City of Los Angeles
Integrated Resource Plan

Facilities Plan
Volume 5: Adaptive Capital Improvement Program

December 2006

Prepared for

City of Los Angeles
Department of Public Works
Bureau of Sanitation
and
Department of Water and Power

Prepared By:

CH: CDM, A Joint Venture

Final Report

Acknowledgements

Project Director

Adel Hagekhalil, Bureau of Sanitation
Tom Erb, Department of Water and Power (DWP)
Kellene Burn-Roy, CDM

Project Managers

Debbie Pham, Bureau of Sanitation
William Van Wagoner, DWP
Heather Boyle VanMeter, CDM
Kathleen Bullard, CH2M Hill

Facilities Plan Task Managers

Reina Pereira, Bureau of Sanitation
Judi Miller, CH2M Hill

Financial Plan Task Managers

Lisa Mowery, Bureau of Sanitation
Dan Rodrigo, CDM
Mike Matichich, CH2M Hill

Public Outreach Task Managers

Hyginus Mmeje, Bureau of Sanitation
Chris Harris, Harris & Company

Environmental Task Managers

Ara Kasparian, Bureau of Engineering
Jawahar Shah, Bureau of Sanitation
Louis Utsumi, Envicraft, LLC
Christine Roberts, CH2M Hill

Stakeholder Facilitator

Paul Brown, CDM

Management Advisory Committee and Technical Advisory Committee

Varouj Abkian/BOE
Sam Alavi/BOS
Ralph Avila/Planning
Ron Bagel/LAUSD
Vik Bapna/LACDPW
Bob Birk/BOS
Melinda Bartlett/DEA
Allison Becker/CD13
Angelo Bellomo/LAUSD
Barry Berggren/BOS
Dale Burgoyne/BOS
Bee Campbell/CAO
Jeff Catalano/CD9
Jeanne Chang/CD4
Emeverto Cheng/BOS
Donna Chen/BOS
Dan Comorre/BOE
Froy Cornejo/BOS
Johne Crosse/CD11
Joseph Cruz/BSS
Patricia Cruz/BOS
Paula Daniels/Board of Public Works
Steve Davis/RAP
Gus Dembegiotes/BOS
Ed Demesa/USACE
John De Witt/Rec & Parks
Mark Dierkin/CD7
John Dierking/Office of Finance
Rebecca Drayse/Tree People
Jim Doty/BOE
Tom Erb/DWP
Kurt Erikson/City of Glendale
Doug Failing/Caltrans
Darryl Ford/RAP
Yolanda Fuentes/Board of Public Works
Jose Gardea/CD1
Maria Gomez/BOS
Dan Griset/SCAG
Aaron Gross/CD11
Gerald Gubatan/CD1
Keith Hanks/BOE
Daniel Hackney/BOS
Adel Hagekhalil/BOS
Chris Harris/Harris & Company
Bill Hartnett/EED
Tim Haug/BOE
Patricia Huber/CAO
David Jensen/LAUSD
Robert Jensen/RAP
Josh Kamensky/CD13
Ara Kasparian/BOE
Shahram Kharaghani/BOS
Rod Kubomoto/LACDPW
Wayne Lawson/BOE
Julie Lee/CD8
Andy Lipkis/TreePeople
Brent Lorscheider/BOS
Carmelo Martinez/BOS
Mark Mackowski/ULARA Watermaster
Jim Marchese/BOS
Laura McLennan/CD7
Jon Mukri/RAP
Carl Mills/BOE
Traci Minamide/BOS
Hyginus Mmeje/BOS
Omar Moghaddam/BOS
Lisa Mowery/BOS
Mike Mullin/BOS
Joe Mundine/BOS
Greg Nelson/DONE
Hiddo Netto/BOS
Reina Pereira/BOS
Mark Pestrella/LACDPW
Susan Pfann/CAO
Debbie Pham/BOS
Randy Price/BOS
Rafael Prieto/CLA
Ken Redd/BOE
Phil Richardson/BOE
Rita Robinson/BOS
Dan Rosales/CD7
Bill Rosendahl/CD11
Cynthia Ruiz/ BPW
Brian Sasaki/LACDPW
Shahrouzeh Saneie/BOS
Jawahar Shah/BOS
Susan Shu/BOE
Michael Shull/RAP
Cathy Shuman/USACE
Siegmund Shyu/CAO
Jill Sourial/CD1
Mike Spiker/LAG
Mark Starr/BOS
William Steele/US Bureau of Reclamation
Nancy Sutley/Mayor's Office
Raja Takidin/City of Glendale
Wing Tam/BOS
Robert Tanowitz/BOS
Paul Thakur/Caltrans
Chuck Turhollow/BOS
Herman Van Buren/CLA – Planning

Lupe Vela/CD1

Bill Van Wagoner/DWP

Camille Walls/RAP

Doug Walters/BOS

Deborah Weintraub/BOE

Chris Westhoff/CAO

Judy Wilson/JW & Associates

Robb Whitaker/Water Replenishment District of Southern California

Don Wolfe/LACDPW

Robert Wu/Caltrans

Clayton Yoshida/BOS

Steve Zurn/City of Glendale

Contributing Staff and Consultants

Wastewater Management

Treatment

Chuck Turhollow, Bureau of Sanitation
Tim Haug, Bureau of Engineering
Varouj Abkian, Bureau of Sanitation
Ken Redd, Bureau of Engineering
Steve Fan, Bureau of Sanitation
Bob Birk, Bureau of Sanitation
Curt Roth, CH2M Hill
Hector Ruiz, CH2M Hill
Heather Boyle VanMeter, CDM
Glen Daigger, CH2M Hill
Ilknur Ahmad, CH2M Hill
Gary Guyll, CH2M Hill

Collection System

Farsheed Farhang, Bureau of Sanitation
Betty Dong, Bureau of Sanitation
John Wang, Bureau of Sanitation
Devang Parikh, MapVision
Judi Miller, CH2M Hill

Biosolids

Diane Gilbert Jones, Bureau of Sanitation
Omar Mogahaddam, Bureau of Sanitation
Ruth Roxburgh, CH2M Hill
Sava Nedic, CDM
Fred Soroushian, CH2M Hill

Water Management

William Van Wagoner, DWP
Tom Gackstetter, DWP
Alvin Bautista, DWP
Victoria Cross, DWP
Jennifer Barrack, DWP
Mike Mullin, Bureau of Sanitation
Dan Rodrigo, CDM
Scott Lynch, CH2M Hill
Megan Laetsch, CH2M Hill
Bob Kemmerle, E2
Kathleen Higgins, CH2M Hill
Mike Savage, CDM

Runoff Management

Shahram Kharaghani, Bureau of Sanitation
Morad Sedrak, Bureau of Sanitation
Robert Vega, Bureau of Sanitation
Mike Mullin, Bureau of Sanitation
Wing Tam, Bureau of Sanitation
Hampik Dekermenjian, CDM
Jennifer Gronberg, CDM
Don Schroeder, CDM
Judi Miller, CH2M Hill
Curt Roth, CH2M Hill
Andy Lipkis, TreePeople
Bob Kemmerle, E2

Decision Science

Dan Rodrigo, CDM
Enrique Lopez-Calva, CDM

Regulatory Forecast

Traci Minamide, Bureau of Sanitation
Shahram Kharaghani, Bureau of Sanitation
Adel Hagekhalil, Bureau of Sanitation
Donna Toy Chen, Bureau of Sanitation
Diane Gilbert Jones, Bureau of Sanitation
Lisa Mowery, Bureau of Sanitation
Reina Pereira, Bureau of Sanitation
William Van Wagoner, DWP
Carrie Takayama, DWP
Chris Westhoff, City Attorney's Office
Judy Wilson, JW & Associates
Ruth Roxburgh, CH2M Hill
Heather Boyle VanMeter, CDM

Contents

Section 1	**Introduction**		**1-1**
1.1	Background		1-1
1.2	Overview of Documents		1-2
Section 2	**Recommended Alternative**		**2-1**
2.1	Approach for Selecting Recommended Alternative		2-1
	2.1.1	Background on Alternative Development	2-1
	2.1.2	EIR Analysis Approach	2-2
	2.1.3	Quadrant Analysis Approach	2-2
2.2	Analysis of Alternatives		2-3
	2.2.1	EIR Alternative Analysis	2-3
	2.2.2	Quadrant Analysis	2-5
	2.2.2.1	Recycled Water Analysis	2-5
	2.2.2.2	Runoff Management Analysis	2-6
	2.2.2.3	Wastewater Analysis	2-9
	2.2.3.4	Integrated Results	2-10
2.3	Overview of Recommended Alternative (Alternative 4)		2-11
	2.3.1	Implementation Strategy	2-12
	2.3.2	Wastewater Components	2-13
	2.3.3	Runoff Management	2-16
	2.3.4	Recycled Water and Water Conservation	2-16
Section 3	**Capital Cost Data Updates**		**3-1**
3.1	Assumptions		3-1
	3.1.1	Cost Factors	3-1
	3.1.2	Construction Cost Index Updates	3-2
3.2	Wastewater Project Updates		3-2
	3.2.1	Wastewater Go-Projects for Immediate Implementation	3-3
	3.2.1.1	Construct Wastewater Storage Facilities at Tillman	3-4
	3.2.1.2	Construct Wastewater Storage Facilities and Recycled Water Storage at LAG	3-5
	3.2.1.3	Construct Hyperion Treatment Plant Solids Handling and Truck Loading Facility	3-7
	3.2.1.4	Construct Glendale-Burbank Interceptor Sewer	3-9
	3.2.1.5	Construct North East Interceptor Sewer, Phase II	3-9
	3.2.2	Go If Triggered Projects	3-10
	3.2.2.1	Potential Upgrades at Tillman to Advanced Treatment (Current Capacity)	3-11
	3.2.2.2	Potential Expansion of Tillman to 100 mgd with Advanced Treatment	3-13

3.2.2.3 Potential Upgrade of LAG to Advanced Treatment (Current Capacity) 3-13
3.2.2.4 Design/Construction of Secondary Clarifiers at Hyperion to Provide Operation Performance of 450 mgd 3-15
3.2.2.5 Design / Construction of up to 12 Digesters at Hyperion 3-16
3.2.2.6 Prepare Alignment Study, Environmental Documentation, and Subsequent Design/Construction of Valley Spring Lane Interceptor Sewer (VSLIS) 3-17
3.2.2.7 Potential Expansion of Hyperion to 500 mgd 3-17
3.2.3 Wastewater Leadership Projects 3-18
3.3 Runoff Management 3-18
3.3.1 Runoff Management Programmatic Projects 3-19
3.3.1.1 Smart Irrigation 3-20
3.3.1.2 Divert Runoff from Compton Creek to Urban Runoff Plant 3-21
3.3.1.3 Divert Runoff Ballona Creek to Urban Runoff Plant 3-21
3.3.1.4 Divert Runoff from Inland Creeks to Urban Runoff Plants or Treatment Wetlands 3-22
3.3.1.5 Divert Runoff from Coastal Areas to Hyperion 3-22
3.3.1.6 Treat and Beneficially Use/Discharge in Coastal Areas 3-23
3.3.1.7 Neighborhood Recharge in Vacant Lots 3-23
3.3.1.8 Neighborhood Recharge in Parks/Open Space 3-24
3.3.1.9 Neighborhood Recharge in Abandoned Alleys 3-24
3.3.1.10 Onsite Percolation at Schools 3-24
3.3.1.11 Onsite Percolation at Government Facilities 3-25
3.3.1.12 Non-Urban Regional Recharge 3-25
3.3.1.13 Onsite Storage and Use at Schools 3-25
3.3.1.14 Onsite Storage and Use at Government Facilities 3-26
3.3.1.15 New/Redevelopment Areas with Onsite Treatment and Discharge 3-26
3.3.2 Runoff Management Go-Policy Directions and Leadership Projects 3-26
3.3.3 Proposition O Conceptual Projects 3-27
3.3.4 Proposition O Projects in Funding Review 3-27
3.4 Recycled Water 3-28
3.4.1 Potential Recycled Water Projects 3-29
3.4.1.1 Recycled Water Pipelines 3-30
3.4.1.2 Recycled Water Pumping 3-30
3.4.1.3 Diurnal Storage 3-31
3.4.1.4 End User Retrofit 3-31

3.4.1.5 Groundwater Replenishment 3-31
3.4.2 Parallel Projects Underway and Conceptual Projects 3-32
3.4.3 Recycled Water Go-Policy Directions 3-32
3.5 Water Conservation 3-33
3.5.1 DWP Water Conservation Program 3-34
3.5.1.1 Awareness/Support 3-35
3.5.1.2 Residential 3-35
3.5.1.3 Commercial/Industrial/Institutional 3-35
3.5.1.4 Landscape 3-35
3.5.1.5 System Maintenance 3-36

Section 4 Baseline Project Timing and Assumed Triggers 4-1
4.1 Baseline Project Timing for Go Projects 4-1
4.1.1 Wastewater Storage Facilities at Tillman 4-1
4.1.2 Wastewater Storage Facilities at LAG 4-2
4.1.3 Recycled Water Storage at LAG 4-2
4.1.4 HTP Solids Handling/Truck Loading Facility 4-2
4.1.5 GBIS 4-2
4.1.6 NEIS Phase II, West Alignment – Option B 4-3
4.2 Baseline Project Timing for Go If Triggered Projects 4-3
4.2.1 Upgrades at Tillman to Advanced Treatment (Current Capacity) 4-4
4.2.2 Expansion of Tillman to 100 mgd with Advanced Treatment 4-4
4.2.3 Upgrade of LAG to Advanced Treatment (Current Capacity) 4-7
4.2.4 Design/Construction of Secondary Clarifiers at HTP to Provide Operational Performance at 450 mgd 4-7
4.2.5 Expansion of HTP to 500 mgd 4-8
4.2.6 Design/Construction of up to 12 Digesters at HTP 4-8
4.2.7 Alignment Study, Environmental Documentation, and Subsequent Subsequent Design / Construction of Valley Spring Lane Interceptor Sewer 4-8

Section 5 Implementation Tracking 5-1
5.1 IRP Implementation Strategy Committee 5-1
5.1.1 Committee Members 5-1
5.1.2 Meeting Schedule 5-1
5.1.3 Meeting Agenda 5-2
5.2 IRP Implementation Tracking Tools 5-3
5.2.1 Trigger Tracking Tools 5-3
5.2.2 Tracking Go-Policy Directions 5-6
5.2.3 IRP Progress Reporting 5-9

Acknowledgements

Appendices

Appendix A Implementation Strategy
Appendix B Cost Estimating Approach for the IRP Facilities Plan
Appendix C Rough Order of Magnitude Estimate Installation of MF/RO Treatment at LAG and DCT
Appendix D IRP Implementation Flow Charts
Appendix E Trigger Tracking Charts

List of Figures

Figure 1-1 Final IRP Documentation 1-2

Figure 2-1 Quadrant Analysis Approach to Evaluating Alternatives 2-2
Figure 2-2 Illustration of Ranking Scenarios 2-2
Figure 2-3 Quadrant Analysis – Recycled Water 2-6
Figure 2-4 Quadrant Analysis – Dry Weather Runoff 2-7
Figure 2-5 Quadrant Analysis – Wet Weather 2-8
Figure 2-6 Quadrant Analysis – Wastewater 2-9
Figure 2-7 Quadrant Analysis – Integrated Results 2-10
Figure 2-8 Staff-Recommended NEIS Alignment 2-14
Figure 2-9 Staff-Recommended GBIS Alignment 2-15

Figure 3-1 Wastewater Storage Facilities at Tillman 3-4
Figure 3-2 LAG Wastewater and Recycled Water Storage Facilities 3-6
Figure 3-3 Overview of Treatment Plants, Service Area, and Proposed Sewer Lines 3-8
Figure 3-4 Tillman Phase 1 and Phase 2 Proposed Layout 3-12
Figure 3-5 Possible Locations of Proposed MF/RO and UV Facilities 3-14
Figure 3-6 Possible Locations for Biosolids Handling Building, Digesters, and Clarifiers 3-16

Figure 4-1 IRP Go Projects 4-5
Figure 4-2 Go if Triggered Projects 4-5
Figure 4-3 Determining Point in Time of Trigger Flow to Provide Flow Relief Source: Wastewater Collection System Capacity Report and Plan, June 2006 4-9

List of Tables

Table 1-1 IRP Facilities Plan Volume 5: Adaptive Capital Improvement Program 1-3

Table 2-1 Alternative Analysis – Potential Recycled Water Costs and Benefits 2-5
Table 2-2 Alternative Analysis – Dry Weather Runoff Costs and Benefits 2-7
Table 2-3 Alternative Analysis – Wet Weather Runoff Costs and Benefits 2-8
Table 2-4 Alternative Analysis – Wastewater Costs and Benefits 2-9

Table 3-1 IRP Alternative Four Wastewater Estimated Capital Costs - Go – Projects 3-3
Table 3-2 IRP Alternative Four Wastewater Estimated Capital Costs – Go if Triggered Projects 3-11
Table 3-3 IRP Alternative Four Runoff Management Estimated Capital Costs 3-20
Table 3-4 Proposition O Estimated Capital Costs for Runoff Management Conceptual Plans 3-27
Table 3-5 Proposition O Estimated Capital Costs for Projects in Funding Review 3-28
Table 3-6 IRP Alternative Four Recycled Water Estimated Capital Costs 3-30
Table 3-7 Recycled Water Projects Parallel to IPR Estimated Capital Costs for Underway and Conceptual Projects 3-32
Table 3-8 Water Conservation Measures (Potential and Existing) 3-34

Table 5-1 Implementation Strategy Committee 5-2
Table 5-2 Plant Scenarios 5-4
Table 5-3 IRP Go-Policy Directions 5-7

Section 1
Introduction

1.1 Background

The City of Los Angeles has embarked on a unique approach of technical integration and community involvement to guide policy decisions and water resources facilities planning. The Integrated Resources Plan (IRP) incorporates a future vision of water, wastewater and runoff management in the City that explicitly recognizes the complex relationships that exist among all of the City's water resources activities and functions. Addressing and integrating the water, wastewater and runoff needs of the City in the year 2020, the IRP also takes important steps toward comprehensive basin-wide water resources planning in the Los Angeles area. This integrated process is a departure from the City's traditional single-purpose planning efforts for separate agency functions, and it will result in greater efficiency and additional opportunities for citywide benefits, including potential overall cost savings. This integrated process also highlights the benefits of establishing partnerships with other city-wide and regional agencies, City departments and other associations, both public and private.

The IRP seeks to accomplish two basic goals as part of developing an implementable facilities plan:

- Integrate water supply, water conservation, water recycling and runoff management issues with wastewater facilities planning through a regional watershed approach, and

- Enlist the public in the entire planning and design development process from a very early stage beginning with the determination of policy recommendations to guide planning.

The IRP is a multi-phase program:

- Phase I – Integrated Plan for the Wastewater Program (IPWP) (completed in 2001): Focused on defining the future vision for the City by developing a set of guiding principles to direct future, more detailed water resources planning.

- Phase II – Integrated Resources Plan: Focuses on the more detailed planning required to develop a facilities plan, an environmental impact report and a financial plan.

- Projects – Implementation (2006 and beyond): Includes future concept reports, studies, demonstration and pilot projects, and design and construction projects to implement the capital improvement program (CIP) developed as part of Phase II.

The City is facing many challenges including: the dynamic nature of current and projected regulations affecting the recycled water, runoff and wastewater programs;

potential community concerns with expansion of existing wastewater facilities or siting new wastewater, runoff and recycled water facilities in neighborhoods; potential funding needs for the proposed facilities and programs, and the importance of inter-agency coordination to handle jurisdictional issues. By addressing these challenges now as part of the IRP, the City will move forward towards having the structure and tools in place to adapt to changing conditions in the future.

The combination of Phases I and II constitute the documentation and overall implementation plan for the IRP, which is intended as an integration of the City's water (water reuse/recycle and water conservation), wastewater (collection, treatment and biosolids) and runoff (dry weather and wet weather) service functions. By using this integrated approach, the City will establish a framework for a sustainable future for the Los Angeles basin, one where there are sufficient wastewater services, adequate water supply and proper and proactive protection and restoration of the environment.

1.2 Overview of Document

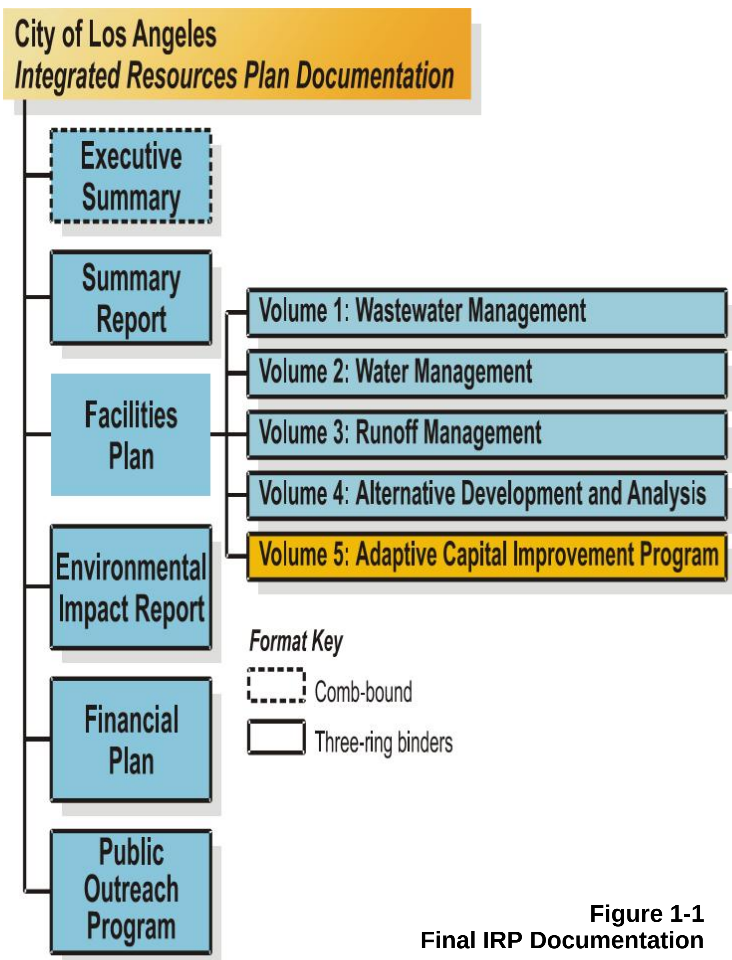


Figure 1-1
Final IRP Documentation

The IRP documentation includes a series of volumes consisting of an Executive Summary; a Summary Report; Facilities Plan (five volumes); a Final Environmental Impact Report (EIR); a Financial Plan; and a Public Outreach document. Each volume will include sections and subsections. Figure 1-1 illustrates the organization of these volumes.

As part of developing the IRP, over 20 preliminary alternatives were developed and evaluated, by a stakeholder group defined by a participatory decision-making stakeholder process. From the preliminary alternatives, four alternatives were selected

For further evaluation in an Environmental Impact Report (EIR), prepared in accordance with California Environmental Quality Act (CEQA) requirements. Preliminary capital cost estimates were developed for the four alternatives with the intent to develop a preferred strategy with further refinement once a staff-recommended alternative was selected. During the interim period in which the EIR was completed, minor changes have occurred to all alternatives, with impacts on capital costs. As part of finalizing the EIR and transitioning into implementation, staff have recommended an alternative for implementing the City's wastewater, runoff, and recycled water programs to meet year 2020 system needs.

IRP Facilities Plan, Volume 5: Adaptive Capital Improvement Program (CIP) has been developed to reflect the staff-recommended alternative and includes changes in capital costs and project schedules for the staff-recommended alternative since completion of the preliminary capital cost estimates contained in the Facilities Plan. This staff-recommended alternative has component projects and policy directions that are ready for initiation, as well as projects that are contingent on specific conditions that could trigger the need for implementation. It is this flexibility that characterizes the adaptive nature of this CIP, and drives the establishment of a working group to monitor these trigger conditions. A framework for this group is provided as part of this Adaptive CIP. Table 1-1 provides a description of each of the sections of this document.

Table 1-1
IRP Facilities Plan
Volume 5: Adaptive Capital Improvement Program

Section	Description
1 – Introduction	Background of IRP and objectives of Volume 5
2 – Recommended Alternative	Overview of approach used for selection of staff-recommended alternative and overview of staff-recommended alternative
3 – Capital Cost Data Updates	Updated capital cost data for staff-recommended alternative
4 – Baseline Project Timing and Assumed Triggers	Description of project timing and assumed triggers for wastewater components of staff-recommended alternative
5 – Implementation Tracking	Description of the mechanisms and tools to facilitate implementation of projects and policies amongst the various Divisions and Bureaus
Appendices	Supporting documentation

Section 2
Recommended Alternative

2.1 Approach for Selecting Recommended Alternative

To select a recommended alternative, staff relied on: (1) the information contained in the Environmental Impact Report (EIR) (including the project objectives, environmental analysis, and public comments on the Draft EIR) and (2) updated IRP Facilities Plan quadrant analysis that evaluated the preliminary alternatives originally discussed in the IRP Facilities Plan.

2.1.1 Background on Alternatives Development

For the IRP Facilities Plan, the City of Los Angeles conducted extensive and iterative stakeholder meetings with a Steering Group to develop alternatives that would achieve the multiple objectives of the IRP Facilities Plan. The Steering Group comprises interested parties and individuals with an interest in the long-term planning of the City's recycled water, runoff management and wastewater systems. The City of Los Angeles, in association with the Steering Group, developed over 20 preliminary project alternatives that addressed future (2020) wastewater, recycled water, and runoff needs. The City of Los Angeles used the information from the Steering Group as the basis for ranking preliminary alternatives, and those that ranked lowest were eliminated from further consideration. The details of the development and evaluation of the preliminary project alternatives are contained in the *IRP Facilities Plan: Volume 4 - Alternatives Development and Analysis* (City of Los Angeles, 2004). The remaining alternatives were further evaluated in terms of the extent to which they addressed wastewater needs, provided leadership in water resources, and incorporated fiscal conditions. Applying various criteria, the alternatives initially considered by City were reduced to four as described in the IRP Facilities Plan and subsequently carried forward for analysis in the IRP EIR. (In addition to these build alternatives; a no-build alternative was also evaluated in the Draft EIR to comply with the requirements of CEQA to assess a No Project alternative.)

The IRP alternatives make use of different mixes of components and different levels of use intensity to meet the project goals. Although they may not substantially differ from one another in terms of wastewater capacity, recycled water use, or runoff management, they represent a reasonable range of alternatives given the City's existing wastewater treatment and conveyance infrastructure, runoff infrastructure, recycled water infrastructure, existing and future regulatory environment, and future population projections. Future population projections were developed by the Southern California Association of Governments (SCAG).

2.1.2 EIR Analysis Approach

Potentially significant impacts associated with the final alternatives were examined in the Draft EIR in accordance with the California Environmental Quality Act (CEQA). In addition to considering the relative differences in environmental impacts among the alternatives, staff also considered the comments received on the Draft EIR. (Chapter 3 in Volume 2 of the Final EIR contains copies of the comments received and responses to those comments.) Staff also reviewed the comments on the Draft EIR that focused on system-wide issues to help identify the Recommended Alternative.

2.1.3 Quadrant Analysis Approach

To evaluate the final alternatives, the team used a quadrant analysis method to evaluate the costs and benefits of the alternatives. This analysis was originally conducted as part of the evaluation of the preliminary alternatives in the Facilities Plan and is summarized in the IRP Facilities Plan *(IRP Facilities Plan: Volume 4 - Alternatives Development and Analysis* (City of Los Angeles, 2004)). The concept of the quadrant analysis is to use a grid to plot the benefits and costs of each alternative. As shown in Figure 2-1, different quadrants are more optimal than others, based on the ranking of benefits to costs. For example, the upper left quadrant (shown in green in the figure) is more desirable, because it reflects alternatives with high benefits and low costs. The lower right quadrant (shown in pink in the figure) would be least desirable, because it reflects alternatives with low benefits and high costs.

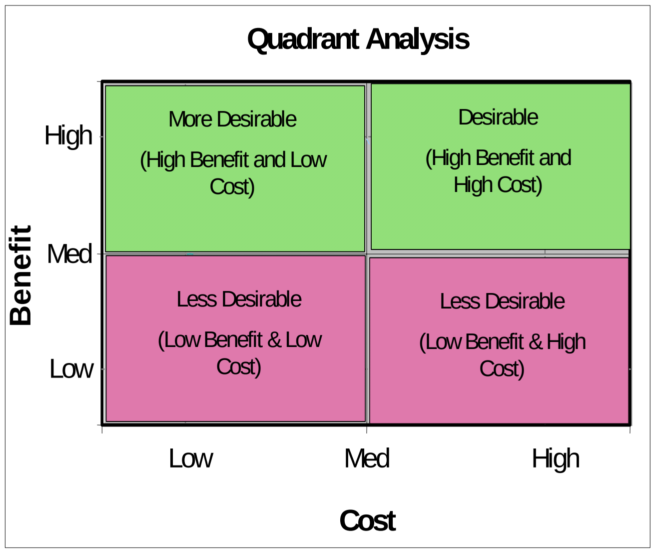


Figure 2-1
Quadrant Analysis Approach to Evaluating Alternatives

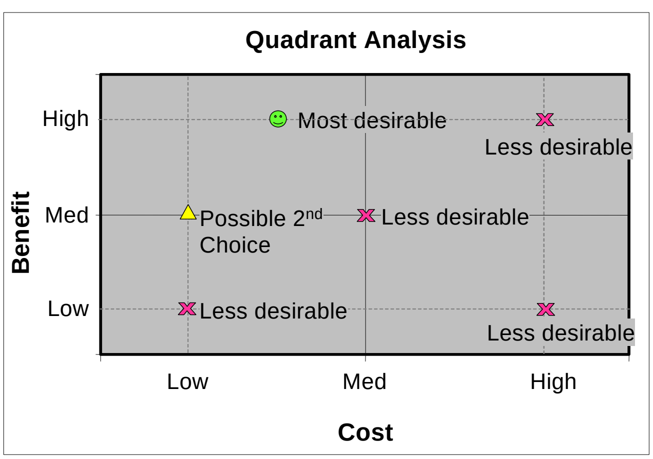


Figure 2-2
Illustration of Ranking Scenarios

As shown in Figure 2-2, when plotting the benefits and costs on the quadrant chart, alternatives in the most desirable quadrant (high benefit and low cost) would be considered more desirable than an alternative with higher cost but the same or lower benefit because it most clearly meets the established and ranked criteria. Similarly, an alternative with a lower benefit for the same cost would be considered less desirable. If costs are of concern, then a potential second choice would be an alternative with lower costs (compared to the desirable alternative) and slightly lower benefits. If costs are not of concern, then a possible second choice would be an alternative with higher costs (compared to the desirable alternative) and slightly higher costs. These possible ranking scenarios are shown in Figure 2-2.

To apply the quadrant analysis approach for the IRP, the City conducted the following steps:

- Defined the benefits for the separate service functions (i.e., recycled water, dry and wet runoff management, and wastewater).
- Plotted the benefits and costs for each alternative on the quadrant chart for each separate service function.
- Compared the results by service function and prioritized the highest ranking to the lowest ranking alternative for each service function
- Compared the service function quadrant charts and counted the number of times each alternative achieved first or second place ranking.

As discussed earlier, this analysis was originally conducted as part of the evaluation of the preliminary alternatives in the Facilities Plan and is summarized in the IRP Facilities Plan *(IRP Facilities Plan: Volume 4 - Alternatives Development and Analysis* (City of Los Angeles, 2004). The evaluation was used to select the four alternatives that would be further evaluated in the Draft EIR. Now we are using the same analysis to assist staff in identifying the preferred alternative. Where possible, staff did not rescale the results of the analysis, despite having four alternatives to compare, rather than over 12 from the Facilities Plan. Therefore, the cost and benefits definitions, as well as the results for recycled water and wet weather runoff management are unchanged from the analysis conducted in the Facilities Plan. For dry weather runoff, the benefits were slightly modified to take into account both volume of runoff managed and the beneficial use of the runoff. For wastewater management, the benefits were redefined to prevent "double counting" of recycled water benefits.

2.2 Analysis of Alternatives

Using the previously discussed EIR and quadrant analysis approach the final alternatives were analyzed to select a Recommended Alternative.

2.2.1 EIR Alternative Analysis

As discussed in the Draft EIR (see Table ES-1 in the Draft EIR Executive Summary), the majority of the potentially significant impacts are associated with components that are common to all of the IRP alternatives, such as the proposed new sewer alignments. Differences in impacts between alternatives are most prevalent when considering alternate locations of proposed wastewater treatment facilities. For example, all proposed alternatives would result in potential odor impacts related to increased wastewater treatment capacity, but the potential for impact differs depending on where a given alternative focuses the expansion of treatment capacity. For that reason, Alternative 1 was identified as the Environmentally Superior Alternative because it would result in lower use of energy and less air pollutant emissions.

Staff reviewed the comments on the Draft EIR that focused on system-wide issues to help identify the recommended alternative. In general, the comment letters that made recommendations for specific systemwide alternatives emphasized the following:

- Expand treatment plants in areas distant from homeowners (e.g., the Homeowners of Encino requested that Alternative 1 be selected because it avoids expansion of Donald C. Tillman (Tillman) in the Sepulveda Basin).
- Maximize sustainability and select either Alternative 2 and/or Alternative 4, because either of these alternatives would use a watershed approach (e.g., Mono Lake Committee),
- Maximize use and reuse of urban runoff (e.g., Heal the Bay) and maximize recycled water production at LAG (e.g., City of Glendale).

In the consideration of the comments on the Draft EIR regarding the Recommended Alternative, staff prioritized comments that addressed system sustainability.

During the public comment period for the Draft EIR, numerous comments were received on the proposed GBIS alignments. Many who commented in the Burbank area expressed concern about potential GBIS construction and facilities at the Valley Heart shaft site, Riverside East shaft site, and Riverside West shaft site, all of which are located along the eastern half of the GBIS North Alignment. Toluca Lake area residents and Forest Lawn also commented on the GBIS South Alignment, in particular, the western portion of the GBIS South Alignment. In addition, comments were received on a possible construction shaft site and air treatment facility at Woodbridge Park due to its proximity to the school as well as the use and access of the Park. Interim communication occurred between the City of Los Angeles and the City of Burbank subsequent to the close of the public comment period. These interim activities included meetings and correspondence that focused on the relative merits of the proposed alignments for GBIS. The meetings were conducted to review constraints and issues associated with an alignment along the Los Angeles River channel, review any additional information provided by the city of Burbank related to their concerns about the GBIS alignments, and consider other measures to further reduce potential impacts to residents.

2.2.2 Quadrant Analysis

2.2.2.1 Recycled Water Analysis

Definition of Recycled Water Benefits

An IRP guiding principle is to produce and use as much recycled water as possible from existing and planned facilities. Therefore, higher benefits were assigned to alternatives that produced and used higher amounts of recycled water.

Recycled water benefits were defined as:

- Volume of recycled water (in acre-foot per year) from wastewater effluent that could be beneficially used for irrigation and industrial purposes.

Recycled Water Results

Using the defined benefits, the City assigned recycled water costs and benefits scores for the alternatives. Table 2-1 presents a summary of the results.

Table 2-1
Alternative Analysis – Potential Recycled Water Costs and Benefits

Alternative[1]	Recycled Water Costs		Recycled Water Benefits	
	Results	Capital Cost ($mil)[2]	Results	Reason for Results (volume)
Alt 1	Med	$374	Med	Up to 38,700 AF/yr
Alt 2	Med-High	$516	Med-High	Up to 49,900 AF/yr
Alt 3	Med	$443	Med	Up to 40,100 AF/yr
Alt 4	Med-High	$544	Med-High	Up to 52,800 AF/yr

Notes:
[1] For detailed discussion of components of each alternative, see Facilities Plan Volume 4, Section 6.
[2] Capital costs are from the IRP Facilities Plan, Volume 4, are presented in $2004 dollars, and are appropriate for conducting relative comparisons.

Figure 2-3 shows the quadrant chart for the recycled water benefits and costs. As shown in the figure, Alt 2 and 4 are more desirable, because they provide Med-High benefits with Med- High costs. Alternatives 1 and 3 are possible second choices if cost is a concern.

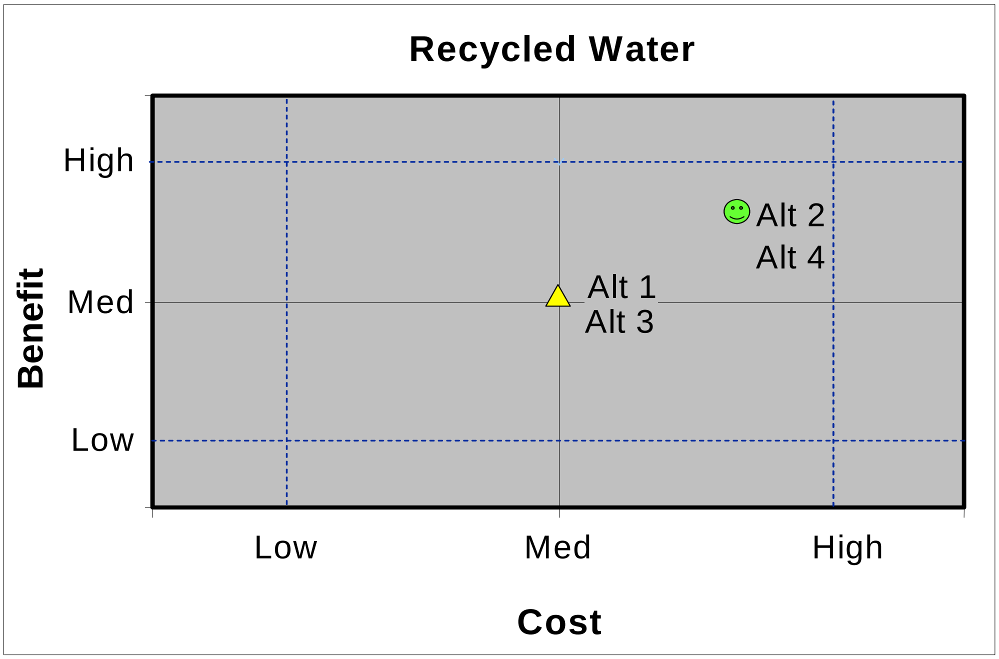


Figure 2-3
Quadrant Analysis – Recycled Water

2.2.2.2 Runoff Management Analysis

Definition of Runoff Management Benefits

The IRP guiding principles also included increasing the amount of dry weather and wet weather urban runoff that is diverted and treated or captured and beneficially used. Therefore, for the quadrant analysis, runoff management benefits for both dry and wet weather runoff were defined as a combination of potential volume of runoff managed and volume of runoff beneficially used. Beneficial use was defined as options that offset potable water use or provide natural treatment methods (e.g., constructed wetlands). The definitions of runoff management benefits for both dry and wet weather runoff were defined as a combination of:

- Volume of runoff managed
- Volume of runoff beneficially used

For this analysis, beneficial use was defined as options that offset potable water use, such as: smart irrigation, urban runoff plants (URPs), local/neighborhood solutions (cisterns, on-site percolation, neighborhood recharge), and non-urban regional recharge.

Dry Weather Runoff Management Results

Using the defined benefits, the City assigned dry weather runoff management costs and benefits scores for the alternatives. Table 2-2 presents a summary of the results.

Table 2-2
Alternative Analysis – Dry Weather Runoff Costs and Benefits

	Dry Runoff Costs		Dry Weather Runoff Benefits		
Alternative[1]	Results	Capital Cost ($mil)[2]	Results	Reason for Results (volume)	Reason for Results (beneficial use)
Alt 1	Med	$274	Med-High	High - 42 percent managed	Med - Smart irrigation & diversion to wastewater system, and reuse through some URPs/wetlands
Alt 2	High	$591	High	High - 42 percent managed	High – Smart irrigation & reuse through URPs/wetlands
Alt 3	Med	$250	Med	Med - 26 percent managed	Med – Smart irrigation & reuse through some URPs/wetlands
Alt 4	High	$591	High	High - 42 percent managed	High – Smart irrigation & reuse through URPs/wetlands

Notes:
[1] For detailed discussion of components of each alternative, see Facilities Plan Volume 4, Section 6.
[2] Capital costs are from the IRP Facilities Plan, Volume 4, are presented in $2004 dollars, and are appropriate for conducting relative comparisons.

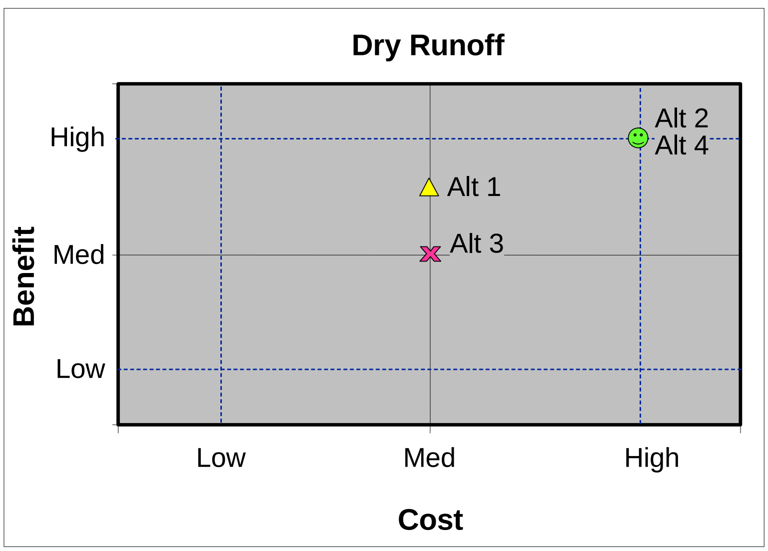


Figure 2-4
Quadrant Analysis - Dry Weather Runoff

Figure 2-4 shows the quadrant chart for the dry weather runoff benefits and costs. As shown in the figure, Alternatives 2 and 4 provide high benefit. Alternative 1 is a potential second choice if cost is a concern, because it provides medium-high benefits at medium costs. Alternative 3 is not selected because it generates fewer benefits than Alternative 1 for the same cost.

Wet Weather Runoff Management Results

Using the defined benefits, the City assigned wet weather runoff management costs and benefits scores for the alternatives. Table 2-3 presents a summary of the results.

Table 2-3 Alternative Analysis – Wet Weather Runoff Costs and Benefits					
	Wet Runoff Costs		Wet Weather Runoff Benefits		
Alternative[1]	Results	Capital Cost ($mil)[2]	Results	Reason for Results (volume)	Reason for Results (beneficial use)
Alt 1	Med	$1,597	Med - High	High – 47 percent[3]	High – Onsite percolation and storage/use
Alt 2	Med	$1,597	Med - High	High – 47 percent[3]	High – Onsite percolation and storage/use
Alt 3	Med	$1,666	Med	Med – 39 percent[3]	Med – Neighborhood recharge
Alt 4	Med	$1,597	Med - High	High – 47 percent[3]	High – Onsite percolation and storage/use

Notes:
[1] For detailed discussion of components of each alternative, see Facilities Plan Volume 4, Section 6.
[2] Capital costs are from the IRP Facilities Plan, Volume 4, are presented in $2004 dollars, and are appropriate for conducting relative comparisons.
[3] Percent of estimated runoff generated from a ½ inch storm citywide.

