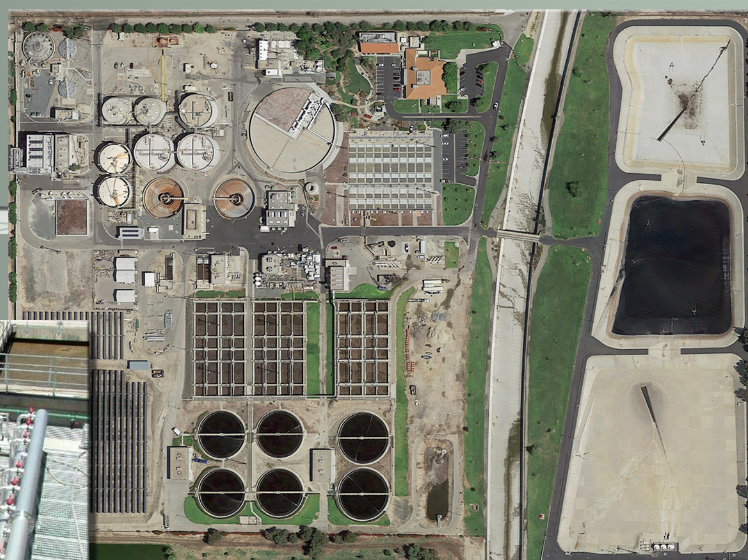
FINAL

Wastewater Facilities Master Plan Update Report

Volume 1 of 2



Submitted to:

Inland Empire Utilities Agency

Submitted by:

CH2MHILL

In Association With:

carollo

Engineers...Working Wonders With Water®

June 2015

WT0122151041SCO

Final Report

Wastewater Facilities Master Plan Update Report Volume 1 of 2

Prepared for

Inland Empire Utilities Agency

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June 2015

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SIGNED: 06-03-15

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Contents

Tables

Figures

Acronyms and Abbreviations

AF	acre-feet
AQMP	air quality management plan
BOD	biological oxygen demand
C&T	cap and trade
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal-EPA	California Environmental Protection Agency
CARB	California Air Resources Board
CCWRF	Carbon Canyon Water Recycling Facility
CEQA	California Environmental Quality Act
CFR	*Code of Federal Regulations*
CIP	Capital Improvement Plan
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalents
CTR	California Toxics Rule
DDW	Division of Drinking Water
DT/d	dry tons per day
ENR CCI	*Engineering-News Record* Construction Cost Index
EQ	equalization
ft^2	square feet
GIS	Geographic Information System
IERCF	Inland Empire Regional Composting Facility
IEUA	Inland Empire Utilities Agency
IRP	Integrated Resources Plan
MBR	membrane bioreactor
MCL	maximum contaminant level
MG	million gallons
mg/L	milligrams per liter
mgd	million gallons per day
MPN	most probable number
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act

NH3-N	ammonia as nitrogen
NL	notification level
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRW	Non-Reclaimable Wastewater
NTU	nephelometric turbidity units
PE	primary effluent
PHG	public health goal
ppb	parts per billion
ppmv	parts per million volume
PS	primary sludge
RAS	return activated sludge
RO	reverse osmosis
RP-1	Regional Water Recycling Plant No 1
RP-2	Regional Water Recycling Plant No. 2
RP-4	Regional Water Recycling Plant No. 4
RP-5	Regional Water Recycling Plant No. 5
RWC	recycled water contribution
RWPS	Recycled Water Program Strategy
RWQCB	Regional Water Quality Control Board
RWRP	Regional Water Recycling Plant
Sanitation Districts	Sanitation Districts of Los Angeles County
SCAB	South Coast Air Basin
SCAQMD	South Coast Air Quality Air District
SIP	State Implementation Plan
SWD	sidewater depth
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TIN	total inorganic nitrogen
TKN	total Kjeldahl nitrogen
TM	Technical Memorandum
TN	total nitrogen
TOC	total organic carbon
TSS	total suspended solids
USACE	United States Army Corps of Engineers

USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WAS	waste activated sludge
WFMP	Wastewater Facilities Master Plan
WT/d	wet tons per day

Executive Summary

The Inland Empire Utilities Agency (IEUA) completed the Wastewater Facilities Master Plan (WFMP) in 2002. Changes in economic conditions and water use efficiency practices, discharge permit requirements, and water recycling needs have created a need to re-evaluate the assumptions and update the WFMP. This WFMP Update Report will provide the basis for developing the Capital Improvement Plan (CIP) over the next 20 years. The report addresses long term projection of growth and capacity needs within the service area, capacity utilization of the four Regional Water Recycling Plants (RWRPs), relocation of RP-2 solids handling facilities to RP-5, and diversion of flows to RP-1 to maximize groundwater recharge in the northern service area. Careful consideration was given to nitrogen limits and other applicable regulatory requirements anticipated in the near future when evaluating facilities planning and expansion needs for each of the RWRPs.

As part of this WFMP effort, IEUA's collection system hydraulic model was updated and validated based on the most recent two years of flow data provided by IEUA and the results of the flow monitoring program conducted in November 2013. While IEUA's collection system generally has adequate capacity to convey buildout peak dry weather flows, capacity limitations were identified in the Montclair pipeline reach that conveys flow from the Montclair pump station to RP-1. In addition to identifying capacity deficiencies within the existing collection system, four flow diversion alternatives were developed to divert flows from RP-5 to RP-1 to optimize groundwater recharge in the northern service area. The selected flow diversion alternative offered cost-effective near-term benefits in diverting flow from both the Whispering Lakes and Haven pump stations to RP-1.

Given the preferred flow diversion alternative identified above, influent wastewater flow and loading projections were established for each of the RWRPs for the planning year 2035, as well as for the buildout year 2060. Influent wastewater flows are projected to increase at each of the RWRPs, primarily as a result of population growth. The increase in flows to RP-4 is largely attributable to the gradual incorporation of septic flows into the system beginning in 2020, whereas RP-5 flows are projected to more than double by year 2060 as a result of population growth in Chino and other areas served by RP-5. An analysis of the current influent wastewater characteristics and plant operations was conducted based on the most recent two years of plant data provided by IEUA to establish the basis for projecting the plant loading. While constituent concentrations have remained relatively constant during the 2-year evaluation period, wastewater strength has increased substantially since the 2002 WFMP.

A process model was then developed for each RWRP using CH2M HILL's whole plant simulator, PRO2D, to evaluate treatment capacities, identify system deficiencies and expansion needs, and establish facilities sizing and footprint requirements for new and expanded facilities. Each model was constructed with the operations and performance criteria reflective of the evaluation period conditions, and then calibrated to reflect the actual performance, solids yields, and water quality data. The capacity expansion and footprint requirements were based on using the membrane bioreactor (MBR) technology, which offers a smaller footprint, elimination of secondary clarifiers and tertiary filters for recycled water production, and superior water quality. Facility reliability and redundancy considerations were based on IEUA's agency-wide approach consistent with Title 22 requirements, with RP-5 being the end-of-the-line facility receiving all flow diversions, if needed, from other RWRPs.

CIP projects were developed based on the expansion needs identified for each RWRP over the next 20 years. Implementation of each of these projects over the next 20 years will depend on actual timing of influent wastewater flows that are projected to exceed treatment or conveyance capacities. However, the immediate need to relocate the RP-2 solids handling facilities to RP-5 is driven by the United States Army Corps of Engineers (USACE) decision to raise the elevation of the Prado Dam, which would cause the solids handling facilities at RP-2 to be below the 100-year flood plain. The RP-5 solids expansion project includes relocation of RP-2 solids handling facilities to RP-5, demolition of the RP-2 facilities, and relocation of the

RP-2 lift station to a location above the flood plain. This solids expansion project, as well as the RP-1 solids expansion project, are most imminent, followed by the liquid treatment expansion projects at RP-5, RP-1, and RP-4. There are no expansion projects planned for Carbon Canyon Water Recycling Facility (CCWRF) or the Inland Empire Regional Composting Facility (IERCF) for the 20-year CIP, since both facilities have sufficient capacity to treat projected flows and loads through 2035. Planning level cost estimates were developed for each project and escalated to mid-point of construction. A summary of these projects and their respective costs are presented in Table 1.

TABLE 1
Major Capital Projects Needed to Meet Projected Capacity for the Next 20 Years

Major Capital Project	Purpose	Project Elements	Escalated Cost[a] ($Million)
Montclair Pipeline Upgrades Project	Upsize four pipeline segments from 21-inch and 30-inch diameter to 36-inch diameter to mitigate deficiencies in conveyance system, reliably accommodate future growth, and convey peak buildout flows	Four Reaches of Montclair Pipeline	$25.4
Whispering Lakes Pump Station Expansion Project	Increased pumping capacity to meet projected future flows; Ability to send more flows to RP-1 for treatment	Whispering Lakes Pump Station	$6.1
RP-1 Solids Treatment Expansion Project	Increased solids treatment capacity to meet existing and projected future flows	Anaerobic Digesters	$24.9
RP-1 Liquid Treatment Expansion and Primary Effluent Equalization Elimination Project	Increased liquid treatment capacity to meet projected future flows; Eliminating primary flow equalization and converting ponds for other uses	MBR (Train D = 5 mgd) Secondary Clarifiers Equalization pond piping modifications	$122.4
RP-4 Liquid Treatment Expansion Project	Increased liquid treatment capacity to meet projected future flows	Tertiary Filter Chlorine Contact Tank	$6.6
RP-5 Solids Handling Facilities Project (RP-2 Relocation)	Relocation of RP-2 solids handling operations to RP-5; Increased solids treatment capacity to meet existing and projected future flows; Relocation of RP-2 Lift Station to above the flood elevation; Demolition of RP-2 facilities	Thickening Anaerobic Digesters High Pressure Gas Storage Dewatering Building Odor Control RP-2 Lift Station	$157.3
RP-5 Liquid Treatment Expansion Project	Increased liquid treatment capacity to meet projected future flows	Primary Clarifiers MBR (7.5 mgd) Chlorine Contact Basin	$125.5

[a] Cost estimates based on 3 percent annual escalation of total project costs to midpoint of construction.
mgd – million gallons per day

Details of the analysis are presented in *Technical Memorandum (TM) No. 1 through 10*, located in Volume 2 of this WFMP Update Report. A summary of each of these TMs is presented herein in Volume 1, along with a discussion of the major capital projects needed to meet projected capacity for the next 20 years, followed by a discussion of regulatory considerations related to water reuse, air quality, biosolids management, and environmental impacts. A brief synopsis is also provided for IEUA's Integrated Resources Plan (IRP) and Recycled Water Program Strategy (RWPS) currently underway, which collectively aim to develop a strategy for meeting projected water resource demands within the IEUA service area in a cost-effective manner and maximize the beneficial use of recycled water. The IRP will integrate findings from the RWPS, this WFMP Update Report, the Recharge Master Plan Update Report, and the Water Use Efficiency Business Plan to create a cost-effective and consistent regional water resource management strategy.

1.0 Summary of TM 1 Existing Facilities

The Inland Empire Utilities Agency (IEUA) provides wastewater treatment, biosolids handling, and recycled water service to the cities of Upland, Montclair, Ontario, Fontana, Chino, and Chino Hills, as well as to Cucamonga Valley Water District, which services the city of Rancho Cucamonga and some unincorporated areas of San Bernardino County.

IEUA's existing wastewater facilities include wastewater collection, wastewater treatment, recycled water distribution, and biosolids handling. Wastewater within IEUA's service area is collected by two collection systems—the Non-Reclaimable Wastewater (NRW) System and the Regional Trunk Sewer System. The NRW System collects industrial and high-salinity wastewater for conveyance to the Sanitation Districts of Los Angeles County (Sanitation Districts) or the Orange County Sanitation District for treatment and ocean disposal. The Regional Trunk Sewer System collects municipal domestic wastewater and conveys it to IEUA's Regional Water Recycling Plants (RWRPs). Municipal domestic wastewater is treated at one of four RWRPs: Regional Water Recycling Plant No. 1 (RP-1), Regional Water Recycling Plant No. 4 (RP-4), Regional Water Recycling Plant No. 5 (RP-5), and Carbon Canyon Water Recycling Facility (CCWRF). The liquid treatment facilities at these plants are designed to produce Title 22 water that can be reused or recharged into the groundwater. Recycled water is distributed from each facility into six different recycled water pressure zones for reuse. Recycled water in excess of the recycled water demand is dechlorinated and discharged to streams that are tributary to the Santa Ana River.

IEUA operates two regional biosolids treatment facilities located at RP-1 and Regional Water Recycling Plant No. 2 (RP-2). The RP-1 solids handling facility treats biosolids produced at RP-1 and RP-4, and the RP-2 solids handling facility treats biosolids produced at RP-5 and CCWRF. Biosolids are thickened, stabilized, and dewatered at each facility, and are trucked to the Inland Empire Regional Composting Facility (IERCF) for composting. The IERCF accepts biosolids from both the IEUA and the Sanitation Districts treatment facilities and produces a high-quality soil amendment.

A map of the existing wastewater system is presented in Figure 1.

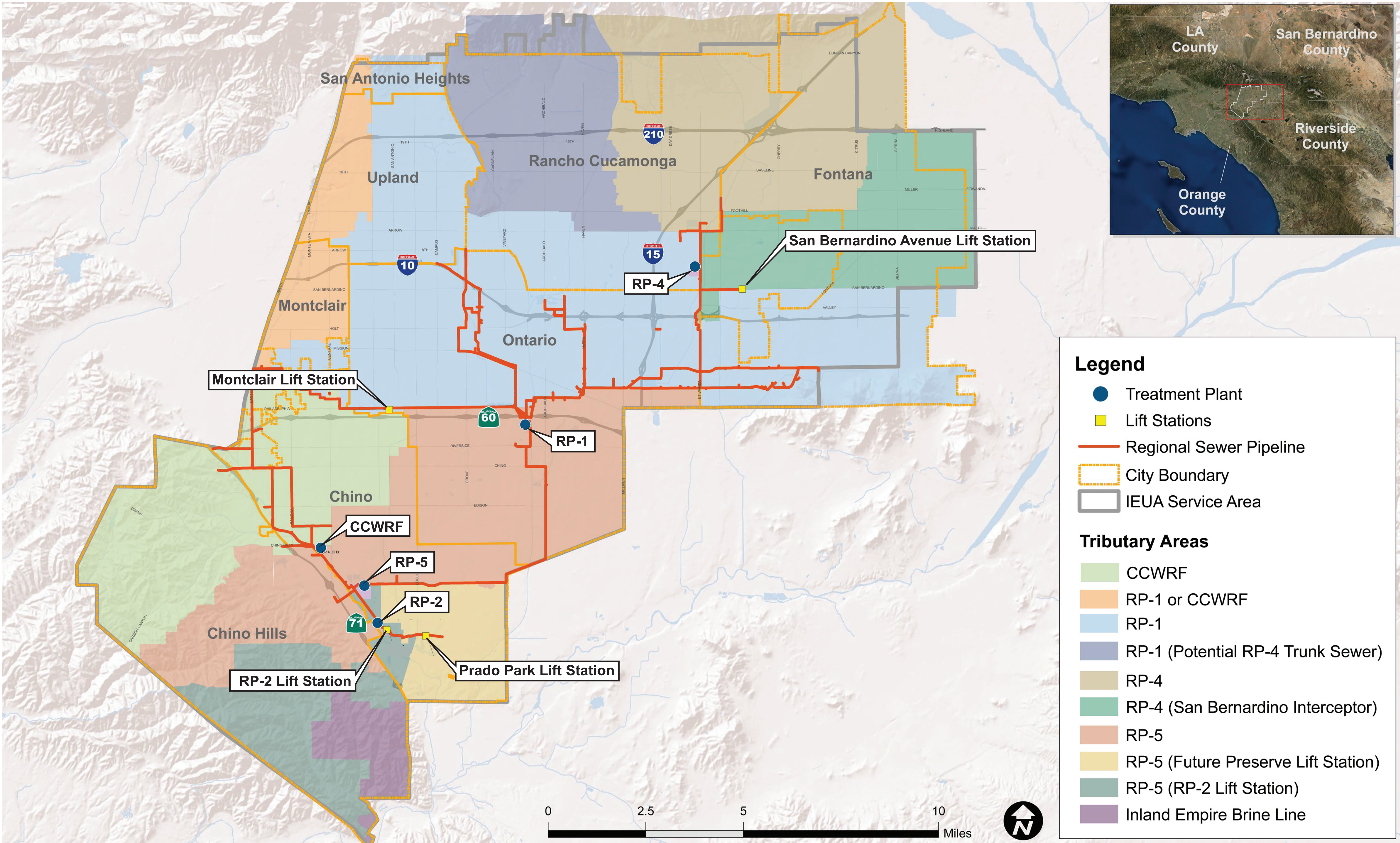
1.1 Wastewater Conveyance

The Regional Trunk Sewer System consists of gravity interceptor systems, lift stations, force mains, and diversions. IEUA currently operates four of these lift stations and force mains - the San Bernardino Avenue Lift Station, Montclair Interceptor Lift Station, Prado Park Lift Station, and RP-2 Lift Station.

