City of Los Angeles
Integrated Resources Plan

Facilities Plan
Volume 4: Alternatives Development and Analysis

July 2004

(Revised November 2005)

Prepared For:
City of Los Angeles
Department of Public Works
Bureau of Sanitation
and
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Abbreviations

acre-ft/yr	Acre-feet per year
ADWF	Average Dry Weather Flow
BOD	Biological Oxygen Demand
BOS	Bureau of Sanitation
BUREAU	Bureau of Sanitation
CAAA	Clean Air Act Amendments
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CFS	cubic feet per second
CIP	capital improvement program
CIS	Coastal Interceptor Sewer
CITY	City of Los Angeles
d/D	depth/diameter
DOF	State of California Department of Finance
DWP	Department of Water and Power
dtpd	dry tons per day
DWUR	dry weather urban runoff
ECIS	East Central Interceptor Sewer
EIR/EIS	Environmental Impact Report/Environmental Impact statement
EMS	Environmental Management System
EMWD	Eastern Municipal Water District
EPA	Environmental Protection Agency
EVWRP	East Valley Water Recycling Project
EQ	Exceptional Quality
FP	Financial Plan
GBIS	Glendale-Burbank Interceptor Sewer
gpcd	gallons per capita per day
gped	gallons per employee per day

gpd	gallons per day
gpd/ft^2	gallons per day per square foot
gpm	gallons per minute
GWI	groundwater infiltration
HA	High Adaptability
HTP	Hyperion Treatment Plant
Hyb	Hybrid Alternative
IPWP	Integrated Plan for the Wastewater Program
IRP	Integrated Resources Plan
kW-hr/yr	kilowatt hour per year
LA River	Los Angeles River
LAA	Los Angeles Aqueduct System
LADPW	Los Angeles Department of Public Works
LACSD	Los Angeles County Sanitation District
LADWP	Los Angeles Department of Water and Power
LAGWRP	Los Angeles -Glendale Water Reclamation Plant
LAUSD	Los Angeles Unified School District
LCMR	Low Cost Minimum Requirements
Low/Mod	Low to Moderate
LR	Low Risk
MD	More Decentralized
MF	microfiltration
MF/RO	microfiltration/reverse osmosis
MG	million gallons
Mg/L	milligrams per liter
mgd	million gallons per day
MW	mega watts
MWD	Metropolitan Water District
NdN	nitrification/denitrification
NEIS II	North East Interceptor Sewer-Phase II

NEPA	National Environmental Policy Act
O&M	Operation and Maintenance
ppm	parts per million
ppt	parts per trillion
RO	Reverse Osmosis
SCAG	Southern California Associations of Government
SCAQMD	Southern California Air Quality Management District
sf	square feet
SFR	Single Family Residential
SUSMP	Standard Urban Stormwater Mitigation Plan
TIRE	Terminal Island Renewable Energy
TITP	Terminal Island Treatment Plant
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
TWRP	Donald C. Tillman Water Reclamation Plant
URP	Urban Runoff Plant
UV	Ultraviolet
UWMP	Urban Water Management Plan
VSLIS	Valley Spring Lane Interceptor Sewer
WFP	Wastewater Facilities Plan
WR	High Beneficial Use of Water Resources
wtpd	wet tons per day

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 (2005 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

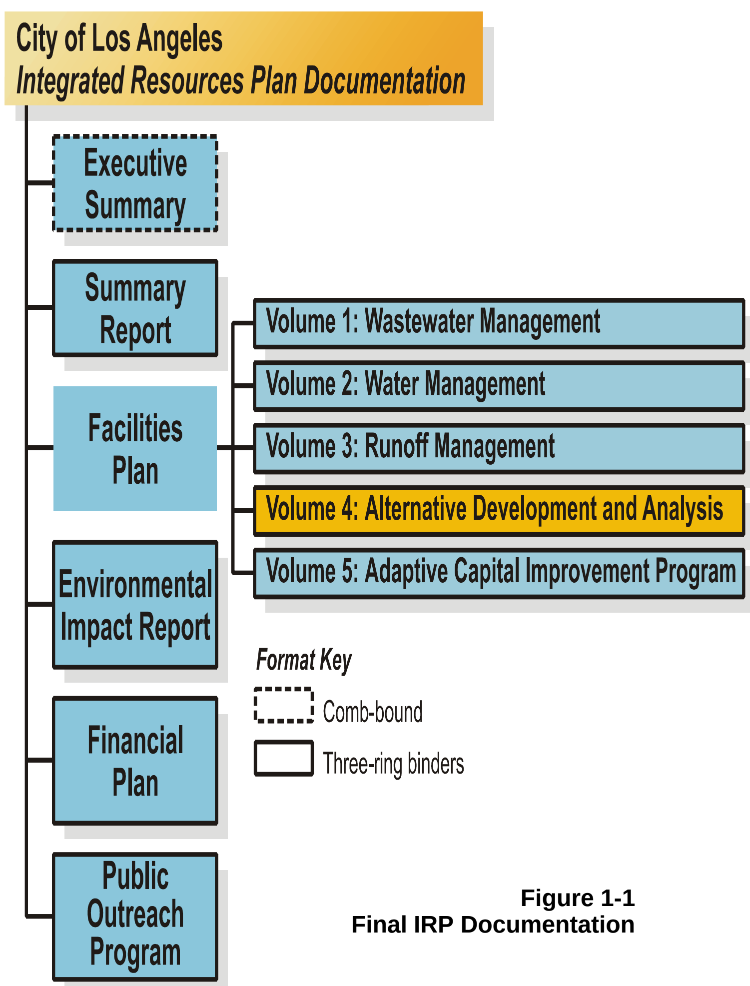


Figure 1-1
Final IRP Documentation

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.

Facilities Plan *Volume 4: Alternative Development and Analysis* focuses on the selection and screening of alternatives, including preliminary, hybrid and recommended draft alternatives. Table 1-1 provides a description of each of the sections of this document.

Table 1-1
IRP Facilities Plan
Volume 4: Alternatives Development and Analysis

Section	Description
1 – Introduction	Study objectives and background
2 – Approach	Study approach
3 – IRP Objectives, Sub-objectives and Performance Measures	Description of objectives, sub-objectives and performance measures
4 – Preliminary Alternatives	Description of the 12 preliminary alternatives
5 – Evaluation of Preliminary Alternatives	Evaluation of the differences between the preliminary alternatives, as well as steering group ratings
6 – Hybrid Alternatives	Description of 9 hybrid alternatives
7 – Evaluation of Hybrid Alternatives	Quadrant analysis of each of the hybrid alternatives and selection of the top four.
8 – Recommended Draft Alternatives	Recommended draft alternatives
References	Summarizes the sources of data, information, and contributions of others
Appendices	Supporting documentation

Section 2
Approach

2.1 Introduction

The approach to developing and evaluating alternatives must take into account the integration of options from each of the service functions (i.e., wastewater, recycled water and runoff). This volume details the approach used to create alternatives, evaluate them using criteria developed by the IRP stakeholders, revise them based on the evaluation and ultimately recommend a short list to continue through the environmental analysis.

This section will describe the overall project approach, as well as the approach to developing and analyzing alternatives.