Figure 2-5 shows the quadrant chart for the wet weather runoff benefits and costs. As shown in the figure, Alt 1, 2, and 4 are of greater merit, because they provide medium-high benefits with medium costs. Alt 3 is not selected because it provides fewer benefits at the same cost as the other alternatives.

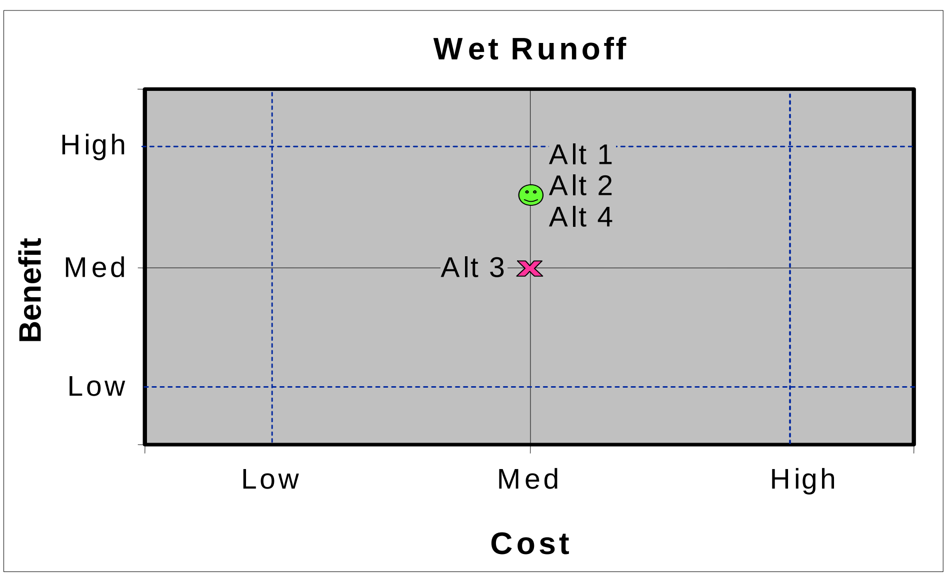


Figure 2-5
Quadrant Analysis – Wet Weather Runoff

2.2.2.3 Wastewater Analysis

Definition of Wastewater Benefits

On the basis of past investment and resources in the Hyperion Treatment Plant (HTP), wastewater benefits were defined in direct correlation to the volume of wastewater treated at that plant. Therefore, for the quadrant analysis, a high benefit was assigned to alternatives that enhanced capacity at HTP, a medium benefit to alternatives that enhanced capacity at one upstream plant (e.g., Tillman) and a low benefit to alternatives that enhanced capacity at both Tillman and LAG.

Wastewater Results

Using the defined benefits, the City assigned wastewater costs and benefits scores for the alternatives. Table 2-4 presents a summary of the results.

Table 2-4
Alternative Analysis – Wastewater Costs and Benefits

	Wastewater Costs		Wastewater Benefits	
Alternativ[1]	**Results**	**Capital Cost ($mil)**[2]	**Results**	**Reason for Results**
Alt 1	Low	$631	High	Expands Hyperion
Alt 2	High	$841	Low	Expands upstream at Tillman and LAG
Alt 3	Med	$817	Med	Expands upstream at Tillman
Alt 4	Med	$817	Med	Expands upstream at Tillman

Notes:
[1] For detailed discussion of components of each alternative, see Facilities Plan Volume 4, Section 6.
[2] Capital costs are from the IRP Facilities Plan, Volume 4, are presented in $2004 dollars, and are appropriate for conducting relative comparisons.

Figure 2-6 shows the quadrant chart for the wastewater benefits and costs. As shown in the figure, Alt 1 is the highest ranked when considering wastewater only, because it provides high benefit (i.e., expands at HTP) with low costs. Alt 3 and 4 are potential second choices, because they expand at Tillman with medium costs. Alt 2 is not desirable, because it provides fewer benefits at higher costs.

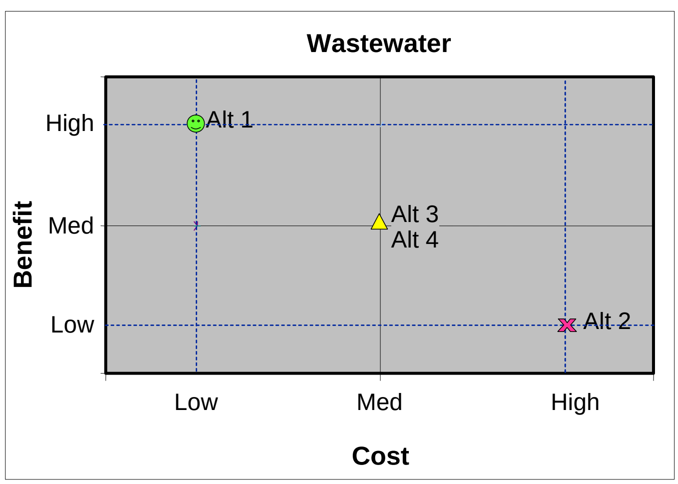


Figure 2-6
Quadrant Analysis – Wastewater

2.2.2.4 Integrated Results

After evaluating the alternatives for each service function, the next step was to consider the alternatives as an integrated system. The City compared each of the service function quadrant charts (Figures 2-3 through 2-6) and counted the number of times each alternative was ranked first or second.

Figure 2-7 presents a summary of the four alternatives and how they scored relative to the four service functions.

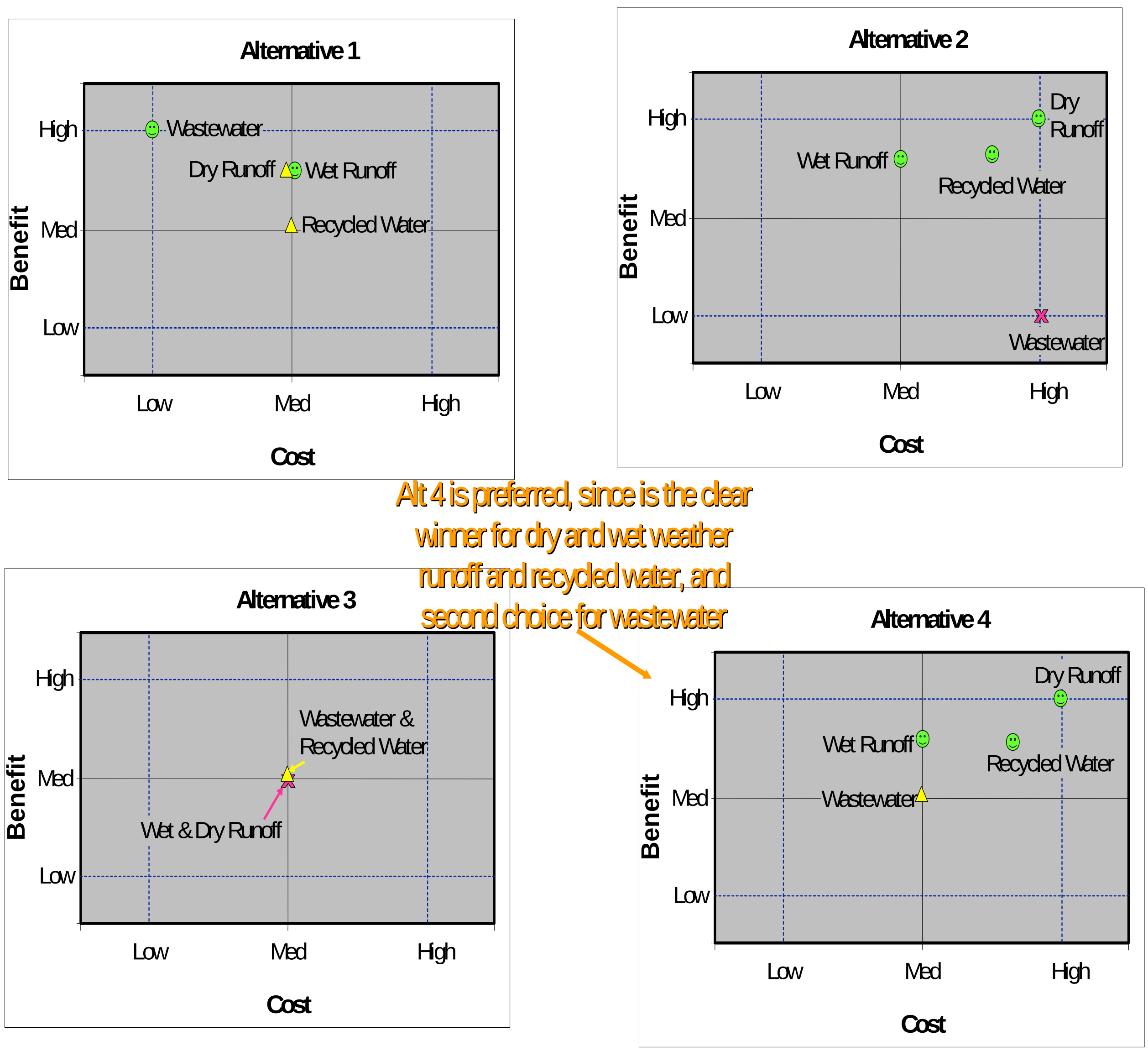


Figure 2-7
Quadrant Analysis – Integrated Results

Using the defined benefits and estimated costs, staff evaluated each alternative for each service function, and then considered them as an integrated system. After counting the times each alternative ranked as first or second choice and analyzing the results, the staff recommended the following ranking of alternatives:

1. Alternative 4 (highest ranked for recycled water, dry weather runoff and wet weather runoff, and possible second choice for wastewater): Alternative 4 as the Preferred Alternative is attributable to a great extent to its recycled water benefits. Changes in future regulations regarding the use of recycled water or future policy decisions regarding the use of recycled water for groundwater replenishment could reduce these recycled water benefits. If those conditions occurred, then Alternative 1 could be considered a potential second choice, on the basis of its lower costs and high benefits.

2. Alternative 1 (highest ranking for both wastewater and wet weather runoff, and possible second choices for dry weather runoff and recycled water)

3. Alternative 2 (highest ranking for recycled water, wet weather runoff and dry weather runoff, but not desirable for wastewater): Alternative 2 was ranked third and therefore not preferred, because it produced similar recycled water and runoff management benefits as Alternative 4, but at higher costs. Also, it provided low benefits for the wastewater system, since it relied on expansion of two water reclamation plants, thereby impacting multiple neighborhoods.

4. Alternative 3 (possible second choices for wastewater and recycled water): Alternative 3 was ranked last and therefore not preferred, due to its lower recycled water, wastewater and runoff benefits compared to all the other alternatives. In addition its costs were similar to Alternative 1, which provided more benefits.

2.3 Overview of Recommended Alternative (Alternative 4)

On the basis of the analysis conducted in the EIR, the comments received on the Draft EIR, and an updated IRP Facilities Plan quadrant analysis that evaluated the preliminary alternatives originally discussed in the IRP Facilities Plan, Alternative 4 (expansion at Tillman with high potential for water resources projects) is the Recommended Alternative. Alternative 4 reserves the ability for future needed expansion at Tillman, while recognizing groundwater replenishment potential. The Adaptive CIP is based on the Alternative 4 components discussed in this section. Capital costs for the other alternatives are not presented in this Adaptive CIP.

Alternative 4 is recommended based on its recycled water benefits. If in the future the use of recycled water from Tillman for groundwater replenishment or other recycled water uses is considered infeasible based on a combination of factors, (including public acceptability, costs, future regulations, and the need for additional treatment capacity) then Alternative 1 would be considered the Recommended Alternative.

Alternative 1 focuses its wastewater treatment expansion only at HTP by increasing its current capacity from 450 mgd to 500 mgd. Alternative 4 would focus wastewater treatment expansion only at Tillman.

2.3.1 Implementation Strategy

The *Implementation Strategy,* dated September 2006 (see Appendix A), for the IRP will be directed by certain "triggers" that include policy decisions regarding recycled water and groundwater replenishment, regulatory requirements regarding more restrictive permits for discharge of water into the Los Angeles River, and the need for additional wastewater treatment capacity.

For example, the decision to upgrade to advanced treatment at Tillman will be dependent on future regulations regarding discharge to the Los Angeles River and the use of recycled water, and/or policy decisions regarding use of recycled water for groundwater replenishment, thereby requiring partnership between the Department of Public Works (DPW) and the Department of Water and Power (DWP). If groundwater replenishment is not feasible based on a combination of factors including public acceptability, costs, or future regulations when expansion is needed, then expansion could occur at HTP (i.e., Alternative 1).

Also, if regulatory permit requirements result in a need for advanced treatment to discharge to the Los Angeles River or if recycled water requirements result in higher treatment requirements, then advanced treatment could be added to LAG at existing capacity, which would require partnership and coordination with the City of Glendale.

The implementation strategy for the IRP is organized into three categories of projects:

- Go Projects: projects that have been evaluated under the IRP EIR as a site-specific project and are recommended for immediate implementation because their associated triggers have been met.
- Go If Triggered Projects: projects that have been recommended for future implementation if a specific trigger occurs.
- Go-Policy Directions: specific directions to staff on the next studies and evaluations required to provide progress on the programmatic elements in the Recommended Alternative.

All of the Go Projects and most of the Go If Triggered Projects were evaluated in the EIR at a project-level. Because the conservation, runoff management, and recycled water components of the Recommended Alternative were evaluated in the EIR as programmatic elements, they require Go-Policy Decisions regarding the future study and environmental analysis that will be required before implementation.

Section 4 provides details on the timing and assumed triggers for the Go and Go If Triggered Projects. Section 5 provides details regarding implementation of the projects and policies.

2.3.2 Wastewater Components

Alternative 4 includes expanding the Donald C. Tillman Water Reclamation Plant (Tillman) from its assumed current capacity of 80 million gallons per day (mgd) to 100 mgd, upgrading its treatment processes to advanced treatment, and adding wastewater storage; adding new collection system sewers; adding wastewater and recycled water storage at the Los Angeles-Glendale Water Reclamation Plant (LAG); and adding a truck loading facility, digesters and secondary clarifiers to the HTP. The Recommended Alternative also includes adding advanced treatment to LAG at existing capacity, if regulatory permit requirements result in a need for advanced treatment to discharge to the Los Angeles River or if recycled water requirements result in higher treatment requirements. Implementation of advanced treatment at LAG would require partnership and coordination with the City of Glendale.

Recommended NEIS II Alignment

In evaluating which NEIS II alignment would be recommended for implementation, staff considered the following:

- Constructability
- Availability of right-of-way
- Other factors including hazardous materials and accessibility

Based on these considerations, staff has identified the NEIS II West Alignment, Option B as the recommended NEIS II alignment. The shaft sites that would be used to construct the NEIS II West Alignment are the Division Street shaft site, the Crystal Springs shaft site, and the Pecan Grove shaft site. Figure 2-8 illustrates the staff-recommended NEIS alignment.

Recommended GBIS Alignment

In evaluating which GBIS alignment would be considered for implementation, staff considered the following:

- Key concerns about potential impacts
- Surface construction activity
- Contingency response
- System relief

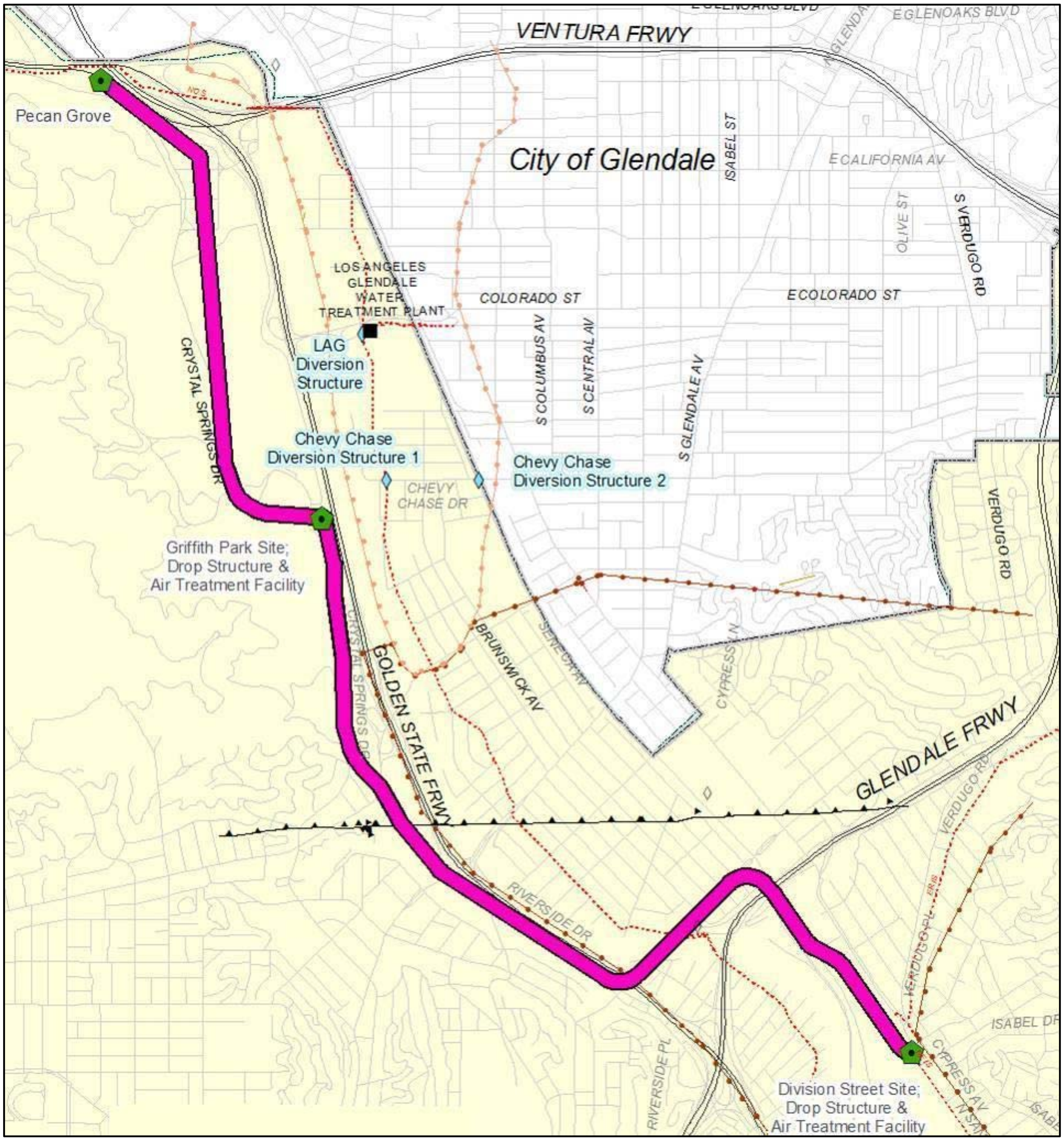


Figure 2-8
Recommended-NEIS Alignment

Based on these considerations, staff has identified a GBIS alignment, the Combined Alignment – Option A, that connects the eastern half of the GBIS South Alignment with the western half of the GBIS North Alignment, with a short section of tunnel beneath Pass Avenue in the City of Burbank as illustrated in Figure 2-9. Because the GBIS North and GBIS South Alignments have been evaluated in the Draft EIR, and because the recommended GBIS Alignment does not constitute a new project component (i.e., the recommended GBIS Alignment combines portions of the GBIS North Alignment and GBIS South Alignment in a way that further minimizes impacts.) The former proposed alignments would be joined by a ½ mile connector along Pass Avenue, which would not result in new significant impacts.

To further minimize potential impacts, the following shaft sites are proposed with the recommended GBIS alignment: Pecan Grove shaft site with an air treatment facility, Travel Town shaft site, Barham shaft site and Caltrans North Hollywood Maintenance Yard shaft site with an air treatment facility.

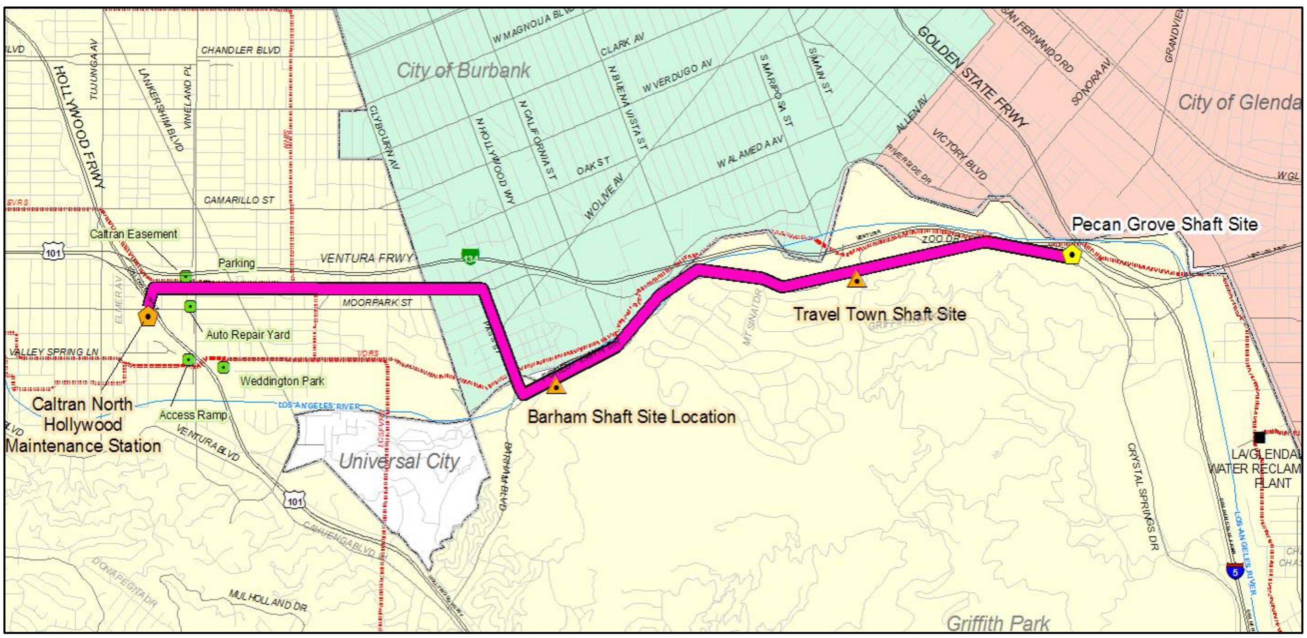


Figure 2-9
Recommended GBIS Alignment

Valley Spring Lane Interceptor Sewer (VSLIS):
VSLIS would be comprised of approximately 8 ½ mile interceptor and associated structures that would extend from the Toluca Lake area, northwest to Tillman. This project was evaluated at a program-level in the EIR and would require further study/analysis.

2.3.3 Runoff Management

Alternative 4 includes smart irrigation, diversion of runoff from creeks to urban runoff plants; treatment and beneficial reuse/discharge of runoff in coastal areas, non-urban regional recharge; onsite percolation of wet weather runoff at schools and government properties; neighborhood-scale percolation at vacant lots, parks/open space, and abandoned alleys in the east valley; and onsite cisterns for storage and reuse at schools and government facilities for management of up to 42 percent of the dry weather and 47 percent of wet weather urban runoff generated in the City. The timing and specifics of runoff management implementation will be coordinated with the Total Maximum Daily Load (TMDL) requirements and subsequent Implementation Plans.

2.3.4 Recycled Water and Water Conservation

Potential recycled water projects under Alternative 4 may result in the saving of up to 42,000 acre-feet per year of recycled water for non-potable uses. Projects include installing recycled water distribution pipelines, pump stations, diurnal storage facilities, and end user retrofits.

Alternative 4 also calls for continued implementation of water conservation programs, such as smart irrigation devices to reduce outdoor water use and urban runoff. Water conservation in the IRP is designed to complement the Department of Water and Power's (DWP) Urban Water Management Plan (UWMP) process by providing input towards the creation of conservation measures.

Section 3
Capital Cost Data Updates

Updated capital cost data were developed for the Recommended Alternative (Alternative 4) for wastewater, runoff management, and recycled water components and the HTP treatment capacity expansion component of Alternative 1. Updates presented here reflect the latest assumptions and minor conceptual changes that have occurred since the completion of the Facilities Plan in July 2004.

3.1 Assumptions

Estimated capital cost data and associated assumptions used to develop the data were originally presented in the IRP Facilities Plan, Volume 4: Alternatives Development and Analysis, Appendix S, Unit Costs (Wastewater, Recycled Water, and Runoff) (July 2004). This cost data was utilized as a starting point and updated with revised assumptions to reflect current conditions. Cost factors and cost index adjustments were applied to the original capital costs to arrive at the Adaptive CIP. All capital costs presented in the Adaptive CIP are expected to be greater than listed as a result of inflation as projects will be constructed in the future. Not included in the costs presented here are the costs associated with the City's baseline Wastewater Capital Improvement Program (WCIP), stormwater CIP, and Department of Water and Power CIP, which are significant and needed for rehabilitation of the current system, near-term regulatory and system requirements, and security purposes.

3.1.1 Cost Factors

Updated capital costs presented include both estimated construction costs and construction mark-ups. Total construction mark-ups included in the estimated capital cost include: overhead at 7 percent, profit at 7 percent, mobilization at 7 percent, bond and insurance at 2 percent, and contingency at 15 percent unless otherwise noted. Total construction mark-ups are cumulative resulting in a total mark-up of 44 percent. For example, if a project's construction cost estimate was $1,000,000, then the following would represent the total markup:

(1) $1,000,000 (raw construction cost estimate) x 1.07 (overhead) = $1,070,000

(2) $1,070,000 (new subtotal) x 1.07 (profit) = $1,144,900

(3) $1,144,900 (new subtotal) x 1.07 (mobilization) = $1,225,043

(4) $1,225,043 (new subtotal) x 1.02 (bond/insurance) = $1,249,544

(5) $1,249,544 (new subtotal) x 1.15 (contingency) = $1,436,975

Therefore, in this example, the total construction cost markup would be:

(6) $1,436,975 – $1,000,000 = $436,975 (or a 44% markup)

Non-construction mark-ups for program management, engineering studies/basin design services, construction management services, and start-up costs totaling 30 percent are also included within the estimated capital costs unless otherwise noted. Therefore, in order to get the non-construction cost markup a factor of 0.30 should be multiplied by the construction cost estimate (without construction cost markups). In the above referenced example, this would yield:

(7) $1,000,0000 (construction cost estimate) x 0.30 (non-construction cost markup) = $300,000

Therefore, the total capital cost for this example project would equal:

(8) raw construction cost estimate = $1,000,0000

(9) construction cost markup, see equation (6) = $436,975

(10) non-construction cost markup, see equation (7) = $300,000

(11) total capital cost = $1,000,000 + $436,975 + $300,000 = 1,736,975

Further explanation of these costs and assumptions used to develop the original capital costs are provided in Technical Memorandum: Cost Estimate Approach for the IRP Facilities Plan dated May 12, 2003 (Appendix B) and Appendix S, Unit Costs (Wastewater, Recycled Water, and Runoff) of the *IRP Facilities Plan, Volume 4: Alternatives Development and Analysis,* dated July 2004.

3.1.2 Construction Cost Index Updates

Capital cost estimates for the IRP were updated to reflect March 2006 dollars. Capital cost estimates for projects developed as part of the IRP are based on September 2002 dollars. Capital costs presented in the Facilities Plan were developed to an Engineering News Record (ENR) Construction Cost Index (CCI) of 7414 for Los Angeles for September 2002.

Capital costs presented in the Adaptive CIP are updated to March 2006 dollars using an ENR CCI of 8552 for Los Angeles. To reflect the updated ENR CCI a factor of 1.153 was applied to all September 2002 capital costs.

3.2 Wastewater Project Updates

Capital cost estimates for the wastewater component of IRP Alternative 4 were updated to reflect March 2006 dollars and changes to assumptions utilized in the Facilities Plan. Total capital costs in the Facilities Plan for the wastewater component were estimated at approximately $807 million in September 2002 dollars. Current estimated capital costs in March 2006 dollars are approximately $1,882 million, inclusive of Go, Go If Triggered, and Leadership Projects. This increase reflects changes in assumptions, as outlined below, and an increase in the ENR CCI for Los Angeles. Disregarding changes to the project components and taking into account an increase solely in the ENR CCI results in an estimated capital cost increase of approximately $123 million for a total of $930 million in March 2006 dollars.

Alternative 4 includes components that are well defined and components that are more conceptual. The well-defined components for Alternative 4 are site specific and therefore, more detailed capital cost data is available. Conceptual components will require additional detailed study and environmental analysis resulting in the formation of conceptual cost data.

The DPW is responsible for developing the 10-year Wastewater Capital Improvement Program (WCIP). This program includes replacement, rehabilitation, and expansion of the City's wastewater treatment and collection facilities.

3.2.1 Wastewater Go-Projects for Immediate Implementation

Go-Projects represent projects from Alternative 4 that have been evaluated at a project-level in the EIR, and are recommended for immediate implementation because the flow or regulatory triggers have already been met. The following section presents a description of Go-Projects, estimated capital costs and schedule, previous capital costs from the Facilities Plan, and a description of the changes in Capital Costs that have occurred since the Facilities Plan was completed. These projects will be included in the WCIP as part of the annual budget process. The total estimated capital cost for the Go-Projects is $663 million in March 2006 dollars. Table 3-1 provides a summary of estimated capital costs for the Go-Projects.

Table 3-1
IRP Alternative Four
Wastewater Estimated Capital Costs - Go-Projects

	Estimated Capital Cost (2006$)[1] Millions	Forecast Operational Date[2]
Go Projects		
Treatment		
Construct Wastewater Storage Facilities at Tillman (60 Million Gallon with Real Time Control)	$120	2013
Construct Wastewater Storage Facilities at LAG (5 Million Gallon with Real Time Control)	$20	2012
Recycled Water Storage at LAG (5 Million Gallon with Real Time Control)	$8	2012
HTP Solids Handling/Truck Loading Facility	$89	2012
Collection System		
Glendale Burbank Interceptor Sewer (GBIS), including air treatment	$196	2016
North East Interceptor Sewer (NEIS) Phase 2	$230	2016
Total Go Projects	**$663**	

Notes:
[1] Costs are presented in 2006 dollars (March 2006 ENR CCI for Los Angeles). Capital costs include construction costs and non-construction costs including program management, engineering studies/design services, construction management, and start-up costs. Costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

[2] Year construction is expected to be completed, does not include post-construction/start-up.

3.2.1.1 Construct Wastewater Storage Facilities at Tillman

There is a shortage of wastewater conveyance capacity (sewers) in the western and central portion of the Valley, as well as a shortage of treatment capacity at Tillman during wet weather conditions. Adding up to 60 million gallons of buried storage with real time control will be necessary to provide the needed wet weather wastewater storage and operational storage. Construction of wastewater storage at Tillman consists of the preparation of a concept report and subsequent design and construction. Figure 3-1 depicts the proposed layout of the wastewater storage facilities at Tillman. The project is estimated to be online by 2013 and have an estimated total capital cost of $120 million[1].

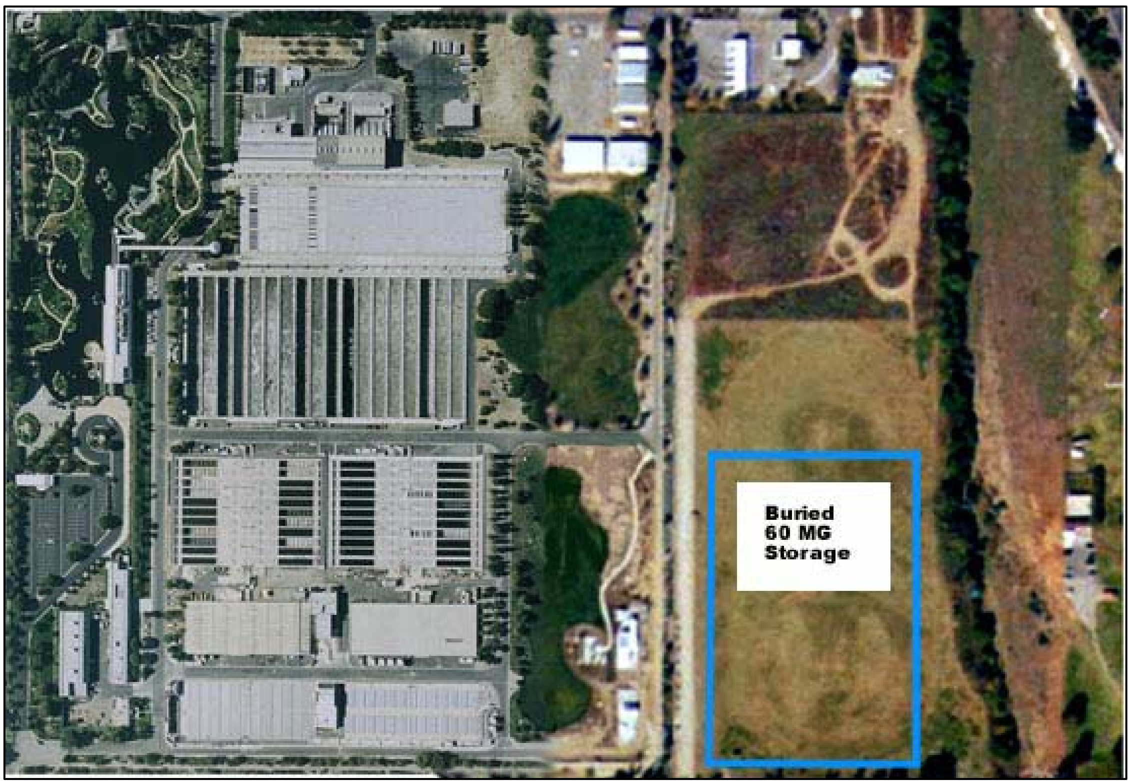


Figure 3-1
Wastewater Storage Facilities at Tillman

Changes have occurred to the project after completion of the Facilities Plan impacting cost and implementation. The preliminary capital estimate for the project developed

[1] Costs are presented in 2006 dollars (March 2006 ENR CCI for Los Angeles.) Capital costs include construction costs and non-construction costs including program management, engineering studies/design services, construction management and start-up costs. Costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

as part of the Facilities Plan was $104 million in September 2002 dollars[2]. All cost changes associated with this project are solely related to the changes in the ENR CCI. As described in the Facilities Plan this project was originally an alternative to the construction of the Valley Spring Lane Interceptor Sewer (VSLIS) discussed in Section 3.2.2.6, however, since that time it has been identified as a near-term Go-Project that will be implemented in conjunction with the longer-term sewer relief to be provided by the VSLIS trunk-line.

The source of the original cost estimate for the wastewater storage tank in the Facilities Plan was based on City Interdepartmental Correspondence, dated January 22, 2003, "Installation of MF/RO Treatment at DCT and LAG, Rough Order of Magnitude Estimate of Costs Draft Technical Memorandum" (see Appendix C). This document provided estimates by the Bureau of Engineering that served as the basis for estimates for the Microfiltration/Reverse Osmosis, Ultra-Violet Disinfection, and the storage tanks. Real time control estimates were based on data from similar projects.

3.2.1.2 Construct Wastewater and Recycled Water Storage Facilities at LAG

LAG provides recycled water to DWP and Glendale for reuse. The volume of recycled water that can be delivered to customers is limited by the daily variation of flows at the plant. Therefore, providing an up to 5 million gallon underground storage facility with real time control as an equalization basin will provide more efficient plant operations by making plant inflows more constant, which would also improve recycled water flows to the customers. Capital cost estimates for the construction of wastewater storage at LAG are inclusive of the preparation of a concept report and subsequent design and construction. Figure 3-2 depicts the proposed layout of the wastewater storage facilities and recycled water storage at LAG. The project is estimated to be online by 2012 and have an estimated total capital cost of $20 million[1].

The use of recycled water from LAG is dependent on the seasonal and daily demands for the water, which can fluctuate during the day and during the rainy season. Therefore, providing up to 5 million gallons of recycled water storage with real time control will allow LAG to deliver recycled water to customers at times when wastewater flows are low (i.e., during the night.) Capital cost estimates for the construction of recycled water storage at LAG consists of the preparation of a concept report and subsequent design and construction. The project is estimated to be online by 2012 and have an estimated total capital cost of $8 million[1].

Revised cost estimates for the 5 million gallon equalization basin and 5 million gallon recycled water storage tank were provided by the Environmental Engineering

---

[2] September 2002 ENR CCI. Assumptions used to develop the original cost estimate are provided in IRP Facilities Plan, Appendix S, Unit Costs (Wastewater, Recycled Water, and Runoff) of the Facilities Plan, Volume 4: Alternatives Development and Analysis dated July, 2004.

Division of the Bureau of Engineering. Real time control estimates are based on data from similar projects.

In the Facilities Plan it was originally proposed that a 10 million gallon diurnal storage tank with real time control would be needed at LAG. Further refinement of this Go-Project has led to the current proposal of two 5 million gallon storage tanks with real time control, one for an equalization basin for wastewater and the other for reclaimed water storage. The original cost estimate for the 10 million gallon storage tank with real time control was $22 million[2] in September 2002 dollars. Estimated capital costs now reflect the cost of these changes.

Figure 3-2
LAG Wastewater and Recycled Water Storage Facilities

3.2.1.3 Construct Hyperion Treatment Plant Solids Handling and Truck Loading Facility

Hyperion processes biosolids removed from wastewater generated from throughout the Hyperion Service Area. The Hyperion Service Area is illustrated in Figure 3-3. A new solids handling and truck loading facility will provide more efficient operations and will also meet future solids handling production. Additionally, the structure would be enclosed and the air treated prior to release to the atmosphere. Figure 3-6 illustrates the proposed location of the facility at Hyperion. The facility is estimated be online by 2012 and have an estimated total capital cost of $89 million as calculated by the City in the WCIP[1]. Capital costs include preparation of preliminary design, subsequent design, and construction.

The solids handling/truck loading facility proposed as a "Go Project" for Hyperion was originally included in the City's baseline WCIP. It is now included in the IRP estimated capital costs. Class "O" cost estimates were provided by the City in the WCIP. Components included in the cost estimate are:

- Screening and dewatering of digested sludge
- Wet cake storage and loading
- Odor control

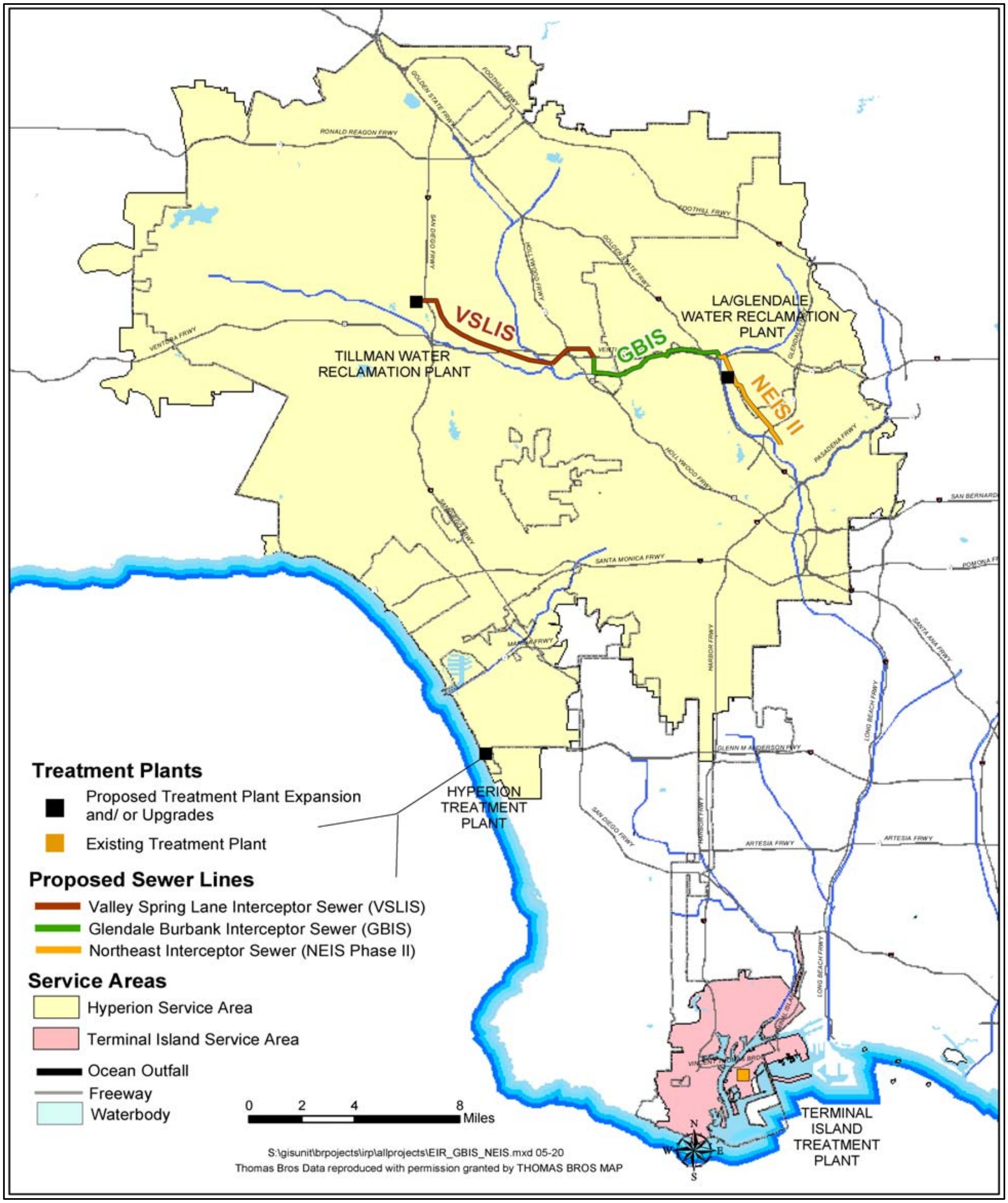


Figure 3-3
Overview of Treatment Plants, Service Area, and Proposed Sewer Lines

3.2.1.4 Construct Glendale-Burbank Interceptor Sewer

GBIS is needed to provide relief or additional capacity in the near future to prevent overflows and spills. GBIS would include construction and operation of approximately 5 ¾ miles of 8-foot-diameter (inside) interceptor sewer and associated structures, including diversion structures, drop structures, maintenance hole structures, and air treatment facilities (if needed). The specific GBIS alignment would begin at the Pecan Grove shaft site, would travel beneath Zoo Drive, then head beneath the northern-most hillside in Griffith Park to reach the Travel Town Shaft Site. It would extend under Forest Lawn Drive to the Barham Shaft Site. GBIS would then be tunneled northwest beneath the Los Angeles River to Pass Avenue, head northward beneath Pass Avenue to Riverside Drive then turn westward beneath Riverside Drive to the western terminus. As part of the Draft EIR public review, the community expressed their opposition to the use of the Woodbridge Park due to the proximity to the school as well as the use and access of the Park. After thorough review of the alternative and the DEIR comments, it is concluded that the Caltrans North Hollywood Maintenance Yard is the most viable option. Figure 2-9, Section 2.3.1, page 2-15 depicts the proposed alignment and Figure 3-3 illustrates the general location of the proposed alignment in relation to other wastewater facilities. GBIS is estimated to be online by 2016 and have an estimated total capital cost of $196 million[1] as calculated by the City in the WCIP. The initial preliminary capital cost estimate was $92 million in September 2002 dollars. Included in the estimate are right of way acquisition costs, real estate costs, and design and construction costs, inclusive of air treatment facilities.