The Regional Trunk Sewer System has the capability to divert flows within the collection system at several locations. Each of the four RWRPs is interconnected through an intricate network of diversion points within the wastewater collection system, which enables plant influent flows to be shifted between the facilities to efficiently treat the wastewater and meet recycled water demands within the IEUA service area. The Montclair/Westside Interceptor Diversion Structure connects the Westside Interceptor, the Montclair Interceptor, and the Northern NRW System. At this diversion structure, flows can be directed to RP-1 via the Montclair Interceptor Lift Station, to CCWRF via the Westside Interceptor, or to the NRW System. Currently, 3 mgd of flow is diverted from RP-1 to CCWRF to reduce flows in the Montclair Interceptor and at RP-1. RP-4 and CCWRF are also configured to bypass flows to RP-1 and RP-5, respectively, and primary effluent flows from RP-1 can be diverted to RP-5, if needed. Additionally, influent flows to RP-5 and CCWRF can be bypassed from each plant to the Inland Empire Brine Line under emergency conditions.

1.2 Wastewater Treatment

IEUA owns and operates five treatment plants within its service area—RP-1, RP-2, RP-4, RP-5, and CCWRF. Liquid wastewater streams are treated at RP-1, RP-4, RP-5, and CCWRF, and solids produced at the treatment facilities are processed at RP-1 and RP-2.



Data Source: RMC // Prepared by: IEUA // Date Created: 12/24/13

FIGURE 1

IEUA EXISTING WASTEWATER SYSTEM

INLAND EMPIRE UTILITIES AGENCY
WASTEWATER FACILITIES MASTER PLAN

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Regional Water Recycling Plant No. 1

RP-1 was originally constructed in 1948 and has undergone many expansions and improvements over the years. The treatment plant includes preliminary, primary, secondary, and tertiary liquid treatment facilities and solids handling facilities. The liquid facilities produce an effluent quality meeting Title 22 standards for spray irrigation, unrestricted recreational use, landscape impoundments, and groundwater recharge. The facility receives waste solids from RP-4 through the sewer system, and biosolids from RP-1 are trucked to IERCF for further treatment and composting.

Regional Water Recycling Plant No. 2

RP-2 was constructed in the 1960s and has both liquid treatment and solids handling facilities. However, due to the United States Army Corps of Engineers (USACE) decision to raise the elevation of the Prado Dam, the RP-2 liquid treatment capacity was relocated to RP-5. This Wastewater Facilities Master Plan (WFMP) evaluates the decision of when and where to relocate the RP-2 solids handling facilities. RP-2 receives waste solids from RP-5 and CCWRF and provides thickening, digestion, and dewatering. The solids handling recycles generated throughout the process are diverted to RP-5 for treatment, and the biosolids are hauled to IERCF for composting and beneficial use.

Regional Water Recycling Plant No. 4

RP-4 has been in operation since 1997. RP-4 serves as an upstream satellite facility to RP-1 by scalping flow from the Etiwanda sewer that is tributary to RP-1. The treatment plant includes preliminary, primary, secondary, and tertiary treatment facilities. The liquid facilities produce an effluent quality meeting Title 22 standards for spray irrigation, unrestricted recreational use, landscape impoundments, and groundwater recharge. Solids produced at RP-4 are returned to the sewer system and conveyed to RP-1 for treatment.

Regional Water Recycling Plant No. 5

RP-5 began operation in March 2004 to replace the liquid treatment process at RP-2. RP-1 and CCWRF have the ability to divert flows to RP-5, thus making RP-5 the end-of-the-line facility for the entire wastewater treatment system. RP-5 also receives flows from the RP-2 Lift Station. The liquid treatment facilities include preliminary, primary, secondary, and tertiary treatment. Recycled water from RP-5 meets Title 22 standards for spray irrigation, unrestricted recreational use, and landscape impoundments. Excess recycled water is dechlorinated and discharged to Chino Creek. Solids produced at RP-5 are sent to RP-2 for treatment through a dedicated sludge line.

Carbon Canyon Water Recycling Facility

CCWRF began operation in 1992 and includes preliminary, primary, secondary, and tertiary treatment facilities producing an effluent quality meeting Title 22 standards for landscape irrigation and other recycled water uses. Excess recycled water is dechlorinated and discharged to Chino Creek.

1.3 Biosolids Management Facilities

Biosolids produced at IEUA's RP-1 and RP-2 regional solids handling facilities are trucked to the IERCF. The Inland Empire Regional Composting Authority was created in February 2002 by a joint powers agreement between IEUA and the Sanitation Districts to construct, operate, and maintain a regional composting facility. Both IEUA and the Sanitation Districts send biosolids to the facility for processing and reuse as a high-quality soil amendment. Additionally, IEUA owns and leases a food-waste processing facility located at RP-5 to treat dairy and food waste.

1.4 Recycled Water System

IEUA currently produces about 60,000 acre-feet (AF) of recycled water annually. In 2013, recycled water use totaled about 32,362 AF. Recycled water produced at the RWRPs is distributed throughout the IEUA service area using six different pressure zones, which are interconnected to allow the transfer of recycled water from higher pressure zones to lower pressure zones.

2.0 Summary of TM 2 Hydraulic Modeling and GIS Implementation

As part of the WFMP, IEUA is planning facilities for growth and the optimization of wastewater treatment, collection, and recycled water systems. An integral part of that planning effort is the continued development of the IEUA Geographic Information System (GIS) and collection system hydraulic model.

The WFMP incorporated the wastewater flow projections developed by the Integrated Resources Plan (IRP) consultant in conjunction with input from IEUA on the operations of the wastewater collection and treatment systems to develop a comprehensive facilities and operations plan. This TM discusses the foundations of those planning efforts.

The model for IEUA's wastewater collection system was updated and validated based on the inputs provided by IEUA. The flow projections were allocated into the model, and tributary areas were reviewed for accuracy. The model was calibrated based on flow monitoring data and the most recent two years of flow data provided by IEUA, and the flows were verified at 33 sites throughout the IEUA collection system. Based on the results of the model calibration, the model was determined to be aligned with industry standards for planning-level analysis and evaluations of flow routing alternatives.

As part of the IRP and the WFMP, goals for the utilization of water resources within IEUA were established. It was determined that the northern portions of the IEUA service area would be the targeted area for groundwater recharge. Therefore, the flow diversion alternatives developed as part of the WFMP focused on diverting additional flows north to RP-1 to optimize groundwater recharge opportunities. Four flow diversion alternatives were developed that utilized a combination of existing IEUA and city of Ontario facilities as well as a new pump station and diversion pipelines to convey either raw wastewater or treated water from RP-5 to RP-1.

2.1 Flow Diversion Alternatives

The flow diversion alternatives focus on options to utilize readily available diversion scenarios, such as areas of the system that currently convey flow to RP-5 but were previously pumped to RP-1. These areas include the service areas tributary to the city of Ontario's Haven and Whispering Lakes pump stations. Those areas would provide IEUA with a relatively quick way to divert flows to RP-1 but would not provide enough flow to account for the additional capacity at RP-1 that could be available after a treatment upgrade. Therefore, diversion alternatives also focused on diverting wastewater flows generated by new growth within the city of Ontario's New Model Colony area. The New Model Colony area is a large area of land within the city of Ontario's sphere of influence that is currently slated for development in the near future.

In addition to evaluating the Haven and Whispering Lakes areas, diversion alternatives consider the impacts of the Montclair diversion structure operations on system capacity and availability of flows to RP-1. Currently, approximately 3.3 mgd of flow enters the Montclair diversion structure. Based on discussions with IEUA staff and data from the flow monitoring program, the flow is split approximately 50 percent to RP-1 and 50 percent to CCWRF. The CCWRF portion of the flow can ultimately end up at RP-5. Diversion alternatives were analyzed taking the Montclair diversion operations into consideration. All of the alternatives include maximizing use of the Montclair diversions to RP-1.

In addition to the flow diversion alternatives discussed herein, the option of adding satellite treatment facilities where the recycled water would most likely be used was also considered. Although the use of satellite facilities for this purpose may be viable in some cases, it was not deemed to be a viable option for this project. IEUA already has an extensive recycled water distribution system and the focus of future growth in reclamation is on groundwater recharge in close proximity to the existing system.

Based on these considerations, the diversion alternatives summarized below were identified, and the benefits of each alternative were analyzed as part of the work conducted for *TM 3 Regional Trunk Sewer Alternatives Analysis*.

Alternative 1

Alternative 1 is the "Do Nothing" alternative. This alternative makes use of the future flow projections for RP-1 and RP-5 and determines how keeping the existing methodologies for flow routing in place affects IEUA's ability to meet its goals. The assumption is that all flows from the Whispering Lakes and Haven tributary areas are conveyed by gravity to RP-5.

Alternative 2

Alternative 2 assumes that the flows from the Whispering Lakes tributary area are pumped to RP-1 for treatment. Currently, the Haven pump station conveys flow to RP-1, and Alternative 2 assumes that the flows would continue to be conveyed to RP-1 in the future. Alternative 2 provides flexibility where the wastewater is routed because IEUA would still have the option to send the flows to RP-5 either through the Eastern Trunk Sewer or the RP-1 Bypass.

Alternatives 3A, 3B, and 3C

Alternative 3 would install a new pump station south of the Archibald Ranch area to convey flows from the Whispering Lakes, Haven, and Archibald Ranch developments to RP-1. There would be three sub-alternatives of Alternative 3 to compare different locations for the new pump station to maximize the collection of sewer flows from the New Model Colony in the city of Ontario and to optimize the amount of flow diverted to RP-1. Alternative 3 also includes additional flow diversions from the eastern portions of the New Model Colony. Thus, in contrast to Alternative 2, Alternative 3 maximizes the amount of flow going to RP-1 by taking flow from new development. Potential locations for the new pump station are (a) south of Edison Avenue to intercept approximately 30 percent of the New Model Colony flows, (b) near the flood control channel and Hellman Avenue to intercept approximately 50 percent of the New Model Colony flows, and (c) near Euclid Avenue and Kimball Avenue to intercept all of the New Model Colony flows. Each location represents a corresponding sub-alternative (3A, 3B, and 3C).

Alternatives 4A and 4B

Instead of diverting flows to RP-1 for treatment, Alternative 4 assumes that flows are treated at RP-5 and pumped to RP-1 to be distributed in the recycled water distribution system to the northern portions of the IEUA service area. It is assumed that the existing recycled water pump station currently installed at RP-5 would need to be expanded to pump the increased recycled water flow to the recycled water facility at RP-1. Alternative 4 requires an expansion of RP-5 to handle the increase in flow to the plant. This is the least flexible of the alternatives because flows to RP-5 could not be diverted. Alternative 4 has two sub-alternatives. Alternative 4A assumes that all flows at the Montclair Diversion would be diverted to the Montclair pump station and ultimately conveyed to RP-1. Alternative 4B assumes that flows at the Montclair Diversion would be diverted to RP-5.

3.0 Summary of TM 3 Regional Trunk Sewer Alternatives Analysis

IEUA's collection system generally has adequate capacity to convey buildout peak dry weather flows. However, capacity limitations were identified in the Montclair pipeline reach that conveys flow from the Montclair pump station to RP-1. In addition to evaluating the existing collection system, four flow diversion alternatives were developed that would allow IEUA to optimize groundwater recharge opportunities in its northern service area. IEUA identified Alternative 2 as the preferred flow diversion alternative, which utilizes the existing Whispering Lakes and Haven pump stations to divert flows from RP-5 to RP-1.

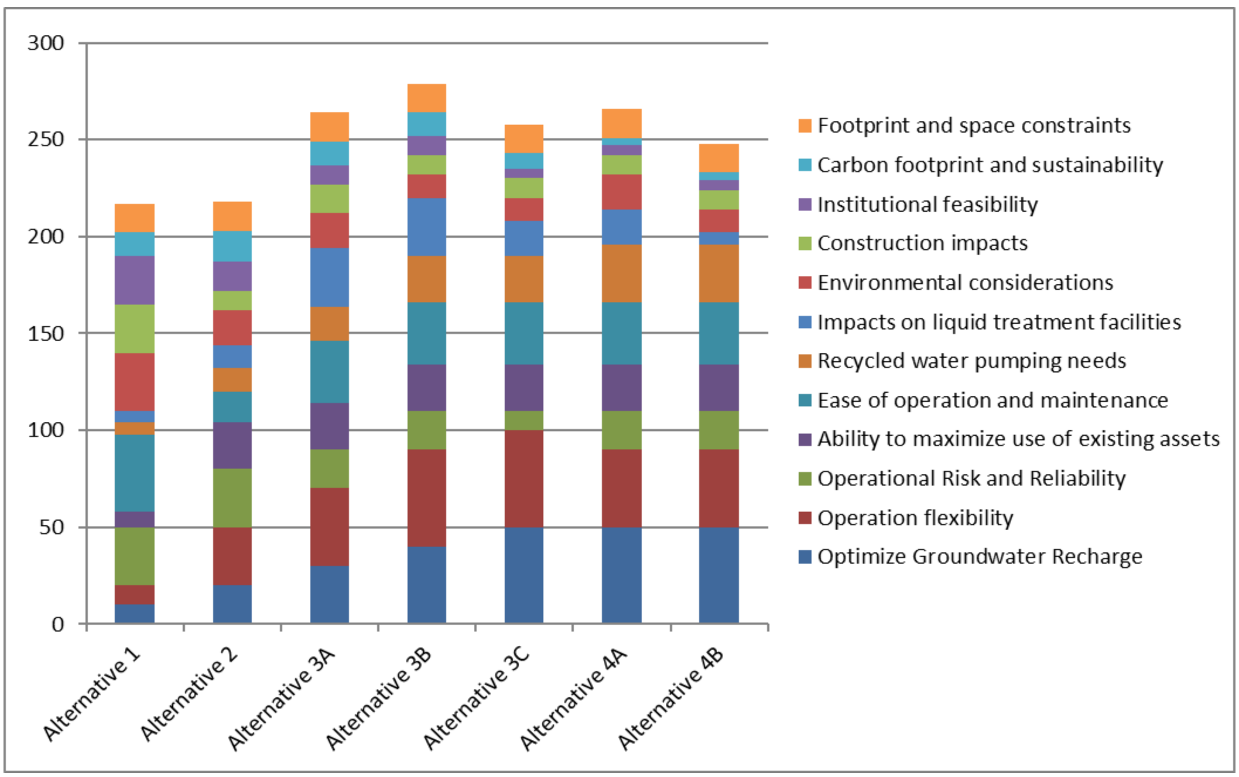
3.1 Evaluation of Existing Collection System

The hydraulic model was run under future system conditions as part of the analysis of the diversion alternatives, and a reach of the Montclair pipeline that includes approximately 24,000 linear feet of 30-inch-diameter sewer was determined to be deficient based on peak buildout flow projections. To mitigate the capacity deficiencies, the pipeline would need to be upgraded to a 36-inch-diameter line to convey peak buildout flows. Other mitigation options also exist such as constructing parallel reaches of the trunk line.

