City of Riverside

WASTEWATER COLLECTION AND TREATMENT FACILITIES INTEGRATED MASTER PLAN

VOLUME 1: EXECUTIVE SUMMARY
CHAPTER 1: EXECUTIVE SUMMARY

FINAL
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10540 TALBERT AVENUE, SUITE 200 EAST • FOUNTAIN VALLEY, CALIFORNIA 92708 • (714) 593-5100 • FAX (714) 593-5101

City of Riverside

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VOLUME 1: EXECUTIVE SUMMARY
CHAPTER 1: EXECUTIVE SUMMARY

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Chapter 1

EXECUTIVE SUMMARY

1.1 PURPOSE

This Wastewater Collection and Treatment Facilities Integrated Master Plan has been prepared to serve as a planning document for facility planning for the City of Riverside (City) Regional Water Quality Control Plant (RWQCP) and collection system. The recommended plan is intended to enable the RWQCP to continue to reliably provide wastewater treatment to the City as the wastewater flow increases due to the projected population growth. This master plan addresses facility needs for projected influent flow through the year 2025.

The purpose of this executive summary is to provide a concise overview of the key issues and alternative analyses of the facility planning for the Integrated Master Plan.

1.2 EXISTING FACILTIES

The City Sewerage System Division is responsible for collection and treatment of wastewater flows generated within the City and the communities of Jurupa, Rubidoux, Edgemont, and Highgrove. The City's collection system consists of approximately 800 miles of gravity sewers ranging from 6 to 48 inches in diameter and 18 wastewater pump stations. The wastewater pump stations range in size from 100 gallons per minute (gpm) up to 2,000 gpm. Treatment is provided at the RWQCP, which provides preliminary, primary, secondary, and tertiary treatment for a rated capacity of approximately 40 million gallons per day (average annual basis).

1.3 GOALS AND OBJECTIVES

The City seeks to develop an Integrated Master Plan for the wastewater collection and treatment facilities to identify and plan for expansion and replacement needs through the year 2025. The Integrated Master Plan evaluates most of the facilities that make up the wastewater collection and treatment facilities, in order to make recommendations to accommodate facility rehabilitation and replacement (R&R) and projected population growth. For facilities not specifically evaluated in this Master Plan, findings and recommendations of previous and ongoing plans and studies are evaluated and included. This combination of recommendations from new facility evaluations and previously made findings and recommendations from other plans provides the City with a Master Plan that is integrated into one document. Specific goals for the Integrated Master Plan include:

1. Develop a capital improvement plan (CIP).
2. Develop an asset management program that will provide capital R&R costs.

3. Perform financial planning and establish user rates and connection fees.
4. Develop an Environmental Impact Report from the proposed facilities.
5. Identify, analyze, and recommend alternatives for various system processes.
6. Create easily updateable Volumes and Chapters.
7. Use the Master Plan Manager™ (MPM™) software so the City can modify the plan based on changes to the planning criteria (i.e., regulatory changes and flow projection changes).

The sections that follow present first the outline of the Integrated Master Plan and then the major findings from the individual master plan volumes, excluding the Environmental Impact Report.

1.4 INTEGRATED MASTER PLAN OUTLINE

The Integrated Master Plan is organized into thirteen Volumes, as shown in Table ES.1.

Table ES.1 Integrated Master Plan Volumes
Wastewater Collection and Treatment Facilities Integrated Master Plan
City of Riverside

Volume 1: Executive Summary

Volume 2: Basis of Planning

- Chapter 1: Introduction
- Chapter 2: Regulatory Requirements
- Chapter 3: Population and Flow Projections
- Chapter 4: Basis of Cost Estimates

Volume 3: Wastewater Collection System

- Chapter 1: Review of 1992 Master Plan Update

Volume 4: Wastewater Treatment System

- Chapter 1: Existing Facilities
- Chapter 2: Summary of Planning Studies
- Chapter 3: Process Design and Reliability Criteria
- Chapter 4: Plant Hydraulics
- Chapter 5: Preliminary Treatment
- Chapter 6: Primary Treatment
- Chapter 7: Secondary Treatment
- Chapter 8: Tertiary Treatment
- Chapter 9: Disinfection

Table ES.1 Integrated Master Plan Volumes Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside
Chapter 10: Recycle Stream Management
Chapter 11: Plant Utilities and Support Facilities
Chapter 12: Primary Effluent Equalization
Chapter 13: Proposed Expansion Plan and Site Layout
Chapter 14: Implementation Schedule and Cost
Volume 5: Air Quality and Emissions Control
Chapter 1: Review of the 2005 Odor Control Master Plan
Chapter 2: Review of Applicable Regulatory Requirements
Volume 6: SCADA Management and Communications System
Chapter 1: SCADA Management Plan
Volume 7: Reclamation and Reuse
Chapter 1: Reclamation and Reuse
Volume 8: Biosolids Management
Chapter 1: Existing Facilities
Chapter 2: Summary of Planning Studies
Chapter 3: Design Criteria
Chapter 4: Solids Production and Thickening Options
Chapter 5: Solids Processing
Chapter 6: Solids Dewatering
Chapter 7: Solids Disposal
Chapter 8: Implementation Schedule and Cost
Volume 9: Energy Management
Chapter 1: Existing Energy Facilities
Chapter 2: Summary of Planning Studies
Chapter 3: Existing and Future Energy Uses
Chapter 4: Energy Saving Options
Chapter 5: Power Supply Alternatives
Chapter 6: Standby Power
Chapter 7: Implementation Schedule and Cost
Volume 10: CIP and Overall Implementation Schedule
Chapter 1: Capital Costs and Implementation Schedule
Chapter 2: Operations and Maintenance Cost Projections

Table ES.1 Integrated Master Plan Volumes Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside
Volume 11: Financial Plan and User Rates and Fees
Chapter 1: Master Plan Manager™
Chapter 2: Financial Planning Tool™
Chapter 3: Master Plan Manager™ User Manual
Volume 12: Asset Management
Chapter 1: Strategic Vision
Chapter 2: Condition Assessment
Volume 13: Environmental Impact Report (EIR)
Public Draft EIR
Final Draft EIR
Final Mitigation Monitoring and Reporting Program Report
Final Response to Comments
Final Statement of Overriding Consideration and Findings of Fact
Notice of Determination