In the interim a specific alignment was selected during development of the final EIR process. A combination of the development of a specific alignment, an increase in the ENR CCI, and revised cost data based upon actual costs for the construction of the North East Interceptor Phase I project (approximately $28.4 million per mile) has resulted in the revised capital cost estimate.

The air treatment portion of the project was included in the original Facilities Plan capital costs with an initial preliminary capital cost estimate of $8 million in September 2002 dollars. Revised capital cost estimates for air treatment are $10 million[1] in March 2006 dollars related to an increase in the ENR CCI. Air treatment costs are based on the Preliminary East Central Interceptor Sewer Air Treatment Facilities Cost estimated by the City of Los Angeles, Bureau of Engineering.

3.2.1.5 Construct North East Interceptor Sewer, Phase II

NEIS II would relieve the section of the North Outfall Sewer (NOS) south of LAG and convey additional flow from the GBIS to provide relief or additional capacity in the near future to prevent overflows and spills. The proposed NEIS II would include construction and operation of approximately 5 ½ miles of 8-foot-diameter (inside) interceptor sewer and associated structures, including diversion structures, drop structures, maintenance hole structures, and air treatment facilities (if needed). NEIS II extends from an existing NEIS (Phase I) at the Division Shaft site. It would cross

State Route 2, the Los Angeles River, and Interstate 5 to Griffith Park Shaft site. It would extend from the Crystal Springs (Picnic Grounds) shaft site, travel westward beneath Griffith Park Drive, then go north beneath the golf courses to its terminus at Pecan Grove. Figure 2-8, in Section 2.3.2, page 2-14, depicts the proposed alignment and Figure 3-3 illustrates the general location of the proposed alignment in relation to other wastewater facilities. NEIS II is estimated to be online by 2016 and have an estimated total capital cost of $230 million[1]. Included in the estimate are design and construction costs, inclusive of air treatment facilities.

NEIS II was not originally included in the IRP estimated capital costs developed in the Facilities Plan as cost estimates were developed by the City and were incorporated into the City's baseline WCIP for 2003/2004 with a cost estimate of $95 million, exclusive of air treatment. The project is now included in the IRP estimated capital costs.

Similar to GBIS, a specific alignment was selected during development of the final EIR process. A combination of the development of a specific alignment, an increase in the ENR CCI, and revised cost data based upon actual costs for the construction of the North East Interceptor Phase I project (approximately $28.4 million per mile) has resulted in the revised capital cost estimate.

The air treatment portion of the project was included in the original Facilities Plan capital costs with an initial preliminary capital cost estimate of $8 million in September 2002 dollars. Revised capital cost estimates for air treatment are $19 million[1] in March 2006 dollars. Refinement of the project has led to incorporation of two air treatment facilities instead of one resulting in an increase in the cost coupled with an increase ENR CCI. Air treatment costs are based on the Preliminary East Central Interceptor Sewer Air Treatment Facilities Cost estimated by the City of Los Angeles, Bureau of Engineering.

3.2.2 Go If Triggered Projects

Alternative 4 also includes potential projects that will go if triggered by an action, flow, or regulation. If triggered, these projects will be included in the WCIP as part of the annual budget process. Triggers will be monitored by staff as discussed in detail in Section 4.2. The following section presents a description of Go If Triggered Projects, current estimated capital costs, previous capital costs from the Facilities Plan, and a description of the changes in capital costs that have occurred since the Facilities Plan was completed. These projects will be included in the WCIP as part of the annual budget process if they are triggered. Total estimated capital costs for the Go If Triggered projects are estimated at $1,205 million in March 2006 dollars. Table 3-2 summarizes the estimated capital costs for the Go If Triggered Projects.

Table 3-2
IRP Alternative Four
Wastewater Estimated Capital Costs - Go If Triggered Projects

	Estimated Capital Cost (2006$)[1] Millions
Tillman Upgrade to Advanced Treatment and UV Disinfection Phase 1 (current capacity 80 mgd)	$339
Tillman Expansion to 100 mgd (Secondary, MF/RO, and UV) (add 20 mgd)	$210
LAG Upgrade to Advanced Treatment and UV disinfection (existing - 20 mgd capacity)[2]	$105
HTP Secondary Clarifiers (add 100 mgd to get capacity to 450 mgd)	$92
HTP Digesters (up to 12 total)	$303
Valley Spring Lane Interceptor Sewer (VSLIS) including air treatment	$156
Total Go If Triggered Projects	**$1,205**

Notes:

[1] Costs are presented in 2006 dollars (March 2006 ENR CCI for Los Angeles). Capital costs include construction costs and non-construction costs including program management, engineering studies/design services, construction management, and start-up costs. Costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future

[2] In the unlikely event that the overall framework for recycled water changes to disallow its use, then Alternative 1 becomes the Recommended Alternative and "Expansion of Hyperion to 500 mgd (add 50 mgd)" would replace the "Tillman Expansion to 100 mgd (Secondary, MF/RO, and UV) (add 20mgd)" project at a total estimated capital cost of $46 million.

3.2.2.1 Potential Upgrades at Tillman to Advanced Treatment (Current Capacity)

Tillman currently provides tertiary-treated recycled water (Title 22 with nitrification and denitrification) for irrigation use and environmental benefits to the Lake Balboa and the Wildlife Lake at Sepulveda Basin, and the Los Angeles River. If triggered by regulations and/or decision to reuse Tillman recycled water for groundwater replenishment, then additional advanced treatment using membrane technology (e.g., microfiltration and reverse osmosis (MF/RO) with ultraviolet (UV) disinfection) could be required. Treatment projects at Tillman have been divided into two phases. Phase 1 is discussed here and Phase 2 is discussed in more detail in Section 3.2.2.2. Phase 1 upgrades at Tillman to advanced treatment would retain the current capacity of 80 mgd. If triggered, this project will require coordination with Public Works and DWP as a result of the additional recycled water use. Figure 3-4 depicts the proposed facility layout for both Phase 1 discussed here and Phase 2 discussed below. The project is estimated to be triggered by 2007 for new permit requirements and 2010 for groundwater replenishment. The estimated total capital cost of $339 million[1], assuming advanced treatment using MF/RO and UV disinfection.

During development of the Facilities Plan it was assumed that Tillman had a derated tertiary treatment capacity of 64 mgd due to planned conversion to nitrification/denitrification (NdN) operation. Testing conducted since completion of the Facilities Plan indicates that the current treatment capacity of Tillman is 80 mgd. This revised information led to a revision of the original 3 phases of potential projects at Tillman. Specific changes include revising the Tillman related Go If Triggered Projects: Phase 1 for advanced treatment and UV is now proposed for treatment of 80 mgd, Phase 2 for advanced treatment and UV is now proposed for an additional 20 mgd, and Phase 3 for secondary treatment, the addition of 20 mgd of capacity, is now moved to Phase 2. The Phase 1 project that could have increased the secondary treatment capacity of the plant by 16 mgd has been removed from the Adaptive CIP. This project had an estimated capital cost in the Facilities Plan of $7 million[2].

Original estimated capital costs in the Facilities Plan for advanced treatment with UV disinfection upgrades to 80 mgd at Tillman were $294 million[2], inclusive of the original Phase 1 advanced treatment of 64 mgd and the original Phase 2 advanced treatment of 16 mgd. Estimated capital cost changes are solely related to an increase in the ENR CCI.

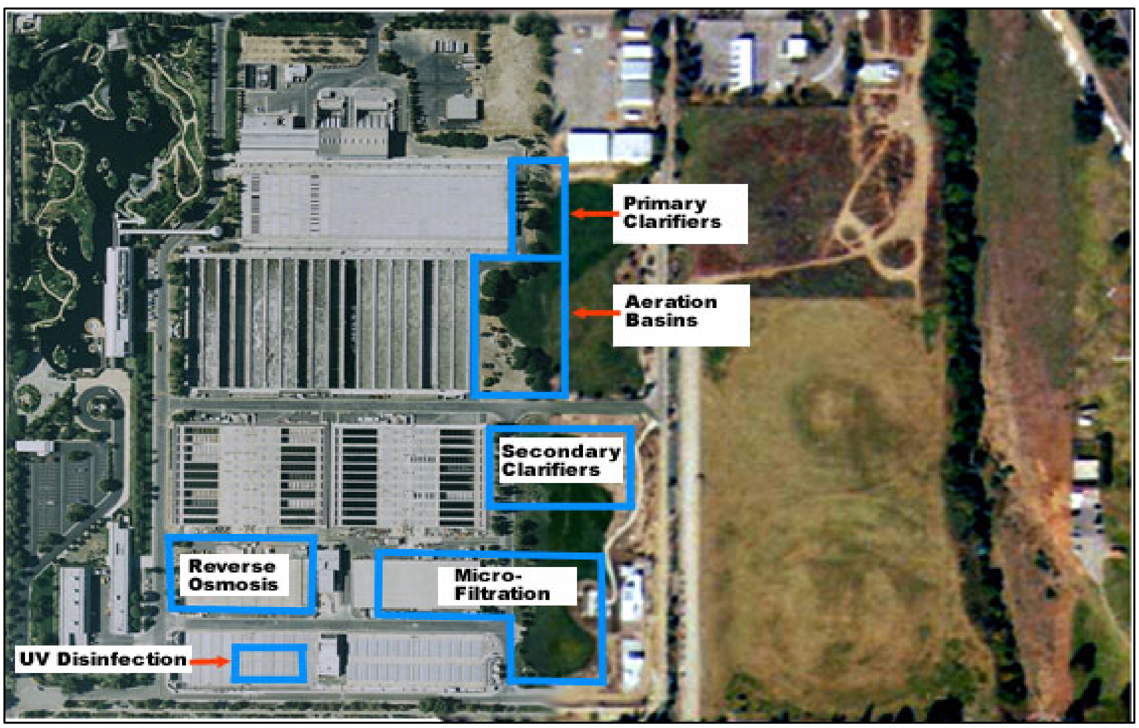


Figure 3-4
Tillman Phase 1 and Phase 2 Proposed Layout

Capital cost estimates are based on City Interdepartmental Correspondence, dated January 22, 2003, "Installation of MF/RO Treatment at DCT and LAG, Rough Order of Magnitude Estimate of Costs Draft Technical Memorandum" (see Appendix C).

This document provided estimates by the Bureau of Engineering that served as the basis for estimates for the Microfiltration/Reverse Osmosis, Ultra-Violet Disinfection, and previously described storage tanks.

3.2.2.2 Potential Expansion of Tillman to 100 mgd with Advanced Treatment

If triggered by increase in population (flows), regulations, and/or groundwater replenishment decision, then Phase 2 could be triggered and result in the expansion of Tillman to 100 mgd with advanced treatment using membrane technology. As part of Phase 2, secondary treatment and advanced treatment would be expanded by 20 mgd. If triggered, this project will require coordination between DPW and DWP. Estimated trigger review for new SCAG population projections would occur by 2008. Based on 2004 projections, expansion would occur after year 2025. Estimated trigger review for groundwater replenishment would occur by 2010. Figure 3-4 above depicts the layout for both Phase 1 and 2. The project is estimated to have an estimated total capital cost of $210 million[1], assuming expansion by 20 mgd of secondary treatment and advanced treatment using MF/RO and UV disinfection.

In the Facilities Plan, the original estimated capital costs for the current Phase 2 components were $182.2 million[2]. As discussed in Section 3.2.2.1 above, Phase 2 was originally classified as Phase 3. Estimated capital cost changes are solely related to an increase in the ENR CCI.

Capital cost estimates for the secondary treatment upgrade were based on the costs developed during the first phase of the IRP, i.e., the Integrated Plan for the Wastewater Program (IPWP) Final Report (Volume 1 of 2) – Cost Estimating Approach, Capital Cost Curves (Appendix B, Section B4 of that document), dated November 2001 and City Interdepartmental Correspondence, dated January 22, 2003, "Installation of MF/RO Treatment at DCT and LAG, Rough Order of Magnitude Estimate of Costs Draft Technical Memorandum" (see Appendix C) for the advanced treatment upgrade. Cost estimates for advanced treatment were calculated in the Facilities Plan by subtracting the 100 mgd advanced treatment costs from the 80 mgd advanced treatment costs in the IRP Facilities Plan, Appendix S, Unit Costs (Wastewater, Recycled Water, and Runoff) of the *IRP Facilities Plan, Volume 4: Alternatives Development and Analysis* dated July 2004.

3.2.2.3 Potential Upgrade of LAG to Advanced Treatment (Current Capacity)

LAG currently provides tertiary-treated recycled water (Title 22 with nitrification and denitrification) for irrigation use and environmental benefits to the Los Angeles River. If triggered by regulations, availability of downstream sewer capacity, and/or decision to reuse recycled water, then advanced treatment using membrane technology at the current capacity of 20 mgd could be required. Figure 3-5 depicts possible locations of the proposed MF/RO and UV facilities. If triggered, this project will require a partnership between Public Works and the City of Glendale. Estimated trigger review for new permit requirements would occur by 2007. The estimated total capital cost is $105 million[1], assuming advanced treatment using MF/RO and UV disinfection.

Refinement of the Facilities Plan, has led to adding this project to the Go if Triggered Projects. This project was not originally included in Alternative 4. This addition is now reflected in total estimated capital costs.

Capital cost estimates are based on City Interdepartmental Correspondence, dated January 22, 2003, "Installation of MF/RO Treatment at DCT and LAG, Rough Order of Magnitude Estimate of Costs Draft Technical Memorandum" (see Appendix C). This document provided estimates by the Bureau of Engineering that served as the basis for estimates for the Microfiltration/Reverse Osmosis, Ultra-Violet Disinfection, and previously described storage tanks.

Refinement of the Facilities Plan, has led to adding this project to the Go If Triggered Projects. This project was not originally included in Alternative 4. This addition is now reflected in total estimated capital costs.

Figure 3-5
Possible locations of proposed MF/RO and UV facilities

3.2.2.4 Design/Construction of Secondary Clarifiers at Hyperion to Provide Operational Performance of 450 mgd

The existing secondary clarifiers at Hyperion are performing below their rated capacity of 450 mgd. Staff is currently investigating ways to optimize the existing secondary clarifiers to improve their operating performance to 450 mgd. If these options prove to be unsuccessful, then new secondary clarifiers will be needed to improve operational performance 100 mgd to 450 mgd. Figure 3-6 below depicts the possible location of new secondary clarifiers. Estimated trigger review would occur by 2008. The estimated total capital cost is $92 million[1]. Included in the estimate are design and construction costs.

Secondary clarifiers proposed for Hyperion to add an additional 100 mgd capacity as a "Go if Triggered Project" were originally included in the City's baseline WCIP and were not accounted for in the IRP estimated capital costs developed as part of the Facilities Plan. The estimated capital cost for the secondary clarifiers is in now included in the IRP.

For comparative purposes, cost estimates for Alternative 1 included 8 secondary clarifiers. This cost was multiplied by two to arrive at the original estimated capital costs and to serve as the basis for Alternative Four. Thus, cost estimates for 16 clarifiers in September 2002 dollars were $80 million[2]. Assumptions included in this estimate are each of 16 clarifiers is circular with a diameter of 150 feet and piping/ flow splitting from the existing reactors to the new clarifiers is included in the amount of $10 million. Various design reports for past installations provided by the City and compared to similar installations were utilized to develop the cost of the clarifiers as described in Appendix S of Volume Four of the Facilities Plan. The actual number of clarifiers and configurations required to increase capacity the derated capacity to 450 mgd will be determined during the design phase. Estimated capital costs changed since completion of the Facilities Plan are based on an increase in the ENR CCI.

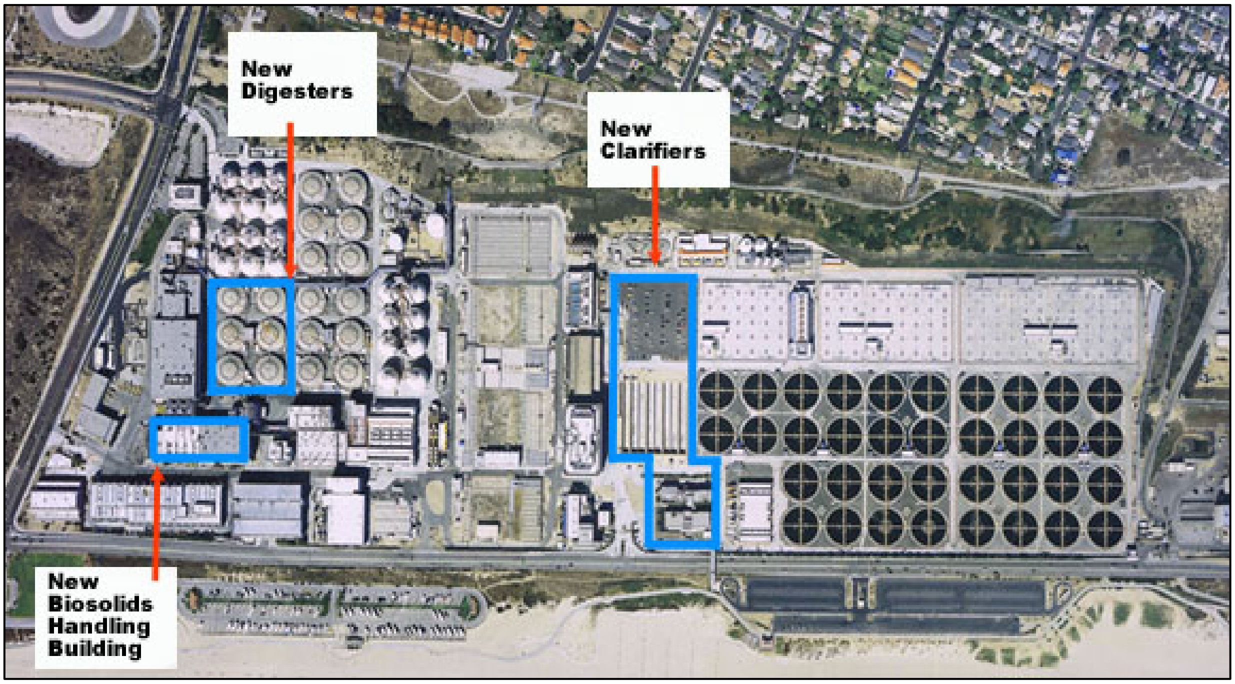


Figure 3-6
Possible locations for biosolids handling building, digesters, and clarifiers

3.2.2.5 Design/Construction of up to 12 Digesters at Hyperion

If triggered by increased biosolids production in the service area, additional digesters will be required at Hyperion. A maximum of 12 egg-shaped digesters are proposed under this option. Additionally, the digesters will increase redundancy for improved operations and maintenance allowing digesters to be rotated out of service for maintenance. Figure 3-6 above depicts the possible locations of the new digesters. Estimated trigger review for new SCAG population projections would occur by 2008. Based on 2004 projections, expansion would occur after 2025. The estimated total capital cost is $303 million[1]. Design and construction costs are both included in the cost estimate.

After completion of the Facilities Plan further refinement of the Hyperion Digesters Go if Triggered Project has resulted in changing the number of proposed digesters from four to twelve. The original cost estimate for the four digesters was $88 million[2] in September 2002 dollars. Using 12 digesters the estimated capital cost in September 2002 dollars is $263 million. This cost has been adjusted for the ENR CCI to arrive at the current estimated capital cost.

As a basis for calculating the cost of each 2.25 million gallon digester capital cost estimates are based the on the same City Interdepartmental Correspondence, expanded on in Sections 3.2.2.1 and 3.2.2.2 (see Appendix C). The revised cost for twelve digesters is reflected in the current estimated capital cost.

3.2.2.6 Prepare Alignment Study, Environmental Documentation, and Subsequent Design/Construction of Valley Spring Lane Interceptor Sewer (VSLIS)

To provide additional sewer conveyance capacity between Tillman and the Valley Spring Lane/Forman Avenue Diversion structure, a new sewer, VSLIS, may be required. If triggers are met, then a detailed alignment study and associated environmental documentation will be required followed by subsequent design and construction. The project has been evaluated in the EIR as a programmatic element. Figure 3-3 depicts a general alignment in relation to other wastewater facilities. This project is estimated to be online by 2020, and have an estimated total capital cost of $156 million[1]. Cost estimates include the alignment study, environmental documentation, design, and construction. Cost estimates were not included for this project in the Facilities Plan as the estimates were scheduled to be included in the Adaptive CIP after the project was more defined.

The air treatment portion of the project is included in the capital cost estimate. Two air treatment facilities are recommended. Initial preliminary capital cost estimates were provided in the Facilities Plan for GBIS and NEIS for one air treatment facility at $8.3 million[2] in September 2002 dollars. These air treatment costs are based on the Preliminary East Central Interceptor Sewer Air Treatment Facilities Cost estimated by the City of Los Angeles, Bureau of Engineering Division. Multiplying the estimate for one air treatment facility by two and applying the ENR CCI resulted in a total capital cost attributed to air treatment of $19.1 million[1] in March 2006 dollars.

Selection of a preferred alignment may result in revised capital cost estimated in the future to account for unknown variables that are not currently captured in the cost.

3.2.2.7 Potential Expansion of Hyperion to 500 mgd

In the unlikely event that the overall framework for recycled water changes to disallow its use so Alternative 1 becomes the Recommended Alternative, then the "Potential Expansion of Hyperion to 500 mgd" project would replace the "Potential expansion of Tillman to 100 mgd with Advanced Treatment" project described above.

If triggered by increase in population, regulations, and/or groundwater replenishment decision, then Hyperion could be expanded to 500 mgd, through the addition of secondary clarifiers with a capacity of 50 mgd. Estimated trigger review for new SCAG population projections would occur by 2008. Based on 2004 projections expansion would occur after 2025. Figure 3-6 above depicts the possible layout of the 500 mgd expansion project at Hyperion. Estimated trigger review for groundwater replenishment would occur by 2010. The estimated total capital cost is $46 million[1].

Capital cost estimates of $39.8 million in September 2002 dollars were developed for the expansion of the secondary clarifiers by 50 mgd as part of Alternative 1 in the Facilities Plan. Assumptions included in this estimate are each of the 8 clarifiers is circular with a diameter of 150 feet and piping/ flow splitting from the existing reactors to the new clarifiers is included in the amount of $5 million. Various design reports for past installations provided by the City and compared to similar installations were utilized to develop the cost of the clarifiers as described in Appendix S of Volume Four of the Facilities Plan. The actual number of clarifiers and configurations required to increase the capacity to 500 mgd will be determined during the design phase. Estimated capital costs changed since completion of the Facilities Plan are based on an increase in the ENR CCI.

3.2.3 Wastewater Leadership Projects

Leadership projects are projects that require study before large-scale implementation. They allow the City to confirm the "implementabity" of a promising approach from technological, operability, results verification, scale-up effect, and public acceptance perspectives; and from City policy and agency coordination perspectives. Examples of types of leadership projects included in the wastewater estimated capital costs are pilot projects, feasibility studies, and demonstration projects. Further details regarding the leadership projects are available in the Facilities Plan Volume 4: Alternative Development and Analysis (Section 6). Capital costs for wastewater leadership projects are estimated at $14 million[1]. Capital cost estimates developed for the Facilities Plan for wastewater leadership projects were $12 million in September 2002 dollars.

3.3 Runoff Management

Capital cost estimates for the runoff management components of IRP Alternative 4 were updated to reflect March 2006 dollars and changes to assumptions utilized in the Facilities Plan. Total capital costs in the Facilities Plan for the runoff management component were estimated at approximately $2.2 billion in September 2002 dollars. Current estimated capital costs in March 2006 dollars are approximately $2.5 billion. This increase reflects an increase in the ENR CCI for Los Angeles and changes to project components as further explained in this section. Disregarding changes in project components and taking into account an increase in the ENR CCI results in an estimated capital cost increase of approximately $335 million.

To provide progress on the programmatic elements of runoff management Go-Policy Directions have been adopted as City policy. Go-Policy Directions are specific directions to staff on the next studies and evaluations required to develop the programmatic elements of Alternative 4.

Numerous Proposition O projects aligned with runoff management are under development and funding review in a process parallel to the IRP process. Conceptual plans are being developed for projects that have been approved for funding by the Citizen's Oversight Advisory Committee. Other Proposition O projects are currently under review for potential approval. Capital costs have been developed for both the projects under development and those projects under funding review.

Public Works is responsible for watershed protection, which includes compliance with stormwater and urban runoff regulations (TMDLs and NPDES permits) and beneficial use of runoff. Staff develops a CIP for the watershed protection program as part of the annual budget process.

3.3.1 Runoff Management Programmatic Projects

Programmatic projects are currently broad in scope and require future refinement. The projects were evaluated at a programmatic level in the EIR requiring additional detailed studies to delineate specific projects and subsequent environmental analysis. Overall when refined the individual components of these projects could potentially manage up to 42 percent of the dry weather (41 mgd managed) and 47 percent of the wet weather urban runoff (791 mgd managed) generated in the City. The following section presents a description of the programmatic projects, expected online years, current estimated capital costs, and previous capital costs from the Facilities Plan.

Original capital costs estimates for the programmatic projects described in the Facilities Plan were based on unit costs developed for actual construction projects, such as the Santa Monica Urban Runoff Recycling Facility (SMURRF), Sun Valley recharge projects, and planned wastewater diversion structures. Mark-ups for construction and non-construction items, as listed in Section 3.1.1, were then applied to the unit costs where applicable and escalated to September 2002 dollars.

For wet weather runoff management projects the approach will be revisited upon approval of the Santa Monica Bay Beaches Bacteria Total Maximum Daily Load Implementation Plan by the Regional Board. The approved implementation change may change the described mix of wet weather projects that would be implemented.

Table 3-3 presents current estimated capital costs in March 2006 dollars for both dry and wet weather runoff management components and leadership projects of IRP Alternative 4.

Table 3-3
IRP Alternative Four
Runoff Management Estimated Capital Costs

	Estimated Capital Cost (2006$)[1] Millions
Dry Weather Urban Runoff	
Smart irrigation (reduce runoff by ~10 mgd)	$119
Divert runoff from Compton Creek to URP (~2 mgd)	$19
Divert runoff from Ballona Creek to URP (~3 mgd)	$27
Divert runoff from Inland Creeks to URPs and Wetlands (15.9 mgd)	$393
Subtotal Dry Weather Urban Runoff	$558
Wet Weather Urban Runoff	
Treat and beneficially use/discharge (coastal area - 160 mgd)	$1,039
Neighborhood recharge in vacant lots (east valley)	$389
Neighborhood recharge in parks/open space	$124
Neighborhood recharge in abandoned alleys	$18
Onsite percolation - Schools	$52
Onsite percolation - Government	$17
Non-urban regional recharge (east valley)	$87
Cisterns (onsite storage use) - Schools	$71
Cisterns (onsite storage use) - Government	$45
Onsite percolation - Schools	$52
New/Redevelopment Areas - Onsite treat/discharge	$0
Subtotal Wet Weather Urban Runoff	$1,894
Leadership Projects	$12
Total	**$2,463**

Notes:

[1] Costs are presented in 2006 dollars (March 2006 ENR CCI for Los Angeles). Capital costs include construction costs and non-construction costs including program management, engineering studies/design services, construction management, and start-up costs. Costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

2 No costs are associated with new/redevelopment areas as onsite treatment and discharge would be included in the SUSMP requirements. SUSMP compliance is the responsibility of the property owner.

3.3.1.1 Smart Irrigation

Implementation of smart irrigation is expected to reduce dry weather runoff up to 10 mgd and reduce potable water usage by up to 15,800 acre-feet per year. Smart irrigation involves installing irrigation control devices to monitor and control water use and irrigation. It was estimated in the Facilities Plan that installation of the devices would occur in up to 80 percent of single family residences, up to 50 percent of multifamily residences, and up to 20 percent of commercial/industrial facilities with as many as 576,000 devices installed by 2020 to achieve the 10 mgd potable water usage reduction estimate. The actual rate of implementation will depend on available funding and resources, and verification of effectiveness assumptions. This project has an estimated total capital cost of $119 million[1] assuming installation of 576,000 devices.

In the Facilities Plan the estimated capital costs for smart irrigation were $101 million in 2001 dollars[3]. This is based on a per unit cost provided in a study by the Irvine Ranch Water District in 2001 of approximately $175 per unit ($100 per unit and $75 for installation). Construction and non-construction mark-ups of 44% and 30%, respectively, were not applied to the per unit cost to arrive at the total capital cost estimates as this project is not a traditional construction project, but a retrofit and installation project. Estimated capital cost increases are solely related to an increase in the ENR CCI.

3.3.1.2 Divert Runoff from Compton Creek to Urban Runoff Plant

Diversion of dry weather runoff from Compton Creek to an urban runoff plant (URP) could treat up to 2 mgd. An URP would treat diverted runoff to Title 22 standards with the clean effluent used in industrial processes and for irrigation. This project has an estimated total capital cost of $19 million[1]. Included in the capital cost estimate is the URP and conveyance piping from the creek to the URP. Capital costs associated with pumping, temporary storage, and distribution of runoff to end users are included within the estimated capital costs for recycled water in Section 3.4.

Capital cost estimates developed for the Facilities Plan for this programmatic element were $60 million[2] in September 2002 dollars. Sources used to develop cost data included construction bids received for similar projects, steel tank manufacturers, O&M costs correlated with DWP data, and costs associated with construction of the SMURRF facility. The difference between the original cost estimate and current estimate is related to an increase in the ENR CCI and a reduction of costs for items that were already included in the recycled water capital cost estimates as specified above.

3.3.1.3 Divert Runoff Ballona Creek to Urban Runoff Plant

As part of this programmatic element, up to 3 mgd of dry weather runoff could be diverted from Ballona Creek to an URP for treatment to Title 22 standards. Similar to the Compton Creek URP clean effluent would be used in industrial processes and for irrigation. This project is expected has an estimated total capital cost of $27 million[1]. Capital costs associated with pumping, temporary storage, and distribution of runoff to end users are included within the estimated capital costs for recycled water in Section 3.4

Capital cost estimates developed for the Facilities Plan for this programmatic element were $89.3 million[2] in September 2002 dollars. The same sources used for the development of estimated capital costs for 3.3.1.1 above were used to develop costs

---

[3] Capital cost estimates in *Volume 3: Runoff Management*, did not escalate the June 2001 per unit cost as developed in the Irvine Ranch Water District study to September 2002 ENR CCI. Therefore, costs were escalated from June 2001 to the March 2006 ENR CCI using a factor of 1.18.

for this project. Total cost includes both construction and non-construction mark-ups. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI. The difference between the original cost estimate and current estimate is related to an increase in the ENR CCI and a reduction of costs for items that were already included in the recycled water capital cost estimates as specified above.

3.3.1.4 Divert Runoff from Inland Creeks to Urban Runoff Plants or Treatment Wetlands

Up to 15.9 mgd of dry weather runoff could be diverted from inland creeks to either URPs or constructed treatment wetlands for treatment and discharge to the source creeks. Creeks included in this programmatic element and their respective potential diversion quantities are:

- Browns Creek up to 3 mgd
- Wilbur Wash up to 1 mgd
- Limekiln Canyon up to 1.5 mgd
- Caballero Canyon up to 1 mgd
- Bull Creek up to 2.4 mgd
- Pacoima Wash up to 7 mgd.

URPs or constructed treatment wetlands would be constructed near the diversion locations. This has an estimated total capital cost of $392 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $341 million[2] in September 2002 dollars assuming construction of an URP as opposed to a wetland. The same sources used for the development of estimated capital costs for 3.3.1.1 above were used to develop costs for this project. Total cost includes both construction and non-construction mark-ups. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.5 Divert Runoff from Coastal Areas to Hyperion

Coastal dry weather runoff would be managed by diverting the runoff into the Coastal Interceptor Sewer for treatment at Hyperion. Diversions of up to 9 mgd would occur along the Santa Monica Bay. Most of the storm drains along the coast have or are currently programmed for diversion. This programmatic element would include diverting the remaining half of the coastal storm drains including:

- Castlerock

- Santa Ynez Canyon
- Marquez Avenue
- Pulga Canyon
- Montana Avenue
- Wilshire Boulevard
- North Westchester.

Each of these projects is already incorporated into the City's stormwater CIP and are therefore not included in the Adaptive CIP.

3.3.1.6 Treat and Beneficially Use/Discharge in Coastal Areas

If other nonstructural and local structural measures are found inadequate in meeting the Santa Monica Bay Wet Weather Bacteria Total Maximum Daily Load (TMDL) requirements, then up to three wet weather URPs could be constructed near the coast in the Santa Monica Bay Watershed. Combined, the URPs could treat up to 160 mgd of wet weather runoff. Each URP is assumed to treat up to approximately 53 mgd and would have storage for approximately 25 million gallons of runoff. The URPs would assist in complying with the Santa Monica Bay Wet Weather Bacteria TMDL. Treated wet weather runoff could be beneficially reused or discharged. The IRP approach to URPs will be revisited upon approval of the Santa Monica Bay Beaches Bacteria TMDL Implementation Plan by the Regional Board. That plan includes a detailed description methodology and projects to meet the TMDL requirements. The URPs have an estimated total capital cost of $1,039 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $902 million[2] in September 2002 dollars. The same sources used for the development of estimated capital costs for 3.3.1.1 above were used to develop costs for this project. Total cost includes both construction and non-construction mark-ups. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.7 Neighborhood Recharge in Vacant Lots

Up to 220 mgd of wet weather runoff could be captured and percolated into the ground on vacant lots in the eastern part of the San Fernando Valley. Approximately 79 capture-and-percolation facilities could be constructed on vacant lots for wet weather runoff management. The area of the City with the greatest amount of permeable soils tends to be concentrated in the eastern San Fernando Valley, thus these facilities would be limited to this region of the City. Capture-and-percolation facilities in vacant lots have an estimated total capital cost of $389 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $338 million in September 2002 dollars. Sources used as a basis for developing the cost data included actual cost data from the Sun Valley Park Drain and Infiltration Project for the neighborhood recharge component and data from similar construction bids for the piping. Total cost includes both construction and non-construction mark-ups. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.8 Neighborhood Recharge in Parks/Open Space

Approximately 65 capture-and-percolation facilities could be located in parks and open space in the east San Fernando Valley. Combined these facilities could potentially manage up to 70 mgd of wet weather runoff. These improvements could either be implemented as retrofits to existing facilities or incorporated into the design of new facilities. Capture-and-percolation facilities in vacant lots have an estimated total capital cost of $124 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $107 million in September 2002 dollars. Sources used as a basis for developing the cost data included actual cost data from the Sun Valley Park Drain and Infiltration Project for the neighborhood recharge component and data from similar construction bids for the piping. Total cost includes both construction and non-construction mark-ups. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.9 Neighborhood Recharge in Abandoned Alleys

Neighborhood recharge projects in abandoned alleys could manage up to 10 mgd of wet weather runoff. Approximately 189 facilities could be located in abandoned alleys throughout the east San Fernando Valley. Neighborhood recharge projects in abandoned alleys have an estimated total capital cost of $18 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $15 million[2] in September 2002 dollars. Sources used as a basis for developing the cost data included actual cost data from the Sun Valley Park Drain and Infiltration Project for the neighborhood recharge component and data from similar construction bids for the piping. Total cost includes both construction and non-construction mark-ups. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.10 Onsite Percolation at Schools

Up to 3 mgd of wet weather runoff could be managed at schools (public, private, religious, and universities) in the eastern San Fernando Valley through onsite percolation. Approximately 213 facilities could be sited in the eastern San Fernando Valley. Capture-and-percolation facilities at schools have an estimated total capital cost of $52 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $45 million[2] in September 2002 dollars. For estimating purposes it was assumed that: bioretention areas, French drains, and/or porous pavement. Cost data for these types of percolation projects were gathered from the Low Impact Development Center. Non-construction mark-ups were not applied. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.11 Onsite Percolation at Government Facilities

Approximately 84 capture-and-percolation facilities could be sited at government facilities in the eastern San Fernando Valley with the ability to manage up to 1 mgd of wet weather runoff. Capture-and-percolation facilities at government facilities have an estimated total capital cost of $17 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $15 million[2] in September 2002 dollars. For estimating purposes it was assumed that either of the following options would be utilized: bioretention areas, French drains, and/or porous pavement. Cost data for these types of percolation projects were gathered from the Low Impact Development Center. Non-construction mark-ups were not applied. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.12 Non-Urban Regional Recharge

Under this programmatic element up to 245 mgd of wet weather runoff could be captured from the non-urban areas of the San Fernando Valley to recharge groundwater basins from which the City receives a portion of its water. Recharge would occur primarily at existing spreading grounds in the eastern San Fernando Valley. Rainfall from the northwestern areas of the valley (hillside and mountain areas) would be collected in a pipeline and conveyed to the spreading grounds. Non-urban regional recharge facilities have an estimated total capital cost of $87 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $76 million[2] in September 2002 dollars. Construction bids for similar projects were used as a basis for developing cost data. Total cost includes both construction and non-construction mark-ups. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.13 Onsite Storage and Use at Schools

Onsite storage and use of wet weather runoff at schools throughout the City could capture up to 49 mgd of runoff for irrigation on dry days. Runoff would be stored in cisterns. Installed cisterns would be either individual units at each downspout or larger common units. Approximately 6,100 10,000 gallon cisterns could be installed at schools by 2020. These improvements could either be implemented as retrofits to existing facilities or incorporated into the design of new facilities. Onsite storage and use facilities at schools have an estimated total capital cost of $71 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $61 million[2] in September 2002 dollars. For estimating purposes it was assumed that 6,130 10,000 gallon cisterns each with a 3 horse power pump would be used. Cost data was gathered from the Low Impact Development Center. Non-construction mark-ups were not applied. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.14 Onsite Storage and Use at Government Facilities

Installation of onsite storage and use facilities to capture wet weather runoff at government facilities could capture up to 31 mgd of runoff. Approximately 3,900 cisterns could be installed at government facilities by 2020. Similar to cisterns at schools, these improvements could either be implemented as retrofits to existing facilities or incorporated into the design of new facilities. Onsite storage and use facilities at schools have an estimated total capital cost of $45 million[1].

Capital cost estimates developed for the Facilities Plan for this programmatic element were $39 million[2] in September 2002 dollars. For estimating purposes it was assumed that 3,880 10,000 gallon cisterns each with a 3 horse power pump would be used. Cost data was gathered from the Low Impact Development Center. Non-construction mark-ups were not applied. The difference between the original cost estimate and current estimate is solely related to an increase in the ENR CCI.

3.3.1.15 New/Redevelopment Areas with Onsite Treatment and Discharge

In the Facilities Plan it was estimated that up to 2 mgd of wet weather runoff would be treated onsite and subsequently discharged through baseline Standard Urban Mitigation Plan (SUSMP) measures. SUSMP requirements are triggered by specific criteria related to the development of a parcel or redevelopment. If SUSMP requirements are triggered, then the cost of compliance is the responsibility of the property owner. Therefore, no costs are provided for this programmatic element.

3.3.2 Runoff Management Go-Policy Directions and Leadership Projects

Go-Policy Directions have been adopted by City Council to provide progress on developing and implementing the programmatic elements of runoff management. Go-Policy Directions are specific directions to staff on the next studies and evaluations required to develop the programmatic elements of Alternative 4. The timing of these actions may be dependent on staff and funding availability. As part of these policies, staff will provide periodic status updates.

The Go-Policy Directions are divided into three categories: dry weather runoff management, wet weather runoff management, and general runoff management. These actions are listed in Section 5.2.2, Table 5-3, and items 11-22.

Runoff Management leadership projects as previously identified in Volume 4: Alternatives Analysis and Development (Section 6) are incorporated into the Go-

Policy Directions. Capital costs for runoff management leadership projects are estimated at $12 million[1]. Capital cost estimates developed for the Facilities Plan for runoff management leadership projects were $10 million in September 2002 dollars.

3.3.3 Proposition O Conceptual Projects

The DPW has taken the lead in developing a Proposition O program that will improve water quality at the beaches, rivers, and lakes within the City. This program includes solicitation of project ideas from the public and the development of conceptual plans for those projects that are approved by the Citizen's Oversight Advisory Committee (COAC). In a multi-phase process, the City will allocate $500 million in bond funds for these projects.

At this time numerous conceptual wet weather runoff management projects are under development with funding from Proposition O. These projects are listed in Table 3-4 with their respective estimated capital costs. Estimated total capital costs are estimated at $39.4 million. Total capital costs are expected to be greater than this as the projects will be constructed in the future and the ENR CCI will continue to increase as time progresses.

Table 3-4
Proposition O
Estimated Capital Costs for Runoff Management Conceptual Plans

	Estimated Capital Cost (2006$)[1] Millions	Forecast Operational Date
Santa Monica Bay/Ballona Creek BMP Project	$13	2008
Santa Monica Bay Beaches Wet Weather Bacteria TMDL Project-Phase 1	$26	2009
Santa Monica Beaches Low Flow Diversions Upgrades	$9	2009
Catch Basin Opening Screen Covers to meet 30% Trash Reduction Milestone	$27	2007
Total Conceptual Projects	**$75**	

Notes:

[1] Capital costs are expected to be greater than listed as the projects will be constructed in the future and the ENR CCI will increase.

3.3.4 Proposition O Projects in Funding Review

Nine projects are currently being considered for Proposition O funding based on a review of eligibility and merit. Estimated capital costs as stated in the applications are provided in Table 3-5. For those applications that provided ranges the high cost is presented. Costs presented here are preliminary and subject to change during the funding review process as well as during the preliminary design phase.

Table 3-5
Proposition O
Estimated Capital Costs for Projects In Funding Review

	Estimated Capital Cost (2006$)[1]	Forecast Operational Date
South Los Angeles Wetlands Park	$19	2008
Echo Park Lake Restoration Project	$40	2011
LA Zoo Parking Lot Retrofit Project	$29	2009
Freemont High Community Gardens Project	$10	2009
Cabrito Paseo Walkway and Bike Path Project	$1	2008
Parking Grove in El Sereno Project	$1	2008
Rosecrans Recreational Center Stormwater Enhancement Project	$4	2009
Lake Machado Ecosystem – Water Quality/Habitat Improvement Project	$62	2011
Peck Park Canyon Enhancement Project	$7	2010
Total	**$173**	

Notes:

[1] Capital costs are expected to be greater than listed as the projects will be constructed in the future and the ENR CCI will increase.

[2]Capital costs are based on costs in applications for funding and may change as concepts are developed.

3.4 Recycled Water

The IRP identified four conceptual alternatives for recycled water that could be implemented by DWP. Alternative 4 for the IRP had an estimated recycled water capital cost of $544 million (in September 2002 dollars). As part of the IRP, a detailed *Recycled Water Master Plan* was developed by DWP which examined these alternatives in more detail. Updated capital costs presented in this Volume of the IRP are for reference purposes only. Actual implementation of recycled water projects by DWP will be based on benefits, costs, regulations, and public acceptance. DWP will develop its CIP for recycled water based on its own budgeting process and using the *Recycled Water Master Plan* as its planning document.