2.2 Overall Project Approach

Using the year 2020 as the planning horizon, the steps in the IRP approach for facilities planning include:

- Developing and confirming data (general and specific): Establish the system demands in year 2020 and intermediate years; summarize the current and potential future regulatory drivers; and confirm the capacities of the existing systems and programs to meet those demands. This information is documented in *Volume 1: Wastewater Management, Volume 2: Water Management,* and *Volume 3: Runoff Management.*

- Identifying shortfalls and options: Determine shortfalls or gaps between demands and existing systems for the water, wastewater and runoff systems and options to address the gaps. This information is documented in *Volume 1: Wastewater Management, Volume 2: Water Management,* and *Volume 3: Runoff Management.*

- Developing preliminary alternatives based on a range of options to meet the water, recycled water, wastewater and runoff program requirements.

- Performing initial screening: Evaluate the appropriateness and effectiveness of the different strategies using criteria established by the IRP public stakeholders, i.e., the Steering Group; select the most preferred strategies or strategy combinations.

- Refining alternatives using detailed models and developing hybrid alternatives.

- Evaluating and screening hybrid alternatives; selecting recommended draft alternatives.

- Preparing a CIP and implementation plan for preferred alternative selected by the City following the environmental analyses.

Figure 2-1 illustrates the facilities planning approach and its relationship with the financial and environmental planning tasks.

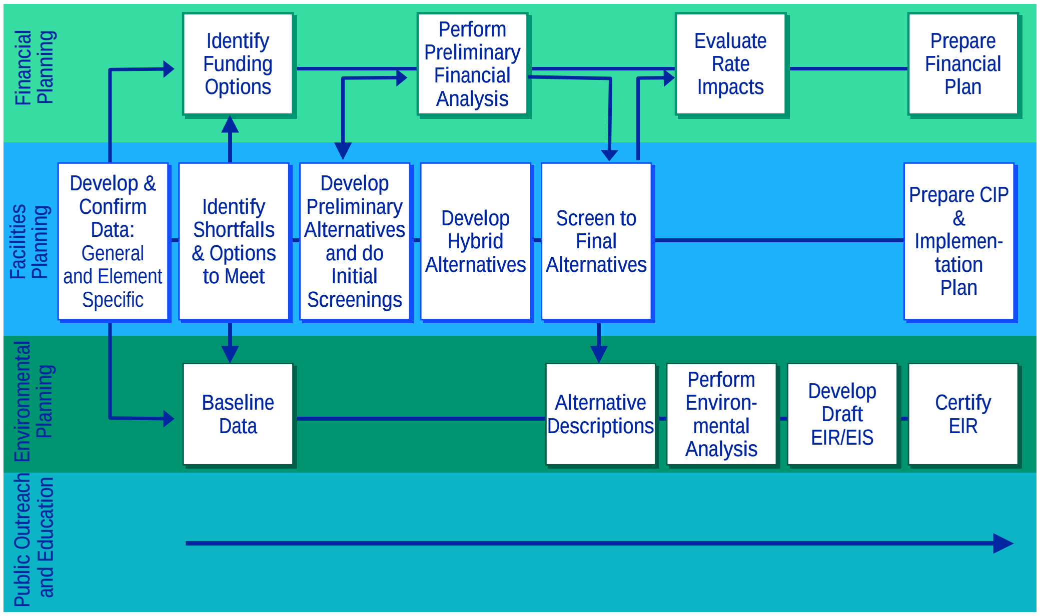


Figure 2-1
Overall IRP Approach

2.3 Approach for Developing and Evaluating Alternatives

As discussed in the in Facilities Plan Volumes 1 through 3, the IRP has identified planning parameters that will result in the need for new programs, infrastructure and facilities to meet the 2020 needs. These planning parameters, or drivers, include population growth, increased wastewater flows, increased dry and wet weather runoff flows, increased demands for drinking water and current and future regulations to protect water quality in the basin. In addition, the IRP has an established set of Guiding Principles to guide future planning, which includes such objectives as producing and using as much recycled water as possible from existing and planning facilities, increasing water conservation and increasing the beneficial use of runoff.

Alternatives are the means of accomplishing the IRP objectives (which include options from each service function). Section 3 describes the IRP objectives. Alternatives answer the question, "How are we going to accomplish the objectives?" In Volumes 1 through 3, potential options (or projects) for meeting these drivers were discussed. But, to meet the complete 2020 needs, the IRP needed to develop integrated alternatives, which include combinations of wastewater, recycled water and runoff options into complete alternatives. By considering the system using an integrated watershed approach, more holistic alternatives could be identified and evaluated.

As shown in Figure 2-2, the IRP team used a multi-step process to create and evaluate alternatives: (1) develop preliminary alternatives, (2) evaluate preliminary alternatives, (3) refine alternatives and develop hybrid alternatives, (4) evaluate hybrid alternatives and (5) screen to recommended draft alternatives for environmental analysis.

Figure 2-2 shows these steps that were taken to identify the recommended draft alternatives.

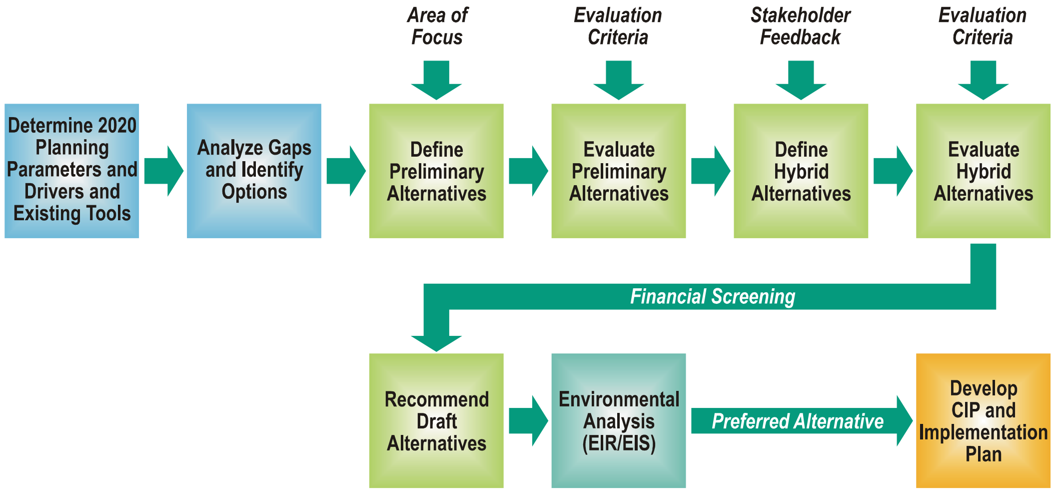


Figure 2-2
IRP Process Chart

All alternatives were constructed to meet current requirements related to regulatory requirements, system capacity and minimum levels of water recycling, beneficial use of runoff, conservation and discharges to the Los Angeles River. But, not all alternatives are the same in terms of meeting future regulations. Some alternatives were designed to meet current regulations, some were designed to be flexible to meet new regulations; and some alternatives have anticipated future regulations and were designed to meet those from the start.

Using a multi-step approach allowed the team to evaluate a broad range of alternatives and recommend four alternatives to be further evaluated through the EIR process.