3.2 Evaluation of Flow Diversion Alternatives

Each of the four flow diversion alternatives was evaluated using both monetary and non-monetary evaluation criteria, as well as a benefit-cost analysis to identify the most suitable alternative for meeting IEUA objectives. The analysis was based on a planning horizon of 20 years (2035) and takes into account the infrastructure needs for each alternative based on the projected flows. The results of the non-monetary evaluation of flow diversion alternatives are presented in Figure 2, and the monetary and benefit-cost analysis are presented in Table 2.

FIGURE 2
Flow Diversion Alternatives Non-Monetary Evaluation Results



Evaluation criteria were established collaboratively with IEUA to provide a framework for the analysis of the collection system using the hydraulic model, the conveyance system, and the flow diversion alternatives. For the non-monetary evaluation, a multi-attribute analysis methodology was employed to develop clear and defensible benefit scores for identified alternatives. Once the benefit score was established for each alternative, a monetary evaluation was conducted to estimate life-cycle costs for each alternative. A benefit-to-cost ratio was then determined for each alternative to establish the recommended alternative.

For each alternative, planning level costs for expansion were developed and escalated to the mid-point of construction using the inflation rate, and were brought back to present worth with the bond interest rate. The year in which each treatment plant expansion would be required was determined based on the flow curves developed for each alternative. Operation and maintenance costs were annualized and brought to a net present value in the same manner. The resulting estimated planning level life-cycle cost for each alternative is summarized in Table 2.

TABLE 2
Flow Diversion Alternatives Life-Cycle Costs and Benefit/Cost Ratios

Alternative	Life-Cycle Cost ($ Millions)	Benefit/Cost Ratio
1	$172	1.26
2	$178	1.25
3A	$261	1.01
3B	$219	1.28
3C	$341	0.76
4A	$265	1.00
4B	$335	0.74

Alternative 2 provides IEUA with cost-effective near-term benefits in diverting flow from both the Whispering Lakes and Haven pump stations, while prolonging the treatment expansions of RP-1 and RP-5. Furthermore, Alternative 2 has a lower capital cost, is easier to implement, and provides a relatively higher benefit related to diverting additional flows to RP-1 for groundwater recharge. Alternative 2 also provides operational flexibility in conveying flows to RP-5 by gravity should the need arise. For these reasons, Alternative 2 was selected as the preferred alternative and forms the basis of the wastewater flow projections established in *TM 4 Wastewater Flow and Loading Forecast* for evaluating treatment plant capacities and expansion needs in subsequent TMs.

To provide greater system reliability and redundancy, IEUA requested that RP-5 facilities planning and expansion needs be evaluated under the assumption that both the Whispering Lakes and Haven pump stations are offline, with flows conveyed by gravity to RP-5 rather than to RP-1. Facilities planning and expansion needs for RP-1 were evaluated under the assumption that both pump stations are online, with flows pumped to RP-1. Facilities planning and expansion needs for each of the RWRPs are discussed in TMs 5 through 8.

4.0 Summary of TM 4 Wastewater Flow and Loading Forecast

Analysis of the influent wastewater flow and quality data for each of the four treatment plants was conducted to establish average values and peaking factors. As discussed in TM 3, the WFMP planning effort was based on the IEUA preferred flow diversion Alternative 2, optimizing groundwater recharge by diverting flows from Whispering Lakes and Haven pump stations to RP-1. The corresponding influent wastewater flow and loading projections under this alternative for the planning year 2035, as well as for the buildout year 2060, are presented in this TM and forms the basis of the master planning effort for each of the treatment plants. Influent wastewater flow projections were developed by the IRP consultant as part of the flow monitoring program. The load projections are calculated based on these flow projections along with analysis of the current influent wastewater characteristics and wastewater system operation.

4.1 Influent Wastewater Flow and Quality

The data analysis is based on two consecutive years of recent IEUA data for influent flow and key wastewater quality constituents, including biological oxygen demand (BOD), total organic carbon (TOC), total suspended solids (TSS), ammonia as nitrogen (NH3-N), and total Kjeldahl nitrogen (TKN). In general, plant influent flows and constituent concentrations have remained relatively constant over the 2-year evaluation period. As shown in Figure 3, the average influent flow for the entire system was about 56 mgd during the 2-year analysis period. However, influent wastewater flows are projected to increase, as a result of population growth, at CCWRF between 2020 and 2060 by about 15 percent, with more significant flow increases expected at RP-1, RP-4, and RP-5. The increase in flows to RP-4 by approximately 60 percent is largely attributable to the gradual incorporation of septic flows into the system beginning in 2020. RP-1 flows are projected to increase by 20 percent, while RP-5 flows are projected to more than double by year 2060 as a result of population growth in Chino and other areas served by RP-5.

The average concentrations for key constituents for each of the RWRPs are summarized in Table 3. For comparison, the concentrations established previously for the 2002 WFMP are also presented. Comparison of the two analyses demonstrates a substantial increase in wastewater strength since the 2002 WFMP.

FIGURE 3
Summary of Current Influent Wastewater Flows

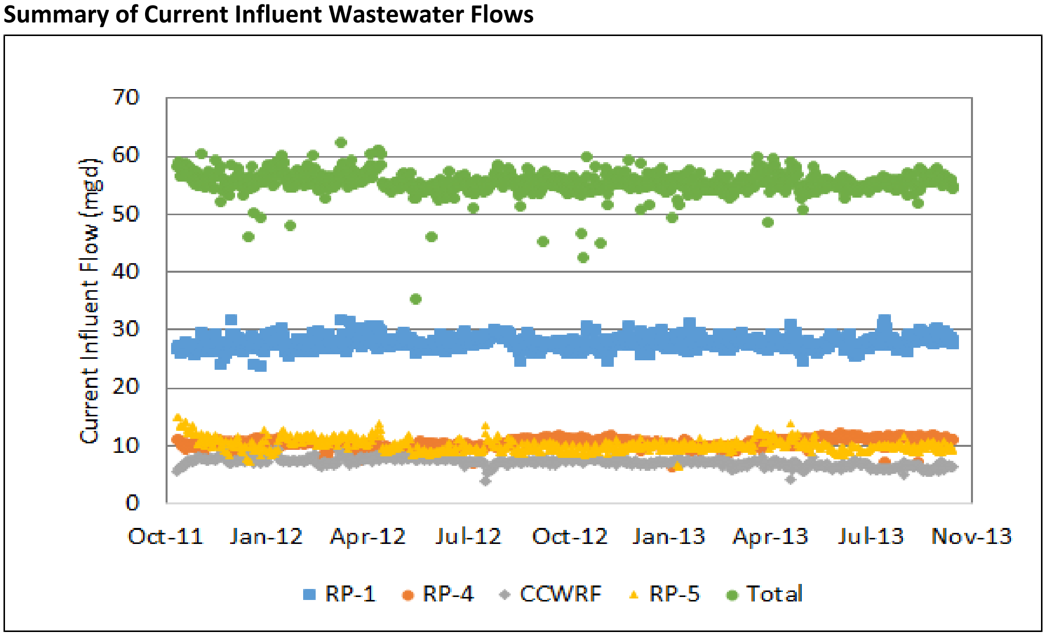


TABLE 3
Summary of Influent Wastewater Concentrations

	Average Influent Water Quality[a,b] (mg/L)							
	RP-4		RP-1		CCWRF		RP-5	
	Current	2002	Current	2002	Current	2002	Current	2002
BOD	352	245	434	243	455	240	321	240
TSS	318	256	472	301	367	300	267	300
NH3-N	41	28	32	23	34	23	35	23
TKN	59	43	55	42	53	42	52	42

[a] Analysis based on plant influent data provided by IEUA for the period between October 15, 2011, and October 15, 2013.
[b] 2002 wastewater characteristics as presented in the 2002 WFMP Volume II memoranda.
mg/L – milligrams per liter

4.2 Wastewater Flow and Loading Forecast

Flow projections were developed by the IRP consultant based on the average influent wastewater flows measured during the flow monitoring period in November 2013 and projected through the year 2060 using population, employment, and land use information. The current and forecasted influent wastewater flows and loads are summarized in Table 4 and form the basis of the master planning effort in subsequent TMs.

TABLE 4
Influent Flow and Loading Projections for Preferred Flow Diversion Alternative 2

		Flows[a,b]		Loads[a,b]							
				BOD		TSS		NH3-N		TKN	
		Max Month PF	Ave Flow mgd	Max Month PF	Ave Load lb/day	Max Month PF	Ave Load lb/day	Max Month PF	Ave Load lb/day	Max Month PF	Ave Load lb/day
RP-4	Current	1.10	10.5	1.85	30,543	1.59	27,630	1.24	3,550	1.46	5,015
	Planning Year 2035	1.10	14.7	1.85	43,207	1.59	38,948	1.24	5,010	1.46	7,186
	Buildout Year 2060	1.10	18.4	1.85	54,082	1.59	48,752	1.24	6,271	1.46	8,994
RP-1	Current	1.04	27.8	1.53	101,197	1.38	109,880	1.20	7,544	1.24	12,975
	Planning Year 2035	1.04	33.1	1.53	119,771	1.38	130,296	1.20	8,937	1.24	15,249
	Buildout Year 2060	1.04	36.3	1.53	131,350	1.38	142,893	1.20	9,801	1.24	16,723
CCWRF	Current	1.13	7.2	1.58	26,839	1.88	21,683	1.21	1,993	1.28	3,105
	Planning Year 2035	1.13	7.3	1.58	27,708	1.88	22,353	1.21	2,048	1.28	3,257
	Buildout Year 2060	1.13	7.9	1.58	29,985	1.88	24,190	1.21	2,217	1.28	3,524
RP-5	Current	1.27	10.0	1.79	27,771	2.47	23,181	1.35	3,005	1.60	4,602
	Planning Year 2035	1.27	20.2	1.79	54,112	2.47	44,972	1.35	5,953	1.60	8,823
	Buildout Year 2060	1.27	27.2	1.79	72,864	2.47	60,556	1.35	8,016	1.60	11,880

[a] Analysis based on average concentrations established from IEUA plant data between October 15, 2011, and October 15, 2013.
[b] Site planning considerations will be based on the projections established for the 2060 buildout year.

5.0 Summary of TM 5 RP-1 Future Plans

This TM evaluates alternatives for improving RP-1 flow equalization, identifies RP-1 plant expansion projects within the 20-year planning period, and provides preliminary capital cost estimates for the projects. The influent flow and loading projections and effluent requirements were used to evaluate the existing capacities of the RP-1 liquid treatment facilities. The estimated capacities were then compared to the projected flow and loads to determine facilities expansion needs by planning year 2035.

5.1 Discharge Requirements

IEUA operates under an umbrella permit and must meet water quality requirements for discharge and recycled water. The tertiary effluent from RP-1 is regulated by the Santa Ana Regional Water Quality Control Board (RWQCB) Order No. R8-2009-0021, which replaced Order No. 01-1 and Order No. 95-43, National Pollutant Discharge Elimination System (NPDES) No. CA 0105279. This permit is an umbrella permit governing all of IEUA’s wastewater treatment plants (RP-1, RP-4, RP-5, and CCWRF). Effluent quality standards require tertiary treatment with filters and disinfection equivalent to Title 22 requirements for recycled water, due to the use of the receiving water for recreation.

Effluent from RP-1 is used as recycled water for irrigation and groundwater recharge via spreading in seven Phase I recharge basin sites and six Phase II recharge basin sites. Specifically, recycled water from RP-1 is discharged to a use area overlying Chino North “Max Benefit” Groundwater Management Zone (DP 005). Recycled water quality requirements for groundwater recharge are governed under RWQCB Order No. R8-2007-0039. Recycled water quality for irrigation is regulated by Order No. R8-2009-0021 and must meet the discharge requirements described in Table 5.

TABLE 5
Summary of Effluent Quality Limits[a]

	Weekly Average	Monthly Average	Annual Average	Daily Maximum	Instantaneous Maximum
BOD	30 mg/L[b]	20 mg/L[b]	-	-	-
TSS	30 mg/L[b]	20 mg/L[b]	-	-	-
NH_4-N	-	4.5 mg/L	-	-	-
Chlorine Residual	-	-	-	-	0.1 mg/L[b]
TIN	-	-	8 mg/L	-	-
TDS[c]	-	-	550 mg/L	-	-
pH	-	-	-	6.5 to 8.5	-
Turbidity[d]	24-hr Average 2 NTU	-	-	24-hr 5% Maximum 5 NTU	10 NTU
Coliform	7-day Median 2.2 MPN	30-day Maximum 23 MPN	-	-	240 MPN

[a] RWQCB Order No. R8-2009-0021
[b] Without 20:1 dilution in the receiving water and for recycled water. BOD and TSS limits increased to 45 mg/L average weekly and 30 mg/L average monthly with 20:1 dilution. Chlorine residual limits increased to 2.1 mg/L instantaneous maximum with dilution.
[c] Shall not exceed 12-month running average TDS concentration in water supply by more than 250 mg/L.
[d] When treated through natural undisturbed soils or a bed of filter media.
TIN – total inorganic nitrogen
TDS – total dissolved solids
NTU – nephelometric turbidity unit(s)
MPN – most probable number

The effluent discharge concentration of TIN in the 12-month flow-weighted average of plant effluent shall not exceed 8 mg/L. This limitation may be met on an agency-wide basis using flow-weighted averages of discharges from RP-1, RP-4, RP-5, and CCWRF. In accordance with Water Recycling Order No. R8-2007-0039, TN concentration of the recycled water used for recharge must not exceed 5 mg/L. Samples for TN may be collected before or after surface application. The organic nitrogen content in plant effluent is typically in the range of 1.0 to 2.0 mg/L. Therefore, with a plant effluent TIN of 8 mg/L, the corresponding TN would be about 9.0 to 10 mg/L in the recycled water. Existing recharge basins provide approximately 50 percent nitrogen removal in the soil prior to reaching the groundwater table, and therefore the recycled water complies with the 5 mg/L TN requirement. IEUA has the flexibility to monitor TN in the recycled water either before or after surface application.