The recycled water production targets for Alternative 4 would only be pursued by DWP if groundwater replenishment is implemented. DWP has concluded that Alternative 4, as presented in the IRP (without groundwater replenishment), would be too costly for the City to implement given the extensive pipeline system that would have to be constructed. Therefore, Alternative 4 has been modified from what was presented in the *IRP Facilities Plan, Volume 4: Alternatives Development and Analysis* to include groundwater replenishment resulting in a reduction in capital costs.

To estimate the modified Alternative 4 capital costs for recycled water, the IRP Alternative 1 was used for pipeline, pump stations, end user retrofits, and diurnal storage. This capital cost, updated to reflect March 2006 dollars, is $492 million. Approximately $4 million in capital cost would be required to implement the groundwater replenishment component of the modified Alternative 4, bringing the total cost to $496 million.

Potential recycled water projects for the modified Alternative 4 are presented in Section 3.4.1; while recycled water projects currently underway and conceptual projects included in DWP's *Recycled Water Master Plan* are presented in Section 3.4.2.

To provide progress on the programmatic elements of recycled water, Go-Policy Directions have been adopted as City policy. Go-Policy Directions are specific directions to staff on the next studies and evaluations required to develop the programmatic elements of Alternative 4. These actions are listed in Section 5.2.2, Table 5-3, items 1-5.

3.4.1 Potential Recycled Water Projects

Potential recycled water projects included as part of Alternative 4 may result in the production and use of up to 42,000 acre-feet per year of recycled water for non-potable uses including the treatment and reuse of runoff. Recycled water uses would include industrial, irrigation, environmental and potential groundwater replenishment uses. After Tillman is upgraded to advanced treat with MF/RO, up to 9,900 acre-feet per year of recycled water could be pumped to the eastern San Fernando Valley for groundwater replenishment.

If public acceptance for groundwater replenishment is not secured or if Tillman is not expanded with advanced treatment, then DWP would implement recycled water projects consistent with IRP Alternative 1.

Table 3-6 presents current estimated capital costs in March 2006 dollars for the recycled water component of IRP Alternative 4.

Table 3-6 IRP Alternative Four Recycled Water Estimated Capital Costs	
	Estimated Capital Cost (2006$)[1] Millions
Non-Potable Use	
Recycled Water Pipelines	$286
Recycled Water Pumping	$40
Diurnal Storage	$83
End User Retrofit	$83
Groundwater Replenishment	$4
Total	**$496**

Notes:

[1] Costs are presented in 2006 dollars (March 2006 ENR CCI for Los Angeles). Capital costs include construction costs and non-construction costs including program management, engineering studies/design services, construction management, and start-up costs. Costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

3.4.1.1 Recycled Water Pipelines

Recycled water pipelines are proposed to convey additional recycled water generated by Hyperion (secondary effluent is pumped to West Basin Municipal Water District for further treatment and distribution), Tillman, LAG, and the URPs on Ballona and Compton Creeks would be distributed to an expanded industrial and irrigation user base. An estimated 177 miles of pipelines would be installed. These pipelines have an estimated total capital cost of $286 million. Capital cost estimates developed for the Facilities Plan for this programmatic element were $316 million in September 2002 dollars. The difference between the original cost estimate and current estimate is related to an increase in the ENR CCI, pipe cost adjustments that were revised in the Master Plan, and a reduction in the total miles of conveyance pipelines from 289 to 177.

3.4.1.2 Recycled Water Pumping

Pump stations would be required throughout the recycled water distribution network to ensure adequate pressure for end-users. The pump stations have an estimated total capital cost of $39 million in March 2006 dollars. Capital cost estimates developed for the Facilities Plan for this programmatic element were $43 million in September 2002 dollars. The difference between the original cost estimate and current estimate is related to an increase in the ENR CCI, pump station adjustments that were revised in the Master Plan, and a reduction in the volume of pumping required.

3.4.1.3 Diurnal Storage

Diurnal storage facilities would be placed along the distribution network to ensure that adequate supplies remain in the system during peak demand periods or periods of low production. Capacities would range between 1 and 2 million gallons. Total storage required would be 42 million gallons. The diurnal storage facilities have an estimated total capital cost of $83 million in March 2006 dollars. Capital cost estimates developed for the Facilities Plan for this programmatic element were $94 million in September 2002 dollars. The difference between the original cost estimate and current estimate is related to an increase in the ENR CCI, pump station adjustments that were revised in the Master Plan, and a reduction in the total storage from 76 million gallons to 42 million gallons.

3.4.1.4 End User Retrofit

End user retrofit is required to utilize recycled water. Through this project, facilities would install an additional plumbing system for non-potable water uses such as industrial or irrigation purposes. End user retrofit would have an estimated total capital cost of $83 million in March 2006 dollars. Capital cost estimates developed for the Facilities Plan for this programmatic element were $91 million in September 2002 dollars. The difference between the original cost estimate and current estimate is related to an increase in the ENR CCI, end user retrofit adjustments that were revised in the Master Plan, and a reduction in the number of end user retrofits required.

3.4.1.5 Groundwater Replenishment

Even though the City has not decided to implement groundwater replenishment, the groundwater replenishment option was included in the EIR to comply with CEQA. CEQA requires a reasonable range of alternatives to be considered. Groundwater replenishment with high quality recycled water treated with MF/RO is consistent with the IRP goals and is therefore considered reasonable. After Tillman is upgraded to advanced treatment with MF/RO, up to 9,900 acre-feet per year of recycled water could be pumped to the eastern San Fernando Valley for groundwater replenishment. As previously stated, the Facilities Plan did not incorporate groundwater replenishment into the original capital cost estimates for the recycled water component. As an optional component it was also not included in Table 3-6. If groundwater replenishment were to occur the capital cost estimate would increase by $4 million in March 2006 dollars. Additional costs related to the groundwater replenishment option are minimal as the main pipeline and pumps were previously constructed as part of the East Valley project that was not placed into operation.

In the future, if the City decides to pursue groundwater replenishment, further environmental documentation under CEQA will occur. In addition, any subsequent recycled water groundwater replenishment projects would undergo an extensive and open permitting process through the Department of Health Services and the Regional Water Quality Control Board that will include public hearings sponsored by both of these agencies. In addition, DWP would undertake and extensive outreach process to solicit input from the public and other stakeholders.

3.4.2 Parallel Projects Underway and Conceptual Projects

In a process parallel to the IRP the Master Plan has resulted in the development of multiple recycled water projects that are funded and underway and one conceptual project. These projects will continue to provide recycled water to irrigation customers and meet the overall IRP objectives and guiding principles. Projects, estimated capital costs, and expected completion dates are provided in Table 3-7. Total capital costs for projects underway are estimated at $32.2 million and $2.2 million for the conceptual project for a total of approximately $34.4 million in 2006 dollars.

Table 3-7
Recycled Water Projects Parallel to IRP
Estimated Capital Costs for Underway and Conceptual Projects

	Estimated Capital Cost (2006$)[1] Millions	Forecast Operational Date
Projects Underway		
Sepulveda 4 Pipeline[2]	$5	2007
Hansen Area Phase 1 Pipeline and Tank Storage[2]	$11	2007
Central City Elysian Pipeline[3]	$17	2012
Subtotal Projects Underway	**$33**	
Conceptual Projects		
Harbor Recycling Project	$2	2013
Subtotal Conceptual Projects	**$2**	
Total	**$35**	

Notes:

[1] Costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

[2] CEQA completed by DWP.

[3] CEQA not initiated.

3.4.3 Recycled Water Go-Policy Directions

Similar to runoff management, Go-Policy Directions have been adopted by City Council to provide progress on developing and increasing demands for recycled water supplies. Go-Policy Directions are specific directions to staff on the next studies and evaluations required to develop the programmatic recycled water elements of Alternative 4. The timing of these actions may be dependent on staff and funding availability. As part of these policies, staff will provide periodic status updates.

The Go-Policy Directions are divided into four categories: non-potable uses, indirect potable water uses (groundwater replenishment, environmental use, and general recycled water use). These actions are listed in Section 5.2.2, Table 5-3, and items 1-5.

3.5 Water Conservation

As part of its 5-year update to the Urban Water Management Plan (UWMP), DWP staff included water conservation and runoff management options that are aligned with the IRP, demonstrating their commitment to collaboration with DPW on integrated resources planning.

To provide progress on the increasing water conservation in the City, Go-Policy Directions have been adopted as City policy. Go-Policy Directions are specific directions to staff on the next studies and evaluations required to further development of water conservation measures and Alternative 4. The actions related to water conservation policies are listed in Section 5.2.2, Table 5-3, items 6-10.

DWP has invested $164 million in water conservation since 1991 with successful results. Water demand in 2004 was lower than 1984 levels even though the population has increased by over 750,000. Additionally, per capita water use in 2004 was 18 percent lower than in 1989 when DWP started its aggressive conservation campaign. The viability of water conservation programs is subject to funding, in the form of both outside and internal funding, and DWP's ability to implement the programs. DWP has made a stronger commitment to obtain outside funding for conservation projects. Current water conservation funding sources include:

- Water Rate Adjustments – An adjustment factor is applied to each bill to fund conservation and recycling projects
- Metropolitan Water District of Southern California Conservation Credits Program – MWD offers rebates of half of the project cost (an approximate rebate of $154 per acre-foot saved) for the installation of specified conservation measures.
- Grant Funding – LADWP applies for and has received grant funding from a variety of sources for water conservation projects, such as Proposition 13 and Proposition 50.

This section is for reference purposes only as the UWMP is developed outside of the IRP process. However, the IRP process has resulted in valuable input towards the development of water conservation measures and in viewing water use in an integrated manner in conjunction with wastewater, runoff management, and recycled water. The 2005 UWMP should be consulted for a more in depth discussion of water conservation programs.

Water conservation is the responsibility of DWP. DWP is a separate department from DPW and operates independently. Any financial impacts related to water conservation are evaluated by DWP.

3.5.1 DWP Water Conservation Program

DWP's conservation planning process entails working with other City departments to ensure that cross-departmental goals are met. As part of its 5-year update to the UWMP, DWP has included water conservation and runoff management programs elements that are aligned with their commitment to collaboration with Public Works on integrated planning. In the 2005 UWMP, DWP has increased its water conservation goals from 15 percent to 20 percent of historical water usage. The UWMP outlines programs to achieve this goal over the next 25 years. DWP's conservation programs are designed to address cost-effective demand reduction, customer service, and environmental responsibility. LADWP's conservation programs are broken down into five categories: awareness/support, residential, commercial/industrial/institutional (CII), landscape, and system maintenance. Each category is briefly discussed in this section.

Table 3-8 lists DWP's conservation measure categories.

Table 3-8
Water Conservation Measures (Potential and Existing)

Interior and exterior water audits and incentive programs for single- and multi-family residential customers Residential plumbing and retrofit
Distribution system water audits, leak detection, and repair
Metering with commodity rates for all new connections, and retrofit of existing connections
Large landscape water audits and incentives
High efficiency washing machine rebate program
Public information
School education
Commercial and industrial water conservation
Conservation pricing
Water conservation coordinator
Water waste prohibition
Residential ultra-low flush toilet replacement program
Direct installation of ultra-low flush toilets, showerheads, and aerators
Public agency retrofits through Technical Assistance Program and Ultra-low Flush Toilet Programs
Large industrial incentive program through Technical Assistance Program
Industrial Cooling Water Study
Ascending block rate structure and other economic incentives
Development of ultra-low flush toilet supplementary purchase specification
Homeowner association irrigation pilot program and study
Landscape education in English and in Spanish through Protector del Agua Program
Ultra-low flush toilet on resale ordinance
Residential evapotranspiration-based irrigation controller program pilot
Toilet flapper study and replacement program
Graywater use
Customer class-based billing records

DWP's conservation programs are broken down into five categories: awareness/support, residential, commercial/industrial/institutional (CII), landscape, and system maintenance. Each category is briefly discussed in this section. In-depth details are provided in the 2005 UWMP.

3.5.1.1 Awareness/Support

Awareness/support measures can be active or passive. Active components are inclusive of conservation rate structures, assessment of volumetric sewer charges, and full metering of water use. Passive components include the provision of educational materials for schools, community presentations, and public information readily available. Passive components create awareness and encourage community involvement. Advocacy on behalf of DWP in the development of more stringent standards in water use efficiency is also part of awareness/support.

3.5.1.2 Residential

Residential water conserving measures encourage water use efficiency through retrofits of water saving devices and ordinances that require the installation of ultra low flush toilets and low-flow showerheads prior to the close of escrow. Programs have been enacted for the distribution of new devices by community based organizations. Rebate programs provide residents with rebates for the purchase of water efficient devices, such as high efficiency washing machines. Additionally, home water surveys and pilot programs for weather sensitive irrigation controllers (smart irrigation) are part of residential water conserving measures.

3.5.1.3 Commercial/Industrial/Institutional

In conjunction with the Metropolitan Water District of Southern California, DWP has implemented a commercial rebate program. The rebate program provides a variety of rebates for water conserving devices, such as toilets, cooling tower conductivity controllers, and coin-operated washing machines.

A Technical Assistance Program was also created to provide incentives for the retrofit of water-intensive equipment. This program provides site specific incentives based on a given project's water savings.

3.5.1.4 Landscape

Landscape water use is reduced through a variety or programs. In the past the City enacted an ordinance to require customers with three or more acres of turf to reduce water consumption by ten percent from 1986 levels or have a surcharge of 100 percent on their water bills. Other programs include development and distribution of a guidebook, free training classes for large turf customers, sponsoring of garden and conservation expos to highlight conservation, incentives through the Technical Assistance Program, and enactment of a landscape ordinance to regulate landscape requirements.

New programs that DWP is investigating under this category include a pilot study on the effectiveness of weather sensitive irrigation controllers (smart irrigation) in large landscape applications. DWP is continuing to investigate these controllers with the goal of developing a financial incentive program. Additionally, DWP is developing a landscape irrigation program for homeowner associations and large landscape customers.

DWP is also partnering with community based organizations, such as TreePeople, to develop stormwater management systems to conserve runoff for onsite irrigation use and local groundwater replenishment projects.

3.5.1.5 System Maintenance

DWP utilizes measures to reduce water waste and leakage from its system. Programs include pipeline replacement, pipeline corrosion control, cement lining, and water meter replacement.

Section 4
Baseline Project Timing and Assumed Triggers

The projects identified through the IRP program will be initiated in accordance with the City's processes for CIP project implementation. The Department of Public Works (DPW) is responsible for implementation of wastewater and stormwater facilities and the Department of Water and Power (DWP) is responsible for implementation of recycled water facilities. With the certification of the IRP EIR by the City Council, both the DPW will proceed with the specific "Go" projects (described above in Section 3.2.1.) as well as the "Go-Policy Directions" (described in section 3.2.3). The "Go If Triggered" projects (section 3.2.2) will be implemented by DPW when the associated triggers are reached.

4.1 Baseline Project Timing for Go Projects

The Go projects consist of the following six projects:

- Wastewater Storage Facilities at Tillman
- Wastewater Storage Facilities at LAG
- Recycled Water Storage at LAG
- HTP Solids Handling/Truck Loading Facility
- GBIS
- NEIS Phase II, West Alignment – Option B

Figure 4-1, in Section 4.2, shows an initial schedule for the implementation of these projects. Forecast online dates as discussed refer to completion of construction prior to post-construction/startup. This is subject to change through the annual WCIP process and quarterly IRP Implementation Strategy process (described in Section 5).

4.1.1 Wastewater Storage Facilities at Tillman

A concept study is just beginning for the Wastewater Storage Facilities at Tillman project. Although the IRP EIR identifies and evaluates the impacts of constructing a 60 million gallon (MG) buried storage tank just outside the bermed, Tillman plant property line, this represents a worst-case scenario option. When originally defined, this project was intended to provide wet weather hydraulic relief to the sewer system downstream of the Tillman plant as an alternative to constructing a new sewer relief trunk line (VSLIS). However, during the development of the EIR, the wastewater storage tank project was recognized to be necessary for plant operations, and, as such, was planned to be implemented in conjunction with the VSLIS line. The size of the storage tank is currently being reevaluated in light of this change, and it is likely that since it will be providing hydraulic relief primarily until the VSLIS can be constructed, the size of it can be reduced considerably. Sizing the storage facilities will need to balance storage tank size with considerations for future usage of the storage tank after the VSLIS line is constructed, as well as timing of the construction of the VSLIS line. Although the schedule reflected in Figure 4-1 is based on the buried, 60-MG tank, it is likely that the recommended storage tank size will be smaller as the purpose of this storage has been modified since this concept was initially developed.

The baseline schedule shown includes 1-year periods for the concept study, predesign, and design phases, followed by a 6-month bid and award period, a 3-year construction period, and a 6-month startup period. The on-line date is currently expected to be the middle of 2013.

4.1.2 Wastewater Storage Facilities at LAG

The baseline schedule for the Wastewater Storage Facilities at LAG project shown includes 1-year periods for the concept study, predesign, and design phases, followed by a 6-month bid and award period, 1½-year construction period (assuming this is a 5 MG storage tank), and a 6-month startup period. The on-line date is currently expected to be the middle of 2012.

4.1.3 Recycled Water Storage at LAG

The schedule shown for the Recycled Water Storage at LAG project includes 1-year periods for the concept study, predesign, and design phases, followed by a 6-month bid and award period, 1½-year construction period (assuming this is a 5 MG storage tank), and a 6-month startup period. This work is assumed to proceed in parallel with the wastewater storage facilities at LAG. The on-line date is currently expected to be the middle of 2012.

4.1.4 HTP Solids Handling/Truck Loading Facility

A concept report has already been prepared for the HTP Solids Handling/Truck Loading Facility project. The schedule shown here includes a 1-year predesign period, 18-month design period, 6-month bid and award period, 2½-year construction period, and a 6-month startup period. The on-line date is currently expected to be the end of 2012.

4.1.5 GBIS

A portion of the predesign for the GBIS project, a major sewer tunnel trunk line, has been completed. Although the design process has been in hiatus for approximately 1-year, it is scheduled to resume in early 2007 for a period of 1 year. A 2½-year design process will follow. A 3-year ROW acquisition process will begin in the middle of 2007, before the completion of the predesign, and end 6 months after design has been completed, i.e., by the end of 2010. Bid and award will follow the ROW acquisition, with a 4½-year construction period and 1-year post-construction period. The on-line date is currently expected to be the beginning of 2016.

4.1.6 NEIS Phase II, West Alignment – Option B

Much of the predesign for the NEIS Phase II, West Alignment – Option B project, a major sewer tunnel trunk line, has been completed. Although the design process has been in hiatus for approximately 1-year, it is scheduled to resume in early 2007 for a period of 6 months. A 2½-year design process will follow, paralleled by a 3-year right-of-way (ROW) acquisition process. Bid and award will follow the ROW acquisition, with a 4½-year construction period and 1-year post-construction period. There is a construction constraint in the Griffith Park area during the LADWP Festival of Lights from October 1 through January 2 that must be accommodated each year. This affects work and travel on Crystal Springs Drive between Los Feliz Drive and Zoo Drive leading to the 5 Freeway on and off ramps. The on-line date is currently expected to be the beginning of 2016.

4.2 Baseline Project Timing for Go If Triggered Projects

The "Go If Triggered" projects include the following:

- Upgrades at Tillman to Advanced Treatment (current capacity)
- Expansion of Tillman to 100 mgd with advanced treatment
- Secondary Clarifiers at HTP (up to 100 mgd for operational needs)
- HTP Digesters
- Expansion of HTP to 500 mgd
- VSLIS

The implementation of these projects is contingent on their need, as determined through pertinent "triggers". These triggers may be related to regulatory actions such as new discharge or recycled water permit requirements, population increases and associated wastewater flow increases, operational requirements, and/or changes in public perception. The primary mechanism for monitoring these triggers will be an IRP Implementation Strategy Committee that will meet quarterly to review the trigger status and determine project readiness for initiation. Section 5, below, discusses this trigger tracking process. Forecast online dates discussed refer to completion of construction prior to post-construction/startup.

Figure 4-2 shows possible schedules for the implementation of these projects, but this schedule is highly speculative at this time. The purpose of this schedule is to identify the durations that will be needed for implementation of each project should a trigger occur, and will also serve as the basis for a financial analysis of the recommended IRP alternatives. These schedules will certainly change as the trigger tracking process continues, and will be modified as necessary, and appropriate, if they are triggered and become part of the WCIP.

4.2.1 Upgrades at Tillman to Advanced Treatment (Current Capacity)

A fundamental assumption for the triggering of the Upgrades at Tillman to Advanced Treatment (Current Capacity) project is that this treatment technology will be needed to either meet new permit limits or provide higher quality water for groundwater replenishment, if there is a policy change at the City to conduct this. New permit limits may apply to either effluent discharge to the LA River (NPDES permit) or for recycled water use [Water Recycling Requirements (WRR) and/or Waste Discharge Requirements (WDR) permits]. Assuming a new discharge permit is issued in 2007, this schedule assumes that a concept study to develop the advanced treatment system would be prepared in 2008, followed by pilot testing of the selected membrane technology system. This would lead into a 1½-year predesign period, a 2½-year design period, a 6-month bid and award period, a 3-year construction period, and a 6-month startup period for the membrane system. The advanced oxidation system would lag behind the determination of the select membrane process so that the appropriate effluent can be tested. The on-line date for both the membrane and advanced oxidation processes would thus be expected to be the middle of 2017. Trigger review of the new permits is expected in 2007 prior to the initiation of the concept study and a decision by the City policy makers regarding groundwater replenishment is expected by 2010.

4.2.2 Expansion of Tillman to 100 mgd with Advanced Treatment

The primary driver for the Expansion to 100 mgd with Advanced Treatment project would be the need for additional treatment capacity in the Hyperion Service Area. This corresponds to Alternative 4 of the IRP EIR alternatives. If these conditions do not apply at Tillman and expansion is needed in the Hyperion Service Area, then IRP Alternative 1 (Expansion at HTP) will instead be implemented.

The baseline schedule for this project assumes that plant expansion is not necessary until 2020, at the earliest, and, since Southern California Association of Governments (SCAG) population projections have been reduced considerably since the IRP Facilities Plan was prepared, it is quite likely that expansion will not be needed until after 2020. For the purposes of keeping this project on the radar screen of the IRP Implemenation Strategy Committee, it is shown here with a related timeline for concept study, predesign, design, and construction with and end date of 2021. However, the continued tracking of population growth and associated wastewater treatment capacity needs will be necessary to gauge the timing of this project. The next triennial release of population projections from SCAG is scheduled for 2007. Revised population projections should be available to the City for consideration of projected long-term capacity needs in 2008. In addition, a decision regarding City policy regarding groundwater replenishment is likely to be determined by 2010, another trigger review milestone for this project.

FIGURE 4-1
IRP GO PROJECTS

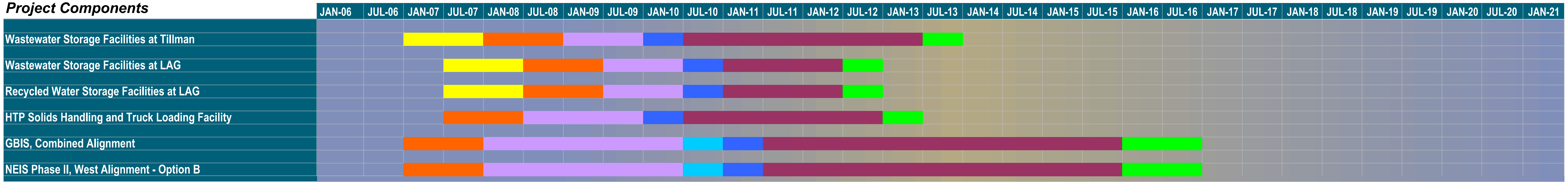
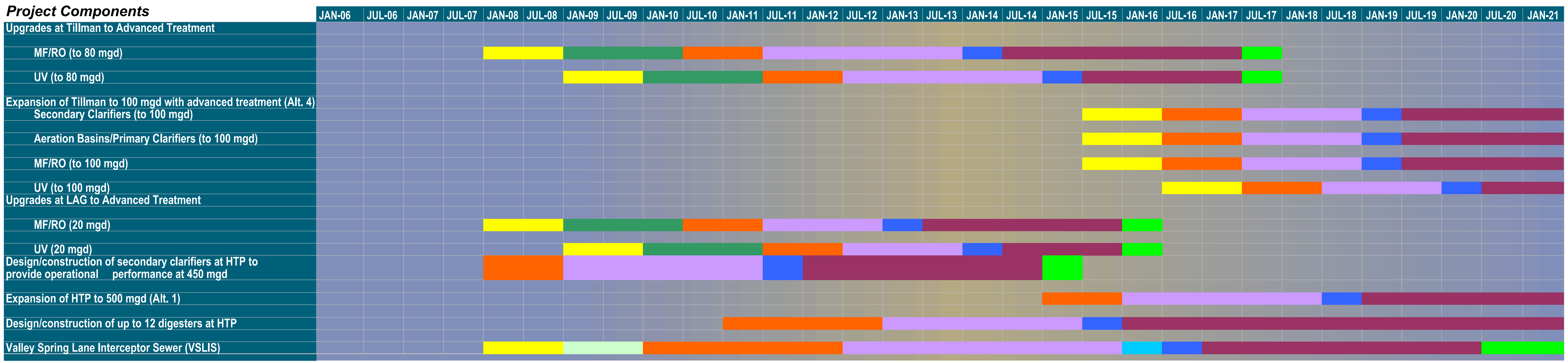
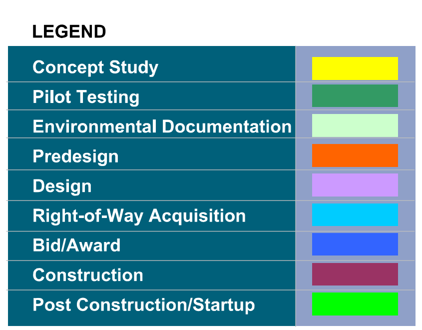


FIGURE 4-2
GO IF TRIGGERED PROJECTS





4.2.3 Upgrade of LAG to Advanced Treatment (Current Capacity)

Similar to the upgrades at Tillman, the Upgrade of LAG to Advanced Treatment (Current Capacity) project is contingent on the need to implement advanced treatment technology for the purpose of meeting discharge or recycled water permit limits. The consideration of groundwater replenishment is not a factor here, though, as it is for the Tillman plant, since there are no spreading grounds in the vicinity of the LAG plant. Like the Tillman project, assuming a trigger in 2007, the concept study to develop the advanced treatment system requirements would be prepared in 2008, followed by pilot testing of the selected membrane technology system, and a 1½-year predesign period, identical to the Tillman project. However, due to the smaller size of the LAG plant (20 mgd vs. 80 mgd at Tillman), a shorter timeframe has been estimated for completion of the membrane system (i.e., a 1½-year design period, 6-month bid and award period, 2½-year construction period, and a 6-month startup period). The advanced oxidation system would again lag behind the determination of the selected membrane process so that the appropriate effluent can be tested. The on-line date for both the membrane and advanced oxidation processes would thus be expected to be the end of 2016.

4.2.4 Design/Construction of Secondary Clarifiers at HTP to Provide Operational Performance at 450 mgd

The triggers associated with the Design/Construction of Secondary Clarifiers at HTP to Provide Operational Performance at 450 mgd project are primarily related to current plant operations that have been effectively reducing the treatment capacity of the secondary clarifiers. To improve the settling of the oxygen reactor effluent in the secondary clarifiers, Modules 3, 5 and 7 have been converted to have anaerobic selectors. The improved settling is a result of the control of filamentous bacteria that this configuration provides. The remaining modules still contain the original configuration (i.e., aerobic selectors). However, future plans include possibly converting all or part of the remaining oxygen reactors to the anaerobic selectors.

While the anaerobic selector modules have been effectively controlling the growth of filamentous organisms and demonstrated improved settling characteristics, there has been an increase in foaming, presumably due to *Nocardia*, a slow-growing filamentous actinomycete. This is resulting in high turbidity levels in the plant effluent.

To remedy these problems and regain the lost capacity of the secondary clarifiers, the City has been undertaking process optimization strategies, including testing of a "microaeration" process and polymer addition. The effectiveness of these strategies to recover the design capacity of the existing secondary clarifiers will be tracked as a trigger for this project. If necessary, this project will provide for up to 100 mgd of additional secondary clarifier capacity.

The schedule shown for this project assumes that the results of the implementation of these process optimization strategies will be known in 2007. Thus, as a worst-case scenario, if additional clarifiers are needed, predesign (1 year), design (2½ years), bid and award (6 months), construction (3 yrs), and startup (6 months) could begin in 2008. Given this schedule, the on-line date would be the end of 2014.

4.2.5 Expansion of HTP to 500 mgd

The Expansion of HTP to 500 mgd project would take place only if there is a need for additional wastewater treatment capacity in the Hyperion Service Area and expansion of Tillman is not an option due to a policy decision by the City to not pursue groundwater replenishment with Tillman effluent or the lack of adequate flow in the Tillman Service Area to warrant Tillman expansion. This corresponds to Alternative 1 of the IRPAlternatives.

As discussed above under the Expansion at Tillman project, the baseline schedule for this HTP expansion project assumes that such expansion is not necessary until at least 2020. This expansion project consists primarily of the addition of 50 mgd of secondary clarifier capacity. The schedule shown assumes a 1 year predesign period, 2½-year design period, 6-month bid and award period, and 2½-year construction period, with an on-line date of 2021. Also as noted above for the Expansion at Tillman project, updated population projections from SCAG should be available to the City for consideration of projected long-term capacity needs in 2008.

4.2.6 Design/Construction of up to 12 Digesters at HTP

Increases in solids loadings at HTP is related to increases in population growth resulting in the need for the Design/Construction of up to 12 Digesters at HTP project. Similar to the plant expansion projects described above for Tillman or HTP, the need for additional digester capacity due to population growth is unlikely to be required until after 2020 (the planning horizon for the IRP), but to keep it on the CIP radar screen for future needs, it is shown in this schedule with a construction end date of 2021. However, to meet this on-line date, design would need to begin in early 2011 because of a protracted construction schedule of nearly 6 years. This is due to an assumed construction of 12 digesters built in 2 phases of 6 digesters per phase, with each phase taking approximately 3 years. The available and projected capacities of the digesters can be tracked by evaluating the hydraulic detention times (HDT) in the active digesters, i.e., greater solids loading correlates to lower HDT.

4.2.7 Alignment Study, Environmental Documentation, and Subsequent Design/Construction of the Valley Spring Lane Interceptor Sewer

The Alignment Study, Environmental Documentation, and Subsequent Design/Construction of Valley Spring Lane Interceptor Sewer (VSLIS) project trunk line will provide hydraulic relief to the sewer system just downstream of the Tillman plant. As discussed above under the Wastewater Storage at Tillman project, this project was identified to manage wet weather flows downstream of Tillman as an alternative to installing storage at Tillman. The Tillman storage project is now moving forward as a “Go” Project, and so the need for construction of the VSLIS line will be deferred until the projected wet weather flows downstream of Tillman exceed the capacity of the existing major interceptor system.

To determine the point at which additional sewer capacity will be needed, we can draw on a recent review and evaluation of the City's trigger flow level concept. In application, this refers to monitoring the ratio of sewage depth (d) to sewer diameter (D) of an existing pipe, or d/D, as a measure of when the project planning and design process must begin in order to make sure that the relief project (i.e., new sewer) is operational by the time the relief level in the existing sewer is reached. The relief level is the highest level of peak dry weather flow that will accommodate the anticipated peak wet weather flow within the full flow capacity of the pipe. The trigger level is lower than the relief level to allow for an increase in flow level during the period of time that the planning, design and construction of the relief project is underway. How much lower the trigger level is than the relief level depends on how fast the sewage flow rate is increasing over time (as a function of population growth, land use changes, etc.), and how long the relief project is expected to take to implement. This process is shown in Figure 4-3. (For a more complete description of how to apply this process, see the City's *Wastewater Collection System Capacity Report and Plan*, dated June 2006, prepared by WESD).

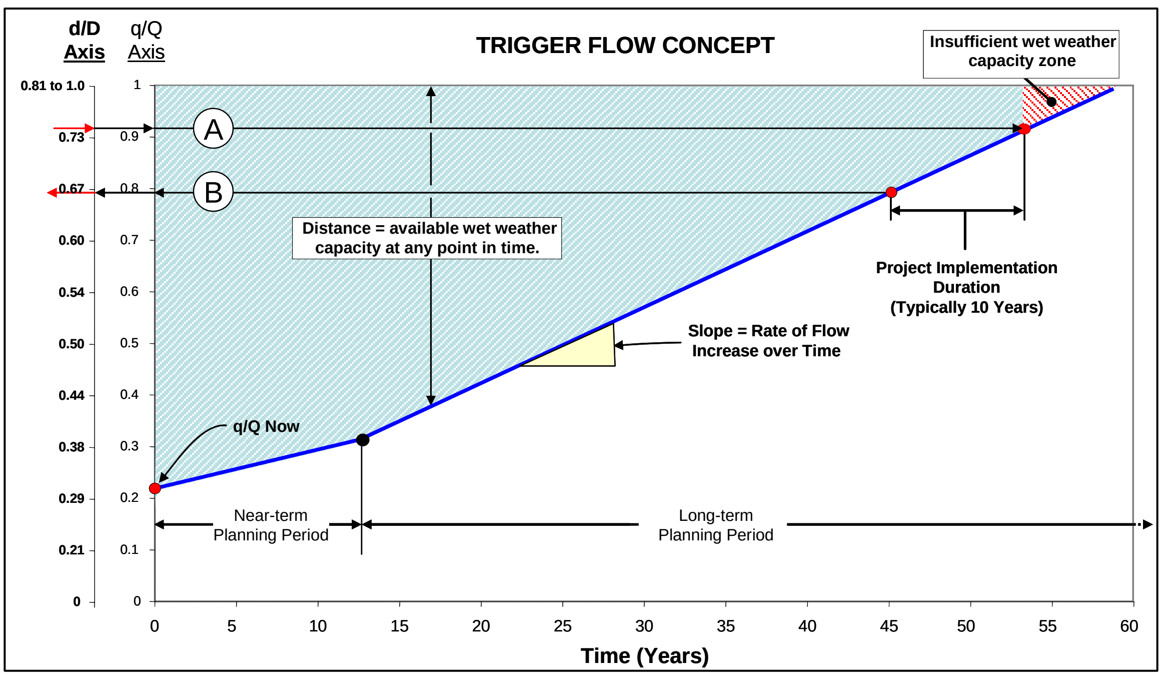


Figure 4-3
Determining Point in Time of Trigger Flow to Provide Flow Relief
Source: Wastewater Collection System Capacity Report and Plan, June 2006

The schedule shown in Figure 4-3 assumes that the VSLIS line is needed by 2020. Based on the discussion above, that may or may not be the case and needs to be monitored through the trigger flow level process. Working backwards, with 1 year allocated for post construction activities, 3½ years for construction, 6 months for bid and award, 6 months beyond design for ROW acquisition, 3½ years for design, 2½ years for predesign, 1 year for environmental documentation (as this was cleared only at the program level in the IRP EIR and requires additional, site-specific environmental clearance), a 1-year concept study to finalize the alignment would need to begin in early 2008.

Section 5
Implementation Tracking

Implementation of the projects and policies recommended through the IRP program will require a coordinated effort amongst the various Bureaus and Divisions within the DPW and DWP. This section describes the mechanisms and tools that have been developed to facilitate this coordination and monitor and report on the progress of implementation of these projects and policies.

5.1 IRP Implementation Strategy Committee

To facilitate this coordination and communication, an IRP Implementation Strategy Committee has been established. Through regular communications among these committee members, status on the "Go" and "Go If Triggered" projects will be tracked. In addition, this forum provides an opportunity to communicate as obstacles to implementation are encountered, or with appropriate and sufficient representation, to identify strategies to overcome these obstacles.

5.1.1 Committee Members

The committee is currently comprised of representatives from the following organizations within DPW and DWP, shown in Table 5-1. Also shown is each organization's primary area of focus and responsibility relative to the IRP projects and policies.

While participation in this committee may vary with project status, the members identified in Table 5-1 represent the core body that will monitor progress and triggers for the IRP projects and policies.

5.1.2 Meeting Schedule

This group has been meeting regularly during 2005 and 2006, generally on a quarterly basis. The frequency has increased in recent months as critical decisions were made regarding the IRP preferred alternative. With the adoption of the IRP EIR scheduled for November 2006, it is anticipated that this forum can return to a quarterly schedule in 2007. While flexibility for more frequent meetings may be needed as specific issues arise, it is expected that meetings will be held quarterly in the following months: January, March, July, and October.

Table 5-1 Implementation Strategy Committee	
Organization	**Area of Focus**
Department of Public Works (DPW)	
Bureau of Sanitation (BOS)	***Wastewater facilities and operations Stormwater Facilities and Operations***
Executive Management Team (EXEC)	Bureau Director, Assistant Directors, Wastewater Program
Wastewater Engineering Services Division (WESD)	Long-range planning for wastewater treatment and collection systems
Watershed Protection Division (WPD)	Dry and wet weather runoff management
Industrial Wastewater Management Division (IWMD)	Industrial source control
Financial Management Division (FMD)	Management of CIP and operations budgets
Regulatory Affairs Division (RAD)	Regulatory compliance
Hyperion Treatment Plant Division (HTP)	HTP plant operations
Water Reclamation Division (WRD)	Tillman (DCT) and LAG plant operations
Wastewater Collection System Division (WCSD)	Operations and Maintenance Input on implementation
Bureau of Engineering	***Wastewater and runoff facilities design and construction***
Environmental Engineering Division (EED)	Technical studies and design
Wastewater Conveyance Engineering Division (WCED)	Major sewer design
Department of Water and Power	
Water Recycling Group	Marketing and delivery of recycled water
Water Conservation Group	Water conservation programs
Department of Recreation and Parks	Operations and maintenance of parks and other recreational facilities
Department of General Services	Management of facilities, equipment, supplies, security, communication, maintenance, and other support services for City departments
Planning Department	Prepares and maintains a general plan, regulates the use of privately-owned property, investigates and reports on applications for amendments to zoning regulations, acquires land by the City for public use, and conducts studies relating to environmental quality

5.1.3 Meeting Agenda

A standing agenda will include a review of the IRP projects and policies and their status, and an update from each of the core group members, shown in Table 5-1, on activities related to these projects. Regular reviews of the key triggers for the "Go If Triggered" projects will also be conducted. A series of tools has been developed to facilitate tracking of project triggers as well as progress with policy recommendations, and are described below in Section 5.2.

WESD, the lead for the IRP program, has the responsibility for leading these meetings and maintaining these tools.

5.2 IRP Implementation Tracking Tools

The following tools have been prepared to assist the Implementation Strategy Committee members with tracking the triggers identified with the specific "Go If Triggered" projects, and to monitor the progress of policy directions.

5.2.1 Trigger Tracking Tools

There are three tools that have been developed thus far that can assist in tracking triggers. These are provided in Appendices D – E and include the following items:

1. Plant Scenarios table (Table 5-2) – this table summarizes the key conditions and decisions that determine the plant expansion and upgrade identified in the IRP. Each of the conditions are linked by color to decision points shown in the IRP Implementation Flow Charts. For example, the first condition shown in Table 5-2 in orange font is that restrictive permits require advanced treatment. This is linked to decision points in the Permit Flow Chart (Appendix D) regarding the need for advanced treatment, to meet either discharge permit or recycled water permit requirements.

2. IRP Implementation Flow Charts (Appendix D) – these flow charts are intended to serve as decision trees to identify decisions necessary for implementation of the "Go If Triggered" projects.

   The flow charts provide the linkages between the key conditions/decisions reflected in the Plant Scenarios table (item 1 above), the major activities necessary to make these decisions, and the organizations responsible for these activities.

   The flow charts developed initially are as follows:

   - **Permits Decision Tree** (Appendix D)– this identifies the specific constituents of concern and related studies or other information needed to assess the impacts of new NPDES or water reclamation (WRR/WDR) requirements. One of the projects that could be triggered for implementation through this decision tree process is the advanced treatment at the DCT or the LAG WRPs. The trigger is to meet restrictive permit limits.

Table 5-2
Plant Scenario

OUTCOMES FOR TREATMENT PLANTS					CONDITIONS (KEY DECISIONS)				
IRP Alternative	Scenario	Plant Expansion & Other System Impacts	Amount Advanced Treatment at DCT	Amount Advanced Treatment at LAG	Implement GWR?	Restrictive Permits require AT[1]?	Additional WW treatment capacity needed in HSA?	Sufficient flow available in DCTSA for expanded DCT to treat?	DCT discharge limited to minimum LA River flow requirements?
4	1	DCT:100 mgd expansion	Full	Full	Y	Y - Full	Y[2]	Y[2]	N
4	2	DCT:100 mgd expansion	Portion 3	Portion 2	Y	Y - Partial	Y[2]	Y[2]	N
4	3	DCT:100 mgd expansion	Portion 1	None	Y	N	Y[2]	Y[2]	N
4	4	None	Full	Full	Y	Y - Full	N	N	N
4	5	DCT: bypass remaining flow to HTP	Half	Full	Y	Y - Full	N	N	Y[3]
4	6	None	Portion 3	Portion 2	Y	Y - Partial	N	N	N
	7	DCT: bypass remaining flow to HTP	Portion 3	None	Y	Y - Partial	N	N	Y[3]
4	8	None	Portion 1	None	Y	N	N	N	N
4	9	DCT: bypass remaining flow to HTP	Half	Full	N	Y - Full	N	n/a[4]	Y[3]
4	10	None	Portion 2	Portion 2	N	Y - Partial	N	n/a[4]	N
4	11	DCT: bypass remaining flow to HTP	Portion 2	Portion 2	N	Y - Partial	N	n/a[4]	Y[3]
1	12	HTP expansion[5] DCT: bypass remaining flow to HTP	Half	Full	N	Y - Full	Y	n/a[4]	Y[6]
1	13	HTP expansion[5]	Full	Full	N	Y - Full	Y	n/a[4]	N
1	14	HTP expansion[5] DCT: bypass remaining flow to HTP	Portion 2	Portion 2	N	Y - Partial	Y	n/a[4]	Y[6]
1	15	HTP expansion[5]	None	None	N	N	Y	n/a[4]	N

Notes:

[1] Applies to plant NPDES or WDR/WRR permits

[2] Expansion at DCT would only occur if both additional wastewater treatment capacity in HSA and additional flows are available in DCTSA.

[3] Half of DCT mothballed due to excessive investment/O&M costs to comply with new permit requirements

[4] Assume DCT will not be expanded unless there is a need for additional capacity in HSA (i.e., RW demands alone would not drive plant expansion).

[5] HTP expansion requires additional environmental documentation

[6] HTP expansion could occur even when half of DCT is mothballed if the HSA flow increases occur downstream of the DCT service area.

