

# RECLAMATION

*Managing Water in the West*

## SANTA ANA WATERSHED BASIN STUDY

INLAND EMPIRE INTERCEPTOR APPRAISAL ANALYSIS  
SUMMARY REPORT  
APRIL 2013 (FINAL - JUNE 2013)



U.S. Department of the Interior  
Bureau of Reclamation



Santa Ana Watershed  
Project Authority

PROJECT INFORMATION	
ESO PROJECT NUMBER:	P2011-019
ESO COST AUTHORITY NUMBER	A10-1994-0001-001-11-0-7
PROJECT NAME:	Santa Ana Watershed Basin Study Inland Empire Interceptor Appraisal Analysis
PROJECT MANAGER:	Thomas R. Nichols, P.E.
CLIENT:	Southern California Area Office (SCAO)
Distribution list for Project Staff	
Jack Simes	SCAO
Scott Tincher, P.E.	Engineering Services Office (ESO)
Phil Mann, P.E.	ESO
Thomas R. Nichols, P.E.	ESO
Distribution List for Study Partners	
Mark R. Norton, P.E.	Santa Ana Watershed Project Authority (SAWPA)
Jeffery Beehler, Ph.D.	SAWPA
Richard E. Haller, P.E.	SAWPA
Carlos Quintero	SAWPA

## TABLE OF CONTENTS

LIST OF TABLES .....	iv
INTRODUCTION.....	1
Santa Ana Watershed Project Authority and Inland Empire Brine Line .....	1
Project Background.....	2
Appraisal Analysis Objectives.....	3
Technical Memoranda and Summary Report .....	3
Feasibility Analysis and Benefit - Cost Analysis .....	4
CONCLUSIONS and RECOMMENDATIONS.....	6
Introduction.....	6
Conclusions.....	7
Recommendations.....	9
Summary.....	11
TECHNICAL MEMORANDUM No. 2 - SUMMARY of BRINE and FLOW DATA .....	13
General Description .....	13
Summary of Total Forecasted Brine Line Flows.....	13
TECHNICAL MEMORANDUM No. 3– OPTIONS and STRATEGIES .....	14
General Description .....	14
Colorado River Basin Region Basin Plan.....	14
Water Quality (TSS and BOD) Impacts .....	15
Salinity (TDS) Impacts .....	15
Economic Development Considerations.....	15
SAW Alternatives Considered.....	16
CV Alternatives Considered & Design Flows.....	16
Summary of Water Quality Treatment Facility Conceptual Design.....	17
TECHNICAL MEMORANDUM No. 4 – SUMMARY of COSTS and RECOMMENDED OPTIONS	19
General Description .....	19
Summaries of Cost Estimates for Santa Ana Watershed Alternatives.....	19
Summaries of Cost Estimates for Coachella Valley Alternatives.....	20
Treatment Facility Cost Estimates .....	20
Least Cost Alternatives.....	21
Present Worth Analysis .....	22

APPENDIX – GIS ALIGNMENT EXHIBITS ..... 23

    Santa Ana Watershed Alignments ..... 23

    Coachella Valley Alignments ..... 24

    Water Quality Treatment Facility ..... 25

**LIST OF TABLES**

Table 1 – Summary of Conclusions and Recommendations ..... 12

Table 2 – Total Forecasted Brine Line Flows ..... 13

Table 6 – Proposed Santa Ana Watershed Alternatives ..... 16

Table 7 – Coachella Valley Alternatives – Peak Flows ..... 17

Table 8 – Treatment Facility Alternative 3 Average Flows and Areas ..... 18

Table 9 – Treatment Facility Alternative 5 Average Flows and Areas ..... 18

Table 10 – Summary of Costs of SAW Alternatives..... 20

Table 11 – Summary of Costs of CV Alternatives (Combined SAW & CV Areas)..... 20

Table 12 – Summary of Costs of TF Alternatives (Combined SAW & CV Areas)..... 21

Table 13 – Summary of Least Cost Alternatives (Combined SAW & CV Areas)..... 21

Table 14 – Summary of Least Cost Alternatives (Existing SAWPA Service Area)..... 22

## INTRODUCTION

### **Santa Ana Watershed Project Authority and Inland Empire Brine Line**

The Santa Ana Watershed Project Authority (SAWPA) is a joint powers authority comprised of five member water districts that serve the vast majority of the Santa Ana Watershed. The area served by SAWPA is located within Orange, Riverside and San Bernardino Counties of California, bounded by the Pacific Ocean on the west, the San Bernardino Mountains to the north, and the San Jacinto Mountains to the east. The five SAWPA Member Agencies are

- Eastern Municipal Water District (EMWD),
- Western Municipal Water District (WMWD),
- Inland Empire Utilities Agency (IEUA),
- San Bernardino Valley Municipal Water District (SBVMWD), and
- Orange County Water District (OCWD).

SAWPA's mission is to protect water quality and enhance the water supply within the Santa Ana River Watershed. For these purposes, SAWPA developed the Inland Empire Brine Line (Brine Line), which is also known as the Santa Ana Regional Interceptor (SARI), for the purpose of exporting salt from the Santa Ana Watershed. Exportation of salt prevents its accumulation in the Watershed and protects the quality of the potable water supply. The future of the potable water supply will continue to rely upon an economical means of collection, treatment and disposal of brine. The Brine Line is critical to SAWPA's mission success.

