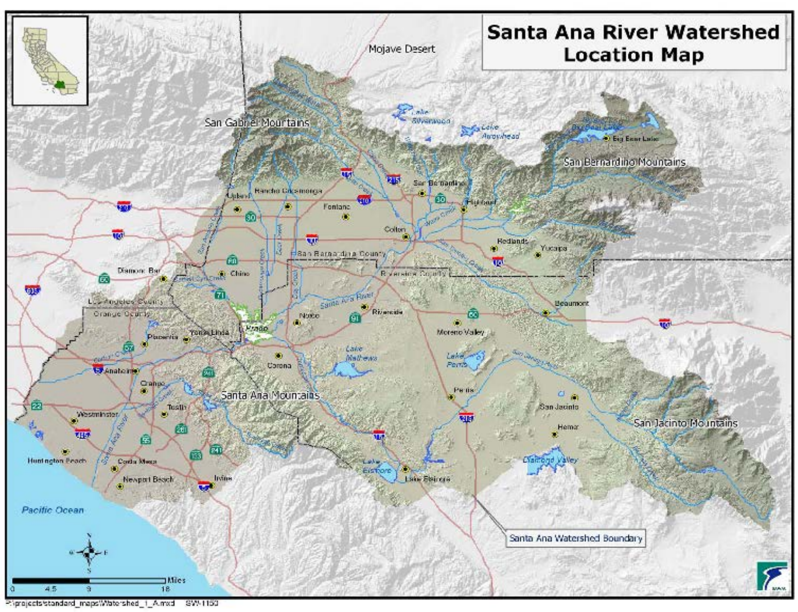
RECLAMATION

Managing Water in the West

SANTA ANA WATERSHED BASIN STUDY

INLAND EMPIRE INTERCEPTOR APPRAISAL ANALYSIS
TECHNICAL MEMORANDUM NO. 2
SUMMARY OF BRINE & FLOW DATA
AUGUST 2012 (FINAL - MAY 2013)



U.S. Department of the Interior
Bureau of Reclamation

Santa Ana Watershed
Project Authority

PROJECT INFORMATION	
ESO PROJECT NUMBER:	P2011-019
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LIST OF ACRONYMS & ABBREVIATIONS

ORGANIZATIONS:

CA-DWR	State of California Department of Water Resources
CDM	Camp, Dresser & McKee
CVWD	Coachella Valley Water District
CRWQCB	California Regional Water Quality Control Board, Colorado River Basin Region
EMWD	Eastern Municipal Water District
ESO	Bureau of Reclamation Engineering Services Office
IEUA	Inland Empire Utilities Agency
MSWD	Mission Spring Water District
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
Reclamation	Bureau of Reclamation
SAWPA	Santa Ana Watershed Project Authority
SBVMWD	San Bernardino Valley Municipal Water District
SCAO	Bureau of Reclamation Southern California Area Office
WMWD	Western Municipal Water District

DOCUMENTS:

Appraisal Analysis	Inland Empire Interceptor Appraisal Analysis
Basin Plan	Water Quality Control Plan: Colorado River Basin – Region 7
Basin Study	Santa Ana Watershed Basin Study
OWOW	One Water One Watershed
SPEIR	Subsequent Program Environmental Impact Report
TM	Technical Memorandum
TM2	Technical Memorandum No. 2
UWMP	Urban Water Management Plan
WMP	Water Management Plan

FACILITIES and PROCESSES:

Brine Line	Inland Empire Brine Line
CLMM	County Line Master Meter
CVSC	Coachella Valley Stormwater Channel
DOM	Domestic (Brine Generator Category)
DS	Desalter Facilities (Brine Generator Category)
IND	Industrial Facilities (Brine Generator Category)
IEBL	Inland Empire Brine Line
IEI	Inland Empire Interceptor
PP	Power Plants (Brine Generator Category)
RECYC	Recycled Water Facilities (Brine Generator Category)
RO	Reverse Osmosis
SARI	Santa Ana Regional Interceptor
TEMP	Temporary (Brine Generator Category)
WH	Waste Haulers (Brine Generator Category)
WRF	Water Reclamation Facilities

PARAMETERS and UNITS of MEASURE:

AF	Acre-Feet
AFY	Acre-Feet per Year
BOD	Biochemical Oxygen Demand (or Biological Oxygen Demand)
MGD	Million Gallons per Day
mg/L	Milligrams per Liter
ppm	Parts per Million
TDS	Total Dissolved Solids
TSS	Total Suspended Solids

REFERENCES

[1] ***Santa Ana Watershed Salinity Management Program, Phase 2 SARI Planning Technical Memorandum***, Camp, Dresser & McKee (CDM), et al for Santa Ana Watershed Project Authority, May 2010.

[2] ***Santa Ana Watershed Salinity Management Program, Summary Report***, CDM, et al for Santa Ana Watershed Project Authority, July 2010.

[3] ***Inland Empire Brine Line Disposal Option Concept Investigation*** (Draft), Santa Ana Watershed Project Authority, October 2011.

[4] ***Reclamation Manual,Directives and Standards, FAC 09-01, Cost Estimating & 09-0,2 Construction Cost Estimates and Project Cost Estimates***, Bureau of Reclamation, October 2007.

[6] ***Coachella Valley Final Water Management Plan***, Coachella Valley Water District in association with MWH Americas, Inc. and Water Consult, Inc., et al, September 2002.

[7] ***Coachella Valley Water Management Plan Update (Draft Report)***, MWH Americas, Inc. and Water Consult, Inc., et al for Coachella Valley Water District, December 2010.

[8] ***2010 Urban Water Management Plan (Final Report)***, Coachella Valley Water District in association with MWH Americas, Inc., July 2011.

[9] ***Draft Subsequent Program Environmental Impact Report (Administrative Draft)***, Coachella Valley Water District, July 2011.

[10] ***Final Subsequent Program Environmental Impact Report***, Coachella Valley Water District with assistance from MWH Americas, Inc. and Water Consult, Inc., January 2012.

Note: Various Urban Water Management Plans also referenced, as cited.

INTRODUCTION

Santa Ana Watershed Project Authority

The Santa Ana Watershed Project Authority (SAWPA) is a joint powers authority comprised of five member water districts that serve most of the Santa Ana Watershed. The area served by SAWPA is located within Riverside and San Bernardino Counties of California in the upper Santa Ana Watershed, bounded by Orange County and 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).

Inland Empire Brine Line

SAWPA's mission is to protect water quality and enhance the water supply within the Santa Ana River Watershed. This mission includes the goal of achieving a salt balance in the upper Santa Ana Watershed. For these purposes, SAWPA developed the Inland Empire Brine Line (Brine Line), also known as the Santa Ana Regional Interceptor (SARI), for the purpose of exporting salt from the Santa Ana Watershed. 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. Another 21 miles of pipeline convey the combined flows to Orange County Sanitation District (OCSD) facilities for treatment and disposal to the Pacific Ocean. The Brine Line has a capacity of approximately 32.5 million gallons per day (MGD); and the current average flows are approximately 11.7 MGD (in 2010 & 2011). It currently collects and exports over 75,000 tons of salt per year.

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.

Project Background

The One Water One Watershed (OWOW) Plan is the integrated water management plan for the Santa Ana Watershed. The OWOW Plan is administered by SAWPA. The Bureau of Reclamation (Reclamation) Southern California Area Office (SCAO) and SAWPA submitted a proposal in June 2010 for funding of a Santa Ana Watershed Basin Study in support of the OWOW Plan update, known as One Water One Watershed 2.0. In August 2010, the proposed Basin Study was selected by Reclamation for funding.

A study entitled ***Santa Ana Watershed Salinity Management Program*** [1] & [2] was prepared for SAWPA by a team of consultants lead by Camp, Dresser & McKee (CDM) in 2010. The Salinity Management Program report identified and evaluated several potential system configuration changes to address future system capacity limitations. One of the alternatives identified in the Salinity Management Program is a proposed new Brine Line outfall to the Salton Sea (identified as Option 4 in the Summary Report). This Brine Line outfall to the Salton Sea option is referred to in this Technical Memorandum (TM2) as the Inland Empire Interceptor, or IEI.

The Salinity Management Program report did not include a detailed evaluation of the IEI alternative, though a limited discussion of the concept was provided in Section 3.2 of the ***Santa Ana Watershed Salinity Management Program, Phase 2 SARI Planning Technical Memorandum*** [1]; and cost estimate information was presented in Appendix A. The magnitude of infrastructure costs and potential impacts associated with this option were noted. However, it was also suggested that SAWPA may choose to investigate this IEI option further.

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*** [3] (SAWPA Investigation) in which four alternative conceptual designs for the proposed IEI were developed and evaluated. The alternatives that will be considered in this Appraisal Analysis for the portion in the upper Santa Ana Watershed (west of San Gorgonio Pass) are based upon those investigated by SAWPA staff.

Appraisal Analysis Objectives

The purpose of this Inland Empire Interceptor Appraisal Analysis (Appraisal Analysis) is to help determine whether more detailed investigations of the proposed Inland Empire Interceptor (IEI) are justified. Under Reclamation criteria (Reclamation Manual FAC 09-01) [4], appraisal analyses "are intended to be used as an aid in selecting the most economical plan by comparing alternative features" and are to be prepared "using the available site-specific data." Several alternative conceptual designs for the proposed IEI will be developed and evaluated for this Appraisal Analysis for the purpose of comparison.

The proposed IEI would replace the existing outfall from the Brine Line system convergence near Prado Dam in western Riverside County near the Orange County boundary to the OCSD system, through which the flow is currently treated and discharged. The proposed IEI runs from a location near Prado Dam, eastward to San Gorgonio Pass and through Coachella Valley in eastern Riverside County. Three of the four alternative conceptual designs developed and evaluated in the SAWPA Investigation for the portion in the Santa Ana Watershed are under consideration in this Appraisal Analysis. And two alternative alignments were developed for the portion in the San Gorgonio Pass and Coachella Valley areas for consideration. The conceptual designs and estimated costs associated with each of these alternatives will be addressed in subsequent Technical Memoranda (TM) for this Appraisal Analysis.

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. This Appraisal Analysis will address this possibility.

This Appraisal Analysis will not include investigation of the benefits associated with the proposed IEI; but it is appropriate to note major categories of potential benefits. Benefits to stakeholders in the Santa Ana Watershed may include increased capacity for removal of salt from the watershed, a more reliable mechanism for treatment and disposal of brine, and an improved climate for economic development associated with improved infrastructure. Potential benefits to possible new stakeholders in San Gorgonio Pass and Coachella Valley may include opportunities for sharing of infrastructure necessary for removal of salt from the area and an improved economic development climate resulting from availability of this infrastructure. Potential benefits to Salton Sea stakeholders may include replacement of a portion of the looming water supply reduction.

A series of Technical Memoranda will be produced as part of this Appraisal Analysis in support of the final report. This Technical Memorandum No. 2 (TM2) is the second of this series.

Technical Memorandum No. 2

This TM2 addresses analysis of available historical Brine Line flow data and forecasting of future flows. It also addresses the potential expansion of the SAWPA / Brine Line service area to include the San Gorgonio Pass and Coachella Valley areas. The forecasts of future flows include those from both the existing Brine Line service area and from potential service area expansion.

TM2 also addresses analysis of available historical data for water quality constituents of the Brine Line flows and forecasting of those constituents in future flows. These constituents include Total Dissolved Solids (TDS), Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD).

PROPOSED INLAND EMPIRE INTERCEPTOR

Proposed Modifications to the Existing Brine Line Gravity Collection System

The conceptual design for the proposed Inland Empire Interceptor (IEI) will be described in a subsequent TM. However, a brief description is included here for background.

The existing Brine Line system operates by gravity-flow, including the existing outfall to the OCSD system. The IEI, as proposed, would replace the existing outfall. The route of the proposed IEI runs through upper Santa Ana Watershed, San Gorgonio Pass and Coachella Valley to the Salton Sea. The proposed IEI would begin at a location near the convergence of the existing system at Prado Dam in western Riverside County. It would run eastward to San Gorgonio Pass. The ground elevation at the high point in San Gorgonio Pass is nearly 2,100 feet above the lowest ground elevation along the route near Prado Dam. Therefore, pumping of the system flows will be necessary and the portion of the proposed IEI in Santa Ana Watershed will operate under pressure.

Proposed Inland Empire Interceptor in Santa Ana Watershed

As noted above, for the portion of the proposed IEI located in the Santa Ana Watershed, three alternatives have been selected for consideration in this Appraisal Analysis. Each alternative will begin at a pumping station located near Prado Dam. Additional pumping stations of various sizes will be necessary at various locations for each alternative.

All three alternatives will connect to the portion of the proposed IEI through San Gorgonio Pass and Coachella Valley. This connection is located at the City of Beaumont in western San Gorgonio Pass.

Proposed Inland Empire Interceptor in San Gorgonio Pass and Coachella Valley

Similarly, for the portion of the proposed IEI through San Gorgonio Pass and Coachella Valley, two alternative alignments have been selected for consideration in this Appraisal Analysis. Both alternatives begin at a point in the City of Beaumont in San Gorgonio Pass common to each of the other alternatives and terminate at the Salton Sea. This portion of the proposed IEI will operate by gravity-flow.

Potential Brine Line Service Connections in Coachella Valley

As noted above, the proposed IEI will provide an opportunity for existing or future brine generators in the San Gorgonio Pass and Coachella Valley areas to connect to the Brine Line. Coachella Valley Water District (CVWD) is the largest water supplier in the Coachella Valley area and potential new Brine Line stakeholder. The most recent long-term assessments of future water supplies and demands for the CVWD are the ***Coachella Valley Water Management Plan Update*** [6] (CVWMPU), dated December, 2010, and the ***2010 Urban Water Management Plan*** [7]. The CVWMPU is supplemented by the ***Subsequent Program Environmental Impact Report (Adminstrative Draft)*** [8] and ***Final Subsequent Program Environmental Impact Report*** [9] (SPEIR), dated July, 2011and January, 2012, respectively.

Like the Santa Ana River Watershed prior to development of the Inland Empire Brine Line, Coachella Valley is experiencing a salt imbalance that poses a long-term threat to the Valley water supply. The CVWMPU identifies a net import of salt into Coachella Valley of as much as 350,000 tons per year and proposes a Salt Management Program for the purpose of exporting salt from the Valley. The proposed program would provide desalination of drain water from the agricultural east portion of Valley to respond to the imbalance.

ANALYSIS of HISTORICAL FLOW DATA for EXISTING SAWPA SERVICE AREA

SAWPA Member Agencies

As previously mentioned, SAWPA is composed of five member agencies. Four of these agencies, all located in the upper Santa Ana Watershed, contribute flows to the Brine Line system. These four 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),
- Orange County Water District.

Orange County Sanitation District (OCSD), receives, treats and disposes of the flows from the Brine Line. Per the Santa Ana Watershed Salinity Management Program report by CDM, SAWPA owns 17 MGD of capacity in the OCSD system and has contractual rights to purchase additional capacity up to 30 MGD. The rate structure established in this agreement is based upon the Brine Line flows entering the OCSD system and the measured TSS and BOD concentrations of the flows. The flows and the TSS and BOD concentrations are measured at the County Line Master Meter (CLMM) located where the Brine Line crosses into Orange County.

SAWPA owns, operates and maintains the Brine Line system. The member agencies own rights to the system capacity. The individual member agencies can use capacity and/or make capacity available to third-party brine generators, up to their share of the system capacity. Like the OCSD agreement discussed above, the SAWPA rate structure is based upon the volume of the flows entering the Brine Line system as well as the TSS and BOD concentrations of the flows.

Analysis of Brine Line Flows

Forecasts of future flows for the existing SAWPA service area were previously prepared by CDM in support of the 2010 Santa Ana Watershed Salinity Management Program. These forecasts and available historical data were provided by SAWPA to Reclamation for this Appraisal Analysis. Reclamation used that information to develop flow projections for potential expansion of the SAWPA service area to include communities in the San Gorgonio Pass and Coachella Valley areas.

To develop those flow projections, the historical flow data were sorted into several Brine Generator Categories for analysis. The data were also sorted into the four SAWPA Member Agencies. Similarly, the forecasts of future flows for the existing SAWPA service area were also sorted by Brine Generator Categories and by SAWPA Member Agencies.

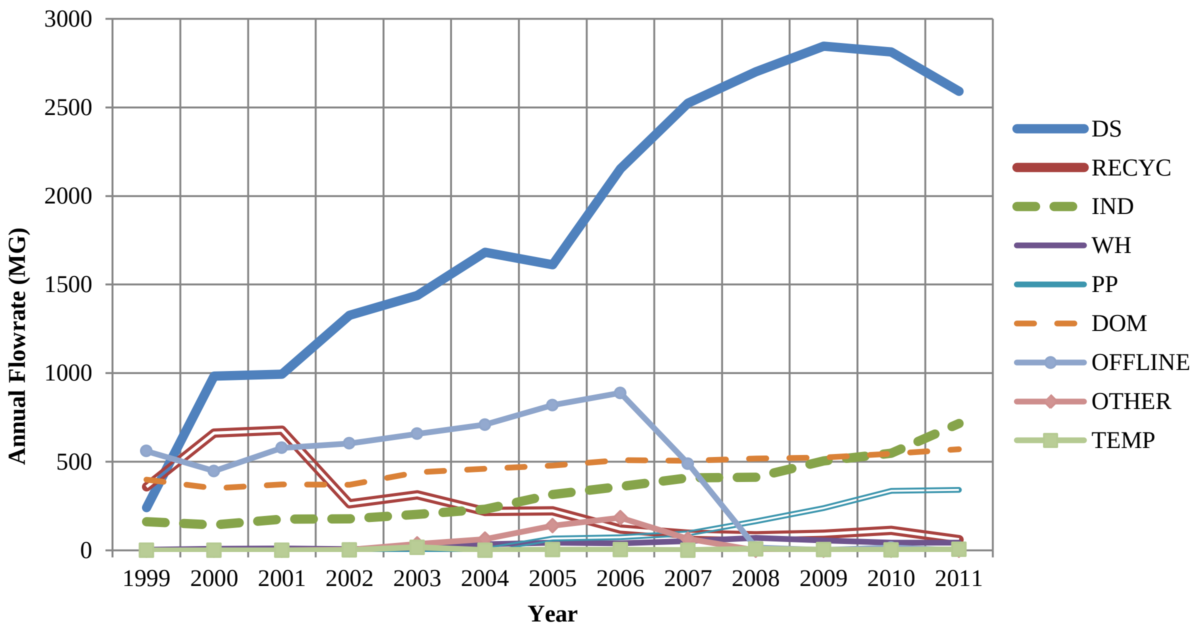
Historical Flow Data by Brine Generator Category

The Brine Generator Categories used in the analysis are designated as follows:

- Desalter Facilities: DS
- Recycled Water Facilities: RECYC
- Industrial Facilities: IND
- Power Plants: PP
- Waste Haulers: WH
- Domestic: DOM
- Offline: OFFLINE
- Temporary: TEMP
- Other: OTHER

Annual flow volumes for each of the Brine Generator Categories are presented graphically in **Figure 1** below.

