12,472,200	33.52	22.97	$ 1,696,607	$ 1,346,889.14	$ 3,900,000	$ 1,082,300.00
2033	23	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 43,700,000	$ 12,127,000	33.64	23.09	$ 1,696,607	$ 1,346,889.14	$ 4,100,000	$ 1,073,400.00
2034	24	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 45,000,000	$ 11,780,900	33.76	23.21	$ 1,696,607	$ 1,346,889.14	$ 4,300,000	$ 1,062,000.00
2035	25	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 46,400,000	$ 11,459,800	33.88	23.33	$ 1,696,607	$ 1,346,889.14	$ 4,600,000	$ 1,071,800.00
2036	26	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 47,800,000	$ 11,137,300	34.00	23.44	$ 1,696,607	$ 1,346,889.14	$ 4,800,000	$ 1,055,100.00
2037	27	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 49,200,000	$ 10,814,700	34.12	23.56	$ 1,696,607	$ 1,346,889.14	$ 5,000,000	$ 1,036,800.00
2038	28	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 50,700,000	$ 10,513,600	34.24	23.68	$ 1,696,607	$ 1,346,889.14	$ 5,300,000	$ 1,036,800.00
2039	29	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 52,200,000	$ 10,211,900	34.35	23.80	$ 1,696,607	$ 1,346,889.14	$ 5,500,000	$ 1,015,100.00
2040	30	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 53,800,000	$ 9,929,200	34.47	23.92	$ 1,696,607	$ 1,346,889.14	$ 5,800,000	$ 1,009,800.00
2041	31	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 55,400,000	$ 9,645,700	34.59	24.04	$ 1,696,607	$ 1,346,889.14	$ 6,100,000	$ 1,002,000.00
2042	32	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 57,000,000	$ 9,362,500	34.71	24.16	$ 1,696,607	$ 1,346,889.14	$ 6,400,000	$ 991,700.00
2043	33	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 58,800,000	$ 9,111,500	34.83	24.28	$ 1,696,607	$ 1,346,889.14	$ 6,700,000	$ 979,400.00
2044	34	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 60,500,000	$ 8,844,300	34.95	24.39	$ 1,696,607	$ 1,346,889.14	$ 7,100,000	$ 979,200.00
2045	35	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 62,300,000	$ 8,591,900	35.07	24.51	$ 1,696,607	$ 1,346,889.14	$ 7,400,000	$ 962,800.00
2046	36	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 64,200,000	$ 8,352,800	35.19	24.63	$ 1,696,607	$ 1,346,889.14	$ 7,800,000	$ 957,400.00
2047	37	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 66,100,000	$ 8,113,200	35.30	24.75	$ 1,696,607	$ 1,346,889.14	$ 8,200,000	$ 949,500.00
2048	38	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 68,100,000	$ 7,885,500	35.42	24.87	$ 1,696,607	$ 1,346,889.14	$ 8,600,000	$ 939,500.00
2049	39	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 70,200,000	$ 7,668,600	35.54	24.99	$ 1,696,607	$ 1,346,889.14	$ 9,000,000	$ 927,500.00
2050	40	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 72,300,000	$ 7,450,900	35.66	25.11	$ 1,696,607	$ 1,346,889.14	$ 9,500,000	$ 923,600.00
2051	41	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 74,400,000	$ 7,233,300	35.78	25.23	$ 1,696,607	$ 1,346,889.14	$ 10,000,000	$ 917,200.00
2052	42	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 76,700,000	$ 7,034,900	35.90	25.35	$ 1,696,607	$ 1,346,889.14	$ 10,500,000	$ 908,500.00
2053	43	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 79,000,000	$ 6,835,700	36.02	25.46	$ 1,696,607	$ 1,346,889.14	$ 11,000,000	$ 897,900.00
2054	44	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 81,300,000	$ 6,636,500	36.14	25.58	$ 1,696,607	$ 1,346,889.14	$ 11,500,000	$ 885,600.00
2055	45	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 83,800,000	$ 6,453,400	36.26	25.70	$ 1,696,607	$ 1,346,889.14	$ 12,100,000	$ 879,100.00
2056	46	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 86,300,000	$ 6,269,700	36.37	25.82	$ 1,696,607	$ 1,346,889.14	$ 12,700,000	$ 870,400.00
2057	47	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 88,900,000	$ 6,093,000	36.49	25.94	$ 1,696,607	$ 1,346,889.14	$ 13,300,000	$ 860,000.00
2058	48	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 91,500,000	$ 5,916,200	36.61	26.06	$ 1,696,607	$ 1,346,889.14	$ 14,000,000	$ 854,000.00
2059	49	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 94,300,000	$ 5,752,100	36.73	26.18	$ 1,696,607	$ 1,346,889.14	$ 14,700,000	$ 845,900.00
2060	50	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 97,100,000	$ 5,587,700	36.85	26.30	$ 1,696,607	$ 1,346,889.14	$ 15,400,000	$ 836,000.00

						Not Including Resale Value of Potable Water			Present Worth Including Revenue from Sale of Potable Water					For Decentralized ZLD + Ocean Discharge		
OCSD O&M Treatment Cost			OCSD O&M Maint. Cost			Capital + O&M	2010	2010	Revenue from Reclaimed Water			2010	2010	2010	2010
2010	Inflated Cost	2010 Pres Worth	2010	Inflated Cost	2010 Pres Worth	Costs	Present Worth	Cumulative	2010	Inflated Revenue	2010 Pres Worth	Capital + OM	Cumulative	Capital + OM	Cumulative
Dollars	(F/P, IR1,n)	(P/F, INTR,n)	Dollars	(F/P, IR2,n)	(P/F, INTR,n)	Per Year	(P/F, INTR, n)	Present Worth	Dollars	(F/P,IR1,n)	(P/F,INTR,n)	Present Worth	Present Worth	Present Worth	Present Worth
$ 7,914,842	$7,914,800	$7,914,800	$ 140,290	$ 140,300	$ 140,300	$ 9,751,707	$9,751,707	$9,751,707	$ -	$ -	$ -	9,751,700	9,751,700	0	0
$ 8,103,853	$8,914,200	$8,409,600	$ 140,290	$ 148,700	$ 140,300	$ 10,759,507	$10,200,000	$19,951,707	$ -	$ -	$ -	10,246,500	19,998,200	0	0
$ 8,292,864	$10,034,400	$8,930,600	$ 140,290	$ 157,600	$ 140,300	$ 11,888,607	$10,600,000	$30,551,707	$ -	$ -	$ -	10,767,500	30,765,700	0	0
$ 8,481,875	$11,289,400	$9,478,800	$ 140,290	$ 167,100	$ 140,300	$ 13,153,107	$11,000,000	$41,551,707	$ -	$ -	$ -	11,315,700	42,081,400	0	0
$ 8,670,887	$11,796,600	$9,344,000	$ 140,290	$ 177,100	$ 140,300	$ 13,670,307	$10,800,000	$52,351,707	$ -	$ -	$ -	11,180,900	53,262,300	0	0
$ 8,859,898	$12,426,500	$9,285,800	$ 140,290	$ 187,700	$ 140,300	$ 39,610,807	$29,600,000	$81,951,707	$ -	$ -	$ -	30,028,300	83,290,600	18,905,600	18,905,600
$ 9,162,555	$12,562,000	$8,855,700	$ 140,290	$ 199,000	$ 140,300	$ 53,157,607	$37,500,000	$119,451,707	$ 762,538	$ 1,400,000	$ 986,900	35,952,100	119,242,700	19,196,800	38,102,400
$ 9,465,211	$13,677,700	$9,096,500	$ 140,290	$ 210,900	$ 140,300	$ 59,785,207	$39,800,000	$159,251,707	$ 1,525,077	$ 3,000,000	$ 1,995,200	36,352,400	155,595,100	19,433,500	57,535,900
$ 9,767,868	$14,877,300	$9,334,200	$ 140,290	$ 223,600	$ 140,300	$ 66,797,507	$41,900,000	$201,151,707	$ 2,287,615	$ 4,900,000	$ 3,074,300	36,574,100	192,169,200	19,505,300	77,041,200
$ 10,070,525	$16,166,600	$9,569,000	$ 140,290	$ 237,000	$ 140,300	$ 74,200,207	$43,900,000	$245,051,707	$ 3,050,153	$ 7,200,000	$ 4,261,700	36,605,600	228,774,800	19,339,900	96,381,100
$ 10,373,182	$17,551,700	$9,800,800	$ 140,290	$ 251,200	$ 140,300	$ 82,199,507	$45,900,000	$290,951,707	$ 3,812,692	$ 9,900,000	$ 5,528,100	36,563,400	265,338,200	19,118,400	115,499,500
$ 10,675,839	$18,063,800	$9,515,800	$ 140,290	$ 266,300	$ 140,300	$ 89,526,707	$47,200,000	$338,151,707	$ 4,575,230	$ 13,100,000	$ 6,900,900	35,753,500	301,091,700	18,658,800	134,158,300
$ 10,978,495	$18,575,900	$9,231,700	$ 140,290	$ 282,300	$ 140,300	$ 97,354,807	$48,400,000	$386,551,707	$ 5,337,768	$ 16,800,000	$ 8,349,100	34,863,100	335,954,800	18,079,400	152,237,700
$ 11,281,152	$19,088,000	$8,949,200	$ 140,290	$ 299,200	$ 140,300	$ 105,383,807	$49,400,000	$435,951,707	$ 6,100,307	$ 21,100,000	$ 9,892,500	33,720,100	369,674,900	17,307,900	169,545,600
$ 11,583,809	$19,600,100	$8,669,100	$ 140,290	$ 317,200	$ 140,300	$ 113,913,907	$50,400,000	$486,351,707	$ 6,862,845	$ 26,100,000	$ 11,544,100	32,475,900	402,150,800	16,396,900	185,942,500
$ 11,886,466	$20,112,200	$8,392,100	$ 140,290	$ 336,200	$ 140,300	$ 81,845,007	$34,200,000	$520,551,707	$ 7,625,383	$ 31,900,000	$ 13,310,800	13,927,600	416,078,400	-1,851,000	184,091,500
$ 11,950,288	$20,220,200	$7,959,600	$ 140,290	$ 356,400	$ 140,300	$ 60,773,207	$23,900,000	$544,451,707	$ 7,625,383	$ 35,000,000	$ 13,777,600	12,015,100	428,093,500	1,077,000	185,168,500
$ 12,014,110	$20,328,100	$7,549,100	$ 140,290	$ 377,800	$ 140,300	$ 62,102,507	$23,100,000	$567,551,707	$ 7,625,383	$ 38,500,000	$ 14,297,500	10,647,200	438,740,700	110,000	185,278,500
$ 12,077,932	$20,436,100	$7,159,700	$ 140,290	$ 400,400	$ 140,300	$ 63,433,107	$22,200,000	$589,751,707	$ 7,625,383	$ 42,400,000	$ 14,854,600	9,263,500	448,004,200	-854,200	184,424,300
$ 12,141,753	$20,544,100	$6,790,100	$ 140,290	$ 424,500	$ 140,300	$ 64,865,207	$21,400,000	$611,151,707	$ 7,625,383	$ 46,600,000	$ 15,401,900	7,942,100	455,946,300	-1,808,600	182,615,700
$ 12,205,575	$20,652,100	$6,439,400	$ 140,290	$ 449,900	$ 140,300	$ 66,398,607	$20,700,000	$631,851,707	$ 7,625,383	$ 51,300,000	$ 15,995,600	6,623,700	462,570,000	-2,775,100	179,840,600
$ 12,269,397	$20,760,100	$6,106,700	$ 140,290	$ 476,900	$ 140,300	$ 67,933,607	$20,000,000	$651,851,707	$ 7,625,383	$ 56,400,000	$ 16,590,400	5,317,400	467,887,400	-3,744,000	176,096,600
$ 12,333,219	$20,868,100	$5,791,000	$ 140,290	$ 505,500	$ 140,300	$ 69,370,207	$19,300,000	$671,151,707	$ 7,625,383	$ 62,100,000	$ 17,233,100	3,949,300	471,836,700	-4,760,900	171,335,700
$ 12,397,041	$20,976,100	$5,491,500	$ 140,290	$ 535,900	$ 140,300	$ 71,008,607	$18,600,000	$689,751,707	$ 7,625,383	$ 68,300,000	$ 17,880,800	2,648,000	474,484,700	-5,753,800	165,581,900
$ 12,460,863	$21,084,100	$5,207,300	$ 140,290	$ 568,000	$ 140,300	$ 72,648,707	$17,900,000	$707,651,707	$ 7,625,383	$ 75,100,000	$ 18,548,100	1,339,000	475,823,700	-6,767,200	158,814,700
$ 12,524,685	$21,192,000	$4,937,700	$ 140,290	$ 602,100	$ 140,300	$ 74,490,707	$17,400,000	$725,051,707	$ 7,625,383	$ 82,600,000	$ 19,245,700	60,500	475,884,200	-7,785,900	151,028,800
$ 12,588,507	$21,300,000	$4,682,000	$ 140,290	$ 638,200	$ 140,300	$ 76,234,807	$16,800,000	$741,851,707	$ 7,625,383	$ 90,900,000	$ 19,980,700	-1,269,400	474,614,800	-8,843,400	142,185,400
$ 12,652,329	$21,408,000	$4,439,300	$ 140,290	$ 676,500	$ 140,300	$ 77,981,107	$16,200,000	$758,051,707	$ 7,625,383	$ 100,000,000	$ 20,736,800	-2,609,100	472,005,700	-9,922,100	132,263,300
$ 12,716,151	$21,516,000	$4,209,200	$ 140,290	$ 717,100	$ 140,300	$ 79,929,707	$15,600,000	$773,651,707	$ 7,625,383	$ 110,000,000	$ 21,519,300	-3,922,800	468,082,900	-11,005,700	121,257,600
$ 12,779,973	$21,624,000	$3,990,900	$ 140,290	$ 760,100	$ 140,300	$ 81,780,707	$15,100,000	$788,751,707	$ 7,625,383	$ 121,000,000	$ 22,331,400	-5,276,600	462,806,300	-12,119,500	109,138,100
$ 12,843,795	$21,732,000	$3,783,800	$ 140,290	$ 805,800	$ 140,300	$ 83,834,407	$14,600,000	$803,351,707	$ 7,625,383	$ 133,100,000	$ 23,174,100	-6,614,400	456,191,900	-13,244,900	95,893,200
$ 12,907,617	$21,840,000	$3,587,300	$ 140,290	$ 854,100	$ 140,300	$ 85,890,707	$14,100,000	$817,451,707	$ 7,625,383	$ 146,400,000	$ 24,046,900	-7,975,000	448,216,900	-14,401,200	81,492,000
$ 12,971,439	$21,948,000	$3,401,000	$ 140,290	$ 905,300	$ 140,300	$ 87,949,907	$13,600,000	$831,051,707	$ 7,625,383	$ 161,000,000	$ 24,948,100	-9,356,000	438,860,900	-15,585,600	65,906,400
$ 13,035,261	$22,056,000	$3,224,300	$ 140,290	$ 959,700	$ 140,300	$ 90,212,307	$13,200,000	$844,251,707	$ 7,625,383	$ 177,100,000	$ 25,889,600	-10,737,500	428,123,400	-16,778,100	49,128,300
$ 13,099,083	$22,163,900	$3,056,700	$ 140,290	$ 1,017,200	$ 140,300	$ 92,477,707	$12,800,000	$857,051,707	$ 7,625,383	$ 194,800,000	$ 26,865,200	-12,148,100	415,975,300	-18,020,900	31,107,400
$ 13,162,905	$22,271,900	$2,897,700	$ 140,290	$ 1,078,300	$ 140,300	$ 94,746,807	$12,300,000	$869,351,707	$ 7,625,383	$ 214,300,000	$ 27,881,500	-13,592,200	402,383,100	-19,289,600	11,817,800
$ 13,226,727	$22,379,900	$2,746,900	$ 140,290	$ 1,143,000	$ 140,300	$ 97,219,507	$11,900,000	$881,251,707	$ 7,625,383	$ 235,700,000	$ 28,930,000	-15,036,000	387,347,100	-20,577,200	-8,759,400
$ 13,290,549	$22,487,900	$2,603,900	$ 140,290	$ 1,211,600	$ 140,300	$ 99,696,107	$11,500,000	$892,751,707	$ 7,625,383	$ 259,300,000	$ 30,025,200	-16,521,700	370,825,400	-21,912,000	-30,671,400
$ 13,354,370	$22,595,900	$2,468,400	$ 140,290	$ 1,284,300	$ 140,300	$ 102,276,807	$11,200,000	$903,951,707	$ 7,625,383	$ 285,200,000	$ 31,154,900	-18,024,600	352,800,800	-23,269,400	-53,940,800
$ 13,418,192	$22,703,900	$2,339,800	$ 140,290	$ 1,361,300	$ 140,300	$ 104,961,807	$10,800,000	$914,751,707	$ 7,625,383	$ 313,700,000	$ 32,328,500	-19,555,700	333,245,100	-24,659,900	-78,600,700
$ 13,482,014	$22,811,900	$2,217,800	$ 140,290	$ 1,443,000	$ 140,300	$ 107,751,507	$10,500,000	$925,251,707	$ 7,625,383	$ 345,100,000	$ 33,551,400	-21,122,200	312,122,900	-26,100,500	-104,701,200
$ 13,545,836	$22,919,900	$2,102,200	$ 140,290	$ 1,529,600	$ 140,300	$ 110,546,107	$10,100,000	$935,351,707	$ 7,625,383	$ 379,600,000	$ 34,816,500	-22,726,900	289,396,000	-27,583,200	-132,284,400
$ 13,609,658	$23,027,800	$1,992,500	$ 140,290	$ 1,621,300	$ 140,300	$ 113,545,707	$9,800,000	$945,151,707	$ 7,625,383	$ 417,600,000	$ 36,133,800	-24,361,000	265,035,000	-29,098,900	-161,383,300
$ 13,673,480	$23,135,800	$1,888,600	$ 140,290	$ 1,718,600	$ 140,300	$ 116,551,007	$9,500,000	$954,651,707	$ 7,625,383	$ 459,400,000	$ 37,500,600	-26,041,500	238,993,500	-30,664,900	-192,048,200
$ 13,737,302	$23,243,800	$1,790,000	$ 140,290	$ 1,821,700	$ 140,300	$ 119,562,107	$9,200,000	$963,851,707	$ 7,625,383	$ 505,300,000	$ 38,912,700	-27,763,700	211,229,800	-32,276,200	-224,324,400
$ 13,801,124	$23,351,800	$1,696,500	$ 140,290	$ 1,931,000	$ 140,300	$ 122,879,407	$8,900,000	$972,751,707	$ 7,625,383	$ 555,800,000	$ 40,378,900	-29,513,000	181,716,800	-33,925,500	-258,249,900
$ 13,864,946	$23,459,800	$1,607,900	$ 140,290	$ 2,046,900	$ 140,300	$ 126,203,307	$8,600,000	$981,351,707	$ 7,625,383	$ 611,400,000	$ 41,904,000	-31,319,100	150,397,700	-35,634,300	-293,884,200
$ 13,928,768	$23,567,800	$1,523,900	$ 140,290	$ 2,169,700	$ 140,300	$ 129,634,107	$8,400,000	$989,751,707	$ 7,625,383	$ 672,500,000	$ 43,482,700	-33,168,900	117,228,800	-37,389,700	-331,273,900
$ 13,992,590	$23,675,800	$1,444,200	$ 140,290	$ 2,299,900	$ 140,300	$ 133,172,307	$8,100,000	$997,851,707	$ 7,625,383	$ 739,800,000	$ 45,126,600	-35,075,300	82,153,500	-39,210,400	-370,484,300
$ 14,056,412	$23,783,800	$1,368,700	$ 140,290	$ 2,437,900	$ 140,300	$ 136,918,307	$7,900,000	$1,005,751,707	$ 7,625,383	$ 813,800,000	$ 46,830,700	-37,027,100	45,126,400	-41,078,600	-411,562,900
$ 14,120,234	$23,891,800	$1,297,000	$ 140,290	$ 2,584,200	$ 140,300	$ 140,672,607	$7,600,000	$1,013,351,707	$ 7,625,383	$ 895,200,000	$ 48,598,900	-39,041,300	6,085,100	-43,011,200	-454,574,100