The Brine Line includes approximately 72 miles of pipeline in multiple branches which converge in the vicinity of Prado Dam near the City of Corona. It has a planned capacity of approximately 32.5 MGD and was planned for collection and exportation of approximately 271,000 tons of salt per year from the upper Santa Ana Watershed, east of the Santa Ana Mountains. Currently (2010 & 2011), average system flows are approximately 11.7 MGD and over 75,000 tons of salt are exported per year.

An additional 21 miles of pipeline convey the combined flows to Orange County Sanitation District (OCSD) facilities for treatment and disposal by discharge to the Pacific Ocean. This pipeline has a nominal capacity of 30 MGD. The planned capacity of the Brine Line system (32.5 MGD) exceeds the hydraulic capacity of the pipeline from the Brine Line convergence near Prado Dam to the OCSD facilities.

Furthermore, the agreement between SAWPA and OCSD allows Brine Line flows to the OCSD system up to only 17.0 MGD, with a contractual right to purchase up to 30.0 MGD capacity.

### **Project Background**

The One Water One Watershed (OWOW) Plan is the integrated water management plan for the Santa Ana Watershed and is administered by SAWPA. This Inland Empire Interceptor Appraisal Analysis is one component of the Basin Study.

A study entitled *Santa Ana Watershed Salinity Management Program* (Salinity Management Program) was completed in 2010 by a team of consultants led by Camp, Dresser & McKee (CDM), which addressed the Brine Line capacity limitations. The Salinity Management Program identified and evaluated six strategies for managing flows in the Brine Line system, which were identified as follows:

- Option 1: Baseline Condition – continued discharge to OCSD.
- Option 2a: SARI (IEBL) flow reduction via a centralized treatment, concentration, and reclamation plant.
- Option 2b: SARI (IEBL) flow reduction via a decentralized brine minimization projects installed at each groundwater desalter.
- Option 3a: Direct ocean discharge of SARI (IEBL) brine without brine minimization.
- Option 3b: Direct ocean discharge of SARI (IEBL) brine with brine minimization projects as described under Option 2b.
- Option 4: Rerouting all SARI (IEBL) system flows for discharge to Salton Sea.

Four of these Options (2a, 2b, 3a and 3b) involve changes to the method and/or degree of treatment of Brine Line flows. Option 4 is a proposed new Brine Line outfall to the Salton Sea, which would replace the existing Brine Line outfall from the system convergence near Prado Dam to the OCSD system.

The *Phase 2 Technical Memorandum* of the Salinity Management Program included estimated costs (indexed to Year 2010) and present worth analyses for each of these strategies.

After delivery of the Santa Ana Watershed Salinity Management Program report by CDM, SAWPA staff prepared a report entitled *Inland Empire Brine Line Disposal Option Concept Investigation* (SAWPA

Investigation) in which four alternative conceptual designs for the portion of Option 4 in the Santa Ana Watershed were developed and evaluated.

### **Appraisal Analysis Objectives**

Option 4 described above is the subject of this Appraisal Analysis and is identified herein as the Inland Empire Interceptor (IEI).

The purpose of this Appraisal Analysis is to help determine whether more detailed investigations of the proposed IEI are justified. Reclamation criteria for appraisal analyses are set forth in *Reclamation Manual, Directives and Standards, FAC 09-01, Cost Estimating* (Reclamation Manual). Appraisal analyses “are intended to be used as an aid in selecting the most economical plan by comparing alternative features”. Several alternative conceptual designs for the proposed IEI have been developed and evaluated for this Appraisal Analysis for the purpose of comparison.

Three of the four alternative conceptual designs for the portion of the proposed IEI in the Santa Ana Watershed addressed in the SAWPA Investigation described above were considered in this Appraisal Analysis.

Two alternative alignments were developed and evaluated in this Appraisal Analysis for the portion in the San Gorgonio Pass and Coachella Valley. The route of the proposed IEI through the San Gorgonio Pass and Coachella Valley areas in eastern Riverside County represents an opportunity for SAWPA to expand the Brine Line service area.

### **Technical Memoranda and Summary Report**

This Summary Report presents the major conclusions and recommendations drawn from this Appraisal Analysis, followed by brief summaries of three of the four Technical Memoranda (TM) that were produced for this Appraisal Analysis.

Technical Memorandum No. 1 presents the results of the initial review of previous studies and other available site-specific data pertinent to this Appraisal Analysis. Additional sources of information that were not cited in Technical Memorandum No. 1 were subsequently identified as useful for the preparation of this



Appraisal Analysis. Those additional information sources are identified in the three subsequent technical memoranda.

The three other technical memoranda produced for this Appraisal Analysis are as follows:

- Technical Memorandum No. 2 – Summary of Brine and Flow Data
- Technical Memorandum No. 3 – Options and Strategies
- Technical Memorandum No. 4 – Summary of Costs and Recommended Options

### **Feasibility Analysis and Benefit - Cost Analysis**

As discussed above, the purpose of an Appraisal Analysis is to help determine whether more detailed investigations of a proposed project are justified, the criteria for which are set forth in the Reclamation Manual. The Reclamation Manual also describes criteria for “a project Feasibility Study and Feasibility-level cost estimate, which are intended to support funding authorization for new construction” and “cannot be conducted without authorization and appropriation of funds by the Congress.”