The preliminary alternatives were created with different focuses (or themes), which allowed the stakeholders and decision-makers to see trade-offs in some key planning objectives. These alternatives were purposefully created to "push-the envelope" in each area of focus (see Section 4). These alternatives were evaluated against the IRP project objectives; using weighting and preference information from the Steering Group (see Section 5). This information was presented to the Steering Group.

Using feedback from the Steering Group, the team created hybrid alternatives that combined the best elements of the preliminary alternatives, thereby allowing them to perform better than the original preliminary alternatives (see Section 6). These alternatives were further evaluated by comparing their costs to their expected benefits in terms of wastewater management, recycled water, and runoff management (see

Section 7). Using this analysis, the team recommended four draft alternatives for detailed environmental analysis in the EIR (see Section 8).

Through the EIR process, a preferred alternative will be selected. The resulting CIP and specific implementation plan will be presented in *Volume 5: CIP*.

The Steering Group played an important role in the development, evaluation and screening of alternatives by providing a "sounding board" throughout the process, giving the necessary feedback to keep the facilities planning efforts aligned with the Guiding Principles. Many Steering Group members elected to complete surveys used in the decision-making process. For other members, feedback was received via discussion during the workshop sessions, through letters, emails and IRP open comment forms, during telephone conversations and individual meetings that were held as part of the workshops follow up activities. A separate document titled, "Public Outreach Program," describes the stakeholder involvement in detail. In addition, refer to Section 3.3, 5.2 and 5.4 for their role in evaluating alternatives.

The Steering Group served, additionally, as an avenue for communication to a broader audience by taking the IRP message to their respective organization members and boards.

Section 3
IRP Objectives, Sub-Objectives and Performance Measures

3.1 Introduction

An essential role of the Steering Group during the first phase of the IRP was to determine the objectives for the planning process. These objectives provided the framework for developing and evaluating alternatives, and they were eventually reflected in the IRP Guiding Principles. This section will present a discussion on the IRP objectives, sub-objectives and performance measures, which combined constitute the evaluation criteria used to analyze alternatives.

The following terms will be used throughout this document in describing the alternatives and their performance:

- Objectives: The goals that define the essential purposes of the IRP in broad, overarching terms. The objectives can be seen as a set of goals that answer the question: *Why* do we want to have a wastewater program in place?

- Guiding Principles: The instructions or guidelines for building alternatives. These guiding principles were developed during Phase I of the IRP.

- Alternatives: The means of accomplishing the stated IRP Objectives, which include options for each service function. The alternatives answer the question: *How* are we meeting the desired objectives?

- Performance Measures: The quantifiable indicators or indices of how an alternative performs relative to the objectives. Performance measures answer the question: *How well* does an alternative meet the desired objectives?

3.2 Description of Objectives

The IRP objectives are the goals that define the essential purposes of the IRP. These objectives were developed during Phase I of the IRP. During this more detailed phase, the IRP team continued to use the objectives developed in Phase I as a framework for developing and screening alternatives. Figure 3-1 shows the IRP primary objectives.

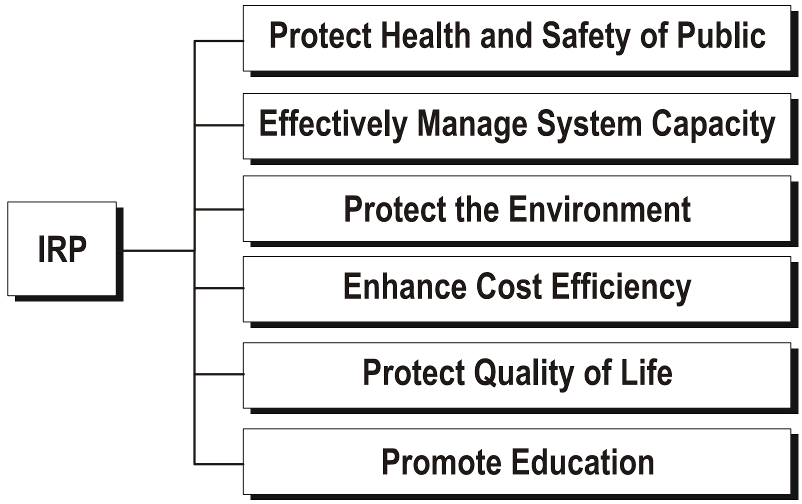


Figure 3-1
IRP Primary Objectives

The objectives for the IRP where further refined to include sub-objectives. The sub-objectives are more specific and allow for the development of performance measures with a clearer focus.

3.2.1 Protect Health and Safety of Public

The first objective for the IRP is to protect the health and safety of the public. The Steering Group also selected five sub-objectives, as shown in Figure 3-2.

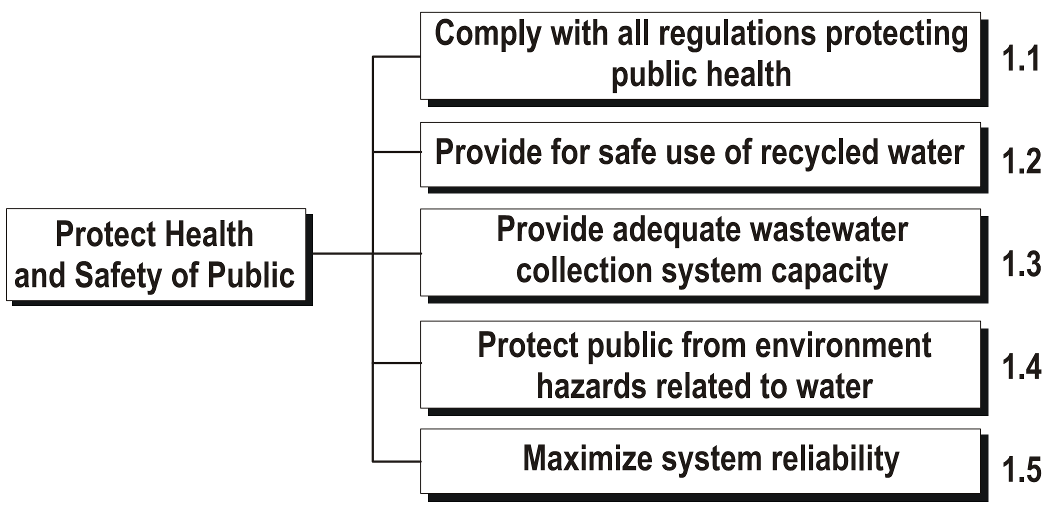


Figure 3-2
Primary Objective 1 and Sub-Objectives

3.2.2 Effectively Manage System Capacity

The second objective for the IRP is to effectively manage system capacity. The Steering Group also selected two sub-objectives, as shown in Figure 3.3.

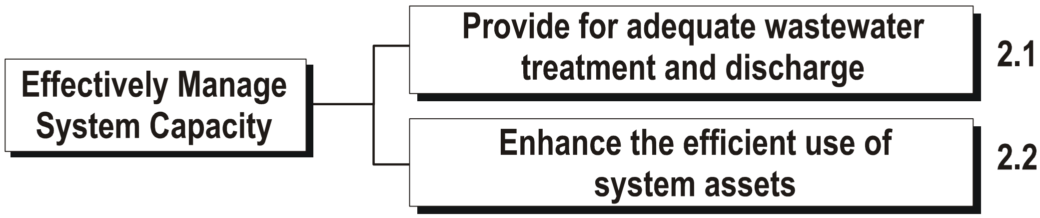


Figure 3-3
Primary Objective 2 and Sub-Objectives

3.2.3 Protect the Environment

The third objective for the IRP is to protect the environment. The Steering Group also selected six sub-objectives, as shown in Figure 3-4.