Ocean Discharge Without ZLD

Pipeline Analysis

OCSD Rates *(i)*		Treatment	
Rate Description		Treatment	OCSD Rate
O&M Inflation Rate 1 (IR1):		102 mg/L BOD	$274 /1000 lbs
Rate up to 2013 ($IR1_{2013}$)	10%	312 mg/L TSS	$407 /1000 lbs
Rate at 2014($IR1_{2014}$)	8%	SARI Flow	$179 /MG
Rate at 2015($IR1_{2015}$)	7%	Treatment Capac	$11,332,000
Rate up to 2020($IR1_{2020}$)	5.4%		
Costs unchanged after 2020	0%		
O&M Inflation Rate 2 (IR2):	**3%**		
Capital Inflation Rate (CIR):	10.0%		
Interest Rate (INTR):	6%		

One-time OCSD Treatment capacity sell back in 2023		27.83	MGD
(Ocean Discharge)	$	315,403,556	2010 Dollars
fix sellback	$	694,100,000	Inflation at 2023
	$	344,946,400	2010 Present Worth
One-time OCSD Treatment capacity sell back in 2025		32.69	MGD
(Salton Sea Discharge)	$	370,443,080	2010 Dollars
fix sellback	$	815,272,540	Inflation at 2025
	$	360,595,800	2010 Present Worth

One-time sellback	Ocean Discharge	Salton Sea Discharge
2010	$ 315,403,556	$ 370,443,080
2013	$ 461,782,346	$ 542,365,713
2014	$ 498,724,934	$ 585,754,971
2015	$ 533,635,679	$ 626,757,818
2020	$ 694,141,346	$ 815,272,540
2025	$ 694,141,346	$ 815,272,540

DISCHARGE TO OCSD OUTFALL 2

Calendar Year	2010 n	Cost of Pipeline 2010 Dollars	Cost of Pipeline Inflated Cost (F/P, CIR,n)	2010 Present Worth (P/F,INTR,n)	Pipeline O& M Costs 2010 Dollars	Pipeline O& M Costs Inflated Cost (F/P, IR2,n)	2010 Present Worth (P/F,INTR,n)	2010 Present Worth (P/F, INTR, n)	2010 Cumulative Present Worth
2010	0	$ -	$ -	$ -	$ -	$0	$0	$ 9,752,000	$9,752,000
2011	1	$ -	$ -	$ -	$ -	$0	$0	$ 10,200,000	$19,952,000
2012	2	$ -	$ -	$ -	$ -	$0	$0	$ 10,800,000	$30,752,000
2013	3	$ -	$ -	$ -	$ -	$0	$0	$ 11,300,000	$42,052,000
2014	4	$ -	$ -	$ -	$ -	$0	$0	$ 11,200,000	$53,252,000
2015	5	$ -	$ -	$ -	$ -	$0	$0	$ 11,100,000	$64,352,000
2016	6	$ -	$ -	$ -	$ -	$0	$0	$ 28,600,000	$92,952,000
2017	7	$ -	$ -	$ -	$ -	$0	$0	$ 29,200,000	$122,152,000
2018	8	$ -	$ -	$ -	$ -	$0	$0	$ 29,800,000	$151,952,000
2019	9	$ -	$ -	$ -	$ -	$0	$0	$ 30,400,000	$182,352,000
2020	10	$ 25,768,527	$ 66,800,000	$ 37,300,800.00	$ -	$0	$0	$ 68,300,800	$250,652,800
2021	11	$ 25,768,527	$ 73,500,000	$ 38,718,900.00	$ -	$0	$0	$ 68,818,900	$319,471,700
2022	12	$ 25,768,527	$ 80,900,000	$ 40,204,800.00	$ -	$0	$0	$ 70,204,800	$389,676,500
2023	13	$ -	$ -	$ -	$ 1,546,112	$2,270,500	$1,064,500	$ (343,881,900)	$ 45,794,600
2024	14	$ -	$ -	$ -	$ 1,546,112	$2,338,600	$1,034,400	$ 1,034,400	$46,829,000
2025	15	$ -	$ -	$ -	$ 1,546,112	$2,408,800	$1,005,100	$ 1,005,100	$47,834,100
2026	16	$ -	$ -	$ -	$ 1,546,112	$2,481,100	$976,700	$ 976,700	$48,810,800
2027	17	$ -	$ -	$ -	$ 1,546,112	$2,555,500	$949,000	$ 949,000	$49,759,800
2028	18	$ -	$ -	$ -	$ 1,546,112	$2,632,200	$922,200	$ 922,200	$50,682,000
2029	19	$ -	$ -	$ -	$ 1,546,112	$2,711,100	$896,100	$ 896,100	$51,578,100
2030	20	$ -	$ -	$ -	$ 1,546,112	$2,792,400	$870,700	$ 870,700	$52,448,800
2031	21	$ -	$ -	$ -	$ 1,546,112	$2,876,200	$846,000	$ 846,000	$53,294,800
2032	22	$ -	$ -	$ -	$ 1,546,112	$2,962,500	$822,100	$ 822,100	$54,116,900
2033	23	$ -	$ -	$ -	$ 1,546,112	$3,051,400	$798,800	$ 798,800	$54,915,700
2034	24	$ -	$ -	$ -	$ 1,546,112	$3,142,900	$776,200	$ 776,200	$55,691,900
2035	25	$ -	$ -	$ -	$ 1,546,112	$3,237,200	$754,300	$ 754,300	$56,446,200
2036	26	$ -	$ -	$ -	$ 1,546,112	$3,334,300	$732,900	$ 732,900	$57,179,100
2037	27	$ -	$ -	$ -	$ 1,546,112	$3,434,400	$712,200	$ 712,200	$57,891,300
2038	28	$ -	$ -	$ -	$ 1,546,112	$3,537,400	$692,000	$ 692,000	$58,583,300
2039	29	$ -	$ -	$ -	$ 1,546,112	$3,643,500	$672,400	$ 672,400	$59,255,700
2040	30	$ -	$ -	$ -	$ 1,546,112	$3,752,800	$653,400	$ 653,400	$59,909,100
2041	31	$ -	$ -	$ -	$ 1,546,112	$3,865,400	$634,900	$ 634,900	$60,544,000
2042	32	$ -	$ -	$ -	$ 1,546,112	$3,981,400	$616,900	$ 616,900	$61,160,900
2043	33	$ -	$ -	$ -	$ 1,546,112	$4,100,800	$599,500	$ 599,500	$61,760,400
2044	34	$ -	$ -	$ -	$ 1,546,112	$4,223,800	$582,500	$ 582,500	$62,342,900
2045	35	$ -	$ -	$ -	$ 1,546,112	$4,350,500	$566,000	$ 566,000	$62,908,900
2046	36	$ -	$ -	$ -	$ 1,546,112	$4,481,100	$550,000	$ 550,000	$63,458,900
2047	37	$ -	$ -	$ -	$ 1,546,112	$4,615,500	$534,400	$ 534,400	$63,993,300
2048	38	$ -	$ -	$ -	$ 1,546,112	$4,754,000	$519,300	$ 519,300	$64,512,600
2049	39	$ -	$ -	$ -	$ 1,546,112	$4,896,600	$504,600	$ 504,600	$65,017,200
2050	40	$ -	$ -	$ -	$ 1,546,112	$5,043,500	$490,300	$ 490,300	$65,507,500
2051	41	$ -	$ -	$ -	$ 1,546,112	$5,194,800	$476,500	$ 476,500	$65,984,000
2052	42	$ -	$ -	$ -	$ 1,546,112	$5,350,600	$463,000	$ 463,000	$66,447,000
2053	43	$ -	$ -	$ -	$ 1,546,112	$5,511,100	$449,900	$ 449,900	$66,896,900
2054	44	$ -	$ -	$ -	$ 1,546,112	$5,676,500	$437,100	$ 437,100	$67,334,000
2055	45	$ -	$ -	$ -	$ 1,546,112	$5,846,800	$424,800	$ 424,800	$67,758,800
2056	46	$ -	$ -	$ -	$ 1,546,112	$6,022,200	$412,700	$ 412,700	$68,171,500
2057	47	$ -	$ -	$ -	$ 1,546,112	$6,202,800	$401,100	$ 401,100	$68,572,600
2058	48	$ -	$ -	$ -	$ 1,546,112	$6,388,900	$389,700	$ 389,700	$68,962,300
2059	49	$ -	$ -	$ -	$ 1,546,112	$6,580,600	$378,700	$ 378,700	$69,341,000
2060	50	$ -	$ -	$ -	$ 1,546,112	$6,778,000	$368,000	$ 368,000	$69,709,000

DISCHARGE TO SALTON SEA (37 MGD)

Calendar Year	Cost of Pipeline 2010 Dollars	Cost of Pipeline Inflated Cost (F/P,CIR,n)	2010 Present Worth (P/F,INTR,n)	Pipeline O&M Costs 2010 Dollars	Pipeline O&M Costs Inflated Cost (F/P,IR2,n)	2010 Present (P/F,INTR,n)	Capital + O&M 2010 Present Worth	Capital + O&M Cumulative Present Worth
2010	$ -	$ -	$ -	$ -	$ -	0	$ 9,752,000	$ 9,752,000
2011	$ -	$ -	$ -	$ -	$ -	0	$ 10,200,000	$ 19,952,000
2012	$ -	$ -	$ -	$ -	$ -	0	$ 10,800,000	$ 30,752,000
2013	$ -	$ -	$ -	$ -	$ -	0	$ 11,300,000	$ 42,052,000
2014	$ -	$ -	$ -	$ -	$ -	0	$ 11,200,000	$ 53,252,000
2015	$ -	$ -	$ -	$ -	$ -	0	$ 11,100,000	$ 64,352,000
2016	$ -	$ -	$ -	$ -	$ -	0	$ 28,600,000	$ 92,952,000
2017	$ -	$ -	$ -	$ -	$ -	0	$ 29,200,000	$ 122,152,000
2018	$ -	$ -	$ -	$ -	$ -	0	$ 29,800,000	$ 151,952,000
2019	$ -	$ -	$ -	$ -	$ -	0	$ 30,400,000	$ 182,352,000
2020	$ 80,163,502	$ 207,923,500	$ 116,100,000	$ -	$ -	0	$ 147,100,000	$ 329,452,000
2021	$ 80,163,502	$ 228,715,800	$ 120,500,000	$ -	$ -	0	$ 150,600,000	$ 480,052,000
2022	$ 80,163,502	$ 251,587,400	$ 125,000,000	$ -	$ -	0	$ 155,000,000	$ 635,052,000
2023	$ 80,163,502	$ 276,746,200	$ 129,700,000	$ -	$ -	0	$ 159,600,000	$ 794,652,000
2024	$ 80,163,502	$ 304,420,800	$ 134,600,000	$ -	$ -	0	$ 164,300,000	$ 958,952,000
2025	$ -	$ -	$ -	$ 8,016,350	$ 11,772,300	$ 5,200,000	$ (355,395,800)	$ 603,556,200
2026	$ -	$ -	$ -	$ 8,016,350	$ 12,863,900	$ 4,800,000	$ 4,800,000	$ 608,356,200
2027	$ -	$ -	$ -	$ 8,016,350	$ 13,249,800	$ 4,600,000	$ 4,600,000	$ 612,956,200
2028	$ -	$ -	$ -	$ 8,016,350	$ 13,647,300	$ 4,500,000	$ 4,500,000	$ 617,456,200
2029	$ -	$ -	$ -	$ 8,016,350	$ 14,056,700	$ 4,400,000	$ 4,400,000	$ 621,856,200
2030	$ -	$ -	$ -	$ 8,016,350	$ 14,478,400	$ 4,300,000	$ 4,300,000	$ 626,156,200
2031	$ -	$ -	$ -	$ 8,016,350	$ 14,912,800	$ 4,100,000	$ 4,100,000	$ 630,256,200
2032	$ -	$ -	$ -	$ 8,016,350	$ 15,360,200	$ 4,000,000	$ 4,000,000	$ 634,256,200
2033	$ -	$ -	$ -	$ 8,016,350	$ 15,821,000	$ 3,900,000	$ 3,900,000	$ 638,156,200
2034	$ -	$ -	$ -	$ 8,016,350	$ 16,295,600	$ 3,800,000	$ 3,800,000	$ 641,956,200
2035	$ -	$ -	$ -	$ 8,016,350	$ 16,784,500	$ 3,700,000	$ 3,700,000	$ 645,656,200
2036	$ -	$ -	$ -	$ 8,016,350	$ 17,288,000	$ 3,600,000	$ 3,600,000	$ 649,256,200
2037	$ -	$ -	$ -	$ 8,016,350	$ 17,806,600	$ 3,500,000	$ 3,500,000	$ 652,756,200
2038	$ -	$ -	$ -	$ 8,016,350	$ 18,340,800	$ 3,400,000	$ 3,400,000	$ 656,156,200
2039	$ -	$ -	$ -	$ 8,016,350	$ 18,891,100	$ 3,300,000	$ 3,300,000	$ 659,456,200
2040	$ -	$ -	$ -	$ 8,016,350	$ 19,457,800	$ 3,200,000	$ 3,200,000	$ 662,656,200
2041	$ -	$ -	$ -	$ 8,016,350	$ 20,041,500	$ 3,100,000	$ 3,100,000	$ 665,756,200
2042	$ -	$ -	$ -	$ 8,016,350	$ 20,642,800	$ 3,000,000	$ 3,000,000	$ 668,756,200
2043	$ -	$ -	$ -	$ 8,016,350	$ 21,262,000	$ 2,900,000	$ 2,900,000	$ 671,656,200
2044	$ -	$ -	$ -	$ 8,016,350	$ 21,899,900	$ 2,800,000	$ 2,800,000	$ 674,456,200
2045	$ -	$ -	$ -	$ 8,016,350	$ 22,556,900	$ 2,800,000	$ 2,800,000	$ 677,256,200
2046	$ -	$ -	$ -	$ 8,016,350	$ 23,233,600	$ 2,700,000	$ 2,700,000	$ 679,956,200
2047	$ -	$ -	$ -	$ 8,016,350	$ 23,930,600	$ 2,600,000	$ 2,600,000	$ 682,556,200
2048	$ -	$ -	$ -	$ 8,016,350	$ 24,648,500	$ 2,500,000	$ 2,500,000	$ 685,056,200
2049	$ -	$ -	$ -	$ 8,016,350	$ 25,388,000	$ 2,500,000	$ 2,500,000	$ 687,556,200
2050	$ -	$ -	$ -	$ 8,016,350	$ 26,149,600	$ 2,400,000	$ 2,400,000	$ 689,956,200
2051	$ -	$ -	$ -	$ 8,016,350	$ 26,934,100	$ 2,300,000	$ 2,300,000	$ 692,256,200
2052	$ -	$ -	$ -	$ 8,016,350	$ 27,742,200	$ 2,300,000	$ 2,300,000	$ 694,556,200
2053	$ -	$ -	$ -	$ 8,016,350	$ 28,574,400	$ 2,200,000	$ 2,200,000	$ 696,756,200
2054	$ -	$ -	$ -	$ 8,016,350	$ 29,431,600	$ 2,100,000	$ 2,100,000	$ 698,856,200
2055	$ -	$ -	$ -	$ 8,016,350	$ 30,314,600	$ 2,100,000	$ 2,100,000	$ 700,956,200
2056	$ -	$ -	$ -	$ 8,016,350	$ 31,224,000	$ 2,000,000	$ 2,000,000	$ 702,956,200
2057	$ -	$ -	$ -	$ 8,016,350	$ 32,160,800	$ 2,000,000	$ 2,000,000	$ 704,956,200
2058	$ -	$ -	$ -	$ 8,016,350	$ 33,125,600	$ 1,900,000	$ 1,900,000	$ 706,856,200
2059	$ -	$ -	$ -	$ 8,016,350	$ 34,119,300	$ 1,900,000	$ 1,900,000	$ 708,756,200
2060	$ -	$ -	$ -	$ 8,016,350	$ 35,142,900	$ 35,100,000	$ 35,100,000	$ 743,856,200

Estimates of 30-Year Cumulative Costs at SARI Build-out
(Assumed OCSD Capital Inflation Rate = 17.6%)

Cost Components (present worth of 2040 cumulative cost)	Baseline Condition	Brine Minimization: Centralized Inline Plant	Brine Minimization: Decentralized Ground Desalter	Direct Ocean Discharge: Without Brine Minimization	Direct Ocean Discharge: With Brine Minimization
SARI Disposal Flow	37 MGD	12 MGD	26 MGD	37 MGD	26 MGD
Additional Interceptor Capacity Needed	-	-	-	5 MGD	-
Additional Treatment Capacity Needed	20 MGD	(5 MGD)	9 MGD	-	-
Additional Water Recovered	-	25 MGD	10 MGD	-	10 MGD
OCSD Treatment Plant Costs					
OCSD CIP Sinking Fund	$53,000,000	$53,000,000	$53,000,000	$22,000,000	$22,000,000
OCSD Treatment Capacity	$814,000,000	$483,000,000	$442,000,000	$334,000,000	$334,000,000
OCSD O&M Treatment Costs	$290,000,000	$204,000,000	$229,000,000	$132,000,000	$132,000,000
OCSD O&M Maintenance Costs	$4,000,000	$4,000,000	$4,000,000	$2,000,000	$2,000,000
One time capacity sell back	-	$69,000,000	-	$345,000,000	$345,000,000
OCSD Subtotal	***$1,161,000,000***	***$675,000,000***	***$728,000,000***	***$145,000,000***	***$145,000,000***
SAWPA Member Agencies Plant Treatment Costs					
Treatment Plant Capital Costs	-	$781,000,000	$181,000,000	-	$181,000,000
O&M Treatment Costs	-	$461,000,000	$252,000,000	-	$252,000,000
Treatment Plant Subtotal	**-**	***$1,242,000,000***	***$433,000,000***	**-**	***$433,000,000***
Revenue					
Water Resale Value	**-**	**$270,000,000**	**$337,000,000**	**-**	**$337,000,000**
New Pipeline Costs					
Pipeline Capital Cost	-	-	-	$116,000,000	$116,000,000
Pipeline Maintenance Cost	-	-	-	$15,000,000	$15,000,000
Pipeline Subtotal	**-**	**-**	**-**	***$131,000,000***	***$131,000,000***
Cumulative SAWPA Expense in 2040	**$1,161,000,000**	**$1,647,000,000**	**$824,000,000**	**$276,000,000**	**$372,000,000**