Also, as a Federal agency, Reclamation must perform benefit-cost analyses (BCA) for proposed water resources projects at the appropriate stage of project planning. The main set of guidelines for a BCA is the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, U. S. Water Resources Council, 1983 (P&G). For Reclamation projects, BCAs are typically performed at the Feasibility level of study.

The purpose of a BCA is to compare the benefits of a proposed project to its costs. The total costs of the project are subtracted from the total benefits to measure net benefits. If the net benefits are positive (benefits exceed costs), then the project could be considered economically justified. Conversely, if net benefits are negative (costs exceed benefits), then the project would not be economically justified. When multiple alternatives are being considered for a project, the alternative with the greatest positive net benefit would be preferred from an economic perspective.

A BCA is comprised of four “accounts” identified as the National Economic Development (NED) account, the Regional Economic Development (RED) account, the Environmental Quality (EQ) account, and the Social Effects (OSE) account. The NED and RED accounts are used to evaluate the economic effects of proposed alternative plans.

An RED analysis focuses on economic impacts to the region in which the project is located. The RED analysis recognizes the NED benefits accruing to the local region plus the transfers of income into the region.

A NED analysis focuses on economic impacts to the entire Nation. The *P&Gs* require Reclamation to analyze the NED effects so as not to favor one area of the country over another. Economic justification is determined solely by the benefit-cost analysis and must be demonstrated on the basis of NED benefits exceeding NED costs.

## **CONCLUSIONS and RECOMMENDATIONS**

### **Introduction**

The results of the present worth analyses of the estimated costs of the proposed IEI are presented in TM4. A simple comparison of those results with the present worth analyses for the other Options presented in the Salinity Management Program indicates that the costs of the proposed IEI are greater than the costs of other Options. However, certain aspects of the proposed IEI distinguish this Option 4 from the other options considered in the Salinity Management Program and further investigation and analysis of the proposed IEI warrants consideration.

Significant opportunities are available for refinement of the conceptual designs for the proposed IEI presented in this Appraisal Analysis. Further investigation and analysis of these opportunities could help to refine the estimated costs, to reduce the multiplier applied to estimated costs for contingencies, and to evaluate the benefits associated with the project. These refinements could lead to a more favorable present worth comparison of the proposed IEI with the other Options.

Opportunities to refine the scope, conceptual designs, estimated costs, and benefits associated with the proposed IEI are identified and discussed in TM4. In general, these Opportunities represent the Conclusions of this Appraisal Analysis. Suggested Optimization Strategies for the proposed IEI are also identified and discussed in TM4. These suggested Optimization Strategies describe recommended next steps (or Recommendations) for further investigation and analysis of the proposed IEI.

As discussed above, a Feasibility level of study “cannot be conducted without authorization and appropriation of funds by the Congress” and represents a substantial commitment to a project. These Recommendations are suggested as interim stages of investigation and analysis of the proposed IEI. A Feasibility study and benefit-cost analysis of the proposed IEI would be warranted only if these additional investigations and analyses produce favorable results.

## Conclusions

The Conclusions from this Appraisal Analysis are summarized as follows:

- C1. Economic Development: The economic development potential associated with the proposed IEI is significant and unique to this option. If implemented, the proposed IEI would make brine management infrastructure available to prospective employers located in the San Gorgonio Pass and Coachella Valley areas.
- C2. Net Impact: The proposed IEI would impact the Salton Sea in various ways, some of which may be considered beneficial and others negative. Further investigation and analysis of these aspects would help to determine design criteria for associated components of the proposed IEI.
- C3. Salton Sea Restoration: Delays to implementation of a restoration plan for the Salton Sea has contributed to uncertainties regarding salinity and water quality aspects of the proposed IEI. Improved understanding of progress toward restoration of the Sea would help to determine appropriate project design criteria for the affected components of the proposed IEI.
- C4. Basin Plan: Uncertainties regarding Salton Sea salinity and water quality regulatory requirements contribute to uncertainties regarding planning and design of associated components of the proposed IEI and the associated costs.
- C5. Stakeholder Partnering: The standards established in the Basin Plan for salinity and water quality in the Salton Sea are a deterrent to potential new sources of water supply to the Sea. Community and stakeholder support would enhance the likelihood of adoption of changes to those standards.
- C6. Salton Sea Salinity: The salts in the IEI flows would add to the existing rate of accumulation of salts in the Sea. Whether those salts would cause TDS concentrations in the Sea to increase will depend on such factors as the magnitude of the Salton Sea water budget imbalance over time and progress toward implementation of a Salton Sea restoration plan.
- C7. Salton Sea Water Quality: Similar to salinity, whether the TSS and BOD in the IEI flows would cause an adverse impact on the water quality in the Salton Sea will depend on such factors as the

magnitude of the Salton Sea water budget imbalance over time and progress toward implementation of a Salton Sea restoration plan. The estimated cost of the proposed Water Quality Treatment Facility (TF) represents a substantial portion of the total estimated costs for the project, which calls for careful scrutiny of the design criteria for this facility.