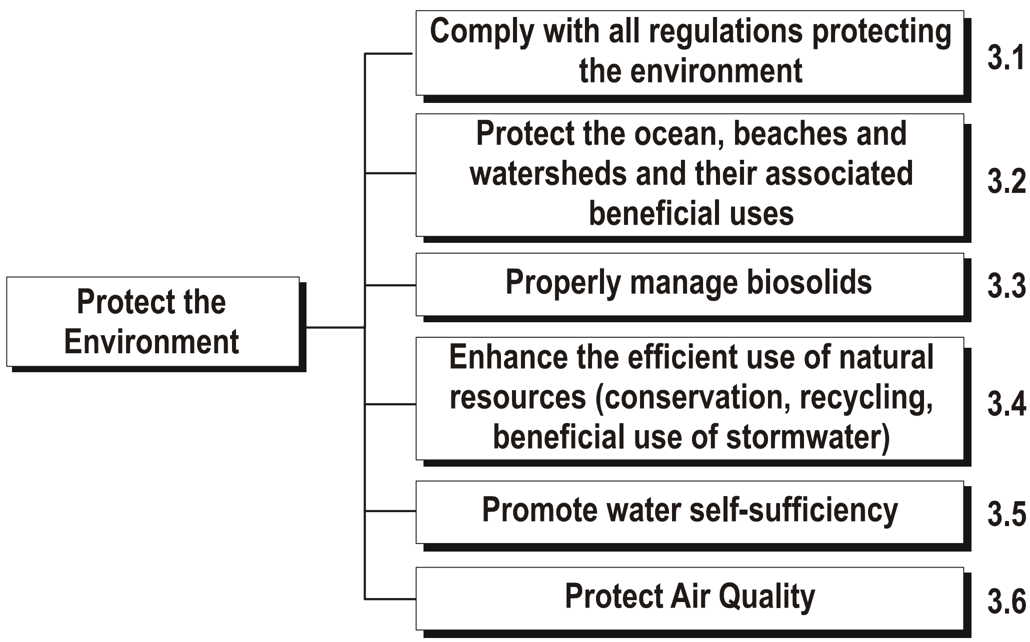


Figure 3-4
Primary Objective 3 and Sub-Objective

3.2.4 Enhance Cost Efficiency

The fourth objective for the IRP is to enhance cost efficiency. The Steering Group also selected three sub-objectives, as shown in Figure 3-5.

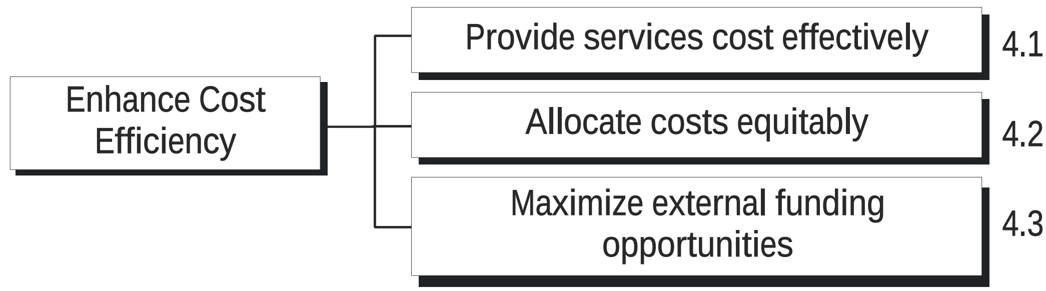


Figure 3-5
Primary Objective 4 and Sub-Objectives

3.2.5 Protect the Quality of Life

The fifth objective for the IRP is to protect quality of life. The Steering Group also selected four sub-objectives, as shown in Figure 3-6.

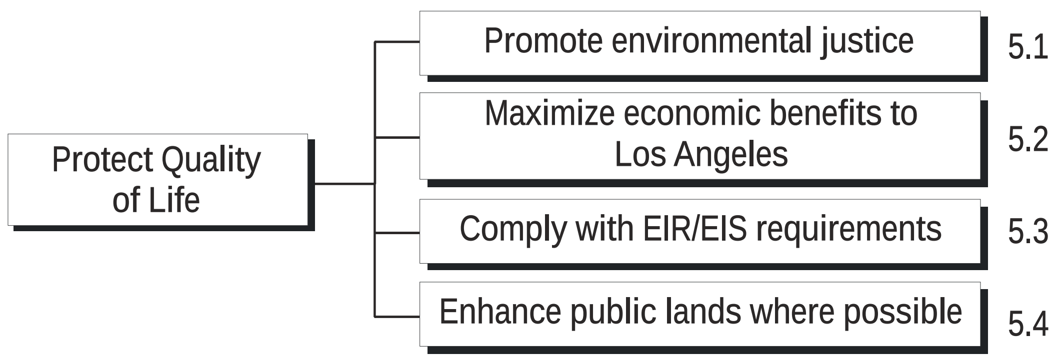


Figure 3-6
Primary Objective 5 and Sub-Objectives

3.2.6 Promote Education

The last primary objective for the IRP is to promote water/environment education. The Steering Group also selected three sub-objectives, as shown in Figure 3-7.

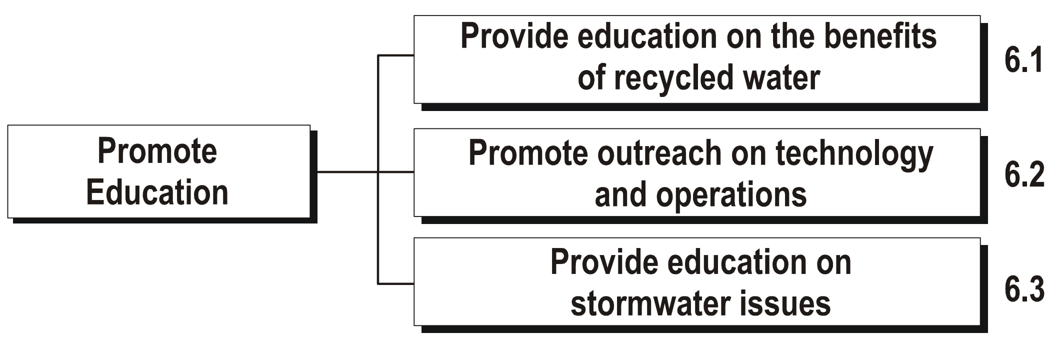


Figure 3-7
Primary Objective 6 and Sub-Objectives

3.3 Weighting of Objectives

In any decision-making process, the criteria used are generally not equally important. Some criteria may be more relevant for the decision than others (e.g., for a given individual, environmental protection may be more important than the potential for external funding) and the relative importance between criteria may differ for different stakeholders. Thus, weighting objectives is necessary to better reflect the priorities of the decision-makers.