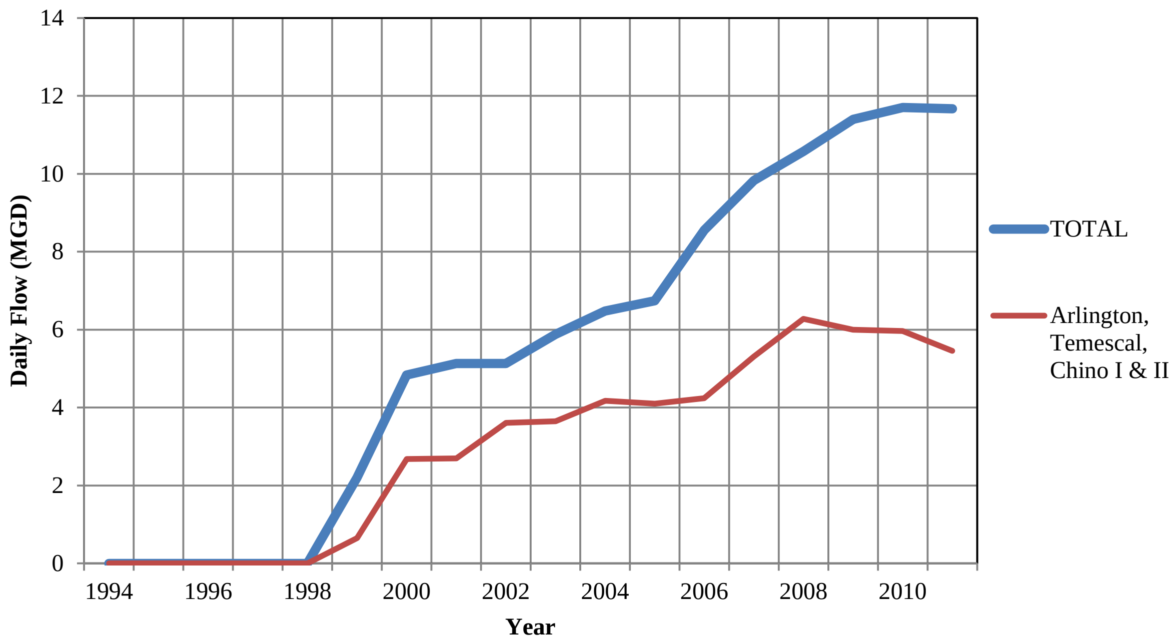
Figure 1 - Historic Brine Line Flow by Brine Generator Category



It is apparent from **Figure 1** that Desalter Facilities contribute a significant portion of the Brine Line flows. In recent years, flows from the Desalter Facilities Brine Generator Category have exceeded the flows from each of the other categories by at least 400 percent.

Historical flows from the Desalter Facilities category have come from only four facilities (Arlington, Temescal, Chino I and Chino II). The significance of these facilities to the Brine Line system is further emphasized by the relationship of the combined average daily flow from the four existing facilities to total Brine Line flows, illustrated in **Figure 2** below.

Figure 2 - Historical Brine Line Flow from Desalter Facilities



Desalter Facilities have accounted for approximately half of the historical total Brine Line flows.

The Industrial Facilities and Domestic Brine Generator Categories have been the next largest in recent years. Flows from the Industrial Facilities category have steadily increased over time. However, flows from the Domestic category have shown only modest increase; and improvements to domestic wastewater collection systems in the area are currently under way that will result in removal of nearly all Domestic flows from the Brine Line by 2015. Therefore, the Domestic category will no longer be a significant contributor to the Brine Line in future years.

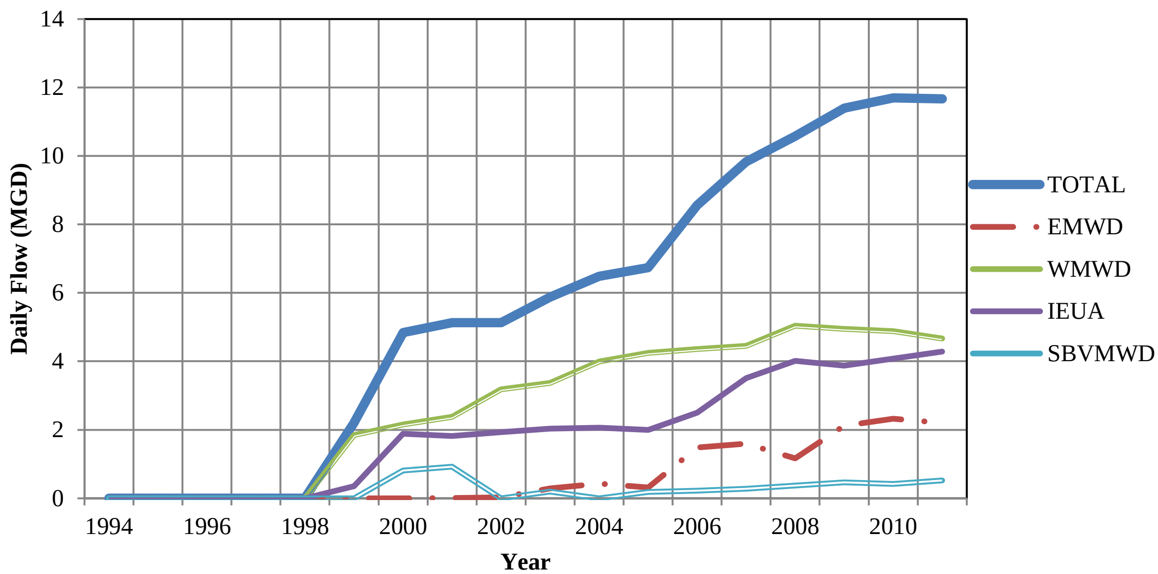
Flows from the Power Plants category have increased steadily and have become an increasingly significant portion of the total Brine Line flows in recent years.

Flows from the Recycled Water Facilities, Offline, Temporary and Other Brine Generator Categories are comparatively minor. The aggregate of historical flows from these categories amounts to approximately one percent of the total Brine Line flows.

Historical Flow Data by SAWPA Member Agency

The historical flow data has also been sorted by SAWPA Member Agency on an average daily flow basis. Because the flows from the Offline, Temporary and Other Brine Generator Categories are small, they have been eliminated from this analysis; the results of which are presented in **Figure 3** below.

Figure 3 - Historical Brine Line Flow by SAWPA Member Agency



The largest flows originate from the WMWD service area, followed closely by IEUA. Combined, these two agencies comprise approximately 75to 90 percent of the total Brine Line flows on an annual basis. As indicated in the discussion of Brine Generator Categories above, more than half of the total Brine

Line flows are generated by four Desalter Facilities. The flows from WMWD and IEUA exceed the flows from EMWD and SBVMWD, primarily because the Desalter Facilities are located in their service areas:

- Arlington Desalter: WMWD
- Temescal Desalter: WMWD
- Chino I Desalter: IEUA
- Chino II Desalter: IEUA

FORECASTING of FLOWS from EXISTING SAWPA SERVICE AREA

Methodology

As discussed above, SAWPA Member Agencies own rights to the Brine Line system capacity. The system capacity is thus allocated and tracked by various parameters, including Member Agency and permit number(s). These allocations and tracking parameters were tabulated by CDM in the Salinity Management Program.

Future service connections in the Santa Ana Watershed were also identified by CDM in the Salinity Management Program with corresponding forecasted flows and sorted into Brine Generator Categories. The timing of the flows for each future service connection was determined using the estimated year the new service connection will become operational and the estimated year that facility operation will reach full capacity. A linear growth rate was applied between those dates.

Existing Brine Line System Capacity

The Salinity Management Program report by CDM addresses the existing capacity constraints of the Brine Line system. These capacity constraints include the OCSD contractual commitments by which SAWPA owns 17 MGD of OCSD capacity and has a right to purchase up to 30 mgd, total, of OCSD capacity. Capacity constraints also include the maximum capacity of the existing pipeline, which is approximately 32.5 MGD. These capacity constraints were contrasted with the total historical and forecasted flows in the Brine Line system. The flows for Years 1994 through 2011 reflect actual system flows measured at the CLMM. The flows for Year 2012 and beyond are the forecasted rates.

The capacity constraints and the total historical and forecasted flows in the Brine Line are shown in **Figure 4** below.

Figure 4 - Existing Brine Line System Capacity

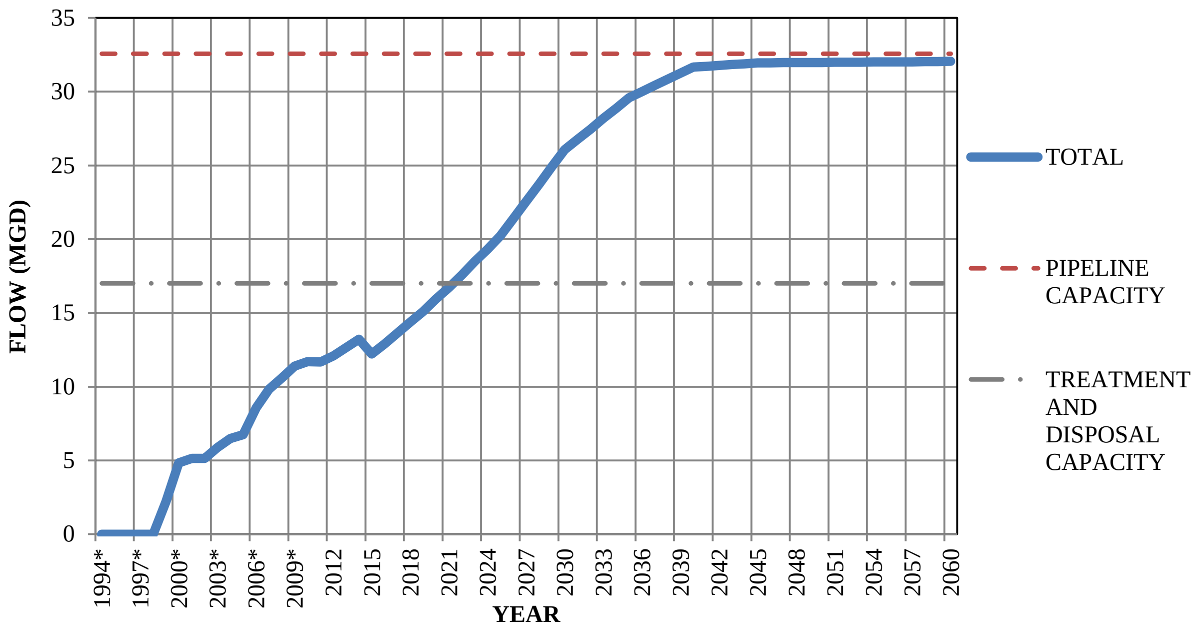
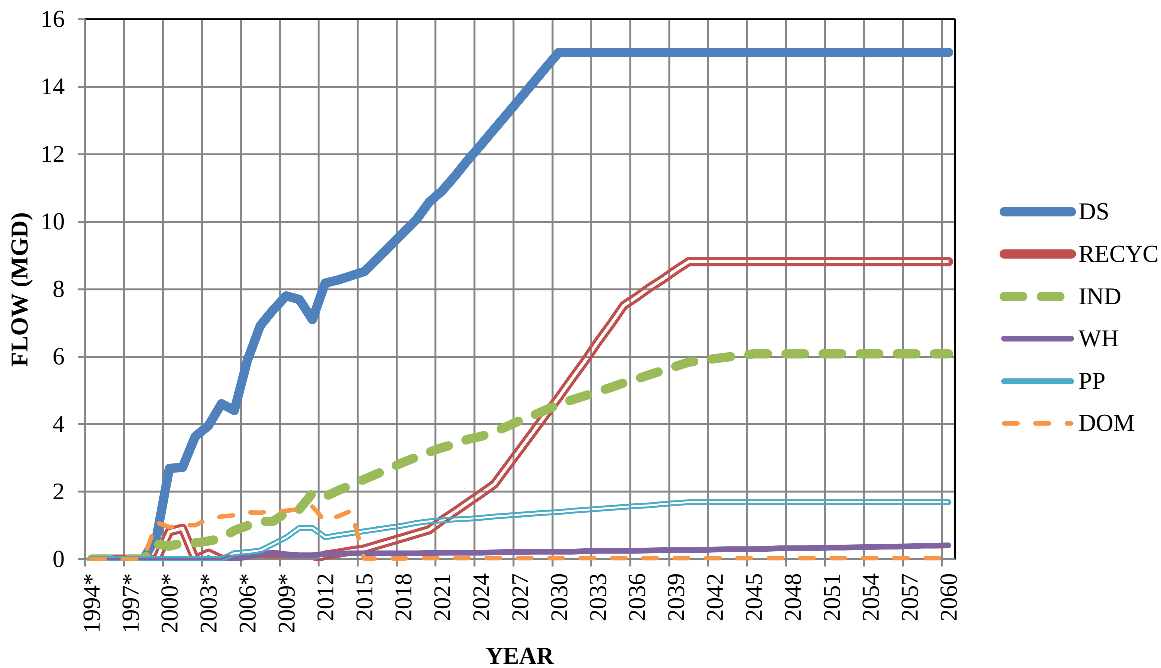


Figure 4 indicates that Brine Line system flows will exceed the maximum rate contracted with OCSD (17 MGD) by Year 2022 and will reach the capacity of the existing pipeline (32.5 MGD) as early as Year 2040. The minor dip in the total flows in the Year 2015 coincides with decreased brine generation from the Arlington Desalter and with planned removal of Domestic flows from the Brine Line system.

Forecasted Flows by Brine Generator Category

Building upon the results shown previously in **Figure 1**, the forecasted Brine Line flows have been sorted by Brine Generation Category. These results are presented in **Figure 5** below.

Figure 5 - Forecasted Flows by Brine Generator Category



As discussed in the “Historical Flow Data by Brine Generator Category” subsection above, the Desalter Facilities category has accounted for approximately half of the historical total Brine Line flows. It is anticipated that flows from Desalter Facilities will continue to account for approximately half of the Brine Line flows. The projected peak flow rate produced from the Desalter Facilities category is 15.0 MGD, occurring in Year 2030.

The flows from the Industrial Facilities category are anticipated to exhibit steady growth, with an average rate of increase of approximately 0.14 MGD per year. The projected peak flow rate produced from the Industrial Facilities category is forecasted to be approximately 6 MGD, reached in Year 2044.

As noted previously, flows from the Domestic category will be eliminated from the system by 2015. The lone exception is the Green River Golf Club, which will continue to contribute domestic wastewater flows to the Brine Line system.

The flows from the Power Plants and Waste Haulers categories are anticipated to remain relatively consistent. Both categories are expected to generate minor flows, with Power Plants contributing approximately five percent and Waste Haulers contributing approximately one percent of the total system flows.

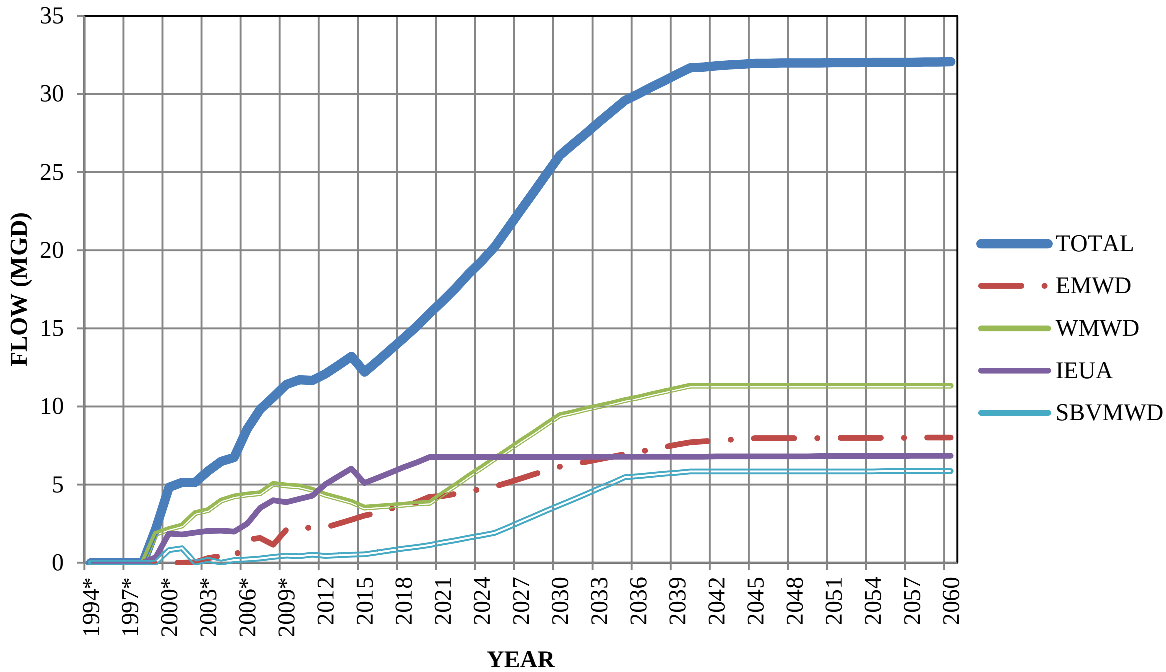
The Recycled Water category has not been a major contributor to historical Brine Line flows. For example, there were no flows in the Brine Line system from Recycled Water connections in 2011. Due to the growing reliance upon recycled water as a portion of the water supply portfolio of water districts throughout the region in their Urban Water Management Plans, the Brine Line flows for this category are expected to significantly increase over the next 25 years. The Recycled Water category is anticipated to overtake the Industrial category as the second largest SAWPA Brine Generator Category by Year 2030. However, it should be noted that the design of Water Reclamation Facilities (WRF) frequently provides for return of the waste flows to the treatment process and direct disposal to the Brine Line may not be the most economical alternative available to those facilities. Therefore, the forecasted Recycled Water category flows may not be realized in the future.

Forecasted Flows by SAWPA Member Agencies

The forecasted flows have also been sorted into four SAWPA Member Agencies. The values for Years 1994 through 2011 represent actual measured rates of flow in the system. Flow rates for Years 2012 and beyond reflect the forecasted values. The forecasted Brine Line flows from each SAWPA Member Agency are expected to continue to increase until their respective share of the capacity has been reached.

The forecasted flows for each SAWPA Member Agency are displayed in **Figure 6** below.

Figure 6- Forecasted Brine Line Flows by SAWPA Member Agency



Consistent with the historical pattern, flows from WMWD are anticipated to be the largest among the four SAWPA Member Agencies analyzed, increasing to its capacity ownership of 11.33 MGD as early as Year 2040. The flows from WMWD began to dip in 2008. This dip coincides with decreased brine generation from the Arlington Desalter and with removal of domestic wastewater service connections in the WMWD service area. This downturn is anticipated to reverse by 2015 as the impact of these changes is offset by increased flows from other sources. For example, it is anticipated that flows from several WMWD service connections in the Industrial Facilities category will increase, peaking in Year 2030, and that several planned Water Reclamation Facilities in the WMWD service area will begin contributing flows to the Brine Line in Year 2021.

EMWD is anticipated to be the second largest SAWPA Member Agency, with flows reaching its capacity ownership of 8.0 MGD as early as Year 2045. EMWD anticipates modest growth, with the two existing Desalter Facilities in the EMWD service area reaching capacity in Year 2020, followed by two additional planned Desalter Facilities coming online at that time and reaching full capacity as early as Year 2030.

SBVMWD is forecasted to experience steady growth to its capacity ownership of 5.84 MGD by Year 2036.

Flows from IEUA are anticipated to experience a dip in the in Year 2015, which coincides with removal of domestic wastewater connections located in the IEUA service area. Nevertheless, IEUA flows are expected to reach capacity ownership of 6.8 MGD as early as Year 2020, much sooner than the other SAWPA Member Agencies.

POTENTIAL SAWPA SERVICE AREA EXPANSION

Communities in the Potential Service Area Expansion

The route of the proposed IEI represents an opportunity for SAWPA to expand the Brine Line service area to include the San Gorgonio Pass and Coachella Valley areas.

The San Gorgonio Pass area is the location of the communities of Beaumont, Banning and Cabazon and tribal lands of the Morongo Band of Mission Indians. (The City of Beaumont is located within the boundary of the SAWPA service area; but not within those of any of the SAWPA Member Agencies.) The area is dominated by major transportation and utilities corridors. Land use in the Pass is predominantly low density residential, with some commercial and light industrial uses attracted by the highway and railroad transportation corridors. The east end of the Pass is dominated by expansive fields of wind turbine electrical generators, which extend into the westernmost portion of Coachella Valley.

The Coachella Valley is characterized by two distinctly different areas, the West Valley and the East Valley. The West Valley, the upper portion, extends from the Palm Springs area eastward to the communities of La Quinta and Indio. Land use in this area is predominately low-density urban, characterized by numerous resort residential golf course communities. Light industrial land use areas are small, sufficient only to support the needs of the local community. The East Valley, the lower portion, extends from vicinity of the City of Coachella southeastward to the Salton Sea. Land use in this area is predominately agricultural, with little industrial land use.