1.5 VOLUME 2: BASIS OF PLANNING

The purpose of the Basis of Planning volume is to document the basic criteria used in facility planning for the City's Integrated Master Plan. In addition to an outline of the Master Plan volumes, three areas are addressed in this volume:

1. Regulatory Requirements.
2. Basis of Cost Estimates.
3. Population and Flow Projections.

For the Regulatory Requirements chapter, a brainstorming session was conducted at the beginning of the project. The purpose of this session was to identify specific regulatory requirements likely to arise over the next 10 to 20 years, and ascertain how these requirements would impact the Integrated Master Plan alternative analyses. Based on the brainstorming session, it was determined that most of the potential future regulatory requirements would be addressed by developing compliance strategies rather than new capital treatment facilities. There were also a few potential regulatory requirements that would require new or improved treatment processes in order to ensure regulatory compliance. These processes included membrane bioreactors, ultraviolet disinfection, ozone disinfection, and odor control for the primary clarifiers. These processes are included in evaluations in the appropriate chapters in Volume 4 - Wastewater Treatment System.

The Basis of Cost Estimates chapter established the procedures and guidelines for estimating operations and maintenance (O&M) and capital costs for the Integrated Master Plan. Tables ES.2 and ES.3 list the cost factors that were applied to the capital and life-cycle cost estimates.

Table ES.2 Capital Cost Estimate Factors
Wastewater Collection and Treatment Facilities Integrated Master Plan
City of Riverside

Category	Factor
Site Work	10% of direct costs
Electrical and Instrumentation	15% of direct costs
Contingency	30% of total direct costs
General Conditions	10%
Contractor OH&P	15%
Escalation	6% (first 5 years), 4% thereafter
Bid Market Allowance	15%
Project Costs	30% of total Construction Cost

Table ES.3 Life-Cycle Cost Estimate Factors
Wastewater Collection and Treatment Facilities Integrated Master Plan
City of Riverside

Category	Factor
Escalation	6% (first 5 years), 4% thereafter
Discount Rate	6%

The Population and Flow Projections chapter developed the projected flow for the planning period. This is summarized in the following section.

1.5.1 Projected Flow

Based on information supplied by the City, the increase in the plant flow is anticipated to grow at a rate of 1.09 percent between 2006 and 2025. Because flow projection is not an exact science, a 90-percent confidence interval for the flow was developed. This is approximately equal to an annual flow increase range of between 0.75 percent (low growth scenario) and 1.5 percent (high growth scenario). It was decided in the August 2006 monthly meeting that the 1.5 percent rate increase was to be used to project the year 2025 flow. This resulted in a projected average daily flow (ADF) of 52.2 mgd.

Subsequently, all the alternative analyses for the facilities were performed assuming they would need to meet the 52.2-mgd capacity. After the analyses were performed, the City noticed a slow down in the population/housing growth, and decided the low growth scenario

would be more appropriate for scheduling projects and determining user rates and connection fees. This decision was made at the August 2007 meeting.

The alternative analyses of this Master Plan are based on a 2025 flow of 52.2 mgd. However, as a result of the August 2007 decision, the capital costs, O&M costs, CIP, and schedule for the projects have been revised to reflect the low growth scenario (2025 flow of 47.3 mgd).

The following peaking factors are used for the Master Plan:

1. Peak wet weather: 2.2.
2. Minimum dry weather: 0.5.
3. Peak dry weather: 1.8.
4. Tertiary peak: 1.5.

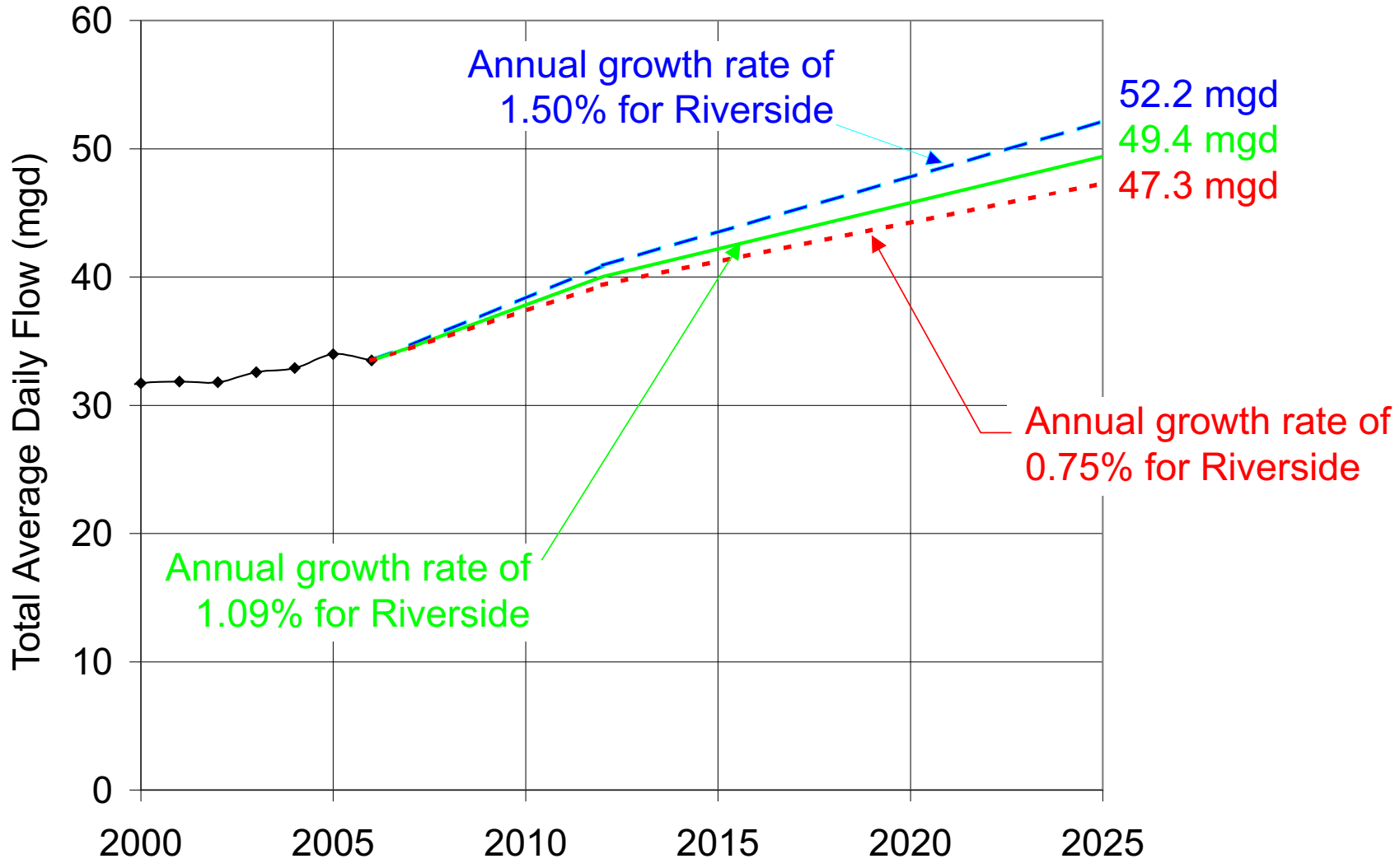
Please see Figure ES.1 for the projected flow for the planning period.