For the IRP the objectives were weighted by using the method known as "forced-pair comparison." The method is based on the fact that, when presented with a series of elements, a decision as to the relative importance of those elements against each other is more simply made when the elements are compared separately in pairs. The results of the comparison of each pair of elements are later aggregated to determine the overall importance of every element.

For example, a potential new homeowner may have three objectives in selecting a new house: (1) Proximity to schools, (2) Cost and (3) Condition/style of house. To understand the relative importance of these objectives compared to each other, a "forced-pair" comparison could be used. The following series of questions would be asked to our homeowner:

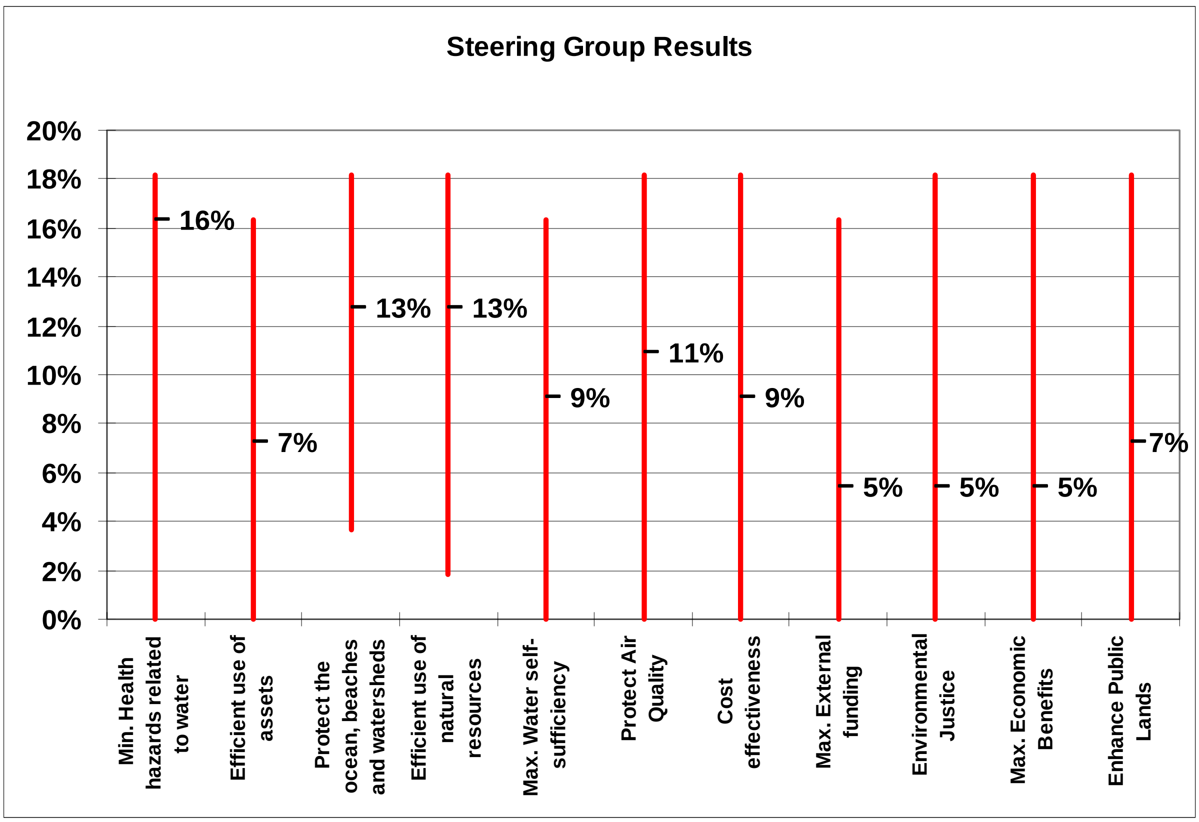
- Which is more important to you in selecting a house?
  - Question 1: Proximity of schools or cost?
  - Question 2: Proximity of schools or condition/style of house?
  - Question 3: Cost or condition/style of house?
- If our potential homeowner answered the following,
  - Answer 1: Cost
  - Answer 2: Condition/style of house
  - Answer 3: Condition/style of house

Then, their overall weighting would be 0% for proximity to schools (since it was selected 0 times, 33% for low cost (since it was selected 1 time out of 3), and 66% for condition/style of house (since it was selected 2 times out of 3).

As discussed in Section 2, the IRP Steering Group had an important role of being a sounding board for keeping us aligned with the Guiding Principles and providing an avenue for communication to a broader audience. To understand the individual preferences of the Steering Group members, the IRP team needed to determine the weighting of objectives for each steering group member. To determine the individual weighting of objectives, the IRP team created two questionnaires (see samples in

Appendix A) for each steering group member to fill out. The questionnaire asked a series of questions that resulted in a forced-pair comparison of objectives, at the sub-objective level, and for those sub-objectives for which the alternatives were expected to perform differently. This resulted in 11 weighted sub-objectives, out of the total number of 23 sub-objectives.

A total of 56 steering group members participated in the survey (41 percent of the 136 members, though an additional 14 members participated in the follow up survey, resulting in a 51 percent participation) and the individuality of the weights was maintained throughout the analysis of the preliminary alternatives (see Section 5 for an explanation of the alternative analysis and screening process). Figure 3-8 shows the distribution of weights for the aforementioned IRP objectives. In the figure, the bars show the range of weights assigned by the Steering Group members who completed the questionnaire. The horizontal line within the bars represent the middle of the range (median); that is, half of the Steering Group members have values that are greater than the value represented by the horizontal line, and half have values that are less.



Note: Based on 56 Steering Group Members.

Figure 3-8
Distribution and median value of weights for the IRP Objectives

3.4 Performance Measures

Performance measures are the quantifiable indicators or indices of how well an alternative meets the objectives. Performance measures answer the question: How well does an alternative meet the desired objectives? Performance measures need to be measurable, non-redundant, concise and understandable. For most of the sub-objectives, the IRP analysis used performance measures that indicate how well each alternative meets the sub-objectives (and ultimately, the objectives). Some sub-objectives did not have specific performance measures because they were not anticipated to change from alternative to alternative. For example, for the sub-objective "Comply with all regulations protecting public health," all alternatives were designed to equally comply. Thus, the sub-objective was not used as a discriminator between alternatives, but rather as a constraint to be met by all alternatives. Table 3-1 presents the complete list of objectives, sub-objectives and performance measures.

The following subsections briefly describe the main logic behind the performance measures selected for each sub-objective. Section 5 presents a detailed description of the performance measures and the methodologies used to assign numerical values for each alternative, for each performance measure.

3.4.1 Performance Measures for the Objective "Protect Health and Safety of Public"

As discussed in Subsection 3.2.1, the objective "Protect Health and Safety of Public" has several sub-objectives. The main sub-objective that could change from alternative to alternative was the sub-objective "Protect the Public from Environmental Health Hazards Related to Water (1.4)." For the IRP, the emphasis of this sub-objective is on the water quality at the beaches in the study area. Beach impacts could be attributed to a number of pollution sources and causes. These sources include dry and wet weather urban runoff, sewer overflows, pollutants from other sources (such as boat discharges), or by a combination of these factors. For the IRP, the focus will be on the urban runoff impacts to the beaches, and the assumption is made that managing urban runoff will reduce, to some extent, the negative impacts it has on the water quality at the beaches. Therefore, the amount (or volume) of runoff managed was the performance measure selected to determine how well each alternative met the sub-objective "Protect the public from environmental health hazards related to water."