- C8. Brine Pre-treatment and Treatment Strategies: The proposed TF could function in place of the Brine Pre-treatment and Treatment Strategies presented in the Salinity Management Program; or it could function as part of a hybrid design in combination with a Strategy from the Salinity Management Program.
- C9. Management of Surplus Energy: The large estimated costs of the proposed IEI Turbine Generator Stations and associated electric transmission facilities indicate that the time period necessary to recover that investment in would be long. The estimated cost of the proposed IEI could likely be significantly reduced by using an alternative approach to remove surplus energy from flows in the system.
- C10. Other Opportunities: Examples of other opportunities to refine, reduce and/or eliminate estimated costs identified in this Appraisal Analysis include but are not limited to the following:
- Synthetic Membrane Liner - The synthetic membrane liner under the TF is the largest single component of the estimated cost of that facility; and use of an alternative approach to soil permeability could likely significantly reduce that cost.
  - Tunneling – Tunneling in lieu of direct bury of the proposed pipeline through the Badlands west of the City of Beaumont along the Gas Main Alignment may reduce impacts associated with construction of the project.
  - Phasing - Phasing of certain project components could allow some project costs to be deferred.

## **Recommendations**

The results of this Appraisal Analysis and the Conclusions listed above suggest appropriate recommended next steps for further investigation and analysis of the proposed IEI to refine the scope, conceptual designs, estimated costs and anticipated benefits of the proposed IEI. These Recommendations are summarized as follows:

- R1. Economic Impact Analysis: In response to Conclusion C1 (Economic Development), perform an economic impact analysis for the proposed IEI to quantify the economic development and other benefits of the proposed IEI.
- R2. Salton Sea Water Budget: In response to Conclusions C2, C3, C6 and C7, develop water budgets for the Salton Sea and for the planned Salton Sea restoration, or update available existing water budgets.
- R3. Salton Sea Salinity and Water Quality Models: In response to Conclusions C2, C3, C6 and C7, develop models for salinity and water quality in the Salton Sea and for the planned Salton Sea restoration, or update available existing models.
- R4. IEI Influence on Salton Sea Salinity: In response to Conclusions C2, C3 and C6, use the water budgets and the salinity models for the Salton Sea to evaluate the impact of the proposed IEI flows on TDS concentrations in the Salton Sea, to evaluate the influence of those impacts on the IEI design, and to refine estimated costs for the proposed IEI.
- R5. IEI Influence on Salton Sea Water Quality: In response to Conclusions C2, C3 and C7, use the water budgets and the water quality models for the Salton Sea to evaluate the impact of the proposed IEI flows on TSS and BOD concentrations in the Salton Sea, to evaluate the influence of those impacts on the IEI design, and to refine estimated costs for associated components of the proposed IEI.
- R6. Salton Sea Restoration Influence on IEI Design: In response to Conclusion C2, C3, C6 and C7, use the water budgets and the salinity and water quality models for the Salton Sea restoration to evaluate the impact of the proposed IEI flows on the planned restoration, to evaluate the influence of the planned restoration on the IEI design, and to refine estimated costs for the proposed IEI.

- R7. Basin Plan Amendment Process: In response to Conclusion C4 (Basin Plan), evaluate the process and technical requirements for a Basin Plan Amendment to modify Salton Sea salinity and water quality regulatory requirements for the proposed IEI.
- R8. Identify, Investigate & Initiate Partnerships: In response to Conclusion C5 (Stakeholder Partnering), seek opportunities to partner with other Salton Sea stakeholders in support of regulatory changes to encourage new sources of water supply to the Salton Sea in support of restoration efforts. This effort may include:
- Establish a dialogue with other organizations serving the San Geronio Pass, Coachella Valley areas, and/or other areas tributary to the Salton Sea,
  - Investigate community support for changes to the regulatory approach to Salton Sea salinity and water quality standards to encourage new sources of water supply to the Salton Sea, and
  - Develop specific proposals for suggested regulatory changes and identify benefits. Communicate the suggested regulatory changes and associated benefits to the community.
- R9. Hybrid Strategies for Brine Treatment: In response to Conclusion C8 (Brine Pre-treatment and Treatment Strategies), identify and evaluate alternative strategies for treatment of the IEI flows, which may include hybrid designs incorporating Salinity Management Program brine pre-treatment strategies in combination with alternative configurations of the wastewater treatment ponds and/or constructed wetlands that comprise the TF considered in this Appraisal Analysis.
- R10. Alternative Designs for Surplus Energy: In response to Conclusion C9 (Management of Surplus Energy), develop and evaluate alternative strategies for management of surplus energy in IEI flows such as low-head in-line turbine generators and pressure reducing valves.
- R11. Alternative Liner Materials: In response to Conclusion C10 (Other Opportunities), investigate alternatives to the proposed synthetic membrane liner under the TF, including site-specific soil investigations to determine actual soil permeability to facilitate investigation of alternatives such as soil treatment using clay and suitability of a “leaky wetland”.
- R12. Tunneling: In response to Conclusion C10 (Other Opportunities), investigate the constructability of and the impacts associated with direct-bury of the proposed pipeline through the Badlands west of the

City of Beaumont along the Gas Main Alignment and the feasibility of tunneling in lieu of direct bury in that area.

- R13. Phasing of Improvements: In response to Conclusion C10 (Other Opportunities), investigate opportunities for phasing of selected project components (e.g. use of dual pipelines in Coachella Valley) to defer costs until warranted by system flows, including a Present Worth analysis of the phased project costs.