1.6 VOLUME 3: WASTEWATER COLLECTION SYSTEM

The purpose of the Wastewater Collection System volume is to evaluate and summarize the collection system master plans (CSMPs) that were completed by Post, Buckley, Schuh & Jernigan, Inc. (PBS&J) between 2002 and 2006. The capital improvements and costs that were proposed in the CSMPs are updated in this volume to reflect completed projects, and future project costs are adjusted and scheduled out to 2025 based on detailed costs and schedules provided by the City.

Overall the CSMPs are sufficient with a few recommended additional efforts the City should pursue. The main recommendation is to update the CSMPs by incorporating infiltration and inflow (I/I) into the collection system model and adjusting capital improvement projects accordingly.

The CSMPs identified a total of 50 capital projects and the City identified an additional 24 R&R projects for sections of the collection system that are more than 50 years old. Of the 50 capital projects identified from the CSMPs, the City has either started or allocated budgets for 12 of them; therefore, these projects are not included in the master plan CIP. The costs for the rest of these capital projects are spread over 10 years. The costs for the City's 24 R&R projects are spread over 50 years.



TOTAL PROJECTED AVERAGE DAILY FLOWS FOR RWQCP

FIGURE ES.1

1.7 VOLUME 4: WASTEWATER TREATMENT SYSTEM

The purpose of the Wastewater Treatment System volume is to identify the deficiencies in the existing treatment systems at the RWQCP and to recommend projects that would meet the year 2025 flow projections. The treatment areas evaluated are listed in Table ES.1 under the heading Volume 4. As mentioned above, the alternative analyses were based on the high growth scenario, a resulting capacity need of 52.2 mgd. The following summarizes the major recommendations of each treatment area process chapter in Volume 4.

1.7.1 Plant Hydraulics

The purpose of the hydraulic analysis was to evaluate the ability of the existing RWQCP to convey flows up to the peak wet weather flow (PWWF) through the facilities and to identify any bottlenecks. No hydraulic bottlenecks were identified during hydraulic model runs using the existing facility ADF treatment capacity (40 mgd) and the existing ADF (33 mgd). However, four hydraulic bottlenecks were identified for the PWWF (88 mgd). Table ES.4 lists the identified bottlenecks and the respective management strategy to correct the bottlenecks.

Table ES.4 Hydraulic Bottlenecks and Management Strategies
Wastewater Collection and Treatment Facilities Integrated Master Plan
City of Riverside

Hydraulic Bottlenecks	Management Strategy
Plant 2 (24-inch) control valves/meters at the headworks.	Install an additional 24-inch control valve at the headworks.
A 42-inch pipe connecting the Plant 2 primary clarifiers splitter box and aeration basin influent splitter box.	Upsizing the existing pipe to 54 inches.
Plant 1A/1B Distribution Channel.	Will be eliminated when the 2008 expansion project is constructed.
A 54-inch pipe connecting Junction Box 13A and Junction Box 14.	Installing a new 48-inch pipeline between Distribution Box 3 and Junction Box 13A and modifying the boxes.

1.7.2 Preliminary Treatment

1. The existing headworks facility is re-rated at a capacity of 37 mgd on an ADF basis, based on the grit removal capacity of the grit chambers. The hydraulic capacity is approximately 46 mgd. Based on the grit removal capacity, an additional separate headworks facility is planned for an ADF of 15 mgd.
2. Two mechanical bar screens (one duty and one standby) and one manual bypass bar screen are recommended for the new headworks.

3. Climber-type and chain-and-rake-type are two alternatives for the bar screens. They should be further evaluated during preliminary design.

4. A shaftless screw conveyor is recommended over a belt conveyor for screenings conveyance.

5. A sloped-bottom vortex grit basin is recommended over a flat-bottom grit basin because the accumulation of settled grit can be minimized, and also because the equipment can be bid instead of sole-sourced.

6. The headworks will be covered for odor control and foul air will be continuously withdrawn and treated in a biofilter.

1.7.3 Primary Treatment

1. The existing Plant 2 primary clarifiers have a capacity of 20 mgd on an annual average (AA) flow basis. New primary clarifiers will have an AA flow capacity of 32.2 mgd and replace the existing Plant 1A and Plant 1B primary clarifiers. The total Plant 1 and Plant 2 primary clarifier capacity will then be 52.2 mgd.

2. Rectangular and circular alternatives were compared. The life-cycle costs for the two alternatives are similar. Circular primaries will be used, given that the costs are similar, circular clarifiers are easier to maintain, and circular units will fit on the site.

3. The type of primary sludge pumps will be decided during preliminary design based on flow quantity and pumping head.

4. Biofilters will be used for odor control for the primary clarifiers (new Plant 1 and existing Plant 2) and for the new headworks facilities. The primary clarifiers will be covered with low profile aluminum domes for odor control. The biofilter is estimated to be 150 feet by 200 feet. The biofilter will be located at the existing Plant 1A primary clarifiers. Therefore, it will be built after the new clarifiers are put in service and the Plant 1A clarifiers are demolished.