5.2 Existing Plant Capacity and Limitations

The capacity of the existing system was evaluated through process modeling using PRO2D. The model was constructed with the operations and performance criteria reflective of the evaluation period conditions, and then calibrated to reflect the actual performance, solids yields, and water quality data. Facility reliability and redundancy considerations were based on IEUA's overall wastewater treatment system, with RP-5 being the end-of-the-line facility receiving all flow diversions, if needed, from other RWRPs. Thus, the capacity evaluation for RP-1 was based on all units in service unless otherwise noted, with reliability and redundancy provided at RP-5. Additional reliability and redundancy considerations driven by the regulatory requirements, such as Title 22 requirements, were also taken into account.

The overall liquid treatment capacity was determined by its most limiting process capacity. For RP-1, the secondary treatment is limited to 32 mgd with all units in service, with primary flow equalization, for an effluent TIN of 8 mg/L, assuming that the mixed liquor return system is installed and dewatering recycles go to the NRW system or are treated separately. Therefore, the RP-1 liquid treatment capacity is 32 mgd. This is less than the rated capacity of 44 mgd, which was based on completion of Train D not yet constructed, as well as the wastewater strength and permit requirements at the time.

In evaluating the solids handling system capacity, operational considerations as well as Part 503 Rule requirements were taken into account when considering the average and maximum month loading. The results of the analysis indicate digestion is the limiting unit process of the solids handling system. The digestion capacity is evaluated based on a minimum SRT of 15 days with one large unit out of service in accordance with the Part 503 Rule Class B biosolids production requirements. It also considered maximum month design conditions and a 90 percent active digester volume including the digester cone volume. While the digestion capacity is limited to 38 mgd under these criteria, greater digestion capacity may be realized with improved digester feed thickening or if IEUA targets a different biosolids classification since IEUA biosolids are composted at IERCF. The results of the RP-1 capacity evaluation are presented in Table 6.

TABLE 6
RP-1 Existing Process Capacity Summary

	Process Capacity (mgd)[a,b,c]
Primary/Secondary Treatment	32
Filtration	43.8
Disinfection	49.8
Overall Liquid Treatment Capacity	**32**
PS Thickening	43.3
WAS Thickening	54
Digestion	38
Dewatering	54

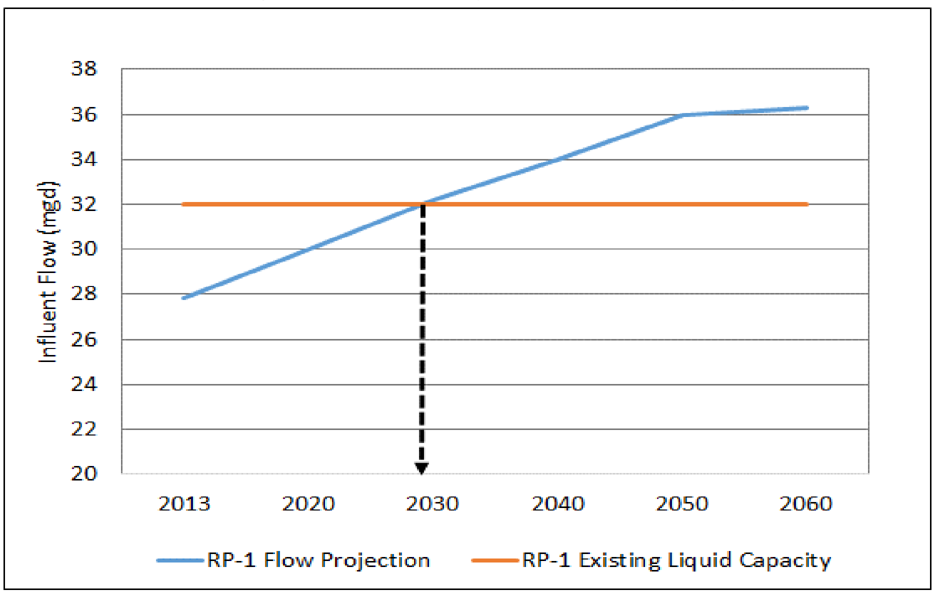
TABLE 6
RP-1 Existing Process Capacity Summary

	Process Capacity (mgd)[a,b,c]
Overall Solids Handling Capacity	**38**

[a] Secondary process capacity based on all units in service, with redundancy provided at RP-5. Plant effluent TIN ≤ 8 mg/L. Assumes internal mixed liquor return is in place and SVI is 150 milliliters per gram or better.
[b] Filtration capacity based on two filter cells out of service. Disinfection capacity based on all units in service.
[c] Solids handling capacities based on largest unit out of service. PS thickening is achieved using one gravity thickener, with redundancy provided by primary clarifiers. Values represent equivalent plant influent capacity and include RP-4 solids diverted to RP-1. Dewatering recycles were considered to be handled separately or treated onsite, not adding to the main plant nutrient loads.
PS – primary sludge

Based on the evaluated capacities presented in Table 6 and the projected influent wastewater flows presented in Table 4, influent flows are projected to exceed the RP-1 liquid treatment capacity by 2030. A graphical illustration of the RP-1 flow projection and when the new capacity needs to be online is presented in Figure 4. In addition, the current influent flows exceed the RP-1 digestion capacity. However, this limited digestion capacity is based on the criteria and assumptions discussed above and on producing Class B biosolids. Currently, biosolids from RP-1 are dewatered and sent to IERCF for composting. Additional digestion capacity will be needed in the future to produce Class B biosolids. The facilities that will be needed to expand the treatment capacity to accommodate future flows and achieve Class B biosolids production are discussed in Section 5.4.

FIGURE 4
RP-1 Influent Flows Projected to Exceed Liquid Treatment Capacity



5.3 Flow Equalization Alternatives Evaluation

As part of the capacity and site planning for RP-1, primary flow equalization was evaluated for the projected RP-1 influent flows. The facility currently has three flow management lagoons for flow management of primary and secondary effluent. While all three lagoons can receive primary effluent, Lagoon 3 primarily receives secondary effluent. Primary effluent is diverted to remaining lagoons as needed to manage peak flows. The following flow equalization alternatives were evaluated considering both non-monetary and monetary implications:

1. Keep the existing system, continuing the current operations as long as possible.

2. Replace with a modern covered tank system with the capability to mix, drain, and clean the contents of the equalization tanks, as well as provide continuous odor control for the tank headspace.
3. Eliminate primary effluent equalization by adding planned aeration basin improvements and secondary clarifiers, and converting the lagoons for other uses.

Non-monetary evaluation criteria included operational flexibility, operational risk and reliability, impacts on plant odors, footprint and space considerations. Alternative 1 proved to be unsustainable because this alternative does not eliminate the currently experienced odor problems or provide a resolution to the lagoon maintenance challenges (for example, the need to clean the open lagoons properly and promptly, etc.). Alternative 2 was not preferred due to its high cost and the operational complexity. Alternative 3 was determined to be the preferred alternative because it offers a sustainable and cost-effective approach that significantly eliminates plant odors from primary effluent storage and pumping, and frees up the existing lagoons for other flow management needs such as emergency primary effluent storage, secondary effluent equalization, or recycled water storage.

5.4 Plant Expansion Needs

In addition to the flow equalization improvements discussed above, additional liquid treatment facilities and solids handling facilities will be needed to accommodate projected influent flows and loads at RP-1. These include construction of Train D for secondary treatment, new secondary clarifiers, and new digesters.

For the 2035 capacity expansion requirements that constitute the basis of the CIP planning, facility sizing was determined using the whole plant PRO2D process model developed and calibrated for the current operation and wastewater quality, and for future average and maximum month flow and load conditions. The membrane bioreactor (MBR) technology was used as the basis for capacity expansion and establishing footprint requirements. The benefits of the MBR technology for long-term IEUA planning include small footprint requirements, elimination of secondary clarifiers and tertiary filters for recycled water production, and superior water quality. The modular design capability of MBR technology also allows stepwise expansion of the treatment facility to meet both load capacity and different effluent TIN requirements. Also, the superior quality effluent can be directly fed to a reverse osmosis (RO) system if IEUA needs to produce higher-quality effluent or reduce final effluent TDS. The expansion requirements are summarized in Table 7 and illustrated in Figure 5.

TABLE 7
RP-1 Facility Expansion Requirements for Planning Year 2035

Parameter	Size of New Units	Comments
Primary Clarifiers	-	No new units are needed.
Train D Secondary Treatment (MBR)	1 module (8 mg/L TIN)	Includes fine screening for the MBR system feed, MBR equipment includes permeate blowers and pumps.
Train D MBR Bioreactor	1 module	Two trains per module.
Train D Membrane Tank	1 module	Three trains per module.
Trains A, B, C New Secondary Clarifiers (PE EQ Elimination)	2 x 120-foot (Trains A and B) 1 x 130-foot (Train C)	Includes flow-splitting structure for each train and RAS/WAS piping and pumping equipment.
Anaerobic Digesters	2 digesters	New digesters with complete sludge transfer and recirculation, mixing and heating, and pumping equipment.
Flow Management Lagoons	-	Modifications to piping and pumping systems.

PE – primary effluent
EQ – equalization
RAS – return activated sludge
WAS – waste activated sludge

Aerial image © Google Earth, 2014. Annotation by CH2M HILL, 2014.

FIGURE 5

RP-1 Planning Year 2035 Facilities Site Plan

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The facility expansion configured in Table 7 was used as the basis of the capital and site planning under this master plan because it allows independent implementation of various facilities listed in the table. For example, elimination of primary effluent equalization impacts on secondary treatment needs to be balanced with the addition of secondary clarifiers. Because the clarifier addition and the MBR system addition are independent projects, they can be implemented separately.

Three plant expansion projects were identified for inclusion in the 20-year CIP: the RP-1 Primary Effluent Equalization Elimination Project, the RP-1 Liquid Treatment Expansion Project, and the RP-1 Solids Treatment Expansion Project. The RP-1 Primary Effluent Equalization Elimination Project and the RP-1 Liquid Treatment Expansion Project may also be combined, and warrants further evaluation during preliminary design. Combining the two projects would involve dedicating the existing six secondary clarifiers to Trains A and B, while converting Train C to MBR technology. Under this alternative, Trains A and B will have adequate capacity to handle diurnal peaks. After conversion to MBR through the addition of membrane tanks and bioreactors, as needed, Train C can provide additional capacity for treatment of RP-1 flows. Train D can be constructed in the future, if needed. This way, no new secondary clarifiers would be built, and more flows could be treated through MBR as compared to constructing Train D only. The constructability and sizing details for converting existing infrastructure would need to be further evaluated during preliminary design.

Planning-level capital costs for each facility identified were developed based on cost curves established from previous projects and known direct costs for similar-sized projects. The capital costs included in the 20-year CIP for these projects are summarized in Table 8.

TABLE 8
RP-1 Expansion Projects Capital Cost Estimate Summary

Component Description	RP-1 Primary Effluent Equalization Elimination Project	RP-1 Liquid Treatment Expansion Project	RP-1 Solids Treatment Expansion Project
Total Estimated Construction Cost[a,b]	$20,739,000	$48,450,000	$15,848,000
Total Estimated Project Cost[c]	$26,961,000	$62,985,000	$20,602,000

[a] *Engineering-News Record* Construction Cost Index (ENR CCI) for Los Angeles (August 2014 - 10,737).
[b] Cost does not include escalation to midpoint of construction.
[c] Total project costs include engineering, construction management, environmental, and legal costs (30 percent).

6.0 Summary of TM 6 RP-4 Future Plans

The flow and loading projections and effluent requirements were used to evaluate the existing capacities of the RP-4 liquid treatment facilities. The estimated capacities were then compared to the projected flow and loads to determine the RP-4 processes that require expansion by planning year 2035.

6.1 Discharge Requirements

Effluent from RP-4 is ultimately used as recycled water for irrigation and groundwater recharge via spreading in seven Phase I recharge basin sites and six Phase II recharge basin sites. Specifically, recycled water is ultimately discharged to a use area overlying Chino North “Max Benefit” Groundwater Management Zone (DP 005). Recycled water quality requirements for groundwater recharge are governed under RWQCB Order No. R8-2007-0039. Recycled water quality for irrigation is regulated by Order No. R8-2009-0021 and must meet the discharge requirements described previously in Table 5.

6.2 Existing Plant Capacity and Limitations

The capacity of the existing system was evaluated through process modeling using PRO2D. The model was constructed with the operations and performance criteria reflective of the evaluation period, and then calibrated to reflect the actual performance, solids yields, and water quality data. Facility reliability and redundancy considerations were based on IEUA’s overall wastewater treatment system, with RP-5 being the end-of-the-line facility receiving all flow diversions, if needed, from other RWRPs. Thus, the capacity evaluation for RP-4 was based on all units in service unless otherwise noted, with reliability and redundancy provided at RP-5. Additional reliability and redundancy considerations driven by the regulatory requirements, such as Title 22 requirements, were also taken into account. The overall plant capacity is determined by its most limiting process capacity. For RP-4, the tertiary processes are limited to approximately 14 mgd. Therefore, the RP-4 plant capacity is approximately 14 mgd under the assumptions presented in this section including the system reliability and redundancy being provided at RP-5. The results of the liquid treatment capacity evaluation are presented in Table 9.

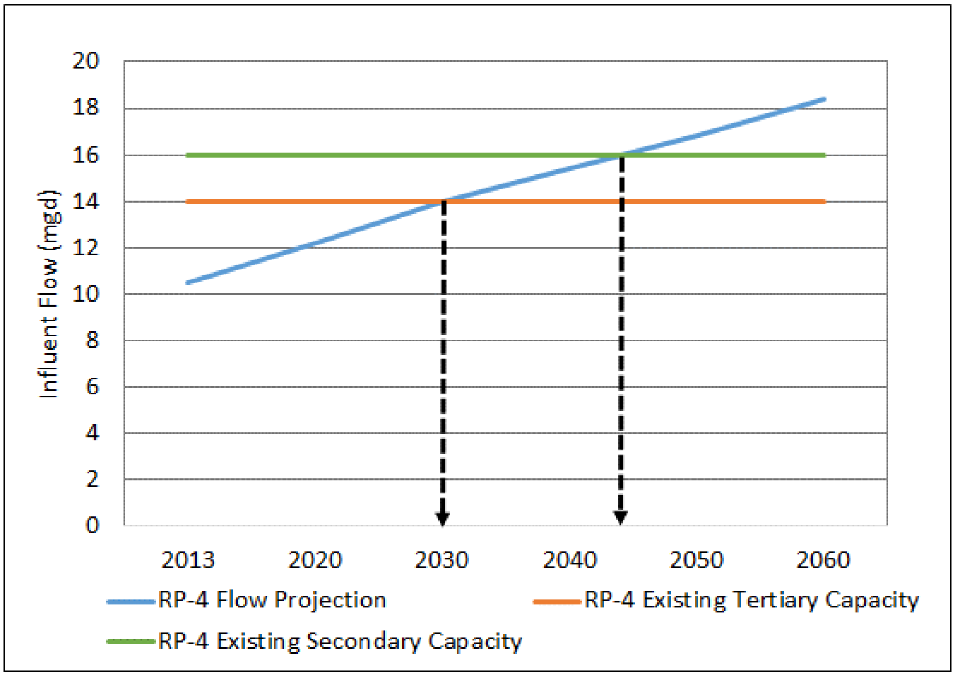
TABLE 9
RP-4 Existing Liquid Treatment Capacity

	Process Capacity (mgd)[a,b]
Primary/Secondary Treatment	16
Filtration	14.1
Disinfection	14.2
Overall Liquid Treatment Capacity	**14**

[a] Secondary process capacity based on all units in service, with redundancy provided at RP-5. Plant effluent TIN $\leq$ 8 mg/L.
[b] Filtration capacity based on one dual-media filter cell in backwash and one cloth filter out of service. Disinfection capacity based on all units in service.