Implementation of the proposed IEI would likely make San Gorgonio Pass and Coachella Valley more attractive to industry, by making important infrastructure more readily available.

Water Supplies in San Gorgonio Pass and Coachella Valley

The State of California Department of Water Resources requires each supplier of water in the state that serves over 3,000 connections or supplies 3,000 acre-feet of water annually to conduct long term resource planning. This planning is documented by each such supplier in an Urban Water Management Plan (UWMP), which must be updated at five-year intervals. The purpose of the UWMP is to assess the reliability of water supplies over a 20-year period to ensure that existing and future water demands in the given service area will be met. The UWMP takes into consideration population, changes in land use, conservation measures, climate change, and environmental issues that potentially impact the water supplier's operations.

The most recent UWMPs produced by the water suppliers for the various communities in San Gorgonio Pass and Coachella Valley were reviewed for this Appraisal Analysis as part of the evaluation of the potential for new service connections to the proposed IEI.

The communities in San Gorgonio Pass enjoy high quality groundwater supply, which is recharged by runoff from the mountains on either side. This supply has historically been sufficient to meet the needs of these communities and no augmentation with imported water has been necessary.

Coachella Valley has benefitted from high quality groundwater as its principal source of water supply. However, this local water supply is not sufficient to meet the total water demands of the area. So the local supply is augmented by Colorado River water delivered via the Colorado River Aqueduct and via the Coachella Canal, which receives Colorado River water via the All-America Canal.

The water from the Colorado River Aqueduct is used to recharge the aquifer in the West Valley using the Whitewater River recharge facility located in the Palm Springs area. These groundwater supplies primarily serve the urbanized West Valley and are closely monitored. Coachella Canal water is delivered to the East Valley. The water is primarily used for agricultural irrigation, urban landscape irrigation, and groundwater recharge. The groundwater resource in the East Valley is split into upper and lower zones by an aquitard. The Thomas E. Levy and Martinez Canyon recharge facilities are used to augment natural groundwater recharge of the upper zone of the aquifer.

Water Demands in San Gorgonio Pass and Coachella Valley

Like the upper Santa Ana Watershed, the communities of the San Gorgonio Pass and Coachella Valley area are served by several suppliers of water. The populations and total water demands of the four SAWPA Member Agencies and of the San Gorgonio Pass and Coachella Valley communities are presented in **Table 1** below.

Table 1 – Regional Water Demand and Population Comparison

	2010		2020		2030	
Location	**Population**	**Total Demand (AFY)**	**Population**	**Total Demand (AFY)**	**Population**	**Total Demand (AFY)**
EMWD[3]	*695,932*	154,700	*870,603*	241,400	*1,111,729*	302,200
WMWD[5]	*85,469*	85,634	*112,157*	124,042	*161,016*	156,231
IEUA[9]	*846,469*	222,623	*981,651*	347,739	*1,176,066*	393,746
SBVMWD[4]	*187,690*	55,940	*207,715*	75,850	*221,400*	94,264
Santa Ana Watershed Totals	***1,815,560***	**518,897**	***2,172,126***	**789,031**	***2,670,211***	**946,441**
Beaumont[8]	*27,305*	18,029	*59,898*	24,417	*90,290*	25,577
Banning[7]	*29,603*	7,586	*36,086*	10,183	*48,567*	12,413
Indio Water Authority[6]	*76,036*	20,466	*93,115*	34,141	*105,873*	44,154
DWA/MSWD Totals[1]	*111,400*	50,500	*141,300*	59,100	*177,500*	73,400
CVWD Totals[2]	*435,698*	678,600	*614,938*	719,100	*922,994*	817,100
San Gorgonio Pass and Coachella Valley Totals	***680,042***	**775,181**	***945,337***	**846,941**	***1,345,224***	**972,644**

1- Desert Water Agency 2010 Urban Water Management Plan, Tables 2, 4, & 15
2- Coachella Valley Water District 2010 Urban Water Management Plan, values from Tables 3-1, 3-2,
3- Eastern Municipal Water District 2010 Urban Water Management Plan, values from Tables 1.2, 1.3, 3-2, 3-4
4- 2010 San Bernardino Valley Regional Urban Water Management Plan, values from Tables 10-2, 10-35
5- Western Municipal Water District 2010 Urban Water Management Plan, values from Tables 1-3, 2-1, 2-10,
6- Indio Water Authority 2010 Urban Water Management Plan, values taken from Table 2-8,
7- City of Banning 2010 Urban Water Management Plan, values taken from Table 3-8
8- Beaumont Cherry Valley Water District 2005 Urban Water Management Plan, values taken from Table 3-8
9- Inland Empire Water District 2010 Urban Water Management Plan, values from Table 3-9, 3-12

It is readily apparent from **Table 1** that the upper Santa Ana Watershed has a much larger population than San Gorgonio Pass and Coachella Valley. It is also apparent that the upper Santa Ana Watershed has a smaller total water demand per capita than San Gorgonio Pass and Coachella Valley. This variance is a reflection of non-potable agricultural water demands in those areas; and it is especially large for CVWD due to the large agricultural demands in the East Valley. Urban development is expected to reduce the per capita water needs in Coachella Valley as the increased urban demands (for both potable and non-potable landscape irrigation uses) will be offset by the much larger reduction of agricultural irrigation demands.

Coachella Valley Water Resources Planning

As noted above, Coachella Valley is served by several suppliers of water. These organizations collaborated on the Coachella Valley Integrated Regional Water Management Plan, dated December, 2010, which provides an overview of water related issues facing the stakeholders. Of the stakeholders Coachella Valley Water District (CVWD) is the largest and the most strategically significant to the proposed IEI. The most recent long-term assessments of future water supplies and demands for the CVWD are the ***Coachella Valley Water Management Plan Update (Draft Report)*** [6] (CVWMPU), dated December, 2010, and the ***2010 Urban Water Management Plan*** [7]. The CVWMPU is supplemented by the ***Draft*** and ***Final Subsequent Program Environmental Impact Reports*** [8] & [9] (SPEIR).

The CVWMPU identifies a salt imbalance in Coachella Valley. The primary source of this salt is Colorado River water delivered to the upper valley via the Colorado River Aqueduct and to the lower valley via the Coachella Canal. The State (California) Water Resources Control Board Recycled Water Use Policy requires development of a salt/nutrient management plan by Year 2014; and the CVWMPU proposes development of a Salt Management Program to respond to the existing imbalance. Alternative mechanisms for removal of salt from the Valley are addressed in the CVWMPU, including desalination of Colorado River water and desalination of drain water from the East Valley. Both of these alternatives would produce brine for which a means of disposal would be needed. There are currently no operational Desalter Facilities in the area.

The costs reported in the CVWMPU for the first alternative (desalination of Colorado River water) range from $460 per AF to $685 per AF for capacity up to 90,000 AFY. The CVWMPU notes that expansion of this alternative by as much as 80,000 AFY has been suggested by stakeholders. At the higher (170,000 AFY) capacity, this alternative would produce up to 40 MGD of brine at an 85% recovery rate. The costs reported in the CVWMPU for the latter alternative (desalination of drain water) range from $480 per AF to $740 per AF. The anticipated capacity range is 55,000 to 85,000 AFY.

The cost information presented in the CVWMPU suggests that the total cost of each alternative will depend on system capacity and the influence of technical aspects on the unit cost (per AF). The first alternative, desalination of Colorado River water, is ruled out in the CVWMPU as economically infeasible (within the 20-year planning horizon). The CVWMPU suggests that the latter alternative, desalination of drain water from the East Valley, is the more promising alternative; and CVWD has investigated this alternative with a pilot and feasibility study by consultant Malcolm-Pirnie, completed in 2008.

Both of these CVWMPU alternatives would utilize reverse osmosis (RO) Desalter Facilities that will produce large quantities of brine. For the purpose of this Appraisal Analysis, it is anticipated that Desalter Facilities will be used in Coachella Valley. Forecasts of Brine Line flows and brine characteristics from Coachella Valley were developed using historical Brine Line data for the upper Santa Ana Watershed as discussed later in this TM2.

As noted above, both of the two alternatives addressed in the CVWMPU would produce brine for which a means of disposal would be needed. The proposed IEI could serve that need. The CVWMPU Final SPEIR includes a schematic plan for a network of brine lines in Coachella valley. This schematic plan was used for this Appraisal Analysis to identify locations of potential future service connection points to the proposed IEI.

Potential Brine Generators in San Gorgonio Pass & Coachella Valley

An investigation of the San Gorgonio Pass and Coachella Valley area was performed for the purpose of identifying potential brine generators. The research included a review of publicly available information about potential Brine Line customers in the area, including Land Use Plans adopted by the various municipalities; UWMPs for the various municipalities and water districts, and information about wastewater treatment facilities, power plants and other potential brine generators.

This investigation led to identification of a set of Brine Generator Categories that could reasonably be expected to benefit from the proposed IEI. This group of Brine Generator Categories for San Gorgonio Pass and Coachella Valley includes Desalter Facilities, Recycled Water Facilities and Waste Haulers.

As discussed above, the large net annual salt import into Coachella Valley suggests that Brine Line flows from Desalter Facilities in the Valley could be quite large.

Regarding the Industrial Facilities and Waste Haulers Brine Generator Categories, few existing industrial facilities were identified in San Gorgonio Pass and Coachella Valley that would be expected to benefit from a Brine Line outfall through the area. As discussed above, land use in the West Valley is predominately low-density residential and the allocations for light industrial in the local land use plans are small. Similarly, land use in the East Valley is predominately agricultural; and the area has not yet attracted industry. Therefore, forecasted flows from both Brine Generator Categories are anticipated to be small and have been grouped in the Waste Haulers category in this Appraisal Analysis. However, as noted previously herein, implementation of the proposed Brine Line outfall to the Salton Sea may make San Gorgonio Pass and Coachella Valley more attractive to industry and the Waste Hauler and Industrial Facilities categories may become more significant over time.

The Recycled Water Facilities Brine Generator Category is among those that could be expected to contribute significant Brine Line flows from San Gorgonio Pass and Coachella Valley. The UWMPs of the water districts and municipalities in the region, including CVWD, predict a growing reliance upon recycled water as a portion of their water supply portfolios. And this resource is currently being used in Coachella Valley for irrigation of golf courses and other landscaped areas. However, it should be noted that WRF design frequently provides for return of brine waste to the treatment process; so the forecasted Brine Line flows from the Recycled Water Facilities category may not be realized.

METHODOLOGY for FORECASTING of FLOWS from POTENTIAL SERVICE AREA EXPANSION

Introduction

Three distinct methods were employed for this Appraisal Analysis for forecasting flows from the potential service area expansion in San Gorgonio Pass and Coachella Valley. These three approaches are referred to herein as "Historic Average Ratio Method", "Member Capacity Ratio Method" and "Mixed Forecast Ratio Method". This section of this TM2 describes the three methods.

Each method was applied to each Santa Ana Watershed Brine Generator Category to develop estimated rates of flow specific to that category for that method. These rates were then applied to the appropriate metric for each Brine Generator Category identified in the San Gorgonio Pass and Coachella Valley area. This established a range for each category, each of which was then evaluated to determine the forecasted Brine Line flows from each Brine Generator Category in the potential service area expansion.

As discussed previously in this TM2, the CVWMPU addresses alternatives for a proposed salt management program to protect the water resources of the area. The 2002 ***Coachella Valley Final Water Management Plan*** [5] proposed implementation of a salt management program by Year 2035. A simple mass balance analysis of the rate of salt accumulation in the Valley was performed for this Appraisal Analysis which reinforced this timeframe for implementation. Therefore, the forecasted Brine Line flows from the potential service area expansion are predicted in this TM2 to begin in Year 2035 with a period of transition to the full rates by Year 2040.

Historic Average Ratio Method

The Historic Average Ratio Method is based upon the actual measured flow in the existing Brine Line system. Though it reflects actual operational experience, the accuracy of forecasts based on the Historic Average Ratio is only as good as the operational data upon which it is based. This method utilizes the available historic Brine Line flow data for various service connections and the production capacities of the associated facilities to identify a ratio of brine generation rates and facility design capacity. Brine Line historical flow data has been recorded by service connection. The data has generally been collected on a monthly basis; but much of it is intermittent. For months with multiple data points, the first data point for the month was used as the monthly flow rate (in millions of gallons per month). These twelve monthly flow rates were summed to create an annual total rate, which was identified as the "Annual Sum of Monthly Average". This annual sum was then converted to an annual average daily flow rate, which was designated as "Adjusted Daily Average of Historic Monthly Flow", measured in millions of gallons per day (MGD).

The results of these calculations for the Perris Desalter (for Years 2003 through 2012) are summarized in **Table 2** below as an example.

Table 2 –Calculation of Adjusted Daily Average of Historic Monthly Flow for the Perris Desalter

Month	2006	2007	2008	2009	2010	2011	2012	Monthly Average (MG)
JAN	18.2199	19.0946	18.057	26.5948	22.0703	27.4107	18.612	21.44
FEB	18.1792	17.4284	0.01	20.3065	23.9567	23.8447	22.2943	21
MAR	4.1697	20.0648	0	25.8315	25.2725	25.2883	24.3551	20.83
APR	5.7474	19.6151	0	22.0335	22.9619	24.6631	#N/A	19
MAY	26.57	21.1267	0	21.132	24.268	22.3567	#N/A	23.09
JUN	23.4396	21.0684	9.0277	21.8507	22.789	23.6302	#N/A	20.3
JUL	25.2809	27.1433	21.3829	23.8305	21.4846	23.1773	#N/A	23.72
AUG	21.1893	22.4053	28.0477	25.4459	24.5799	23.6561	#N/A	24.22
SEP	12.8895	19.8229	25.0795	25.0468	21.9273	18.4427	#N/A	20.53
OCT	20.786	23.3983	24.0326	26.4075	26.0558	16.9349	#N/A	22.94
NOV	22.9296	20.5636	15.7815	17.213	23.8393	18.837	#N/A	19.86
DEC	23.0345	15.8419	15.8743	17.5268	23.0747	25.4182	#N/A	20.13
Total (MG)	222.4	247.6	157.3	273.2	282.3	273.7	65.3	257.1

Adjusted Daily Average of Historic Monthly Flow = 257.1 / 365 = 0.70 MGD

The "Historic Average Ratio" for each service connection was then calculated as the ratio of the "Adjusted Daily Average of Historic Monthly Flow" and the rated production capacity of that facility. For example, the metric for the production capacity of Mountain View Power Plant is mega-watts (MW); and the "Historic Average Ratio" was calculated in millions of gallons per day (MGD) per mega-watt (MW). The weighted average of all the facilities in the given Brine Generation Category was then calculated to yield the "Historic Weighted Average Ratio" for that category.

The "Historic Weighted Average Ratio" for each Brine Generator Category is presented in **Table 3** below.

Table 3 – Summary of Historic Average Ratios

BRINE CATEGORY	METRIC	HISTORIC WEIGHTED AVG RATIO DESCRIPTION	HISTORIC WEIGHTED AVG RATIO
DESALTER	RAW WATER CAPACITY	MGD of BRINE / MGD of H2O	0.095
RECYCLED WATER	n/a		
INDUSTRIAL	n/a		
WASTE HAULER	PER CAPITA	MGD of BRINE / PERSON	6.13E-08
POWER PLANT	MEGA WATTS GENERATED	MGD of BRINE / MW	3.94E-04
DOMESTIC	n/a		

The Historic Average Ratio method is best used for forecasting of Brine Generation Categories with ample historical flow data, such as Desalter Facilities, Power Plants and Waste Haulers. Indeed, in the case of the Waste Hauler category, only the Historic Average Ratio method was used. Conversely, The Historic Average Ratio method was not used for the Recycled Water category because there is no available data for Recycled Water service connections to the Brine Line.

Member Capacity Ratio Method

The Member Capacity Ratio method estimates the Brine Line system capacity that would potentially be purchased to accommodate future flows. As discussed above, SAWPA Member Agencies own rights to the Brine Line system capacity and make that capacity available to third-party brine generators. Allocated system capacity is tracked by permit numbers. This method utilizes the permitted Brine Line capacity for a given Brine Generator Category to forecast rates of Brine Line flow. The "Member Capacity Ratio" is calculated by dividing the permitted capacity (in MGD) by the metric specific to that Brine Generator Category. The same metrics used in the Historic Ratio Method were also employed in this method. SAWPA's actual operational experience suggests that this method is more conservative than the other methods, since it relies upon capacity in the existing system that has not yet been fully utilized.

The results of the Member Capacity Ratio calculations for the Desalter Facilities in the EMWD service area are summarized in **Table 4** below as an example.

Table 4 –Member Capacity Ratio for EMWD Desalter Facilities

FACILITY NAME	AGENCY	DESALTER DESIGN FLOW CAPACITY (MGD)	CURRENT PERMITTED BRINECAPACITY (MGD)	MEMBER CAPACITY RATIO (MGD of BRINE / MGD of DESIGN FLOW)
Menifee	EMWD	4.1	1.07	0.26
Perris	EMWD	7.9	1.86	0.24
Perris II	EMWD	6.2	0.75	0.12
Hemet	EMWD	4	0.5	0.13

The weighted average of the Member Capacity Ratios for all the facilities in the given Brine Generation Category was then calculated to yield the "Member Capacity Weighted Ratio" for that category. The "Member Capacity Weighted Ratio" and corresponding metrics for each Brine Generator Category are presented in **Table 5** below.

Table 5 – Summary of Member Capacity Ratios

BRINE CATEGORY	METRIC	MEMBER CAPACITY WEIGHTED RATIO DESCRIPTION	MEMBER CAPACITY WEIGHTED RATIO
DESALTER	DESIGN FLOW CAPACITY	MGD of BRINE / MGD of DESIGN FLOW	0.137
RECYCLED WATER	TREATMENT CAPACITY	MGD of BRINE / MGD of EFF H2O	0.106
INDUSTRIAL	n/a		
WASTE HAULER	n/a		
POWER PLANT	MEGA WATT GENERATED	MGD of BRINE / MW	8.91E-04
DOMESTIC	n/a		

The Member Capacity Ratio method was not used for the Domestic, Industrial Facilities or Waste Hauler Brine Generation Categories. As previously discussed, domestic flows are being removed from the system; and flows from Industrial Facilities in San Gorgonio Pass and Coachella Valley are included in the Waste Hauler flows. The Waste Hauler category is not suitable for analysis using the Member Capacity Ratio method because permits are not issued for these stations. Waste hauler stations are managed differently because they are used by Brine Line customers with small volumes of brine or who lack a direct connection to the system; and the customers and associated flows are more variable.

The Member Capacity Ratio method is best used for forecasting of Brine Line capacity that may be purchased by new Member Agencies or customers. The rates calculated by the Member Capacity Ratio method are not estimates of the flows that will be conveyed in the Brine Line, but rather of the potential maximum flows and of the system capacity needs.

Mixed Forecast Ratio Method

The Mixed Forecast Ratio Method was used to produce Brine Line flow forecasts for the Member Agencies based on relationship to water demand forecasts. Therefore, this method is best used for forecasting of Brine Generation Categories directly associated with water supply, specifically Desalter Facilities and Recycled Water. The forecasts of Brine Line flows for the existing SAWPA Member Agencies developed by CDM are discussed above (in the section entitled "Forecasting of Future Flows for Existing SAWPA Service Area"). Forecasts of water demand have been developed by the water districts and municipalities in their respective Urban Water Management Plans, as previously discussed above (in the section entitled "Potential Service Area Expansion"). The "Mixed Forecast Ratio" is simply calculated as the ratio of the forecasts for brine flow and for water demand.

As an example, the results of the Mixed Forecast Ratio calculations for the Desalter Facilities Brine Generator Category are summarized in **Table 6** on the next page.

The Mixed Forecast Ratio and corresponding metrics for each Brine Generator Category are presented in **Table 7**, also on the next page.