1.7.4 Secondary Treatment

1. The existing secondary treatment system was evaluated and the plant capacity is 40 mgd AA.

2. For future increases in capacity, Plant 1 will be expanded since some of the process units have aged and there is enough room for future units adjacent to Plant 1, whereas Plant 2 has limited room for future expansion.

3. The ultimate expansion would increase Plant 1 capacity to 32.2 mgd AA and the total RWQCP treatment capacity to 52.2 mgd AA.

4. Four options for expanding the RWQCP secondary treatment plant were considered: Conventional Activated Sludge (CAS), Conventional Activated Sludge-High SRT (CAS-SRT), Membrane Bioreactor (MBR), and Integrated Fixed Film Activated Sludge (IFAS).

5. CAS, CAS-SRT, MBR, and IFAS options can all achieve the required expanded capacity. The IFAS option presents more risks than the other alternatives due to the limited experience and number of installations using this technology.

6. For meeting current effluent limits, CAS is the most cost-effective alternative, followed by IFAS, CAS-SRT, and MBR in that order. However, in order to meet future potential endocrine disrupting compound (EDC) chemical limits, a high SRT process is preferred. The two options that include a high SRT process and have many installations are the MBR and CAS-SRT options. Their life-cycle costs are nearly the same, within the uncertainty of the cost estimate.

Based on the ability to achieve better effluent quality, the City chose the MBR alternative for the future expansion at a meeting on November 17, 2006. It was decided the MBR facility would be completed in two phases. The first phase will convert Plant 1 from a 20-mgd CAS facility to a 26-mgd MBR facility. The second phase will add the remaining 6-mgd capacity for a Plant 1 secondary capacity of 32.2 mgd, and a total RWQCP capacity of 52.2 mgd AA.

1.7.5 Tertiary Treatment

1. The volume of the existing tertiary influent equalization basins is 6.0 million gallons (MG). It is estimated that an additional equalization volume of 6.1 MG will be required based on the simulated Riverside wet-weather diurnal curves. The additional equalization basins can be built either as tertiary influent equalization basins or as primary effluent equalization basins.

2. The existing filters are rated to have a capacity of 28.2 mgd on an ADF basis. If MBRs are used for secondary expansion, no tertiary facility expansion is needed. If MBRs are not used, an additional tertiary capacity of 24.0 mgd will be required to meet the 52.2-mgd ADF.

3. Cloth-disk filters are recommended over conventional dual-media filters because of their lower life-cycle cost and ease of operation.

There is no tertiary facility expansion required since MBR is selected as the secondary treatment method.

1.7.6 Disinfection

1. Existing NaOCl should continue to be used as the disinfection method unless future regulations require removal of pollutants that only advanced disinfection systems can provide. The total existing disinfection capacity is 44 mgd; therefore, an additional 8 mgd would be required to increase the capacity to 52.2 mgd.

2. Ozone or ozone plus UV should be considered for disinfection if removal of EDCs is required by future regulations. These alternatives have been developed as alternate treatment scenarios for the MPM^{TM}.

3. UV alone will not be used as the disinfection method because it is incapable of removing EDCs.

4. A tracer test should be performed for each existing chlorine contact basin (CCB) in order to determine the size requirement for the new basin. Depending on the results of the tracer tests, it is possible that a new CCB will not be required.

1.7.7 Recycle Stream Management

The following four recycle stream treatment alternatives were evaluated for treating recycle flows from the dewatering process:

1. Equalization (EQ) Alternative.

2. Single Reactor High-Activity Ammonia Removal Over Nitrite (SHARON) Alternative.

3. SHARON combined with Anaerobic Ammonia Oxidation (ANAMMOX) Alternative.

4. Centrate and Return Activated Sludge (RAS) Re-Aeration Basin (CaRRB) Alternative.

After extensive evaluations of each alternative, none of the alternatives are economically feasible for use at the RWQCP.

1.7.8 Plant Utilities and Support Facilities

1. The utility water system, which includes the pump station and distribution piping, is not adequate. PBS&J has designed an upgrade to the distribution piping, and Lee and Ro is currently designing a new pump station, which will be located in CCB No. 2. Upsizing and looping of the distribution piping in the vicinity of CCB No. 2 will be necessary to accommodate the new pump station location.

2. The communication system includes a phone system, plant radio system, and public address system. The public address system is old and should be upgraded.

3. Based on *Interim Voluntary Security Guidance for Wastewater/Stormwater Utilities*, published by the Water Environment Federation, the site security level should be evaluated for access control, cyber security, monitoring for flammable/toxic substances, and backup power.

4. The existing storm drain system drains to a pump station and is pumped to the Plant 1 aeration basins. In the future, an option to pump upstream of primaries will be added.

5. A new maintenance building will be located south of the existing maintenance building. Additional parking space will be added east of the existing parking lot.

6. All new buildings over 5,000 square feet will be designed to meet the Leadership in Energy and Environmental Design (LEED) standard.

7. Based on an analysis of the existing levee that protects the RWQCP from the river, it is possible that the levee will have to be raised. The City will have a hydrology study performed to determine if the levee needs to be raised.

1.7.9 Primary Effluent Equalization

1. Primary effluent equalization will be used to provide better control for downstream processes and a reduction in project costs for the MBRs. In addition, the reduction in project costs for the MBR facility is more than the project cost of providing primary effluent equalization.

2. Two equalization basins with a total volume of 12.1 MG will be required based on the Riverside wet-weather diurnal curves.

3. Hypalon liners will be used for the basin liner material because of its lower cost compared to concrete and better durability than polypropylene.

4. Basin covers will not be used because of cost and cleaning issues. To minimize odors, the basins will need to be dewatered and cleaned daily.