Amount of Advanced Treatment (AT):

Full	Full plant flow
Half	Half of plant flow
Portion 1	Portion of total plant flow treated with A.T. for GWR and/or non-potable reuse
Portion 2	Portion of total plant flow treated with A.T. for LAR discharge
Portion 3	Portion of total plant flow treated with A.T. for GWR and LAR disch

Current Plant Capacities: DCT = 80 mgd, LAG = 20 mgd, HTP = 450 mgd

- **Advanced Treatment Needs Decision Tree** (Appendix D)– this identifies the degree of advanced treatment (MF/RO/UV/H_2O_2) that may be needed at the DCT or LAG WRPs to meet permit or end use requirements. Here, the triggers for implementing the advanced treatment at DCT "Go If Triggered" project could be either permit-based (orange-colored decision points), as shown in Table 5-2, or for the implementation of groundwater replenishment (blue-colored decision points). Another consideration shown here is the decision related to the possible limitation of flow treated at DCT to deliver only enough to meet minimum flow requirements to sustain habitat in the LA River (green-colored decision point).

- **Plant Expansion Decision Tree** (Appendix D)– this identifies the major considerations for determining whether and where plant expansion will take place. Key decision points (conditions in Table 5-2) include: whether additional wastewater treatment capacity is needed in the Hyperion Service Area (pink-colored decision point), whether sufficient flows are available in the DCT service area to allow for expansion at DCT (purple-colored decision point), and whether groundwater replenishment is implemented (blue-colored decision point). These are major factors that will determine whether the DCT Expansion "Go If Triggered" project is necessary, and possible.

- **HTP Secondary Clarifiers Decision Tree** (Appendix D)– this identifies the studies and considerations for determining clarifier capacity and expansion needs at the Hyperion Treatment Plant. The triggers for implementing the HTP Secondary Clarifier are either for operational needs (grey-colored decision point, not referenced as a condition in Table 5-2) or for plant expansion (pink-colored decision point).

- **VSLIS** (Appendix D)– this chart shows the relationship between the sizing of the wastewater equalization basin at DCT and the timing of the need for installation of the VSLIS trunk line "Go If Triggered" project. Wet weather storage at DCT would provide wet weather flow relief until such time as increases in wastewater flows, driven primarily by population growth, necessitate the construction of a relief sewer downstream of DCT. The larger the storage tank, the longer the construction of the VSLIS can be deferred. This needs to be balanced with site constraints, investment value, and other considerations that are currently being investigated through a concept study.

The flow charts have been prepared using Microsoft Visio software and can be readily updated and modified as necessary and appropriate for use by the Implementation Strategy Committee.

3. Trigger Tracking Charts (Appendix E) – these are spreadsheet tools.

   Three (3) Trigger Tacking Charts have been developed thus far:

   - **Hyperion and DCT Service Area Flows** – this chart is a tool monitoring monthly and annual average flows in the Hyperion and DCT service areas to determine trends. (It is referenced in the **Plant Expansion Decision Tree** flow chart tool described above.)

   - **HTP Secondary Clarifier Expansion** – this chart is a tool for monitoring the need for secondary clarifier expansion, either due to process inadequacies and the need to recover design capacity, or plant expansion requirements. (It is referenced in the **HTP Secondary Expansion Decision Tree** flow chart tool described above.)

   - **HTP Digester Expansion** – this chart is a tool for monitoring the need for digester expansion at HTP. (It is not referenced in any of the flow charts developed thus far.)

It is entirely likely, and expected, that these tools may be refined as appropriate and additional tools developed for use by the Implementation Strategy Committee. The tools provided herein are intended to serve as starting points to convey the intent of the IRP projects, their anticipated impacts, and likely triggers. As noted above, these tools will be maintained by WESD.

5.2.2 Tracking Go-Policy Directions

Included in the preferred alternative is a listing of recommended policy directions for City staff to proceed with specific activities related to recycled water, water conservation, and runoff management. Staff is to provide periodic status updates to the City Council, along with an identification of any impacts these actions might have on existing City. Each agency identified as lead will be invited to periodically report out to the IRP Implementation Strategy Committee on the activities and progress on these actions.

Table 5-3 summarizes these policy directions, and the responsible party or parties leading the activities. These actions are grouped by service function. The General Go-Policy Directions listed are applicable to more than one resource area.

Table 5-3
IRP Go-Policy Directions

	Policy Direction	Responsible Party (lead organization listed first)
	Recycled Water	
	Non-Potable Uses:	
1.	Work together to maximize use of recycled water for non-potable uses in Terminal Island Treatment Plant service area, west side, and LAG services areas. DWP to conduct additional Tier 1 and 2 customer analysis to verify the potential demands and feasibility. Develop a long-range marketing strategy for recycled water that includes a plan for recruiting (and keeping) new customers.	DWP and DPW
2.	Evaluate and develop ordinances to require installation where feasible of dual plumbing for new multi-family, commercial and industrial developments, schools and government properties in the vicinity of existing or planned recycled water distribution systems in coordination with LA River Revitalization Master Plan. Consider proximity and demand when determining feasibility.	Dept. of Building and Safety
3.	Coordinate where feasible the design/construction of recycled water distribution piping (purple pipe) with other major public works projects, including street widening, and LA River Revitalization Master Plan project areas. Also coordinate with other agencies, including MTA and Caltrans on major transportation projects.	DWP and DPW
	Indirect Potable Uses:	
4.	Develop a public outreach program to explore the feasibility of implementing groundwater replenishment with advanced treated recycled water.	DWP
	Environmental Uses:	
5.	Continue to provide water from DCT to Lake Balboa, Wildlife Lake, and the Japanese Garden at Sepulveda Basin, and the LA River to meet baseline needs for habitat, i.e., approximately 27 mgd through flow-through lakes).	DWP and DPW
	Water Conservation	
6.	Continue conservation efforts, including programs to reduce outdoor usage, including using smart irrigation devices on City properties, schools and large developments (those with 50 dwelling units or 50,000 gross square feet or larger), and to increase incentives to residential properties.	DWP
7.	Continue conservation efforts, including evaluating and considering new water conservation technologies, including no-flush urinal technology.	DWP and DBS
8.	Continue conservation efforts, including working with Building and Safety to evaluate and develop policy that requires developers to implement individual water meters for all new apartment buildings	DWP and DBS
9.	Continue conservation awareness efforts, including increasing education programs on the benefits of using climate-appropriate plants with an emphasis on California friendly plants for landscaping or landscaped areas developed in coordination with LA River Revitalization Master Plan, and to develop a program of incentives for implementation.	DWP

Table 5-3 IRP Go-Policy Directions		
	Policy Direction	**Responsible Party (lead organization listed first)**
10.	Consider the development of City Directive to require the use of California friendly plants in all City projects where feasible and not in conflict with other facilities usage.	Planning Dept.
	Wet Weather Runoff Management	
11.	Review SUSMP requirements to require on-site infiltration instead of treat/discharge BMPs, where feasible, along with in-lieu fess where infiltration is infeasible.	DPW
12.	Evaluate and modify codes to encourage on-site capture and retention and/or infiltration, where feasible. Evaluate porous pavements in all new public facilities and large developments >1 acre.	DBS, DPW and Planning Dept.
13.	Evaluate ordinances to reduce are on private properties that can be paved with impervious pavement.	Planning Dept.
14.	Evaluate and implement integration of porous pavements into sidewalks and street programs where feasible.	DPW
15.	Prepare concept report and determine feasibility of developing powerline easement demonstration project.	DPW, DWP, DRP
16.	Determine feasibility of developing projects for new and retrofitted schools, as well as government/city-owned facilities with stormwater BMPs.	DPW, DWP, LAUSD
17.	Identify sites that can provide onsite percolation in surplus properties, vacant lots, parks/open space, abandoned alleys in the East Valley, and along the LA River in the East Valley, where feasible.	DPW, DGS, DRP
18.	Maximize unpaved open space in City-owned properties and parking medians through use of all feasible BMPs and by removing all unnecessary pavement.	DPW, DGS, DOT
19.	Include all feasible BMPs in the construction or reconstruction of highway medians under City's jurisdiction.	DPW
20.	Coordinate with Million Trees LA team to identify potential locations of tree planting to provide stormwater benefits.	DPW
	Dry Weather Runoff Management	
21.	Consider diversion of dry weather runoff from Ballona Creek to constructed wetlands, wastewater system or urban runoff plant for treatment and/or beneficial use in development of TMDL implementation plans.	DPW, DRP,
22.	Consider diversion of dry weather runoff from inland creeks and storm drains tributary to LA River to wastewater system, constructed wetlands, or treatment/retention/infiltration basins in development of TMDL implementation plans.	DPW
	General	
23.	Consider opportunities to incorporate IRP policy decisions in the General Plan, Community Plan, and Specific Plan updates or revisions, and in the future LA River Revitalization Master Plan and Opportunity Areas.	Planning Dept.
24.	Coordinate to include stormwater BMPs in all new parks.	DRP, DPW

Table 5-3 IRP Go-Policy Directions		
	Policy Direction	**Responsible Party (lead organization listed first)**
25.	Evaluate feasibility of all City properties identified as surplus for potential development of multiple-benefit projects to improve stormwater management, water quality and groundwater replenishment.	GS, Planning Dept., DPW
LEGEND: DPW – Dept. of Public Works DWP – Dept. of Water and Power DBS – Dept. of Building and Safety DRP – Dept. of Recreation and Parks DGS – Dept. of General Services LAUSD – Los Angeles Unified School District DOT – Dept. of Transportation		

5.2.3 IRP Progress Reporting

The status of IRP project and policies is of great interest to the affected agencies within the City, as well as the stakeholders, including community and partner agencies, that have been engaged in this program since its inception in 1999. As the keepers of this program, WESD will lead the communications of program progress. At a minimum, minutes of the IRP Implementation Strategy Committee meetings will be prepared and distributed among the committee member organizations. In addition, on an annual basis, WESD will prepare a summary brochure that communicates the following:

- Highlights of key accomplishments in furthering IRP goals,
- Status summary of IRP Go Projects,
- Trigger status and implications to IRP Go If Triggered Projects,
- Status of actions associated with Go Policy Directions
- Short-term goals for the upcoming fiscal year.

This brochure will be distributed at the end of each fiscal year to the IRP stakeholders as well as the City leadership, i.e., City Council members, Commissioners of the Board of Public Works and DWP Board. In this manner, the IRP will continue as an evolving, adaptive plan that will continue to reflect the IRP guiding principles that have culminated through the IRP process in the recommended projects and policies described in this Adaptive CIP, and from which the next facilities plan can be launched.

Appendix A
Implementation Strategy

City of Los Angeles
Integrated Resources Plan

Implementation Strategy

September 2006

Prepared For:

City of Los Angeles

Department of Public Works

Bureau of Sanitation

and

Department of Water and Power

Prepared By:

CH:CDM, A Joint Venture

CH:CDM

Section 1
Background

The Integrated Resources Plan (IRP) is a strategic facilities plan for the City's wastewater, runoff, and recycled water programs. As part of developing the IRP, over 20 preliminary alternatives were developed and evaluated through a participatory decision-making stakeholder process. From the preliminary alternatives, four alternatives were selected for further evaluation in an Environmental Impact Report (EIR), prepared in accordance with California Environmental Quality Act (CEQA) requirements. As part of finalizing the EIR and transitioning into implementation, staff is recommending a preferred alternative for implementing the City's wastewater, runoff, and recycled water programs for 2020.

Section 2
Recommended Alternative

2.1 Selection Approach

To select a recommended alternative, staff relied on: (1) the information contained in the EIR (including the project objectives, environmental analysis, and public comments on the Draft EIR) and (2) updated IRP Facilities Plan quadrant analysis that evaluated the preliminary alternatives originally discussed in the IRP facilities Plan. This section also provides a summary of the alternatives evaluated in the IRP Facilities Plan to provide context for the selection process for the Recommended Alternative.

2.1.1 Background on Alternatives Evaluated in IRP Facilities Plan and EIR

For the IRP Facilities Plan, the City of Los Angeles conducted extensive and iterative stakeholder meetings with a Steering Group to develop alternatives that would achieve the multiple objectives of the IRP Facilities Plan. The Steering Group comprises interested parties and individuals with an interest in the long-term planning of the City's recycled water, runoff management and wastewater systems. The City of Los Angeles, in association with the Steering Group, developed over 20 preliminary project alternatives that addressed future (2020) wastewater, recycled water, and runoff needs. The City of Los Angeles used the information from the Steering Group as the basis for ranking preliminary alternatives, and those that ranked lowest were eliminated from further consideration. The details of the development and evaluation of the preliminary project alternatives are contained in the *IRP Facilities Plan, Volume 4: Alternatives Development and Analysis* (City of Los Angeles, 2004). The remaining alternatives were further evaluated in terms of the extent to which they addressed wastewater needs, provided leadership in water resources, and incorporated fiscal conditions. Applying various criteria, the alternatives initially considered by City were reduced to four as described in the IRP Facilities Plan and subsequently carried forward for analysis in the IRP EIR. (In addition to these build alternatives; a no-build alternative was also evaluated in the Draft EIR to comply with the requirements of CEQA to assess a No Project alternative.)

The alternatives evaluated in both the IRP Facilities Plan and in the EIR are:

- ***Alternative 1: Expansion of Hyperion Treatment Plant (Hyperion) to 500 million gallons per day (mgd) with high potential for water resources projects (Hyperion Alternative):*** Alternative 1 would focus the expansion of wastewater treatment capacity only at Hyperion by increasing its current capacity of 450 mgd to 500 mgd. Alternative 1 would also upgrade the Donald C. Tillman Water Reclamation Plant (Tillman) to advanced treatment and add wastewater storage at Tillman and wastewater and recycled water storage at the Los Angeles-Glendale Water

Reclamation Plant (LAG). In addition, Alternative 1 would reuse up to 42,000 acre-feet per year of recycled water for non-potable reuse, as well as manage up to 42 percent of the dry weather and 47 percent of the wet weather urban runoff generated in the City.

- ***Alternative 2: Donald C. Tillman Water Reclamation Plant (Tillman) Expansion (to 80 mgd) and Los Angeles-Glendale Water Reclamation Plant (LAG) Expansion (to 30 mgd) with high potential for water resources projects (Tillman-LAG Alternative):*** Alternative 2 would focus the expansion of wastewater treatment capacity at Tillman by increasing its assumed derated capacity of 64 mgd to 80 mgd and LAG by increasing its assumed derated capacity of 15 mgd to 30 mgd. Both of these plants would be upgraded to advanced treatment, and wastewater storage at Tillman and wastewater and recycled water storage would be added at LAG. In addition, Alternative 2 would reuse up to 53,200 acre-feet per year of recycled water, as well as manage up to 42 percent of the dry weather and 47 percent of the wet weather urban runoff generated in the City.

- ***Alternative 3: Tillman Expansion (to 100 mgd) with moderate potential for water resources projects (Tillman Moderate Alternative):*** Alternative 3 would focus the expansion of wastewater treatment capacity only at Tillman by increasing its assumed derated capacity of 64 mgd to 100 mgd and upgrading its treatment processes to advanced treatment. This alternative would add wastewater storage at Tillman and wastewater and recycled water storage at LAG. In addition, Alternative 3 would reuse up to 43,400 acre-feet per year of recycled water, as well as manage up to 26 percent of the dry weather and 39 percent of the wet weather urban runoff generated in the City. This alternative would manage less urban runoff than the other alternatives.

- ***Alternative 4: Tillman Expansion (to 100 mgd) with high potential for water resources projects (Tillman High Alternative***): Alternative 4 would focus the expansion of wastewater treatment capacity only at Tillman by increasing its assumed derated capacity of 64 mgd to 100 mgd and upgrading its treatment processes to advanced treatment. This alternative would add wastewater storage at Tillman and wastewater and recycled water storage at LAG. In addition, Alternative 4 would reuse up to 56,100 acre-feet per year of recycled water, as well as manage 42 percent of the dry weather and 47 percent of the wet weather urban runoff generated in the City.

- ***No Project Alternative***: Under the CEQA No Project Alternative, integrated improvements to the wastewater treatment and collection system, recycled water system, and runoff system would not occur. Individual projects would likely be necessary in the future, but would be designed and constructed as localized system needs occur rather than being planned in a system-wide integrated manner, and would be subject to environmental documentation on a case-by-case basis.

All alternatives would also include three new sewer alignments to provide needed wastewater conveyance capacity in the system and prevent sanitary sewer overflows. These proposed sewer alignments include:

- ***Glendale-Burbank Interceptor Sewer (GBIS)***: GBIS would be comprised of approximately 5 ¾ miles of 8-foot diameter interceptor sewer and associated structures that would provide sewer relief of the North Outfall Sewer (NOS) from the vicinity of Griffith Park (LA Zoo) to the vicinity of Toluca Lake. The Draft EIR evaluated two GBIS alignments at a project level, the GBIS South Alignment and the GBIS North Alignment. The GBIS South Alignment would extend from the Los Angeles zoo area and generally follow a westward corridor along Zoo Drive, Forest Lawn Drive, and Valley Spring Lane, terminating near U.S. Highway 101 near Moorpark Street. The GBIS North Alignment would extend generally northward from the Los Angeles Zoo area, cross the Los Angeles River, then head westward along the north side of the Los Angles River to Riverside Drive, and would follow Riverside Drive west to the vicinity of U.S. Highway 101. The Draft EIR evaluated both of these routes to provide a comprehensive assessment of the possible GBIS alignments. The Draft EIR anticipated that only a single GBIS alignment would be recommended in the Final EIR.

- ***Northeast Interceptor Sewer Phase II (NEIS-II):*** NEIS II would be comprised of approximately 5 ½ miles of 8-foot diameter interceptor and associated structures from the vicinity of Glassell Park to a point north of LAG. The Draft EIR evaluated two NEIS II alignments at a project level, the NEIS II East Alignment and the NEIS II West Alignment. The NEIS II East Alignment extends from the Eagle Rock area and generally follows a north-south corridor located to the west of San Fernando Road to the vicinity of the Los Angeles Zoo. The NEIS II West Alignment would also extend from the Eagle Rock area northward to the vicinity of the Los Angeles Zoo, but would use an alignment located west of the Los Angeles River through Griffith Park. The Draft EIR evaluated both of these routes to provide a comprehensive assessment of the possible NEIS II alignments. The Draft EIR anticipated that only a single NEIS II alignment would be recommended in the Final EIR.

- V***alley Spring Lane Interceptor Sewer (VSLIS):*** VSLIS would be comprised of approximately 8 ½ mile interceptor and associated structures that would extend from the Toluca Lake area, northwest to Tillman. (This project was evaluated at a program-level in the Draft EIR and would require further study/analysis.)
  All alternatives would increase the amount of recycled water that is used for non-potable reuse, but would do so at different levels. Similarly, the alternatives differ in the amount of groundwater replenishment with recycled water that may be utilized.

  Regarding runoff, the alternatives differ somewhat in they ways they would manage dry and wet weather runoff. As an example, Alternatives 1, 2 and 4 would manage up to 42 percent of the dry weather runoff and up to 47 percent of the wet weather runoff generated in the city from a ½ inch storm event, while

Alternative 3 would manage up to 26 percent of the dry weather and up to 39 percent of the wet weather urban runoff generated in the City. Because Alternative 3 would manage less wet weather runoff than the other alternatives, Alternative 3 would not capture wet weather runoff from residential, schools and government properties for onsite storage/use in cisterns for later reuse, or provide onsite percolation of runoff from schools and government properties, whereas the other Alternatives would. To further illustrate the differences, Alternative 3 would not divert runoff from inland creeks for treatment and beneficial use, while the others would. For these inland areas, Alternative 1 would utilize low-flow diversions of dry weather runoff to the sewer system, whereas Alternatives 2 and 4 would divert to wetlands or urban runoff plants for beneficial use.

The IRP alternatives make use of different mixes of components and different levels of use intensity to meet the project goals. Although they may not substantially differ from one another in terms of wastewater capacity, recycled water use, or runoff management, they represent a reasonable range of alternatives given the City's existing wastewater treatment and conveyance infrastructure, runoff infrastructure, recycled water infrastructure, existing and future regulatory environment, and future population projections. Future population projections were developed by the Southern California Association of Governments (SCAG).

2.1.2 EIR Alternatives Analysis

Also discussed in the Draft EIR (see Table ES-1 in the Draft EIR Executive Summary), the majority of the potentially significant impacts are associated with components that are common to all of the IRP alternatives, such as the proposed new sewer alignments. Differences in impacts between alternatives are most prevalent when considering alternate locations of proposed wastewater treatment facilities. For example, all proposed alternatives would result in potential odor impacts related to increased wastewater treatment capacity, but the potential for impact differs depending on where a given alternative focuses the expansion of treatment capacity.

For that reason, Alternative 1 was identified as the Environmentally Superior Alternative because it would result in lower use of energy and less air pollutant emissions.

In addition to considering the relative differences in environmental impacts among the alternatives, staff also considered the comments received on the Draft EIR. (Chapter 3 in Volume 2 of the Final EIR contains copies of the comments received and responses to those comments.) Staff also reviewed the comments on the Draft EIR that focused on system-wide issues to help identify the Recommended Alternative. In general, the comment letters that made recommendations for specific systemwide alternatives emphasized the following:

- Expand treatment plants in areas distant from homeowners (e.g., the Homeowners of Encino requested that Alternative 1 be selected because it avoids expansion of Tillman in the Sepulveda Basin).

- Maximize sustainability and select either Alternative 2 and/or Alternative 4, because either of these alternatives would use a watershed approach (e.g., Mono Lake Committee),

- Maximize use and reuse of urban runoff (e.g., Heal the Bay) and maximize recycled water production at LAG (e.g., City of Glendale).

In the consideration of the comments on the Draft EIR regarding the Recommended Alternative, staff prioritized comments that addressed system sustainability.

During the public comment period for the Draft EIR, numerous comments were received on the proposed GBIS alignments. Many who commented in the Burbank area expressed concern about potential GBIS construction and facilities at the Valley Heart shaft site, Riverside East shaft site, and Riverside West shaft site, all of which are located along the eastern half of the GBIS North Alignment. Toluca Lake area residents and Forest Lawn also commented on the GBIS South Alignment, in particular, the western portion of the GBIS South Alignment. In addition, comments were received on a possible construction shaft site and air treatment facility at Woodbridge Park due to its proximity to the school as well as the use and access of the Park. Interim communication occurred between the City of Los Angeles and the City of Burbank subsequent to the close of the public comment period. These interim activities included meetings and correspondence that focused on the relative merits of the proposed alignments for GBIS. The meetings were conducted to review constraints and issues associated with an alignment along the Los Angeles River channel, review any additional information provided by the city of Burbank related to their concerns about the GBIS alignments, and consider other measures to further reduce potential impacts to residents.

2.1.3 Quadrant Analysis

To assist further in the identification of a Recommended Alternative, City staff revisited the previous alternatives ranking process conducted for the Facilities Plan (IRP Facilities Plan, Volume 4: Alternatives Development and Analysis (City of Los Angeles, 2004). In this plan, staff applied the guiding principles of the IRP, using a quadrant analysis method to evaluate the costs and benefits of the alternatives.

The primary objectives of the IRP are to:

- Protect Health and Safety of the Public

- Provide Effective Management of System Capacity

- Protect the Environment

- Enhance Cost Efficiency
- Protect Quality of Life
- Promote Education

To meet these objectives, a set of guiding principles was developed with assistance from stakeholders, which provided instructions on how to meet the objectives in the context of the three service functions evaluated (recycled water, runoff management, and wastewater):

- Produce and use as much recycled water as possible from existing and planned facilities
- Reduce the amount of rainfall-dependent inflow and infiltration as much as possible
- Increase the level of water conservation beyond what is currently planned
- Increase the amount of dry weather runoff that is diverted and treated or captured and beneficially used
- Increase the amount of wet weather urban runoff that can be captured and beneficially used
- Focus on lower-cost solutions, within the framework of the other guiding principles.

To apply the quadrant approach for the four IRP alternatives, staff conducted the following steps:

- Defined the benefits for the separate service functions (i.e., wastewater, recycled water and runoff management).
- Plotted the benefits and costs for each alternative on the quadrant chart for each separate service function.
- Compared the results by service function and identified "clear winners", "clear losers" and "possible second choices" for each service function
- Compared the service function quadrant charts and counted the number of times each alternative was a clear winner or second choice.
- Evaluated results and selected recommended alternative and implementation strategies.

See Appendix A of this document for additional background on the updated quadrant analysis. For the quadrant analysis, staff defined benefits as follows:

- **Recycled water**. The guiding principle for recycled water is to maximize volume of recycled water (in acre-foot per year) from wastewater effluent that could be beneficially used to offset other sources of drinking water. The city assigned higher benefits to alternatives that produced and used higher amounts of recycled water.

- **Runoff management.** The IRP guiding principles also included increasing the amount of dry weather and wet weather urban runoff that is diverted and treated or captured and beneficially used. For the quadrant analysis, runoff management benefits for both dry and wet weather runoff were defined as a combination of potential volume of runoff managed and volume of runoff beneficially used. For this analysis, beneficial use was defined as options that offset potable water use, and the greater the level of potable water offsets (with treated runoff), the higher .management is to maximize options that offset potable water use, such as: smart irrigation, urban runoff plants, local/neighborhood solutions (cisterns, on-site percolation, neighborhood recharge), and non-urban regional recharge.

- **Wastewater.** On the basis of past investment and resources at the Hyperion Treatment Plant and the anticipated permit requirements, wastewater benefits were defined in direct correlation to the volume of wastewater treated at that plant. A high benefit was assigned to alternatives that enhanced capacity at Hyperion, a medium benefit to alternatives that enhanced capacity at one upstream plant (e.g., Tillman) and a low benefit to alternatives that enhanced capacity at both Tillman at LAG.

Using the defined benefits and estimated costs, staff evaluated each alternative for each service function, and then considered them as an integrated system. Staff compared each service function chart and counted the number of times an alternative was the clear winner or second choice. The resulting ranking was as follows:

1. Alternative 4 (highest ranking for recycled water, dry weather runoff and wet weather runoff, and possible second choice for wastewater): Alternative 4 as the Recommended Alternative is attributable to great extent to its recycled water benefits. Changes in future regulations regarding the use of recycled water or future policy decisions regarding the use of recycled water for groundwater replenishment could reduce these recycled water benefits. If those conditions occurred, then Alternative 1 could be considered a potential second choice, on the basis of its lower costs and moderate benefits.

2. Alternative 1 (highest ranking for both wastewater and wet weather runoff, and possible second choices for dry weather runoff and recycled water)

3. Alternative 2 (highest ranking for recycled water, wet weather runoff and dry weather runoff, but not desirable for wastewater): Alternative 2 was ranked third and therefore not preferred, because it produced similar recycled water and runoff management benefits than as Alternative 4, but at higher costs. Also, it provided low benefits for the wastewater system, since it relied on

expansion of two water reclamation plants, thereby impacting multiple neighborhoods.

4. Alternative 3 (possible second choices for wastewater and recycled water): Alternative 3 was ranked last and therefore not preferred, due to its lower recycled water, wastewater and runoff benefits compared to all the other alternatives. In addition, its costs were similar to Alternative 1, which provided more benefits.

In addition to the environmental impacts of the IRP Alternatives, City staff relied on the comments on the Draft EIR in conjunction with the alternatives ranking evaluation discussed above to identify the Recommended Alternative. Because Alternative 4 was ranked the highest in the ranking evaluation summarized above, and because Alternative 4 was also recommended in comments (received on the Draft EIR) that focused on system-wide issues and sustainability issues, Alternative 4 has been selected as the Recommended Alternative.

2.2 Recommended Alternative

On the basis of the analysis conducted in the EIR, the comments received on the Draft EIR, and the quadrant analysis conducted by staff, Alternative 4 (expansion at Tillman with high potential for water resources projects) is the recommended IRP alternative. Alternative 4 reserves the ability for future needed expansion at Tillman, while recognizing groundwater replenishment potential.

Alternative 4 includes expanding Tillman to 100 mgd, adding new collection system sewers, adding storage to Tillman and LAG, and adding a truck loading facility, digesters and secondary clarifiers to the Hyperion Treatment Plant.

In addition, Alternative 4 includes increasing the amount of effluent from Tillman and LAG that is recycled, onsite percolation of wet weather runoff at schools and government properties, and neighborhood-scale percolation at vacant lots, parks/open space in the east valley. The timing and specifics of runoff management implementation will be coordinated with the Total Maximum Daily Load (TMDL) requirements and subsequent Implementation Plans. Alternative 4 also calls for continued implementation of water conservation programs, such as smart irrigation devices to reduce outdoor water use and urban runoff.

Alternative 4 is recommended based on its recycled water benefits. If in the future the use of recycled water from Tillman for groundwater replenishment or other recycled water uses is considered infeasible based on a combination of factors (including public acceptability, costs, future regulations, and the need for additional treatment capacity) then Alternative 1 would be considered the Recommended Alternative.

The Recommended Alternative also includes adding advanced treatment to LAG at existing capacity, if regulatory permit requirements result in a need for advanced treatment to discharge to the Los Angeles River or if recycled water requirements result in higher treatment requirements. Implementation would require partnership and coordination with the City of Glendale.

Recommended NEIS II Alignment
In evaluating which NEIS II alignment would be recommended for implementation, staff considered the following:

- Constructability
- Availability of right-of-way
- Other factors including hazardous materials and accessibility

Based on these considerations, staff has identified the NEIS II West Alignment, Option B as the recommended NEIS II alignment. The shaft sites that would be used to construct the NEIS II West Alignment are the Division Street shaft site, the Crystal Springs shaft site, and the Pecan Grove shaft site.

Recommended GBIS Alignment
In evaluating which GBIS alignment would be considered for implementation, staff considered the following:

- Key Concerns about potential impacts
- Surface construction activity
- Contingency response
- System relief

Based on these considerations, staff has identified a GBIS alignment that connects the eastern half of the GBIS South Alignment with the western half of the GBIS North Alignment, with a short section of tunnel beneath Pass Avenue in the city of Burbank. Because the GIBS North and GBIS South Alignments have been evaluated in the Draft EIR, and because the recommended GBIS Alignment contains portions of both of these GBIS alignments, the recommended GBIS Alignment does not constitute a new project component (i.e., the recommended GBIS Alignment combines portions of the GBIS North Alignment and GBIS South Alignment in a way that further minimizes impacts.) The former proposed alignments would be joined by a ½ mile connector along Pass Avenue, which would not result in new significant impacts.

To further minimize potential impacts, the following shaft sites are proposed with the recommended GBIS alignment: Pecan Grove shaft site with an air treatment facility, Travel Town shaft site, Barham shaft site, Caltrans North Hollywood Maintenance Yard shaft site with an air treatment facility, and the GBIS Optional Alignment A (Riverside Branch) along the alignment's west end.

The Pecan Grove shaft site is recommended because it would avoid potential impacts to the Los Angeles Zoo parking lot. The Caltrans North Hollywood Maintenance Yard shaft site is recommended because it would avoid a construction shaft site and air treatment facility at Woodbridge Park. The ½ mile connector along Pass Avenue was developed in response to concerns expressed by the local community. Staff sent 7,600 announcement notices, which included list provided by Burbank to inform the affected community that "The City is considering alignment modifications for the Glendale Burbank Interceptor Sewer (GBIS) alignments analyzed in the DEIR to minimize potential impacts to the residential neighborhoods. The alignment modifications being considered, which will be analyzed as part of the final EIR, would connect the eastern portion of the GBIS South Alignment along Forest Lawn Drive with the western portion of the GBIS North Alignment in Riverside Drive through a corridor in the public right-of-way in or in the vicinity of Pass Avenue."

As a result of the interim coordination with the City of Burbank, staff has also included additional voluntary improvement measures that the City of Los Angeles will implement to address traffic, noise and vibration concerns.

Section 3
Recommended Implementation Strategy

3.1 Introduction

The IRP Alternatives discussed in the EIR include components that are well defined and components that are more conceptual. The well-defined components in the EIR were site specific, and therefore detailed project-level environmental analysis was conducted. The conceptual components were evaluated in the EIR at a program-level. For those program-level components, there may be additional detailed study and environmental analysis required by CEQA before they can be implemented.

The implementation strategy for the IRP will be directed by certain "triggers" that include policy decisions regarding recycled water and groundwater replenishment, regulatory decisions regarding more restrictive permits for discharge of water into the Los Angeles River, and the need for additional wastewater treatment capacity.

For example, the decision to upgrade to advanced treatment at Tillman will be dependent on future regulations regarding discharge to the Los Angeles River, future regulations regarding the use of recycled water, and/or policy decisions regarding use of recycled water for groundwater replenishment, thereby requiring partnership between the Department of Public Works and DWP. If groundwater replenishment is not feasible based on a combination of factors (including public acceptability, costs, or future regulations when expansion is needed, then expansion could occur at Hyperion Treatment Plant (i.e., Alternative 1).

Also, if regulatory permit requirements result in a need for advanced treatment to discharge to the Los Angeles River or if recycled water requirements result in higher treatment requirements, then advanced treatment could be added to LAG at existing capacity, which would require partnership and coordination with the City of Glendale.

The implementation strategy for the IRP is organized into three categories of projects:

- ***Go-Projects:*** projects that have been evaluated in the IRP EIR as a site-specific project and are recommended to be implemented immediately because their associated triggers have been reached.

- ***Go If Triggered Projects:*** projects that are recommended to be implemented in the future, once a certain trigger is reached.

- ***Go-Policy Directions:*** Specific directions to staff on the next studies and evaluations required to provide progress on the programmatic elements in the Recommended Alternative.

All of the Go-Projects and most of the Go If Triggered Projects were evaluated in the EIR at a project-level. Because the conservation, runoff management, and recycled water components of the Recommended Alternative were evaluated in the EIR as programmatic elements, they require Go-Policy Decisions regarding the future study and environmental analysis that will be required before implementation.

The Department of Public Works is responsible for developing the 10-year Wastewater Capital Improvement Program (WCIP). This program includes replacement, rehabilitation, and expansion of the City's wastewater treatment and collection facilities. The Department of Public Works is also responsible for watershed protection, which includes compliance with TMDLs and beneficial use of runoff. Using a similar process, staff develops a CIP for the watershed protection program as part of the annual budget process. The Department of Water and Power is responsible for implementation of recycled water projects and water conservation programs, and its associated CIP.

3.2 Go-Projects for Immediate Implementation

Go-Projects represent projects from the Recommended Alternative that have been evaluated at a project-level in the EIR, and are recommended for immediate implementation because the flow or regulatory triggers have already been met. Estimated costs are presented in Section 3.5. The following Go-Projects are recommended for immediate City Council approval:

- ***Construct Wastewater Storage Facilities at Tillman (Prepare concept report and subsequent design and construction)***: There is a shortage of wastewater conveyance capacity (sewers) in the western and central portion of the Valley, as well as a shortage of treatment capacity at Tillman during wet weather conditions. Adding up to 60 million gallons of storage will be necessary to provide the needed wet weather wastewater storage and operational storage. (Estimated to be online by 2011, estimated total capital cost of $120 million[1])

- ***Construct Wastewater Storage Facilities at Los Angeles Glendale Water Reclamation Plant (LAG) (Prepare concept report and subsequent design and construction):*** LAG provides recycled water for DWP and Glendale for reuse. The volume of recycled water that can be delivered to customers is limited by the daily variation of flows at the plant. Therefore, providing an up to 5 million gallon storage facility for daily operational wastewater storage will provide more efficient plant operations by making plant inflows more constant, which would also improve recycled water flows to the customers. (Estimated to be online by 2012, estimated total capital cost of $20 million[1])

[1] Costs are presented in 2006 dollars (March 2006 ENR CCI for Los Angeles.) Capital costs include construction costs and non-construction costs including program management, engineering studies/design services, construction management and start-up costs. Costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

- ***Construct Recycled Water Storage at Los Angeles Glendale Water Reclamation Plant (LAG) (Prepare concept report and subsequent design and construction):*** The use of recycled water from LAG is dependent on the seasonal and daily demands for the water, which can fluctuate during the day and during the rainy season. Therefore, providing up to 5 million gallons of recycled water storage will allow LAG to deliver recycled water to customers at times when wastewater flows are low (i.e., during the night.) (Estimated to be online by 2012, estimated total capital cost of $8 million[1])

- ***Construct Hyperion Treatment Plant Solids Handling and Truck Loading Facility (Prepare preliminary design and subsequent design and construction):*** Hyperion processes biosolids removed from wastewater generated from throughout the city. A new solids handling and truck loading facility will provide more efficient operations and will also meet future solids handling production. (Estimated to be online by 2012, estimated total capital cost of $89 million[1]),

- ***Construct Glendale-Burbank Interceptor Sewer (GBIS), Combined Alignment – Option A (Design and Construction)***: GBIS is needed to provide relief or additional capacity in the near future to prevent overflows and spills. GBIS would include construction and operation of approximately 5 ¾ miles of 8-foot-diameter (inside) interceptor sewer and associated structures, including diversion structures, drop structures, maintenance hole structures, and air treatment facilities (if needed). The specific GBIS alignment would begin at the Pecan Grove shaft site, would travel beneath Zoo Drive, then head beneath the northern-most hillside in Griffith Park to reach the Travel Town Shaft Site. It would extend under Forest Lawn Drive to the Barham Shaft Site. GBIS would then be tunneled northwest beneath the Los Angeles River to Pass Avenue, head northward beneath Pass Avenue to Riverside Drive then turn westward beneath Riverside Drive to the western terminus. As part of the Draft EIR public review, the community expressed their opposition to the use of the Woodbridge Park due to the proximity to the school as well as the use and access of the Park. After thorough review of the alternative and the DEIR comments, it is concluded that the Caltrans North Hollywood Maintenance Yard is the most viable option. (Estimated to be online by 2016, estimated total capital cost of $196 million[1])

- ***Construct North East Interceptor Sewer (NEIS) Phase II, West Alignment – Option B (Design and Construction):*** NEIS II would relieve the section of the North Outfall Sewer (NOS) south of LAG and convey additional flow from the GBIS to provide relief or additional capacity in the near future to prevent overflows and spills. The proposed NEIS II would include construction and operation of approximately 5 ½ miles of 8-foot-diameter (inside) interceptor sewer and associated structures, including diversion structures, drop structures, maintenance hole structures, and air treatment facilities (if needed). NEIS II extends from an existing NEIS (Phase I) at the Division Shaft site. It would cross State Route 2, the Los Angeles River, Interstate 5 to Griffith Park Shaft site. It would extend from the Crystal Springs (Picnic Grounds) shaft site, travel westward beneath Griffith Park Drive, then go north beneath the golf courses to its terminus at Pecan Grove. ADD: (Estimated to be online by 2016, estimated total capital cost of $230 million[1])

Total estimated capital costs for Go Projects in ($2006) are presented in Section 3.5. Detailed rate impacts and subsequent budget approval will be conducted as part of the Public Works annual budget approval process.

3.3 Go if Triggered Projects

Alternative 4 also includes potential projects that will go if triggered by an action, flow, or regulation. Once triggered, these projects will be included in the WCIP as part of the annual budget process. Therefore, we are recommending that Council direct staff to monitor the triggers for these projects, and if triggered, proceed with implementation of the following projects that have been evaluated as site-specific projects in the EIR. Estimated costs are presented in Section 3.5.

- ***Potential upgrades at Tillman to advanced treatment (current capacity):*** Tillman currently provides tertiary-treated recycled water for irrigation use and environmental benefits to the Lake Balboa and the Wildlife Lake at Sepulveda Basin, and the Los Angeles River. If triggered by regulations and/or decision to reuse Tillman recycled water for groundwater replenishment, then additional advanced treatment (e.g., microfiltration and reverse osmosis with ultra violet disinfection) could be required. This will require coordination with Public Works and DWP. (Estimated trigger review for new permit requirements by 2007, estimated trigger review for groundwater replenishment by 2010, estimated total capital cost of $339 million[1])

- ***Potential expansion of Tillman to 100 mgd with advanced treatment:*** If triggered by increase in population, regulations, and/or groundwater replenishment decision, then Tillman could be expanded to 100 mgd with advanced treatment. Will require coordination between Public Works and DWP. (Estimated trigger review for new SCAG population projections by 2008. Based on 2004 projections, expansion would occur after year 2025. Estimated trigger review for groundwater replenishment by 2010. Estimated total capital cost of $210 million[1], assuming 20 mgd of secondary treatment, MF/RO and UV disinfection)

- ***Potential upgrade of LAG to advanced treatment (current capacity):*** LAG currently provides tertiary-treated recycled water for irrigation use and environmental benefits to the Los Angeles River. If triggered by regulations, availability of downstream sewer capacity, and/or decision to reuse, then advanced treatment at current capacity could be required. Would be subject to partnership between Public Works and City of Glendale. (Estimated trigger review for new permit requirements by 2007, estimated total capital cost of $105 million[1])

- ***Design/construction of secondary clarifiers at Hyperion to provide operational performance at 450 mgd:*** The existing secondary clarifiers at Hyperion are performing below their rated capacity of 450 mgd. Staff is currently investigating ways to optimize the existing secondary clarifiers to get them operating up to 450 mgd. If these options prove to be unsuccessful, then new secondary clarifiers will be needed to provide operational performance at 450 mgd. (Estimated trigger review by 2008, estimated total capital cost of $92 million[1])

- ***Design/construction of up to 12 digesters at Hyperion:*** If triggered by increased biosolids production in the service area, additional digesters will be required at Hyperion. (Estimated trigger review for new SCAG population projections by 2008. Based on 2004 projections, expansion would occur after year 2025. Estimated total capital cost of $303 million[1])

We also recommend that Council direct staff to monitor the triggers for the following project, and if triggered, proceed with detailed alignment study and associated environmental review for the following project that has been evaluated as a programmatic element in the EIR:

- ***Prepare alignment study, environmental documentation, and subsequent design/construction of Valley Spring Lane Interceptor Sewer:*** To provide additional sewer conveyance capacity between Tillman and the Valley Spring Lane/Forman Avenue Diversion structure, a new sewer will be required, which would require subsequent environmental analysis. (Estimated to be online by 2020, estimated total capital cost of $156 million[1])

The total estimated capital cost (in $2006) for Go If Triggered projects are presented in Section 3.3. Detailed rate impacts and subsequent budget analysis will be conducted as part of the Public Works annual budget process.

In the unlikely event that the overall framework for recycled water changes to disallow its use so Alternative 1 is the Recommended Alternative, then the following potential project would replace the "Potential expansion of Tillman to 100 mgd with Advanced Treatment" project described above:

- ***Potential expansion of Hyperion to 500 mgd:*** If triggered by increase in population, regulations, and/or groundwater replenishment decision, then Hyperion could be expanded to 500 mgd, through the addition of 50 mgd of secondary clarifiers. (Estimated trigger review for new SCAG population projections by 2008. Based on 2004 projections, expansion would occur after year 2025. Estimated trigger review for groundwater replenishment by 2010. Total estimated capital cost of $46 million)

3.4 Go-Policy Directions

The following recommended Go-Policy Directions provide direction to staff on immediate activities and actions for recycled water, water conservation, and runoff management. The timing of these actions may be dependent on staff and funding availability. It is recommended that Council approve these policy directions. Any resulting impacts on existing City policy should be reported back to Council for action. Staff should also provide status updates.

Although these policy directions are covered programmatically in the Final EIR for the IRP, more specific environmental documentation may be needed as these policies are developed and implemented.