Based on the evaluated capacities presented in Table 9 and the projected influent wastewater flows presented in Table 3, influent flows are projected to exceed the RP-4 tertiary treatment capacity and secondary treatment capacity by 2030 and 2044, respectively. A graphical illustration of this capacity exceedance projection is presented in Figure 6. The facilities that will be needed to expand the treatment capacity to accommodate future flows are discussed in the next section.

FIGURE 6
RP-4 Influent Flows Projected to Exceed Secondary and Tertiary Treatment Capacity



6.3 Plant Expansion Needs

For the 2035 capacity expansion requirements that will constitute the basis of the CIP planning, facility sizing was determined using the whole plant PRO2D process model developed and calibrated for the current operation and wastewater quality, and for future average and maximum month flow and load conditions. Due to the incorporation of septic flows into the IEUA sewer system, RP-4 plant influent flows and loads are projected to increase substantially by 2035. Although the existing primary and secondary treatment processes at RP-4 have sufficient capacity to treat projected flows and loads through planning year 2035, the tertiary processes will need to be expanded. Additional filtration and disinfection units will be needed by 2035 to handle the increased flows and loads. The expansion requirements are summarized in Table 10 and illustrated in Figure 7.

TABLE 10
RP-4 Facility Expansion Requirements for Planning Year 2035

Parameter	Size of New Units	Comments
Primary Clarifiers	-	No new units are needed.
Secondary Treatment	-	No new units are needed.
Tertiary Filters	1 Cloth Filter	Same size as existing cloth filters, with 12 discs per filter.
Disinfection	1 Train	Same size as existing Chlorine Contact Tank No. 2 train, with 3 passes or channels per train.

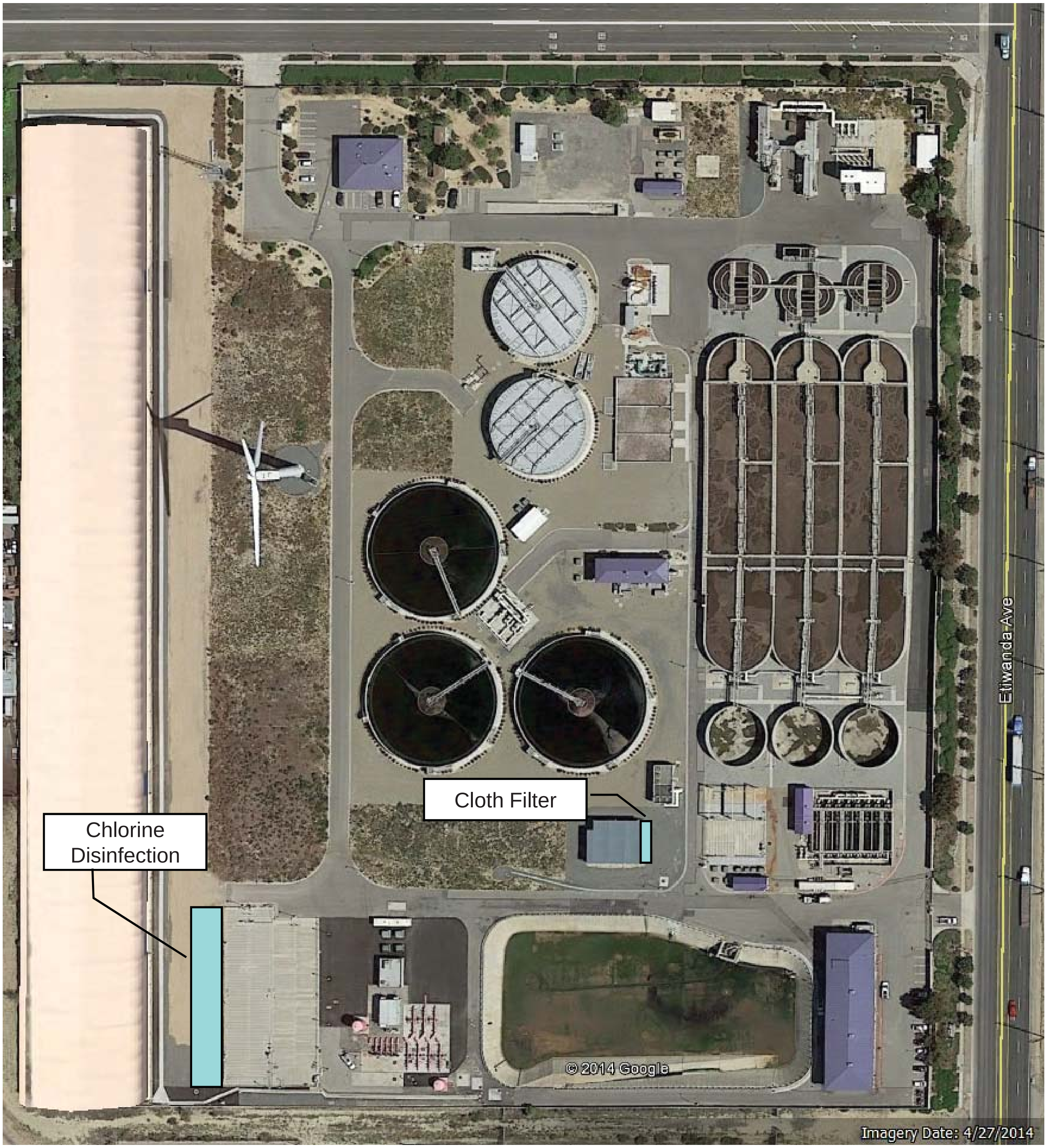


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FIGURE 7

RP-4 Planning Year 2035 Facilities Site Plan

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One plant expansion project was identified for inclusion in the 20-year CIP. The RP-4 Tertiary Expansion Project would expand the RP-4 tertiary treatment capacity beyond 14 mgd to match that of the primary and secondary treatment processes.

Planning-level capital costs for each facility identified were developed based on cost curves established from previous projects and known direct costs for similar-sized projects. The capital costs included in the 20-year CIP for this project are summarized in Table 11.

TABLE 11
RP-4 Expansion Projects Capital Cost Estimate Summary

Component Description	RP-4 Tertiary Expansion Project
Total Estimated Construction Cost[a,b]	$3,622,000
Total Estimated Project Cost[c]	$4,709,000

[a] ENR CCI for Los Angeles (August 2014 - 10,737).
[b] Cost does not include escalation to midpoint of construction.
[c] Total project costs include engineering, construction management, environmental, and legal costs (30 percent).

7.0 Summary of TM 7 RP-5 and RP-2 Complex Future Plans

This TM evaluates potential locations for the RP-2 solids facilities at RP-5, identifies RP-5 plant expansion projects within the 20-year planning period, and provides preliminary capital cost estimates for the projects. The influent flow and loading projections and effluent requirements were used to evaluate the existing capacities of the RP-5 liquid treatment facilities. The estimated capacities were then compared to the projected flow and loads to determine the RP-5 facilities that require expansion by planning year 2035.

7.1 Discharge Requirements

Effluent from RP-5 is used as recycled water for irrigation in the area overlying Chino North “Max Benefit” Groundwater Management Zone (DP 007). Recycled water quality for irrigation is regulated by Order No. R8-2009-0021 and must meet the discharge requirements described previously in Table 5.

7.2 Existing Plant Capacity and Limitations

The capacity of the existing system was evaluated through process modeling using PRO2D. The model was constructed with the operations and performance criteria reflective of the evaluation period, and then calibrated to reflect the actual performance, solids yields, and water quality data. Facility reliability and redundancy considerations were based on IEUA’s overall wastewater treatment system, with RP-5 being the end-of-the-line facility receiving all flow diversions, if needed, from other RWRPs. Thus, the RP-5 capacity evaluation was based on taking the largest unit out of service. Additional reliability and redundancy considerations driven by regulatory requirements, such as Title 22, were also taken into account.

The RP-5 primary, secondary, and tertiary process capacities are all equally limited to about 16.3 mgd. The primary/secondary treatment capacity is 15 mgd with one unit out of service plus 1.3 mgd of return flows from the RP-2 Lift Station. Therefore, the RP-5 plant capacity is approximately 15 mgd plus 1.3 mgd of return flows, which is consistent with the permitted capacity of 15 mgd previously established during design.

In evaluating the solids handling system capacity, operational considerations and Rule 503 requirements were taken into account considering the average and maximum month loading. The system capacity with one unit out of service was evaluated using the industry standard loading rates and operational criteria. The capacity values calculated are considered to represent equivalent plant influent flow values at the current wastewater characteristics. The results of the analysis indicate digestion is the limiting unit process of the solids handling system at 18 mgd under the same assumptions presented for RP-1. The results of the capacity evaluation are presented in Table 12.

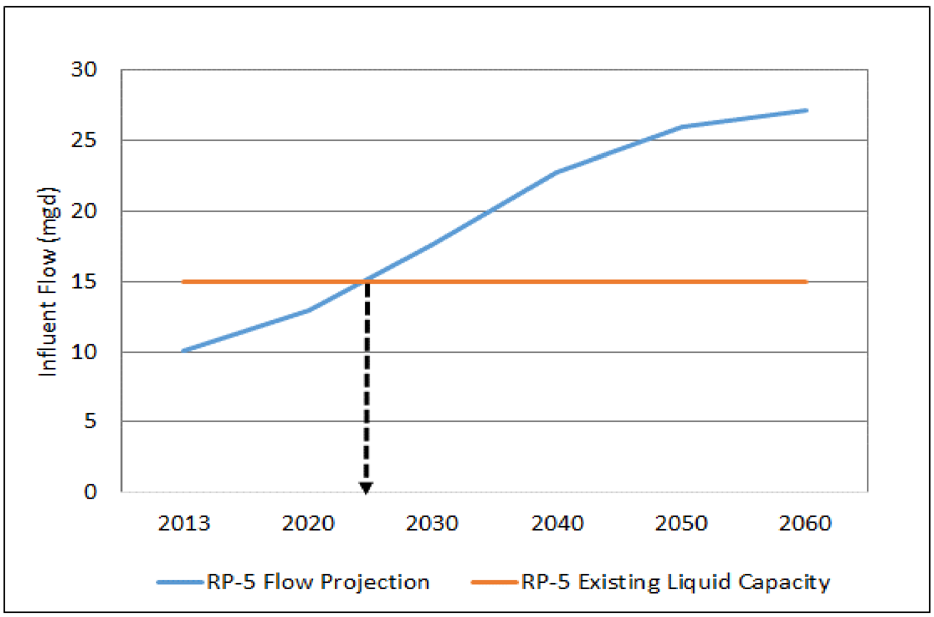
Based on the evaluated capacities presented in Table 12 and the projected influent wastewater flows presented in Table 3, influent flows are projected to exceed the RP-5 liquid treatment capacity by 2025. A graphical illustration of the RP-5 flow projection and when the new capacity needs to be online is presented in Figure 8. In addition, the current influent flows exceed the RP-5/RP-2 digestion capacity. However, this limited digestion capacity is based on the criteria and assumptions discussed above and on producing Class B biosolids. Currently, biosolids from RP-5/RP-2 are dewatered and sent to IERCF for composting. Additional digestion capacity will be needed in the future to produce Class B biosolids. The facilities that will be needed to expand the treatment capacity to accommodate future flows and achieve Class B biosolids production are discussed in Section 7.4.

TABLE 12
RP-5/RP-2 Existing Process Capacity Summary

	Process Capacity (mgd)[a,b,c]
Primary/Secondary Treatment	15 (+1.3 from RP-2 LS)
Filtration	16.5
Disinfection	16.3
Overall Liquid Treatment Capacity	**15 (+1.3 from RP-2 LS)**
PS Thickening	30.3
WAS Thickening	30.3
Digestion	18
Dewatering	34.8
Overall Solids Handling Capacity	**18**

[a] Secondary process capacity based on one secondary clarifier and one aeration basin out of service. Includes solids recycles.
[b] Filtration capacity based on one filter out of service. Disinfection capacity based on all units in service.
[c] Solids handling capacities based on largest unit out of service in each process.

FIGURE 8
RP-5 Influent Flows Projected to Exceed Liquid Treatment Capacity



7.3 RP-2 Solids Handling Facilities Relocation Alternatives Evaluation

Due to the USACE decision to raise the elevation of the Prado Dam, the RP-2 solids handling facilities need to be relocated to RP-5 during the 20-year planning period. Three relocation alternatives were considered:

1. Southwest corner of the RP-5 site
2. East side of the RP-5 site
3. Solids Handling Site at the corner of Flowers Street and Mountain Avenue

In addition to the RP-2 facilities that need to be relocated to RP-5, the existing facilities at RP-2 need to be demolished and removed from the site since RP-2 is on land that is leased from USACE. This demolition would be performed on the existing solids handling facilities, the RP-2 Lift Station, and the RP-2 liquid treatment facilities that were abandoned after RP-5 was placed into service.

The three alternatives were evaluated based on both economic and nonmonetary criteria. The economic difference between the three alternatives was assumed to be negligible. Each alternative requires the same facilities and equipment and the site work during construction would also be similar. Therefore, the difference between the alternatives is identified in the nonmonetary evaluation. Alternative 2 was selected as the proposed alternative for its proximity to the RP-5 liquid treatment facilities, distance from neighbors, and minimal impact on the existing solar facility at RP-5.

7.4 Plant Expansion Needs

In addition to the relocation and demolition of RP-2 facilities discussed above, additional liquid treatment facilities and solids handling facilities will be needed to accommodate projected influent flows and loads at RP-5. For the 2035 capacity expansion requirements that constitute the basis of the CIP planning, facility sizing was determined using the whole plant PRO2D process model developed and calibrated for the current operation and wastewater quality, and for future average and maximum month flow and load conditions. Similar to RP-1, the MBR technology was used as the basis for capacity expansion and establishing footprint requirements. As mentioned previously, the benefits of the MBR technology for long-term IEUA planning include small footprint requirements, elimination of secondary clarifiers and tertiary filters for recycled water production, and superior water quality.

The expansion requirements are summarized in Table 13 and illustrated in Figure 9. An alternative for adding a new MBR train at RP-5 would be to convert the existing secondary treatment facilities to MBR. Although not evaluated in this TM, this could be accomplished by converting the existing secondary treatment system to MBR. The details of this alternative can be evaluated further during preliminary design.