1.7.10 Proposed Expansion Plan and Site Layout

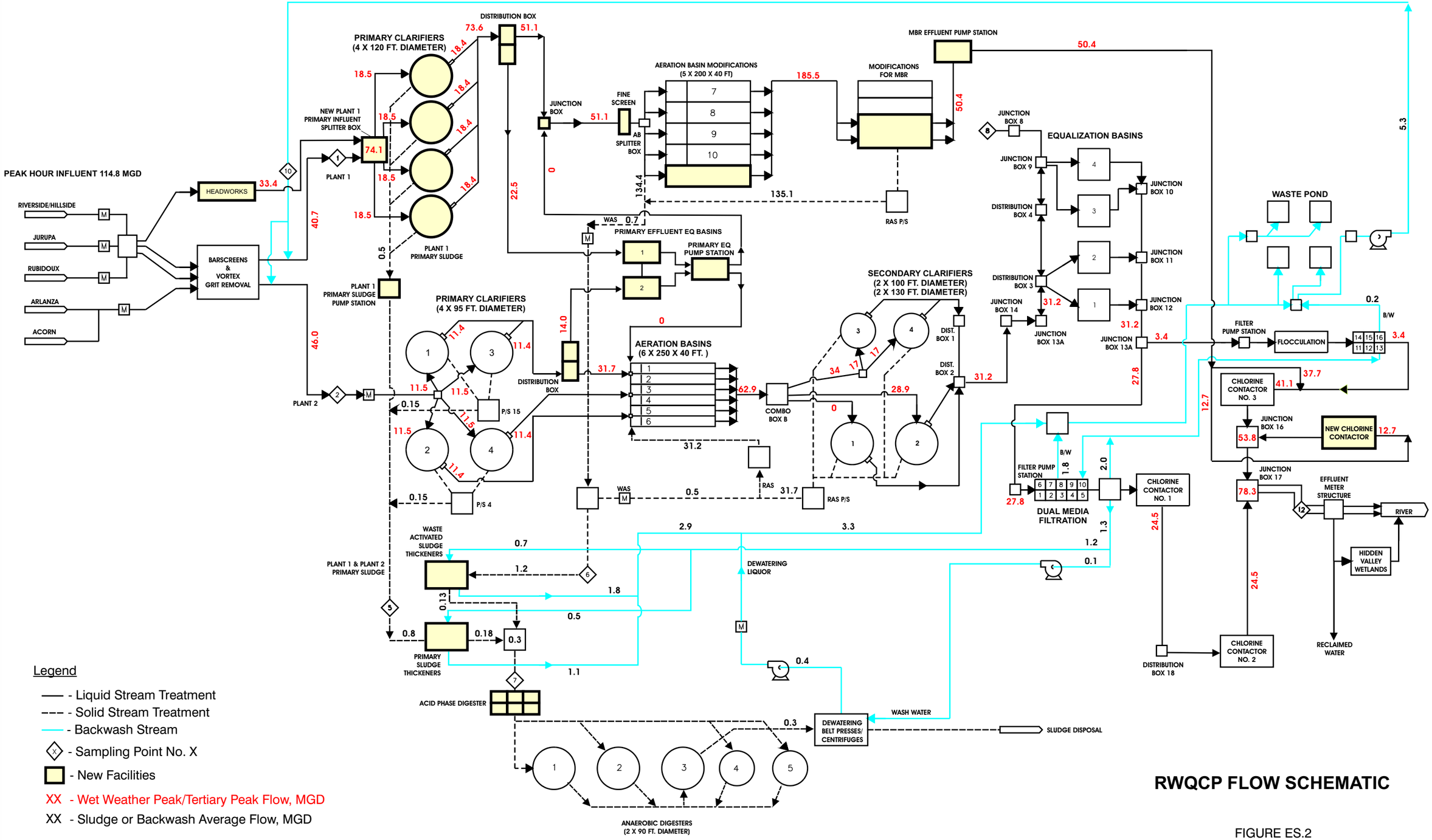
Based on the evaluations performed in this volume, a revised RWQCP flow schematic and site layout have been developed for the ultimate expansion to 52.2 mgd on an AA basis (Figures ES.2 and ES.3).

1.8 VOLUME 5: AIR QUALITY AND EMISSION CONTROL

The purpose of this volume is to provide a review of the 2005 Odor Control Master Plan (2005 Report by Brown and Caldwell) and applicable regulatory requirements for the RWQCP. In general, the 2005 report provides the City with adequate guidance for addressing odor issues. Therefore, the report is generally sufficient for odor control planning at the RWQCP.

1.9 VOLUME 6: SCADA MANAGEMENT AND COMMUNICATIONS SYSTEM

The Supervisory Control and Data Acquisition (SCADA) Management Volume provides a review of the SCADA plan written by WaterHammer, Inc., of Upland, CA. Overall, the SCADA Plan covers the existing system and makes general recommendations for future support. The Plan provides good descriptions of existing hardware. It provides adequate analysis and recommendations in some areas.



RWQCP FLOW SCHEMATIC

FIGURE ES.2

Key

1 New Headworks
2 Biofilters
3 Plant 1 New Primary Clarifiers
4 Primary Sludge Pump Station
5 Primary Effluent Equalization Basins
6 Plant 1 Aeration/Anoxic Basins Additions
7 Plant 1 Membrane Bioreactor
8 New Chlorine Contact Basin
9 Primary Sludge Thickeners
10 New Waste Activated Sludge Thickeners
11 Acid Phase Digester
12 New Maintenance Building
13 Parking Lot Expansion
14 Fine Screens
15 MBR Equipment