Table 6 – Mixed Forecast Ratio for Desalting Facilities Brine Generator Category

	2010 Population	2010 Potable Demand (MGD)	2010 Brine Demand (MGD)	2010 Mixed Forecast Ratio	2020 Population	2020 Potable Demand (MGD)	2020 Brine Demand (MGD)	2020 Mixed Forecast Ratio	2030 Population	2030 Potable Demand (MGD)	2030 Brine Demand (MGD)	2030 Mixed Forecast Ratio
EMWD	695,932	69.37	1.68	0.02	870,603	108	3.06	0.03	1,111,729	134.19	4.18	0.03
WMWD	85,469	22.09	2.7	0.12	112,157	31	2.23	0.07	161,016	38.23	5.55	0.15
IEUA	846,469	188.71	3.32	0.02	981,651	205	5.29	0.03	1,176,066	224.88	5.29	0.02

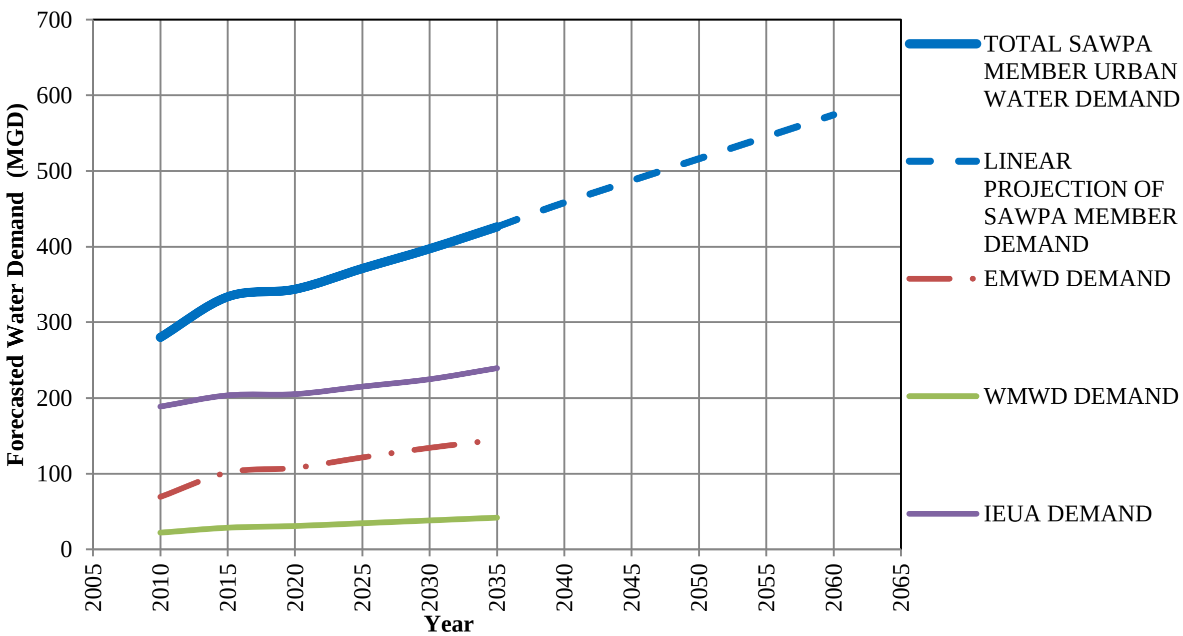
Table 7 – Summary of Mixed Forecast Ratios

BRINE CATEGORY	METRIC	2010 MIXED FORCAST RATIO	2015 MIXED FORCAST RATIO	2020 MIXED FORCAST RATIO	2025 MIXED FORCAST RATIO	2030 MIXED FORCAST RATIO	2035 MIXED FORCAST RATIO
DESALTER	WATER DEMAND	0.028	0.024	0.034	0.032	0.036	0.034
RECYCLED WATER	RECYCLED WATER DEMAND	0.0	0.01	0.01	0.03	0.06	0.08
INDUSTRIAL	n/a						
WASTE HAULER	n/a						
POWER PLANT	n/a						
DOMESTIC	n/a						

As **Table 6** shows, the Mixed Forecast Ratio for a given Brine Generator Category varies from year to year, as do the forecasts for both brine flow and water demand upon which the ratio is based. The Mixed Forecast Ratio is reasonably consistent for each SAWPA Member Agency within each Brine Generator Category. A weighted average was applied to the Mixed Forecast Ratios for the Member Agencies to develop one Mixed Forecast Ratio for each Brine Generator Category for each year considered. The appropriate Ratios were then applied to the proposed facilities within the Service Area Expansion.

The calculated Mixed Forecast Ratios presented in **Table 7** above are limited by the planning window for water demands in a UWMP is 25 years, which extends only to Year 2035. The planning window for this Appraisal Analysis extends to Year 2060. To develop a Mixed Forecast Ratio for the period between 2035 and 2060, an estimate of the water and recycled water demands was developed. Linear projections were used to predict the demands beyond 2035. The linear projection of water demands by SAWPA Member Agency is depicted on **Figure 7** below.

Figure 7- SAWPA Member Agency Water Demand Forecast

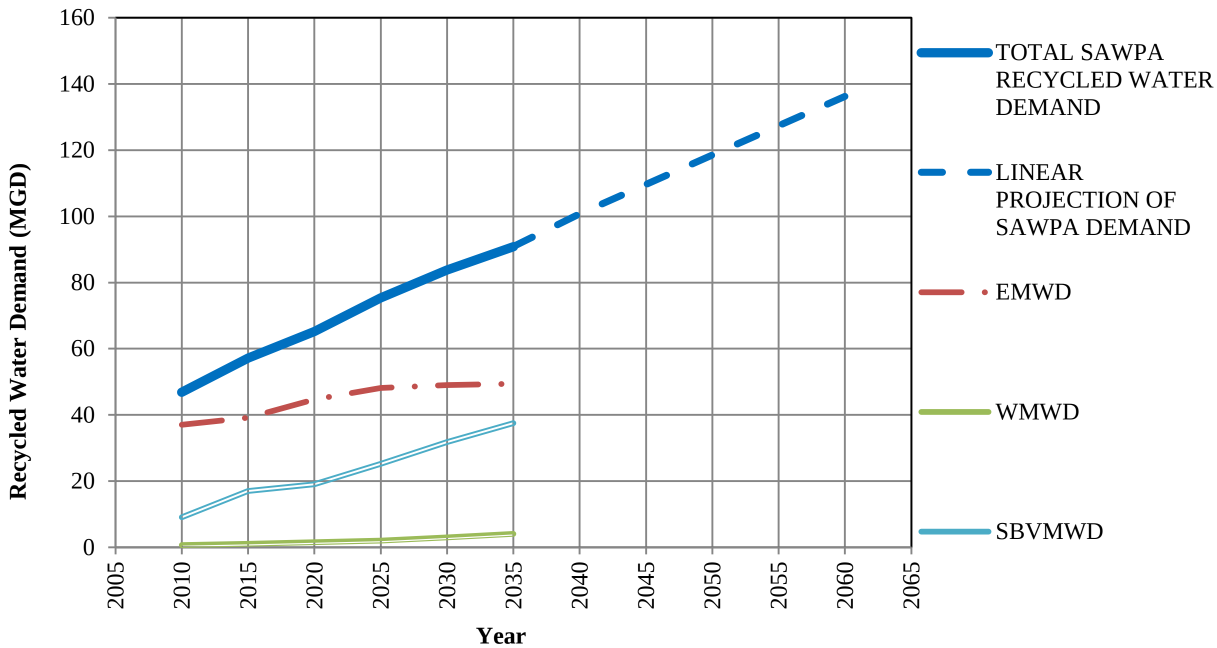


The linear projection shown on **Figure 7** of cumulative water demands for WMWD, IEUA and EMWD translates to a rate of increase for the Santa Ana Watershed of approximately 5.8 MGD annually. Water demand is anticipated to reach 574 MGD in Year 2060. As discussed previously, brine flow from the

Desalter Facilities Brine Generator Category is forecasted to plateau by Year 2030 at 15.02 MGD. Therefore, as water demands continue to increase in the Santa Ana Watershed, the Mixed Forecast Ratios (ratio of brine generation to water demand) will decrease after Year 2030.

The linear projection shown on **Figure 8** below of aggregate recycled water demands for WMWD, IEUA and EMWD translates to a rate of increase for the Santa Ana Watershed of approximately 1.8 MGD. Recycled water demand is anticipated to reach 136 MGD in Year 2060. As previously discussed, brine flow from the Recycled Water Facilities Brine Generator Category is forecasted to plateau by Year 2040 at 8.8 MGD. As a result, the Mixed Forecast Ratio for the Recycled Water category in the Santa Ana Watershed is expected to decrease after Year 2040.

Figure 8- SAWPA Member Agencies Recycled Water Demand Forecast



The Mixed Forecast Ratios for Years 2040 through 2060 are presented in **Table 8** below.

Table 8 – Summary of Mixed Forecast Ratios with Approximated Demand

BRINE CATEGORY	METRIC	2040 MIXED FORCAST RATIO	2050 MIXED FORCAST RATIO	2060 MIXED FORCAST RATIO
DESALTER	WATER DEMAND	0.033	0.029	0.026
RECYCLED WATER	RECYCLED WATER DEMAND	0.09	0.07	0.06
INDUSTRIAL	n/a			
WASTE HAULER	n/a			
POWER PLANT	n/a			
DOMESTIC	n/a			

FORECASTING of FLOWS from POTENTIAL SERVICE AREA EXPANSION

Desalter Facilities

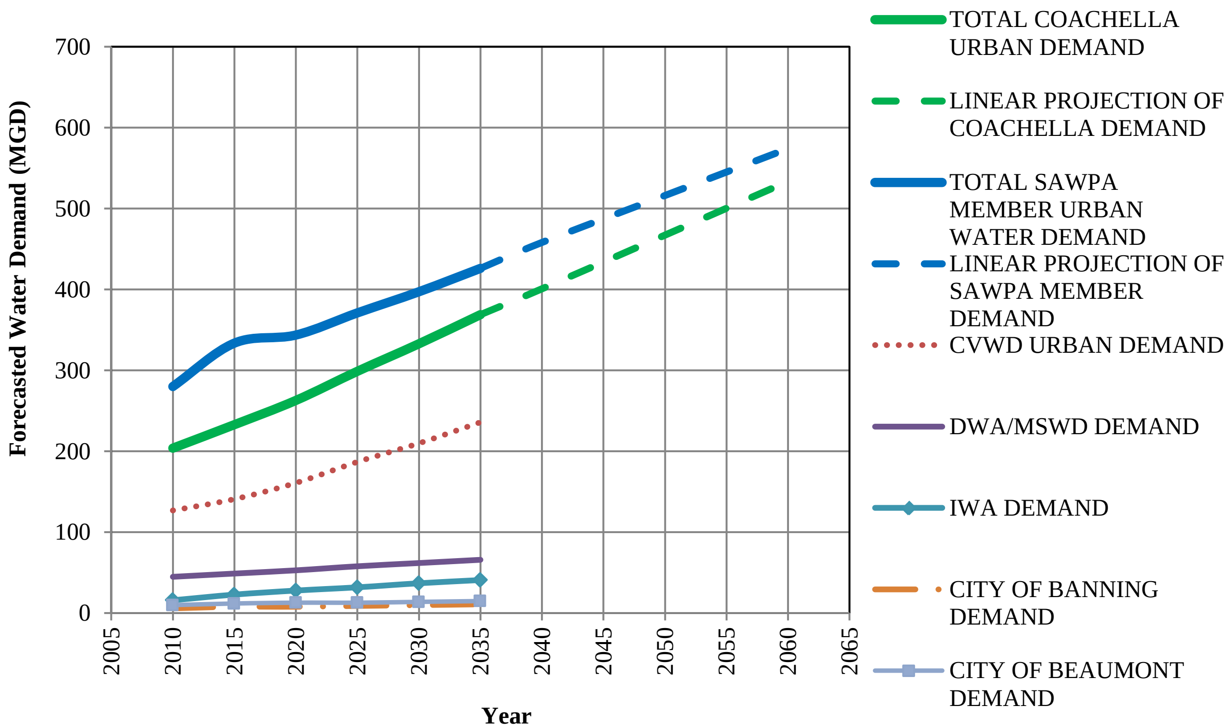
For Desalter Facilities, all three ratio methods described in the Methodology section above (Historic Average Ratio, Member Capacity Ratio and Mixed Forecast Ratio) utilize water demand forecasts to predict rates of Brine Line flow. Therefore, the forecasted future water demands established in the 2010 UWMPs for the municipalities and water districts in San Gorgonio Pass and Coachella Valley were utilized to develop forecasts of Brine Line flows for the potential SAWPA service area expansion.

Due to large agricultural irrigation water demands in Coachella Valley, the cumulative forecasted water demand in the potential SAWPA service area expansion (San Gorgonio Pass and Coachella Valley) is similar to that of Santa Ana Watershed. The forecasted rate of growth of water demand in the area averages 6.6 MGD annually. The estimated demand in Year 2060 for the entire potential service area expansion is 533 MGD. This compares with estimated demand of 574 MGD for the Santa Ana Watershed.

As discussed previously, CVWD is the largest water supplier in the area. The forecasted rate of growth of urban water demand in the CVWD service area alone is approximately 4.0 MGD annually. Using the linear projection to predict urban water demands beyond Year 2035, CVWD alone could require as much as 290 MGD by Year 2060.

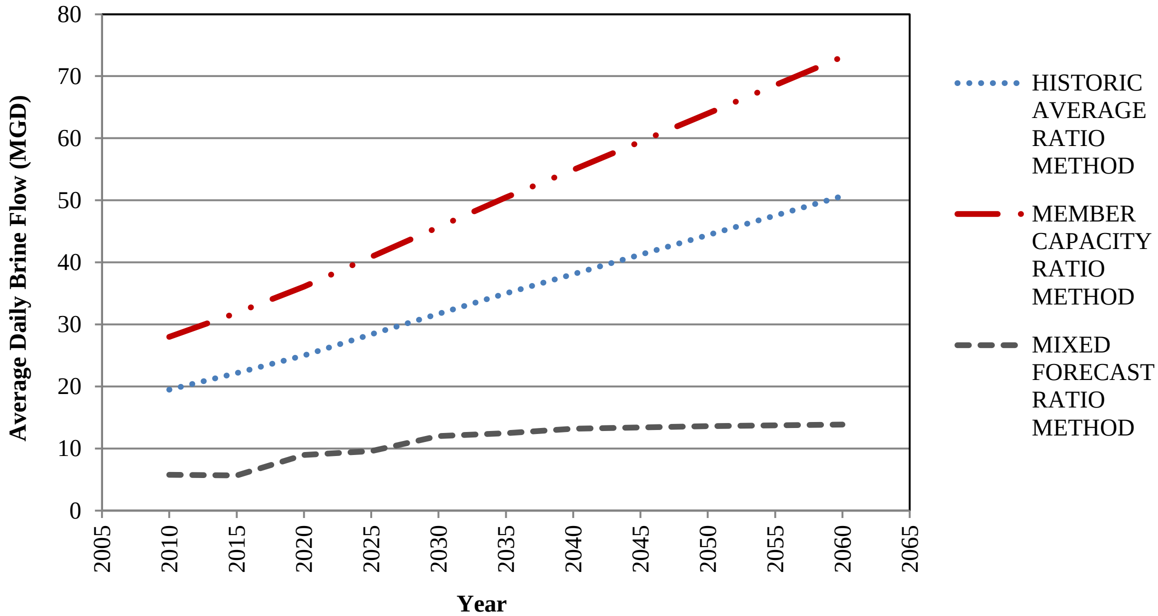
A comparison of forecasted water demands for the Santa Ana Watershed from **Figure 7** with those of the potential service area expansion (referred to here as "Coachella Valley") is shown on **Figure 9** below.

Figure 9- Water Demand Forecasts



All three ratio methods described in the Methodology section above for predicting rates of Brine Line flow were used for Desalter Facilities. The daily Brine Line flow rates predicted by each method are shown on **Figure 10** below.

Figure 10- Range of Forecasted Brine Line Flows from Coachella Valley Desalter Facilities



The results from the three ratio methods define the range for forecasting of Brine Line flows from future Desalter Facilities in the San Gorgonio Pass and Coachella Valley area. For this Brine Generator Category, the range is quite large; and it was decided that the Member Capacity Ratio method was overly conservative. Moreover, the large volume of agricultural irrigation in Coachella Valley caused this method to predict flows from Desalter Facilities in Year 2060 to be approximately double the flows from all other categories in the existing SAWPA service area. Therefore, the forecasted Brine Line flows from the Desalter Facilities category were calculated as the average of those calculated by the Historic Average Ratio and Mixed Forecast Ratio methods, initiating by Year 2035 with a period of transition to full flow.

The forecasted Brine Line flows from future Desalter Facilities in the Coachella Valley are presented on **Figure 11** and the values are listed in **Table 9** below.

Figure 11- Forecasted Brine Line Flows from Coachella Valley Desalter Facilities

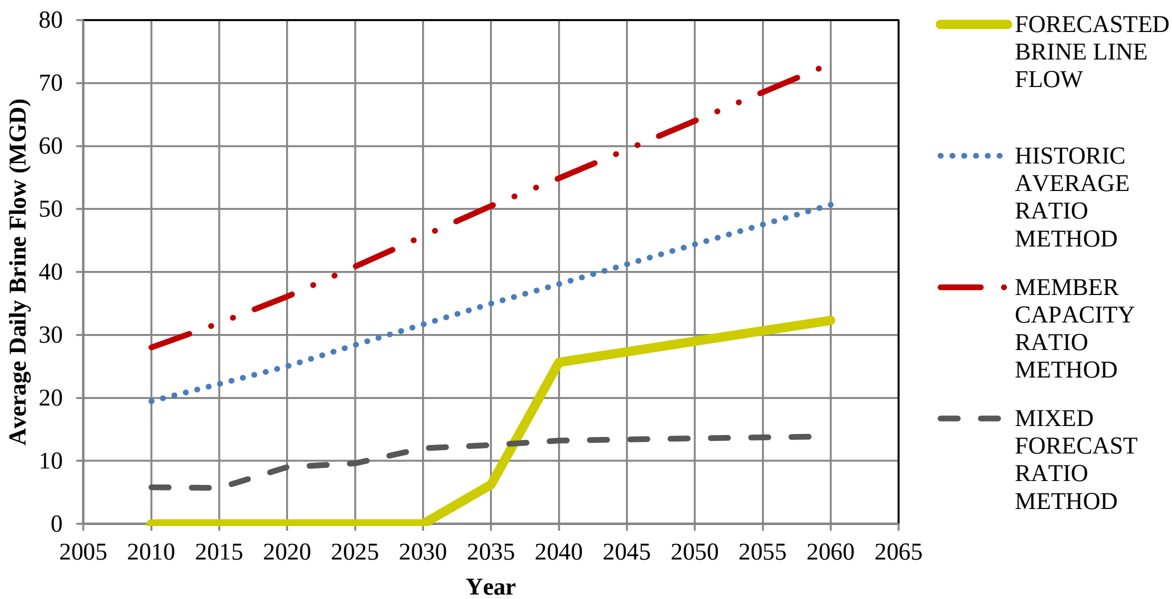


Table 9 – Forecasted Brine Line Flows for Coachella Valley Desalter Facilities

2010	2015	2020	2025	2030	2035	2040	2050	2060
0	0	0	0	0	6.25	25.65	29.0	32.3

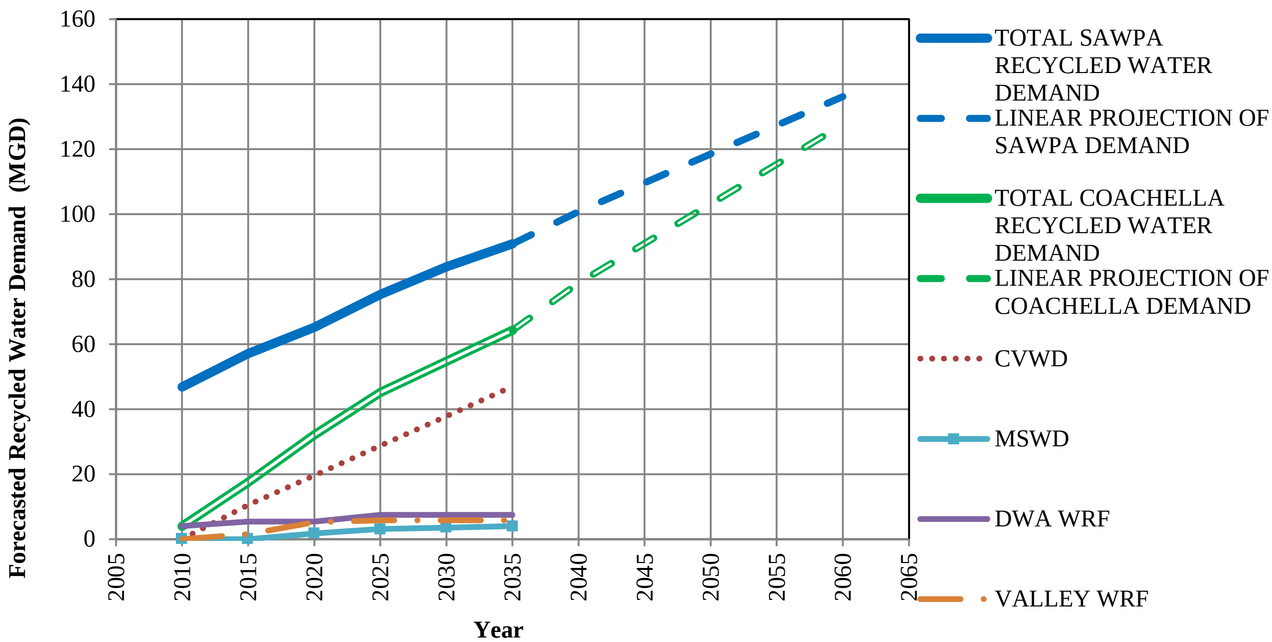
Values in millions of gallons per day.