TABLE 13
RP-5 Facility Expansion Requirements for Planning Year 2035

Facility	Number of Units	Size of Unit
Liquid Treatment		
Primary Clarifier	2	100-foot diameter
Membrane Bioreactor	1[a]	7.5 mgd
Chlorine Contact Basin	1	0.8 MG
Solids Treatment		
Gravity Thickener	3	45-foot diameter
DAFT	3	40-foot diameter
Acid-Phase Anaerobic Digestion	6 Cells	20-ft^2 30-foot SWD per cell
Methane-Phase Anaerobic Digestion	4	90-foot diameter 35-foot SWD
Sludge Holding Tank	1	90-foot diameter 35-foot SWD
High-Pressure Gas Storage	1	35-foot diameter w/ 30- ft^2 equipment pad
Dewatering Building	1	100-foot x 150-foot Building
Biofilter	3 Cells	60-foot x 80-foot per cell
RP-2 Lift Station	1	10 mgd

[a] Includes fine screens, bioreactor, blowers, membrane tanks, RAS/WAS pump station, and associated equipment.
MG – million gallons
ft^2 – square feet
SWD – sidewater depth

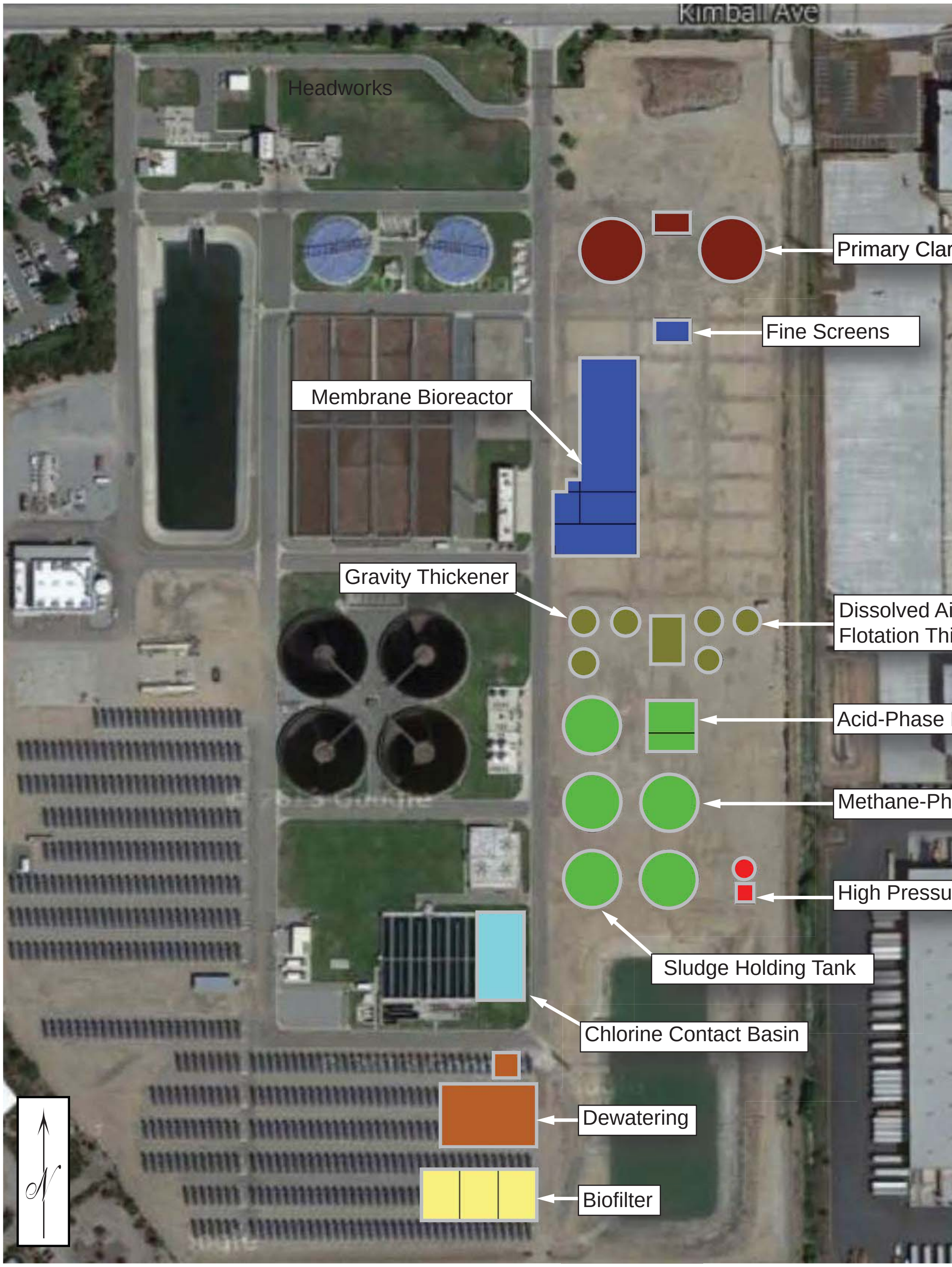


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FIGURE 9

RP-5 Planning Year 2035 Facilities Site Plan

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Two plant expansion projects were identified for the 20-year CIP: the RP-5 Solids Handling Facilities Project and the RP-5 Expansion Project. The RP-5 Solids Handling Facilities Project would relocate solids handling facilities from RP-2 to RP-5, demolish RP-2 facilities, and relocate the RP-2 Lift Station to a location above the flood plain. This project would include the construction of thickening, digestion, dewatering, and ancillary facilities at RP-5. The RP-5 Expansion Project would expand the RP-5 liquid treatment capacity from 15 mgd to 22.5 mgd, and would include the construction of primary treatment, MBR, disinfection, and ancillary facilities.

Planning-level capital costs for each facility identified were developed based on cost curves established from previous projects and known direct costs for similar-sized projects. The capital costs included in the 20-year CIP for these projects are summarized in Table 14.

TABLE 14
RP-5 Expansion Projects Capital Cost Estimate Summary

Component Description	RP-5 Solids Handling Facilities Project[a]	RP-5 Expansion Project
Total Estimated Construction Cost[b,c]	$99,958,000	$79,791,000
Total Estimated Project Cost[d]	$129,945,000	$103,728,000

[a] Costs include the demolition of the RP-2 facility, which are estimated to range between $7 million and $10 million assuming removal of all assets (above and below ground) and grading to match surrounding contours.
[b] ENR CCI for Los Angeles (August 2014 - 10,737).
[c] Cost does not include escalation to midpoint of construction.
[d] Total project costs include engineering, construction management, environmental, and legal costs (30 percent).

8.0 Summary of TM 8 Carbon Canyon WRF Future Plans

The flow and loading projections and effluent requirements were used to evaluate the existing capacities of the CCWRF liquid treatment facilities. The estimated capacities were then compared to the projected flow and loads to determine the CCWRF processes that require expansion by planning year 2035.

8.1 Discharge Requirements

Effluent from CCWRF is used for irrigation in the area overlying Chino North "Max Benefit" Groundwater Management Zone (DP 008). Recycled water quality for irrigation is regulated by Order No. R8-2009-0021 and must meet the discharge requirements described previously in Table 5.

8.2 Existing Plant Capacity and Limitations

The capacity of the existing system was evaluated through process modeling using PRO2D. The model was constructed with the operations and performance criteria reflective of the evaluation period, and then calibrated to reflect the actual performance, solids yields, and water quality data. Facility reliability and redundancy considerations were based on IEUA's overall wastewater treatment system, with RP-5 being the end-of-the-line facility receiving all flow diversions, if needed, from other RWRPs. Thus, the capacity evaluation for CCWRF was based on all units in service unless otherwise noted, with reliability and redundancy provided at RP-5. Additional reliability and redundancy considerations driven by the regulatory requirements, such as Title 22 requirements, were also taken into account.

The overall plant capacity is determined by its most limiting process capacity. The limiting treatment process is the secondary treatment system. Therefore, the average CCWRF plant capacity is 14 mgd under the current wastewater flow and loads, as well as the reliability and redundancy considerations at RP-5. The results of the liquid treatment capacity evaluation are presented in Table 15.

TABLE 15
CCWRF Existing Liquid Treatment Capacity

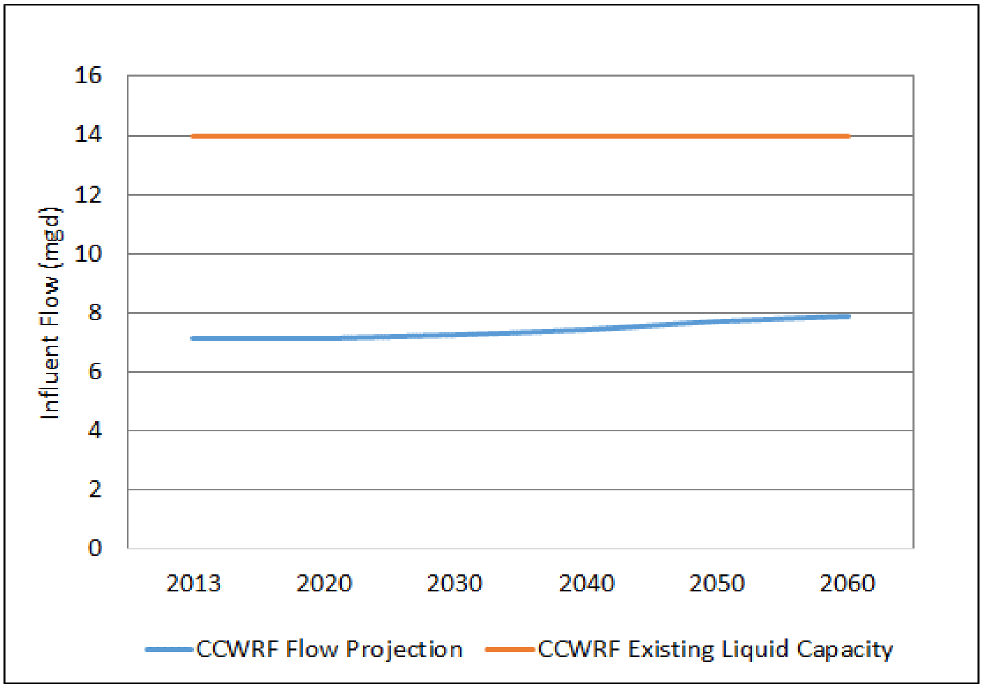
	Process Capacity (mgd)[a,b]
Primary/Secondary Treatment	14
Filtration	18.4
Disinfection	15.4
Overall Liquid Treatment Capacity	**14**

[a] Secondary process capacity based on all units in service, with redundancy provided at RP-5. Plant effluent TIN $\leq$ 8 mg/L.
[b] Filtration capacity based on one filter out of service. Disinfection capacity based on all units in service. Per Title 22 Engineering Report, the reliable annual average capacity is equal to peak capacity due to the ability to discharge to RP-5, availability of short-term onsite storage, standby equipment, and use of automatic flow controls to provide reliability and redundancy.

Based on the evaluated capacity presented in Table 15 and the projected influent wastewater flows presented in Table 3, influent flows are not projected to exceed the CCWRF liquid treatment capacity. As illustrated in Figure 10, CCWRF will have excess capacity through buildout. Since some of the CCWRF service area is also tributary to the RP-5 service area, it may be possible to use some of the CCWRF excess capacity by diverting flow that is tributary to both CCWRF and RP-5 to CCWRF. The analysis presented in *TM 7 RP-5 and RP-2 Complex Future Plans* shows that RP-5 will require a capacity expansion during the planning period. Based on a collection system model run with the flows tributary to both RP-5 and CCWRF, approximately

1 mgd of the RP-5 average daily flow can be diverted to CCWRF by gravity. This diversion can delay the RP-5 expansion by about 2 years beyond that projected in the current CIP.

FIGURE 10
CCWRF Influent Flows Not Projected to Exceed Treatment Capacity



8.3 Plant Expansion Needs

CCWRF has sufficient capacity to treat projected flows and loads. There are no expansion projects planned for CCWRF for the 20-year CIP. As there are no projects planned for the expansion of CCWRF, the plant will remain as currently operated. Figure 11 presents the current site layout, which is estimated to be the facilities site plan through buildout.

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WT0122151041SCO 480772.03.31.60.03 inland_empire_fig11_rev1.ai 3/15

FIGURE 11

CCWRF Planning Year 2035 Facilities Site Plan

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9.0 Summary of TM 9 Organics Management Plan

The purpose of the IEUA Organics Management Plan is to assess the existing solids handling and composting capacities within the northern and southern service areas and determine the facilities expansion needs through the ultimate buildout year 2060 based on the projected plant influent flows and loads, and the corresponding projected biosolids quantities. The expected solids generation in wet and dry tons per day from now until ultimate buildout was calculated based on the current wastewater characteristics and projected influent wastewater flows to each of the four RWRPs established in *TM 4 Wastewater Flow and Loading Forecast*. Projected biosolids quantities were then compared to the existing capacity of the solids handling and composting facilities to assess the biosolids handling capacity requirements for the biosolids generated, and determine what options are available for expansion, if expansion is deemed necessary.

9.1 RWRPs Solids Handling Expansion Considerations

Based on the influent flow and load projections presented in *TM 4 Wastewater Flow and Loading Forecast*, the solids handling facilities at RP-1 and RP-5/RP-2 will need to be expanded beyond their existing solids handling capacities of 38 mgd and 18 mgd, respectively, to meet future demands in the northern and southern service areas, respectively. RP-1 solids handling will require the addition of anaerobic digesters, while RP-5/RP-2 solids handling facilities need to be relocated to RP-5. The RP-2 solids handling facilities will need to be decommissioned and relocated to the RP-5 site by 2023 in anticipation of USACE raising the Prado Spillway. In addition, the RP-2 Lift Station will also need to be relocated to a location above the flood plain. New RP-5 solids handling facilities to be completed by 2035 include thickening, anaerobic digestion, dewatering, digester gas storage and utilization, and odor control. Additional thickening and digestion capacity would be needed at RP-5 by 2060 to meet the projected demands in the southern service area.

9.2 Projections of Biosolids Quantities

With influent wastewater flows projected to increase through the ultimate buildout year 2060 as a result of increased population growth and incorporation of septic flows into the IEUA system, biosolids production is similarly expected to increase. The projected average biosolids quantities for the northern and southern service areas for planning year 2035 and buildout year 2060 are presented in Table 16. Overall, the total biosolids production is projected to increase by 37 percent from 145 to 198 wet tons per day by 2035, and up to 241 wet tons per day by 2060 using current dewatering technologies.