### **Summary**

The Conclusions (Opportunities) and the associated Recommendations (Optimization Strategies) identified above are summarized in **Table 1** on the next page. Priority rankings are assigned in **Table 1** to those Recommendations, which are loosely based on the potential influence on the estimated project costs and/or the value of anticipated benefits.



**Table 1 – Summary of Conclusions and Recommendations**

CONCLUSIONS (OPPORTUNITIES)	PRIORITY	RECOMMENDATIONS (OPTIMIZATION STRATEGIES)												
		R1 - Economic Impact Analysis	R2 - Salton Sea Water Budget	R3 - Salton Sea Salinity & Water Quality Model	R4 - IEI Influence on Salton Sea Salinity	R5 - IEI Influence on Salton Sea Water Quality	R6 - Influence on of Salton Sea on IEI Design	R7 - Basin Plan Amendment Process	R8 - Identify, Investigate, & Initiate Partnerships	R9 - Hybrid Strategies for Brine Treatment	R10 - Alternative Designs for Surplus Energy	R11 - Alternative Liner Materials	R12 - Tunneling in Lieu of Direct Bury	R13 - Phasing of Improvements
		1	2	2	2	2	2	3	4	5	6	7	7	7
C1 - Economic Development	1	X												
C2 - Net Impact	2		X	X	X	X	X							
C3 - Salton Sea Restoration	2		X	X	X	X	X							
C4 - Basin Plan	3							X						
C5 - Stakeholder Partnering	4								X					
C6 - Salton Sea Salinity	2		X	X	X		X							
C7 - Salton Sea Water Quality	2		X	X		X	X							
C8 - Brine Pre-treatment and Treatment	5									X				
C9 - Management of Surplus Energy	6										X			
C10 - Other Opportunities	7											X	X	X

## TECHNICAL MEMORANDUM No. 2 - SUMMARY of BRINE and FLOW DATA

### General Description

TM2 addresses analysis of available historical Brine Line flow data and forecasting of future flows from the existing Brine Line service area and from the San Gorgonio Pass and Coachella Valley areas. TM2 also addresses analysis of available historical data for Total Dissolved Solids (TDS), Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD) in the Brine Line flows and forecasting of those constituents in future flows.

### Summary of Total Forecasted Brine Line Flows

The total forecasted flows (in millions of gallons per day) from the existing Brine Line system service area in the Santa Ana Watershed (SAW), from the San Gorgonio Pass and Coachella Valley (CV) areas, and from the combined SAW and CV areas are listed in **Table 2** below.

**Table 2 – Total Forecasted Brine Line Flows**

	2010	2015	2020	2025	2030	2035	2040	2050	2060
<i>Subtotal - SAWPA</i>	11.7	12.21	15.95	20.22	26.06	29.59	31.67	31.98	32.06
<i>Subtotal - Coachella</i>	0	0	0	0	0	12.38	33.53	38.24	43.04
<b>Total Brine Flow</b>	<b>11.7</b>	<b>12.21</b>	<b>15.95</b>	<b>20.22</b>	<b>26.06</b>	<b>41.97</b>	<b>65.20</b>	<b>70.22</b>	<b>75.10</b>

## TECHNICAL MEMORANDUM No. 3– OPTIONS and STRATEGIES

### General Description

TM3 presents conceptual designs and results of hydraulic analyses for the various alternatives for the proposed Inland Empire Interceptor (IEI) under consideration in this Appraisal Analysis and addresses various options and strategies, including:

- Proposed modification to the existing Brine Line system.
- Existing easements and rights-of-way.
- Salton Sea considerations, including:
  - Salton Sea restoration plans.
  - Increased water supply to the Salton Sea.
  - Water quality (Total Suspended Solids and Biochemical Oxygen Demand concentrations).
  - Salt load (Total Dissolved Solids concentration).
- Brine pre-treatment strategies.
- Alternative alignments considered.
- Alternative designs considered.
- Pumping requirements.
- Energy recovery strategies.
- Permit requirements.

Potential strategies for treatment of the Brine Line (IEI) flows are also presented in TM3 as alternatives to the brine pre-treatment strategies discussed in the Salinity Management Program.

### Colorado River Basin Region Basin Plan

The California Regional Water Quality Control Board, Colorado River Basin Region adopted the *Water Quality Control Plan: Colorado River Basin - Region 7* (Basin Plan), with the intent “to provide definitive guidelines” and to “optimize the beneficial uses of state waters within the Colorado River Basin Region of California by preserving and protecting the quality of these waters.”

If implemented, the projected flows in the proposed IEI would provide a reliable new source of water to the Salton Sea. But the projected TDS, TSS and BOD concentrations in the IEI flows would not comply with

the adopted Basin Plan standards for those parameters. Approval of a Basin Plan Amendment would likely be necessary for implementation of the proposed IEI.

The high water quality standards in the Basin Plan are a deterrent to any potential new sources of water to the Salton Sea. If new sources of water are to be encouraged in support of Salton Sea restoration efforts, then a change to the regulatory approach to water quality standards warrants serious consideration.

### **Water Quality (TSS and BOD) Impacts**

The proposed Inland Empire Interceptor Water Quality Treatment Facility (TF), if needed, would represent a substantial portion of the cost of implementation of the proposed IEI. If further study or design development for the proposed IEI is performed, those efforts should include more detailed investigation and analysis of the specific water quality characteristics of the projected IEI flows, of the water quality standards established in the Basin Plan, of water quality projections for the Salton Sea, of the influence of Salton Sea restoration planning on the design of the proposed IEI and associated treatment facility.