Cumulative Present Worth for Capital and O&M Costs for All SARI Configuration Alternatives

Year	Status Quo Option 1	Inline Brine Minimization Plant Option 2a	Decentralized Brine Minimization Plant Option 2b	Direct Ocean Discharge with ZLD Option 3a	Direct Ocean Discharge Without ZLD Option 3b	Salton Sea Option 4
2010	$9,752,000	$9,752,000.00	$9,751,700.00	$9,752,000	$9,752,000	$ 9,752,000
2011	$19,952,000	$19,999,000.00	$19,998,200.00	$19,952,000	$19,952,000	$ 19,952,000
2012	$30,752,000	$30,767,000.00	$30,765,700.00	$30,752,000	$30,752,000	$ 30,752,000
2013	$42,052,000	$42,083,000.00	$42,081,400.00	$42,052,000	$42,052,000	$ 42,052,000
2014	$53,252,000	$53,264,000.00	$53,262,300.00	$53,252,000	$53,252,000	$ 53,252,000
2015	$64,352,000	$64,387,000.00	$83,290,600.00	$83,257,600	$64,352,000	$ 64,352,000
2016	$109,752,000	$109,818,000.00	$125,093,800.00	$147,854,400	$109,752,000	$ 109,752,000
2017	$159,752,000	$159,815,000.00	$168,695,300.00	$217,287,900	$159,752,000	$ 159,752,000
2018	$214,652,000	$214,710,000.00	$214,053,100.00	$291,693,200	$214,652,000	$ 214,652,000
2019	$274,952,000	$274,971,000.00	$261,076,100.00	$371,333,100	$274,952,000	$ 274,952,000
2020	$341,052,000	$500,247,000.00	$309,868,400.00	$493,852,300	$378,352,800	$ 457,152,000
2021	$412,152,000	$729,823,000.00	$359,897,800.00	$622,330,000	$488,171,700	$ 648,752,000
2022	$489,652,000	$964,186,000.00	$411,260,300.00	$758,114,200	$605,876,500	$ 851,252,000
2023	$574,152,000	$1,204,033,000.00	$464,015,200.00	$431,540,200	$ 261,994,600	$ 1,065,452,000
2024	$666,352,000	$1,450,077,000.00	$518,252,300.00	$448,971,500	$263,029,000	$ 1,292,252,000
2025	$767,052,000	$1,410,549,000.00	$556,965,500.00	$448,125,600	$264,034,100	$ 936,856,200
2026	$787,652,000	$1,438,026,000.00	$574,924,600.00	$450,179,300	$265,010,800	$ 941,656,200
2027	$808,452,000	$1,463,787,000.00	$592,293,500.00	$451,238,300	$265,959,800	$ 946,256,200
2028	$829,452,000	$1,487,876,000.00	$609,159,500.00	$451,306,300	$266,882,000	$ 950,756,200
2029	$850,852,000	$1,510,273,000.00	$625,661,900.00	$450,393,800	$267,778,100	$ 955,156,200
2030	$872,852,000	$1,531,007,000.00	$641,920,400.00	$448,489,400	$268,648,800	$ 959,456,200
2031	$895,452,000	$1,550,084,000.00	$658,033,300.00	$445,591,400	$269,494,800	$ 963,556,200
2032	$918,952,000	$1,567,522,000.00	$674,137,300.00	$441,652,600	$270,316,900	$ 967,556,200
2033	$943,452,000	$1,583,294,000.00	$690,398,700.00	$436,697,600	$271,115,700	$ 971,456,200
2034	$969,152,000	$1,597,443,000.00	$706,951,600.00	$430,706,600	$271,891,900	$ 975,256,200
2035	$996,152,000	$1,609,922,000.00	$723,997,700.00	$423,675,000	$272,646,200	$ 978,956,200
2036	$1,024,752,000	$1,620,771,000.00	$741,719,900.00	$415,564,500	$273,379,100	$ 982,556,200
2037	$1,055,252,000	$1,629,978,000.00	$760,303,800.00	$406,354,600	$274,091,300	$ 986,056,200
2038	$1,087,852,000	$1,637,543,000.00	$780,013,200.00	$396,040,900	$274,783,300	$ 989,456,200
2039	$1,122,752,000	$1,643,445,000.00	$801,091,300.00	$384,593,800	$275,455,700	$ 992,756,200
2040	$1,160,352,000	$1,647,682,000.00	$823,831,900.00	$372,002,300	$276,109,100	$ 995,956,200
2041	$1,201,052,000	$1,650,233,000.00	$848,543,600.00	$358,236,000	$276,744,000	$ 999,056,200
2042	$1,245,152,000	$1,651,112,000.00	$875,571,600.00	$343,267,300	$277,360,900	$ 1,002,056,200
2043	$1,293,052,000	$1,650,272,000.00	$905,313,100.00	$327,088,700	$277,960,400	$ 1,004,956,200
2044	$1,345,252,000	$1,647,691,000.00	$938,193,100.00	$309,650,300	$278,542,900	$ 1,007,756,200
2045	$1,402,252,000	$1,643,382,000.00	$974,678,400.00	$290,926,700	$279,108,900	$ 1,010,556,200
2046	$1,464,652,000	$1,637,284,000.00	$1,015,305,300.00	$270,899,500	$279,658,900	$ 1,013,256,200
2047	$1,533,052,000	$1,629,390,000.00	$1,060,651,900.00	$249,521,900	$280,193,300	$ 1,015,856,200
2048	$1,608,052,000	$1,619,667,000.00	$1,111,382,200.00	$226,771,800	$280,712,600	$ 1,018,356,200
2049	$1,690,552,000	$1,608,085,000.00	$1,168,221,600.00	$202,616,500	$281,217,200	$ 1,020,856,200
2050	$1,781,352,000	$1,594,602,000.00	$1,231,954,900.00	$177,006,300	$281,707,500	$ 1,023,256,200
2051	$1,881,352,000	$1,579,183,000.00	$1,303,478,500.00	$149,899,600	$282,184,000	$ 1,025,556,200
2052	$1,991,552,000	$1,561,794,000.00	$1,383,789,700.00	$121,263,700	$282,647,000	$ 1,027,856,200
2053	$2,113,152,000	$1,542,396,000.00	$1,473,988,800.00	$91,048,700	$283,096,900	$ 1,030,056,200
2054	$2,247,452,000	$1,520,940,000.00	$1,575,292,300.00	$59,209,600	$283,534,000	$ 1,032,156,200
2055	$2,395,852,000	$1,497,364,000.00	$1,689,074,300.00	$25,708,900	$283,958,800	$ 1,034,256,200
2056	$2,559,852,000	$1,471,635,000.00	$1,816,838,300.00	($9,512,700)	$284,371,500	$ 1,036,256,200
2057	$2,741,252,000	$1,443,690,000.00	$1,960,270,600.00	($46,501,300)	$284,772,600	$ 1,038,256,200
2058	$2,941,952,000	$1,413,466,000.00	$2,121,219,700.00	($85,322,000)	$285,162,300	$ 1,040,156,200
2059	$3,164,152,000	$1,380,903,000.00	$2,301,772,800.00	($126,021,900)	$285,541,000	$ 1,042,056,200
2060	$3,410,152,000	$1,345,940,000.00	$2,504,222,500.00	($168,665,100)	$285,909,000	$ 1,077,156,200

ZLD Inline Plant

Cost Assumptions			OCSD
OCSD Capital Costs	Units		
- Treatment and Disposal Rights	$/MGD		$ 10,017,500.00
- Pipeline Capacity	$/MGD		$ 3,750,000.00
- BOD Capacity	$/lb BOD over 124 mg/L		$ 2,631.00
- TSS Capacity	$/lb TSS over 255 mg/L		$ 1,613.00
- Brine Only	$/MGD		$ 4,547,250.00
- Retail Value of Reclaimed Water	$/AF		$ 600.00
- Retail Value of Potable Water	$/AF		
Potable Water Production			
- Assumed MF Recovery		95%	
- Asumed RO Recover		70%	
ZLD Treatment Capital Costs (based on water produced, NOT treated)			
- Preciptative Softening	$/MGD		$ 1,000,000.00
- Microfiltration	$/MGD		$ 4,500,000.00
- Reverse Osmosis	$/MGD		$ 6,500,000.00
- Biological Pretreatment	$/MGD		$ 8,000,000.00
- AOP Post Treatment	$/MGD		$ 1,000,000.00
Chemical Costs			
- Cost of caustic soda	$/ton		$ 200.00
- Cost of caustic soda	$/lb		$ 0.38
- Cost of Soda Ash	$/lb		$ 1.08
- Cost of Acid -93% pure	$/lb		$ 0.33
- Cost of Threshold Inhibitor - 100% p	$/lb		$ 1.00
- RO Cleaning (Annual)	$/mgd		$ 3,700.00
- MF Cleaning (Annual)	$/mgd		$ 1,850.00
Electrical Power	$/kWh		$ 0.125
Sludge Disposal Cost	$/ton		$65
Sludge Generated According to Softening Chemicals Used			
- Lime Alone	tons/MG		15
- Lime + Soda Ash	tons/MG		20
- Caustic + Soda Ash	tons/MG		10

Brine Minimization Alternatives		Centralized Plant			
- Flow to concentration plant	mgd	**14.74**	**16.5**	**32.69**	**36.85**
Chemicals:					
- Caustic:					
- Caustic Soda Dose	mg/L	650	650	650	650
Caustic Soda Usage	lb/d	79,906	89,447	177,212	199,764
Cost of Caustic Soda	$/lb	**0.38**	**0.38**	**0.38**	**0.38**
Annual cost of Caustic	$	**$ 11,082,898.40**	**$ 12,406,229.55**	**$ 24,579,372.36**	**$ 27,707,246.00**
- Soda Ash:					
- Soda Ash Dose	mg/L	0	0	0	0
Soda Ash Usage	lb/d	-	-	-	-
Cost of Soda Ash	$/lb	**1.08**	**1.08**	**1.08**	**1.08**
Annual Cost of Soda Ash	$	**$ -**	**$ -**	**$ -**	**$ -**
- Acid:					
- Acid Dose	mg/L	20	20	20	20
Acid Usage	lb/d	2458.632	2752.2	5452.692	6146.58
Cost of Acid	$/lb	**0.33**	**0.33**	**0.33**	**0.33**
Annual Cost of Acid	$	**$ 296,142.22**	**$ 331,502.49**	**$ 656,776.75**	**$ 740,355.56**
- Threshold Inhibitor:					
- Threshold Inhibitor Dose	mg/L	4	4	4	4
- TI Usage	lb/day	491.7264	550.44	1090.5384	1229.316
- Cost of Threshold Inhinitor	$/lb	**1.00**	**1.00**	**1.00**	**1.00**
- Annual Cost of TI	$	**$ 179,480.14**	**$ 200,910.60**	**$ 398,046.52**	**$ 448,700.34**
- Cleaning Chemicals					
- MF Flow	mgd	14.7	16.5	32.7	36.9
- Annual MF Cleaning Costs	$/mgd	**1,850.00**	**1,850.00**	**1,850.00**	**1,850.00**
- RO Permeate	mgd	9.8021	10.9725	21.73885	24.50525
- Annual RO Cleaning Costs	$/mgd	**3,700.00**	**3,700.00**	**3,700.00**	**3,700.00**
- Annual Membrane Cleaning Cost	$	**$ 63,536.77**	**$ 71,123.25**	**$ 140,910.25**	**$ 158,841.93**
- **Total Annual Cost of Chemicals**		**$ 11,622,057.53**	**$ 13,009,765.89**	**$ 25,775,105.88**	**$ 29,055,143.82**
Sludge Disposal:					
- Raw Brine Flow Rate	mgd	14.74	16.5	32.69	36.85
- Sludge Generated/MG brine	tons	10	10	10	10
- Estimated Mass of Sludge generate	tons/day	147.4	165	326.9	368.5
- Cost of Sludge Processing + Dispos	tons/day	**$65**	**$65**	**$65**	**$65**
- Annual Cost of Sludge Disposal	$	**$ 3,497,065.00**	**$ 3,914,625.00**	**$ 7,755,702.50**	**$ 8,742,662.50**
Treatment Process:					
RO Power Cost					
- RO Feed Flow Rate	mgd	**14.74**	**16.5**	**32.69**	**36.85**
- RO Feed Flow Rate	gpm	10235.456	11457.6	22699.936	25588.64
- Average Operating Pressure	psi	215	215	215	215
- Overall Pump Efficiency	%	70%	70%	70%	70%
- Pumping Power	hp	1833.85	2052.82	4067.07	4584.63
- Power Consumed	kWh	1366.220137	1529.3509	3029.968541	3415.550343
- Annual RO Power Consumption	kWh/yr	11968088.4	13397113.88	26542524.42	29920221.01
- Power Cost	$/kWh	**0.16**	**0.16**	**0.16**	**0.16**
- Annual RO Power Cost	$	**$ 1,914,894.14**	**$ 2,143,538.22**	**$ 4,246,803.91**	**$ 4,787,235.36**
MF Power Cost					

-	MF Feed Flow Rate	mgd		**14.74**	**16.5**	**32.69**	**36.85**
-	Annual Power Cost per MGD	$		20000	20000	20000	20000
-	Annual MF Power Cost			**$ 294,800.00**	**$ 330,000.00**	**$ 653,800.00**	**$ 737,000.00**
Membrane Replacement							
-	Assume typical RO life	$/1000 gal		0.16	0.16	0.16	0.16
-	Annual Cost for RO Membranes	$		$ 860,816.00	$ 963,600.00	$ 1,909,096.00	$ 2,152,040.00
-	Annual Cost for MF Membranes	$		$ 516,489.60	$ 578,160.00	$ 1,145,457.60	$ 1,291,224.00
-	Annual Mem Repl Cost	$		**$ 1,377,305.60**	**$ 1,541,760.00**	**$ 3,054,553.60**	**$ 3,443,264.00**
Annual O&M Costs for Brine Minimization							
-	Power + Membrane Replacement			**$ 3,586,999.74**	**$ 4,015,298.22**	**$ 7,955,157.51**	**$ 8,967,499.36**
-	Chemical Costs			**$ 11,622,057.53**	**$ 13,009,765.89**	**$ 25,775,105.88**	**$ 29,055,143.82**
-	Sludge Disposal			**$ 3,497,065.00**	**$ 3,914,625.00**	**$ 7,755,702.50**	**$ 8,742,662.50**
	O&M LABOR			**$ 1,870,612.23**	**$ 2,093,968.91**	**$ 4,148,596.59**	**$ 4,676,530.57**
-	Total Annual Costs			**$ 20,576,734.50**	**$ 23,033,658.02**	**$ 45,634,562.47**	**$ 51,441,836.25**
Capital Cost:							
-	Volume Water Generated by Soften	mgd		14.74	16.50	32.69	36.85
-	Volume Produced by MF	mgd		14.00	15.68	31.06	35.01
-	Volume Produced by RO	mgd		9.80	10.97	21.74	24.51
-	Installed Cost for Softener	$		$ 14,740,000.00	$ 16,500,000.00	$ 32,690,000.00	$ 36,850,000.00
-	Installed Cost for MF System	$		$ 63,013,500.00	$ 70,537,500.00	$ 139,749,750.00	$ 157,533,750.00
-	Installed Cost for RO System	$		$ 63,713,650.00	$ 71,321,250.00	$ 141,302,525.00	$ 159,284,125.00
-	Intalled Cost for Biological Pretreatn	$		$ 117,920,000.00	$ 132,000,000.00	$ 261,520,000.00	$ 294,800,000.00
-	Installed Cost for AOP Treatmetn	$		$ 9,802,100.00	$ 10,972,500.00	$ 21,738,850.00	$ 24,505,250.00
-	Engineering and Contingency		30%	$ 80,756,775.00	$ 90,399,375.00	$ 179,100,337.50	$ 201,891,937.50
-	Estimated ZLD Capital Cost	$		**$ 349,946,025.00**	**$ 391,730,625.00**	**$ 776,101,462.50**	**$ 874,865,062.50**
-	ZLD Cost Per MGD	$/MGD		**$ 23,741,250.00**	**$ 23,741,250.00**	**$ 23,741,250.00**	**$ 23,741,250.00**
Annual Cost of Capital:							
-	Average Annual Interest Rate	%		6%	6%	6%	6%
-	Loan Period	years		20	20	20	20
-	Annual Payment	$		$30,509,889.16	$34,152,860.99	$67,664,062.18	$76,274,722.89
Revenue from New Water Production							
-	Assumed MF Recovery	%		95%	95%	95%	95%
-	Assumed RO Recovery	%		70%	70%	70%	70%
-	Reclaimed Water Produced	mgd		9.80	10.97	21.74	24.51
-	Reclaimed Water Produced	AF/Y		10,981	12,292	24,352	27,451
-	Selling Price of Reclaimed Water	$/AF		$288.00	$288.00	$288.00	$288.00
-	Annual Revenue	$		**$ 3,162,386.97**	**$ 3,539,985.42**	**$ 7,013,462.01**	**$ 7,905,967.43**

Cost Assumptions		OCSD
OCSD Capital Costs	Units	
- Treatment and Disposal Rights	$/MGD	$ 10,017,500.00
- Pipeline Capacity	$/MGD	$ 3,750,000.00
- BOD Capacity	$/lb BOD over 124 mg/L	$ 2,631.00
- TSS Capacity	$/lb TSS over 255 mg/L	$ 1,613.00
- Brine Only	$/MGD	$ 4,547,250.00
- Retail Value of Reclaimed Water	$/AF	$ 600.00
- Retail Value of Potable Water	$/AF	
Potable Water Production		
- Assumed MF Recovery	95%	
- Asumed RO Recover	70%	

ZLD Decen Plant

ZLD Treatment Capital Costs (based on water produced, NOT treated)		
- Preciptative Softening	$/MGD	$ 1,000,000.00
- Microfiltration	$/MGD	$ 4,500,000.00
- Reverse Osmosis	$/MGD	$ 6,500,000.00
Chemical Costs		
- Cost of caustic soda	$/ton	$ 200.00
- Cost of caustic soda	$/lb	$ 0.38
- Cost of Soda Ash	$/lb	$ 1.08
- Cost of Acid -93% pure	$/lb	$ 0.33
- Cost of Threshold Inhibitor - 100% p	$/lb	1
- RO Cleaning	$/mgd	$ 3,700.00
- MF Cleaning	$/mgd	$ 1,850.00
Electrical Power	$/kWh	$ 0.125
Sludge Disposal Cost	$/ton	$65
Sludge Generated According to Softening Chemicals Used		
- Lime Alone	tons/MG	15
- Lime + Soda Ash	tons/MG	20
- Caustic + Soda Ash	tons/MG	10