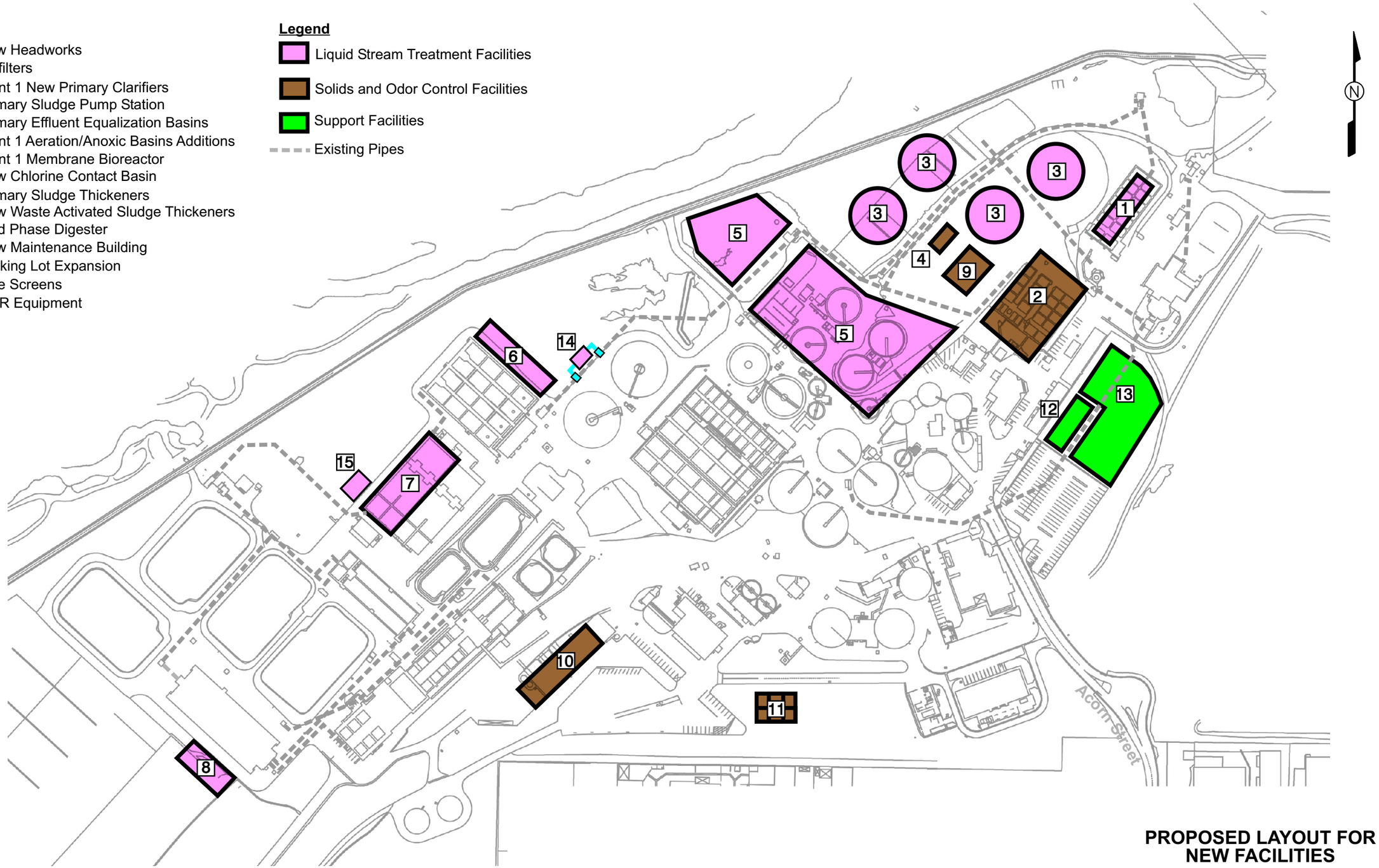
Legend

Liquid Stream Treatment Facilities

Solids and Odor Control Facilities

Support Facilities

Existing Pipes



PROPOSED LAYOUT FOR NEW FACILITIES

FIGURE ES.3

The main deficiency of the SCADA plan is that it is not integrated with other Master Plan documents and does not include planning recommendations or costs for future SCADA expansion to accommodate the RWQCP expansion. It was decided in the May monthly meeting to include $1 million (August 2006 dollars) in the CIP to allow for future SCADA upgrade projects, spread evenly over the planning period. The $1 million would make up for SCADA deficiencies that are not already being covered in the RWQCP treatment system projects. A list of priority enhancements that the City might want to consider to add to the existing SCADA Plan is also provided.

1.10 VOLUME 7: RECLAMATION AND REUSE

The purpose of the Reclamation and Reuse volume is to review the information in the existing City of Riverside Recycled Water Phase I Feasibility Study and Citywide Master Plan (Parsons, September 2003), present an update to the existing Master Plan regarding the planned recycled water pump station, and develop costs for the planned pump station that can be used in the overall CIP for the Integrated Master Plan. A new recycled water pump station is to be constructed at the discharge end of CCB No. 2. The pump station will be used to supply the on-site and off-site demands for recycled water. The new pump station will include a cover over CCB No. 2 to help reduce chlorine demand and prevent wind-born trash from entering the basin.

1.11 VOLUME 8: BIOSOLIDS TREATMENT AND HANDLING

This volume addresses the expansion needs in the biosolids treatment and handling area and incorporates findings and recommendations from the 2003 Bio-Solids Handling Improvements report by Brown and Caldwell, along with alternative analyses results done for this Integrated Master Plan. Since the City plans to continue with the dewatering implementation plans recommended from the 2003 Report, no analyses are done for the dewatering facility, but the findings of the 2003 Report are presented in the volume. Furthermore, for solids disposal, the City has decided to dispose its solids at the EnerTech Environmental California, LLC in Rialto facility, based on an agreement with EnerTech Environmental California, LLC to participate in the Rialto Regional Biosolids Project as a component of the City's long-term biosolids management strategy.

The following subsections summarize the recommendations for the thickening and digestion facilities for the Integrated Master Plan.

1.11.1 Solids Thickening Options

1. Based on the dissolved air flotation thickeners (DAFTs) design criteria and current operating conditions, the capacity of the DAFTs (without polymer addition) with both units in service was estimated to be 36.3 mgd on an ADF basis, which are operating

near their rated capacity. With polymer addition, and both units in operation, the DAFTs would have a capacity of 48.4 mgd ADF.

The City has chosen to provide separate thickening facilities for primary thickening and secondary thickening, using gravity belt thickeners (GBTs) for both types of solids.

1.11.1.1 Solids Processing

1. The City could reduce digestion construction to a minimum of one 90-foot digester and possibly not have to build any additional digestion during the Master Plan planning period by using acid-phased anaerobic digestion (APAD) versus conventional anaerobic digestion.
2. It is recommended that the City use Digester No. 3 for downstream digester sludge storage, as this would provide the City with 3 days of storage versus 2 days, if the City were to use Digester No. 5, instead.

The City has selected the APAD system with a new multi-compartment acid-phase digester for their digestion facilities.

1.12 VOLUME 9: ENERGY MANAGEMENT

The energy management volume evaluates the existing and future energy uses, power saving options and power alternatives, as well as the RWQCP standby power system. The following summarizes the main recommendations of these areas.

1.12.1 Existing and Future Energy Uses

1. Historical data for electrical power demand and consumption at the RWQCP show that the average power demand is 2,456 kW and a peak demand of 3,096 kW.
2. The anticipated future loads based on the low growth scenario for the RWQCP are listed in Table ES.5.