Recycled Water Facilities

For Recycled Water Facilities, only the Member Capacity Ratio and Mixed Forecast Ratio methods were used to predict rates of Brine Line flow. The absence of available historical data eliminated the Historic Average Ratio method from consideration for this category. As in the Santa Ana Watershed, the Brine Line flows for the Recycle Water category are expected to significantly increase over the next 25 years. Recycled water is already in use for landscape irrigation in the area. However, brine from post-secondary treatment at these facilities is returned to the treatment stream, which suggests that the forecasted Recycled Water category Brine Line flows may not be realized.

As noted previously, 2010 UWMP forecasts of recycled water demands extend only to Year 2035. A linear extrapolation was used to estimate the demand for Years 2040, 2050, and 2060. A comparison of forecasted recycled water demand for the Santa Ana Watershed with that of the potential service area expansion (referred to here as “Coachella Valley) is shown on **Figure 12** below.

Figure 12 - Recycled Water Demand Forecasts

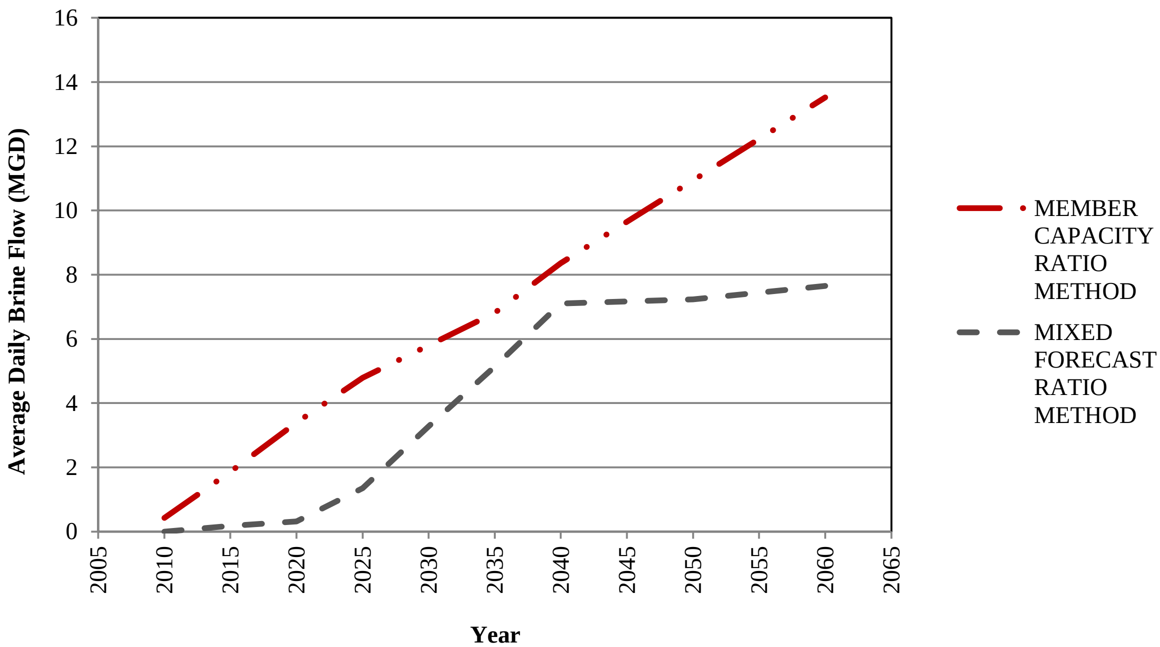


This comparison suggests that the anticipated use of recycled water in the two areas is similar. Water suppliers in both areas already utilize recycled water, approximately 46 MGD in the Santa Ana Watershed in 2010 and a little over 4 MGD in Coachella Valley in 2010. And aggressive growth in the use of recycled water in Coachella Valley is anticipated, as demonstrated by development of new infrastructure such as the Mid-Valley Pipeline by CVWD to deliver recycled water to urban irrigation customers.

The Recycled Water Facilities Brine Generator Category is forecasted to be the second largest category in San Gorgonio Pass and Coachella Valley; and the linear projection shown on **Figure 12** above yields an estimate of 127 MGD of recycled water use in the area in Year 2060.

Only the Member Capacity Ratio and the Mixed Forecast Ratio methods were used to define the predicted range of Brine Line flows from future Recycled Water Facilities in San Gorgonio Pass and Coachella Valley. The flows predicted by these methods are shown on **Figure 13** below.

Figure 13- Range of Forecasted Brine Line Flows from Coachella Valley Recycled Water Facilities



The Mixed Forecast Ratio method correlates the forecasted recycled water demand with forecasted Brine Line flows. The plateau of forecasted recycled water demand in the potential service area expansion that begins in Year 2040 on **Figure 13** above reflects the similar plateau of Brine Line flows from Santa Ana Watershed due to system capacity limitations.

The forecasted Brine Line flows from the Recycled Water Facilities category were calculated as the average of those calculated by the Member Capacity Ratio and Mixed Forecast Ratio methods. As in the case of Desalter Facilities category, the flows are initiated by Year 2035 with a period of transition to full flow.

The forecasted Brine Line flows from Recycled Water Facilities in San Gorgonio Pass and Coachella Valley are presented graphically on **Figure 14** and the values are listed in **Table 10** below.

Figure 14- Forecasted Brine Line Flows from Coachella Valley Recycled Water Facilities

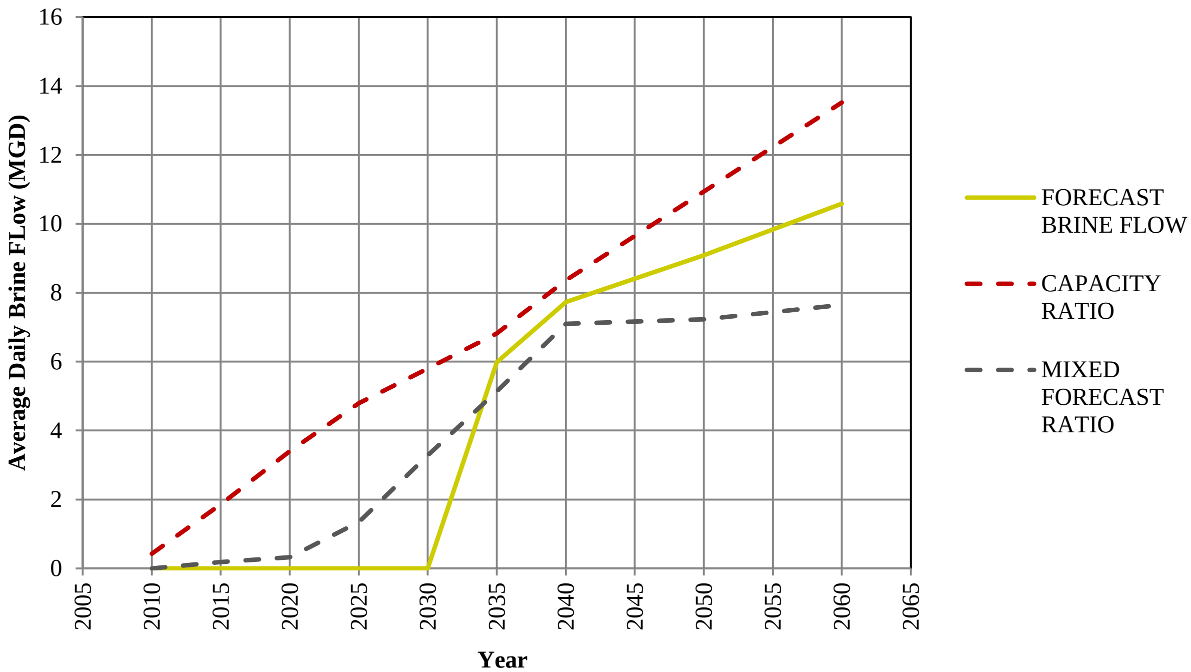


Table 10 – Forecasted Brine Line Flows from Coachella Valley Recycled Water Facilities

2010	2015	2020	2025	2030	2035	2040	2050	2060
0	0	0	0	0	5.98	7.73	9.09	10.59

Values in millions of gallons per day.

Power Plants

Brine Line flows from the Power Plants Brine Generator Category is the waste brine from cooling. Unlike the Desalter and Recycled Water Facilities categories, the Brine Line flows from the Power Plants category do not correlate well with consumer water demand. These flows correlate with plant production capacity in megawatts (MW). All three power plants in the Santa Ana Watershed are powered by natural gas, as are three of the four existing plants in Coachella Valley.

The Power Plants considered in this analysis and the respective generating capacities are listed in **Table 11** below.

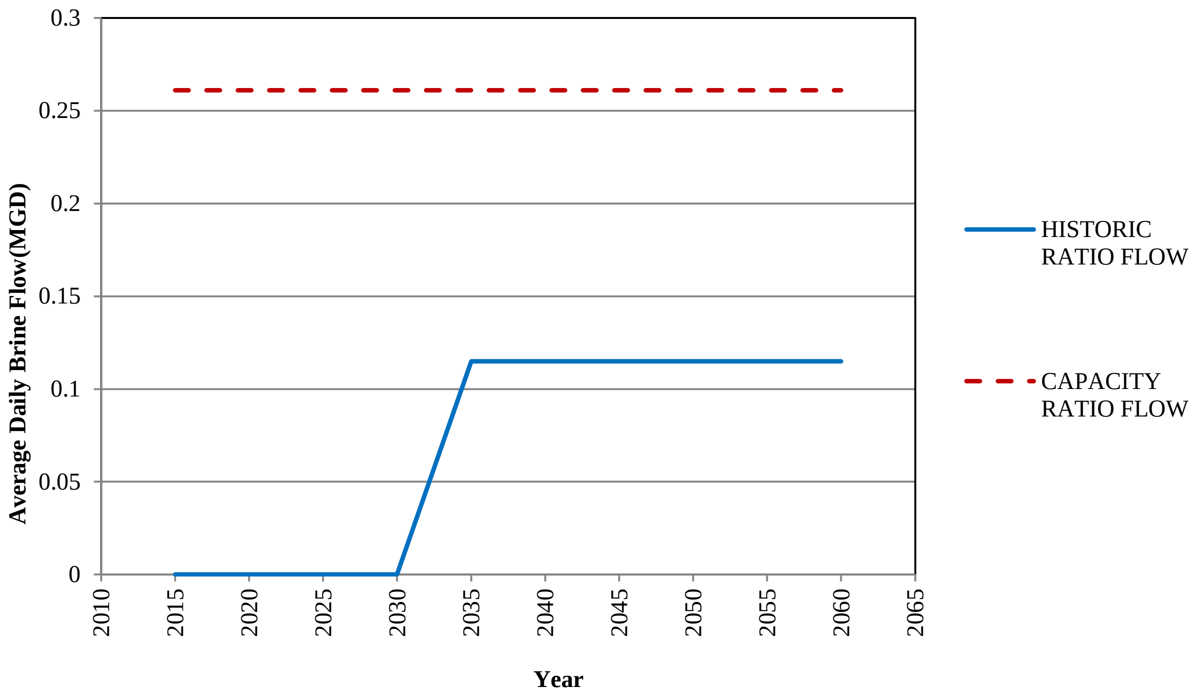
Table 11 – Power Plants in the Santa Ana and Coachella Valleys

FACILITY NAME	AGENCY	GENERATING CAPACITY (MW)	POWER SOURCE
Mountain View	SBVMWD	1054	Natural Gas
E.I. Colton (Agua Mansa Power Plant)	SBVMWD	48	Natural Gas
IEEC	EMWD	800	Natural Gas
Indigo Energy Facility	Diamond Generating Corp., (3) - 50 MW turbines	150	Natural Gas
Municipal Cogeneration Plant	City of Palm Springs, (2) - 1 MW internal combustion generators	2	Natural Gas
Coachella	Imperial Irrigation District, (4) - 23 MW turbines	92	Natural Gas
Colmac Energy Biomass	Colmac Band of Mission Indians, (1) - 48 MW turbine	48	Waste wood

The total rated capacity of the four power plants identified in the Coachella Valley (292 MW) is significantly smaller than that of the three power plants in the Santa Ana Watershed (1,902 MW); so the corresponding forecasted Brine Line flows are small. The Historic Average Ratio and Member Capacity Ratio methods were used to define the range of predicted Brine Line flows from the Power Plants Brine Generator Category. As with the Desalting and Recycled Water Facilities categories, it is anticipated that Brine Line flows for this category will begin in Year 2035.

The range of flows predicted by the Historic Average Ratio and Member Capacity Ratio methods are presented graphically on **Figure 15** below.

Figure 15- Range of Brine Line Flows from Power Plants



The flows predicted by the Historic Average Ratio method were selected as most representative of the expected Brine Line flows from the Power Plants category in Coachella Valley. Forecasted flow values are listed in **Table 12** below.

Table 12 – Forecasted Brine Line Flows from Coachella Valley Power Plants

2010	2015	2020	2025	2030	2035	2040	2050	2060
0	0	0	0	0	0.115	0.115	0.115	0.115

Values in millions of gallons per day.

Waste Haulers

Brine Line flows from Waste Haulers enter the system at dump stations which serve Brine Line customers that do not have a direct service connection to the Brine Line. The Member Capacity Ratio method cannot be used for this category because these flows are highly variable and there is no permitted capacity assigned to the dump stations. Similarly, the Mixed Forecast Ratio method because there is no measurable base demand with which to associate the forecasted brine flows. Therefore, the Historic Average Ratio method was used to correlate this category with the populations of the service areas. As with the other Brine Generator Categories, it is anticipated that Brine Line flows for this category will begin in 2035.

The forecasted flows from Waste Haulers in San Gorgonio Pass and Coachella Valley are listed in **Table 13** below.

Table 13 – Forecasted Brine Line Flows from Coachella Valley Waste Haulers

2010	2015	2020	2025	2030	2035	2040	2050	2060
0	0	0	0	0	0.039	0.039	0.039	0.039

Values in millions of gallons per day.

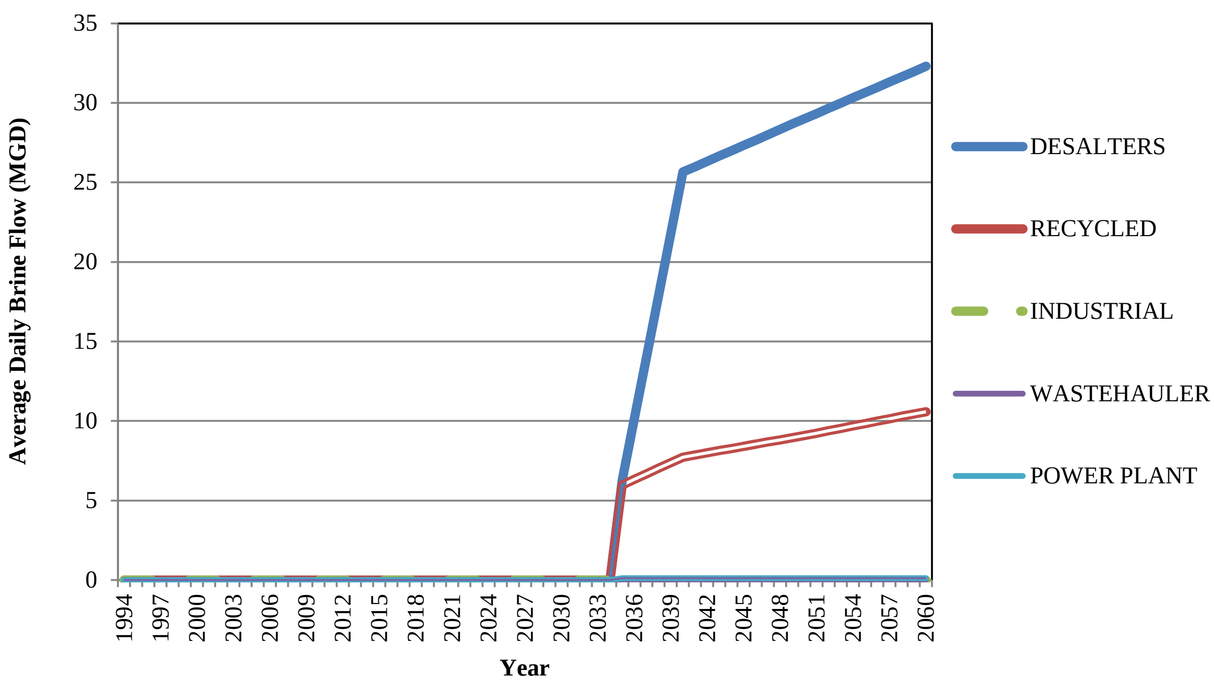
TOTAL FORECASTED BRINE LINE FLOWS from EXPANDED SERVICE AREA

Flows from Potential Service Area Expansion

Each forecasted Brine Generator Category in San Gorgonio Pass and Coachella Valley is assumed to connect to the proposed Brine Line outfall in the Year 2035. The Desalter Facilities category is anticipated to be the largest, with approximately half of the total flows from the area initially and increasing to approximately 75% of the total by Year 2040. The Recycled Water category follows with approximately half of the total flows initially. Though the forecasted Recycled Water category flows continue to increase, the increases are much smaller than the rate of increase of Desalter Facilities category flows; and the forecasted Recycled Water category flows represent only approximately 25% of the total by Year 2040. The Power Plants and Waste Haulers Brine Generator Categories make up slightly less than half of one percent of the total flows.

The forecasted flows from each of the major Brine Generator Categories anticipated in San Gorgonio Pass and Coachella Valley are presented on **Figure 16** below.