### **Salinity (TDS) Impacts**

Though the projected concentrations of TDS in the IEI flows (up to 6,800mg/L) are much lower than existing TDS concentrations in the Sea (approximately 48,000 mg/L), the salts in the IEI flows would add to the existing rate of accumulation of salts in the Sea. If the brine pool proposed as part of various Salton Sea restoration plan alternatives were not available to remove the salt load from IEI flows, then a separate facility would be necessary to reduce or mitigate for accumulation of that salt in the Salton Sea. If further study or design development for the proposed IEI is performed, those efforts should include more detailed investigation and analysis of the brine characteristics of the projected IEI flows, of the TDS standards in the Basin Plan, of Salton Sea water budget projections, of the influence of Salton Sea restoration planning on the design of the proposed IEI and associated treatment technologies under consideration.

### **Economic Development Considerations**

Brine management infrastructure has been a valuable tool for economic development in Santa Ana Watershed and has great potential as a tool for economic development in the San Geronio Pass and Coachella Valley areas along the route of the proposed IEI.

**SAW Alternatives Considered**

The three SAW Alternatives considered in this Appraisal Analysis (SAW Alternatives 1, 2 and 4) are based upon two Primary Alignments, which are identified herein and in the SAWPA Investigation as the Gas Main Alignment and the North Alignment. These Primary Alignments are complemented by various combinations of Secondary Alignments to form the three SAW Alternatives. Several pump stations are necessary for each of the three SAW Alternatives.

All three of these SAW Alternatives begin with the IEBL Alignment at proposed pump station PS 1-BL near Prado Dam and terminate at a common point located in the City of Beaumont in San Gorgonio Pass. This location is common with the point of beginning of both Coachella Valley Alignments. The three SAW Alternatives considered in this Appraisal Analysis are summarized in tabular form in **Table 6** below.

**Table 3 – Proposed Santa Ana Watershed Alternatives**

Alignment	SAW Alternative No. with Alignment Length (Feet)		
	1	2	4
<b>Primary Alignments:</b>			
Gas Main	228,700	228,700	0
North	0	0	278,900
<b>Secondary Alignments:</b>			
IEBL:			
BL-1a	12,500	12,500	12,500
BL-1b	0	0	24,000
EMWD North	94,100	0	0
IEUA	0	0	9,000
<b>Total Length (Ft)</b>	<b>335,300</b>	<b>241,200</b>	<b>324,400</b>

**Note:** SAW Alternative 3 was not selected for further consideration.

**CV Alternatives Considered & Design Flows**

Two alternative alignments are considered in this Appraisal Analysis (CV Alignments A and B) for the portion of the proposed IEI through the San Gorgonio Pass and Coachella Valley areas. CV Alignment A follows Coachella Canal for a substantial portion of the length and CV Alignment B follows the Whitewater

River / Coachella Wash Storm Water Channel (CVSC). The point of beginning of both alignments is common with the point of termination of the three SAW Alternatives in the City of Beaumont; and the point of termination common to both alignments is located near the north edge of the Salton Sea.

Conceptual designs are presented for both of the CV Alignments using design flows both with and without projected flows from the San Gorgonio Pass and Coachella Valley (CV) area. Energy Recovery Facilities are included in each of these alternative designs to maintain full pipe flow. These CV Alternatives and the projected Peak Flows are summarized in **Table 7** below.

**Table 4 – Coachella Valley Alternatives – Peak Flows**

Alignment	Alternative	Service Area	Projected Peak Flows at Salton Sea (2060)	
			(MGD)	(gpm)
CV Alignment A	A-1	Combined SAW & CV Areas	87.4	60,636
	A-2	Existing	37.3	25,937
CV Alignment B	B-1	Combined SAW & CV Areas	87.4	60,636
	B-2	Existing	37.3	25,937

**Summary of Water Quality Treatment Facility Conceptual Design**

A Water Quality Treatment Facility (TF) is proposed to remove TSS and BOD from IEI flows prior to discharge to the Salton Sea. Several alternative conceptual designs are considered for this TF, of which two (TF Alternatives 3 and 5) would provide pre-treatment in Facultative Treatment Ponds (FTP) followed by treatment in Free Water Surface Constructed Wetlands (FWS CW).

TF Alternative 3 is conceptually designed to produce TSS and BOD concentrations in discharges that would meet or exceed EPA standards for wastewater effluent. The projected minimum surface areas of both the FTP and the FWS CW for TF Alternative 3 and the total area of the facility are summarized for both projected flows in **Table 8** on the next page.

**Table 5 – Treatment Facility Alternative 3 Average Flows and Areas**

	Avg. Flow (2060)	Minimum Surface Area			Minimum Total Area
		FTP	FWS CW	Subtotal	
	(MGD)	(Acres)	(Acres)	(Acres)	(Acres)
<b>Existing SAWPA Service Area (Alt. 3-2)</b>	32.1	1,391	1,039	2,430	3,159
<b>Combined SAW &amp; CV Areas (Alt. 3-1)</b>	75.1	2,411	1,800	4,211	5,474

TF Alternative 5 is conceptually designed to treat partial flows, which would be blended with the balance of the IEI flows to produce discharges with average TSS concentration of approximately 200 mg/L. The projected minimum surface areas of the FTP and the FWS CW for TF Alternative 5 and the total area of the facility are summarized for both projected flows in **Table 9** below.