Table ES.5 Anticipated Future Loads for RWQCP Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside

Treatment Facility	Future Loads
Headworks	Additional 186 kW in year 2023
Primary Clarifier, Primary EQ, MBR and Sludge Thickening	Additional 1,955 kW in year 2013; increase to 3,047 kW in year 2025
Acid Digester	Additional 186 kW in year 2013
Disinfection	Additional 8 kW in year 2020

Table ES.5 Anticipated Future Loads for RWQCP Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside	
Treatment Facility	**Future Loads**
UV/Ozone	Possible addition of 583 kW in year 2020
WAS Thickeners	Additional 34 kW in year 2027

3. Future heat uses will include additional digester heating required because of increased plant loading and flow. Projections of future digester heating through 2025 were made. The estimated 2025 digester heat demand based on the low growth scenario is as follows:

Table ES.6 Estimated 2025 Digester Heat Demand Wastewater Collection and Treatment Facilities Integrated Master Plan City of Riverside

Year	Flow, mgd	No Grease: Average Heat Demand, Btu/hr	No Grease: Peak Heat Demand, Btu/hr	Grease Addition: Average Heat Demand, Btu/hr	Grease Addition: Peak Heat Demand, Btu/hr
2025	47.3	4,421,000	6,896,000	5,221,000	7,896,000

1.12.2 Selected Energy Management Projects

1. Install a 1,000-kW digester gas-fueled fuel cell. This project is currently under construction.
2. Add an additional digester gas-fueled 1,200-kW fuel cell cogeneration system prior to 2012 to replace the three existing 3,300-kW engine generator cogeneration systems, and retrofit the existing engine generators to become natural gas fueled standby generators.
3. Install a low-pressure digester gas holder to assist with digester gas control.
4. Upgrade the existing RWQCP cogeneration, control, and electrical systems to provide standby power and distribution reliability.
5. Retrofit the existing eddy-current drives with variable frequency drives (VFDs) for the three 250-hp filter influent pumps and two 100-hp waste backwash pumps. Replace the pump motors with premium efficiency motors.

1.13 VOLUME 10: CIP AND OVERALL IMPLEMENTATION SCHEDULE

The purpose of this volume is to present the CIP for the RWQCP. This includes the wastewater treatment plant upgrades (low growth scenario) as well as the collection system capital improvement projects. Table ES.7 is a summary of the improvement projects

recommended for this integrated master plan and presents the implementation schedule of the CIP, as well as the total project costs in August 2006 dollars.

Table ES.7 Implementation Schedule for Treatment System Projects - Low Growth Scenario
Wastewater Collection and Treatment Facilities Integrated Master Plan
City of Riverside

Project	Total Project Cost[(1)] ($ Million)	Project Duration	Date	
			Start	Completion
2008 Expansion Project	$185.0	5.5	Jan-08	Jul-13
Plant 1 Primary Expansion ($64M)				
MBR ($108 M)				
APAD ($13M)				
1.2-MW Fuel Cell	$13.2	4	Jan-08	Dec-11
Low-Pressure Digester Gas Holder	$1.2	3	Jan-08	Dec-10
42-inch Pipe Upgrade (54-inch dia. from Connecting Plant 2 Splitter Box to Aeration Basins	$0.1	1.5	Jul-08	Dec-09
Waste Gas Burner	$0.5	1.5	Jul-08	Dec-09
24-inch Meter Control Valve	$0.5	1.5	Jul-08	Dec-09
New Boilers	$3.0	1	Jan-14	Dec-14
Biofilter Nos. 1 and 2 Media	$2.1	1.5	Jul-14	Dec-15
O&M Building	$2.1	1.5	Jul-14	Dec-15
Influent Metering Project	$5.9	1.5	Jul-14	Dec-15
Power System Projects	$5.1	2	Jan-16	Dec-17
New Chlorine Contact Basin	$4.0	3.5	Jul-16	Dec-20
New Headworks	$10.0	3.5	Jan-19	Jul-22
Additional MBR Equipment	$12.0	4	Aug-19	Jul-23
Building-Headquarters for Sewer Line Maintenance	$0.3	1.5	Jul-14	Dec-15
WAS Thickening Facility	$17.0	3.5	Jul-23	Dec-26
SCADA System Upgrades	$1.0	No specific projects have been assigned at this time		
Total	**$263.00**			

Notes:
(1) Costs are in August 2006 dollars.

As mentioned earlier, only 38 of the 50 expansion projects identified from the CSMPs, along with the 24 projects identified by the City, are included in the City's CIP. There are no

set schedules for the 62 collection system projects. The project costs are assumed to be distributed evenly over a 10-year period from FY 2007/2008 through FY 2016/2017 for the CSMP derived projects (total of $37.7 million, August 2006 dollars), and over a 50-year period from FY 2007/2008 through FY 2055/2056 for the 24 projects identified by the City (total of $418 million, August 2006 dollars). For the 24 projects identified by the City, only costs for up to FY 2024/2025 are included in the CIP.