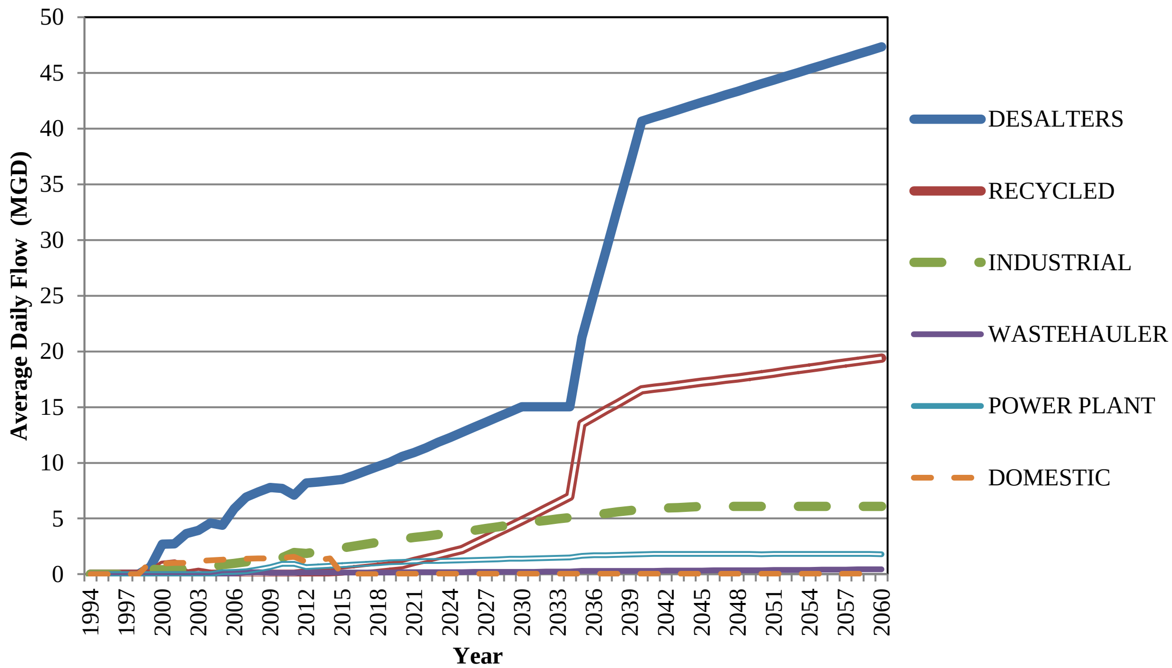
Figure 16- Forecasted Brine Line Flows from Coachella Valley by Brine Generator Categories



Flows from Expanded SAWPA Service Area by Brine Generator Categories

The total forecasted flows from each of the major Brine Generator Categories of the entire expanded Brine Line system service area (including Santa Ana watershed, San Gorgonio Pass and Coachella Valley) are presented on **Figure 17** below.

Figure 17- Total Brine Line Flows by Brine Generator Categories



The total flows from the Desalter Facilities Brine Generator Category are anticipated to continue to account for the majority of the flows in the system. The projected flows from Santa Ana Watershed Desalter Facilities are anticipated to plateau at 15.02 MGD in Year 2030, with the Coachella Desalter Facilities coming online in Year 2035. The total forecasted Brine Line flows from the Desalter Facilities category are 47 MGD in Year 2060.

The forecasted Brine Line flows from the Water Recycling Facilities category are expected to significantly increase in the near future. Recycled water is anticipated to become the second largest brine generation category. The forecasted flows from the potential service area expansion are more than double the flows from the existing SAWPA Member Agencies. The total flows are anticipated to be over 19 MGD in Year 2060.

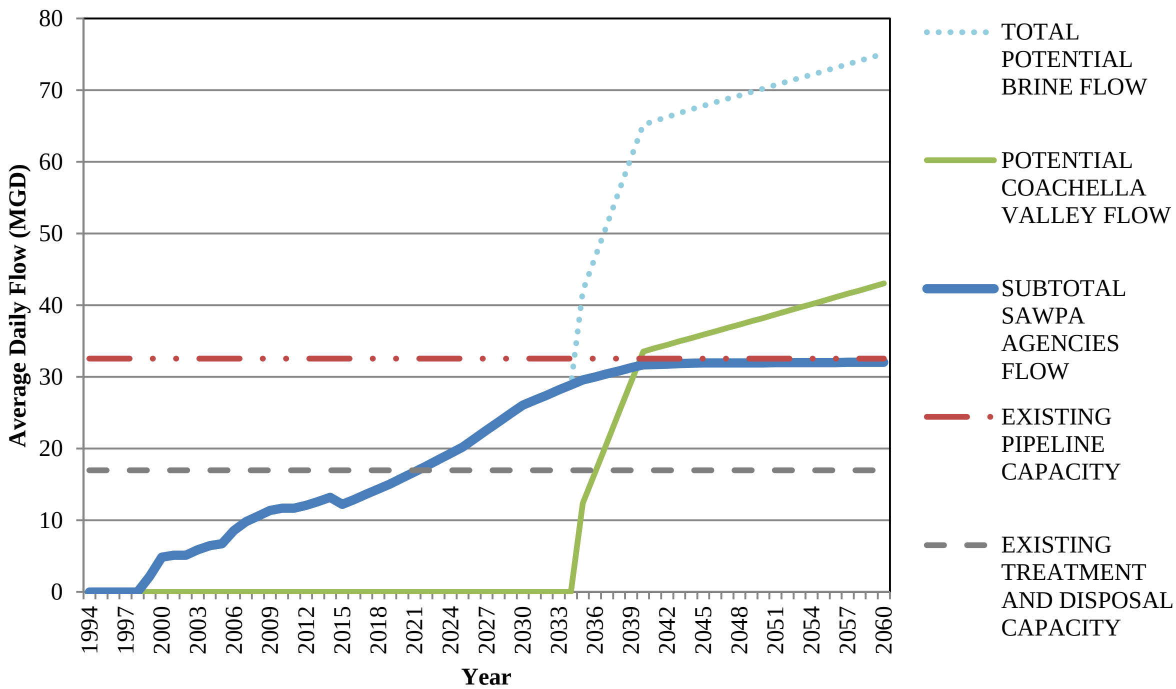
The forecasted Brine Line flows from the Industrial Facilities category are anticipated to continue to increase, but at much lower rates than the Desalter and Water Recycling Facilities categories, accounting for approximately eight percent of the total flows in Year 2060.

The forecasted Brine Line flows from the Power Plants and Waste Haulers categories exhibit relatively slow growth, accounting for approximately three percent of the total flows in Year 2060.

Total Forecasted Brine Line Flows

The total forecasted flows for the entire expanded Brine Line system service area (including Santa Ana watershed, San Gorgonio Pass and Coachella Valley) are presented on **Figure 18** below.

Figure 18- Total Forecasted Brine Line Flows



The total forecasted flows for the entire expanded Brine Line system service area (including Santa Ana Watershed, San Gorgonio Pass and Coachella Valley) are listed in **Table 14** below.

Table 14 – Total Forecasted Brine Line Flows

	2010	2015	2020	2025	2030	2035	2040	2050	2060
SAWPA Desalting	7.7	8.52	10.58	12.74	15.02	15.02	15.02	15.02	15.02
Coachella Desalting	0	0	0	0	0	6.25	25.65	29	32.3
Subtotal Desalting	**7.7**	**8.52**	**10.58**	**12.74**	**15.02**	**21.27**	**40.67**	**44.02**	**47.32**
SAWPA Recycled Water	0	0.3	0.87	2.22	4.8	7.52	8.82	8.82	8.82
Coachella Recycled Water	0	0	0	0	0	5.98	7.73	9.085	10.585
Subtotal Recycled Water	**0**	**0.3**	**0.87**	**2.22**	**4.8**	**13.5**	**16.55**	**17.90**	**19.40**
SAWPA Industrial	1.48	2.37	3.17	3.77	4.59	5.22	5.84	6.09	6.09
Coachella Industrial	0	0	0	0	0	0	0	0	0
Subtotal Industrial	**1.48**	**2.37**	**3.17**	**3.77**	**4.59**	**5.22**	**5.84**	**6.09**	**6.09**
SAWPA Waste Hauler	0.12	0.17	0.18	0.2	0.22	0.25	0.27	0.33	0.41
Coachella Waste Hauler	0	0	0	0	0	0.039	0.039	0.039	0.039
Subtotal Waste Hauler	**0.12**	**0.17**	**0.18**	**0.2**	**0.22**	**0.289**	**0.309**	**0.37**	**0.45**
SAWPA Power Plant	0.92	0.83	1.12	1.26	1.4	1.55	1.69	1.69	1.69
Coachella Power Plant	0	0	0	0	0	0.115	0.115	0.115	0.115
Subtotal Power Plant	**0.92**	**0.83**	**1.12**	**1.26**	**1.4**	**1.665**	**1.805**	**1.805**	**1.805**
SAWPA Domestic	**1.48**	**0.02**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**
Subtotal SAWPA	11.7	12.21	15.95	20.22	26.06	29.59	31.67	31.98	32.06
Subtotal Coachella	0	0	0	0	0	12.38	33.53	38.2	43
Total Brine Flow	**11.7**	**12.21**	**15.95**	**20.22**	**26.06**	**41.974**	**65.204**	**70.22**	**75.10**

Values in millions of gallons per day.

ANALYSIS of HISTORICAL BRINE DATA for EXISTING SAWPA SERVICE AREA

Background

Forecasting of Brine Line flows is an essential aspect of planning for the proposed Inland Empire Interceptor (IEI). Of similar importance is forecasting of the major brine constituents of those Brine Line flows.

The brine constituents under consideration in this Appraisal Analysis are Total Dissolved Solids (TDS), Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD). TDS is the measure of solids in solution that pass through a 2 micron filter and is an indicator of hardness and salinity in water. TSS is the measure of solids suspended in water that are trapped by a 2 micron filter, which can reduce transmission of light in water. BOD is the measure of oxygen used by microorganisms in water over a 5 day period at 20°C and is an indirect measure of organic matter in water. High levels of TDS, TSS and BOD in discharges can adversely affect water quality and forecasts of these constituents are necessary to assess potential impacts on receiving waters.

Standards established for discharges to the Salton Sea from Coachella Valley by the State of California Colorado River Regional Water Quality Control Board limit TDS to an average concentration of 2,000 mg/L and peak concentration of 2,500 mg/L. The current and projected future concentrations of TDS in the flows entering the Salton Sea from the proposed IEI exceed these values. No specific standards have been established for concentrations of TSS or BOD in discharges to the Salton Sea from Coachella Valley, except for municipal wastewater treatment plants for which the limitations are the typical EPA standards for discharges to surface water bodies (30 mg/L for both TSS and BOD for the 30-day Arithmetic Mean Discharge Rate). The current and projected future concentrations of TSS and BOD in the flows entering the Salton Sea from the proposed IEI exceed these values, also. Therefore, appropriate considerations should be addressed in the planning and design of the proposed IEI to address these considerations. These measures will need to include approval by the Colorado River Regional Water Quality Control Board of an amendment to the Basin Plan, which will be addressed further in TM3 of this Appraisal Analysis.

A mass balance approach was used to analyze the historical data and to develop the necessary projections of future brine concentrations. In this approach, the mass of the constituents entering the system must be equal to the mass of the same constituents exiting the system, plus any mass accumulated in the system. The analysis for this Appraisal Analysis assumes a steady-state and non-reactive system. In other words, there is no accumulation of mass in the Brine Line system (steady-state) and there are no chemical reactions taking place in the system that alters the constituents (non-reactive). However, information contained in the Salinity Management Program report prepared by CDM and other available SAWPA documents suggest otherwise. Determination of these dynamics is beyond the scope of this Appraisal Analysis; and mass adjustments have been used in the analysis to address imbalances as described below in the Methodology discussion.

Methodology for Analyses of TSS and BOD

Measurements of TSS and BOD are discussed in this Appraisal Analysis in terms of both mass (in tons) and concentration (in mg/L). Concentration is used the presence of these constituents in water is measured using this metric. Mass is also used because it provides a measure of the aggregate amount (or "load") of the given constituent at a specific location in the system during a specific time period, and because it is a necessary component of the methodology for calculation of concentrations.

The estimated mass of the TSS and BOD exiting the system was calculated from available historical data for the flows and the concentrations of these constituents recorded at the County Line Master Meter (CLMM), located downstream of the convergence of the existing Brine Line system. The estimated mass of the TSS and BOD entering the Brine Line system was calculated from available historical data for the flows and the concentrations of these constituents at various service connections to the system.

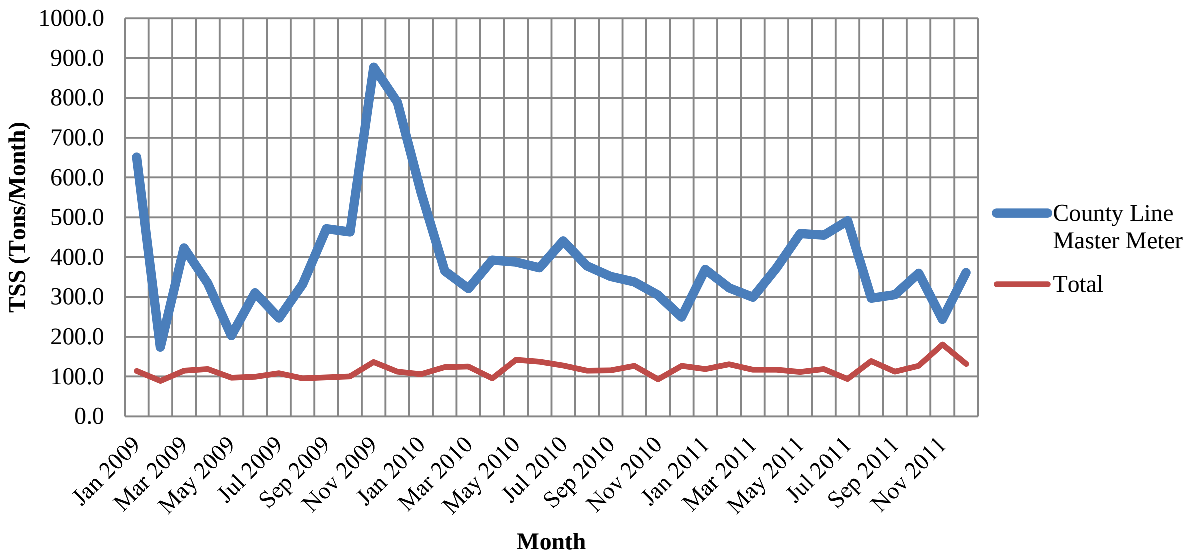
The anticipated mix of Brine Generator Categories for the potential service area expansion differs from that of the existing SAWPA service area. Therefore, it was necessary to develop separate projections of TSS and BOD loads for each applicable Brine Generator Category. The average concentrations of TSS and BOD for each category were calculated from available historical Brine Line system data for the most recent 3-year period, 2009 through 2011, inclusive.

The mass of TSS and BOD entering the Brine Line system (in tons) was estimated for each Brine Generator Category by multiplying the average category concentrations by the forecasted flows for that category. The mass of TSS and BOD exiting the Brine Line system (in tons) was estimated from the historical data recorded at the County Line Master Meter (CLMM). (Note that in the case of the Recycled Water category, historical flow data was used for this brine data analysis that was excluded from the flow data analysis described earlier in this TM2; this was necessary to develop average concentrations for this category.)

Comparison of the mass entering the system with the mass exiting the system revealed imbalances, as mentioned above. In the case of TSS, the 3-year average of mass exiting the system was 3.6 times greater than the average total mass entering the system.

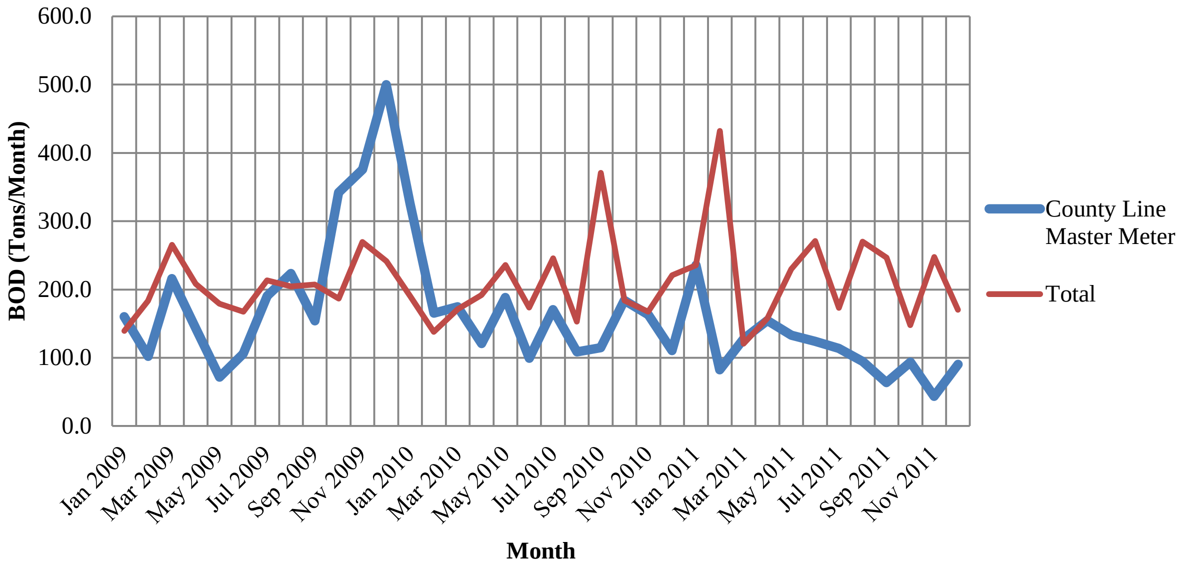
The imbalance between the mass (in tons) of TSS exiting the system at CLMM and the total mass of TSS entering the system is displayed on **Figure 19** below.

Figure 19 -TSS Mass Exiting System (at CLMM) vs. Total TSS Mass Entering System



Conversely, the 3-year average of mass of BOD exiting the system at the CLMM was only 77% of the average total mass of BOD entering the system. The imbalance between the mass (in tons) of BOD exiting the system at CLMM and the total mass of BOD entering the system is displayed on **Figure 20** below.

Figure 20 - BOD Mass Exiting System (at CLMM) vs. Total BOD Mass Entering System



Therefore, mass adjustments were developed to account for the imbalances in the system. The Prorated Mass for each Brine Generator Category for each month was calculated using the ratio of the mass calculated from the CLMM data (exiting the system) and the total mass for all Brine Generator Categories (entering the system) for the corresponding time interval. Using TSS for an example:

$$Prorated\ TSS\ Mass\ (Tons)_{Category} = \frac{TSS\ Mass\ (Tons)_{CLMM}}{TSS\ Mass\ (Tons)_{Total}}\ x\ TSS\ Mass\ (Tons)_{Category}$$

The Prorated Average Mass for each Brine Generator Category was calculated as the average of the Prorated Mass for the respective Brine Generator Category for all months.

The Adjusted Monthly Concentration for each Brine Generator Category was calculated as the Prorated Mass divided by the corresponding rate of flow and adjusting for units. Continuing with the TSS example:

$$Adjusted\ Monthly\ TSS\ Conc.(mg/L)_{Category} = \frac{Prorated\ TSS\ (Tons)_{Category}}{Flow\ \left(\frac{MG}{Month}\right)_{Category}} * \frac{2000\ \left(\frac{lbs}{ton}\right)}{8.34\ \left(\frac{lbs}{MG}\, x\, \frac{L}{mg}\right)}$$

The Adjusted Average Concentration for each Brine Generator Category was calculated as the average of the Adjusted Monthly Concentrations for the respective Brine Generator Category for all months.

Figure 19 and **Figure 20** on the preceding pages depict spikes in the Mass Exiting the System recorded at the CLMM for both TSS and BOD during the period November, 2009 through January, 2010. No such spike is depicted on **Figure 19** for the Total Mass of TSS Entering the System for the same time interval. This was the case also for BOD on **Figure 20**. It should be noted that, due to the proration methodology described, these spikes are echoed in the Adjusted Monthly Concentration for the various Brine Generator Categories for both TSS and BOD.