**Table 6 – Treatment Facility Alternative 5 Average Flows and Areas**

	Avg. Flow (2060)	Minimum Surface Area			Minimum Total Area
		FTP	FWS CW	Subtotal	
	(MGD)	(Acres)	(Acres)	(Acres)	(Acres)
<b>Existing SAWPA Service Area (Alt. 5-2)</b>	32.1	927	693	1,620	2,106
<b>Combined SAW &amp; CV Areas (Alt. 5-1)</b>	75.1	1,434	1,071	2,505	3,257

## **TECHNICAL MEMORANDUM No. 4 – SUMMARY of COSTS and RECOMMENDED OPTIONS**

### **General Description**

TM4 presents estimated capital construction costs and operation and maintenance costs for the alternative conceptual designs for the proposed IEI described in TM3. These estimated costs are indexed to Year 2010 to facilitate comparison with the estimated costs presented for the various Options considered in the *Salinity Management Program Phase 2 Technical Memorandum*. And a present worth analysis of the combination of alignment alternatives that would serve the combined Santa Ana Watershed (SAW) and San Gorgonio Pass & Coachella Valley (CV) areas with the lowest estimated cost is provided to facilitate comparison with the present worth analyses presented in the Salinity Management Program. Opportunities (Conclusions) and suggested Optimization Strategies for implementation of the proposed IEI (Recommendations) are also presented in TM4.

A simple comparison of the results of these present worth analyses indicates that the present worth of the estimated costs of the proposed IEI are greater than the costs of other options considered in the Salinity Management Program. However, various aspects of the proposed IEI distinguish this option from the other options considered in the Salinity Management Program. For example, the proposed IEI has great potential as a tool for economic development in the San Gorgonio Pass and Coachella Valley areas along the route, making brine management infrastructure available to prospective employers in the area. This Economic Development Opportunity is unique to the proposed IEI among all the options considered.

### **Summaries of Cost Estimates for Santa Ana Watershed Alternatives**

The estimated costs for the three SAW Alternatives considered (SAW Alternatives 1, 2 and 4) are summarized in **Table 10** on the next page. SAW Alternative 2 is the least-cost alternative for this portion of the proposed IEI.



**Table 7 – Summary of Costs of SAW Alternatives**

Description	SAW Alternative		
	1	2	4
Construction Costs	\$344,029,200	\$337,680,902	\$368,539,425
Distributive Costs (25%)	\$86,007,300	\$84,420,226	\$92,134,856
Contingencies (25%)	\$86,007,300	\$84,420,226	\$92,134,856
<b>Total Construction Costs</b>	<b>\$516,043,800</b>	<b>\$506,521,354</b>	<b>\$552,809,138</b>
Annual O&M Costs	\$18,069,608	\$20,249,464	\$21,090,154

**Summaries of Cost Estimates for Coachella Valley Alternatives**

The estimated costs for the two CV Alternatives designed to serve the combined SAW & CV areas (CV Alternatives A-1 and B-1) are summarized in **Table 11** below. CV Alternative B-1 is the least-cost alternative for this portion of the proposed IEI serving the combined SAW & CV areas.

**Table 8 – Summary of Costs of CV Alternatives (Combined SAW & CV Areas)**

Description	CV Alternative	
	A-1	B-1
Construction Costs	\$396,307,228	\$309,420,966
Distributive Costs (25%)	\$99,076,807	\$77,355,241
Contingencies (25%)	\$99,076,807	\$77,355,241
<b>Total Construction Costs</b>	<b>\$594,460,842</b>	<b>\$464,131,449</b>
Annual O&M Costs	\$6,536,048	\$4,661,725

**Treatment Facility Cost Estimates**

The estimated costs of the proposed Water Quality Treatment Facility (TF) represent a substantial portion of the estimated costs for the overall project. Therefore, if implementation of the proposed IEI receives further consideration, the need for the TF and the applicable design criteria warrants careful scrutiny.

The estimated costs for the two TF Alternatives designed to serve the combined SAW & CV areas (TF Alternatives 3-1 and 5-1) are summarized in **Table 12** below. TF Alternative 5-1 is the least-cost alternative for this portion of the proposed IEI serving the combined SAW & CV areas.

**Table 9 – Summary of Costs of TF Alternatives (Combined SAW & CV Areas)**

Description	TF Alternative	
	3-1	5-1
Construction Costs	\$745,972,900	\$443,759,100
Distributive Costs (25%)	\$186,493,225	\$110,939,775
Contingencies (25%)	\$186,493,225	\$110,939,775
<b>Total Construction Costs</b>	<b>\$1,118,959,350</b>	<b>\$665,638,650</b>
Annual O&M Costs	\$16,784,390	\$9,984,580

**Least Cost Alternatives**

The least-cost combination of alternatives for the various components of the proposed IEI to serve the combined SAW & CV areas is SAW Alternative 2, CV Alternative B-1 and TF Alternative 5-1. The total estimated cost for this least-cost alternative is summarized in **Table 13** below.