The other sub-objectives under "Protect Health and Safety of Public" must all be equally met by each alternative, and therefore were not assigned specific performance measures. These sub-objectives include:

- Comply with all regulations protecting the public health (1.1)
- Provide for safe use of recycled water (1.2)
- Provide adequate wastewater collection system capacity (1.3)
- Maximize system reliability (1.5)

Table 3-1
Objectives, Sub-objectives and Performance Measures for the IRP

Objectives and Sub-objectives	Performance Measures
1 Protect Health and Safety of Public	
1.1 Comply with all regulations protecting the public health	Alternative complies with all current and proposed regulations (YES/NO)
1.2 Provide for the safe use of recycled water	Alternative complies with all current and proposed Department of Health regulations (Y/N) Alternative meets current and proposed regulations for groundwater recharge (Y/N/NA)
1.3 Provide adequate wastewater collection system capacity	Alternative provides for adequate wastewater collection capacity (Y/N)
1.4 Protect public from environmental health hazards related to water	**Amount of runoff managed**
1.5 Maximize system reliability	Alternative provides security measures and redundancy to reduce vulnerability (Yes/NO)
2 Effectively Manage System Capacity	
2.1 Provide for adequate wastewater treatment and discharge	Alternative provides for adequate wastewater treatment capacity (Y/N)
2.2 Enhance the efficient use of system assets	**Miles of additional pipelines (and their diameter) required for appropriate conveyance**
	Additional process area required for wastewater treatment
3 Protect the Environment	
3.1 Comply with all regulations protecting the environment	Alternative complies with all current and proposed regulations (YES/NO)
3.2 Protect the ocean, beaches and watersheds and their associated beneficial uses	**Reduction in pollutant loading to receiving waters due to urban runoff**
	Dry weather urban runoff managed
3.3 Properly manage biosolids	Percent biosolids reused
3.4 Enhance the efficient use of natural resources and promote water self-sufficiency (conservation, recycling, beneficial use of stormwater)	**Potable water demand reduced through conservation programs**
	Urban runoff beneficially used **Amount of effluent recycled**
3.5 Promote water self-sufficiency	Savings from reductions in imported water - Accounted for in 3.4
3.6 Protect Air Quality	**Total net energy use**
4 Enhance Cost Efficiency	
4.1 Provide services cost effectively	**Present Value cost of alternative** Rate impact of alternative (to be determined in Financial Plan)
4.2 Allocate costs equitably	Costs paid balance the benefits accrued (YES/NO)
4.3 Maximize external funding opportunities	**Potential for external funding (Low/mid/high)**
5 Protect Quality of Life	
5.1 Promote environmental justice	**Potential impacts to low income and minority communities**
5.2 Maximize economic benefits to Los Angeles	**Number of jobs created**
5.3 Comply with EIR/EIS Requirements	Impacts to water quality, air quality, noise, and traffic due to construction/operations of alternative (to be measured in EIR)
5.4 Enhance public lands where possible	**Potential positive impacts on public lands due to implementation of alternative (total acres of beneficial projects associated with the alternative)**
6 Promote Education	
6.1 Provide education on the benefits of recycled water	All alternatives should include appropriate education and outreach
6.2 Provide outreach on technology and operations	All alternatives should include appropriate education and outreach
6.3 Provide education on stormwater issues	All alternatives should include appropriate education and outreach

Note: Sub-Objectives in BOLD represent those expected to vary from alternative to alternative.

3.4.2 Performance Measures for the Objective "Effectively Manage System Capacity"

As discussed in Subsection 3.2.2, the objective "Effectively Manage System Capacity" has several sub-objectives. The main sub-objective that could change from alternative to alternative was the sub-objective "Enhance the efficient use of system assets (2.2)." To measure efficient use of system assets, the IRP team selected two performance measures: (1) miles of additional sewer pipelines and (2) acres of additional process area required for wastewater treatment. These two performances measures were combined into one index that relates miles of new sewer pipelines and new wastewater process capacity to overall efficiency (index = 0 to 10 (most efficient)). The intent of this performance measure is to measure the level of construction that will need to take place in the sewer system and the wastewater treatment plants to implement the alternative. The rationale for this performance measure is that an efficient operation will effectively use the existing capacity in the sewers and wastewater treatment plants, thus requiring less construction of additional capacity. The team recognizes that new sewers or treatment facilities do not necessarily represent an "inefficiency" in the system, but instead may be a result of hydraulic conditions and location of growth.

The other sub-objective under "Effectively Manage System Capacity" must be equally met by each alternative, and therefore was not assigned specific performance measures. The sub-objective was "Provide for adequate wastewater treatment and discharge (2.1)."

3.4.3 Performance Measures for the Objective "Protect the Environment"

As discussed in Subsection 3.2.3, the objective "Protect the Environment" has several sub-objectives. The main sub-objectives that could change from alternative to alternative were the sub-objectives, "Protect the ocean, beaches and watersheds and their beneficial uses (3.2)", "Enhance the efficient use of natural resources (3.4)", "Promote water self-sufficiency (3.5)" and "Protect air quality (3.6)."

Protect the Ocean, Beaches and Watersheds and their Associated Beneficial Uses (3.2)

This sub-objective has an emphasis on water quality, as was the case for the sub-objective of "Protect the Public from Environmental Health Hazards Related to Water." This sub-objective, however, reflects the goals for environmental protection, rather than public health. The IRP team selected two performance measures under this sub-objective as indicators of the level of environmental protection:

- Amount of dry weather urban runoff managed
- Reduction in pollutant loading

Dry weather runoff management is included as a measure of performance because the negative impacts on receiving waters due to dry weather runoff has been documented and programs are already in place for reducing those impacts.

During rain events, runoff conveys pollutants to the Los Angeles River, Ballona Creek, Santa Monica Bay, Dominguez Channel and Long Beach. These pollutants include trash, pesticides, herbicides, fertilizers, oils, animal waste (bacteria), yard trimmings and leaves, pollutants from the air, hazardous products and sediment. For comparison of alternatives for the IRP, an "indicator" pollutant was selected to measure the reduction in the level of pollutants as a means to protect the oceans, beaches, and watersheds. For the IRP, total suspended solids (TSS) were selected for this relative comparison of alternatives. The data for TSS was obtained from the County of Los Angeles Watershed Division monitoring data for Los Angeles River and Ballona Creek. The reduction in pollutant loading can be accomplished by managing both dry and wet weather urban runoff.

Pollution concentrations vary from one rain event to another. In most cases, the first rain of the season or the first rain of a storm (first flush), carry a greater percentage of most pollutants then subsequent rain events. However, for the purpose of comparing alternatives, the annual average pollutant loading was used to calculate the reduction. Since TSS is being used as the indicator pollutant, it is assumed that by reducing the amount of runoff that reaches the ocean, beaches and other water bodies, a proportional amount of TSS is also reduced. Section 5.3.3.1 further describes this performance measure.