It should be noted that Section 4 of this document provides a listing of currently identified related projects for recycled water, water conservation and runoff management. Additional projects will be developed as part of the corresponding capital improvement program and will be included in the annual report to the City Council.

Recycled Water – Non-Potable Uses

1. Direct DWP and Public Works to work together to maximize use of recycled water for non-potable uses in Terminal Island Treatment Plant service area, west side, and LAG services areas. DWP to conduct additional Tier 1 and 2 customer analysis to verify the potential demands and feasibility. Develop a long-range marketing strategy for recycled water that includes a plan for recruiting (and keeping) new customers.
2. Direct Building and Safety to evaluate and develop ordinances to require installation where feasible of dual plumbing for new multi-family, commercial and industrial developments, schools and government properties in the vicinity of existing or planned recycled water distribution systems in coordination with LA River Revitalization Master Plan. Proximity and demand will be considered when determining feasibility. The dual plumbing will consist of separate plumbing and piping systems, one for potable water and the second for recycled water for non-potable uses such as irrigation and industrial use.
3. Direct Public Works and DWP to coordinate where feasible the design/construction of recycled water distribution piping (purple pipe) with other major public works projects, including street widening, and LA River Revitalization Master Plan project areas. Also coordinate with other agencies, including MTA and Caltrans on major transportation projects.

Recycled Water - Indirect-Potable Uses (Groundwater Replenishment)

4. Direct DWP to develop a public outreach program to explore the feasibility of implementing groundwater replenishment with advanced treated recycled water.

Recycled Water - Environmental Uses

5. Direct DWP and Public Works to continue to provide water from Tillman to Lake Balboa, Wildlife Lake, and the Japanese Garden at Sepulveda Basin, and the LA River to meet baseline needs for habitat, i.e., approximately 27 mgd through flow-through lakes).

Water Conservation

6. Direct DWP to continue conservation efforts, including programs to reduce outdoor usage, including using smart irrigation devices on City properties, schools and large developments (those with 50 dwelling units or 50,000 gross square feet or larger), and to increase incentives to residential properties.

7. Direct DWP to work with Building and Safety in continued conservation efforts, including evaluating and considering new water conservation technologies, including no-flush urinal technology.
8. Direct DWP to continue conservation efforts, including working with Building and Safety to evaluate and develop policy that requires developers to implement individual water meters for all new apartment buildings
9. Direct DWP to continue conservation awareness efforts, including increasing education programs on the benefits of using climate-appropriate plants with an emphasis on California friendly plants for landscaping or landscaped areas developed in coordination with LA River Revitalization Master Plan, and to develop a program of incentives for implementation.
10. Direct Planning to consider the development of City Directive to require the use of California friendly plants in all City projects where feasible and not in conflict with other facilities usage.

Runoff Management – Wet Weather Runoff

11. Direct Public Works to review SUSMP (Standard Urban Stormwater Management Plan) requirements to determine ways to require where feasible on-site infiltration and/or treat/reuse, rather than treat and discharge, including in-lieu fees for projects where infiltration is infeasible (e.g., similar programs developed by City of Santa Monica.)
12. Direct Building and Safety to evaluate and modify applicable codes to encourage all feasible Best Management Practices (BMPs) for maximizing on-site capture and retention and/or infiltration of stormwater instead of discharge to the street and storm drain, including porous pavement. (This is currently handled through variances). Direct Public Works and Department of Planning to evaluate the possibility of requiring porous pavements in all new public facilities in coordination with LA River Revitalization Master Plan, and large developments greater than 1 acre. Program feasibility should consider slope and soil conditions.
13. Direct Department of Planning to evaluate ordinances that would need to be changed to reduce the area on private properties that can be paved with non-permeable pavement (i.e., change/support landscape ordinance and encourage the use of permeable pavement).
14. Direct Public Works to evaluate and implement integration of porous pavements into the sidewalks and street programs where feasible. For example, conduct pilot program in East Valley, taking into consideration soil conditions and Proposition O project criteria, as well as along the future LA River Revitalization Master Plan.
15. Direct Public Works and DWP and Department of Recreation and Parks to prepare a concept report and determine the feasibility of developing a powerline easement demonstration project (for greening, public access, stormwater management, and groundwater replenishment).
16. Direct Public Works and DWP to work with LAUSD to determine the feasibility of developing projects for both new schools and for retrofitted schools, as well as

government/city-owned facilities with stormwater management BMPs. [Provide wet weather runoff storage (cisterns) to beneficially use wet weather runoff for irrigation. Also, schools and government properties to reduce paving and hardscape and add infiltration basins to allow percolation of wet weather runoff into the ground where feasible.] As appropriate, integrate with LAUSD's new schools development program.

17. Direct Public Works, General Services, and Recreation and Parks to identify sites that can provide onsite percolation of wet weather runoff in surplus properties, vacant lots, parks/open space, abandoned alleys in East Valley, and along the LA River in the East Valley where feasible. Program feasibility should consider slope and soil conditions.
18. Direct Public Works and General Services and the Department of Transportation (DOT) to maximize unpaved open space in City-owned properties and parking medians through using all feasible BMPs and by removing all unnecessary pavement.
19. Direct Public Works to include all feasible BMPs in the construction or reconstruction of highway medians under its jurisdiction.
20. Direct Public Works to coordinate with the Million Trees LA team on identifying potential locations of tree plantings that would provide stormwater benefit, with consideration of slope and soil conditions

Runoff Management - Dry Weather Runoff

21. In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from Ballona Creek to constructed wetlands, wastewater system, or urban runoff plant for treatment and/or beneficial use. Coordinate with the Department of Recreation and Parks. Coordinate and evaluate the impact with the LA River Master Plan.
22. In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from inland creeks and storm drains that are tributary to the Los Angeles River to wastewater system or constructed wetlands or treatment/retention/infiltration basins with consideration for slope and topography.

General

23. Direct the Department of Planning to consider opportunities to incorporate IRP policy decisions in the General Plan, Community Plan, and Specific Plan updates or revisions, and in the future LA River Revitalization Master Plan and Opportunity Areas.
24. Direct Department of Recreation and Parks to coordinate with Public Works on including stormwater management BMPs in all new parks.
25. Direct General Services in coordination with Planning and Public Works to evaluate feasibility of all City properties identified as surplus for potential development of multiple-benefit projects to improve stormwater management, water quality and groundwater recharge.

3.5 Potential Fiscal Impacts

Tables 1 through 4 provides a summary of the estimated capital costs for the Go Projects, Go if Triggered Projects, and the estimated projects resulting from implementation of the Go Policy Directions.

Table 1 **IRP Recommended Alternative** **Estimated Capital Costs – Go Projects**	
Go Projects	**Estimated Capital Cost (2006$)[1] Millions**
Treatment	
Wastewater Storage at Tillman (60 Million Gallon with Real Time Control)	$120
Wastewater Storage at LAG (5 Million gallons with Real Time Control)	$20
Recycled Water Storage at LAG (5 Million gallons with Real Time Control)	$8
HTP Solids Handling/Truck Loading Facility	$89
Collection System	
Glendale Burbank Interceptor Sewer (GBIS)	$196
North East Interceptor Sewer (NEIS) Phase 2	$230
Total Go Projects	**$663**

Notes:

[1] Costs are presented in 2006 dollars (March 2006 ENR CCI for Los Angeles.) Capital costs include construction costs and non-construction costs including program management, engineering studies/design services, construction management and start-up costs. Costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

Table 2 **IRP Recommended Alternative** **Estimated Capital Costs – Go if Triggered Projects**	
Go If Triggered Projects	**Estimated Capital Cost (2006$)[1] Millions**
Treatment	
Tillman Upgrade to Advanced Treatment and UV Disinfection (current capacity 80 mgd)	$339
Tillman Expansion to 100 mgd (Secondary, MF/RO and UV) (add 20 mgd)[2]	$210
LAG Upgrade to Advanced Treatment (existing - 20 mgd capacity) (MF/RO and UV)	$105
HTP Secondary Clarifiers (add 100 mgd to get capacity to 450 mgd)	$92
HTP Digesters (12 total)	$303
Valley Spring Lane Interceptor Sewer (VSLIS)	$156
Total Go If Triggered Projects	**$1,205**
Notes:	

[1] Costs are presented in 2006 dollars (March 2006 ENR CCI for Los Angeles.) Capital costs include construction costs and non-construction costs including program management, engineering studies/design services, construction management and start-up costs. Costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

[2] In the unlikely event that the overall framework for recycled water changes to disallow its use so Alt. 1 is the Recommended Alternative, then "Expansion of Hyperion to 500 mgd (add 50 mgd) would replace the "Potential expansion of Tillman to 100 mgd with Advanced Treatment" project, at a total estimated capital cost of $46 million.

Table 3
IRP Recommended Alternative
Runoff Management Estimated Capital Costs

Runoff Management Projects	Estimated Capital Cost (millions) (2006$)[1]
Dry Weather Urban Runoff	
Smart irrigation (reduce runoff by ~10 mgd)	$116.2
Divert runoff from Compton Creek to URP (~2 mgd)	$69.0
Divert runoff from Ballona Creek to URP (~3 mgd)	$103.0
Divert runoff from various Inland Creeks to URPs and Wetlands (up to 16 mgd)	$392.9
Subtotal Dry Weather Urban Runoff	$681.1
Wet Weather Urban Runoff	
Treat and beneficially use/discharge (coastal area - 160 mgd)	$1,039.4
Neighborhood recharge in vacant lots (east valley)	$389.3
Neighborhood recharge in parks/open space	$123.8
Neighborhood recharge in abandoned alleys	$17.6
Non-urban regional recharge (east valley)	$87.1
Cisterns (onsite storage use) - Schools	$70.7
Cisterns (onsite storage use) - Government	$44.7
Onsite percolation - Schools	$51.9
Onsite percolation - Government	$17.3
New/Redevelopment Areas - Onsite treat/discharge	$0
Subtotal Wet Weather Urban Runoff	$1,841.8
Total	**$2,522.9**

Notes:

[1] Capital costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

Table 4
IRP Recommended Alternative
Recycled Water Estimated Capital Costs

Recycled Water Projects	Estimated Capital Cost (2006$)[1]
Recycled Water Pipelines	$364.2
Recycled Water Pumping	$49.7
Diurnal Storage	$108.2
End User Retrofit	$105.1
Total	**$627.2**

Notes:

[1] Capital costs are expected to be greater than listed as a result of inflation as projects will be constructed in the future.

3.6 Potential Related/Impacted Agencies and Departments

The following City departments and outside agencies could be impacted by this implementation strategy:

- Department of Public Works – Bureau of Sanitation, Bureau of Engineering, Bureau of Contract Administration, Bureau of Street Services.
- DWP
- Department of Recreation and Parks
- Planning Department
- Environmental Affairs Department
- Department of Building and Safety
- Community Redevelopment Agency
- Metropolitan Transit Authority (MTA)
- Los Angeles Department of Transportation (DOT)
- LAUSD

Section 4
Information on Projects Underway (For Information Only, No Action Required)

4.1 Introduction

Staff has made progress on parallel projects that meet the overall IRP objectives and guiding principles. These projects and programs are presented in this section for information only.

Recycled Water and Water Conservation

As part of its 5-year update to the Urban Water Management Plan (UWMP), DWP staff included recycled water, water conservation, and runoff management elements that are aligned with the IRP, demonstrating their commitment to collaboration with Public Works on integrated planning.

Also, the following recycled water projects are underway to continue to provide recycled water to irrigation customers:

Sepulveda 4 Pipeline (CEQA completed by DWP)

Hansen Area Phase 1 Pipeline and Tank Storage (CEQA completed by DWP)

Central City Elysian Pipeline (CEQA not initiated)

Runoff Management

As part of the TMDL compliance strategy, Public Works has developed an implementation plan to meet the Santa Monica Bay Beaches Wet Weather Bacteria TMDL requirements. This plan utilizes an integrated watershed resources approach to implement projects in a phased iterative manner that would provide the greatest opportunity for success in improving water quality at the Santa Monica Bay Beaches.

Public Works has also taken the lead in developing a Proposition O program that will improve water quality at the beaches, rivers, and lakes within the City of Los Angeles. This program includes the solicitation of project ideas from the public and the development of conceptual plans for those projects that are approved by the Citizen's Oversight Advisory Committee (COAC). In a multi-phase process, the City will allocate $500 million, as approved by the bond measure, for these projects.

The first round of Proposition O has completed and the City is in the process of completing conceptual plans for several projects including:

- Santa Monica Bay/Ballona Creek BMP Project
- Santa Monica Bay Beaches Wet Weather Bacteria TMDL Project-Phase 1

- Santa Monica Beaches Low Flow Diversions Upgrades
- Catch Basin Opening Screen Covers to meet 30% Trash Reduction Milestone
- Proposition O projects under funding review include:
- South Los Angeles Wetlands Park
- Echo Park Lake Restoration Project
- LA Zoo Parking Lot Retrofit Project
- Freemont High Community Gardens Project
- Cabrito Paseo Walkway and Bike Path Project
- Parking Grove in El Sereno Project
- Rosecrans Recreational Center Stormwater Enhancement Project
- Lake Machado Ecosystem – Water Quality/Habitat Improvement Project
- Peck Park Canyon Enhancement Project

Appendix A
Quadrant Analysis of Final Alternatives

A.1 Approach to Evaluating Alternatives

To evaluate the final alternatives, the team used a quadrant analysis method to evaluate the costs and benefits of the alternatives. This analysis was originally conducted as part of the evaluation of the preliminary alternatives in the Facilities Plan and is summarized in the IRP Facilities Plan *(IRP Facilities Plan, Volume 4: Alternatives Development and Analysis* (City of Los Angeles, 2004). The concept of the quadrant analysis is to use a grid to plot the benefits and costs of each alternative. As shown in Figure 1, different quadrants are more optimal than others, based on the ranking of benefits to costs. For example, the upper left quadrant (shown in green in the figure) is more desirable, because it reflects alternatives with high benefits and low costs. The lower right quadrant (shown in pink in the figure) would be least desirable, because it reflects alternatives with low benefits and high costs.

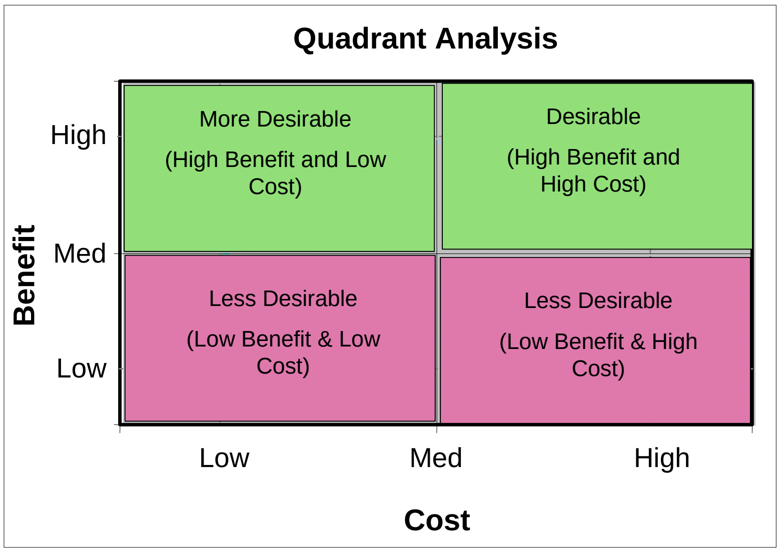


Figure 1
Quadrant Analysis Approach to Evaluating Alternatives

As shown in Figure 2, when plotting the benefits and costs on the quadrant chart, alternatives in the most desirable quadrant (high benefit and low cost) would be considered more desirable than an alternative with higher cost but the same or lower benefit because it most clearly meets the established and ranked criteria. Similarly, an alternative with a lower benefit for the same cost would be considered less desirable. If costs are of concern, then a potential second choice would be an alternative with lower costs (compared to the desirable alternative) and slightly lower benefits. If costs are not of

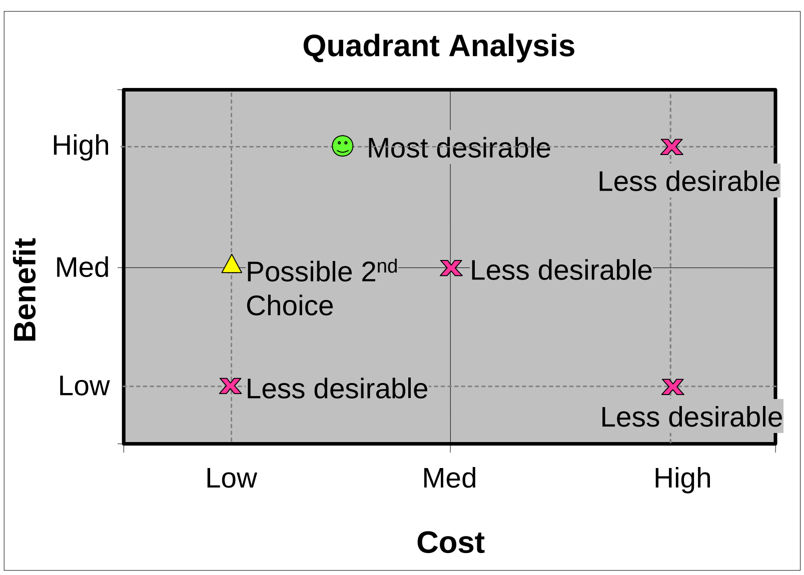


Figure 2
Illustration of Ranking Scenarios

concern, then a possible second choice would be an alternative with higher costs (compared to the desirable alternative) and slightly higher costs. These possible ranking scenarios are shown in Figure 2.

To apply the quadrant analysis approach for the IRP, the City conducted the following steps:

- Defined the benefits for the separate service functions (i.e., recycled water, dry and wet runoff management, and wastewater).
- Plotted the benefits and costs for each alternative on the quadrant chart for each separate service function.
- Compared the results by service function and prioritized the highest ranking to the lowest ranking alternative for each service function
- Compared the service function quadrant charts and counted the number of times each alternative achieved first or second place ranking.

As discussed earlier, this analysis was originally conducted as part of the evaluation of the preliminary alternatives in the Facilities Plan and is summarized in the IRP Facilities Plan *(IRP Facilities Plan, Volume 4: Alternatives Development and Analysis* (City of Los Angeles, 2004). The evaluation was used to select the four alternatives that would be further evaluated in the Draft EIR. Now we are using the same analysis to assist staff in identifying the preferred alternative. Where possible, staff did not rescale the results of the analysis, despite having four alternatives to compare, rather than over 12 from the facilities plan. Therefore, the cost and benefits definitions, as well as the results for recycled water and wet weather runoff management are unchanged from the analysis conducted in the Facilities Plan. For dry weather runoff, the benefits were slightly modified to take into account both volume of runoff managed and the beneficial use of the runoff. For wastewater management, the benefits were redefined to prevent “double counting” of recycled water benefits.

A.2 Recycled Water Analysis

A.2.1 Definition of Recycled Water Benefits

An IRP guiding principle is to produce and use as much recycled water as possible from existing and planned facilities. Therefore, higher benefits were assigned to alternatives that produced and used higher amounts of recycled water.

Recycled water benefits were defined as:

- Volume of recycled water (in acre-foot per year) from wastewater effluent that could be beneficially used for irrigation and industrial purposes.

A.2.2 Recycled Water Results

Using the defined benefits, the City assigned recycled water costs and benefits scores for the alternatives. Table 1 presents a summary of the results.

Table 1
Alternative Analysis – Potential Recycled Water Costs and Benefits

Alternative[1]	Recycled Water Costs		Recycled Water Benefits	
	Results	Capital Cost ($ mil)[2]	Results	Why (volume)
Alt 1	Med	$374	Med	Up to 38,700 AF/yr
Alt 2	Med-High	$516	Med-High	Up to 49,900 AF/yr
Alt 3	Med	$443	Med	Up to 40,100 AF/yr
Alt 4	Med-High	$544	Med-High	Up to 52,800 AF/yr

Notes:
[1] For detailed discussion of components of each alternative, see Facilities Plan Volume 4, Section 6.
[2] Capital costs are from the IRP Facilities Plan, Volume 4, are presented in $2004 dollars, and are appropriate for conducting relative comparisons. The costs for the preferred alternative will be updated to $2006 dollars and fined-tuned in Volume 5 (Implementation Strategy).

Figure 3 shows the quadrant chart for the recycled water benefits and costs. As shown in the figure, Alt 2 and 4 are more desirable, because they provide Med High benefits with Med- High costs. Alternatives 1 and 3 are possible second choices if cost is a concern.

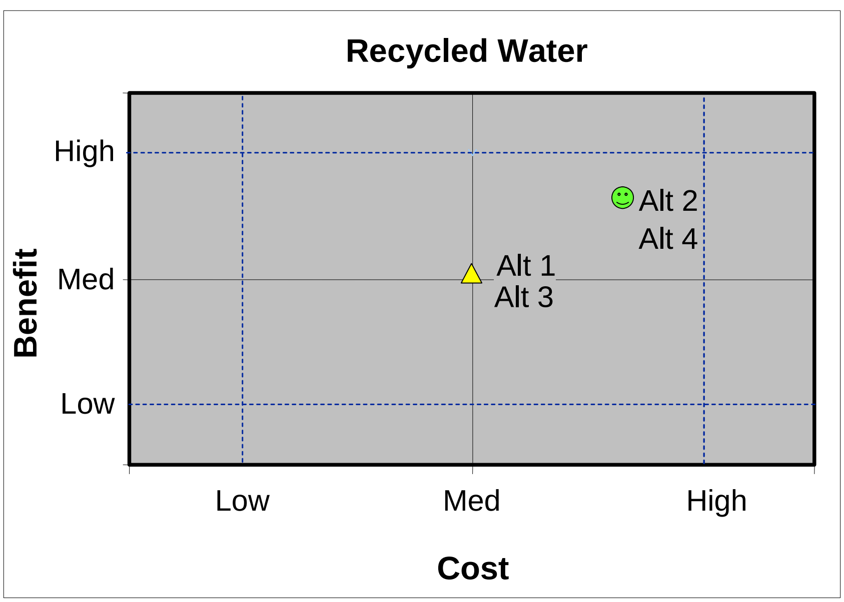


Figure 3
Quadrant Analysis – Recycled Water

A.3 Runoff Management Analysis

A.3.1 Definition of Runoff Management Benefits

The IRP guiding principles also included increasing the amount of dry weather and wet weather urban runoff that is diverted and treated or captured and beneficially used. Therefore, for the quadrant analysis, runoff management benefits for both dry and wet weather runoff were defined as a combination of potential volume of runoff managed and volume of runoff beneficially used. Beneficial use was defined as options that offset potable water use or provide natural treatment methods (e.g., constructed wetlands). The definitions of runoff management benefits for both dry and wet weather runoff were defined as a combination of:

- Volume of runoff managed
- Volume of runoff beneficially used

For this analysis, beneficial use was defined as options that offset potable water use, such as: smart irrigation, urban runoff plants (URPs), local/neighborhood solutions (cisterns, on-site percolation, neighborhood recharge), and non-urban regional recharge.

A.3.2 Runoff Management Results

A.3.2.1 Dry Weather Runoff

Using the defined benefits, the City assigned dry weather runoff management costs and benefits scores for the alternatives. Table 2 presents a summary of the results.

Table 2
Alternative Analysis – Dry Weather Runoff Costs and Benefits

	Dry Runoff Costs		Dry Weather Runoff Benefits		
Alternative[1]	Results	Capital Cost ($ mil)[2]	Results	Why (volume)	Why (beneficial use)
Alt 1	Med	$274	Med-High	High - 42 percent managed	Med - Smart irrigation & diversion to wastewater system, and reuse through some URPs/wetlands
Alt 2	High	$591	High	High - 42 percent managed	High – Smart irrigation & reuse through URPs/wetlands
Alt 3	Med	$250	Med	Med - 26 percent managed	Med – Smart irrigation & reuse through some URPs/wetlands
Alt 4	High	$591	High	High - 42 percent managed	High – Smart irrigation & reuse through URPs/wetlands

Notes:
[1] For detailed discussion of components of each alternative, see Facilities Plan Volume 4, Section 6.
[2] Capital costs are from the IRP Facilities Plan, Volume 4, are presented in $2004 dollars, and are appropriate for conducting relative comparisons. The costs for the preferred alternative will be updated to $2006 dollars and fined-tuned in Volume 5 (Implementation Strategy).

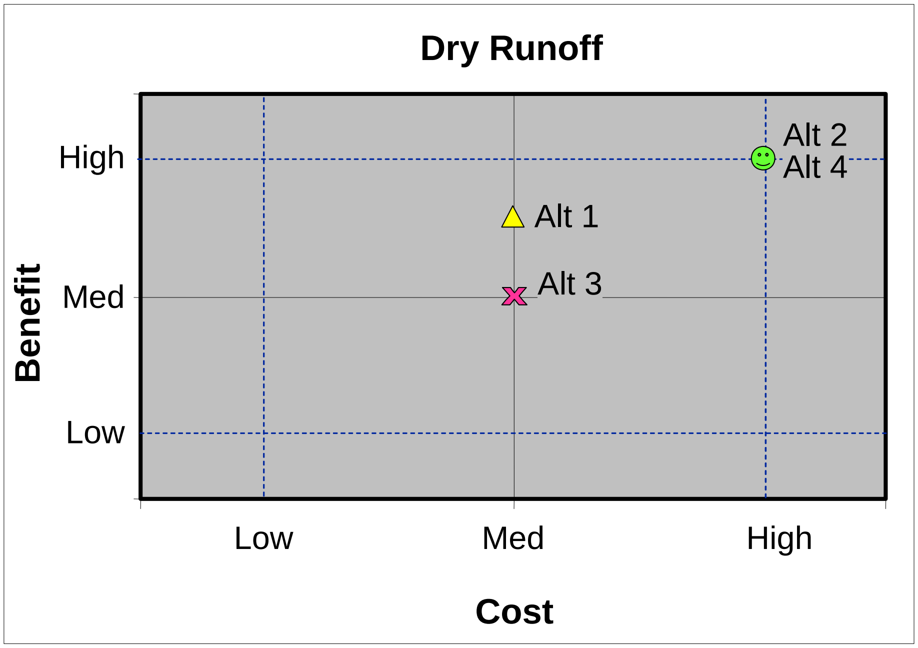


Figure 4 shows the quadrant chart for the dry weather runoff benefits and costs. As shown in the figure, Alternatives 2 and 4 provide high benefit. Alternative 1 is a potential second choice if cost is a concern, because it provides medium-high benefits at medium costs. Alt 3 is not selected because it generates fewer benefits than Alternative 1 for the same cost.

Figure 4
Quadrant Analysis - Dry Weather Runoff

A.3.2.2 Wet Weather Runoff

Using the defined benefits, the City assigned wet weather runoff management costs and benefits scores for the alternatives. Table 3 presents a summary of the results.

Table 3
Alternative Analysis – Wet Weather Runoff Costs and Benefits

Alternative[1]	Wet Runoff Costs		Wet Weather Runoff Benefits		
	Results	Capital Cost ($ mil)[2]	Results	Why (volume)	Why (beneficial use)
Alt 1	Med	$1,597	Med - High	High – 47 percent[3]	High – Onsite percolation and storage/use
Alt 2	Med	$1,597	Med - High	High – 47 percent[3]	High – Onsite percolation and storage/use
Alt 3	Med	$1,666	Med	Med – 39 percent[3]	Med – Neighborhood recharge
Alt 4	Med	$1,597	Med - High	High – 47 percent[3]	High – Onsite percolation and storage/use

Notes:
[1] For detailed discussion of components of each alternative, see Facilities Plan Volume 4, Section 6.
[2] Capital costs are from the IRP Facilities Plan, Volume 4, are presented in $2004 dollars, and are appropriate for conducting relative comparisons. The costs for the preferred alternative will be updated to $2006 dollars and fined-tuned in Volume 5 (Implementation Strategy).
[3] Percent of estimated runoff generated from a ½ inch storm citywide.

Figure 5 shows the quadrant chart for the wet weather runoff benefits and costs. As shown in the figure, Alt 1, 2, and 4 are of greater merit, because they provide medium-high benefits with medium costs. Alt 3 is not selected because it provides fewer benefits at the same cost as the other alternatives.

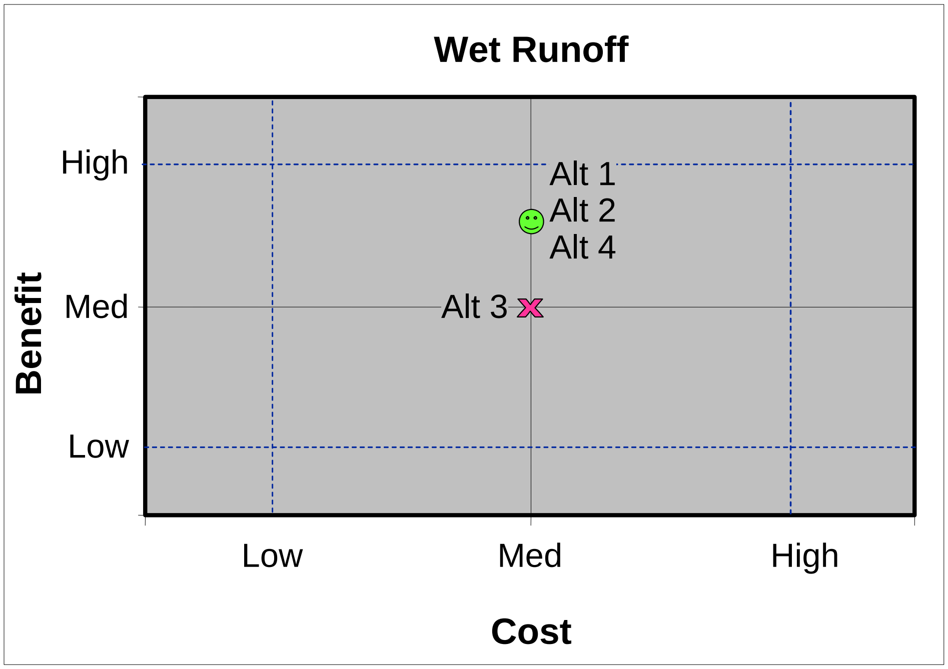


Figure 5
Quadrant Analysis – Wet Weather Runoff

A.4 Wastewater Analysis

A.4.1 Definition of Wastewater Benefits

On the basis of past investment and resources in the Hyperion Treatment Plant, wastewater benefits were defined in direct correlation to the volume of wastewater treated at that plant. Therefore, for the quadrant analysis, a high benefit was assigned to alternatives that enhanced capacity at Hyperion, a medium benefit to alternatives that enhanced capacity at one upstream plant (e.g., DCT) and a low benefit to alternatives that enhanced capacity at both DCT at LAG.

A.4.2 Wastewater Results

Using the defined benefits, the City assigned wastewater costs and benefits scores for the alternatives. Table 4 presents a summary of the results.

Table 4
Alternative Analysis – Wastewater Costs and Benefits

	Wastewater Costs		Wastewater Benefits	
Alternative[1]	**Results**	**Capital Cost ($ mil)[2]**	**Results**	**Why**
Alt 1	Low	$631	High	Expands Hyperion
Alt 2	High	$841	Low	Expands upstream at Tillman and LAG
Alt 3	Med	$817	Med	Expands upstream at Tillman
Alt 4	Med	$817	Med	Expands upstream at Tillman

Notes:
[1] For detailed discussion of components of each alternative, see Facilities Plan Volume 4, Section 6.
[2] Capital costs are from the IRP Facilities Plan, Volume 4, are presented in $2004 dollars, and are appropriate for conducting relative comparisons. The costs for the preferred alternative will be updated to $2006 dollars and fined-tuned in Volume 5 (Implementation Strategy).

Figure 6 shows the quadrant chart for the wastewater benefits and costs. As shown in the figure, Alt 1 is the highest ranked when considering wastewater only, because it provides high benefit (i.e., expands at Hyperion) with low costs. Alt 3 and 4 are potential second choices, because they expand at DCT with medium costs. Alt 2 is not desirable, because it provides fewer benefits at higher costs.

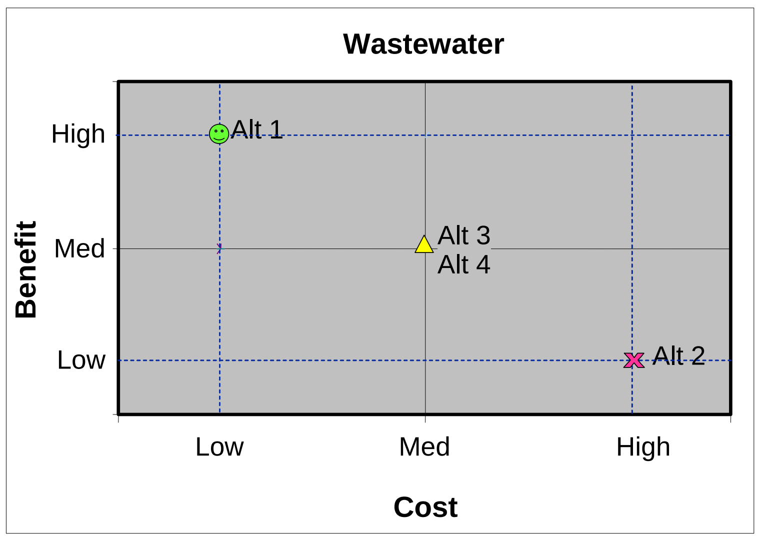


Figure 6
Quadrant Analysis – Wastewater

A.5 Integrated Results

After evaluating the alternatives for each service function, the next step was to consider the alternatives as an integrated system. The City compared each of the service function quadrant charts (Figures 3 through 6) and counted the number of times each alternative was ranked first or second.

Figure 7 presents a summary of the four alternatives and how they scored relative to the four service functions.

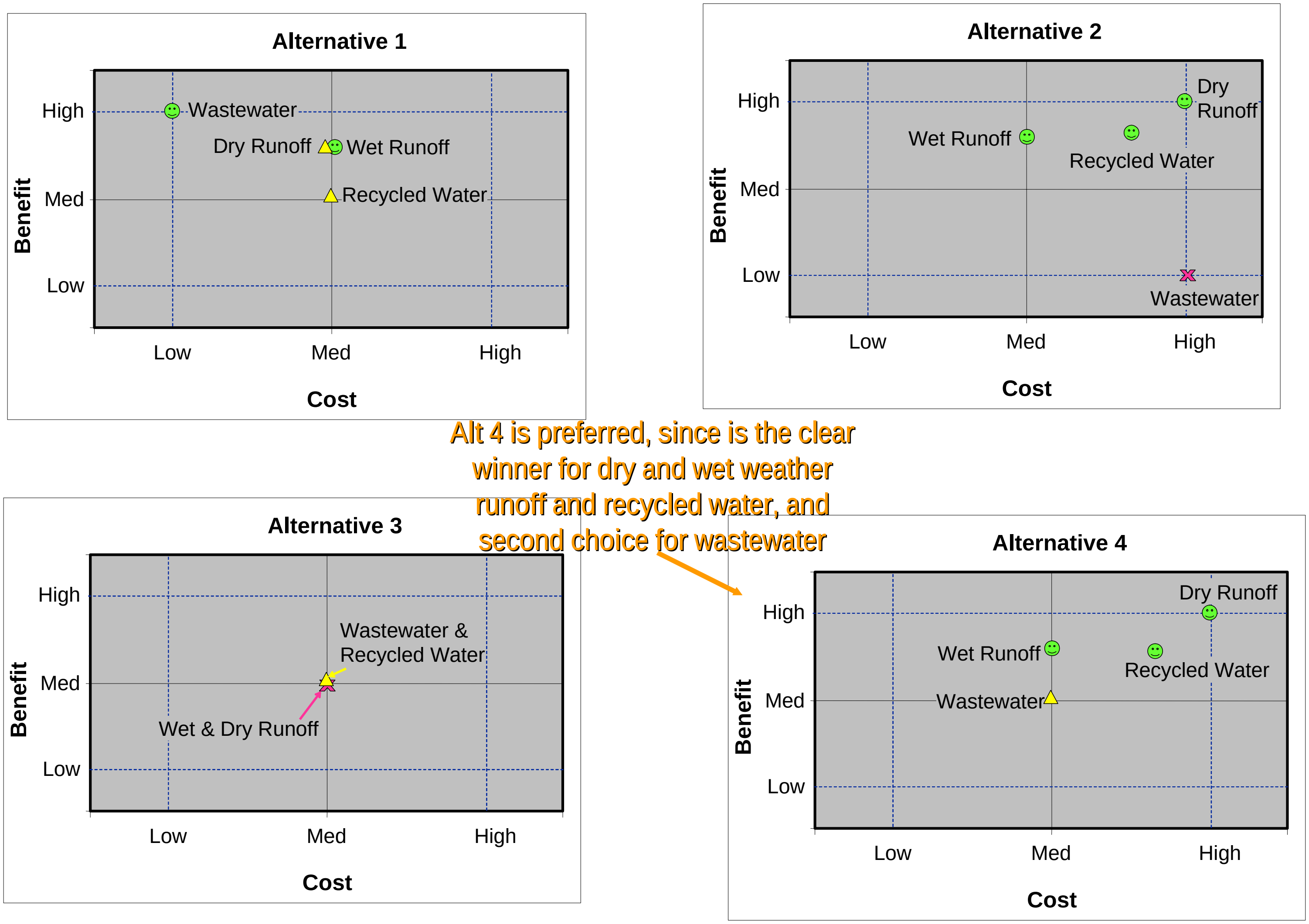


Figure 7
Quadrant Analysis – Integrated Results

Using the defined benefits and estimated costs, staff evaluated each alternative for each service function, and then considered them as an integrated system. After counting the times each alternative ranked as first or second choice and analyzing the results, the staff recommended the following ranking of alternatives:

5. Alternative 4 (highest ranking for recycled water, dry weather runoff and wet weather runoff, and possible second choice for wastewater): Alternative 4 as the Preferred Alternative is attributable to great extent to its recycled water benefits. Changes in future regulations regarding the use of recycled water or future policy decisions regarding the use of recycled water for groundwater replenishment could reduce these recycled water benefits. If those conditions occurred, then Alternative 1 could be considered a potential second choice, on the basis of its lower costs and moderate benefits.

6. Alternative 1 (highest ranking for both wastewater and wet weather runoff, and possible second choices for dry weather runoff and recycled water)

7. Alternative 2 (highest ranking for recycled water, wet weather runoff and dry weather runoff, but not desirable for wastewater): Alternative 2 was ranked third and therefore not preferred, because it produced similar recycled water and runoff management benefits than as Alternative 4, but at higher costs. Also, it provided low benefits for the wastewater system, since it relied on expansion of two water reclamation plants, thereby impacting multiple neighborhoods.

8. Alternative 3 (possible second choices for wastewater and recycled water): Alternative 3 was ranked last and therefore not preferred, due to its lower recycled water, wastewater and runoff benefits compared to all the other alternatives. In addition, its costs were similar to Alternative 1, which provided more benefits.

Appendix B
Cost Estimating Approach for the IRP Facilities Plan

Technical Memorandum:
Cost Estimating Approach for the IRP Facilities Plan

To: *Chuck Turhollow, City of Los Angeles, Bureau of Sanitation*
Project Manager, Los Angeles Integrated Resources Plan

From: *Paul Gustafson, CH:CDM*
Project Manager

Dan Rodrigo, CH:CDM
Task Co-Manager, Financial Plan

Mike Matichich, CH:CDM
Task Co-Manager, Financial Plan

Kent Ennis, CFA, CH:CDM

Date: *May 12, 2003*

Abstract:

Cost estimates are required for projects identified for the Integrated Resources Plan (IRP) for several reasons:

- To help make decisions regarding selection of alternatives, based on total lifecycle costs (capital, debt service and O&M)
- To guide financial planning for the program in terms of determining the best strategy for funding (e.g., rates, grants, bonds, debt financing)
- To assess the financial impact of the program on system customers

Because of the scale of the facilities planning process for a program of this size, cost estimates will be developed by a number of consultants and City staff members associated with the City's wastewater, runoff, and water recycling programs. This memorandum has been prepared to provide a consistent approach for project cost estimation for the IRP that utilizes similar assumptions regarding escalation rates, discount rates, and cost contingency factors.

Cost Estimates for IRP Projects

Each new project will be categorized into one of the following general categories:

- Wastewater treatment plant, expansions (including treatment process)
- Wastewater treatment plant, new (including treatment process)
- Wastewater conveyance, large and small projects
- Stormwater, structural
- Stormwater, non-Structural
- Water recycling treatment
- Water recycling distribution
- Water conservation
- Solid Waste

Capital and O&M cost estimates for all new projects developed as part of the IRP will be based in September 2002 dollars:

- Capital Costs will be developed to an Engineering News Record (ENR) Construction Cost Index (CCI) of 7416 for Los Angeles (see Table A-1).
- O&M cost estimates will be developed to a Bureau of Labor Statistics (BLS) Consumer Price Index (CPI) of 183.4 for Los Angeles (see Table A-2).

When developing cost estimates for these new projects, several sources of information may be useful:

- IPWP Cost Estimating Approach Technical Memorandum, Appendices A and B
- Wastewater Collection System Facilities
  - Latest Bureau of Sanitation Program and Funding Source data, and forecasts if available, to determine collection system trends
  - IPWP Cost Estimating Approach Technical Memorandum, Section B3
- Wastewater Treatment Facilities
  - *IPWP Cost Estimating Approach Technical Memorandum, Appendix A and Appendix B Ssection B4*

  - City Budget Data to estimate O&M costs for treatment trains
  - Advanced Planning Report, Technical Memorandum 7G, City of Los Angeles, to supplement land acquisition cost estimates
  - Latest City information about land acquisition policies and trends
  - EPA document 430-9-80-003, April 1980, *Construction Costs for Municipal Wastewater Treatment Plants: 1973-1978*; and
  - Water Environment Federation, 1998, *Biological and Chemical Systems for Nutrient Removal*
  - "Plan-It STOAT" software system for cost curve estimating

- Biosolids Treatment and Management
  - Latest City Budget information and forecasts, if available, including operating and capital costs for process operating and capital costs, estimates of HTP digester costs, Class A and Class B biosolids processing plans and costs.
  - *IPWP Cost Estimating Approach Technical Memorandum, Appendix A and Appendix B, Section B5*
  - *IPWP Tools Technical Memorandum*

- Potable Water Supply and Water Conservation
  - Current data and forecasts, if available, of DWP and MWD, water rates
  - DWP budget forecasts of water conservation spending
  - *IPWP Cost Estimating Approach Technical Memorandum, Appendix A and Appendix B, Section B6*
  - EPA technical report, Construction Costs for Municipal Water Conveyance Systems: 1973-1977 which was updated in 1982

- Recycled Water Facilities
  - *IPWP Cost Estimating Approach Technical Memorandum, Appendix A and Appendix B, Section B7*
  - *Southern California Comprehensive Water Reclamation and Reuse Study (SCCWRRS*), CH2M HILL 1998
  - *Southern California Comprehensive Water Recycling and Reuse System (SCCWRRS) Allocation and Distribution Model (ADM), CH2M HILL*

- Infiltration and Inflow Reduction
  - *IPWP Cost Estimating Approach Technical Memorandum, Appendix A and Appendix B, Section B8*

- *Infiltration/Inflow (I/I) Reduction Plan*, CH2M HILL 1992
- *1992 I/I Reduction Plan,* City of Los Angeles, and updates
- *IPWP Tools Technical Memorandum*, June 2000

- Urban Runoff Management
  - *IPWP Cost Estimating Approach Technical Memorandum, Appendix A and Appendix B, Section B9*
  - City Bureau of Engineering and Bureau of Sanitation's Watershed Protection estimates for capital costs
  - Bureau of Sanitation Financial Management Division budgets and forecasts for O&M costs to develop cost curves

Timing of Expenditures

The first step for cost estimation of new projects is to determine the timing of these projects. A needs evaluation will determine the year in which the project is needed. For the financial planning analysis, the total capital cost for that project will be spread over a number of years leading up to that year of need. For the financial screening analysis of alternatives, the following simplified assumptions will be made:

- Treatment plants take 12 years to complete
- Pipelines take 5 years to complete
- Stormwater projects, non-storage, take 3 years to complete
- Stormwater projects, storage, take 5 years to complete
- Recycling projects take 5 years to complete

These construction times reflect the necessary planning, design and construction.