Brine Minimization Alternatives		**Decentralized Plants**		
- Flow to concentration plant	mgd	**10.55**	**10.87**	**15.87**
Chemicals:				
- Caustic:				
- Caustic Soda Dose	mg/L	650	650	650
Caustic Soda Usage	lb/d	57,192	58,926	86,031
Cost of Caustic Soda	$/lb	**0.38**	**0.38**	**0.38**
Annual cost of Caustic	$	**$ 7,932,467.99**	**$ 8,173,073.65**	**$ 11,932,537.15**
- Soda Ash:				
- Soda Ash Dose	mg/L	0	0	0
Soda Ash Usage	lb/d	-	-	-
Cost of Soda Ash	$/lb	**1.08**	**1.08**	**1.08**
Annual Cost of Soda Ash	$	**$ -**	**$ -**	**$ -**
- Acid:				
- Acid Dose	mg/L	20	20	20
Acid Usage	lb/d	1759.74	1813.116	2647.116
Cost of Acid	$/lb	**0.33**	**0.33**	**0.33**
Annual Cost of Acid	$	**$ 211,960.68**	**$ 218,389.82**	**$ 318,845.12**
- Threshold Inhibitor:				
- Threshold Inhibitor Dose	mg/L	4	4	4
- TI Usage	lb/day	351.948	362.6232	529.4232
- Cost of Threshold Inhinitor	$/lb	**1.00**	**1.00**	**1.00**
- Annual Cost of TI	$	**$ 128,461.02**	**$ 132,357.47**	**$ 193,239.47**
- Cleaning Chemicals				
- MF Flow	mgd	10.6	10.9	15.9
- MF Cleaning Costs	$/mgd	**1,850.00**	**1,850.00**	**1,850.00**
- RO Permeate	mgd	7.01575	7.22855	10.55355
- RO Cleaning Costs	$/mgd	**3,700.00**	**3,700.00**	**3,700.00**
- Annual Membrane Cleaning Cost	$	**$ 45,475.78**	**$ 46,855.14**	**$ 68,407.64**
- Total Annual Cost of Chemicals		**$ 8,318,365.46**	**$ 8,570,676.07**	**$ 12,513,029.37**
Sludge Disposal:				
- Raw Brine Flow Rate	mgd	10.55	10.87	15.87
- Sludge Generated/MG brine	tons	10	10	10
- Estimated Mass of Sludge generate	tons/day	105.5	108.7	158.7
- Cost of Sludge Processing + Dispos	tons/day	**$65**	**$65**	**$65**
- Annual Cost of Sludge Disposal	$	**$ 2,502,987.50**	**$ 2,578,907.50**	**$ 3,765,157.50**
Treatment Process:				
RO Power Cost				
- RO Feed Flow Rate	mgd	**10.55**	**10.87**	**15.87**
- RO Feed Flow Rate	gpm	7325.92	7548.128	11020.128
- Average Operating Pressure	psi	215	215	215
- Overall Pump Efficiency	%	70%	70%	70%
- Pumping Power	hp	1312.56	1352.37	1974.44
- Power Consumed	kWh	977.8576967	1007.517835	1470.957502
- Annual RO Power Consumption	kWh/yr	8566033.423	8825856.238	12885587.72
- Power Cost	$/kWh	**0.16**	**0.16**	**0.16**
- Annual RO Power Cost	$	**$ 1,370,565.35**	**$ 1,412,137.00**	**$ 2,061,694.03**
MF Power Cost				
- MF Feed Flow Rate	mgd	**10.55**	**10.87**	**15.87**
- Annual Power Cost per MGD	$	20000	20001	20002

-	Annual MF Power Cost			**$ 211,000.00**	**$ 217,410.87**	**$ 317,431.74**
	Membrane Replacement					
-	Assume typical RO life	$/1000 gal		0.16	0.16	0.16
-	Annual Cost for RO Membranes	$		$ 616,120.00	$ 634,808.00	$ 926,808.00
-	Annual Cost for MF Membranes	$		$ 369,672.00	$ 380,884.80	$ 556,084.80
-	Annual Mem Repl Cost	$		**$ 985,792.00**	**$ 1,015,692.80**	**$ 1,482,892.80**
	Annual O&M Costs for Brine Minimization					
-	Power + Membrane Replacement			**$ 2,567,357.35**	**$ 2,645,240.67**	**$ 3,862,018.57**
-	Chemical Costs			**$ 8,318,365.46**	**$ 8,570,676.07**	**$ 12,513,029.37**
-	Sludge Disposal			**$ 2,502,987.50**	**$ 2,578,907.50**	**$ 3,765,157.50**
	O&M LABOR			**$ 1,338,871.03**	**$ 1,379,482.42**	**$ 2,014,020.54**
-	Total Annual Costs			**$ 14,727,581.34**	**$ 15,174,306.67**	**$ 22,154,225.99**
	Capital Cost:					
-	Volume Water Generated by Soften	mgd		10.55	10.87	15.87
-	Volume Produced by MF	mgd		10.02	10.33	15.08
-	Volume Produced by RO	mgd		7.02	7.23	10.55
-	Installed Cost for Softener	$		$ 10,550,000.00	$ 10,870,000.00	$ 15,870,000.00
-	Installed Cost for MF System	$		$ 45,101,250.00	$ 46,469,250.00	$ 67,844,250.00
-	Installed Cost for RO System	$		$ 45,602,375.00	$ 46,985,575.00	$ 68,598,075.00
-	Contingency and Engineering		30%	$ 30,376,087.50	$ 31,297,447.50	$ 45,693,697.50
-	Estimated ZLD Capital Cost	$		**$ 131,629,712.50**	**$ 135,622,272.50**	**$ 198,006,022.50**
-	ZLD Cost Per MGD	$/MGD		**$ 12,476,750.00**	**$ 12,476,750.00**	**$ 12,476,750.00**
	Annual Cost of Capital:					
-	Average Annual Interest Rate	%		6%	6%	6%
-	Loan Period	years		20	20	20
-	Annual Payment	$		$11,476,078.17	$11,824,167.74	$17,263,067.35
Revenue from New Water Production						
-	Assumed MF Recovery	%		95%	95%	95%
-	Assumed RO Recovery	%		70%	70%	70%
-	Reclaimed Water Produced	mgd		7.02	7.23	10.55
-	Reclaimed Water Produced	AF/Y		7,859	8,098	11,822
-	Selling Price of Reclaimed Water	$/AF		$645.00	$645.00	$645.00
-	Annual Revenue	$		**$ 5,069,174.19**	**$ 5,222,931.13**	**$ 7,625,383.36**

Revenue from Available Capacity

-

YEAR	Decen Plant Flow (influent)	O&M
2015	**0.00**	$ -
2016	1.59	$ 2,215,422.60
2017	3.17	$ 4,430,845.20
2018	4.76	$ 6,646,267.80
2019	6.35	$ 8,861,690.40
2020	7.94	$ 11,077,113.00
2021	9.52	$ 13,292,535.60
2022	11.11	$ 15,507,958.20
2023	12.70	$ 17,723,380.80
2024	14.28	$ 19,938,803.39
2025	15.87	$ 22,154,225.99

Cost Estimate: for Pipeline to Salton Sea (125 miles)

Assuming 125 linear miles of 36" pipe with manholes at 1000feet.

Description	QTY	Unit	Unit Cost	Total
60" diameter manholes	660	EA	$2,500.00	$1,650,000.00
36" Dr11 HDPE Pipeline in Open Trench	660,000	LF	$250.00	$165,000,000.00
Fittings and Valves (assumed 5% of pipeline cost)				$8,250,000.00
Excavation (Medium Digging, 12' deep, 6' wide trench)	3,801,600	CY	$4.00	$15,206,400.00
Pump Station (based on 30 mgd; *Pumping Station Design, Sanks et al.*)	30	mgd	$10,302,355.81	$10,302,355.81
Pump Station (C: 150, Elev: -977', 7 fps = 2,670' TDH)	43,308	hp		
				$200,408,755.81
Construction Contingency			50%	$100,204,377.91
Eng, Env, Legal, Admin, CM			50%	$100,204,377.91
				$400,817,511.62

Cost Estimate: for Pipeline from below Prado Dam to Ocean Outfall (25 miles)

Assuming 25 linear miles of 36" pipe with manholes at 1000 feet.

Description	QTY	Unit	Unit Cost	Total
60" diameter manholes	132	EA	$2,500.00	$330,000.00
36" Dr11 HDPE Pipeline in Open Trench	132,000	LF	$250.00	$33,000,000.00
Fittings and Valves (assumed 10% of pipeline cost, due to urban)				$3,300,000.00
Excavation (Medium Digging, 12' deep, 6' wide trench)	352,000	CY	$4.00	$1,408,000.00
Cleaning SARI line estimated at $10/ft	374,880		$10.00	$3,748,800.00
				$41,786,800.00
Construction Contingency			50%	$20,893,400.00
Eng, Env, Legal, Admin, CM			35%	$14,625,380.00
				$77,305,580.00

Flows in bold taken from CDM Phase I report.

Others, calculated assuming constant yearly incr.

Baseline Analysis

OCSD Rates *(i)*		**Treatment**	
Rate Description		Treatment (mg/L	OCSD Rate ($/1000 lb)
O&M Inflation Rate 1 (IR1):		102 mg/L BOD	$274 /1000 lbs
Rate up to 2013 ($IR1_{2013}$)	10%	312 mg/L TSS	$407 /1000 lbs
Rate at 2014($IR1_{2014}$)	8%	SARI Flow	$179 /MG
Rate at 2015($IR1_{2015}$)	7%	Treatment Capac	$11,332,000
Rate up to 2020($IR1_{2020}$)	5.4%		
Costs unchanged after 2020	0%		
O&M Inflation Rate 2 (IR2):	6%		
Capital Inflation Rate (CIR):	17.6%		
Interest Rate (INTR):	6%		

Calendar Year	2010 n	OCSD Treatment Flow (mgd)	OCSD CIP Sinking Fund	OCSD Treatment Capacity Cost 2010 Dollars	Inflated Cost (F/P, CIR,n)	2010 Present Worth (P/F,INTR,n)	OCSD O&M Treatment Cost 2010 Dollars	Inflated Cost (F/P, IR1,n)	2010 Present Worth (P/F,INTR,n)	OCSD O&M Maint. Cost 2010 Dollars	Inflated Cost (F/P, IR2,n)	2010 Present Worth (P/F,INTR,n)	Capital + O&M Costs Per Year	2010 Capital + OM Present Worth	2010 Cumulative Present Worth
2010	0	**14.74**	$ 1,696,607	$ -	$ -	$ -	$ 7,914,842	$7,914,800	$7,914,800	$ 140,290	$ 140,300	$ 140,300	$ 9,751,707	$ 9,752,000	$ 9,752,000
2011	1	15.09	$ 1,696,607	$ -	$ -	$ -	$ 8,103,853	$8,914,200	$8,409,600	$ 140,290	$ 148,700	$ 140,300	$ 10,759,507	$ 10,200,000	$ 19,952,000
2012	2	15.44	$ 1,696,607	$ -	$ -	$ -	$ 8,292,864	$10,034,400	$8,930,600	$ 140,290	$ 157,600	$ 140,300	$ 11,888,607	$ 10,800,000	$ 30,752,000
2013	3	15.80	$ 1,696,607	$ -	$ -	$ -	$ 8,481,875	$11,289,400	$9,478,800	$ 140,290	$ 167,100	$ 140,300	$ 13,153,107	$ 11,300,000	$ 42,052,000
2014	4	16.15	$ 1,696,607	$ -	$ -	$ -	$ 8,670,887	$11,796,600	$9,344,000	$ 140,290	$ 177,100	$ 140,300	$ 13,670,307	$ 11,200,000	$ 53,252,000
2015	5	**16.50**	$ 1,696,607	$ -	$ -	$ -	$ 8,859,898	$12,426,500	$9,285,800	$ 140,290	$ 187,700	$ 140,300	$ 14,310,807	$ 11,100,000	$ 64,352,000
2016	6	18.12	$ 1,696,607	$ 18,346,508	$ 48,500,000	$ 34,190,600.00	$ 9,729,242	$13,339,000	$9,403,500	$ 140,290	$ 199,000	$ 140,300	$ 63,734,607	$ 45,400,000	$ 109,752,000
2017	7	19.74	$ 1,696,607	$ 18,346,508	$ 57,100,000	$ 37,974,800.00	$ 10,598,556	$15,315,500	$10,185,700	$ 140,290	$ 210,900	$ 140,300	$ 74,323,607	$ 50,000,000	$ 159,752,000
2018	8	21.36	$ 1,696,607	$ 18,346,508	$ 67,100,000	$ 42,099,400.00	$ 11,467,929	$17,466,700	$10,958,800	$ 140,290	$ 223,600	$ 140,300	$ 86,486,907	$ 54,900,000	$ 214,652,000
2019	9	22.98	$ 1,696,607	$ 18,346,508	$ 78,900,000	$ 46,700,800.00	$ 12,337,273	$19,805,400	$11,722,800	$ 140,290	$ 237,000	$ 140,300	$ 100,639,007	$ 60,300,000	$ 274,952,000
2020	10	24.60	$ 1,696,607	$ 18,346,508	$ 92,800,000	$ 51,819,000.00	$ 13,206,617	$22,345,900	$12,477,800	$ 140,290	$ 251,200	$ 140,300	$ 117,093,707	$ 66,100,000	$ 341,052,000
2021	11	26.21	$ 1,696,607	$ 18,346,508	$ 109,200,000	$ 57,525,200.00	$ 14,075,961	$22,345,900	$11,771,500	$ 140,290	$ 266,300	$ 140,300	$ 133,508,807	$ 71,100,000	$ 412,152,000
2022	12	27.83	$ 1,696,607	$ 18,346,508	$ 128,400,000	$ 63,810,900.00	$ 14,945,305	$23,816,800	$11,836,200	$ 140,290	$ 282,300	$ 140,300	$ 154,195,707	$ 77,500,000	$ 489,652,000
2023	13	29.45	$ 1,696,607	$ 18,346,508	$ 151,000,000	$ 70,794,700.00	$ 15,814,649	$25,287,800	$11,855,900	$ 140,290	$ 299,200	$ 140,300	$ 178,283,607	$ 84,500,000	$ 574,152,000
2024	14	31.07	$ 1,696,607	$ 18,346,508	$ 177,500,000	$ 78,508,400.00	$ 16,683,993	$26,758,700	$11,835,400	$ 140,290	$ 317,200	$ 140,300	$ 206,272,507	$ 92,200,000	$ 666,352,000
2025	15	**32.69**	$ 1,696,607	$ 18,346,508	$ 208,800,000	$ 87,124,900.00	$ 17,553,337	$28,229,700	$11,779,300	$ 140,290	$ 336,200	$ 140,300	$ 239,062,507	$ 100,700,000	$ 767,052,000
2026	16	32.81	$ 1,696,607	$ 1,346,889	$ 18,000,000	$ 7,085,600.00	$ 17,617,159	$29,700,600	$11,691,500	$ 140,290	$ 356,400	$ 140,300	$ 49,753,607	$ 20,600,000	$ 787,652,000
2027	17	32.93	$ 1,696,607	$ 1,346,889	$ 21,200,000	$ 7,872,900.00	$ 17,680,981	$29,808,600	$11,069,900	$ 140,290	$ 377,800	$ 140,300	$ 53,083,607	$ 20,800,000	$ 808,452,000
2028	18	33.05	$ 1,696,607	$ 1,346,889	$ 24,900,000	$ 8,723,600.00	$ 17,744,803	$29,916,600	$10,481,100	$ 140,290	$ 400,400	$ 140,300	$ 56,913,607	$ 21,000,000	$ 829,452,000
2029	19	33.17	$ 1,696,607	$ 1,346,889	$ 29,300,000	$ 9,684,000.00	$ 17,808,625	$30,024,600	$9,923,500	$ 140,290	$ 424,500	$ 140,300	$ 61,445,707	$ 21,400,000	$ 850,852,000
2030	20	33.28	$ 1,696,607	$ 1,346,889	$ 34,500,000	$ 10,757,300.00	$ 17,872,447	$30,132,600	$9,395,500	$ 140,290	$ 449,900	$ 140,300	$ 66,779,107	$ 22,000,000	$ 872,852,000
2031	21	33.40	$ 1,696,607	$ 1,346,889	$ 40,500,000	$ 11,913,300.00	$ 17,936,269	$30,240,600	$8,895,400	$ 140,291	$ 476,900	$ 140,300	$ 72,914,107	$ 22,600,000	$ 895,452,000
2032	22	33.52	$ 1,696,607	$ 1,346,889	$ 47,700,000	$ 13,237,000.00	$ 18,000,090	$30,348,600	$8,421,900	$ 140,292	$ 505,500	$ 140,300	$ 80,250,707	$ 23,500,000	$ 918,952,000
2033	23	33.64	$ 1,696,607	$ 1,346,889	$ 56,100,000	$ 14,686,800.00	$ 18,063,912	$30,456,600	$7,973,500	$ 140,293	$ 535,900	$ 140,300	$ 88,789,107	$ 24,500,000	$ 943,452,000
2034	24	33.76	$ 1,696,607	$ 1,346,889	$ 65,900,000	$ 16,275,900.00	$ 18,127,734	$30,564,500	$7,548,800	$ 140,294	$ 568,000	$ 140,300	$ 98,729,107	$ 25,700,000	$ 969,152,000
2035	25	33.88	$ 1,696,607	$ 1,346,889	$ 77,500,000	$ 18,057,400.00	$ 18,191,556	$30,672,500	$7,146,700	$ 140,295	$ 602,100	$ 140,300	$ 110,471,207	$ 27,000,000	$ 996,152,000
2036	26	34.00	$ 1,696,607	$ 1,346,889	$ 91,200,000	$ 20,046,700.00	$ 18,255,378	$30,780,500	$6,765,900	$ 140,296	$ 638,300	$ 140,300	$ 124,315,407	$ 28,600,000	$ 1,024,752,000
2037	27	34.12	$ 1,696,607	$ 1,346,889	$ 107,200,000	$ 22,229,800.00	$ 18,319,200	$30,888,500	$6,405,300	$ 140,297	$ 676,600	$ 140,300	$ 140,461,707	$ 30,500,000	$ 1,055,252,000
2038	28	34.24	$ 1,696,607	$ 1,346,889	$ 126,100,000	$ 24,669,000.00	$ 18,383,022	$30,996,500	$6,063,800	$ 140,298	$ 717,200	$ 140,300	$ 159,510,307	$ 32,600,000	$ 1,087,852,000
2039	29	34.35	$ 1,696,607	$ 1,346,889	$ 148,300,000	$ 27,369,800.00	$ 18,446,844	$31,104,500	$5,740,500	$ 140,299	$ 760,200	$ 140,300	$ 181,861,307	$ 34,900,000	$ 1,122,752,000
2040	30	34.47	$ 1,696,607	$ 1,346,889	$ 174,400,000	$ 30,364,800.00	$ 18,510,666	$31,212,500	$5,434,400	$ 140,300	$ 805,800	$ 140,300	$ 208,114,907	$ 37,600,000	$ 1,160,352,000
2041	31	34.59	$ 1,696,607	$ 1,346,889	$ 205,100,000	$ 33,688,700.00	$ 18,574,488	$31,320,500	$5,144,500	$ 140,301	$ 854,200	$ 140,300	$ 238,971,307	$ 40,700,000	$ 1,201,052,000
2042	32	34.71	$ 1,696,607	$ 1,346,889	$ 241,200,000	$ 37,375,700.00	$ 18,638,310	$31,428,400	$4,870,100	$ 140,302	$ 905,400	$ 140,300	$ 275,230,407	$ 44,100,000	$ 1,245,152,000
2043	33	34.83	$ 1,696,607	$ 1,346,889	$ 283,600,000	$ 41,458,400.00	$ 18,702,132	$31,536,400	$4,610,200	$ 140,303	$ 959,800	$ 140,300	$ 317,792,807	$ 47,900,000	$ 1,293,052,000
2044	34	34.95	$ 1,696,607	$ 1,346,889	$ 333,600,000	$ 46,007,300.00	$ 18,765,954	$31,644,400	$4,364,100	$ 140,304	$ 1,017,300	$ 140,300	$ 367,958,307	$ 52,200,000	$ 1,345,252,000
2045	35	35.07	$ 1,696,607	$ 1,346,889	$ 392,300,000	$ 51,040,300.00	$ 18,829,776	$31,752,400	$4,131,200	$ 140,305	$ 1,078,400	$ 140,300	$ 426,827,407	$ 57,000,000	$ 1,402,252,000
2046	36	35.19	$ 1,696,607	$ 1,346,889	$ 461,300,000	$ 56,620,300.00	$ 18,893,598	$31,860,400	$3,910,600	$ 140,306	$ 1,143,100	$ 140,300	$ 496,000,107	$ 62,400,000	$ 1,464,652,000
2047	37	35.30	$ 1,696,607	$ 1,346,889	$ 542,500,000	$ 62,817,800.00	$ 18,957,420	$31,968,400	$3,701,700	$ 140,307	$ 1,211,700	$ 140,300	$ 577,376,707	$ 68,400,000	$ 1,533,052,000
2048	38	35.42	$ 1,696,607	$ 1,346,889	$ 638,000,000	$ 69,694,400.00	$ 19,021,242	$32,076,400	$3,504,000	$ 140,308	$ 1,284,400	$ 140,300	$ 673,057,407	$ 75,000,000	$ 1,608,052,000
2049	39	35.54	$ 1,696,607	$ 1,346,889	$ 750,300,000	$ 77,322,600.00	$ 19,085,064	$32,184,400	$3,316,800	$ 140,309	$ 1,361,500	$ 140,300	$ 785,542,507	$ 82,500,000	$ 1,690,552,000
2050	40	35.66	$ 1,696,607	$ 1,346,889	$ 882,300,000	$ 85,779,100.00	$ 19,148,886	$32,292,400	$3,139,500	$ 140,310	$ 1,443,200	$ 140,300	$ 917,732,207	$ 90,800,000	$ 1,781,352,000
2051	41	35.78	$ 1,696,607	$ 1,346,889	$ 1,037,600,000	$ 95,167,700.00	$ 19,212,707	$32,400,300	$2,971,700	$ 140,311	$ 1,529,800	$ 140,300	$ 1,073,226,707	$ 100,000,000	$ 1,881,352,000
2052	42	35.90	$ 1,696,607	$ 1,346,889	$ 1,220,200,000	$ 105,580,700.00	$ 19,276,529	$32,508,300	$2,812,900	$ 140,312	$ 1,621,600	$ 140,300	$ 1,256,026,507	$ 110,200,000	$ 1,991,552,000
2053	43	36.02	$ 1,696,607	$ 1,346,889	$ 1,435,000,000	$ 117,138,500.00	$ 19,340,351	$32,616,300	$2,662,500	$ 140,313	$ 1,718,900	$ 140,300	$ 1,471,031,807	$ 121,600,000	$ 2,113,152,000
2054	44	36.14	$ 1,696,607	$ 1,346,889	$ 1,687,500,000	$ 129,952,800.00	$ 19,404,173	$32,724,300	$2,520,100	$ 140,314	$ 1,822,000	$ 140,300	$ 1,723,742,907	$ 134,300,000	$ 2,247,452,000
2055	45	36.26	$ 1,696,607	$ 1,346,889	$ 1,984,500,000	$ 144,174,100.00	$ 19,467,995	$32,832,300	$2,385,300	$ 140,315	$ 1,931,400	$ 140,300	$ 2,020,960,307	$ 148,400,000	$ 2,395,852,000
2056	46	36.37	$ 1,696,607	$ 1,346,889	$ 2,333,800,000	$ 159,953,500.00	$ 19,531,817	$32,940,300	$2,257,700	$ 140,316	$ 2,047,300	$ 140,300	$ 2,370,484,207	$ 164,000,000	$ 2,559,852,000
2057	47	36.49	$ 1,696,607	$ 1,346,889	$ 2,744,600,000	$ 177,461,200.00	$ 19,595,639	$33,048,300	$2,136,800	$ 140,317	$ 2,170,100	$ 140,300	$ 2,781,515,007	$ 181,400,000	$ 2,741,252,000
2058	48	36.61	$ 1,696,607	$ 1,346,889	$ 3,227,600,000	$ 196,878,400.00	$ 19,659,461	$33,156,300	$2,022,500	$ 140,318	$ 2,300,400	$ 140,300	$ 3,264,753,307	$ 200,700,000	$ 2,941,952,000
2059	49	36.73	$ 1,696,607	$ 1,346,889	$ 3,795,700,000	$ 218,426,100.00	$ 19,723,283	$33,264,200	$1,914,200	$ 140,319	$ 2,438,400	$ 140,300	$ 3,833,099,207	$ 222,200,000	$ 3,164,152,000
2060	50	**36.85**	$ 1,696,607	$ 1,346,889	$ 4,463,700,000	$ 242,327,000.00	$ 19,787,105	$33,372,200	$1,811,700	$ 140,320	$ 2,584,700	$ 140,300	$ 4,501,353,507	$ 246,000,000	$ 3,410,152,000