Enhance the Efficient Use of Natural Resources (3.4)

The focus of this sub-objective is the reuse of wastewater and beneficial use of runoff. Therefore, the IRP team selected three performance measures under this sub-objective as indicators of the level of efficient use of natural resources:

- Potable water demand reduced through conservation programs
- Amount of runoff beneficially used
- Amount of treated wastewater recycled

All three performance measures potentially offset water demands and are therefore appropriate measures of the efficient use of water as a resource.

The intent of the conservation performance measure was to reflect the view of many of the Steering Group members about water conservation in Los Angeles playing an important role in future wastewater planning.

Dry and wet weather urban runoff and recycled water have the potential of offsetting water demands, in some cases significantly. These performance measures were considered appropriate for that reason, and because many of the options to be evaluated as part of the IRP involve the management and the beneficial use of runoff and the use of recycled water. These performance measures are adequate as a discriminator between integrated alternatives.

Promote Water Self-Sufficiency (3.5)

This sub-objective is dependent on some of the elements included in the previous sub-objectives. The IRP team selected the monetary amount of the savings in imported water as an indicator of water self-sufficiency as a way of reducing the performance measure redundancy, and reflects the differences between alternatives with respect to meeting this sub-objective. The capital and operation and maintenance costs for generating and distributing recycled water or beneficially use runoff are included as a performance measure for "Provide Services Cost Effectively." See Subsection 3.4.4. Refer to Subsection 5.3.3.3 for a more detailed discussion.

Protect Air Quality (3.6)

Energy consumption has been commonly used in cost-benefit analysis and environmental planning as an indicator of potential air quality impacts. For the IRP, energy consumption was selected as the surrogate for air quality impacts and as an indicator of how well alternatives meet the sub-objective of protecting air quality. The sole energy requirements, however, are not an indication of air quality impacts since mitigation measures are generally implemented in energy generation facilities according to the applicable air quality standards. However, for a relative comparison of alternatives, energy consumption serves the goal of this performance measure.

Other Sub-Objectives

The other sub-objectives under "Protect the Environment" must all be equally met by each alternative, and therefore were not assigned specific performance measures. These sub-objectives include:

- Comply with all regulations protecting the environment (3.1)
- Properly manage biosolids (3.3) (all alternatives were designed to reuse 100 percent of the biosolids produced)

3.4.4 Performance Measures for the Objective "Enhance Cost Efficiency"

As discussed in Subsection 3.2.4, the objective "Enhance Cost Efficiency" has several sub-objectives. The main sub-objectives that could change from alternative to alternative were the sub-objectives, "Provide services cost effectively (4.1)" and "Maximize external funding opportunities (4.3)."

Provide services cost effectively (4.1)

For the IRP, the capital and operation and maintenance costs of each alternative were used as the performance measure for this sub-objective. These were combined into an overall lifecycle cost that the IRP team converted to an estimated average single-family cost-per-month equivalent bill. This index is not an indication of rates or rate impacts, but offers a perspective on the relative differences of the alternatives in terms of their potential effect on water and sewer rates. This performance measure was used only for the analysis of the preliminary alternatives, since a complete and comprehensive financial analysis is part of the analysis of short-listed alternatives.

Maximize external funding opportunities (4.3)

To measure how well an alternative meets this sub-objective, an index of potential for external funding is developed and used as a performance measure. The index strives to reflect the fact that some types of projects are more likely to be eligible for external funding from state and federal funds.

Other Sub-Objectives

The other sub-objective under "Enhance Cost efficiency" ("Maximize external funding opportunities (4.3)") will be addressed as part of the Financial Plan analysis.

3.4.5 Performance Measures for the Objective "Protect Quality of Life"

As discussed in Subsection 3.2.5, the objective "Protect Quality of Life" has several sub-objectives. The main sub-objectives that could change from alternative to alternative were the sub-objectives, "Promote environmental justice (5.1), "Maximize economic benefits to Los Angeles (5.2)" and "Enhance public lands where possible (5.4)."

Promote Environmental Justice (5.1)

For this sub-objective, the IRP team selected a performance measure of impacts to minority and low-income communities. The definition of the performance measure for this sub-objective is closely aligned with the definitions of the concept of environmental justice by the federal government (see Section 5 for references and precise definitions), which sets the goal of minimizing the disproportionate impacts to low income and minority communities. This performance measure was used only for the analysis of the preliminary alternatives, since a formal environmental justice evaluation is performed in the mandated environmental process (NEPA and CEQA) before project implementation.

Maximize Economic Benefits to Los Angeles (5.2)

There are many ways to define and measure economic benefits, and in the context of the IRP, the IRP team selected a performance measure of jobs created. This performance measure has been defined as a surrogate for other elements of improvements in the economy of the project area. Jobs created as a result of the implementation of a policy or program is commonly used as an indicator of its economic benefits and there are established methodologies for measuring that economic impact. The use of this performance measure was therefore considered appropriate for this sub-objective.

Enhance Public Lands (5.4)

The focus of this sub-objective is increasing green space in Los Angeles. Therefore, the IRP selected a performance measure of acres of vacant lots and/or abandoned alleys converted to neighborhood recharge areas and parks. This performance measure reflects the level of enhancement of the public lands by accounting for the acreage that would potentially be improved as a result of the implementation of the alternatives.

Other Sub-Objectives

The other sub-objective under "Protect Quality of Life" ("Comply with EIS/EIR requirements (5.3)") will be addressed as part of the EIR analysis.

3.4.6 Performance Measures for the Objective "Promote Education"

As discussed in Subsection 3.2.6, the objective "Promote Education" has several sub-objectives. All of the sub-objectives will be equally met by all of the alternatives. Therefore, no specific performance measures were selected.

Section 4
Preliminary Alternatives

4.1 Introduction

Developing and evaluating alternatives is an essential part of the IRP Facilities Plan. As shown in Figure 4-1, defining preliminary alternatives was a key step in the overall process of defining the four draft alternatives that will undergo the environmental documentation and financial analysis. Preliminary alternatives were designed as integrated solutions that will meet the objectives and guiding principles generated from the Integrated Plan for the Wastewater Program (IPWP). The preliminary alternatives were each constructed with a clear emphasis on a particular focus (i.e., high adaptability, water resources, etc). This section serves to describe the general philosophy used to create the preliminary alternatives (Figure 4-1). Detailed descriptions of the alternatives and analysis can be found in Appendices B through M, and a summary of the alternatives can be found in Table 4-1, the "Rainbow Chart" for the preliminary alternatives.