For example, if a wastewater treatment plant was needed in year 2020 and cost $20 million, then that $20 million would be spread over the 12 years that precede year 2020. However, the costs would not be spread evenly, but rather back-loaded to reflect the increased expenditures during construction.

Definition of Cost Estimate Classes

In the late 1960s, the Association for the Advancement of Cost Engineering International (AACE) developed a guideline for cost estimate classification for the process industries. A three-part simplified version was adopted as an American National Standards Institute (ANSI) Standard Z94.0 in 1972. Those guidelines and standards enjoy reasonably broad acceptance within the engineering and construction communities and within the process industries. These cost estimate classes will be used for the IRP financial or economic sensitivity analysis.

Order of Magnitude Estimate

An order-of-magnitude estimate is made without detailed engineering data. Some examples include:

- An estimate from cost capacity curves
- An estimate using scale-up or scale-down factors
- An approximate ratio estimate

Typically, an order-of-magnitude estimate is prepared during the design concept finalization phase, which represents a design at approximately 5–20 percent complete. In general, actual project cost can be expected to range from 50 percent more than to 30 percent less than the Order of Magnitude Cost Estimate.

Budget Level Estimate

The preparation of a budget estimate requires, at a minimum, the use of flow sheets, layouts, and major equipment quantity, type, and sizing details. Some examples include:

- An estimate using sketches or drawings to quantify specific facilities or processes
- An estimate using equipment cut sheets as the basis for vendor equipment quotes
- An estimate using lists of material quantities

Typically, a budget estimate is prepared at the end of the preliminary design phase, which represents a design at approximately 15-45 percent complete. Actual project cost can be expected to range from 30 percent more than to 15 percent less than the Budget Level Cost Estimate.

Definitive Estimate

A definitive estimate is prepared from very well defined engineering data. At a minimum, the estimator requires 85 to 95 percent complete plot plans and elevations, piping and instrumentation diagrams, one line electrical diagrams, equipment data sheets, vendor quotations, structural sketches, soil data, drawings of major foundations and buildings and a complete set of specifications. Some examples include:

- An estimate using equipment cut sheets as the basis for vendor equipment quotes
- An estimate using vendor or subcontractor quotes for equipment and services

Typically, a definitive estimate is prepared toward the end of the construction documents preparation (final design) phase. Actual project cost can be expected to range from 15 percent more than to 5 percent less than the Definitive Cost Estimate.

It is expected that the majority of the cost estimates for the IRP will fall within the Order of Magnitude or Budget Level estimates.

Construction Markups

The format of an engineer's construction cost estimate is similar to that of a general contractor's estimate for bidding. After the direct cost of material, labor, equipment, and subcontractor's costs are subtotaled; markups in the form of overhead, profit, mobilization, bond and insurance, and contingencies are applied to arrive at the total bid price. Table 1 presents these ranges of mark-ups as well as a recommended markup.

Table 1
Markup Costs for Capital Construction Estimates

Item	Markup	Recommended Markup Factor
Overhead	5 to 10 percent	1.07
Profit	5 to 10 percent	1.07
Mobilization	3 to 10 percent	1.07
Bond and insurance	1.5 to 2 percent	1.02
Contingency	0 to 30 percent	1.15

If the construction cost estimates explicitly incorporate these markups indicate as such and do not apply these markup factors. However, if the construction cost estimates do not explicitly incorporate these items, then the markup factors shown in the "Recommended" column of Table 1 should be applied in a compounding manner. For example, if a project's construction cost estimate was $1,000,000, then the following would represent the total markup:

(1) $1,000,000 (raw construction cost estimate) x 1.07 (overhead) = $1,050,000

(2) $1,070,000 (new subtotal) x 1.07 (profit) = $1,144,900

(3) $1,144,900 (new subtotal) x 1.07 (mobilization) = $1,225,043

(4) $1,225,043 (new subtotal) x 1.02 (bond/insurance) = $1,249,544

(5) $1,249,544 (new subtotal) x 1.15 (contingency) = $1,436,975

Therefore, in this example, the total construction cost markup would be:

(6) $1,436,975 – $1,000,000 = $436,975 (or a 44% markup)

Application of Non-Construction Markups

While the majority of cost for a project consists of the actual construction effort, non-construction activities are also significant. The budget development process for usually requires that projects be identified at least one or more years in advance of actually beginning the work. Typical non-construction cost activities include:

- Program management
- Engineering studies and basic design services
- Construction management services
- Start-up costs and miscellaneous

These non-construction costs are usually amortized (capitalized) for budget purposes and can range from 20 to 30% of the total construction cost estimate (without construction cost markups). For the purposes of the IRP, 30% should be used. Therefore, in order to get the non-construction cost markup a factor of 0.30 should be multiplied by the construction cost estimate (without construction cost markups). In the above referenced example, this would yield:

(7) $1,000,0000 (construction cost estimate) x 0.30 (non-construction cost markup) = $300,000

Therefore, the total capital cost for this example project would equal:

(8) raw construction cost estimate = $1,000,0000

(9) construction cost markup, see equation (6) = $436,975

(10) non-construction cost markup, see equation (7) = $300,000

(11) total capital cost = $1,000,000 + $436,975 + $300,000 = 1,736,975

These are estimates and judgment should be exercised when applying these factors to project construction estimates. These ranges are meant to serve as a guideline only. As the project matures and non-construction activities become more defined, revisions to the original estimates should be prepared and the project costs updated.

Financial Analysis

Two basic financial analyses will be performed on the IRP—the cost comparison of alternatives, and the impact of the program on customer rates.

Comparison of Alternatives

During the IRP, complete alternatives (combinations of individual projects from wastewater, runoff, and water recycling) will be developed. These integrated alternatives will be designed to meet the guiding principles with different focuses. Although the City's practice has been to use annualized costs for cost comparisons, it is recommended that for the IRP the net present value cost for the alternatives be used for economic comparisons. This change is consistent with the performance measures for cost, as developed by the IRP Steering Committee. The City's average cost of capital debt of 5% should be used as the financing rate and discount rate for these purposes. It may be appropriate to also test the sensitivity of such evaluations to variations in the discount rate.

For each alternative, the total capital cost expenditures (including construction and non-construction markups) will be spread over the construction windows, then financed over the life of the projects (using the City's average cost of debt of 5%). O&M costs in September 2002 dollars for the life of the projects will be added to the annualized capital costs in order to get total annual costs for the alternative.

Then a discount rate equal to the City's average cost of debt will be used to bring back the total annual costs for the alternative to present value. The present value cost will then be compared for all of the alternatives.

Customer Rate Impacts

For the purpose of estimating future rate impacts to retail customers, projected annual costs will be estimated in September 2002 dollars (no discounting). This will facilitate comparison with current household incomes. If required to accurately address some financial planning considerations such as debt or levy limit restrictions, the costs may also be escalated to account for expected inflation. In this case, all future year dollars will be escalated using an appropriate inflation rate to determine rate impacts.

Project Cost Template

For each project cost that is being estimated, the following template should be used:

Project Description	Project Category	Cost Estimate Classification	Year of Project Need	Total Capital Cost ($2002)*	Annual O&M Cost ($2002)
Example: Tillman Water Reclamation Plant Upgrade	Wastewater	Budget Level Estimate	2020	$30 million	$5 million/year

* Total capital cost includes raw capital cost, plus construction and non-construction cost markups (see equations 1-7).

Appendix C
Rough Order of Magnitude Estimate Installation of MF/RO Treatment at LAG and DCT

ROUGH ORDER OF MAGNITUDE ESTIMATE
INSTALLATION OF MF/RO TREATMENT
LOS ANGELES GLENDALE WATER RECLAMATION PLANT
DONALD C. TILLMAN WATER RECLAMATION PLANT

JANUARY 2003

PROJECT ENGINEERING STAFF

ALFRED MATA, GROUP PROJECT MANAGER
SLAVICA DEODIVC-HAMMOND, PRINCIPAL ENGINEER
JOAN OPPENHEIMMER, PRINCIPAL SCIENTIST
KARL GRAMITH, SUPERVISING SCIENTIST

BUREAU OF SANITATION, FMD

LISA MOWERY. ASSISTANT DIVISION ENGINEER

PROGRAM STAFF

VAROUJ ABKIAN, DIVISION ENGINEER
KEN REDD, ASSISTANT DIVISION ENGINEER
JOSEPH WOJSLAW, CONSULTANT PROGRAM DIRECTOR

Background

The City of Los Angeles was issued Time-Schedule Orders (TSOs) detailing specific actions to be taken to achieve compliance with Draft NPDES Permit CA0056227 for the Donald C. Tillman (DCT) water reclamation plant and Draft NPDES Permit CA0053953 for the Los Angeles-Glendale (LAG) water reclamation plants. Both of these permits, issued in May of 1998, listed waste discharge requirements that both plants could not consistently achieve at the time. The contaminants of greatest concern were bis-2-ethyl-hexyl phthalate (BEHP), copper, cyanide, diedrin, lindane, and DDT at DCT and BEHP, copper, cyanide, detergents, and methylene chloride at LAG.

Reduction in the effluent concentrations of some of these constituents has been observed since 1998. However, it is still anticipated that additional treatment will be required at DCT and LAG for permit compliance, particularly in light of the revisions anticipated for the next set of permits which will have to comply with the requirements of the California Toxics Rule. To achieve the low effluent concentrations being required, the only effective treatment option is MF/RO. This technical memorandum provides a rough opinion of the annualized costs associated with the construction and operation of MF/RO facilities at DCT and LAG to insure full compliance with present and future permit requirements for the two treatment plants.

Approach

The MF/RO costs are based on an MWH model that utilizes the mass balance equations for a single-pass MF/RO system to solve for the RO influent flow required to achieve a specified percentage reduction level for a pollutant. The MF/RO flow model and mass balance equations used to create the model are presented in Figure 1.

The output can be modified to reflect MF/RO treatment costs for different percentages of plant flow. A cost for 100% of plant flow is obtained by assigning a 95% pollutant reduction requirement in order to quantify costs for full plant flows of 20 mgd for LAG and 80 mgd for DCT. However, the model allows for rapid and simple assessment of alternative removal scenarios or flow regimes by insertion of different pollutant concentrations for the plant effluent and the RO effluent. During an interim status meeting scheduled on January 21, 2003 to discuss DCT and LAG permit issues and treatment options the recommendation was made to also consider MF/RO treatment costs for 75% of total plant flows at DCT and LAG.

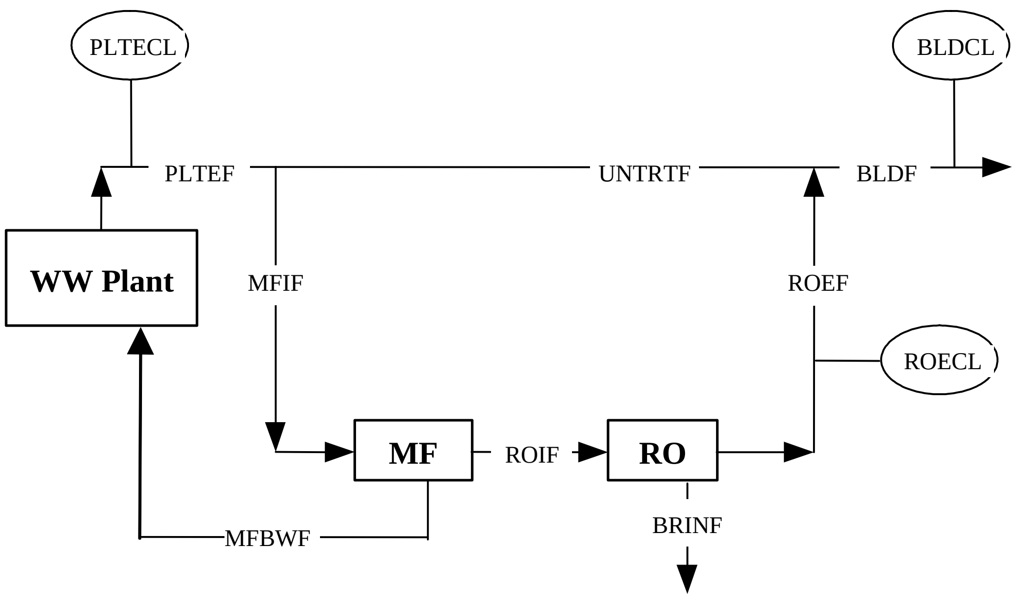
The model assumes 90% MF feed-water recovery and 85% RO feed-water recovery rates. The MF backwash water is assumed to be recycled back to the head of plant. The RO brine is discharged to the ocean through a brine line, but costs for brine disposal were considered independently from the model.

Model Input Parameters

The MF/RO capital cost input parameters for the MWH model were obtained from the project cost estimates prepared by Camp Dresser & McKee Inc. in association with Brown and Caldwell & ASL Consulting Engineers for Orange County Water District's Groundwater Replenishment System Advanced Water Treatment Facility and the City of Los Angeles Terminal Island Wastewater Treatment Plant. The capital cost input values used in the model are summarized in Table 1.

Figure 1. MF/RO Flow Model Schematic and Mass Balance Equations Used to Construct MF/RO Cost Model

MF/RO Flow Model



Parameter Descriptions

Descriptor	Parameter
PLTECL	Plant effluent chloride concentration
PLTEF	Plant effluent flow rate
UNTRTF	Untreated flow rate
MFIF	MF influent flow rate
MFBWF	MF backwash flow rate
ROIF	RO influent flow rate
BRINF	RO brine flow rate
ROEF	RO effluent flow rate
ROECL	RO effluent chloride concentration
BLDF	Treated plant flow rate
BLDCL	Treated plant effluent chloride concentration
MFFWR	MF feed water recovery rate
ROFWR	RO feed water recovery rate

A capital cost scaling factor to adjust for plant flow was based on the MF/RO Costs for IRP obtained from the City of LA's staff meeting that occurred on January 8, 2003. The scaling factor is presented graphically in Figure 2.

The O&M cost input parameters for the MWH model were obtained from cost information for the Terminal Island Treatment Plant (TITP) summarized in Table 2. Annualized capital costs were based on a 20-year finance term and an 8% interest rate.

Table 1. MF/RO Capital Cost Basis for Model

(Based on Cost Estimate Prepard by CDM for OCWD, December 2000)						OCWD Based
Orange County Water District MF RO UV		ENR LA	Dec 2000	7070	Adjustment	Model Cost
Capital Cost Summary		RO Product Flow	mgd	70	Factor	(w Adjustment)
						Factor)
1	Site Power Distribution			$670,000	70%	$469,000
2	Temporary MF System and Site Piping			$3,100,000	100%	$3,100,000
	Imported Water Temporary Connection			$700,000	100%	$700,000
3	Category 1 Demolition			$1,390,000	100%	$1,390,000
4	Piles and Foundation Preparation			$4,900,000	100%	$4,900,000
5	Advanced Water Treatment Facility			$196,890,000		
	Screening Facilities	$3,300,000			100%	$3,300,000
	Influent Pipeline	$1,990,000			100%	$1,990,000
	Microfiltration (Area 42)		$49,320,000			
	MF Equipment	$28,900,000			100%	$28,900,000
	MF Mechanical/Piping Costs	$5,940,000			100%	$5,940,000
	MF Facilities Structure Costs	$8,810,000			100%	$8,810,000
	MF Break Tank/RO Transfer Pump Station	$5,670,000			100%	$5,670,000
	Reverse Osmosis (Area 43)		$62,280,000			
	RO Equipment/Mechanical/Piping	$48,560,000			100%	$48,560,000
	RO Facilities Structure Costs	$13,720,000			100%	$13,720,000
	UV Disinfection	$16,550,000				
	PWPS/BPS	$14,190,000			100%	$14,190,000
	Lime System	$1,350,000			100%	$1,350,000
	Miscellaneous Structures (Area 44)	$2,950,000			100%	$2,950,000
	Chemical/Cartridge Filters (Area 46)		$5,090,000			
	Chemical/Equipment/Mechanical/Piping	$3,500,000			100%	$3,500,000
	Chemical/Cartridge Filters Facilities Structures Costs	$1,590,000			100%	$1,590,000
	Sitework	$7,110,000			80%	$5,688,000
	Yard Piping	$11,610,000			80%	$9,288,000
	Landscaping	$670,000			80%	$536,000
	Electrical	$13,110,000			80%	$10,488,000
	Instrumentation	$6,260,000			80%	$5,008,000
	Category 2 Demolition	$1,110,000			80%	$888,000
6	Barrier Pipeline			$3,210,000		
	East Pipeline	$2,150,000				
	West Pipeline	$1,060,000				
7	Barrier Well Drilling			$2,570,000		
	Monitoring Wells			$600,000		
8	Barrier Wellhead Facilities and Pipeline Branches			$2,800,000		
9	GWR Pipeline (Unit I)			$22,430,000		
10	GWR Pipeline (Unit II)			$18,920,000		
11	GWR Pipeline (Unit III)			$16,880,000		
	SUBTOTAL (w/o contingency)			$275,060,000		182,925,000
	Contingency	10%		$27,506,000		18,292,500
	Total Capital Cost			$302,566,000		201,217,500
	ELA	0%		$0		0
	TOTAL			$302,566,000		**201,217,500**

Figure 2. Scaling Factor Used to Adjust Capital Cost Per MGD of Flow to Capital Cost for a Specified Product Flow

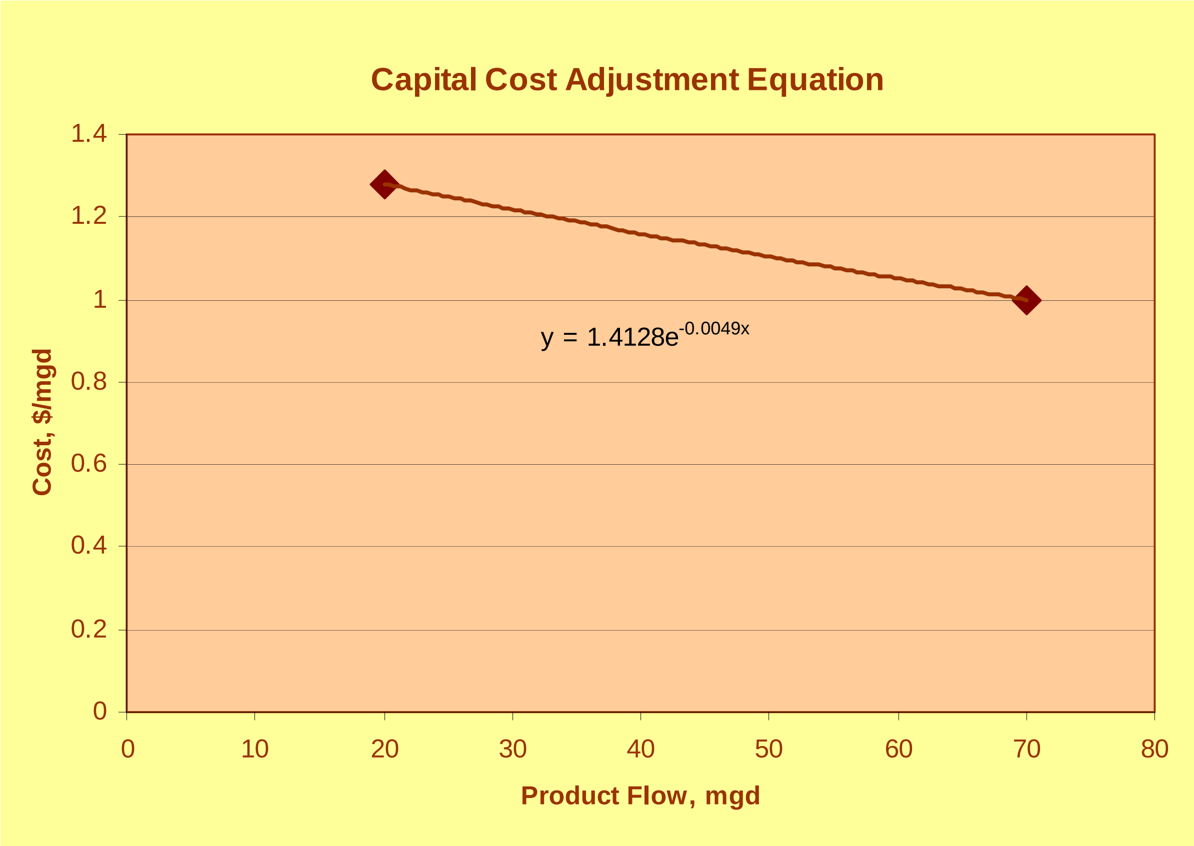


Table 2. MF/RO Operations and Maintenance Cost Factors for Mode

		Value				Value		
Labor	Unit	Default	Manual	Design	Unit	Default	Manual	Design
Operators	#/mgd RO product-yr	0.40		0.40	$/Yr	$52,600		$52,600
Engineers	#/mgd RO product-yr	0.20		0.20	$/Yr	$50,000		$50,000
Maintenance	#/mgd RO product-yr	0.30		0.30	$/Yr	$46,100		$46,100
Total Staff	#/mgd RO product-yr	0.90		0.90				
Total Salary	$/mgd-yr	$44,870		$44,870				
Overhead Rate	---	0.60		0.60				
Total Annual Labor Cost	**$/mgd RO product-yr**	**$71,792**		**$71,792**				
Consumables								
Electricity	KWH/mgd RO product	5,600		5,600	$/KWH	$0.10	$0.09	$0.09
Memclean	gal/mgd RO product	1.2		1.2	$/gal	$12.20		$12.20
Citric Acid	gal/mgd RO product	1		1	$/gal	$10.39		$10.39
Sodium Hydroxide 25%	gal/mgd RO product	10		10	$/gal	$2.65		$2.65
Scale Inhibitor	lb/mgd RO product	39		39	$/lb	$1.624		$1.624
Total Consumable Cost	**$/mgd RO product**	**$675**		**$591**				
Total Annual Consumable Cost	**$/mgd RO product-yr**	**$246,326**		**$215,666**				
MF Element Replacement	Elements / mgd RO product-yr	180		180	$/MF element	$800	$500	$500
					Life, years	5		5
RO Element Replacement	Elements / mgd RO product-yr	151		151	$/element	$756		$756
					Life, years	5		5
Annual Element Replacement Cost	**$/mgd RO product-yr**	**$51,631**		**$40,831**				
MF & RO Maintenance Contract / Spare Parts	$/mgd RO product-yr	$20,000		$20,000				
Total AnnualO&M Costs	**$/mgd RO product-yr**	**$389,749**		**$348,289**				

Results

The treatment schematics of the MF/RO model assuming treatment of 100% of the flows at DCT and LAG are presented in Figure 3 while the schematics assuming treatment o 75% of the flows are presented in Figure 4.

Figure 3. MF/RO Model Treatment Schematic for 100% of DCT and LAG Flow

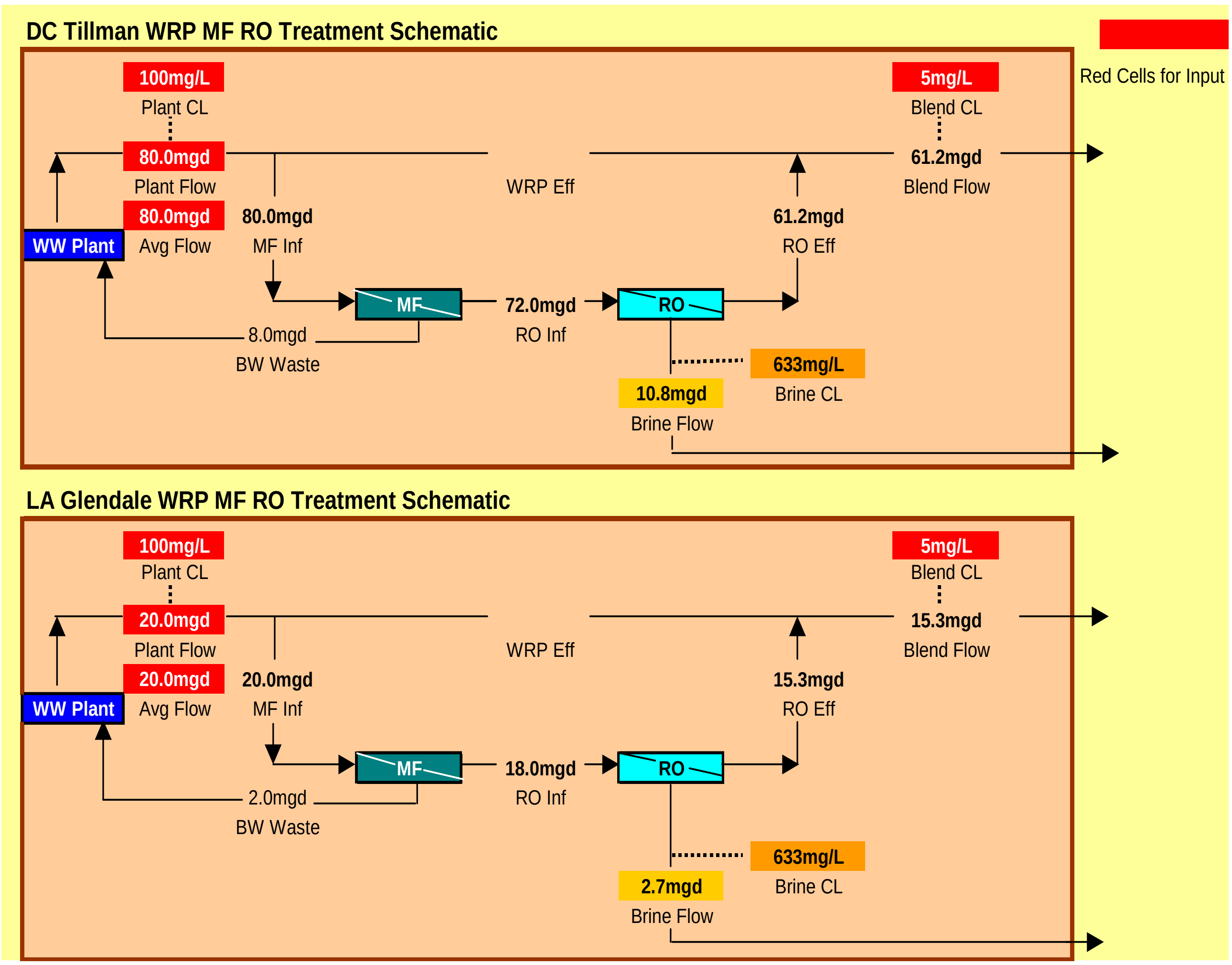
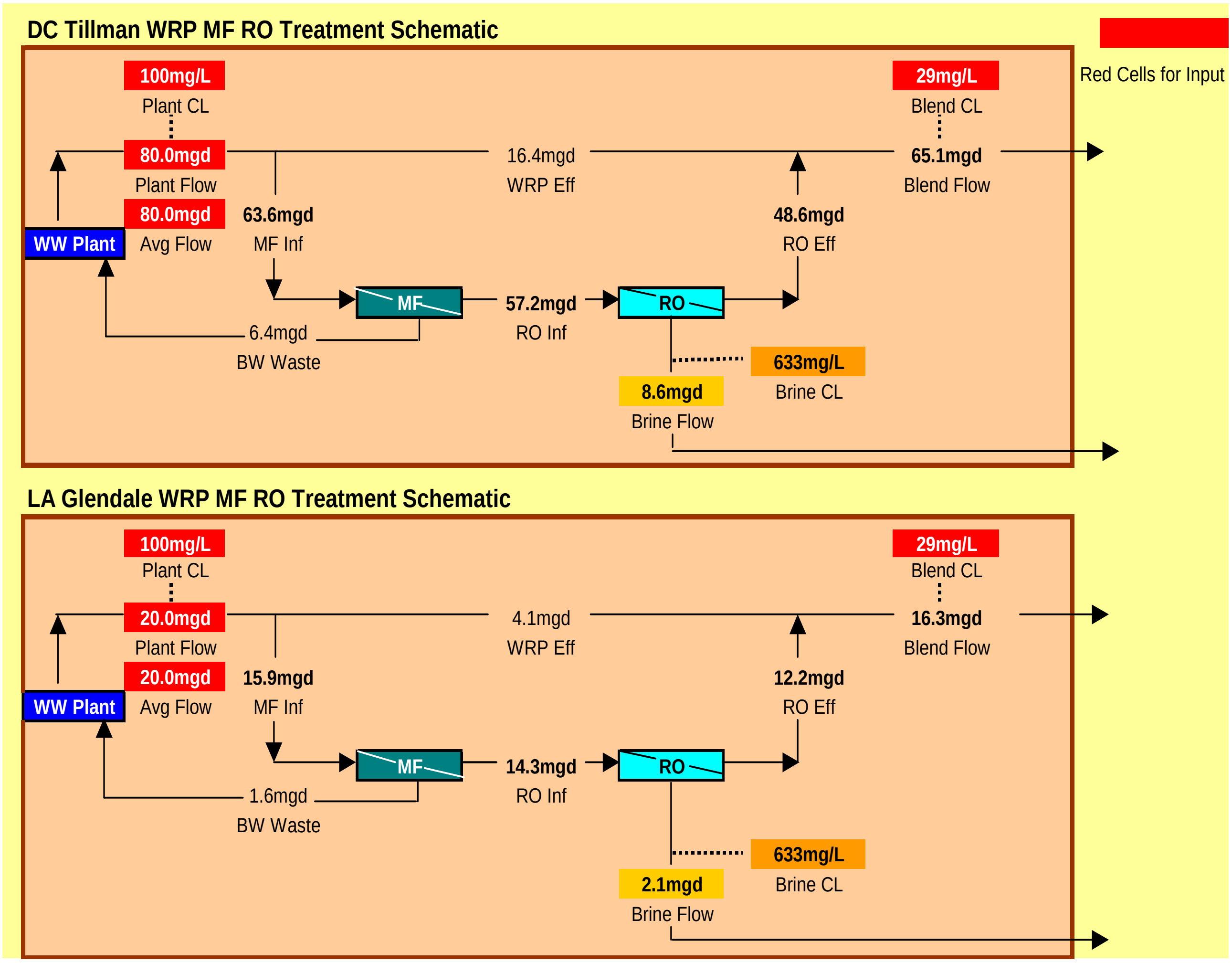


Figure 4. MF/RO Model Treatment Schematic for 75% of DCT and LAG Flow



The accompanying tabular summary sheet provides cost estimates for ten different alternatives that consider MF/RO treatment costs for 100% DCT and LAG flows in combination with costs for brine disposal, handling of wet-weather peaks, and UV treatment to meet California Title 22 standards for non-restricted effluent use.

Table 3 (Alternative 1) (MF/RO with ELA) presents the MF/RO model output as total annualized costs for MF/RO construction and operation at DCT and LAG inclusive of a 15% mark-up for engineering labor, and administrative (ELA) costs.

Table 4 (Alternative 2) (MF/RO w/o ELA) presents these same costs exclusive of the 15% mark-up for ELA.

Table 5 (Alternative 3) (MF/RO + Brine Line w/o ELA) builds on the costs of Table 4 by considering the cost of a brine line to carry the MR/RO brine produced at DCT and LAG to Hyperion Treatment Plant (HTP) for ocean out-fall disposal. The rough cost estimate for the brine line of $150M was obtained directly from City staff. These costs assume a brine line starting at DCT, following the Los Angeles (LA) River to pick up brine from LAG, flowing east toward the

Northeast Interceptor Sewer (NEIS), intercepting the East Corridor Interceptor Sewer (ECIS), and then flowing west along the ECIS and North Outfall Replacement Sewer (NORS) route. This route, of approximately 225,000 ft, would follow the natural river channel as much as possible to minimize the need for tunneling and pumping. Alternatively, the brine line could continue to follow the LA River towards the harbor and eventually tie into the Terminal Island outfall. The brine flow from the two plants is assumed to be 10 mgd (MF/RO model prediction is 13.5 mgd) and the required pipe diameter to handle a 4 fps flow velocity and a d/D of about 0.5 would be 36 inches. Assuming vitrified clay pipe (VCP) and an average 8 ft burial, the unit cost from the City's A/E services group would be about $308/ft. This is an "in place" cost for open trenching, but excludes shoring, mobilization, and traffic controls. Adding a 30% contingency to cover the latter plus other unknowns gives an opinion of cost of $90M. Since the per foot cost of tunneling is estimated to be about 5 times greater than the cost for trenching and some tunneling is anticipated, it is suggested that the opinion of cost be raised to $125M for the brine line until a more detailed study is undertaken.

Table 6 (Alternative 4) (MF/RO + Brine Line + Sewer Line without ELA) combines the costs of Tables 5 and 8 by incorporating both the brine line and sewer line costs with the MF/RO exclusive of ELA markup.

Table 7 (Alternative 5) (MF/RO + Brine Line + Sewer Line + UV without ELA) builds on the costs of Table 6 by incorporating the cost of UV treatment at DCT and LAG in order to disinfect the treated effluents to reclamation standards. A footnote to the table demonstrates the reduction in the total annualized cost if a 50 million-gallon storage tank is substituted for the new sewer line in order to handle wet weather flows at DCT. The UV costs were taken from a report prepared by MWH for the City in March 2001 after adjusting the finance term and interest rate to match those used in the MF/RO model. No adjustment was made to the UV cost to compensate for the lower flows following MF/RO treatment. Furthermore, the UV costs are based on the UV dose required for disinfection and a substantially higher UV dose would be required for control of NDMA.

Table 8 (Alternative 6) (MF/RO + Sewer Line w/o ELA) includes the MF/RO model exclusive of the 15% ELA mark-up and incorporates the new sewer costs to handle the loss in wet weather treatment capacity at DCT arising from the loss of peaking capacity once MF/RO treatment is installed. Wet weather peaks of approximately 8 mgd at LAG could be routed through the East Corridor Interceptor Sewer (ECIS) and the Northeast Interceptor Sewer (NEIS) without the need for additional construction. Installation of MF/RO at DCT would require construction of new sewers to take approximately 65 mgd of wet weather flow from DCT to the upper end of NORS/NOS/NCOS at Rodeo and La Cienega. Assuming that the new sewers will have the same cost as NEIS of $20M per mile, City staff estimated that 23 miles of new sewer will have to be constructed for DCT which will add $460M to the capital cost of installing MF/RO. A footnote to the table demonstrates the reduction in the total annualized cost if a 50 million-gallon storage tank is substituted for the new sewer line to handle wet weather flows at DCT.

Table 9 (Alternative 7) (MF/RO + Brine Line + Equalization + UV without ELA) presents an alternative option to Table 8 for the handling of wet weather flows. Here, the cost of flow equalization is considered in place of sewer line costs to handle wet weather flows. This scenario is based on assumptions and costs provided by Adel Hagekhalil of the City's Bureau of Sanitation. The equalization volume is assumed to be 60 mgd for DCT and 6 mgd for LAG and the costs are based on the assumption that real estate is available at DCT for siting sixty 1-mgd tanks and at LAG for siting six 1-mgd tanks. The unit cost of a 1-mgd tank is assumed to be $1M.

Table 10 (Alternative 8) (MF/RO + Brine Line + Equalization + UV with ELA) presents the same information as Table 9 inclusive of a 15% mark-up for ELA.

Table 11 (Alternative 9) (MF/RO + UV + Equalization without ELA) presents the same information as Table 9 but assumes the brine flow can be discharged to the sewer.

Table 12 (Alternative 10) (MF/RO + UV + Equalization with ELA) presents the same information as Table 10 but assumes the brine flow can be discharged to the sewer.

Table 3 (Alternative 1)
TSO Permit Compliance Cost Estimates (MF RO with 15% ELA)

	Units	DCT MF RO	LAG MF RO	TOTAL
Plant Flow	mgd	80	20	
Design Flow (RO Product Flow)	mgd	61	15	77
Blended Flow RO Percentage	%	100%	100%	
Capital Cost	$M	212	66	278
Financing Term	Years	30	30	
Interest Rate	%/Yr	5.5%	5.5%	
Annualized Capital Cost	$M	15	4.6	19
Annual O&M Cost	$M	21	5.3	27
Total Annual Cost	$M	36	10	46

Table 4 (Alternative 2)
TSO Permit Compliance Cost Estimates (MF RO w/o ELA)

	Units	DCT MF RO	LAG MF RO	TOTAL
Plant Flow	mgd	80	20	
Design Flow (RO Product Flow)	mgd	61	15	
Capital Cost (100% flow)	$M	184	58	242
Capital Cost (75% flow)	$M	156	46	202
Financing Term	Years	30	30	
Interest Rate	%/Yr	5.5%	5.5%	
Annualized Capital Cost (100% flow)	$M	13	4.0	17
Annualized Capital Cost (75% flow)	$M	11	3.2	14
Annual O&M Cost (100% flow)	$M	21	5.3	27
Annual O&M Cost (75% flow)	$M	17	4.2	21
Total Annual Cost (100% flow)	$M	34	9	43
Total Annual Cost (75% flow)	$M	28	7	35

Table 5 (Alternative 3)
TSO Permit Compliance Cost Estimates (MF RO and Brine Line w/o ELA)

	Units	BRINE LINE	TOTAL
Plant Flow	mgd		
Design Flow	mgd	10	
Capital Cost	$M	125	367
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	9	25
Annual O&M Cost	$M	NA	27
Total Annual Cost	$M	9	52

Table 6 (Alternative 4)
TSO Permit Compliance Cost Estimates (MF RO, Brine Line & Sewer Line w/o ELA)

	Units	SEWER LINE	TOTAL
Plant Flow	mgd		
Design Flow	mgd	65	
Capital Cost	$M	460	827
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	32	57
Annual O&M Cost	$M	NA	27
Total Annual Cost	$M	32	84

Note: Replacement of sewer line with 50 MG storage tank at DCT would decrease total annual cost to $56M.

Table 7 (Alternative 5)
TSO Permit Compliance Cost Estimates (MF RO, Brine Line, Sewer Line and UV w/o ELA)

	Units	DCT UV	LAG UV	TOTAL
Plant Flow	mgd			
Design Flows	mgd	80	20	
Capital Cost	$M	17	4.2	848
Financing Term	Years	30	30	
Interest Rate	%/Yr	5.5%	5.5%	
Annualized Capital Cost	$M	1.2	0.3	58
Annual O&M Cost	$M	1.8	0.4	29
Total Annual Cost	$M	2.9	0.7	87

Note: Replacement of sewer line with 50 MG storage tank at DCT would decrease total annual cost to $59m.
UV cost based on disinfection dose of 100 mJ/sq cm and average plant flows of 80 and 20 mgd.

Table 8 (Alternative 6)
TSO Permit Compliance Cost Estimates (MF RO and Sewer Line w/o ELA)

	Units	SEWER LINE	TOTAL
Plant Flow	mgd		
Design Flows	mgd	65	
Capital Cost	$M	460	702
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	32	48
Annual O&M Cost	$M	NA	27
Total Annual Cost	$M	32	75

Table 9 (Alternative 7)
TSO Permit Compliance Cost Est. (MF RO, Brine Line, Equalization, & UV w/o ELA)

	Units	EQUILIZATION	TOTAL
Plant Flow	mgd	66	
Design Flows	mgd		
Capital Cost	$M	66	454
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	4.5	31
Annual O&M Cost	$M	NA	29
Total Annual Cost	$M	4.5	60

Note: Replacement of sewer line with 60 MG storage tank at DCT $60M and 6 MG storage tank at LAG $6 M (Source: Adel Hagekhalil). Equalization volume and cost directed by Adel Hagekhalil.

Table 10 (Alternative 8)
TSO Permit Compliance Cost Est. (MF RO, Brine Line, Equalization, & UV w/ ELA)

	Units	EQUILIZATION	TOTAL
Plant Flow	mgd	66	
Design Flows	mgd		
Capital Cost	$M	68	522
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	4.5	36
Annual O&M Cost	$M	NA	29
Total Annual Cost	$M	4.5	65

Note: Replacement of sewer line with 60 MG storage tank at DCT $60M and 6 MG storage tank at LAG $6 M (Source: Adel Hagekhalil). Equalization volume and cost directed by Adel Hagekhalil.

Table 11 (Alternative 9)
TSO Permit Compliance Cost Est. (MF RO, Equalization, & UV w/o ELA)

	Units	EQUILIZATION	TOTAL
Plant Flow	mgd	66	
Design Flows	mgd		
Capital Cost	$M	66	329
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	4.5	23
Annual O&M Cost	$M	NA	29
Total Annual Cost	$M	4.5	51

Note: Replacement of sewer line with 60 MG storage tank at DCT $60M and 6 MG storage tank at LAG $6 M (Source: Adel Hagekhalil). Equalization volume and cost directed by Adel Hagekhalil.

Table 12 (Alternative 10)
TSO Permit Compliance Cost Est. (MF RO, Equalization, & UV with ELA)

	Units	EQUILIZATION	TOTAL
Plant Flow	mgd	66	
Design Flows	mgd		
Capital Cost	$M	68	378
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	4.5	26
Annual O&M Cost	$M	NA	29
Total Annual Cost	$M	4.5	56

Note: Replacement of sewer line with 60 MG storage tank at DCT $60M and 6 MG storage tank at LAG $6 M (Source: Adel Hagekhalil). Equalization volume and cost directed by Adel Hagekhalil.