s in desalter brine flow (Ph 1 report)		
	Cum Flow	Δflow
2010	14.74	14.74
2014	14.74	0
2015	16.5	1.76
2025	32.69	16.19
2030	36.85	4.16

Assumed Cost Components

Decentralized Plant | OCSD Plant

Inline Plant Analysis

Treatment Plant flows in bold taken from Phase I report. Others calculated assuming constant increase
This analysis does not include cost for new infrastructure for distribution of new potable water generated

One-time OCSD Treatment capacity sell back in 2025	4.66	MGD
	$ 52,753,293	2010 Dollars
	$ 116,100,000	Inflation at 2025
	$ 68,719,400	Inflation at 2025

changed inflation (see column M)

OCSD Rates *(i)*	
Rate Description	
O&M Inflation Rate 1 (IR1):	
Rate up to 2013 ($IR1_{2013}$)	10%
Rate at 2014($IR1_{2014}$)	8%
Rate at 2015($IR1_{2015}$)	7%
Rate up to 2020($IR1_{2020}$)	5.4%
Costs unchanged after 2020	0%
O&M Inflation Rate 2 (IR2):	6%
Capital Inflation Rate (CIR):	**17.6%**
Treatment Plant CIR (TCIR):	5.0%
Interest Rate (INTR):	6%
Treatment Plant O&M Inflation (TIR)	**3%**

Treatment	
Treatment	OCSD Rate
102 mg/L BOD	$274 /1000 lbs
312 mg/L TSS	$407 /1000 lbs
Flow	$179 /MG
Treatment Capacity	$11,332,000 /MG

Revenue Values

Reclaimed Water

$288 /AF EMWD 2009 Non-Agricultural-Tertiary treated, disinfected, and filtered recycled water rates

One-time sellback		
2010	$ 52,753,293	
2013	$ 77,236,096	
2014	$ 83,414,984	
2015	$ 89,254,033	
2020	$ 116,099,648	$ 89,259,754
2025	$ 116,099,648	

Calendar	2010	Treatment Plant	Water	Brine	Treatment Plant Capital Cost			Treatment Plant O&M Costs			OCSD Treatment	OCSD Treatment	OCSD CIP	OCSD Treatment Capacity Cost		
Year	n	Capacity (mgd)	Produced (mgd)	Flow (mgd)	2010 Dollars	Inflated Cost (F/P, TCIR,n)	2010 Pres Worth (P/F, INTR,n)	2010 Dollars	Inflated Cost (F/P, TIR,n)	2010 Pres Worth (P/F, INTR,n)	Flow (No ZLD) (mgd)	Flow (after ZLD) (mgd)	Sinking Fund	2010 Dollars	Inflated Cost (F/P, CIR,n)	2010 Pres Worth (P/F, INTR,n)
2010	0	**14.74**			$ -	$ -	$ -				14.74	14.74	$ 1,696,607	$ -	$ -	$ -
2011	1	15.09			$ -	$ -	$ -				15.09	15.09	$ 1,696,607	$ -	$ -	$ -
2012	2	15.44			$ -	$ -	$ -				15.44	15.44	$ 1,696,607	$ -	$ -	$ -
2013	3	15.80			$ -	$ -	$ -				15.80	15.80	$ 1,696,607	$ -	$ -	$ -
2014	4	16.15			$ -	$ -	$ -				16.15	16.15	$ 1,696,607	$ -	$ -	$ -
2015	5	**16.50**			$ -	$ -	$ -				16.50	16.50	$ 1,696,607	$ -	$ -	$ -
2016	6	18.12			$ -	$ -	$ -				18.12	18.12	$ 1,696,607	$ 18,346,508.00	$ 48,500,000.00	$ 34,190,600.00
2017	7	19.74			$ -	$ -	$ -				19.74	19.74	$ 1,696,607	$ 18,346,508.00	$ 57,100,000.00	$ 37,974,800.00
2018	8	21.36			$ -	$ -	$ -				21.36	21.36	$ 1,696,607	$ 18,346,508.00	$ 67,100,000.00	$ 42,099,400.00
2019	9	22.98			$ -	$ -	$ -				22.98	22.98	$ 1,696,607	$ 18,346,508.00	$ 78,900,000.00	$ 46,700,800.00
2020	10	24.60			$ 174,973,012.50	$ 285,000,000.00	$ 159,142,500.00				24.60	24.60	$ 1,696,607	$ 18,346,508.00	$ 92,800,000.00	$ 51,819,000.00
2021	11	26.21			$ 174,973,012.50	$ 299,300,000.00	$ 157,667,500.00				26.21	26.21	$ 1,696,607	$ 18,346,508.00	$ 109,200,000.00	$ 57,525,200.00
2022	12	27.83			$ 174,973,012.50	$ 314,200,000.00	$ 156,147,800.00				27.83	27.83	$ 1,696,607	$ 18,346,508.00	$ 128,400,000.00	$ 63,810,900.00
2023	13	29.45			$ 174,973,012.50	$ 329,900,000.00	$ 154,670,000.00				29.45	29.45	$ 1,696,607	$ 18,346,508.00	$ 151,000,000.00	$ 70,794,700.00
2024	14	31.07			$ 174,973,012.50	$ 346,400,000.00	$ 153,213,100.00				31.07	31.07	$ 1,696,607	$ 18,346,508.00	$ 177,500,000.00	$ 78,508,400.00
2025	15	**32.69**	21.74	10.95	$ -	$ -	$ -	$ 51,441,836.25	$ 80,100,000	$ 35,428,300	32.69	10.95	$ 1,696,607	$ -	$ -	$ -
2026	16	32.81	21.82	10.99	$ -	$ -	$ -	$ 51,441,836.25	$ 82,500,000	$ 34,424,400	32.81	10.99	$ 1,696,607	$ -	$ -	$ -
2027	17	32.93	21.90	11.03	$ -	$ -	$ -	$ 51,441,836.25	$ 85,000,000	$ 33,459,900	32.93	11.03	$ 1,696,607	$ -	$ -	$ -
2028	18	33.05	21.98	11.07	$ -	$ -	$ -	$ 51,441,836.25	$ 87,600,000	$ 32,531,500	33.05	11.07	$ 1,696,607	$ -	$ -	$ -
2029	19	33.17	22.06	11.11	$ -	$ -	$ -	$ 51,441,836.25	$ 90,200,000	$ 31,601,000	33.17	11.11	$ 1,696,607	$ -	$ -	$ -
2030	20	33.28	22.13	11.15	$ -	$ -	$ -	$ 51,441,836.25	$ 92,900,000	$ 30,704,700	33.28	11.15	$ 1,696,607	$ -	$ -	$ -
2031	21	33.40	22.21	11.19	$ -	$ -	$ -	$ 51,441,836.25	$ 95,700,000	$ 29,839,700	33.40	11.19	$ 1,696,607	$ -	$ -	$ -
2032	22	33.52	22.29	11.23	$ -	$ -	$ -	$ 51,441,836.25	$ 98,600,000	$ 29,003,700	33.52	11.23	$ 1,696,607	$ -	$ -	$ -
2033	23	33.64	22.37	11.27	$ -	$ -	$ -	$ 51,441,836.25	$ 101,500,000	$ 28,166,800	33.64	11.27	$ 1,696,607	$ -	$ -	$ -
2034	24	33.76	22.45	11.31	$ -	$ -	$ -	$ 51,441,836.25	$ 104,600,000	$ 27,384,000	33.76	11.31	$ 1,696,607	$ -	$ -	$ -
2035	25	33.88	22.53	11.35	$ -	$ -	$ -	$ 51,441,836.25	$ 107,700,000	$ 26,599,600	33.88	11.35	$ 1,696,607	$ -	$ -	$ -
2036	26	34.00	22.61	11.39	$ -	$ -	$ -	$ 51,441,836.25	$ 110,900,000	$ 25,839,500	34.00	11.39	$ 1,696,607	$ -	$ -	$ -
2037	27	34.12	22.69	11.43	$ -	$ -	$ -	$ 51,441,836.25	$ 114,300,000	$ 25,124,300	34.12	11.43	$ 1,696,607	$ -	$ -	$ -
2038	28	34.24	22.77	11.47	$ -	$ -	$ -	$ 51,441,836.25	$ 117,700,000	$ 24,407,200	34.24	11.47	$ 1,696,607	$ -	$ -	$ -
2039	29	34.35	22.85	11.51	$ -	$ -	$ -	$ 51,441,836.25	$ 121,200,000	$ 23,710,400	34.35	11.51	$ 1,696,607	$ -	$ -	$ -
2040	30	34.47	22.92	11.55	$ -	$ -	$ -	$ 51,441,836.25	$ 124,900,000	$ 23,051,100	34.47	11.55	$ 1,696,607	$ -	$ -	$ -
2041	31	34.59	23.00	11.59	$ -	$ -	$ -	$ 51,441,836.25	$ 128,600,000	$ 22,390,600	34.59	11.59	$ 1,696,607	$ -	$ -	$ -
2042	32	34.71	23.08	11.63	$ -	$ -	$ -	$ 51,441,836.25	$ 132,500,000	$ 21,763,800	34.71	11.63	$ 1,696,607	$ -	$ -	$ -
2043	33	34.83	23.16	11.67	$ -	$ -	$ -	$ 51,441,836.25	$ 136,400,000	$ 21,136,200	34.83	11.67	$ 1,696,607	$ -	$ -	$ -
2044	34	34.95	23.24	11.71	$ -	$ -	$ -	$ 51,441,836.25	$ 140,500,000	$ 20,539,200	34.95	11.71	$ 1,696,607	$ -	$ -	$ -
2045	35	35.07	23.32	11.75	$ -	$ -	$ -	$ 51,441,836.25	$ 144,800,000	$ 19,969,600	35.07	11.75	$ 1,696,607	$ -	$ -	$ -
2046	36	35.19	23.40	11.79	$ -	$ -	$ -	$ 51,441,836.25	$ 149,100,000	$ 19,398,700	35.19	11.79	$ 1,696,607	$ -	$ -	$ -
2047	37	35.30	23.48	11.83	$ -	$ -	$ -	$ 51,441,836.25	$ 153,600,000	$ 18,853,000	35.30	11.83	$ 1,696,607	$ -	$ -	$ -
2048	38	35.42	23.56	11.87	$ -	$ -	$ -	$ 51,441,836.25	$ 158,200,000	$ 18,318,500	35.42	11.87	$ 1,696,607	$ -	$ -	$ -
2049	39	35.54	23.64	11.91	$ -	$ -	$ -	$ 51,441,836.25	$ 162,900,000	$ 17,795,000	35.54	11.91	$ 1,696,607	$ -	$ -	$ -
2050	40	35.66	23.71	11.95	$ -	$ -	$ -	$ 51,441,836.25	$ 167,800,000	$ 17,292,700	35.66	11.95	$ 1,696,607	$ -	$ -	$ -
2051	41	35.78	23.79	11.99	$ -	$ -	$ -	$ 51,441,836.25	$ 172,800,000	$ 16,800,000	35.78	11.99	$ 1,696,607	$ -	$ -	$ -
2052	42	35.90	23.87	12.03	$ -	$ -	$ -	$ 51,441,836.25	$ 178,000,000	$ 16,326,000	35.90	12.03	$ 1,696,607	$ -	$ -	$ -
2053	43	36.02	23.95	12.07	$ -	$ -	$ -	$ 51,441,836.25	$ 183,400,000	$ 15,869,100	36.02	12.07	$ 1,696,607	$ -	$ -	$ -
2054	44	36.14	24.03	12.11	$ -	$ -	$ -	$ 51,441,836.25	$ 188,900,000	$ 15,419,800	36.14	12.11	$ 1,696,607	$ -	$ -	$ -
2055	45	36.26	24.11	12.15	$ -	$ -	$ -	$ 51,441,836.25	$ 194,500,000	$ 14,978,300	36.26	12.15	$ 1,696,607	$ -	$ -	$ -
2056	46	36.37	24.19	12.19	$ -	$ -	$ -	$ 51,441,836.25	$ 200,400,000	$ 14,559,100	36.37	12.19	$ 1,696,607	$ -	$ -	$ -
2057	47	36.49	24.27	12.23	$ -	$ -	$ -	$ 51,441,836.25	$ 206,400,000	$ 14,146,200	36.49	12.23	$ 1,696,607	$ -	$ -	$ -
2058	48	36.61	24.35	12.27	$ -	$ -	$ -	$ 51,441,836.25	$ 212,600,000	$ 13,746,400	36.61	12.27	$ 1,696,607	$ -	$ -	$ -
2059	49	36.73	24.43	12.30	$ -	$ -	$ -	$ 51,441,836.25	$ 218,900,000	$ 13,352,600	36.73	12.30	$ 1,696,607	$ -	$ -	$ -
2060	50	**36.85**	24.51	12.34	$ -	$ -	$ -	$ 51,441,836.25	$ 225,500,000	$ 12,976,500	36.85	12.34	$ 1,696,607			$ -