TABLE 16
Estimated Current and Projected Average Biosolids Quantities

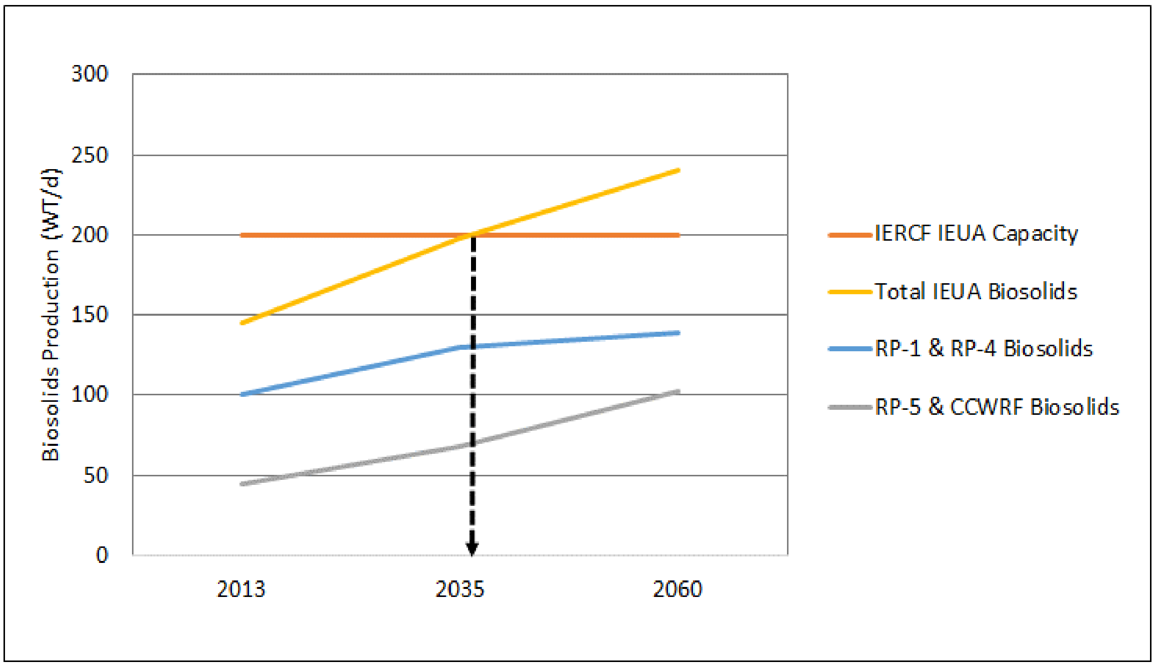
	Current			Planning Year 2035[a]			Buildout Year 2060[a,b]		
	Influent Flow (mgd)	Biosolids (WT/d)	Biosolids (DT/d)	Influent Flow (mgd)	Biosolids (WT/d)	Biosolids (DT/d)	Influent Flow (mgd)	Biosolids (WT/d)	Biosolids (DT/d)
RP-1 / RP-4	38.5	100	24	47.8	130	31	54.7	139	33
RP-5 / CCWRF	17.2	45	11	25.7	68	16	33.2	102	25
Total	55.7	145	35	73.5	198	47	87.9	241	58

[a] Reflects projected flows for IEUA preferred Flow Diversion Alternative 2, with Whispering Lakes and Haven Pump Stations online, and a biosolids cake solids content of 24 percent.
[b] Site planning considerations are based on the projections established for the 2060 buildout year.
WT/d = wet tons per day
DT/d = dry tons per day

9.3 IERCF Biosolids Management Considerations

Based on recent discussions with the IERCF Manager of Operations and Organics, the facility currently has a throughput capacity of 209,625 annual wet tons of biosolids and amendment permitted by the South Coast Air Quality Management District (SCAQMD). Based on the joint powers agreement, IEUA may contribute up to half of this amount, which equates to 200 wet tons of biosolids per day. Thus, IERCF has adequate capacity to receive and process IEUA biosolids over the next 20 years. However, the projected ultimate biosolids are expected to surpass the current permitted capacity of IERCF beyond 2035, at which time IEUA needs to explore additional biosolids management options. Options may include implementing technologies such as heat drying, improved dewatering technologies to reduce the amount of wet tons produced, or diversifying biosolids management by contracting with private companies for land application, composting, energy production, and other biosolids product markets. An illustration of the IERCF capacity relative to projected biosolids quantities from IEUA RWRFs is presented in Figure 12.

FIGURE 12
RWRF Biosolids Production Projected to Exceed IERCF Capacity Beyond 2035



10.0 Summary of TM 10 Asset Management Program

IEUA developed a 10-year Asset Management Plan as a means of providing an overview of their function, incorporating their business goals into their future planning, and evaluating their current assets. As part of the development of the Asset Management Plan, several existing and potential projects were identified to address rehabilitation, replacement, and upgrades to each asset to provide key information for budgeting and project planning over the next 10 years. All projects that are expected to exceed $2 million are included in this TM to highlight initial projects for inclusion in the CIP. The 10-year total project cost for each asset system is summarized in Table 17.

TABLE 17
Total Budget of All Asset Management Projects Greater than $2 Million

IEUA System	10-Year Total Budget ($)
Agency-Wide	38,504,000
Regional Water Recycling Plant No. 1 (RP-1)	24,606,000
Regional Water Recycling Plant No. 2 (RP-2)	-
Carbon Canyon Water Recycling Facility (CCWRF)	2,880,000
Regional Water Recycling Plant No. 4 (RP-4)	-
Regional Water Recycling Plant No. 5 (RP-5)	100,250,000
Recycled Water Distribution and Groundwater Recharge (GWR) Systems	72,910,000
Inland Empire Regional Composting Facility (IERCF)	5,000,000
Agency Lift Stations (LS)	8,915,000
Regional Conveyance System (RC)	2,500,000
Agency Laboratory (AL)	17,100,000
Agency Headquarters (HQ)	-
Business (BIZ) and Process Automation Control (PAC) Networks	14,625,000

Summaries of all Asset Management Plan projects greater than $2 million are listed for each IEUA system in TM 10. These projects initially will be included in the 20-year CIP.

11.0 IEUA Integrated Resources Plan and Recycled Water Program Strategy

In addition to the WFMP planning efforts described herein, IEUA is also conducting the Recycled Water Program Strategy (RWPS) and the IRP. All three planning efforts are being conducted in parallel, requiring careful collaboration and coordination throughout. A brief summary of the RWPS and IRP is presented below. Details of these planning efforts will be available upon completion of the reports by IEUA.

The purpose of the RWPS is to update the 2005 IEUA Recycled Water Implementation Plan. The primary objective of the RWPS is to update supply and demand forecasts and to help map changes for the Recycled Water Program to maximize the beneficial use of recycled water throughout the year.

The IRP is intended to develop an overall strategy for meeting projected water resource demands within the IEUA service area in a cost-effective manner. The goal of the IRP process is to integrate historical activity and new planning efforts into a focused, holistic approach and develop an implementation strategy to achieve improved near and long-term water resources management for IEUA and its member agencies. The IRP will integrate findings from the RWPS, this WFMP Update Report, the Recharge Master Plan Update Report, and the Water Use Efficiency Business Plan to create an overall cost-effective and consistent regional water resource management strategy.

12.0 Major Capital Projects Needed to Meet Projected Capacity for the Next 20 Years

A summary of the major capital projects (liquid treatment and solids handling) needed to accommodate projected influent wastewater flows for the next 20 years is presented in this section.

The major capital projects to be included in the IEUA CIP for the next 20 years are as follows:

- Montclair Pipeline Upgrades Project
- Whispering Lakes Pump Station Expansion Project
- RP-1 Solids Treatment Expansion Project
- RP-1 Liquid Treatment Expansion and Primary Effluent Equalization Elimination Project
- RP-4 Liquid Treatment Expansion Project
- RP-5 Solids Handling Facilities (RP-2 Relocation) Project
- RP-5 Liquid Treatment Expansion Project

Implementation of each of these projects over the next 20 years will depend on actual timing of influent wastewater flows that are projected to exceed treatment or conveyance capacities. As demonstrated previously, the solids expansion projects at RP-1 and RP-5/RP-2 are most imminent, followed by the liquid treatment expansion projects at RP-5, RP-1, and RP-4. A preliminary implementation schedule for each project is presented in Figure 13, including the future expansions beyond 2035 through buildout for long-term planning purposes. The schedule for conveyance projects considers 2 years for preliminary and final design, permitting, environmental compliance, and bidding, followed by 2 years of construction, for a total of 4 years. The schedule for treatment projects considers 4.5 years for preliminary and final design, permitting, environmental compliance, and bidding, followed by 3.5 or 4.5 years of construction depending on project scope and complexity, for a total of 8 or 9 years total.

Preliminary capital cost estimates for design and construction, as presented in TMs 5 through 10, were escalated to mid-point of construction and are presented in Table 18 for each of the major capital projects identified herein. The projects beyond 2035 through buildout year 2060 are also shown.

FIGURE 13

Implementation Schedule for Major Capital Projects through Buildout

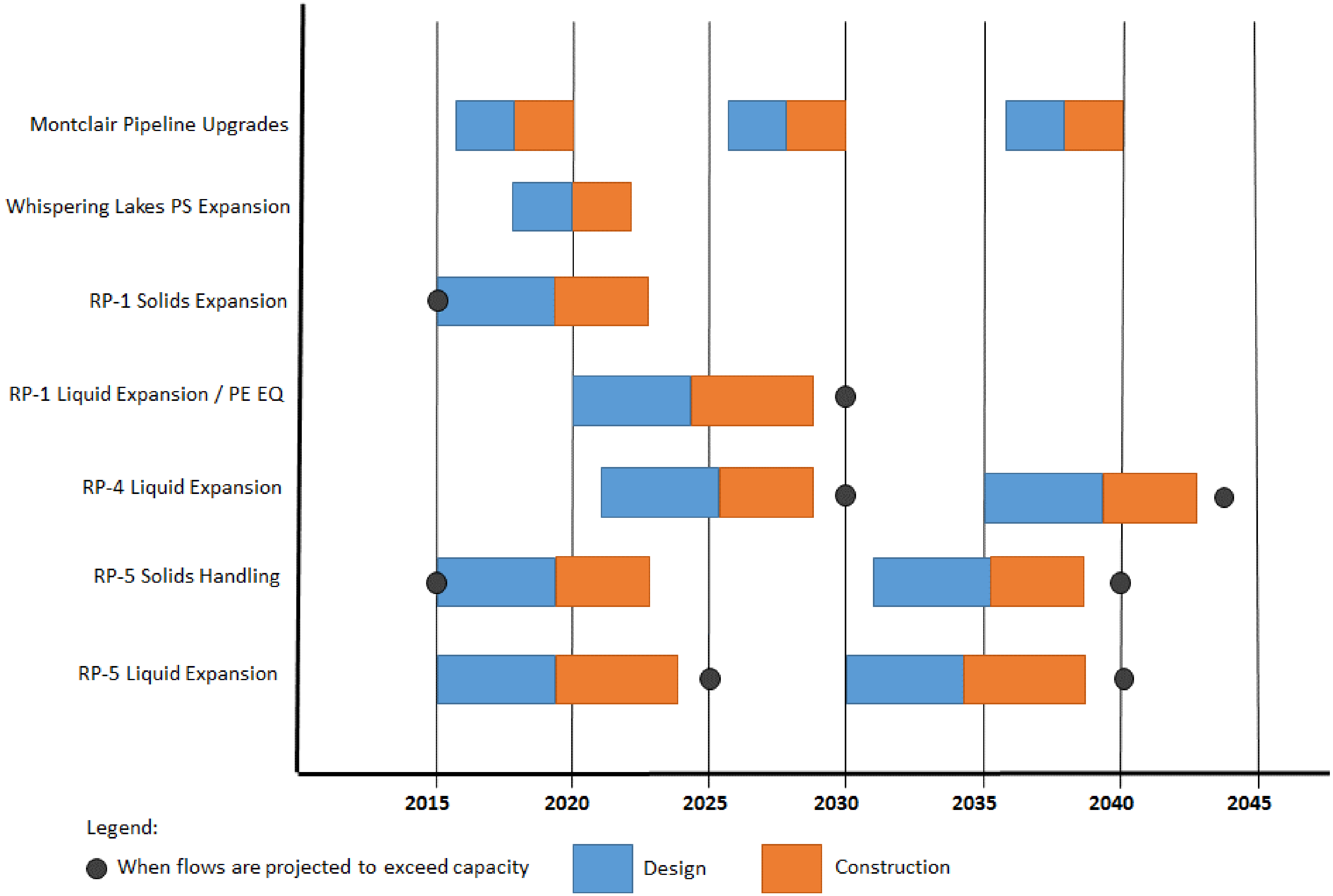


TABLE 18
Major Capital Projects Needed to Meet Projected Capacity for the Next 20 Years and through Buildout

Major Capital Project	Purpose	Planning Year 2035			Buildout Year 2060		
		Project Elements	Escalated Cost[a] ($Million)	Project Needs to be Online by	Project Elements	Escalated Cost[a] ($Million)	Project Needs to be Online by
Montclair Pipeline Upgrades Project	Upsize four pipeline segments from 21-inch and 30-inch diameter to 36-inch diameter to mitigate deficiencies in conveyance system, reliably accommodate future growth, and convey peak buildout flows	Four Reaches of Montclair Pipeline	$25.4	2020 2030	-	$1.8	2040
Whispering Lakes Pump Station Expansion Project	Increased pumping capacity to meet projected future flows; Ability to send more flows to RP-1 for treatment	Whispering Lakes Pump Station	$6.1	2030	-	-	-
RP-1 Solids Treatment Expansion Project	Increased solids treatment capacity to meet existing and projected future flows	Anaerobic Digesters	$24.9	2013	-	-	-
RP-1 Liquid Treatment Expansion and Primary Effluent Equalization Elimination Project	Increased liquid treatment capacity to meet projected future flows; Eliminating primary flow equalization and converting ponds for other uses	MBR (Train D = 5 mgd) Secondary Clarifiers Equalization pond piping modifications	$122.4	2030	-	-	-
RP-4 Liquid Treatment Expansion Project	Increased liquid treatment capacity to meet projected future flows	Tertiary Filter Chlorine Contact Tank	$6.6	2030	MBR (4.5 mgd)	$112.3	2044
RP-5 Solids Handling Facilities Project (RP-2 Relocation)	Relocation of RP-2 solids handling operations to RP-5; Increased solids treatment capacity to meet existing and projected future flows; Relocation of RP-2 Lift Station to above the flood elevation; Demolition of RP-2 facilities	Thickening Anaerobic Digesters High Pressure Gas Storage Dewatering Building Odor Control RP-2 Lift Station	$157.3	2015	Thickening Anaerobic Digesters	$50.9	2040
RP-5 Liquid Treatment Expansion Project	Increased liquid treatment capacity to meet projected future flows	Primary Clarifiers MBR (7.5 mgd) Chlorine Contact Basin	$125.5	2025	MBR (7.5 mgd) Chlorine Contact Basin	$193.8	2040

[a] Cost estimates based on 3 percent annual escalation of total project costs to midpoint of construction.

13.0 Regulatory Considerations

A summary of regulatory considerations is presented below for applicable federal and state requirements for water reuse, air quality, biosolids management, and environmental impacts.

13.1 Water Reuse

The requirements of Title 22 regulate production and use of recycled water in California. Criteria for reuse of secondary and tertiary effluent in various reuse applications include limits on the maximum numbers of total coliform bacteria present within the water. In addition to defining permitted uses of recycled water and treatment requirements, Title 22 defines requirements for sampling and analysis of effluent at treatment plants, requires preparation of an engineering report prior to production or use of recycled water, specifies general design criteria for treatment facilities, establishes reliability requirements, and addresses alternative methods of treatment.

Groundwater recharge using recycled water is governed primarily by state and local agencies. The primary agencies that are involved are the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW), the local RWQCB, and the California Department of Water Resources. The federal government does not have direct jurisdiction over groundwater. However, to the extent groundwater may affect surface water quality, and because the United States Environmental Protection Agency (USEPA) has a role in setting wastewater treatment requirements and standards for surface water discharges, some federal regulations may be indirectly applied to groundwater recharge projects.

Groundwater Replenishment Reuse Draft Regulations from DDW were revised in June 2014. Requirements for Groundwater Replenishment Reuse Projects were outlined for surface and subsurface applications, of which surface application would be most applicable for IEUA projects. The 2014 draft regulations for surface application include general requirements, pathogenic microorganism control, nitrogen compound control, recycled water contribution (RWC), diluent water requirements, TOC requirements, soil aquifer treatment process requirements, additional chemical and contaminant monitoring, response retention time, monitoring well requirements, and reporting.