Methodology for Analysis of TDS

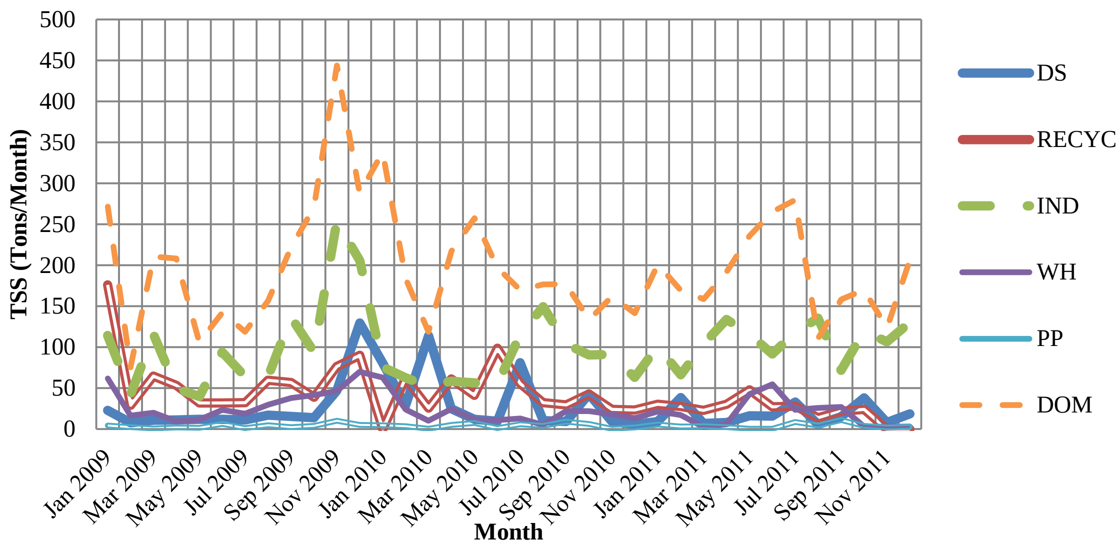
As with TSS and BOD discussed above, measurements of TDS are discussed in this Appraisal Analysis in terms of both mass (in tons) and concentration (in mg/L). Historical data was not available for TDS for Brine Line flows from individual service connections. Historical data was available for TDS only for flows exiting the system as measured at the CLMM; so a mass balance analysis could not be used for this constituent. The estimated mass of the TDS exiting the system was calculated from available historical data for the flows and the concentrations recorded at the CLMM.

The historical TDS data revealed that the average concentration has been trending upward since 1997. It is anticipated that, as demands for water in Southern California continue to grow, optimization and technological improvements will continue to lead to improved system efficiency with increasing TDS concentrations resulting from decreasing rates of flow from individual system connections. A trend analysis was performed and evaluated as described in “Forecasting of Total Dissolved Solids (TDS)” below.

Analysis of Historical TSS Data

The Prorated Mass of TSS for each Brine Generator Category was calculated for each month as described in the methodology discussion above. The results of these calculations are presented on **Figure 21** below.

Figure 21- Prorated Mass of TSS by Brine Generator Category



The Prorated Average Mass of TSS and the Adjusted Average TSS Concentration was calculated for each Brine Generator Category. The results of these calculations are listed in **Table 15** below.

Table 15 – Prorated Average TSS Mass and Adjusted Average TSS Concentration

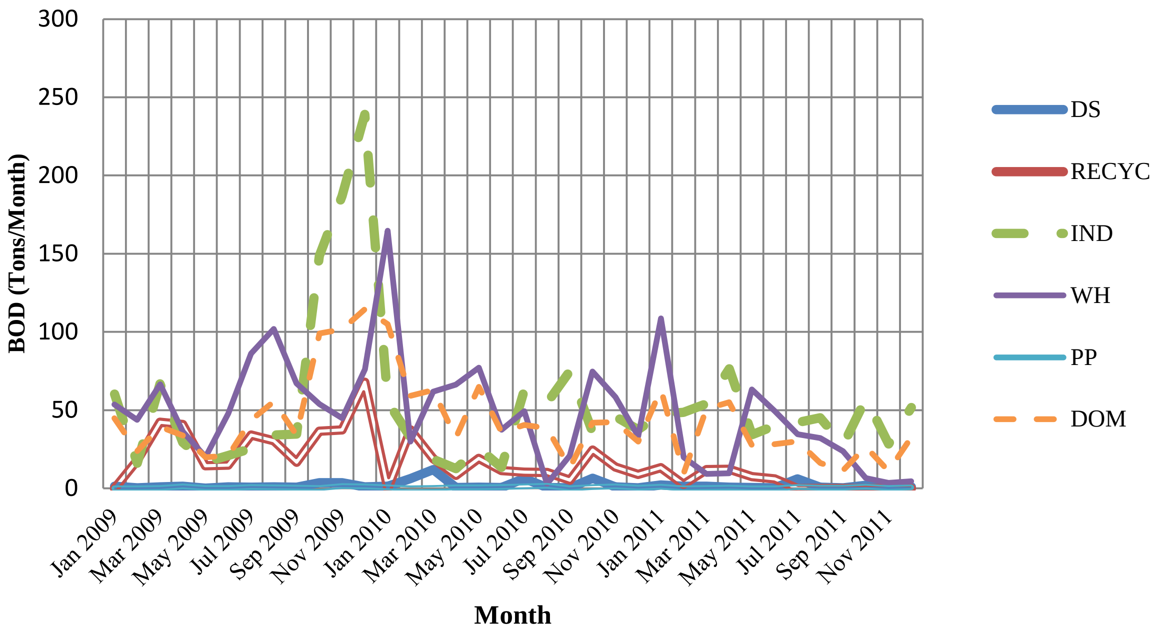
Category	Prorated Average TSS Mass (Tons / Month)	Adjusted Average TSS Concentration (mg/L)
DS	27	27
RECYC	42	1,339
IND	98	487
WH	24	2,660
PP	4	40
DOM	196	1,039
CLMM	**391**	**264**

It is apparent from **Figure 21** and **Table 15** above that the Domestic category is the largest contributor of TSS mass to the Brine Line flows with approximately 50% of the total. The planned removal of the domestic wastewater flows from the system can be expected to significantly reduce TSS in the system. The Industrial category has been the next largest contributor with approximately 25% of the total, which will increase to roughly half after the Domestic category flows have been removed from the system. Though the mass of TSS from the Waste Hauler is not large, the TSS concentration from this category is much higher than the other categories. Pretreatment of flows from service connections in the Industrial and Waste Hauler categories may be effective at further reducing the mass of TSS in the system.

Analysis of Historical BOD Data

As with the TSS data, the Prorated Mass of BOD for each Brine Generator Category was calculated for each month. The results of these calculations are presented on **Figure 22** below.

Figure 22 - Prorated Mass of BOD by Brine Generator Category



The Prorated Average Mass of BOD and the Adjusted Average BOD Concentration was calculated for each Brine Generator Category. The results of these calculations are listed in **Table 16** below.

Table 16 – Prorated Average BOD Mass and Adjusted Average BOD Concentration

Category	Average Prorated BOD Mass (Tons / Month)	Adjusted Average BOD Concentration (mg/L)
DS	2	2
RECYC	16	609
IND	53	268
WH	48	5,127
PP	1	6
DOM	43	229
CLMM	**163**	**110**

It is apparent from **Figure 22** and **Table 16** above that the Domestic category is a significant contributor of BOD mass to the Brine Line flows with approximately 26% of the total. Though system loads from Domestic flows are less significant for BOD mass than for TSS, the planned removal of these flows can be expected to significantly reduce BOD in the system. The Industrial and Waste Hauler categories have been the other large contributors of BOD mass, combining for approximately 62% of the total, increasing to over 80% after the Domestic category flows have been removed from the system. As with TSS, the Waste Hauler category is particularly noteworthy in terms of BOD concentration. Pretreatment of flows from service connections in the Industrial and Waste Hauler categories may be effective at further reducing the mass of BOD in the system.

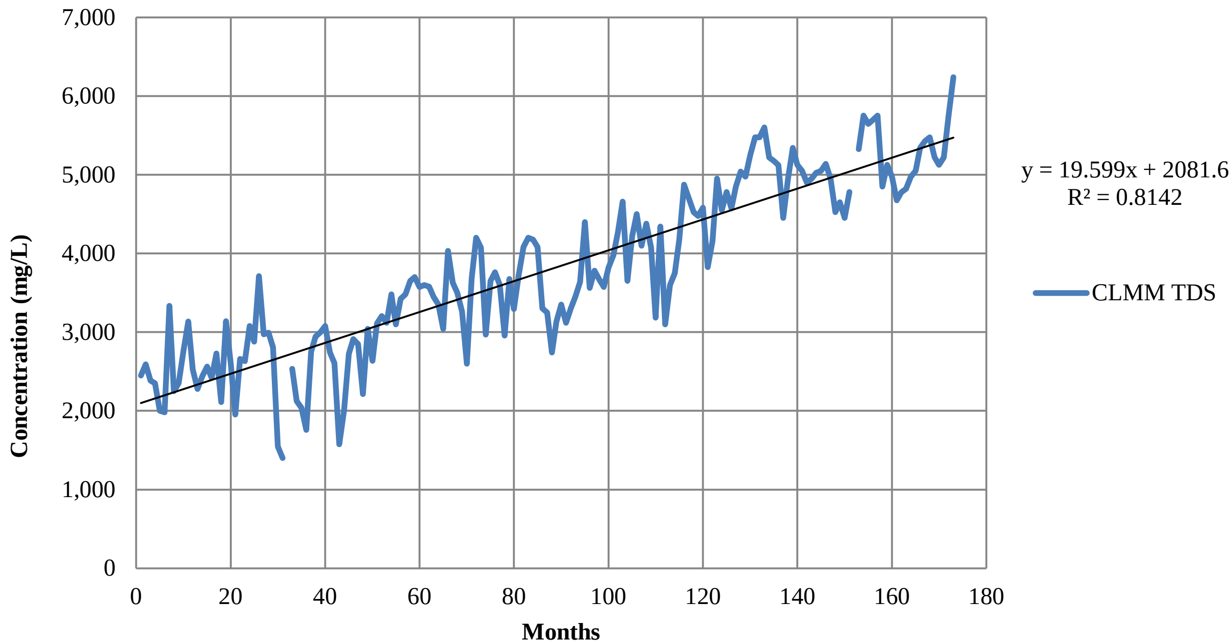
Analysis of Historical TDS Data

As noted above, historical data was available for TDS only for flows measured at the CLMM. Therefore, TDS could not be evaluated for individual Brine Generator Categories and a mass balance analysis could not be performed.

TDS concentrations at the CLMM have been trending upward since 1997. A trend analysis of the historical data for TDS concentrations at CLMM was performed, which revealed a linear trend. The average TDS concentration was approximately 2,082 mg/L in September, 1997, and has been increasing since at the rate of approximately 19.6 mg/L per month. It is anticipated that, as demands for water in Southern California continue to grow, optimization and technological improvements will continue to improve system efficiency, resulting in decreasing rates of flow from individual system connections and increasing TDS concentrations.

The historical data for TDS concentrations at the CLMM (with out-lyers removed) and the results of the trend analysis are depicted on **Figure 23** below.

Figure 23 - TDS Concentration Trend, Starting September, 1997



However, TDS concentrations in the system cannot be expected to continue to increase without limit. It is anticipated that TDS concentrations will level off at some time in the future due to economic and/or technological constraints. Therefore, for the purpose of this Appraisal Analysis, TDS concentrations in Brine Line flows were anticipated to level off when the target rate of salt removal from the Santa Ana Watershed has been accomplished.

The target salt removal rate for Santa Ana Watershed is approximately 270,000 tons per year, as reported in Section 2 of ***Phase 2 SARI Planning Technical Memorandum*** of the Salinity Management Program report. This rate was used as the mass of TDS used for calculation of the maximum average TDS concentration. The Desalter Facilities category is the largest contributor of both flows and mass of TDS to the Brine Line; and the target TDS mass removal is expected to occur when all Desalters are operating at planned capacity. This is forecasted to occur in Year 2030. The forecasted Brine Line flow from the existing SAWPA service area in that year (2030) is 26.06 MGD (see **Table 14**).

Therefore, the maximum average TDS concentration was calculated as the ratio of the target salt removal rate and the forecasted Brine Line flow in Year 2030:

$$Max. TDS\ Conc.\left(\frac{mg}{L}\right) = \frac{270{,}000 \frac{Tons}{Year}(TDS)}{26.06\left(\frac{MG}{Day}\right)(Flow)} * \frac{2000\ \left(\frac{lbs}{ton}\right)}{365\ \left(\frac{Days}{Year}\right) * 8.34\ \left(\frac{lbs}{MG}\, x\, \frac{L}{mg}\right)}$$

$$= 6{,}800\ \left(\frac{mg}{L}\right)$$

The maximum average TDS concentration used in this analysis is 6,800 mg/L. The trend analysis depicted on **Figure 23** above indicates that the maximum average TDS concentration (6,800 mg/L) will be realized as early as Year 2018.

FORECASTING of BRINE LOADS from EXISTING SAWPA SERVICE AREA

Total Suspended Solids

Forecasting of future TSS loads from the existing SAWPA service area was performed using the Adjusted Average Concentration for each applicable Brine Generator Category calculated as described in the section above entitled "Analysis of Historical Brine Data for Existing SAWPA Service Area" and as listed in **Table 15**. These Adjusted Average TSS Concentrations were used in combination with the forecasted flows for the corresponding Brine Generator Category to forecast annual mass of TSS (in tons per year) for each category to Year 2060. Since the average concentration was held constant for each category, the flow forecasts represent the only variable for each category. But, because the rate of change of flow over time is different for each category and the TSS concentrations vary significantly between categories, the overall average concentration also varies over time.

The forecasts of TSS mass from the existing SAWPA service area for each Brine Generator Category and of the average TSS concentration are listed in **Table 17** below.

Table 17 – Forecasted TSS Mass & Average Concentration from Existing SAWPA Service Area

Forecasted TSS Mass (Tons/Year) from Existing SAWPA Service Area								Brine Line Flows (MGD)	Average TSS Concentration (mg/L)
Year	DS	RECYC	IND	WH	PP	DOM	Total		
2010	320.6	0.0	1,097.1	486.2	56.2	2,342.9	4,303.0	11.7	241
2015	354.8	611.7	1,756.8	688.7	50.7	31.7	3,494.4	12.21	188
2020	440.6	1,774.1	2,349.8	729.2	68.4	47.5	5,409.6	15.95	223
2025	530.5	4,526.9	2,794.6	810.3	77.0	47.5	8,786.7	20.22	285
2030	625.5	9,787.9	3,402.4	891.3	85.6	47.5	14,840.1	26.06	373
2035	625.5	15,334.4	3,869.4	1,012.8	94.7	47.5	20,984.3	29.59	465
2040	625.5	17,985.3	4,329.0	1,093.9	103.3	47.5	24,184.4	31.67	501
2050	625.5	17,985.3	4,514.3	1,336.9	103.3	47.5	24,612.8	31.98	505
2060	625.5	17,985.3	4,514.3	1,661.0	103.3	47.5	24,936.9	32.06	510

The Desalter and Domestic categories are illustrative of the variations of TSS mass loads and concentrations over time. Flows from the Domestic category have historically been the source of a significant portion of the TSS mass in the Brine Line flows (approximately 54% in Year 2010) but a small portion of the flows (approximately 13% in Year 2010). Improvements to domestic wastewater collection systems in the existing SAWPA service area are currently under way that will result in removal of nearly all Domestic flows from the Brine Line by Year 2015. This will cause the projected average concentration to decrease for a time. Conversely, the Desalter category contributes a large portion of the flow (approximately 66% in Year 2010) but a small portion of the TSS mass (approximately 7% in Year 2010), which tends to moderate the impact of increasing TSS mass loads from other categories on average concentrations over time. The TSS forecasts in **Table 17** above reflect these changes.

Biochemical Oxygen Demand

Similar to the TSS forecasts, forecasting of future BOD loads from the existing SAWPA service area was performed using the Adjusted Average Concentration for each applicable Brine Generator Category calculated as described in the Analysis of Historical BOD Data section above and as listed in **Table 16**. These Adjusted Average BOD Concentrations were used in combination with the forecasted flows for the corresponding Brine Generator Category to forecast annual mass of BOD (in tons per year) for each category to Year 2060. Since the average concentration was held constant for each category, the flow forecasts represent the only variable for each category. But, as with the TSS variations discussed above, because the rate of change of flow over time is different for each category and the BOD concentrations vary significantly between categories, the aggregate average concentration also varies over time.

The forecasts of BOD mass from the existing SAWPA service area for each Brine Generator Category and of the average BOD concentration are listed in **Table 18** below.

Table 18 – Forecasted BOD Mass & Average Concentration from Existing SAWPA Service Area

Forecasted BOD Mass (Tons/Year) from Existing SAWPA Service Area								Brine Line Flows (MGD)	Average BOD Concentration (mg/L)
Year	DS	RECYC	IND	WH	PP	DOM	Total		
2010	26.4	0.0	603.8	937.1	8.0	515.9	2,091.2	11.7	117
2015	29.2	278.2	966.8	1,327.6	7.2	7.0	2,616.0	12.21	141
2020	36.2	806.8	1,293.2	1,405.7	9.8	10.5	3,562.1	15.95	147
2025	43.6	2,058.7	1,537.9	1,561.9	11.0	10.5	5,223.6	20.22	170
2030	51.5	4,451.3	1,872.5	1,718.1	12.2	10.5	8,115.9	26.06	204
2035	51.5	6,973.7	2,129.5	1,952.3	13.5	10.5	11,130.9	29.59	247
2040	51.5	8,179.2	2,382.4	2,108.5	14.8	10.5	12,746.8	31.67	264
2050	51.5	8,179.2	2,484.4	2,577.1	14.8	10.5	13,317.4	31.98	273
2060	51.5	8,179.2	2,484.4	3,201.8	14.8	10.5	13,942.1	32.06	285

As with the TSS variations discussed above, the Desalter and Domestic categories are illustrative of the variations of BOD mass loads and concentrations over time. Flows from the Domestic category have historically been the source of a significant portion of the BOD mass in the Brine Line flows (approximately 25% in 2010) but a small portion of the flows (approximately 13% in Year 2010). The improvements to domestic wastewater collection systems in the existing SAWPA service area currently under way that will remove nearly all Domestic flows from the Brine Line by Year 2015 and moderate the projected average concentration for a time. The Desalter category, by contrast, contributes a large portion of the flow (approximately 66% in Year 2010) but a small portion of the BOD mass (approximately 1% in Year 2010), which moderates the impact of increasing TSS mass loads from other categories on average concentrations over time. The BOD forecasts in **Table 18** above reflect these changes.

Total Dissolved Solids

As discussed above, unlike TSS and BOD forecasts, historical TDS data could not be evaluated for individual Brine Generator Categories. And the forecasted average TDS concentrations used to estimate future TDS loads from the existing SAWPA service area were determined using the trend analysis, increasing at the rate of 19.6 mg/L per month to a maximum rate of 6,800 mg/l in Year 2020, after which the forecasted concentration remains constant.

The forecasted average TDS concentrations were used to forecast mass of BOD (in tons per year) to Year 2060. The forecasted BOD loads from the existing SAWPA service area are listed in **Table 19** below.

Table 19 – Forecasted TDS Mass from Existing SAWPA Service Area

Forecasted TDS Mass(Tons/Year) from Existing SAWPA Service Area			
Year	**TDS Concentration (mg/L)**	**Flow (MGD)**	**TDS Mass (Tons/Year)**
2010	5,198	11.70	92,627
2015	6,374	12.21	118,535
2020	6,800	15.95	165,191
2025	6,800	20.22	209,415
2030	6,800	26.06	269,899
2035	6,800	29.59	306,458
2040	6,800	31.67	328,000
2050	6,800	31.98	331,211
2060	6,800	32.06	332,040

FORECASTING of BRINE LOADS from POTENTIAL SERVICE AREA EXPANSION

Methodology

Forecasting of future TSS, BOD and TDS loads and concentrations from the potential SAWPA service area expansion in San Gorgonio Pass and Coachella Valley was performed using the same methodology used to forecast the loads and concentrations from the existing SAWPA service area. The Adjusted Average Concentration for each applicable Brine Generator Category was calculated as described in the section above entitled “Analysis of Historical Brine Data for Existing SAWPA Service Area” and used to forecast annual mass of each brine constituent (in tons per year) to Year 2060.

Total Suspended Solids

The forecasts of TSS mass and average concentration from the potential SAWPA service area expansion in San Gorgonio Pass and Coachella Valley for each Brine Generator Category are listed in **Table 20** below.