						Not Including Resale Value of Potable Water			Present Worth Including Revenue from Sale of Potable Water				
OCSD O&M Treatment Cost			OCSD O&M Maint. Cost			Capital + O&M	2010	2010	Revenue from Reclaimed Water			2010	2010
2010 Dollars	Inflated Cost (F/P, IR1,n)	2010 Pres Worth (P/F, INTR,n)	2010 Dollars	Inflated Cost (F/P, IR2,n)	2010 Pres Worth (P/F, INTR,n)	Costs Per Year	Present Worth (P/F, INTR, n)	Cumulative Present Worth	2010 Dollars	Inflated Revenue (F/P,IR1,n)	2010 Pres Worth (P/F,INTR,n)	Capital + OM Present Worth	Cumulative Present Worth
$ 7,914,842	$7,914,800	$7,914,800	$ 140,290	$ 140,300	$ 140,300	$ 9,751,707	$9,800,000	$9,800,000	$ -	$ -	$ -	$9,752,000	$9,752,000
$ 8,103,853	$8,914,200	$8,409,600	$ 140,290	$ 148,700	$ 140,300	$ 10,759,507	$10,200,000	$20,000,000	$ -	$ -	$ -	$10,247,000	$19,999,000
$ 8,292,864	$10,034,400	$8,930,600	$ 140,290	$ 157,600	$ 140,300	$ 11,888,607	$10,600,000	$30,600,000	$ -	$ -	$ -	$10,768,000	$30,767,000
$ 8,481,875	$11,289,400	$9,478,800	$ 140,290	$ 167,100	$ 140,300	$ 13,153,107	$11,000,000	$41,600,000	$ -	$ -	$ -	$11,316,000	$42,083,000
$ 8,670,887	$11,796,600	$9,344,000	$ 140,290	$ 177,100	$ 140,300	$ 13,670,307	$10,800,000	$52,400,000	$ -	$ -	$ -	$11,181,000	$53,264,000
$ 8,859,898	$12,426,500	$9,285,800	$ 140,290	$ 187,700	$ 140,300	$ 14,310,807	$10,700,000	$63,100,000	$ -	$ -	$ -	$11,123,000	$64,387,000
$ 9,729,242	$13,339,000	$9,403,500	$ 140,290	$ 199,000	$ 140,300	$ 63,734,607	$44,900,000	$108,000,000	$ -	$ -	$ -	$45,431,000	$109,818,000
$ 10,598,586	$15,315,500	$10,185,700	$ 140,290	$ 210,900	$ 140,300	$ 74,323,007	$49,400,000	$157,400,000	$ -	$ -	$ -	$49,997,000	$159,815,000
$ 11,467,929	$17,466,700	$10,958,800	$ 140,290	$ 223,600	$ 140,300	$ 86,486,907	$54,300,000	$211,700,000	$ -	$ -	$ -	$54,895,000	$214,710,000
$ 12,337,273	$19,805,400	$11,722,800	$ 140,290	$ 237,000	$ 140,300	$ 100,639,007	$59,600,000	$271,300,000	$ -	$ -	$ -	$60,261,000	$274,971,000
$ 13,206,617	$22,345,900	$12,477,800	$ 140,290	$ 251,200	$ 140,300	$ 402,093,707	$224,500,000	$495,800,000	$ -	$ -	$ -	$225,276,000	$500,247,000
$ 14,075,961	$23,816,800	$12,546,400	$ 140,290	$ 266,300	$ 140,300	$ 434,279,707	$228,800,000	$724,600,000	$ -	$ -	$ -	$229,576,000	$729,823,000
$ 14,945,305	$25,287,800	$12,567,300	$ 140,290	$ 282,300	$ 140,300	$ 469,866,707	$233,500,000	$958,100,000	$ -	$ -	$ -	$234,363,000	$964,186,000
$ 15,814,649	$26,758,700	$12,545,500	$ 140,290	$ 299,200	$ 140,300	$ 509,654,507	$238,900,000	$1,197,000,000	$ -	$ -	$ -	$239,847,000	$1,204,033,000
$ 16,683,993	$28,229,700	$12,486,000	$ 140,290	$ 317,200	$ 140,300	$ 554,143,507	$245,100,000	$1,442,100,000	$ -	$ -	$ -	$246,044,000	$1,450,077,000
$ 5,880,368	$9,949,700	$4,151,700	$ 140,290	$ 336,200	$ 140,300	$ (24,017,493)	($10,000,000)	$1,432,100,000	$ 7,013,462	$ 29,300,000	$ 12,225,900	-$39,528,000	$1,410,549,000
$ 5,901,748	$9,985,900	$3,930,900	$ 140,290	$ 356,400	$ 140,300	$ 94,538,907	$37,200,000	$1,469,300,000	$ 7,038,962	$ 32,300,000	$ 12,714,800	$27,477,000	$1,438,026,000
$ 5,923,129	$10,022,100	$3,721,900	$ 140,290	$ 377,800	$ 140,300	$ 97,096,507	$36,100,000	$1,505,400,000	$ 7,064,462	$ 35,700,000	$ 13,257,700	$25,761,000	$1,463,787,000
$ 5,944,509	$10,058,200	$3,523,800	$ 140,290	$ 400,400	$ 140,300	$ 99,755,207	$34,900,000	$1,540,300,000	$ 7,089,962	$ 39,400,000	$ 13,803,500	$24,089,000	$1,487,876,000
$ 5,965,889	$10,094,400	$3,336,300	$ 140,290	$ 424,500	$ 140,300	$ 102,415,507	$33,800,000	$1,574,100,000	$ 7,115,463	$ 43,500,000	$ 14,377,300	$22,397,000	$1,510,273,000
$ 5,987,270	$10,130,600	$3,158,800	$ 140,290	$ 449,900	$ 140,300	$ 105,177,107	$32,800,000	$1,606,900,000	$ 7,140,963	$ 48,000,000	$ 14,966,600	$20,734,000	$1,531,007,000
$ 6,008,650	$10,166,800	$2,990,600	$ 140,290	$ 476,900	$ 140,300	$ 108,040,307	$31,800,000	$1,638,700,000	$ 7,166,463	$ 53,000,000	$ 15,590,200	$19,077,000	$1,550,084,000
$ 6,030,030	$10,202,900	$2,831,400	$ 140,290	$ 505,500	$ 140,300	$ 111,005,007	$30,800,000	$1,669,500,000	$ 7,191,963	$ 58,500,000	$ 16,234,000	$17,438,000	$1,567,522,000
$ 6,051,411	$10,239,100	$2,680,600	$ 140,290	$ 535,900	$ 140,300	$ 113,971,607	$29,800,000	$1,699,300,000	$ 7,217,463	$ 64,600,000	$ 16,912,100	$15,772,000	$1,583,294,000
$ 6,072,791	$10,275,300	$2,537,800	$ 140,290	$ 568,000	$ 140,300	$ 117,139,907	$28,900,000	$1,728,200,000	$ 7,242,963	$ 71,300,000	$ 17,609,600	$14,149,000	$1,597,443,000
$ 6,094,171	$10,311,500	$2,402,600	$ 140,290	$ 602,100	$ 140,300	$ 120,310,207	$28,000,000	$1,756,200,000	$ 7,268,464	$ 78,800,000	$ 18,360,300	$12,479,000	$1,609,922,000
$ 6,115,552	$10,347,700	$2,274,500	$ 140,290	$ 638,200	$ 140,300	$ 123,582,507	$27,200,000	$1,783,400,000	$ 7,293,964	$ 86,900,000	$ 19,101,500	$10,849,000	$1,620,771,000
$ 6,136,932	$10,383,800	$2,153,300	$ 140,290	$ 676,500	$ 140,300	$ 127,056,907	$26,300,000	$1,809,700,000	$ 7,319,464	$ 96,000,000	$ 19,907,300	$9,207,000	$1,629,978,000
$ 6,158,312	$10,420,000	$2,038,500	$ 140,290	$ 717,100	$ 140,300	$ 130,533,707	$25,500,000	$1,835,200,000	$ 7,344,964	$ 105,900,000	$ 20,717,200	$7,565,000	$1,637,543,000
$ 6,179,693	$10,456,200	$1,929,800	$ 140,290	$ 760,100	$ 140,300	$ 134,112,907	$24,800,000	$1,860,000,000	$ 7,370,464	$ 116,900,000	$ 21,574,700	$5,902,000	$1,643,445,000
$ 6,201,073	$10,492,400	$1,826,800	$ 140,290	$ 805,800	$ 140,300	$ 137,894,807	$24,000,000	$1,884,000,000	$ 7,395,964	$ 129,100,000	$ 22,477,600	$4,237,000	$1,647,682,000
$ 6,222,453	$10,528,500	$1,729,400	$ 140,290	$ 854,100	$ 140,300	$ 141,679,207	$23,300,000	$1,907,300,000	$ 7,421,464	$ 142,500,000	$ 23,406,300	$2,551,000	$1,650,233,000
$ 6,243,834	$10,564,700	$1,637,100	$ 140,290	$ 905,300	$ 140,300	$ 145,666,607	$22,600,000	$1,929,900,000	$ 7,446,965	$ 157,200,000	$ 24,359,300	$879,000	$1,651,112,000
$ 6,265,214	$10,600,900	$1,549,700	$ 140,290	$ 959,700	$ 140,300	$ 149,657,207	$21,900,000	$1,951,800,000	$ 7,472,465	$ 173,500,000	$ 25,363,300	-$840,000	$1,650,272,000
$ 6,286,595	$10,637,100	$1,467,000	$ 140,290	$ 1,017,200	$ 140,300	$ 153,850,907	$21,200,000	$1,973,000,000	$ 7,497,965	$ 191,600,000	$ 26,423,800	-$2,581,000	$1,647,691,000
$ 6,307,975	$10,673,200	$1,388,600	$ 140,290	$ 1,078,300	$ 140,300	$ 158,248,107	$20,600,000	$1,993,600,000	$ 7,523,465	$ 211,400,000	$ 27,504,200	-$4,309,000	$1,643,382,000
$ 6,329,355	$10,709,400	$1,314,500	$ 140,290	$ 1,143,000	$ 140,300	$ 162,649,007	$20,000,000	$2,013,600,000	$ 7,548,965	$ 233,400,000	$ 28,647,700	-$6,098,000	$1,637,284,000
$ 6,350,736	$10,745,600	$1,244,300	$ 140,290	$ 1,211,600	$ 140,300	$ 167,253,807	$19,400,000	$2,033,000,000	$ 7,574,465	$ 257,600,000	$ 29,828,300	-$7,894,000	$1,629,390,000
$ 6,372,116	$10,781,800	$1,177,800	$ 140,290	$ 1,284,300	$ 140,300	$ 171,962,707	$18,800,000	$2,051,800,000	$ 7,599,966	$ 284,300,000	$ 31,056,600	-$9,723,000	$1,619,667,000
$ 6,393,496	$10,817,900	$1,114,800	$ 140,290	$ 1,361,300	$ 140,300	$ 176,775,807	$18,200,000	$2,070,000,000	$ 7,625,466	$ 313,700,000	$ 32,328,500	-$11,582,000	$1,608,085,000
$ 6,414,877	$10,854,100	$1,055,300	$ 140,290	$ 1,443,000	$ 140,300	$ 181,793,707	$17,700,000	$2,087,700,000	$ 7,650,966	$ 346,300,000	$ 33,668,000	-$13,483,000	$1,594,602,000
$ 6,436,257	$10,890,300	$998,800	$ 140,290	$ 1,529,600	$ 140,300	$ 186,916,507	$17,100,000	$2,104,800,000	$ 7,676,466	$ 382,200,000	$ 35,055,000	-$15,419,000	$1,579,183,000
$ 6,457,637	$10,926,500	$945,400	$ 140,290	$ 1,621,300	$ 140,300	$ 192,244,407	$16,600,000	$2,121,400,000	$ 7,701,966	$ 421,800,000	$ 36,497,300	-$17,389,000	$1,561,794,000
$ 6,479,018	$10,962,600	$894,900	$ 140,290	$ 1,718,600	$ 140,300	$ 197,777,807	$16,100,000	$2,137,500,000	$ 7,727,466	$ 465,500,000	$ 37,998,600	-$19,398,000	$1,542,396,000
$ 6,500,398	$10,998,800	$847,000	$ 140,290	$ 1,821,700	$ 140,300	$ 203,417,107	$15,700,000	$2,153,200,000	$ 7,752,967	$ 513,700,000	$ 39,559,600	-$21,456,000	$1,520,940,000
$ 6,521,778	$11,035,000	$801,700	$ 140,290	$ 1,931,000	$ 140,300	$ 209,162,607	$15,200,000	$2,168,400,000	$ 7,778,467	$ 567,000,000	$ 41,192,600	-$23,576,000	$1,497,364,000
$ 6,543,159	$11,071,200	$758,800	$ 140,290	$ 2,046,900	$ 140,300	$ 215,214,707	$14,800,000	$2,183,200,000	$ 7,803,967	$ 625,700,000	$ 42,884,100	-$25,729,000	$1,471,635,000
$ 6,564,539	$11,107,300	$718,200	$ 140,290	$ 2,169,700	$ 140,300	$ 221,373,607	$14,300,000	$2,197,500,000	$ 7,829,467	$ 690,500,000	$ 44,646,600	-$27,945,000	$1,443,690,000
$ 6,585,919	$11,143,500	$679,700	$ 140,290	$ 2,299,900	$ 140,300	$ 227,740,007	$13,900,000	$2,211,400,000	$ 7,854,967	$ 762,100,000	$ 46,486,900	-$30,224,000	$1,413,466,000
$ 6,607,300	$11,179,700	$643,300	$ 140,290	$ 2,437,900	$ 140,300	$ 234,214,207	$13,500,000	$2,224,900,000	$ 7,880,467	$ 841,000,000	$ 48,395,900	-$32,563,000	$1,380,903,000
$ 6,628,680	$11,215,900	$608,900	$ 140,290	$ 2,584,200	$ 140,300	$ 240,996,707	$13,100,000	$2,238,000,000	$ 7,905,967	$ 928,100,000	$ 50,385,000	-$34,963,000	$1,345,940,000

$1,647,682,000

esalter brine flow (Ph 1 report, Table 6-4)

	Cum Flow	Δflow
2010	10.55	10.55
2014	10.55	0
2015	10.87	0.32
2025	15.87	5
2030	15.87	0

Treatment Plant flows in bold taken from Phase I report. Others calculated assuming constant increase
This analysis does not include cost for new infrastructure for distribution of new potable water generated

Assumed Cost Components

Decentralized Plant OCSD Plant

Decentralized Plant Analysis

OCSD Rates *(i)*	
Rate Description	
O&M Inflation Rate 1 (IR1):	
Rate up to 2013 ($IR1_{2013}$)	10%
Rate at 2014($IR1_{2014}$)	8%
Rate at 2015($IR1_{2015}$)	7%
Rate up to 2020($IR1_{2020}$)	5.4%
Costs unchanged after 2020	0%
O&M Inflation Rate 2 (IR2):	6%
Capital Inflation Rate (CIR):	**17.6%**
Treatment Plant CIR (TCIR):	5.0%
Interest Rate (INTR):	6%
Treatment Plant O&M Inflation (TIR)	**3%**

Treatment	
Treatment	OCSD Rate
102 mg/L BOD	$274 /1000 lbs
312 mg/L TSS	$407 /1000 lbs
Flow	$179 /MG
Treatment Capacity	$11,332,000

Revenue Rates

Potable Water $645 /AF EMWD Feb 2010 new rate to residential customers (Indoor Tier 1)