Attachment 1

ROM Cost Summary
W/ schedule & rate increase
Revision January 14th, 2003

TSO Permit Compliance Cost Estimates

	2004	2005	2006	2007	2008	2008 SFR ($/month)	Total % increase
Baseline Rate Increase:	3%	3%	3%	4%	4%		
SFR (Single family residence) Increase $/month:	$0.62	$0.64	$0.66	$0.91	$0.94	$24.52	18%

Table 3 (Alternative 1) TSO Permit Compliance Cost Estimates (MF RO with 15% ELA)

	Units	DCT MF RO	LAG MF RO	TOTAL
Plant Flow	mgd	80	20	
Design Flow (RO Product Flow)	mgd	61	15	77
Blended Flow RO Percentage	%	100%	100%	
Capital Cost	$M	212	66	278
Financing Term	Years	30	30	
Interest Rate	%/Yr	5.5%	5.5%	
Annualized Capital Cost	$M	15	4.6	19
Annual O&M Cost	$M	21	5.3	27
Total Annual Cost	$M	36	10	46

	2004	2005	2006	2007	2008	2008 SFR	
	FY1	FY2	FY3	FY4	FY5	($/month)	
Capital Cost	7.2	7.2	77	146	77		
Rate Increase:	3%	6%	5%	5%	5%		
	$0.62	$1.28	$1.13	$1.19	$1.25	$26.23	26%

Table 4 (Alternative 2) TSO Permit Compliance Cost Estimates (MF RO without ELA)

	Units	DCT MF RO	LAG MF RO	TOTAL
Plant Flow	mgd	80	20	
Design Flow (RO Product Flow)	mgd	61	15	
Blended Flow RO Percentage	%	100%	100%	
Capital Cost	$M	184	58	242
Financing Term	Years	30	30	
Interest Rate	%/Yr	5.5%	5.5%	
Annualized Capital Cost	$M	13	4.0	17
MF RO Annual O&M Cost	$M	21	5.3	27
Total Annual Cost	$M	34	9	43

	2004	2005	2006	2007	2008	2008 SFR		
	FY1	FY2	FY3	FY4	FY5	($/month)		
Capital Cost			60	122	60			
Rate Increase:	3%	6%	5%	5%	5%			
	$0.62	$1.28	$1.13	$1.19	$1.25	$26.23	26%	$1.70

Table 5 (Alternative 3) TSO Permit Compliance Cost Estimates (MF RO and Brine Line without ELA)

	Units	BRINE LINE	TOTAL
Plant Flow	mgd		
Design Flow	mgd	10	
Capital Cost	$M	125	367
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	9	25
Annual O&M Cost	$M	NA	27
Total Annual Cost	$M	9	52

	2004	2005	2006	2007	2008	2008 SFR	
	FY1	FY2	FY3	FY4	FY5	($/month)	
Capital Cost			85	172	110		
Rate Increase:	3%	6%	6%	6%	5%		
	$0.62	$1.28	$1.36	$1.44	$1.27	$26.73	29%

Table 6 (Alternative 4) TSO Permit Compliance Cost Estimates (MF RO, Brine Line & Sewer Line w/o ELA)

	Units	SEWER LINE	TOTAL
Plant Flow	mgd		
Design Flow	mgd	65	
Capital Cost	$M	460	827
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	32	57
Annual O&M Cost	$M	NA	27
Total Annual Cost	$M	32	84

Note: Replacement of sewer line with 50 MG storage tank at DCT would decrease total annual cost to $56M.

	2004	2005	2006	2007	2008	2008 SFR
	FY1	FY2	FY3	FY4	FY5	($/month)
Capital Cost			177	356	294	
Rate Increase:	3%	6%	8%	9%	9%	

TSO Permit Compliance Cost Estimates

$0.62	$1.28	$1.81	$2.20	$2.40	$29.07	40%

Table 7 (Alternative 5) TSO Permit Comp. Cost Est. (MF RO, Brine Line, Sewer Line & UV w/o ELA)

	Units	DCT UV	LAG UV	TOTAL
Plant Flow	mgd			
Design Flows	mgd	80	20	
Capital Cost	$M	17	4.2	848
Financing Term	Years	30	30	
Interest Rate	%/Yr	5.5%	5.5%	
Annualized Capital Cost	$M	1.2	0.3	58
Annual O&M Cost	$M	1.8	0.4	29
Total Annual Cost	$M	2.9	0.7	87

Note: Replacement of sewer line with 50 MG storage tank at DCT would decrease total annual cost to $59M.
UV cost based on disinfection dose of 100 mJ/sq cm and average plant flows of 80 and 20 mgd.

	2004 FY1	2005 FY2	2006 FY3	2007 FY4	2008 FY5	2008 SFR ($/month)	
Capital Cost			181	364	302		
Rate Increase:	3%	6%	9%	9%	8%		
	$0.62	$1.28	$2.04	$2.22	$2.15	$29.07	40%

TSO Permit Compliance Cost Estimates

Table 8 (Alternative 6) TSO Permit Compliance Cost Estimates (MF RO and Sewer Line w/o ELA)

	Units	SEWER LINE	TOTAL
Plant Flow	mgd		
Design Flows	mgd	65	
Capital Cost	$M	460	702
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	
Annualized Capital Cost	$M	32	48
Annual O&M Cost	$M	NA	27
Total Annual Cost	$M	32	75

	2004 FY1	2005 FY2	2006 FY3	2007 FY4	2008 FY5	2008 SFR ($/month)	
Capital Cost			152	306	244		
Rate Increase:	3%	7%	7%	7%	8%		
	$0.62	$1.50	$1.60	$1.71	$2.09	$28.28	36%

Table 9 (Alternative 7) TSO Permit Comp. Cost Est. (MF RO, Brine Line, Equilization & UV w/o ELA)

	Units	Alternative 5	Equalization	TOTAL (+)
Plant Flow	mgd		66	
Design Flows	mgd			
Capital Cost	$M	848	66	454
Financing Term	Years	30		
Interest Rate	%/Yr	5.5%	5.5%	5.5%
Annualized Capital Cost	$M	26.7	4.5	31
Annual O&M Cost	$M	28.8	-	29
Total Annual Cost	$M	55.5	4.5	60

Note: Replacement of sewer line with 60 MG storage tank at DCT $60 million
6 MG storage tank at LAG $6 million (Source: Adel Hagekhalil)
Equalization volume and cost - Direction by Adel Hagekhalil
+ Alternative #5 - $460 million + $66 million for equalization

	2004 FY1	2005 FY2	2006 FY3	2007 FY4	2008 FY5	2008 SFR ($/month)		
Capital Cost			107	215	132			
Rate Increase:	5%	5%	6%	6%	6%			
	$1.04	$1.09	$1.37	$1.45	$1.54	$27.25	31%	$2.72
or:	3%	6%	6%	6%	7%			
	$0.62	$1.28	$1.36	$1.44	$1.78	$27.24	31%	

Table 10 (Alternative 8) TSO Permit Comp. Cost Est. (MF RO, Brine Line, Equilization & UV w/ ELA)

	Units	Alternative 7	ELA	TOTAL
Plant Flow	mgd			
Design Flows	mgd			
Capital Cost	$M	454	68	522
Financing Term	Years	30		
Interest Rate	%/Yr	5.5%		
Annualized Capital Cost	$M	31	4.5	36
Annual O&M Cost	$M	29	-	29
Total Annual Cost	$M	60	4.5	65

Note: Replacement of sewer line with 60 MG storage tank at DCT $60 million
6 MG storage tank at LAG $6 million (Source: Adel Hagekhalil)
Equalization volume and cost - Direction by Adel Hagekhalil
ELA - 15%

	2004 FY1	2005 FY2	2006 FY3	2007 FY4	2008 FY5	2008 SFR ($/month)	
Capital Cost	27	20	114	221	139		
Rate Increase:	5%	6%	6%	6%	6%		
	$1.04	$1.31	$1.39	$1.47	$1.56	$27.51	33%
or:	3%	6%	6%	6%	7%		
	$0.62	$1.28	$1.36	$1.44	$1.78	$27.24	31%

Table 11 (Alternative 9) TSO Permit Comp. Cost Est. (MF RO, Equilization & UV w/o ELA)

	Units	Alternative 7 w/o brine	TOTAL (+)
Plant Flow	mgd		
Design Flows	mgd		
Capital Cost	$M	329	329
Financing Term	Years	30	
Interest Rate	%/Yr	5.5%	5.5%
Annualized Capital Cost	$M	23	23
Annual O&M Cost	$M	29	29
Total Annual Cost	$M	51	51

Note: Replacement of sewer line with 60 MG storage tank at DCT $60 million
6 MG storage tank at LAG $6 million (Source: Adel Hagekhalil)

	2004 FY1	2005 FY2	2006 FY3	2007 FY4	2008 FY5	2008 SFR ($/month)
Capital Cost			82	165	82	329
Rate Increase:	5%	5%	5%	5%	5%	

TSO Permit Compliance Cost Estimates

Equalization volume and cost - Direction by Adel Hagekhalil
+ Alternative #5 - $460 million + $66 million for equalization

	$1.04	$1.09	$1.14	$1.20	$1.26	$26.48	28%
or:	3%	6%	6%	6%	6%		
	$0.62	$1.28	$1.36	$1.44	$1.53	$26.98	30%

Table 12 (Alternative 10) TSO Permit Comp. Cost Est. (MF RO, Equilization & UV w/ ELA)

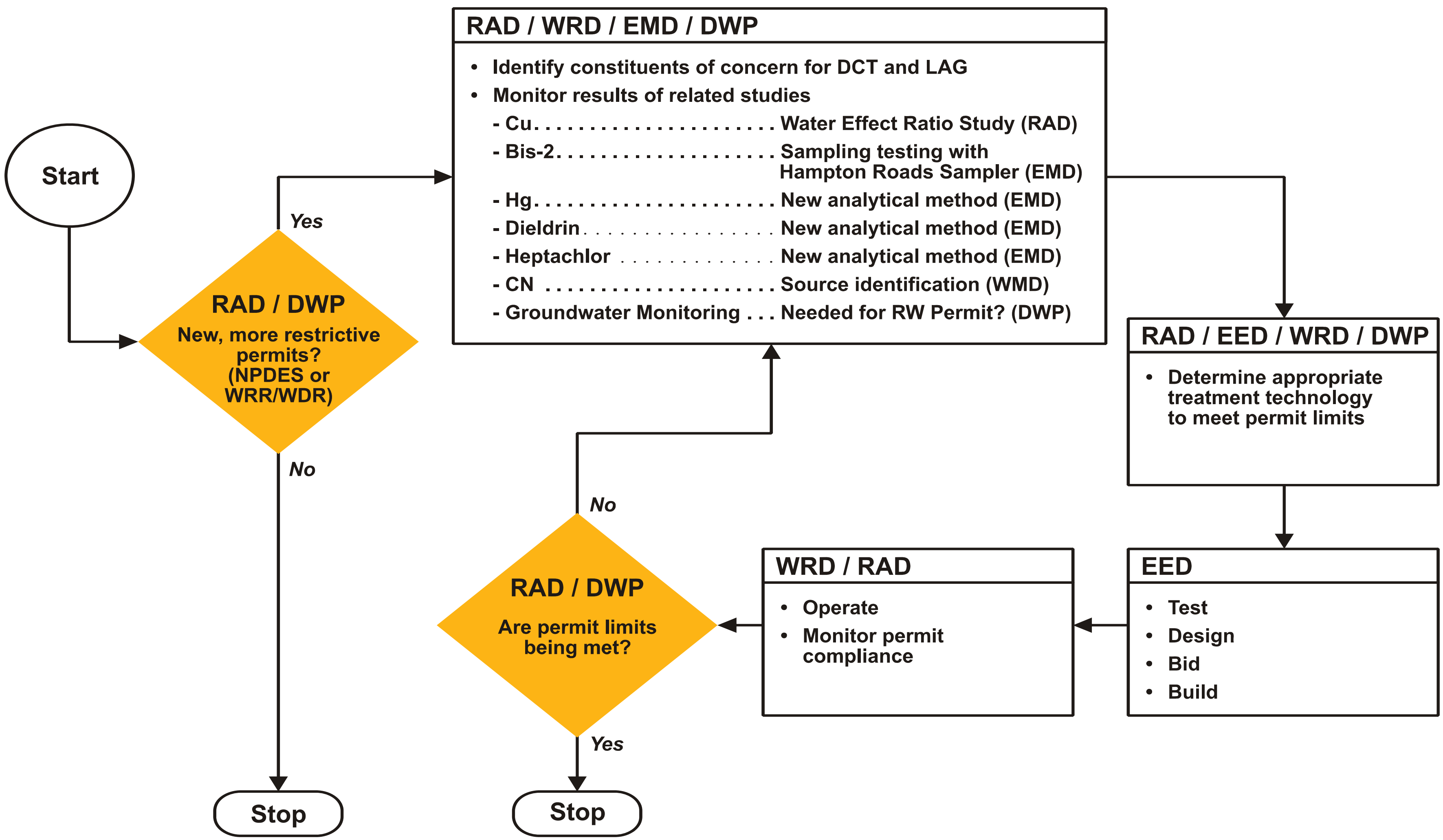
	Units	Alternative 7	ELA	TOTAL
Plant Flow	mgd			
Design Flows	mgd			
Capital Cost	$M	329	49	378
Financing Term	Years	30	30	
Interest Rate	%/Yr	5.5%	5.5%	
Annualized Capital Cost	$M	23	3.4	26
Annual O&M Cost	$M	29	-	29
Total Annual Cost	$M	51	4.5	56

Note: Replacement of sewer line with 60 MG storage tank at DCT $60 million
6 MG storage tank at LAG $6 million (Source: Adel Hagekhalil)
Equalization volume and cost - Direction by Adel Hagekhalil
ELA - 15%

	2004 FY1	2005 FY2	2006 FY3	2007 FY4	2008 FY5	2008 SFR ($/month)	
Capital Cost	20	15	87	169	87		
Rate Increase:	5%	5%	5%	5%	6%		
	$1.04	$1.09	$1.14	$1.20	$1.51	$26.74	29%
or:	3%	6%	6%	6%	6%		
	$0.62	$1.28	$1.36	$1.44	$1.53	$26.98	30%

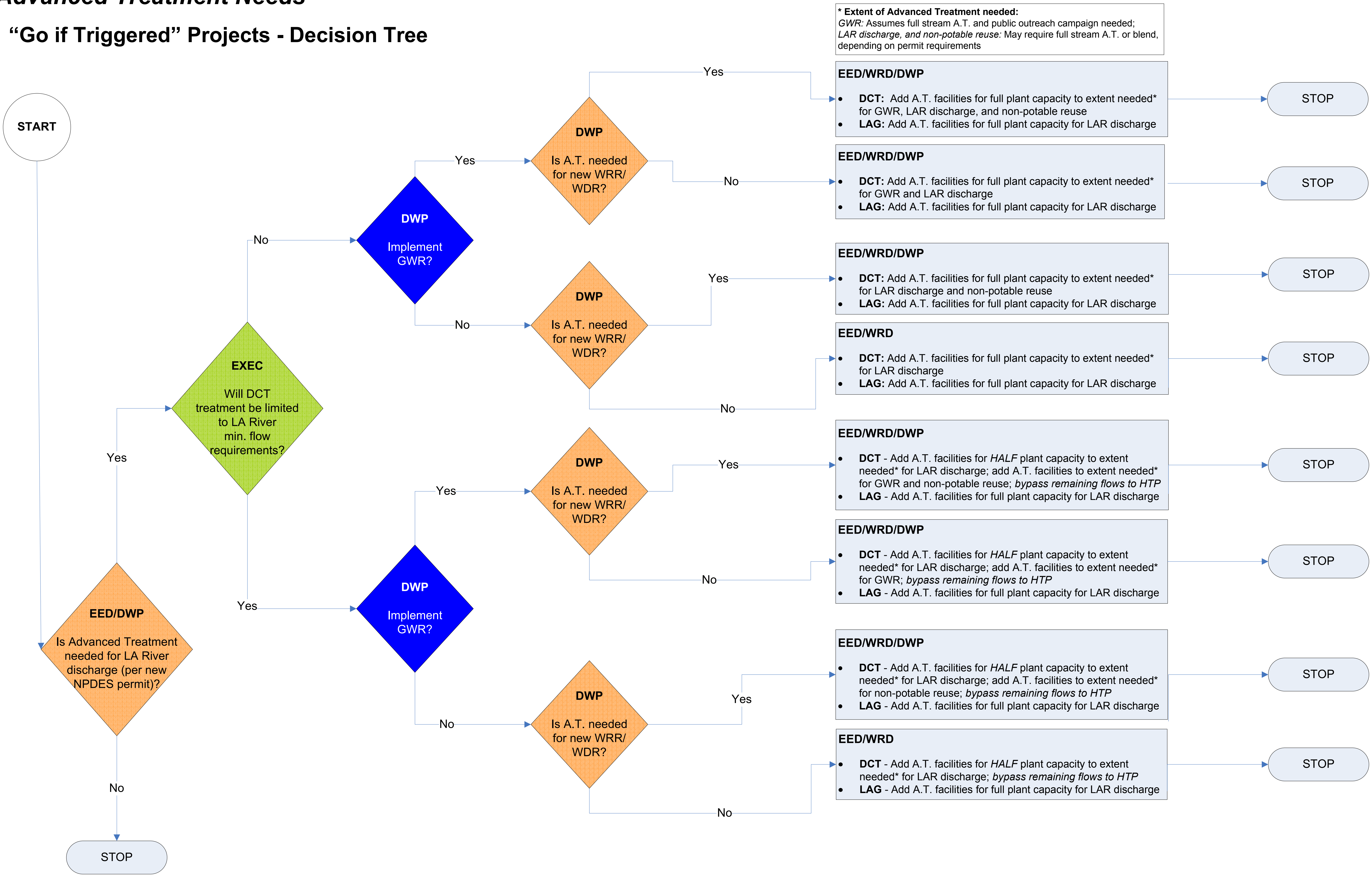
Appendix D
IRP Implementation Flow Charts

Permits
"Go if Triggered" Projects - Decision Tree

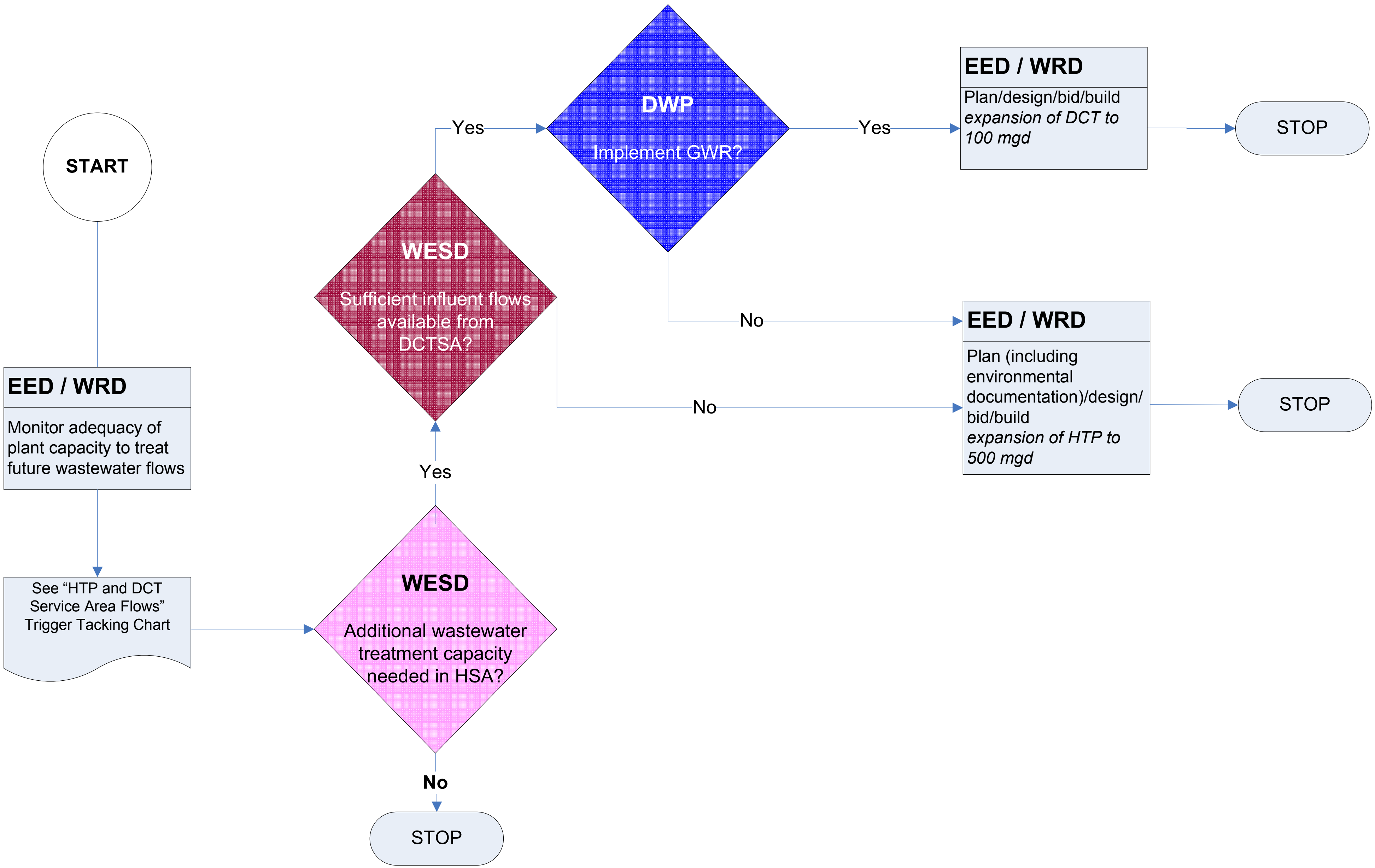


Advanced Treatment Needs

“Go if Triggered” Projects - Decision Tree

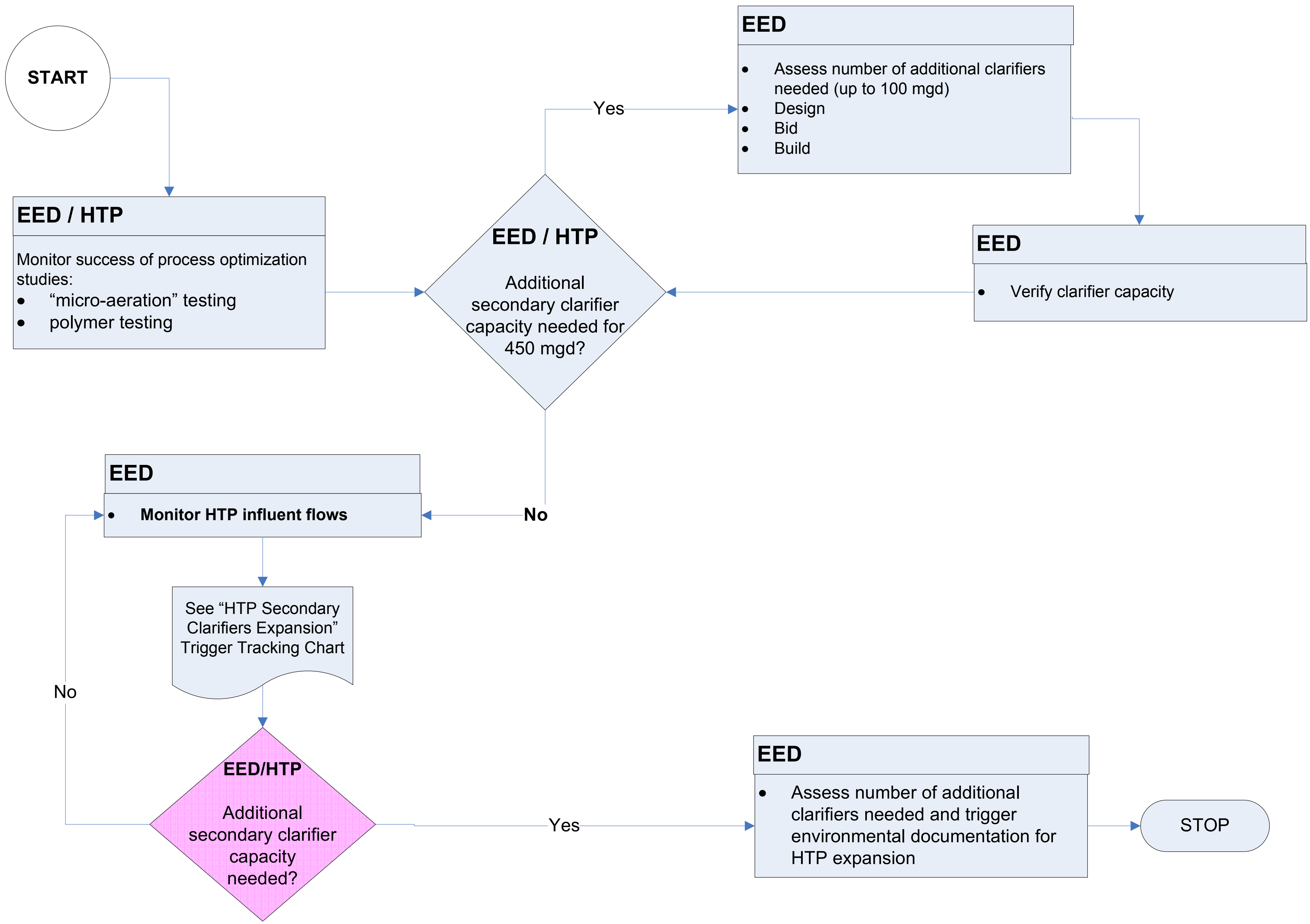


Plant Expansion
"Go if Triggered" Projects - Decision Tree

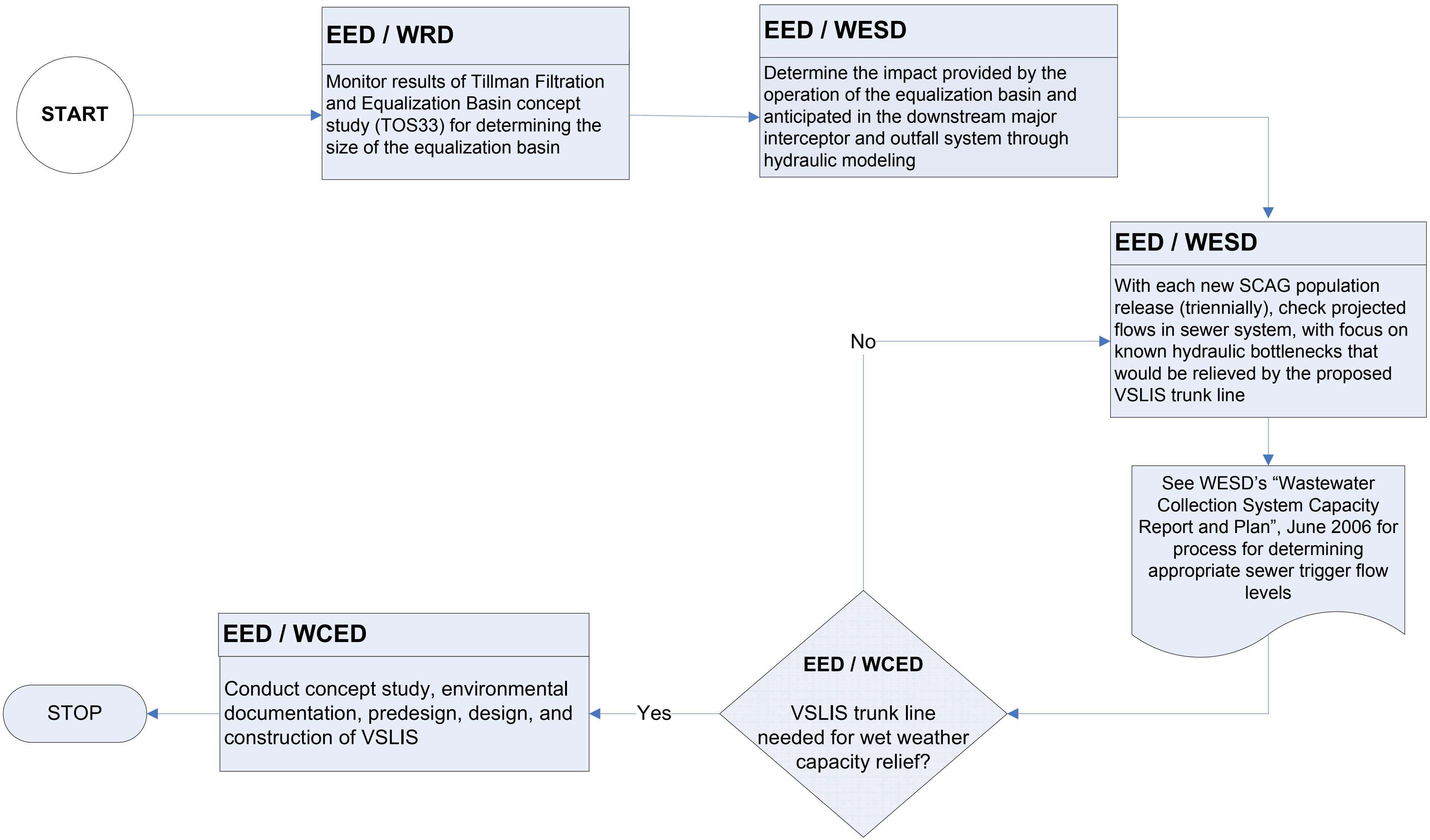


HTP Secondary Clarifiers

"Go if Triggered" Projects - Decision Tree

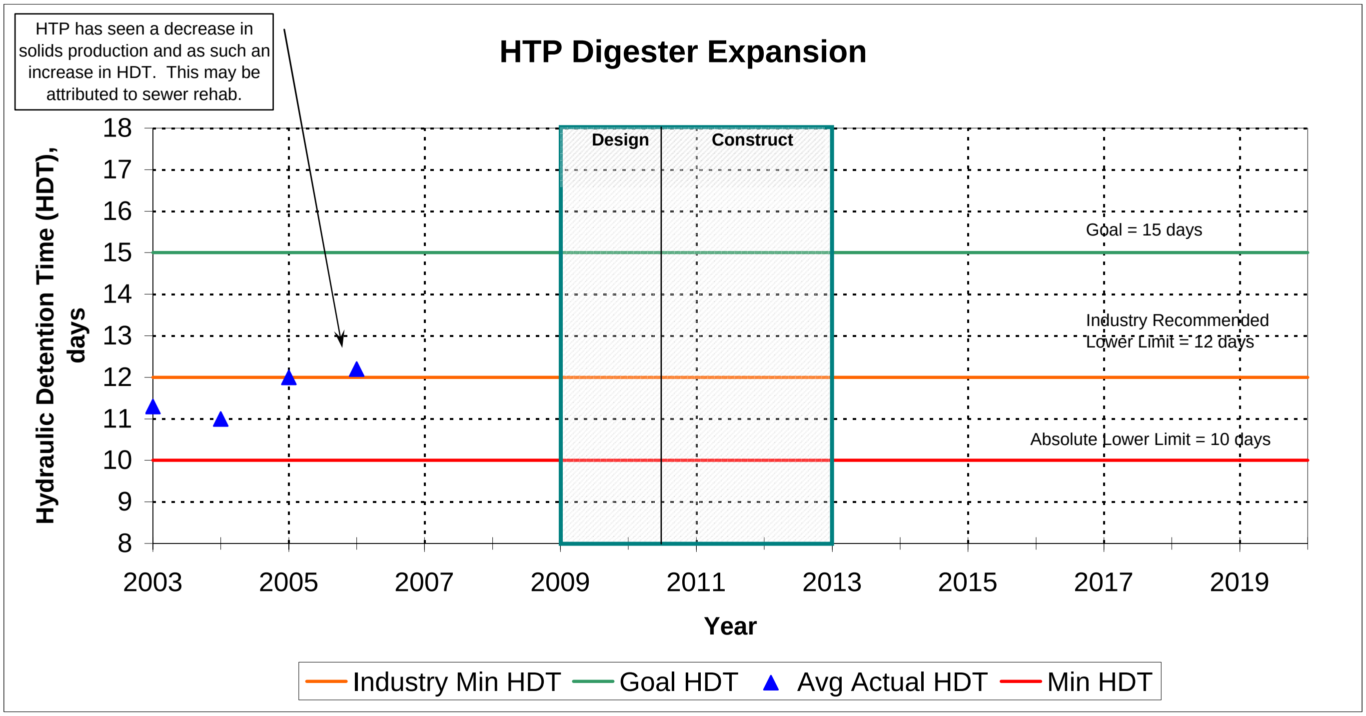


VSLIS
"Go if Triggered" Projects - Decision Tree



Appendix E
Trigger Tracking Charts

Trigger Tracking Charts



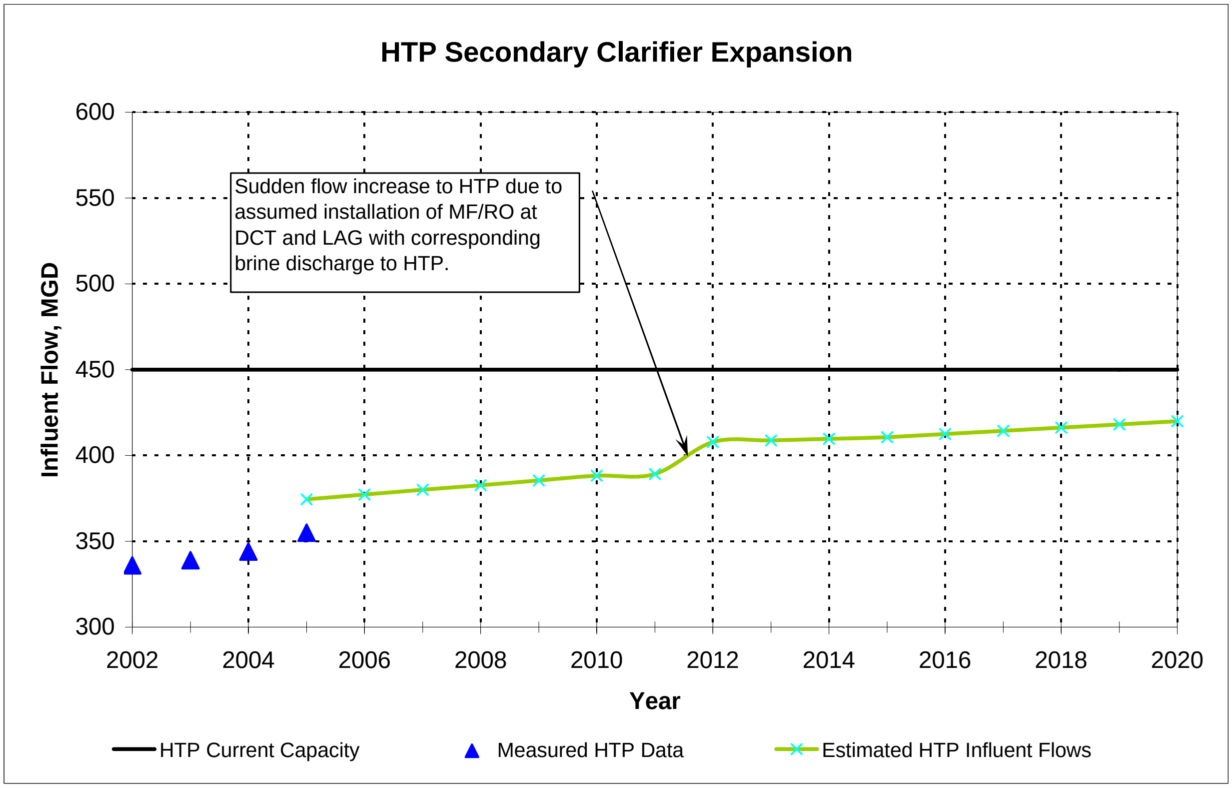
IRP Assumptions		
Data Range Used	From June 2001 to July 2002	
ADWF	340 mgd	
Average TSS	325 mg/L	
Average BOD	410 mg/L	
# of Digesters	18 Modified Egg Shaped	
	2 Modified Egg Shaped Blend Tanks	
Feed Mode Digesters	16	
Batch Mode Digesters	4	
Capacity Each	2.5 MG	
Model Results		
HTP Capacity	450	500
Hydraulic Detention Time	13.1	11.8
IRP Planning Criteria		
Suggested Minimum HDT	12 days	
Goal HDT	15 days	
Absolute Minimum HDT	10 days	

Current Data

Hydraulic Retention Time

Year	Average Actual HSA Flows	Minimum	Maximum
2003	11.3	8.7	16.1
2004	11	8.3	14.4
2005	12	8.4	19
2006	12.2	8.1	16.4
2007			
2008			
2009			
2010			
2011			
2012			
2013			
2014			
2015			
2016			
2017			
2018			
2019			
2020			

Trigger Tracking Chart



IRP Planning Criteria

Current HTP Capacity		450	MGD
Secondary Clarifiers Total		36	
Assumed in service		35	
Option 1	Conversion of all reactors to selector mode operation		
Option 2	Conversion of up to 50% of reactors to selector mode operation.		
Average Surface Overflow Rate	Option 1	850	gpd/sqft
	Option 2	600	gpd/sqft
Hydraulic Capacity	Option 1	17	mgd
	Option 2	11	mgd

Model Results

Option 1

Reactors	Conventional	Selector	Total
Flow (mgd)	0	500	500
Secondary Clarifiers in Service	0	35	35
Avg SOR	NA	820	
Avg SLR	NA	20	

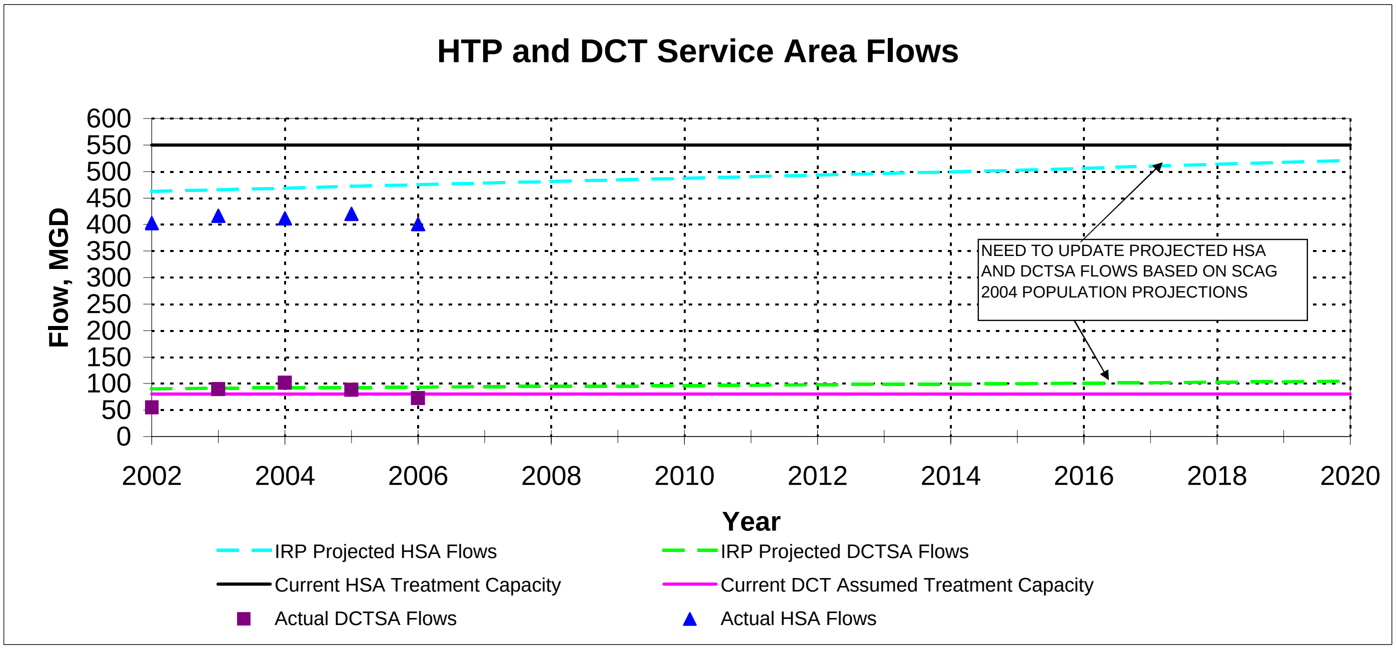
Option 2

Reactors	Conventional	Selector	Total
Flow (mgd)	160	295	455
Secondary Clarifiers in Service	16	20	36
Avg SOR	600	850	
Avg SLR	6	20	

Tracking Data;
Actual HTP Flows

Current Data	
Year	**Flow**
2002	336
2003	339
2004	344
2005	355
2006	
2007	
2008	
2009	
2010	
2011	
2012	
2013	
2014	
2015	
2016	
2017	
2018	
2019	
2020	

Trigger Tracking Chart



Plant	IRP Assumed Capacity	Current Capacity
DCT	64	80
LAG	15	20
HTP	450	450
Total	529	550

Year	Projected HSA Flows	Projected DCTSA Flows	Total IRP Assumed Current Capacity	Total Assumed Current Capacity	DCT Treatment Capacity	Actual HSA Flows	Actual DCTSA Flows
2002	463	90	529	550	80	402.9	54.9
2003	466	91	529	550	80	416.8	89.1
2004	469	92	529	550	80	411.8	101.1
2005	**472**	**92**	529	550	80	420.4	88.0
2006	475	93	529	550	80	400.7	72.7
2007	478	94	529	550	80		
2008	481	95	529	550	80		
2009	484	95	529	550	80		
2010	**487**	**96**	529	550	80		
2011	490	97	529	550	80		
2012	493	98	529	550	80		
2013	496	98	529	550	80		
2014	499	99	529	550	80		
2015	**502**	**100**	529	550	80		
2016	506	101	529	550	80		
2017	510	102	529	550	80		
2018	514	103	529	550	80		
2019	517	103	529	550	80		
2020	**521**	**104**	529	550	80		

Tracking Data:

Hyperion Service Area Flows					**DCT Bypass Flows**
DCT Influent	**DCT Waste**	**LAG Influent**	**LAG Waste**	**HTP Influent**	**Flow Meter-LA05**
54.9	3.6	16.55	1.0	336	
67.1	4.4	16.02	0.9	339	21.97
55.5	3.7	16.93	1.0	344	45.62
55.8	3.7	14.1	0.8	355	32.23
64	4.2	16.89	1.0	325	8.71
Assumed Waste as % of Inflow:					
	6.6%		5.8%		

City of Los Angeles

Integrated Resources Plan

Facilities Plan
Volume 5: Adaptive Capital Improvement Program

December 2006

FINAL

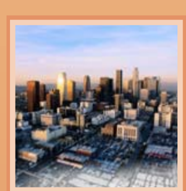
City of Los Angeles
Department of Public Works
Bureau of Sanitation
and
Department of Water and Power

Prepared by

CH:CDM

A Joint Venture • 1000 Wilshire Boulevard, 21st Floor • Los Angeles, CA 90017

FINAL

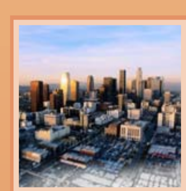


City of Los Angeles Integrated Resources Plan

Facilities Plan Volume 5: Adaptive Capital Improvement Program

December 2006

FINAL

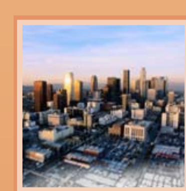


City of Los Angeles Integrated Resources Plan

Facilities Plan Volume 5: Adaptive Capital Improvement Program

December 2006

FINAL



City of Los Angeles Integrated Resources Plan

Facilities Plan Volume 5: Adaptive Capital Improvement Program

December 2006

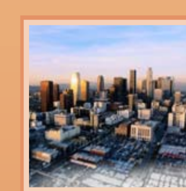
FINAL

City of Los Angeles Integrated Resources Plan

Facilities Plan Volume 5: Adaptive Capital Improvement Program

December 2006

FINAL



City of Los Angeles Integrated Resources Plan

Facilities Plan Volume 5: Adaptive Capital Improvement Program

December 2006