Table 20 – Forecasted TSS Mass & Average Concentration from Service Area Expansion

Forecasted TSS Mass (Tons/Year) from Service Area Expansion								Brine Line Flows (MGD)	Average TSS Concentration (mg/L)
Year	DS	RECYC	IND	WH	PP	DOM	Total		
2010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2015	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2020	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2035	260.3	12,194.1	0.0	158.0	7.0	0.0	12,619.4	12.38	669
2040	1,068.1	15,762.6	0.0	158.0	7.0	0.0	16,995.8	33.53	333
2050	1,207.6	18,525.7	0.0	158.0	7.0	0.0	19,898.3	38.2	341
2060	1,345.0	21,584.4	0.0	158.0	7.0	0.0	23,094.5	43.0	352

Biochemical Oxygen Demand

The forecasts of BOD mass and average concentration from the potential SAWPA service area expansion in San Gorgonio Pass and Coachella Valley for each Brine Generator Category are listed in **Table 21** below.

Table 21 – Forecasted BOD Mass & Average Concentration from Service Area Expansion

Forecasted BOD Mass (Tons/Year) from Service Area Expansion								Brine Line Flows (MGD)	Average BOD Concentration (mg/L)
Year	DS	RECYC	IND	WH	PP	DOM	Total		
2010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2015	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2020	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2035	21.4	5,545.6	0.0	304.6	1.0	0.0	5,872.5	12.38	311
2040	87.9	7,168.4	0.0	304.6	1.0	0.0	7,561.9	33.53	148
2050	99.4	8,425.0	0.0	304.6	1.0	0.0	8,829.9	38.2	152
2060	110.7	9,816.0	0.0	304.6	1.0	0.0	10,232.2	43.0	156

Total Dissolved Solids

As for the forecasts of TDS for the existing SAWPA service area above, forecasted average TDS concentrations (from the forecasts for the existing service area) were used to estimate future TDS loads from the potential SAWPA service area expansion. The forecasts of TDS mass from the potential SAWPA service area expansion in San Gorgonio Pass and Coachella Valley are listed in **Table 22** below.

Table 22 – Forecasted TDS Mass from Service Area Expansion

Forecasted TDS Mass (Tons/Year) from Service Area Expansion			
Year	TDS Concentration (mg/L)	Total Flow (MGD)	Total TDS (Tons / Year)
2010	5,198	0.0	0.0
2015	6,374	0.0	0.0
2020	6,800	0.0	0.0
2025	6,800	0.0	0.0
2030	6,800	0.0	0.0
2035	6,800	12.38	128,259
2040	6,800	33.53	347,305
2050	6,800	38.24	396,034
2060	6,800	43.04	445,747

FORECASTING of TOTAL BRINE LOADS from EXPANDED SERVICE AREA

Methodology

Forecasts of total TSS, BOD and TDS loads from the expanded SAWPA service area are simply the sum of the forecasts for the existing service area in upper Santa Ana Watershed and the potential service area expansion in the San Gorgonio Pass and Coachella Valley area. The forecasted total TSS and BOD loads for each Brine Generator Category were used to calculate the total loads and the average concentration for each year.

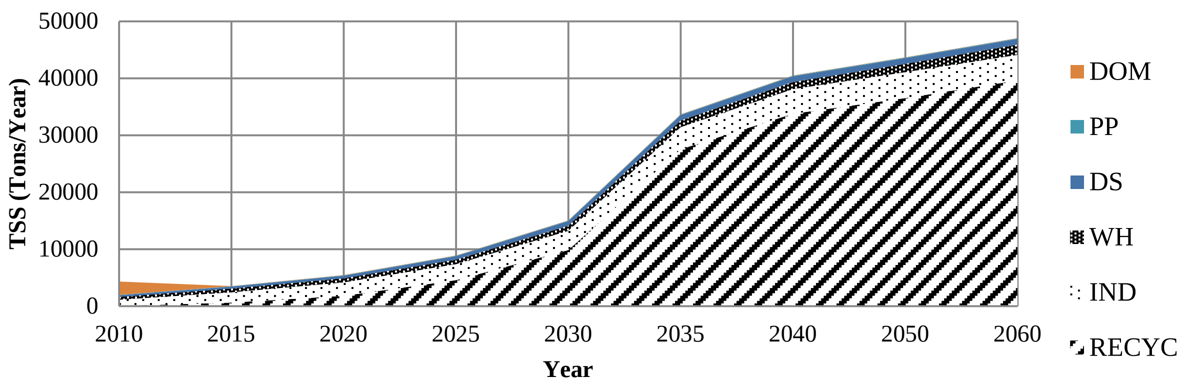
Total Suspended Solids

The total forecasted mass of TSS loads and average concentration from the expanded SAWPA service area for each Brine Generator Category is listed in **Table 23.** The total forecasted mass of TSS loads over time is graphically presented on **Figure 23** on the next page.

Table 23 – Forecasted TSS Mass & Average Concentration from Expanded SAWPA Service Area

Forecasted TSS Mass (Tons/Year)								Brine Line Flows (MGD)	Average TSS Concentration (mg/L)
Year	**DS**	**RECYC**	**IND**	**WH**	**PP**	**DOM**	**Total**		
2010	320.6	0.0	1,097.1	486.2	56.2	2,342.9	4,303.0	11.7	241
2015	354.8	611.7	1,756.8	688.7	50.7	31.7	3,494.4	12.21	188
2020	440.6	1,774.1	2,349.8	729.2	68.4	47.5	5,409.6	15.95	223
2025	530.5	4,526.9	2,794.6	810.3	77.0	47.5	8,786.7	20.22	285
2030	625.5	9,787.9	3,402.4	891.3	85.6	47.5	14,840.1	26.06	374
2035	885.7	27,528.5	3,869.4	1,170.8	101.8	47.5	33,603.7	41.97	525
2040	1,693.6	33,748.0	4,329.0	1,251.9	110.3	47.5	41,180.1	65.20	414
2050	1,833.1	36,511.0	4,514.3	1,494.9	110.3	47.5	44,511.1	70.22	416
2060	1,970.5	39,569.7	4,514.3	1,819.0	110.3	47.5	48,031.3	75.1	420

Figure 24 – Total Forecasted Annual TSS Mass



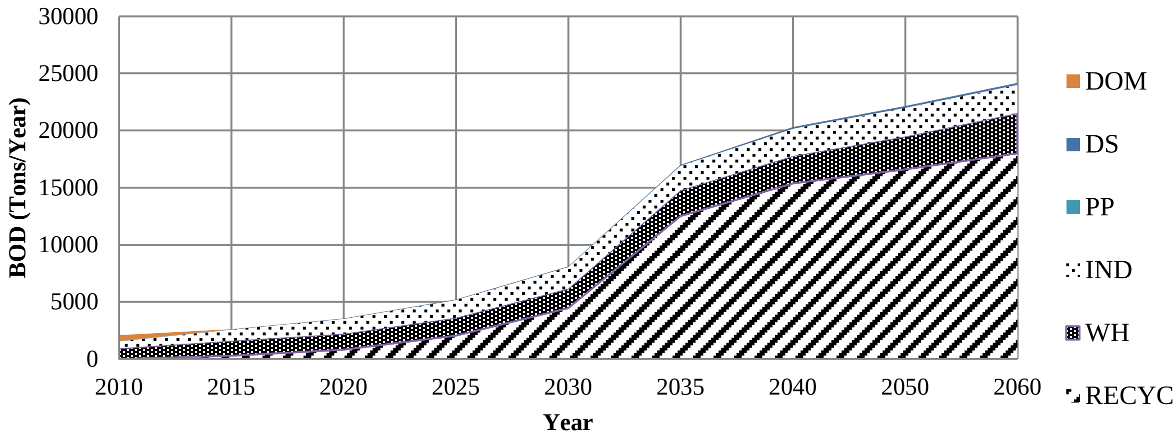
Biochemical Oxygen Demand

The total forecasted BOD loads and average concentration from the expanded SAWPA service area for each Brine Generator Category are listed in **Table 24.** The total forecasted mass of BOD loads over time is graphically presented on **Figure 24** on the next page.

Table 24 – Forecasted BOD Mass & Average Concentration from Expanded SAWPA Service Area

Forecasted BOD Mass (Tons/Year)								Brine Line Flows (MGD)	Average BOD Concentration (mg/L)
Year	DS	RECYC	IND	WH	PP	DOM	Total		
2010	26.4	0.0	603.8	937.1	8.0	515.9	2,091.2	11.7	117
2015	29.2	278.2	966.8	1,327.6	7.2	7.0	2,616.0	12.21	141
2020	36.2	806.8	1,293.2	1,405.7	9.8	10.5	3,562.1	15.95	147
2025	43.6	2,058.7	1,537.9	1,561.9	11.0	10.5	5,223.6	20.22	170
2030	51.5	4,451.3	1,872.5	1,718.1	12.2	10.5	8,115.9	26.06	204
2035	72.9	12,519.2	2,129.5	2,256.9	14.5	10.5	17,003.5	41.97	265
2040	139.3	15,347.7	2,382.4	2,413.1	15.8	10.5	20,308.7	65.20	204
2050	150.8	16,604.2	2,484.4	2,881.7	15.8	10.5	22,147.3	70.22	207
2060	162.1	17,995.2	2,484.4	3,506.4	15.8	10.5	24,174.4	75.1	211

Figure 25 – Total Forecasted Annual BOD Mass



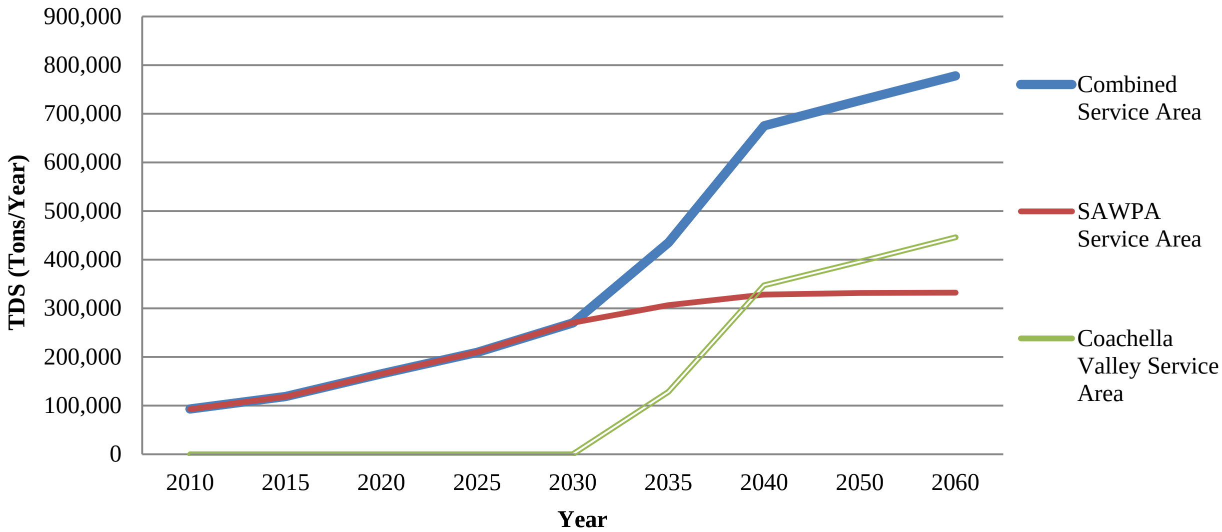
Total Dissolved Solids

The total forecasted TDS loads from the expanded SAWPA service area are listed in **Table 25** and graphically presented on **Figure 25** below. The total forecasted mass of TSS loads over time is graphically presented on **Figure 25** on the next page.

Table 25 – Forecasted TDS Mass from Expanded SAWPA Service Area

Forecasted TDS Mass			
Year	TDS Concentration (mg/L)	Flow (MGD)	TDS Mass (Tons/Year)
2010	5,198	11.70	92,627
2015	6,374	12.21	118,535
2020	6,800	15.95	165,191
2025	6,800	20.22	209,415
2030	6,800	26.06	269,899
2035	6,800	41.97	434,717
2040	6,800	65.20	675,306
2050	6,800	70.22	727,245
2060	6,800	75.10	777,787

Figure 26 – Total Forecasted Annual TDS Mass from Expanded Service Area



Summary of Total Forecasted Brine Line System TSS, BOD and TDS Mass

The total forecasted TSS loads (in tons per year) for the entire expanded SAWPA service area (including Santa Ana Watershed, San Gorgonio Pass and Coachella Valley) are listed in **Table 26** below.

Table 26 – Total Forecasted Annual Brine Line TSS Mass

	2010	2015	2020	2025	2030	2035	2040	2050	2060
SAWPA Desalting	320.6	354.8	440.6	530.5	625.5	625.5	625.5	625.5	625.5
Coachella Desalting	0	0	0	0	0	260.3	1,068.1	1,207.6	1,345.0
Subtotal Desalting	**320.6**	**354.8**	**440.6**	**530.5**	**625.5**	**885.7**	**1,693.6**	**1,833.1**	**1,970.5**
SAWPA Recycled Water	0	611.7	1,774.1	4,526.9	9,787.9	15,334.4	17,985.3	17,985.3	17,985.3
Coachella Recycled Water	0	0	0	0	0	12,194.1	15,762.7	18,525.7	21,584.4
Subtotal Recycled Water	**0**	**611.7**	**1,774.1**	**4,526.9**	**9,787.9**	**27,528.5**	**33,748.0**	**36,511.0**	**39,569.7**
SAWPA Industrial	1,097.1	1,756.8	2,349.8	2,794.6	3,402.4	3,869.4	4,329.0	4,514.3	4,514.3
SAWPA Waste Hauler	486.2	688.7	729.2	810.3	891.3	1,012.8	1,093.9	1,336.9	1,661.0
Coachella Waste Hauler	0	0	0	0	0	158.0	158.0	158.0	158.0
Subtotal Waste Hauler	**486.2**	**688.7**	**729.2**	**810.3**	**891.3**	**1,170.8**	**1,251.9**	**1,494.9**	**1,819.0**
SAWPA Power Plant	56.2	50.7	68.4	77.0	85.6	94.7	103.3	103.3	103.3
Coachella Power Plant	0	0	0	0	0	7.1	7.0	7.0	7.0
Subtotal Power Plant	**56.2**	**50.7**	**68.4**	**77.0**	**85.6**	**101.8**	**110.3**	**110.3**	**110.3**
SAWPA Domestic	2,342.9	31.7	47.5	47.5	47.5	47.5	47.5	47.5	47.5
Subtotal SAWPA	4,303.0	3,494.4	5,409.6	8,786.8	14,840.2	20,984.3	24,184.5	24,612.8	24,936.9
Subtotal Coachella	0	0	0	0	0	12,619.4	16,995.8	19,898.3	23,094.5
Total Brine Flow	**4,303.0**	**3,494.4**	**5,409.6**	**8,786.7**	**14,840.1**	**33,603.7**	**41,180.1**	**44,511.1**	**48,031.3**

The total forecasted BOD loads (in tons per year) for the entire expanded SAWPA service area (including Santa Ana Watershed, San Gorgonio Pass and Coachella Valley) are listed in **Table 27** below.

Table 27 – Total Forecasted Annual Brine Line BOD Mass

	2010	2015	2020	2025	2030	2035	2040	2050	2060
SAWPA Desalting	26.4	29.2	36.2	43.6	51.5	51.5	51.5	51.5	51.5
Coachella Desalting	0	0	0	0	0	21.4	87.8	99.3	110.6
Subtotal Desalting	**26.4**	**29.2**	**36.2**	**43.6**	**51.5**	**72.9**	**139.3**	**150.8**	**162.1**
SAWPA Recycled Water	0	278.2	806.8	2,058.7	4,451.3	6,973.7	8,179.2	8,179.2	8,179.2
Coachella Recycled Water	0	0	0	0	0	5,545.5	7,168.5	8,425.0	9,816.0
Subtotal Recycled Water	**0**	**278.2**	**806.8**	**2,058.7**	**4,451.3**	**12,519.2**	**15,347.7**	**16,604.2**	**17,995.2**
SAWPA Industrial	603.8	966.8	1,293.2	1,537.9	1,872.5	2,129.5	2,382.4	2,484.4	2,484.4
SAWPA Waste Hauler	937.1	1,327.6	1,405.7	1,561.9	1,718.1	1,952.3	2,108.5	2,577.1	3,201.8
Coachella Waste Hauler	0	0	0	0	0	304.6	304.6	304.6	304.6
Subtotal Waste Hauler	**937.1**	**1,327.6**	**1,405.7**	**1,561.9**	**1,718.1**	**2,256.9**	**2,413.1**	**2,881.7**	**3,506.4**
SAWPA Power Plant	8.0	7.2	9.8	11.0	12.2	13.5	14.8	14.8	14.8
Coachella Power Plant	0	0	0	0	0	1.0	1.0	1.0	1.0
Subtotal Power Plant	**8.0**	**7.2**	**9.8**	**11.0**	**12.2**	**14.5**	**15.8**	**15.8**	**15.8**
SAWPA Domestic	515.9	7.0	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Subtotal SAWPA	2,091.2	2,616.0	3,562.1	5,223.6	8,115.9	11,131.0	12,746.9	13,317.5	13,942.2
Subtotal Coachella	0	0	0	0	0	5,872.5	7,561.9	8,829.9	10,232.2
Total Brine Flow	**2,091.2**	**2,616.0**	**3,562.1**	**5,223.6**	**8,115.9**	**17,003.5**	**20,308.7**	**22,147.3**	**24,174.4**

The total forecasted TDS loads (in tons per year) for the entire expanded SAWPA service area (including Santa Ana Watershed, San Gorgonio Pass and Coachella Valley) are listed in **Table 28** below.

Table 28 – Total Forecasted Annual Brine Line TDS Mass

	2010	2015	2020	2025	2030	2035	2040	2050	2060
Subtotal SAWPA	92,627	118,535	165,191	209,415	269,899	306,458	328,000	331,211	332,040
Subtotal Coachella	0	0	0	0	0	128,259	347,306	396,034	445,747
Total Brine Flow	**92,627**	**118,535**	**165,191**	**209,415**	**269,899**	**434,717**	**675,306**	**727,245**	**777,787**

Summary of Total Forecasted Brine Line System TSS, BOD and TDS Concentration

The total forecasted TSS concentrations (in mg/L) for the entire expanded SAWPA service area (including Santa Ana Watershed, San Gorgonio Pass and Coachella Valley) are listed in **Table 29** below.

Table 29 – Total Forecasted Annual Brine Line TSS Concentration

	2010	2015	2020	2025	2030	2035	2040	2050	2060
Subtotal SAWPA	241	188	223	285	374	465	501	505	510
Subtotal Coachella	0	0	0	0	0	669	333	341	352
Total Brine Flow	**241**	**188**	**223**	**285**	**374**	**525**	**414**	**416**	**420**

The total forecasted BOD concentrations (in mg/L) for the entire expanded SAWPA service area (including Santa Ana Watershed, San Gorgonio Pass and Coachella Valley) are listed in **Table 30** below.

Table 30 – Total Forecasted Annual Brine Line BOD Concentration

	2010	2015	2020	2025	2030	2035	2040	2050	2060
Subtotal SAWPA	117	141	147	170	204	247	264	273	285
Subtotal Coachella	0	0	0	0	0	311	148	152	156
Total Brine Flow	**117**	**141**	**147**	**170**	**204**	**266**	**204**	**207**	**211**

The total forecasted TDS concentrations (in mg/L) for the entire expanded SAWPA service area (including Santa Ana Watershed, San Gorgonio Pass and Coachella Valley) are listed in **Table 31** below.

Table 31 – Total Forecasted Annual Brine Line TDS Concentration

	2010	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2050**	**2060**
Subtotal SAWPA	5,198	6,374	6,800	6,800	6,800	6,800	6,800	6,800	6,800
Subtotal Coachella	0	0	0	0	0	6,800	6,800	6,800	6,800
Total Brine Flow	**5,198**	**6,374**	**6,800**	**6,800**	**6,800**	**6,800**	**6,800**	**6,800**	**6,800**