Calendar Year	2010 n	Decen (Brine Min) Treatment Plant Capacity (mgd)	Water Produced (mgd)	Brine Flow (mgd)	Decen (Brine Min) Treatment Plant Capital Cost: 2010 Dollars	Capital Cost: Inflated Cost (F/P, TCIR,n)	Capital Cost: 2010 Pres Worth (P/F, INTR,n)	Decen (Brine Min) Treatment Plant O&M Costs: 2010 Dollars	O&M: Inflated Cost (F/P, TIR,n)	O&M: 2010 Pres Worth (P/F, INTR,n)	OCSD Treatment Flow (No ZLD) (mgd)	OCSD Treatment Flow (after ZLD) (mgd)	OCSD CIP Sinking Fund	OCSD Treatment Capacity Cost: 2010 Dollars	Capacity: Inflated Cost (F/P, CIR,n)	Capacity: 2010 Pres Worth (P/F, INTR,n)
2010	0					$ -	$ -				14.74	14.74	$ 1,696,607	$ -	$ -	$ -
2011	1				$ -	$ -	$ -				15.09	15.09	$ 1,696,607	$ -	$ -	$ -
2012	2				$ -	$ -	$ -				15.44	15.44	$ 1,696,607	$ -	$ -	$ -
2013	3				$ -	$ -	$ -				15.80	15.80	$ 1,696,607	$ -	$ -	$ -
2014	4				$ -	$ -	$ -				16.15	16.15	$ 1,696,607	$ -	$ -	$ -
2015	5	**0.00**	0.00	0.00	$ 19,800,602	$ 25,300,000.00	$ 18,905,600.00	$ -	$ -	$ -	16.50	16.50	$ 1,696,607	$ -	$ -	$ -
2016	6	1.59	1.06	0.53	$ 19,800,602	$ 26,500,000.00	$ 18,681,500.00	$ 2,215,422.60	$ 3,600,000	$ 1,502,200	18.12	17.06	$ 1,696,607	$ 6,387,225.14	$ 16,900,000	$ 11,913,800.00
2017	7	3.17	2.11	1.06	$ 19,800,602	$ 27,900,000.00	$ 18,555,100.00	$ 4,430,845.20	$ 7,300,000	$ 2,873,600	19.74	17.63	$ 1,696,607	$ 6,387,225.14	$ 19,900,000	$ 13,234,600.00
2018	8	4.76	3.17	1.59	$ 19,800,602	$ 29,300,000.00	$ 18,383,200.00	$ 6,646,267.80	$ 11,300,000	$ 4,196,400	21.36	18.19	$ 1,696,607	$ 6,387,225.14	$ 23,400,000	$ 14,681,400.00
2019	9	6.35	4.22	2.13	$ 19,800,602	$ 30,700,000.00	$ 18,171,300.00	$ 8,861,690.40	$ 15,500,000	$ 5,430,300	22.98	18.75	$ 1,696,607	$ 6,387,225.14	$ 27,500,000	$ 16,277,200.00
2020	10	7.94	5.28	2.66	$ 19,800,602	$ 32,300,000.00	$ 18,036,200.00	$ 11,077,113.00	$ 20,000,000	$ 6,610,300	24.60	19.32	$ 1,696,607	$ 6,387,225.14	$ 32,300,000	$ 18,036,200.00
2021	11	9.52	6.33	3.19	$ 19,800,602	$ 33,900,000.00	$ 17,858,100.00	$ 13,292,535.60	$ 24,700,000	$ 7,701,600	26.21	19.88	$ 1,696,607	$ 6,387,225.14	$ 38,000,000	$ 20,017,900.00
2022	12	11.11	7.39	3.72	$ 19,800,602	$ 35,600,000.00	$ 17,692,100.00	$ 15,507,958.20	$ 29,700,000	$ 8,736,400	27.83	20.45	$ 1,696,607	$ 6,387,225.14	$ 44,700,000	$ 22,214,500.00
2023	13	12.70	8.44	4.25	$ 19,800,602	$ 37,300,000.00	$ 17,487,700.00	$ 17,723,380.80	$ 35,000,000	$ 9,712,700	29.45	21.01	$ 1,696,607	$ 6,387,225.14	$ 52,600,000	$ 24,660,900.00
2024	14	14.28	9.50	4.78	$ 19,800,602	$ 39,200,000.00	$ 17,338,200.00	$ 19,938,803.39	$ 40,500,000	$ 10,602,800	31.07	21.57	$ 1,696,607	$ 6,387,225.14	$ 61,800,000	$ 27,334,200.00
2025	15	**15.87**	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 46,400,000	$ 11,459,800	32.69	22.14	$ 1,696,607	$ 6,387,225.14	$ 72,700,000	$ 30,335,200.00
2026	16	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 35,600,000	$ 14,854,600	32.81	22.26	$ 1,696,607	$ 1,346,889.14	$ 18,000,000	$ 7,085,600.00
2027	17	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 36,600,000	$ 14,407,500	32.93	22.37	$ 1,696,607	$ 1,346,889.14	$ 21,200,000	$ 7,872,900.00
2028	18	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 37,700,000	$ 14,000,400	33.05	22.49	$ 1,696,607	$ 1,346,889.14	$ 24,900,000	$ 8,723,600.00
2029	19	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 38,800,000	$ 13,593,300	33.17	22.61	$ 1,696,607	$ 1,346,889.14	$ 29,300,000	$ 9,684,000.00
2030	20	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 40,000,000	$ 13,220,500	33.28	22.73	$ 1,696,607	$ 1,346,889.14	$ 34,500,000	$ 10,757,300.00
2031	21	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 41,200,000	$ 12,846,400	33.40	22.85	$ 1,696,607	$ 1,346,889.14	$ 40,500,000	$ 11,913,300.00
2032	22	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 42,400,000	$ 12,472,200	33.52	22.97	$ 1,696,607	$ 1,346,889.14	$ 47,700,000	$ 13,237,000.00
2033	23	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 43,700,000	$ 12,127,000	33.64	23.09	$ 1,696,607	$ 1,346,889.14	$ 56,100,000	$ 14,686,800.00
2034	24	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 45,000,000	$ 11,780,900	33.76	23.21	$ 1,696,607	$ 1,346,889.14	$ 65,900,000	$ 16,275,900.00
2035	25	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 46,400,000	$ 11,459,800	33.88	23.33	$ 1,696,607	$ 1,346,889.14	$ 77,500,000	$ 18,057,400.00
2036	26	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 47,800,000	$ 11,137,300	34.00	23.44	$ 1,696,607	$ 1,346,889.14	$ 91,200,000	$ 20,046,700.00
2037	27	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 49,200,000	$ 10,814,700	34.12	23.56	$ 1,696,607	$ 1,346,889.14	$ 107,200,000	$ 22,229,800.00
2038	28	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 50,700,000	$ 10,513,600	34.24	23.68	$ 1,696,607	$ 1,346,889.14	$ 126,100,000	$ 24,669,000.00
2039	29	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 52,200,000	$ 10,211,900	34.35	23.80	$ 1,696,607	$ 1,346,889.14	$ 148,300,000	$ 27,369,800.00
2040	30	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 53,800,000	$ 9,929,200	34.47	23.92	$ 1,696,607	$ 1,346,889.14	$ 174,400,000	$ 30,364,800.00
2041	31	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 55,400,000	$ 9,645,700	34.59	24.04	$ 1,696,607	$ 1,346,889.14	$ 205,100,000	$ 33,688,700.00
2042	32	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 57,000,000	$ 9,362,500	34.71	24.16	$ 1,696,607	$ 1,346,889.14	$ 241,200,000	$ 37,375,700.00
2043	33	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 58,800,000	$ 9,111,500	34.83	24.28	$ 1,696,607	$ 1,346,889.14	$ 283,600,000	$ 41,458,400.00
2044	34	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 60,500,000	$ 8,844,300	34.95	24.39	$ 1,696,607	$ 1,346,889.14	$ 333,600,000	$ 46,007,300.00
2045	35	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 62,300,000	$ 8,591,900	35.07	24.51	$ 1,696,607	$ 1,346,889.14	$ 392,300,000	$ 51,040,300.00
2046	36	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 64,200,000	$ 8,352,800	35.19	24.63	$ 1,696,607	$ 1,346,889.14	$ 461,300,000	$ 56,620,300.00
2047	37	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 66,100,000	$ 8,113,200	35.30	24.75	$ 1,696,607	$ 1,346,889.14	$ 542,500,000	$ 62,817,800.00
2048	38	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 68,100,000	$ 7,885,500	35.42	24.87	$ 1,696,607	$ 1,346,889.14	$ 638,000,000	$ 69,694,400.00
2049	39	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 70,200,000	$ 7,668,600	35.54	24.99	$ 1,696,607	$ 1,346,889.14	$ 750,300,000	$ 77,322,600.00
2050	40	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 72,300,000	$ 7,450,900	35.66	25.11	$ 1,696,607	$ 1,346,889.14	$ 882,300,000	$ 85,779,100.00
2051	41	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 74,400,000	$ 7,233,300	35.78	25.23	$ 1,696,607	$ 1,346,889.14	$ 1,037,600,000	$ 95,167,700.00
2052	42	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 76,700,000	$ 7,034,900	35.90	25.35	$ 1,696,607	$ 1,346,889.14	$ 1,220,200,000	$ 105,580,700.00
2053	43	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 79,000,000	$ 6,835,700	36.02	25.46	$ 1,696,607	$ 1,346,889.14	$ 1,435,000,000	$ 117,138,500.00
2054	44	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 81,300,000	$ 6,636,500	36.14	25.58	$ 1,696,607	$ 1,346,889.14	$ 1,687,500,000	$ 129,952,800.00
2055	45	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 83,800,000	$ 6,453,400	36.26	25.70	$ 1,696,607	$ 1,346,889.14	$ 1,984,500,000	$ 144,174,100.00
2056	46	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 86,300,000	$ 6,269,700	36.37	25.82	$ 1,696,607	$ 1,346,889.14	$ 2,333,800,000	$ 159,953,500.00
2057	47	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 88,900,000	$ 6,093,000	36.49	25.94	$ 1,696,607	$ 1,346,889.14	$ 2,744,600,000	$ 177,461,200.00
2058	48	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 91,500,000	$ 5,916,200	36.61	26.06	$ 1,696,607	$ 1,346,889.14	$ 3,227,600,000	$ 196,878,400.00
2059	49	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 94,300,000	$ 5,752,100	36.73	26.18	$ 1,696,607	$ 1,346,889.14	$ 3,795,700,000	$ 218,426,100.00
2060	50	15.87	10.55	5.32	$ -	$ -	$ -	$ 22,154,225.99	$ 97,100,000	$ 5,587,700	36.85	26.30	$ 1,696,607	$ 1,346,889.14	$ 4,463,700,000	$ 242,327,000.00

						Not Including Resale Value of Potable Water			Present Worth Including Revenue from Sale of Potable Water					For Decentralized ZLD + Ocean Discharge	
OCSD O&M Treatment Cost			OCSD O&M Maint. Cost			Capital + O&M	2010	2010	Revenue from Reclaimed Water			2010	2010	2010	2010
2010 Dollars	Inflated Cost (F/P, IR1,n)	2010 Pres Worth (P/F, INTR,n)	2010 Dollars	Inflated Cost (F/P, IR2,n)	2010 Pres Worth (P/F, INTR,n)	Costs Per Year	Present Worth (P/F, INTR, n)	Cumulative Present Worth	2010 Dollars	Inflated Revenue (F/P,IR1,n)	2010 Pres Worth (P/F,INTR,n)	Capital + OM Present Worth	Cumulative Present Worth	Capital + OM Present Worth	Cumulative Present Worth
$ 7,914,842	$7,914,800	$7,914,800	$ 140,290	$ 140,300	$ 140,300	$ 9,751,707	$9,751,707	$9,751,707	$ -	$ -	$ -	9,751,700	9,751,700	0	0
$ 8,103,853	$8,914,200	$8,409,600	$ 140,290	$ 148,700	$ 140,300	$ 10,759,507	$10,200,000	$19,951,707	$ -	$ -	$ -	10,246,500	19,998,200	0	0
$ 8,292,864	$10,034,400	$8,930,600	$ 140,290	$ 157,600	$ 140,300	$ 11,888,607	$10,600,000	$30,551,707	$ -	$ -	$ -	10,767,500	30,765,700	0	0
$ 8,481,875	$11,289,400	$9,478,800	$ 140,290	$ 167,100	$ 140,300	$ 13,153,107	$11,000,000	$41,551,707	$ -	$ -	$ -	11,315,700	42,081,400	0	0
$ 8,670,887	$11,796,600	$9,344,000	$ 140,290	$ 177,100	$ 140,300	$ 13,670,307	$10,800,000	$52,351,707	$ -	$ -	$ -	11,180,900	53,262,300	0	0
$ 8,859,898	$12,426,500	$9,285,800	$ 140,290	$ 187,700	$ 140,300	$ 39,610,807	$29,600,000	$81,951,707	$ -	$ -	$ -	30,028,300	83,290,600	18,905,600	18,905,600
$ 9,162,555	$12,562,000	$8,855,700	$ 140,290	$ 199,000	$ 140,300	$ 61,457,607	$43,300,000	$125,251,707	$ 762,538	$ 1,400,000	$ 986,900	41,803,200	125,093,800	19,196,800	38,102,400
$ 9,465,211	$13,677,700	$9,096,500	$ 140,290	$ 210,900	$ 140,300	$ 70,685,207	$47,000,000	$172,251,707	$ 1,525,077	$ 3,000,000	$ 1,995,200	43,601,500	168,695,300	19,433,500	57,535,900
$ 9,767,868	$14,877,300	$9,334,200	$ 140,290	$ 223,600	$ 140,300	$ 80,797,507	$50,700,000	$222,951,707	$ 2,287,615	$ 4,900,000	$ 3,074,300	45,357,800	214,053,100	19,505,300	77,041,200
$ 10,070,525	$16,166,600	$9,569,000	$ 140,290	$ 237,000	$ 140,300	$ 91,800,207	$54,300,000	$277,251,707	$ 3,050,153	$ 7,200,000	$ 4,261,700	47,023,000	261,076,100	19,339,900	96,381,100
$ 10,373,182	$17,551,700	$9,800,800	$ 140,290	$ 251,200	$ 140,300	$ 104,099,507	$58,100,000	$335,351,707	$ 3,812,692	$ 9,900,000	$ 5,528,100	48,792,300	309,868,400	19,118,400	115,499,500
$ 10,675,839	$18,063,800	$9,515,800	$ 140,290	$ 266,300	$ 140,300	$ 116,626,707	$61,400,000	$396,751,707	$ 4,575,230	$ 13,100,000	$ 6,900,900	50,029,400	359,897,800	18,658,800	134,158,300
$ 10,978,495	$18,575,900	$9,231,700	$ 140,290	$ 282,300	$ 140,300	$ 130,554,807	$64,900,000	$461,651,707	$ 5,337,768	$ 16,800,000	$ 8,349,100	51,362,500	411,260,300	18,079,400	152,237,700
$ 11,281,152	$19,088,000	$8,949,200	$ 140,290	$ 299,200	$ 140,300	$ 145,983,807	$68,400,000	$530,051,707	$ 6,100,307	$ 21,100,000	$ 9,892,500	52,754,900	464,015,200	17,307,900	169,545,600
$ 11,583,809	$19,600,100	$8,669,100	$ 140,290	$ 317,200	$ 140,300	$ 163,113,907	$72,100,000	$602,151,707	$ 6,862,845	$ 26,100,000	$ 11,544,100	54,237,100	518,252,300	16,396,900	185,942,500
$ 11,886,466	$20,112,200	$8,392,100	$ 140,290	$ 336,200	$ 140,300	$ 141,245,007	$58,900,000	$661,051,707	$ 7,625,383	$ 31,900,000	$ 13,310,800	38,713,200	556,965,500	-1,851,000	184,091,500
$ 11,950,288	$20,220,200	$7,959,600	$ 140,290	$ 356,400	$ 140,300	$ 75,873,207	$29,900,000	$690,951,707	$ 7,625,383	$ 35,000,000	$ 13,777,600	17,959,100	574,924,600	1,077,000	185,168,500
$ 12,014,110	$20,328,100	$7,549,100	$ 140,290	$ 377,800	$ 140,300	$ 80,202,507	$29,800,000	$720,751,707	$ 7,625,383	$ 38,500,000	$ 14,297,500	17,368,900	592,293,500	110,000	185,278,500
$ 12,077,932	$20,436,100	$7,159,700	$ 140,290	$ 400,400	$ 140,300	$ 85,133,107	$29,800,000	$750,551,707	$ 7,625,383	$ 42,400,000	$ 14,854,600	16,866,000	609,159,500	-854,200	184,424,300
$ 12,141,753	$20,544,100	$6,790,100	$ 140,290	$ 424,500	$ 140,300	$ 90,765,207	$30,000,000	$780,551,707	$ 7,625,383	$ 46,600,000	$ 15,401,900	16,502,400	625,661,900	-1,808,600	182,615,700
$ 12,205,575	$20,652,100	$6,439,400	$ 140,290	$ 449,900	$ 140,300	$ 97,298,607	$30,300,000	$810,851,707	$ 7,625,383	$ 51,300,000	$ 15,995,600	16,258,500	641,920,400	-2,775,100	179,840,600
$ 12,269,397	$20,760,100	$6,106,700	$ 140,290	$ 476,900	$ 140,300	$ 104,633,607	$30,800,000	$841,651,707	$ 7,625,383	$ 56,400,000	$ 16,590,400	16,112,900	658,033,300	-3,744,000	176,096,600
$ 12,333,219	$20,868,100	$5,791,000	$ 140,290	$ 505,500	$ 140,300	$ 113,170,207	$31,400,000	$873,051,707	$ 7,625,383	$ 62,100,000	$ 17,233,100	16,104,000	674,137,300	-4,760,900	171,335,700
$ 12,397,041	$20,976,100	$5,491,500	$ 140,290	$ 535,900	$ 140,300	$ 123,008,607	$32,200,000	$905,251,707	$ 7,625,383	$ 68,300,000	$ 17,880,800	16,261,400	690,398,700	-5,753,800	165,581,900
$ 12,460,863	$21,084,100	$5,207,300	$ 140,290	$ 568,000	$ 140,300	$ 134,248,707	$33,200,000	$938,451,707	$ 7,625,383	$ 75,100,000	$ 18,548,100	16,552,900	706,951,600	-6,767,200	158,814,700
$ 12,524,685	$21,192,000	$4,937,700	$ 140,290	$ 602,100	$ 140,300	$ 147,390,707	$34,300,000	$972,751,707	$ 7,625,383	$ 82,600,000	$ 19,245,700	17,046,100	723,997,700	-7,785,900	151,028,800
$ 12,588,507	$21,300,000	$4,682,000	$ 140,290	$ 638,200	$ 140,300	$ 162,634,807	$35,700,000	$1,008,451,707	$ 7,625,383	$ 90,900,000	$ 19,980,700	17,722,200	741,719,900	-8,843,400	142,185,400
$ 12,652,329	$21,408,000	$4,439,300	$ 140,290	$ 676,500	$ 140,300	$ 180,181,107	$37,400,000	$1,045,851,707	$ 7,625,383	$ 100,000,000	$ 20,736,800	18,583,900	760,303,800	-9,922,100	132,263,300
$ 12,716,151	$21,516,000	$4,209,200	$ 140,290	$ 717,100	$ 140,300	$ 200,729,707	$39,300,000	$1,085,151,707	$ 7,625,383	$ 110,000,000	$ 21,519,300	19,709,400	780,013,200	-11,005,700	121,257,600
$ 12,779,973	$21,624,000	$3,990,900	$ 140,290	$ 760,100	$ 140,300	$ 224,580,707	$41,400,000	$1,126,551,707	$ 7,625,383	$ 121,000,000	$ 22,331,400	21,078,100	801,091,300	-12,119,500	109,138,100
$ 12,843,795	$21,732,000	$3,783,800	$ 140,290	$ 805,800	$ 140,300	$ 252,434,407	$44,000,000	$1,170,551,707	$ 7,625,383	$ 133,100,000	$ 23,174,100	22,740,600	823,831,900	-13,244,900	95,893,200
$ 12,907,617	$21,840,000	$3,587,300	$ 140,290	$ 854,100	$ 140,300	$ 284,890,707	$46,800,000	$1,217,351,707	$ 7,625,383	$ 146,400,000	$ 24,046,900	24,711,700	848,543,600	-14,401,200	81,492,000
$ 12,971,439	$21,948,000	$3,401,000	$ 140,290	$ 905,300	$ 140,300	$ 322,749,907	$50,000,000	$1,267,351,707	$ 7,625,383	$ 161,000,000	$ 24,948,100	27,028,000	875,571,600	-15,585,600	65,906,400
$ 13,035,261	$22,056,000	$3,224,300	$ 140,290	$ 959,700	$ 140,300	$ 367,112,307	$53,700,000	$1,321,051,707	$ 7,625,383	$ 177,100,000	$ 25,889,600	29,741,500	905,313,100	-16,778,100	49,128,300
$ 13,099,083	$22,163,900	$3,056,700	$ 140,290	$ 1,017,200	$ 140,300	$ 418,977,707	$57,800,000	$1,378,851,707	$ 7,625,383	$ 194,800,000	$ 26,865,200	32,880,000	938,193,100	-18,020,900	31,107,400
$ 13,162,905	$22,271,900	$2,897,700	$ 140,290	$ 1,078,300	$ 140,300	$ 479,646,807	$62,400,000	$1,441,251,707	$ 7,625,383	$ 214,300,000	$ 27,881,500	36,485,300	974,678,400	-19,289,600	11,817,800
$ 13,226,727	$22,379,900	$2,746,900	$ 140,290	$ 1,143,000	$ 140,300	$ 550,719,507	$67,600,000	$1,508,851,707	$ 7,625,383	$ 235,700,000	$ 28,930,000	40,626,900	1,015,305,300	-20,577,200	-8,759,400
$ 13,290,549	$22,487,900	$2,603,900	$ 140,290	$ 1,211,600	$ 140,300	$ 633,996,107	$73,400,000	$1,582,251,707	$ 7,625,383	$ 259,300,000	$ 30,025,200	45,346,600	1,060,651,900	-21,912,000	-30,671,400
$ 13,354,370	$22,595,900	$2,468,400	$ 140,290	$ 1,284,300	$ 140,300	$ 731,676,807	$79,900,000	$1,662,151,707	$ 7,625,383	$ 285,200,000	$ 31,154,900	50,730,300	1,111,382,200	-23,269,400	-53,940,800
$ 13,418,192	$22,703,900	$2,339,800	$ 140,290	$ 1,361,300	$ 140,300	$ 846,261,807	$87,200,000	$1,749,351,707	$ 7,625,383	$ 313,700,000	$ 32,328,500	56,839,400	1,168,221,600	-24,659,900	-78,600,700
$ 13,482,014	$22,811,900	$2,217,800	$ 140,290	$ 1,443,000	$ 140,300	$ 980,551,507	$95,300,000	$1,844,651,707	$ 7,625,383	$ 345,100,000	$ 33,551,400	63,733,300	1,231,954,900	-26,100,500	-104,701,200
$ 13,545,836	$22,919,900	$2,102,200	$ 140,290	$ 1,529,600	$ 140,300	$ 1,138,146,107	$104,400,000	$1,949,051,707	$ 7,625,383	$ 379,600,000	$ 34,816,500	71,523,600	1,303,478,500	-27,583,200	-132,284,400
$ 13,609,658	$23,027,800	$1,992,500	$ 140,290	$ 1,621,300	$ 140,300	$ 1,323,245,707	$114,500,000	$2,063,551,707	$ 7,625,383	$ 417,600,000	$ 36,133,800	80,311,200	1,383,789,700	-29,098,900	-161,383,300
$ 13,673,480	$23,135,800	$1,888,600	$ 140,290	$ 1,718,600	$ 140,300	$ 1,540,551,007	$125,800,000	$2,189,351,707	$ 7,625,383	$ 459,400,000	$ 37,500,600	90,199,100	1,473,988,800	-30,664,900	-192,048,200
$ 13,737,302	$23,243,800	$1,790,000	$ 140,290	$ 1,821,700	$ 140,300	$ 1,795,562,107	$138,300,000	$2,327,651,707	$ 7,625,383	$ 505,300,000	$ 38,912,700	101,303,500	1,575,292,300	-32,276,200	-224,324,400
$ 13,801,124	$23,351,800	$1,696,500	$ 140,290	$ 1,931,000	$ 140,300	$ 2,095,279,407	$152,200,000	$2,479,851,707	$ 7,625,383	$ 555,800,000	$ 40,378,900	113,782,000	1,689,074,300	-33,925,500	-258,249,900
$ 13,864,946	$23,459,800	$1,607,900	$ 140,290	$ 2,046,900	$ 140,300	$ 2,447,303,307	$167,700,000	$2,647,551,707	$ 7,625,383	$ 611,400,000	$ 41,904,000	127,764,000	1,816,838,300	-35,634,300	-293,884,200
$ 13,928,768	$23,567,800	$1,523,900	$ 140,290	$ 2,169,700	$ 140,300	$ 2,860,934,107	$185,000,000	$2,832,551,707	$ 7,625,383	$ 672,500,000	$ 43,482,700	143,432,300	1,960,270,600	-37,389,700	-331,273,900
$ 13,992,590	$23,675,800	$1,444,200	$ 140,290	$ 2,299,900	$ 140,300	$ 3,346,772,307	$204,100,000	$3,036,651,707	$ 7,625,383	$ 739,800,000	$ 45,126,600	160,949,100	2,121,219,700	-39,210,400	-370,484,300
$ 14,056,412	$23,783,800	$1,368,700	$ 140,290	$ 2,437,900	$ 140,300	$ 3,917,918,307	$225,500,000	$3,262,151,707	$ 7,625,383	$ 813,800,000	$ 46,830,700	180,553,100	2,301,772,800	-41,078,600	-411,562,900
$ 14,120,234	$23,891,800	$1,297,000	$ 140,290	$ 2,584,200	$ 140,300	$ 4,588,972,607	$249,100,000	$3,511,251,707	$ 7,625,383	$ 895,200,000	$ 48,598,900	202,449,700	2,504,222,500	-43,011,200	-454,574,100