**Table 10 – Summary of Least Cost Alternatives (Combined SAW & CV Areas)**

Description	Alternative			
	SAW Alt. 2	CV Alt. B-1	TF Alt. 5-1	TOTALS
Construction Costs	\$337,680,902	\$309,420,966	\$443,759,100	\$1,090,860,968
Distributive Costs (25%)	\$84,420,226	\$77,355,241	\$110,939,775	\$272,715,242
Contingencies (25%)	\$84,420,226	\$77,355,241	\$110,939,775	\$272,715,242
<b>Total Construction Costs</b>	<b>\$506,521,354</b>	<b>\$464,131,449</b>	<b>\$665,638,650</b>	<b>\$1,636,291,452</b>
Annual O&M Costs	\$20,249,464	\$4,661,725	\$9,984,580	\$34,895,769

The least-cost combination of alternatives for the various components of the proposed IEI to serve the existing SAWPA service area is SAW Alternative 2, CV Alternative B-2 and TF Alternative 5-2. The total estimated cost for this least-cost alternative is summarized in **Table 14** below.

**Table 11 – Summary of Least Cost Alternatives (Existing SAWPA Service Area)**

Description	Alternative			
	SAW Alt. 2	CV Alt. B-2	TF Alt. 5-2	TOTALS
Construction Costs	\$337,680,902	\$250,100,820	\$286,984,800	\$874,766,522
Distributive Costs (25%)	\$84,420,226	\$62,525,205	\$71,746,200	\$218,691,631
Contingencies (25%)	\$84,420,226	\$62,525,205	\$71,746,200	\$218,691,631
<b>Total Construction Costs</b>	<b>\$506,521,354</b>	<b>\$375,151,230</b>	<b>\$430,477,200</b>	<b>\$1,312,149,783</b>
Annual O&M Costs	\$20,249,464	\$3,756,286	\$6,457,158	\$30,462,908

**Present Worth Analysis**

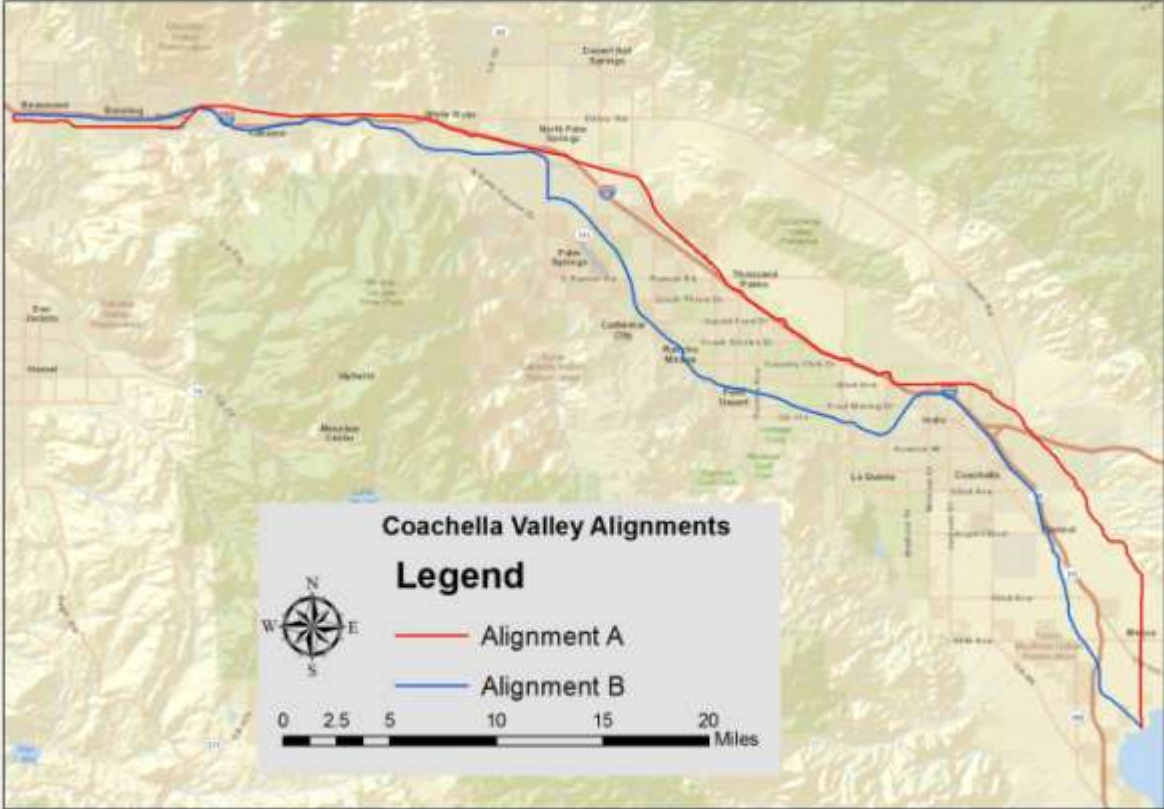
Present worth analyses were presented in the *Salinity Management Program Phase 2 Technical Memorandum* of the estimated costs for each of the options considered in that study to facilitate comparison. A similar present worth analysis is presented in TM4 for the least-cost combination of alternatives identified above to facilitate comparison of the proposed IEI with the present worth analyses of the options considered in the Phase 2 Technical Memorandum.

# APPENDIX – GIS EXHIBITS

## Santa Ana Watershed Alignments



**Coachella Valley Alignments**



### Water Quality Treatment Facility