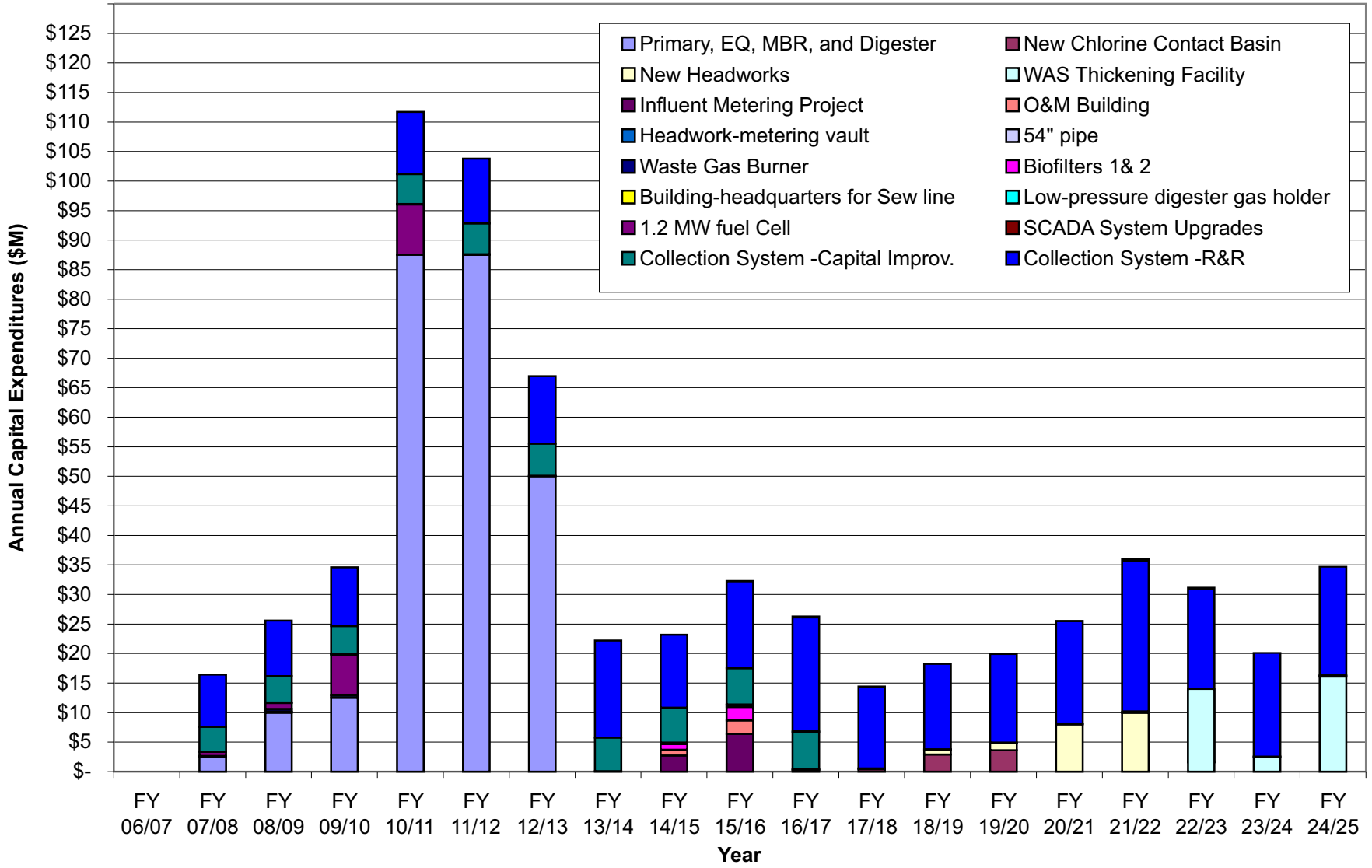
For the treatment systems, the total estimated capital costs in inflated dollars through FY 2024/2025 are approximately $373 million. For the collection system, the total estimated capital costs in inflated dollars for the CSMP derived projects over the 10-year period are approximately $53 million, and the estimated costs for the 24 projects identified by the City through FY 2024/2025 are approximately $239 million. The total estimated CIP project costs in inflated dollars for the Integrated Master Plan is approximately $666 million. About 44 percent of the $666 million CIP comes from the collection system. Figure ES.4 shows the annual capital expenditures.

1.14 VOLUME 11: FINANCIAL PLAN AND USER RATES AND FEES

Volume 11 presents the MPM™ and the results of assessments made using the Financial Planning Tool™. It presents the recommendations in regards to the user rates and connection fees.

1.14.1 Master Plan Manager™

The purpose of this chapter is to explain the overall functionality of the MPM™ and how the City can use it in the future to meet their needs. MPM™ allows the user to create and update numerous options for growth and regulatory assumptions that can be combined in a variety of ways to create many scenarios. The software provides immediate scenario results that can be compared and evaluated against one another. These analyses can help the City identify and understand planned trigger points for various projects, the impacts to capacity and effluent quality from the different growth options, and the relative impacts to the CIP in terms of cost and scheduling. All together, the City can understand potential future capacity bottlenecks, and potential failures to meet effluent quality requirements based on various growth options and selection of treatment processes. This information will allow the City to plan for flexibility and react to uncertainty. MPM™ results will allow the City to implement projects just in time, save their customers money, and continue to provide high quality, uninterrupted service.



ANNUAL CAPITAL EXPENDITURES

FIGURE ES.4

1.14.2 Financial Planning Tool™

The purpose of this chapter is to present the results of an assessment of the rates charged to the treatment and collection system customers to determine if they are adequate to address current and future O&M and capital costs. The following summarizes the recommendations presented to the City in regards to the user rates and connections fees:

1. Connection Fees - Implement the recommended methodology of calculating connection fees for commercial and industrial customers on an equivalent dwelling unit (EDU) basis and flow and load basis, respectively. It is recommended that the City increase the Residential Connection Fees from $2,684 to $3,472 per EDU. Based on this fee per EDU, Commercial and Industrial Connection Fees would be revised according to each category/users EDU contribution to the system. In subsequent years, it is recommended that the Connection Fees be increased based on construction cost inflation.
2. User Rates - In order to meet future annual debt coverage requirements and financial obligations for O&M, it is recommended that the City increase the annual sewer user rate from $13.05 to $19.77 per EDU in FY 2008/09. It is also recommended that the City implement annual increases of between 5.5 and 17 percent in the subsequent 4 years. This projection should be revised on a periodic basis, as the City updates its O&M and capital cost projections.

1.15 VOLUME 12: ASSET MANAGEMENT

The purpose of the asset management volume is to provide repair/replacement recommendations for the existing facilities for the overall CIP that is produced as a result of the work completed in the Integrated Master Plan. A prioritized list of R&R projects was developed based on the condition assessment and analyses of each asset's condition, risk, vulnerability, remaining useful life, and associated costs. Accordingly, it was recommended that assets in poor condition (Condition 4 or 5) be assessed annually and a comprehensive assessment of all of the aboveground RWQCP assets be conducted every 3 to 5 years. Based on the information obtained in the condition assessment, 26 R&R projects with Condition 4 or 5 have been identified for inclusion in the City's CIP. Most of the 26 projects will be bundled with the planned projects described in other volumes of the master plan.

Besides identifying the list of R&R projects, the information collected has been input and populated in the Water/Wastewater Asset Manager™ (WAM™) software for City staff to access and update in the future.