Ocean Discharge Without ZLD

Pipeline Analysis

OCSD Rates *(i)*		Treatment	
Rate Description		Treatment	OCSD Rate
O&M Inflation Rate 1 (IR1):		102 mg/L BOD	$274 /1000 lbs
Rate up to 2013 ($IR1_{2013}$)	10%	312 mg/L TSS	$407 /1000 lbs
Rate at 2014($IR1_{2014}$)	8%	SARI Flow	$179 /MG
Rate at 2015($IR1_{2015}$)	7%	Treatment Capacity	$11,332,000
Rate up to 2020($IR1_{2020}$)	5.4%		
Costs unchanged after 2020	0%		
O&M Inflation Rate 2 (IR2):	**3%**		
Capital Inflation Rate (CIR):	10.0%		
Interest Rate (INTR):	6%		

One-time OCSD Treatment capacity sell back in 2023	27.83	MGD	
(Ocean Discharge)	$ 315,403,556	2010 Dollars	
	$ 694,100,000	Inflation at 2023	fix sellback
	$ 344,946,400	2010 Present Worth	
One-time OCSD Treatment capacity sell back in 2025	32.69	MGD	
(Salton Sea Discharge)	$ 370,443,080	2010 Dollars	fix sellback
	$ 815,272,540	Inflation at 2025	
	$ 360,595,800	2010 Present Worth	

One-time sellback	Ocean Discharge	Salton Sea Discharge
2010	$ 315,403,556	$ 370,443,080
2013	$ 461,782,346	$ 542,365,713
2014	$ 498,724,934	$ 585,754,971
2015	$ 533,635,679	$ 626,757,818
2020	$ 694,141,346	$ 815,272,540
2025	$ 694,141,346	$ 815,272,540

DISCHARGE TO OCSD OUTFALL 2

Calendar	2010	Cost of Pipeline		2010	Pipeline O& M Costs		2010	2010	2010
Year	n	2010 Dollars	Inflated Cost (F/P, CIR,n)	Present Worth (P/F,INTR,n)	2010 Dollars	Inflated Cost (F/P, IR2,n)	Present Worth (P/F,INTR,n)	Present Worth (P/F, INTR, n)	Cumulative Present Worth
2010	0	$ -	$ -	$ -	$ -	$0	$0	$ 9,752,000	$9,752,000
2011	1	$ -	$ -	$ -	$ -	$0	$0	$ 10,200,000	$19,952,000
2012	2	$ -	$ -	$ -	$ -	$0	$0	$ 10,800,000	$30,752,000
2013	3	$ -	$ -	$ -	$ -	$0	$0	$ 11,300,000	$42,052,000
2014	4	$ -	$ -	$ -	$ -	$0	$0	$ 11,200,000	$53,252,000
2015	5	$ -	$ -	$ -	$ -	$0	$0	$ 11,100,000	$64,352,000
2016	6	$ -	$ -	$ -	$ -	$0	$0	$ 45,400,000	$109,752,000
2017	7	$ -	$ -	$ -	$ -	$0	$0	$ 50,000,000	$159,752,000
2018	8	$ -	$ -	$ -	$ -	$0	$0	$ 54,900,000	$214,652,000
2019	9	$ -	$ -	$ -	$ -	$0	$0	$ 60,300,000	$274,952,000
2020	10	$ 25,768,527	$ 66,800,000	$ 37,300,800.00	$ -	$0	$0	$ 103,400,800	$378,352,800
2021	11	$ 25,768,527	$ 73,500,000	$ 38,718,900.00	$ -	$0	$0	$ 109,818,900	$488,171,700
2022	12	$ 25,768,527	$ 80,900,000	$ 40,204,800.00	$ -	$0	$0	$ 117,704,800	$605,876,500
2023	13	$ -	$ -	$ -	$ 1,546,112	$2,270,500	$1,064,500	$ (343,881,900)	$ 261,994,600
2024	14	$ -	$ -	$ -	$ 1,546,112	$2,338,600	$1,034,400	$ 1,034,400	$263,029,000
2025	15	$ -	$ -	$ -	$ 1,546,112	$2,408,800	$1,005,100	$ 1,005,100	$264,034,100
2026	16	$ -	$ -	$ -	$ 1,546,112	$2,481,100	$976,700	$ 976,700	$265,010,800
2027	17	$ -	$ -	$ -	$ 1,546,112	$2,555,500	$949,000	$ 949,000	$265,959,800
2028	18	$ -	$ -	$ -	$ 1,546,112	$2,632,200	$922,200	$ 922,200	$266,882,000
2029	19	$ -	$ -	$ -	$ 1,546,112	$2,711,100	$896,100	$ 896,100	$267,778,100
2030	20	$ -	$ -	$ -	$ 1,546,112	$2,792,400	$870,700	$ 870,700	$268,648,800
2031	21	$ -	$ -	$ -	$ 1,546,112	$2,876,200	$846,000	$ 846,000	$269,494,800
2032	22	$ -	$ -	$ -	$ 1,546,112	$2,962,500	$822,100	$ 822,100	$270,316,900
2033	23	$ -	$ -	$ -	$ 1,546,112	$3,051,400	$798,800	$ 798,800	$271,115,700
2034	24	$ -	$ -	$ -	$ 1,546,112	$3,142,900	$776,200	$ 776,200	$271,891,900
2035	25	$ -	$ -	$ -	$ 1,546,112	$3,237,200	$754,300	$ 754,300	$272,646,200
2036	26	$ -	$ -	$ -	$ 1,546,112	$3,334,300	$732,900	$ 732,900	$273,379,100
2037	27	$ -	$ -	$ -	$ 1,546,112	$3,434,400	$712,200	$ 712,200	$274,091,300
2038	28	$ -	$ -	$ -	$ 1,546,112	$3,537,400	$692,000	$ 692,000	$274,783,300
2039	29	$ -	$ -	$ -	$ 1,546,112	$3,643,500	$672,400	$ 672,400	$275,455,700
2040	30	$ -	$ -	$ -	$ 1,546,112	$3,752,800	$653,400	$ 653,400	$276,109,100
2041	31	$ -	$ -	$ -	$ 1,546,112	$3,865,400	$634,900	$ 634,900	$276,744,000
2042	32	$ -	$ -	$ -	$ 1,546,112	$3,981,400	$616,900	$ 616,900	$277,360,900
2043	33	$ -	$ -	$ -	$ 1,546,112	$4,100,800	$599,500	$ 599,500	$277,960,400
2044	34	$ -	$ -	$ -	$ 1,546,112	$4,223,800	$582,500	$ 582,500	$278,542,900
2045	35	$ -	$ -	$ -	$ 1,546,112	$4,350,500	$566,000	$ 566,000	$279,108,900
2046	36	$ -	$ -	$ -	$ 1,546,112	$4,481,100	$550,000	$ 550,000	$279,658,900
2047	37	$ -	$ -	$ -	$ 1,546,112	$4,615,500	$534,400	$ 534,400	$280,193,300
2048	38	$ -	$ -	$ -	$ 1,546,112	$4,754,000	$519,300	$ 519,300	$280,712,600
2049	39	$ -	$ -	$ -	$ 1,546,112	$4,896,600	$504,600	$ 504,600	$281,217,200
2050	40	$ -	$ -	$ -	$ 1,546,112	$5,043,500	$490,300	$ 490,300	$281,707,500
2051	41	$ -	$ -	$ -	$ 1,546,112	$5,194,800	$476,500	$ 476,500	$282,184,000
2052	42	$ -	$ -	$ -	$ 1,546,112	$5,350,600	$463,000	$ 463,000	$282,647,000
2053	43	$ -	$ -	$ -	$ 1,546,112	$5,511,100	$449,900	$ 449,900	$283,096,900
2054	44	$ -	$ -	$ -	$ 1,546,112	$5,676,500	$437,100	$ 437,100	$283,534,000
2055	45	$ -	$ -	$ -	$ 1,546,112	$5,846,800	$424,800	$ 424,800	$283,958,800
2056	46	$ -	$ -	$ -	$ 1,546,112	$6,022,200	$412,700	$ 412,700	$284,371,500
2057	47	$ -	$ -	$ -	$ 1,546,112	$6,202,800	$401,100	$ 401,100	$284,772,600
2058	48	$ -	$ -	$ -	$ 1,546,112	$6,388,900	$389,700	$ 389,700	$285,162,300
2059	49	$ -	$ -	$ -	$ 1,546,112	$6,580,600	$378,700	$ 378,700	$285,541,000
2060	50	$ -	$ -	$ -	$ 1,546,112	$6,778,000	$368,000	$ 368,000	$285,909,000

DISCHARGE TO SALTON SEA (37 MGD)

Calendar Year	Cost of Pipeline			Pipeline O&M Costs			Capital + O&M	Capital + O&M
	2010 Dollars	Inflated Cost (F/P,CIR,n)	2010 Present Worth (P/F,INTR,n)	2010 Dollars	Inflated Cost (F/P,IR2,n)	2010 Present (P/F,INTR,n)	2010 Present Worth	Cumulative Present Worth
2010	$ -	$ -	$ -	$ -	$ -	0	$ 9,752,000	$ 9,752,000
2011	$ -	$ -	$ -	$ -	$ -	0	$ 10,200,000	$ 19,952,000
2012	$ -	$ -	$ -	$ -	$ -	0	$ 10,800,000	$ 30,752,000
2013	$ -	$ -	$ -	$ -	$ -	0	$ 11,300,000	$ 42,052,000
2014	$ -	$ -	$ -	$ -	$ -	0	$ 11,200,000	$ 53,252,000
2015	$ -	$ -	$ -	$ -	$ -	0	$ 11,100,000	$ 64,352,000
2016	$ -	$ -	$ -	$ -	$ -	0	$ 45,400,000	$ 109,752,000
2017	$ -	$ -	$ -	$ -	$ -	0	$ 50,000,000	$ 159,752,000
2018	$ -	$ -	$ -	$ -	$ -	0	$ 54,900,000	$ 214,652,000
2019	$ -	$ -	$ -	$ -	$ -	0	$ 60,300,000	$ 274,952,000
2020	$ 80,163,502	$ 207,923,500	$ 116,100,000	$ -	$ -	0	$ 182,200,000	$ 457,152,000
2021	$ 80,163,502	$ 228,715,800	$ 120,500,000	$ -	$ -	0	$ 191,600,000	$ 648,752,000
2022	$ 80,163,502	$ 251,587,400	$ 125,000,000	$ -	$ -	0	$ 202,500,000	$ 851,252,000
2023	$ 80,163,502	$ 276,746,200	$ 129,700,000	$ -	$ -	0	$ 214,200,000	$ 1,065,452,000
2024	$ 80,163,502	$ 304,420,800	$ 134,600,000	$ -	$ -	0	$ 226,800,000	$ 1,292,252,000
2025	$ -	$ -	$ -	$ 8,016,350	$ 11,772,300	$ 5,200,000	$ (355,395,800)	$ 936,856,200
2026	$ -	$ -	$ -	$ 8,016,350	$ 12,863,900	$ 4,800,000	$ 4,800,000	$ 941,656,200
2027	$ -	$ -	$ -	$ 8,016,350	$ 13,249,800	$ 4,600,000	$ 4,600,000	$ 946,256,200
2028	$ -	$ -	$ -	$ 8,016,350	$ 13,647,300	$ 4,500,000	$ 4,500,000	$ 950,756,200
2029	$ -	$ -	$ -	$ 8,016,350	$ 14,056,700	$ 4,400,000	$ 4,400,000	$ 955,156,200
2030	$ -	$ -	$ -	$ 8,016,350	$ 14,478,400	$ 4,300,000	$ 4,300,000	$ 959,456,200
2031	$ -	$ -	$ -	$ 8,016,350	$ 14,912,800	$ 4,100,000	$ 4,100,000	$ 963,556,200
2032	$ -	$ -	$ -	$ 8,016,350	$ 15,360,200	$ 4,000,000	$ 4,000,000	$ 967,556,200
2033	$ -	$ -	$ -	$ 8,016,350	$ 15,821,000	$ 3,900,000	$ 3,900,000	$ 971,456,200
2034	$ -	$ -	$ -	$ 8,016,350	$ 16,295,600	$ 3,800,000	$ 3,800,000	$ 975,256,200
2035	$ -	$ -	$ -	$ 8,016,350	$ 16,784,500	$ 3,700,000	$ 3,700,000	$ 978,956,200
2036	$ -	$ -	$ -	$ 8,016,350	$ 17,288,000	$ 3,600,000	$ 3,600,000	$ 982,556,200
2037	$ -	$ -	$ -	$ 8,016,350	$ 17,806,600	$ 3,500,000	$ 3,500,000	$ 986,056,200
2038	$ -	$ -	$ -	$ 8,016,350	$ 18,340,800	$ 3,400,000	$ 3,400,000	$ 989,456,200
2039	$ -	$ -	$ -	$ 8,016,350	$ 18,891,100	$ 3,300,000	$ 3,300,000	$ 992,756,200
2040	$ -	$ -	$ -	$ 8,016,350	$ 19,457,800	$ 3,200,000	$ 3,200,000	$ 995,956,200
2041	$ -	$ -	$ -	$ 8,016,350	$ 20,041,500	$ 3,100,000	$ 3,100,000	$ 999,056,200
2042	$ -	$ -	$ -	$ 8,016,350	$ 20,642,800	$ 3,000,000	$ 3,000,000	$ 1,002,056,200
2043	$ -	$ -	$ -	$ 8,016,350	$ 21,262,000	$ 2,900,000	$ 2,900,000	$ 1,004,956,200
2044	$ -	$ -	$ -	$ 8,016,350	$ 21,899,900	$ 2,800,000	$ 2,800,000	$ 1,007,756,200
2045	$ -	$ -	$ -	$ 8,016,350	$ 22,556,900	$ 2,800,000	$ 2,800,000	$ 1,010,556,200
2046	$ -	$ -	$ -	$ 8,016,350	$ 23,233,600	$ 2,700,000	$ 2,700,000	$ 1,013,256,200
2047	$ -	$ -	$ -	$ 8,016,350	$ 23,930,600	$ 2,600,000	$ 2,600,000	$ 1,015,856,200
2048	$ -	$ -	$ -	$ 8,016,350	$ 24,648,500	$ 2,500,000	$ 2,500,000	$ 1,018,356,200
2049	$ -	$ -	$ -	$ 8,016,350	$ 25,388,000	$ 2,500,000	$ 2,500,000	$ 1,020,856,200
2050	$ -	$ -	$ -	$ 8,016,350	$ 26,149,600	$ 2,400,000	$ 2,400,000	$ 1,023,256,200
2051	$ -	$ -	$ -	$ 8,016,350	$ 26,934,100	$ 2,300,000	$ 2,300,000	$ 1,025,556,200
2052	$ -	$ -	$ -	$ 8,016,350	$ 27,742,200	$ 2,300,000	$ 2,300,000	$ 1,027,856,200
2053	$ -	$ -	$ -	$ 8,016,350	$ 28,574,400	$ 2,200,000	$ 2,200,000	$ 1,030,056,200
2054	$ -	$ -	$ -	$ 8,016,350	$ 29,431,600	$ 2,100,000	$ 2,100,000	$ 1,032,156,200
2055	$ -	$ -	$ -	$ 8,016,350	$ 30,314,600	$ 2,100,000	$ 2,100,000	$ 1,034,256,200
2056	$ -	$ -	$ -	$ 8,016,350	$ 31,224,000	$ 2,000,000	$ 2,000,000	$ 1,036,256,200
2057	$ -	$ -	$ -	$ 8,016,350	$ 32,160,800	$ 2,000,000	$ 2,000,000	$ 1,038,256,200
2058	$ -	$ -	$ -	$ 8,016,350	$ 33,125,600	$ 1,900,000	$ 1,900,000	$ 1,040,156,200
2059	$ -	$ -	$ -	$ 8,016,350	$ 34,119,300	$ 1,900,000	$ 1,900,000	$ 1,042,056,200
2060	$ -	$ -	$ -	$ 8,016,350	$ 35,142,900	$ 35,100,000	$ 35,100,000	$ 1,077,156,200