Table 19 presents a summary of the regulations and key information applicable to groundwater recharge using recycled water.

TABLE 19
Summary of Existing and Proposed Regulations

Agency	Regulation	Key Information
USEPA/ Cal-EPA	California Toxics Rule (CTR) (40 *Code of Federal Regulations* [CFR] 131.37)	Contains numeric values for aquatic life criteria and human health criteria for discharge to surface waters. Application of the CTR criteria could result in stringent end-of-the-pipe permit limits for recycled water released to surface waters, which would impact the treatment requirements and subsequent costs associated with the treatment.
	Criteria for Nutrients	Increases efforts to control the discharges of nutrients to waters of the U.S. May require dischargers to install enhanced treatment removal technology, which would impact the treatment alternative and subsequent costs associated with the treatment.
	Criteria for Endocrine Disruptors	Requests that the USEPA develop water quality criteria for the regulation of endocrine disruptors. Ultimately, may require dischargers to install a treatment alternative capable of addressing the endocrine disruptor requirements and may impact subsequent costs associated with the treatment. Current efforts are focused on monitoring and data gathering.

TABLE 19
Summary of Existing and Proposed Regulations

Agency	Regulation	Key Information
SWRCB	Resolution 68-16 Antidegradation Policy	Specifies that no discharge may reduce water quality below the baseline unless the change is consistent with the maximum benefit to the people of the state. Governed by the SWRCB Recycled Water Policy for groundwater recharge projects that use recycled water.
	Recycled Water Policy	Contains four key provisions for groundwater recharge projects: • Development of a basin-wide salt/nutrient management plan • Specific requirements for project approval, permit limits, and permit stream lining • Antidegradation analysis • Monitoring for constituents of emerging concern Key issues that may impact the use of recycled water for groundwater recharge: • Application of permit limits set by the RWQCB may be more stringent than those set by DDW; this is determined on a case-by-case basis • Antidegradation analysis and the type of treatment or amount of dilution required to maintain water quality • Time to implement a project will vary on a case-by-case basis
	Groundwater Replenishment using Recycled Water	Groundwater replenishment via surface spreading has been practiced by IEUA for years and key requirements are stated in this table. Currently, groundwater replenishment via subsurface injection requires full advanced treatment using microfiltration, RO, and ultraviolet advanced oxidation.
	SWRCB Nutrient Objective	The SWRCB is developing a statewide nutrient control program. This proposed program will be developed to protect beneficial uses from the effects of nutrient pollution and eutrophication in California water bodies. The program would be adopted as an amendment to the inland surface water and enclosed bays and estuaries plan. Creating nutrient objectives for the State will assist in supporting SWRCB's mission to "preserve, enhance, and restore the quality of California's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations."
	California Water Code 1211 Petition for Change	Any change in the point of discharge including a reduction in discharge requires a petition of change. This petition must include: • An environmental analysis of the proposed change • Description of impact on the surrounding area • Demonstration that any legal user of the water will not be injured Key issues that may impact the use of recycled water for groundwater recharge: • The time required to prepare the reports • The size of a project and its associated costs
	Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays and Estuaries of California	Establishes the procedure for establishing limits on priority pollutants, compliance determinations, objectives and provisions for chronic toxicity control, CTR criteria, and exceptions to State Implementation Plan (SIP) on a case-by-case basis for discharges to surface waters. May impact the treatment alternative and subsequent costs associated with the treatment.
	Methylmercury Objectives	The State of California is developing a methylmercury objective based on fish tissue criterion. May impact the treatment alternative and subsequent costs associated with the treatment.

TABLE 19
Summary of Existing and Proposed Regulations

Agency	Regulation	Key Information
DDW	Groundwater Replenishment Reuse Draft Regulations	DDW released an updated version of the draft groundwater recharge regulations in 2014. Listed below are some of the key requirements: • Projects shall be designed and operated to achieve a 12-log enteric virus reduction, 10-log Giardia reduction, and a 10-log Cryptosporidium reduction. • 1-log virus reduction will be credited for each month underground, up to 6 months. • If held for 6 months underground and treated to disinfected tertiary treatment or advanced treatment levels, 10-log Giardia reduction and 10-log Cryptosporidium reduction will be credited. • Retention time determination will require a tracer study. • The current draft allows compliance through one method and requires total nitrogen in the recycled water to meet a limit of 10 mg/L in any two consecutive samples. Reduced monitoring for nitrogen is possible following RWQCB approval. • Diluent water quality must meet the primary MCLs, secondary MCLs, or notification levels (NLs). An approved water quality monitoring plan for specified contaminants must be implemented to demonstrate compliance with the primary MCLs, secondary MCLs, and NLs. • The initial maximum RWC shall not exceed 0.20 unless otherwise approved by DDW. An alternative initial RWC of up to 1.0 may be approved by DDW. • TOC shall not exceed 0.5 mg/L divided by the running monthly average RWC based on: (1) the 20-week running average of all TOC results; and (2) the average of the last four TOC results. • Minimum response retention time should be 2 months.
	New Drinking Water Maximum Contaminant Levels (MCLs)	A number of compounds found in drinking water have an MCL and/or public health goal (PHG) identified in 2014. These compounds are chromium hexavalent (6), monochlorobenzene, trichlorofluoromethane (Freon 11), endothal, hexachlorocyclopentadiene, and 2,4,5-TP (Silvex). The MCL and PHG values for these compounds can be obtained from the SWRCB. In addition, there are PHGs for NDMA and 1,2,3-trichloropropane (which are not yet regulated). An MCL (6 parts per billion [ppb]) and PHG (1 ppb) for perchlorate was established in 2015 by the DDW.

13.2 Air Quality

Federal Regulations

The Clean Air Act (CAA) requires each state to prepare a SIP that details how the federally designated nonattainment areas will achieve the National Ambient Air Quality Standards (NAAQS). In California, each air district prepares an air quality management plan (AQMP) to incorporate into the state’s SIP. In the South Coast Air Basin (SCAB), the local regulatory air agency is the SCAQMD. Through the attainment planning process, SCAQMD has developed and adopted rules and regulations to address stationary sources of air pollution in the SCAB. The AQMP addresses several federal planning requirements and incorporates updated emissions inventories, updated ambient measurements, new meteorological episodes, and new air quality modeling tools. The AQMP highlights the necessary reductions and the need to identify additional strategies, especially in the area of mobile sources, to meet federal criteria pollutant standards within the timeframes allowed under the federal CAA.

State Regulations

The California Clean Air Act of 1988, as amended in 1992, outlines a program to attain the California Ambient Air Quality Standards (CAAQS) by the earliest practical date. Because the CAAQS are more stringent than the NAAQS, attainment of the CAAQS will require more emissions reductions than what would be required to show attainment of the NAAQS. Consequently, the main focus of attainment planning in California has shifted from the federal to state requirements. Similar to the federal system, the state requirements and compliance dates are based on the severity of the ambient air quality standard violation within a region.

SCAQMD 1110.2 Rule for Cogen Engines

The purpose of Rule 1110.2 is to reduce nitrogen oxides (NOx), volatile organic compounds (VOCs), and carbon monoxide (CO) from landfill and biogas fired engines. SCAQMD Rule 1110 was first approved in 1990. Numerous revisions have occurred in the intervening years with the latest amendment being approved in July 2010. The February 2008 modification significantly lowered the required limits for the internal combustion gas engines, and placed a timeline on implementation of compliance with these limits. Contingent on results of a technology evaluation, digester gas engines were to be shut down or modified to meet the new limits by July 1, 2012. On the basis of time needed to transition into compliance following the completion of a limited number of technology-based assessments, the amended Rule dated September 7, 2012, extended the compliance deadline. Accordingly, the stationary engines need to comply with NOx and CO limits of 11 and 250 ppmv (parts per million volume, corrected to 15 percent oxygen on a dry basis and averaged over 15 minutes) and with VOC limit of 30 ppmv (parts per million volume, measured as carbon, corrected to 15 percent oxygen on a dry basis and averaged over the sampling time) by January 1, 2016.

AB-32 and Cap and Trade Rule

Cap and trade (C&T) is a market-based regulatory framework in which regulated entities are given “allowances” for their carbon dioxide (CO_2) emissions. To meet compliance obligations, regulated parties can reduce their own emissions or purchase either allowances from other entities within the cap, known as “offsets” or emission reductions made by entities outside the cap. Though federal legislation to institute a national C&T program is not currently in the works, California has recently finalized the long anticipated state C&T program that may link to similar programs in other states and regions. The California Air Resources Board (CARB) implemented the C&T as part of the implementation of California’s landmark climate change legislation, AB 32 – The Global Warming Solutions Act of 2006. CO_2 from the combustion of digester and landfill gas does not count toward the C&T thresholds. Therefore, there are no municipal wastewater treatment plants in California that will have compliance obligations under the C&T that was implemented as follows:

- January 1, 2012: C&T regulation becomes effective.
- August and November 2012: First auctions held.
- January 1, 2013: Compliance obligation for greenhouse gas emissions began.

CARB’s existing offset protocols are restrictive and not suitable for the wastewater agencies’ use, because the wastewater community will have to demonstrate that efforts to reduce carbon through these projects go beyond “business as usual.” As CARB intends to take an adaptive management plan with C&T, the rule will be opened for revisions at a future rulemaking cycle, and new requirements could be added now that the framework is in place and is operational.

California Greenhouse Gas Mandatory Reporting Rule

CARB adopted a Mandatory Reporting Regulation for Greenhouse Gases in 2007, which took effect in January 2009. A number of wastewater agencies currently are reporting their stationary combustion-related emissions under this program and recently have completed their first cycle of third-party verification of their reports. Emissions from wastewater process units are not reported under this program—only those from large combustion sources. Unlike C&T, biomass-related emissions, such as those from combustion of digester gas, are not excluded. They are reported, but are logged separately from fossil-fuel-related emissions.

In order to align with the Federal Mandatory Reporting Regulation adopted by USEPA and to support the C&T program, CARB amended its mandatory reporting program. The final Rule was approved and filed with the Secretary of State on December 14, 2011. The regulation became effective on January 1, 2012. The changes with the greatest potential impacts to wastewater agencies were as follows:

- CARB lowered the reporting threshold for stationary combustion from 25,000 metric tons per year (tons/year) of CO_2 to 10,000 tons/year of CO_2 equivalents (CO_2e), including both biomass and fossil fuel combustion emissions.
- Those facilities with emissions between 10,000 and 25,000 tons/year CO_2 will be able to file an abbreviated report and will not be required to undergo third party verification.
- Different from the previous reporting periods, only the agencies with combustion emissions greater than 10,000 tons/year will be reporting. If emissions are greater than 10,000 tons/year, they will report as a stationary combustion source.

In November 2014, USEPA released updates and a revised framework for assessing Biogenic CO_2 Emissions from Stationary Sources. Accordingly, it was found that the information considered in preparing the revised Framework, including the Scientific Advisory Board peer review and stakeholder input, supported the finding that use of waste-derived feedstocks is likely to have minimal or no net atmospheric contributions of biogenic CO_2 emissions, or may even reduce such impacts, when compared with an alternate fate of disposal. It was stated that USEPA intends to apply this preliminary finding further within the policy contexts and regulatory actions, meaning that biogenic CO_2 emissions from process and waste processing (including sewage treatment and sludge digestion) will not count toward the reporting limits. However, as the greenhouse gas reduction goals get tighter, it is important to benchmark current operations of the Agency, and to continue monitoring the reporting limits to be able to respond if needed.

13.3 Biosolids Management

Federal Regulations

The USEPA promulgated 40 CFR Part 503 in 1993 to establish general requirements, pollutant limits, management practices, and operational standards for the final use or disposal of biosolids. Part 503 of 40 CFR contains regulations for biosolids management options, such as land application, surface disposal, and incineration. The regulations classify biosolids as Exceptional Quality, Class A, or Class B biosolids. Sludge that does not fulfill the requirements for any classification is termed unclassified. Pathogen and vector attraction reduction requirements are outlined in 40 CFR Part 503.

Class A biosolids are sludges which have been dewatered and heated to remove pathogens and meet vector attraction reduction requirements for unrestricted land application such as fertilizer or compost for farms.

Class B biosolids are treated but still contain detectible levels of pathogens and can be applied to agricultural fields and other areas that are not accessible to the general public. The biosolids producer is responsible for monitoring how the biosolids are applied at the point of use and for compliance with all regulations at the point of use.

State Regulations

The SWRCB enacted State Water Quality Order No. 2000-10-DWQ in August 2000, which was later replaced by State Water Quality Order No. 2004-0012-DWQ, to establish general WDRs for the reuse of biosolids. The California land application requirements are more restrictive than those contained in 40 CFR Part 503 and are designed to account for conditions specific to California soils and local environments through the issuance and oversight of general order permits. Biosolids land application is controversial in California and continues to become more stringent.

AB 1826 (Mandatory Commercial Organics Recycling)

In October 2014, Governor Brown signed AB 1826 Chesbro (Chapter 727, Statutes of 2014), requiring businesses to recycle their organic waste on and after April 1, 2016, depending on the amount of waste they generate per week. This law also requires that by 2016, local jurisdictions across the state implement an organic waste recycling program to divert organic waste generated by businesses, including multifamily residential dwellings that consist of five or more units (please note, however, that, multifamily dwellings are not required to have a food waste diversion program). Organic waste (also referred to as organics throughout this resource) means food waste, green waste, landscape and pruning waste, nonhazardous wood waste, and food-soiled paper waste that is mixed in with food waste. This law phases in the mandatory recycling of commercial organics over time, while also offering an exemption process for rural counties. In particular, the minimum threshold of organic waste generation by businesses decreases over time, which means that an increasingly greater proportion of the commercial sector will be required to comply.

Landfill Status

The Solid Waste Information System facility database contains information on solid waste facilities, operations, and disposal sites throughout the State of California. The types of facilities found in this database include landfills, transfer stations, material recovery facilities, composting sites, transformation facilities, waste tire sites, and closed disposal sites. For each facility, the database contains information about location, owner, operator, facility type, regulatory and operational status, estimated closure dates, authorized waste types, local enforcement agency and inspection, and enforcement records.

13.4 Environmental Impacts

Federal Regulations

The National Environmental Policy Act (NEPA) is the nation’s basic charter for the protection of the environment. It establishes environmental policy for the nation, provides an interdisciplinary framework for federal agencies to prevent environmental damage, and contains procedures to ensure that federal agency decision makers take environmental factors into account. NEPA applies to all federal agencies and most of the activities they manage, regulate, or fund that affect the environment. Under NEPA, the lead agency is the federal agency with the primary responsibility for complying with NEPA for a proposed action.

State Regulations

The California Environmental Quality Act (CEQA) applies to all proposed discretionary activities that will be carried out or approved by California public agencies, such as IEUA, unless such activities are specifically exempted. Under CEQA, a lead agency has the principal discretionary responsibility to approve a project and, therefore, is the agency with the primary responsibility for preparing a CEQA document associated with a proposed discretionary action. The purpose of CEQA is to minimize environmental damage. The primary objectives of CEQA are to (1) disclose to decision makers and the public the significant environmental effects of a proposed project to enable them to consider its environmental consequences, and (2) to balance the benefits of a project with the environmental costs.

Major elements of CEQA include:

- Disclosing environmental impacts
- Identifying and preventing environmental damage
- Fostering intergovernmental coordination
- Enhancing public participation
- Disclosing agency decision making