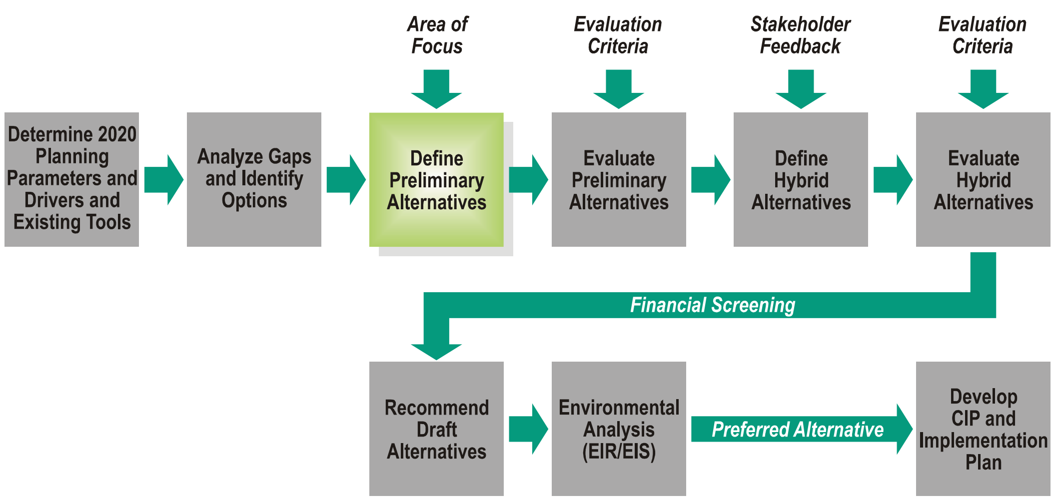


Figure 4-1
IRP Process Chart – Define Preliminary Alternatives

At a minimum, all alternatives were designed to meet the following minimum requirements:

- Provide for adequate system capacity (wastewater treatment and conveyance);
- Provide enough recycled/runoff water to protect beneficial uses of the Los Angeles River;
- Incorporate the baseline conservation savings assumptions that match the Los Angeles Department of Water and Power's Urban Water Management Plan;

- Meet current regulations, including adopted total maximum daily loads (TMDLs) requirements[1];
- Provide some level of beneficial use of runoff and recycled water;
- Promote environmental justice (minimize impacts to low income, minority neighborhoods);
- Meet near-term, immediate project needs; and
- Provide multiple community benefits (for new or expanded treatment facilities), e.g., provide land redevelopment or provide recreation facilities.

Although all of the alternatives were configured to meet the minimum requirements, they were also designed to have different focuses for each alternative. These different focuses allowed stakeholders and decision-makers to see trade-offs in some of the key planning objectives.

The following represents the different focuses or themes on which these alternatives were configured:

- ***Low cost/minimum requirements:*** Alternative includes lower cost solutions to meet minimum requirements
- ***High beneficial use of water resources:*** Alternatives offer higher levels of water recycling, conservation and beneficial use of runoff to reduce imported water supplies
- ***High adaptability*** : Alternatives provide adaptability to respond to changing conditions (e.g., changing flows, technology, or regulations)
- ***More decentralized***: Alternative includes more and smaller local projects rather than fewer and larger regional projects.
- ***Lower risk***: Alternatives offer relatively lower risk from either regulatory or from an ease-of-implementation perspective. Because these two definitions can be contradictory, several different low risk alternatives were created.

The following sections describe the basic elements included in each preliminary alternative, with detailed descriptions included in Appendices B through M. For this document, the alternatives are defined for year 2020 conditions.

For all alternatives, biosolids management options and costs will remain the same. The main reason for this is that under most of the wastewater treatment options the

[1] For the IRP, the following regulations were considered "current" and are considered minimum requirements: Santa Monica Bay Beaches Dry Weather and Wet Weather Bacteria TMDL, LA River Trash TMDL, LA River Nitrogen TMDL and California Toxics Rule.

total load in terms of solids and Biochemical Oxygen Demand (BOD) to the Hyperion Treatment Plant will be constant and there will be little growth at Terminal Island Treatment Plant, therefore the amount of biosolids produced will not change. The projected 2020 Class A biosolids production is 916 wtpd. The City's land application of Class A biosolids has proven to be an effective management option, with the Green Acres Farm providing a sustainable capacity for 550 wtpd. In addition, the City is working to implement the demonstration Terminal Island Renewable Energy (TIRE) project, which may provide a cost effective option for beneficial use of biosolids. The success of this project will impact the future biosolids management options and costs for the City. The City has estimated that the TIRE capacity would be 200 wtpd. The remaining biosolids (166 wtpd) will be allocated to alternative product processing options, such as a composting or drying and pelletizing operation. This will provide diversification of biosolids management and will allow the City to assess the feasibility of such technologies, should future regulations or operational issues impact land application or the TIRE project. See *Volume 1: Wastewater Management*, Section 9 for additional discussion of biosolids management.

4.2 Description of Alternative Low Cost/Minimum Requirements (LCMR)

Alternative Low Cost Minimum Requirements (LCMR) was created to include lower cost solutions to meet the minimum requirements described in Subsection 4.1. Alternative LCMR does do not extend beyond these levels of implementation, as do the other alternatives. The details of Alternative LCMR can be found in Appendix B.

LCMR - Wastewater Management

When considering the wastewater options, LCMR focuses on maximizing the use of existing process capacity at the Hyperion Treatment Plant near El Segundo. Existing capacity upstream in the system would be maintained [upgrade the Donald C. Tillman Water Reclamation Plant (Tillman) to advanced treatment (i.e., treatment of wastewater to levels above the current tertiary filtration), and maintain the Los Angeles-Glendale Water Reclamation Plant (LAG) as a Title 22 plant (current tertiary level of treatment required for water recycling)]. Of all of the alternatives, Alternative LCMR would convey the highest percentage of wastewater to Hyperion and would require an expansion to 500 million gallons per day (mgd) average dry weather flow (ADWF) by increasing the capacities of secondary clarifiers and digesters only. As noted, Tillman would be upgraded to advanced treatment to allow continued discharge of at least 30 mgd to the Los Angeles River. Because of the limited available recycled water upstream in the system, this alternative would provide treated wastewater to meet low levels of non-potable demands using Tillman and LAG treated effluent.

LCMR would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors would be needed which would include the Valley Spring Lane Interceptor Sewer (VSLIS), the Glendale-Burbank Interceptor Sewer (GBIS), and the North East Interceptor Sewer-Phase II (NEIS II). In all cases, it is assumed that Title 22 plants (in this case just LAG) would provide no capacity relief to the sewer system, since there would be no discharge out of the system other than through service to recycled water end users. During wet weather, these end users would not require recycled water (e.g., for irrigation use). Therefore, during these conditions the Title 22 plant would be operated at a minimum capacity (just to maintain the treatment process) and would discharge back to the sewer system for conveyance downstream to Hyperion Under this alternative, only a minimal commitment of recycled water use is consider. This commitment corresponds to the LADWP's current expansion plans for recycled water, whereby approximately 21,000 acre-feet per year of recycled wastewater would be used by irrigation and industrial users. To keep costs minimal, the potential recycled water users selected under this alternative would be the largest and closest to the wastewater treatment plants or to existing recycled water pipeline facilities.

LCMR - Runoff Management

For the runoff system, the options included in Alternative LCMR reflect the minimum required to meet existing regulations. The existing regulations effecting the runoff program (as of February 2004), are the Los Angeles River Trash TMDL, Santa Monica Bay Bacteria TMDL, and Standard Urban Stormwater Mitigation Plan (SUSMP). Therefore, Alternative LCMR includes dry weather diversions of runoff from the coastal area to the wastewater system (10 mgd) to meet the Santa Monica Bay Bacteria TMDL. The flow represents approximately 10 percent of the total dry weather runoff generated in the watershed (which is 97 mgd).

For wet weather runoff, runoff from new/redevelopment areas would be managed per SUSMP requirements. In addition, wet weather runoff tributary to the Santa Monica Bay would be treated and beneficially used or discharged to meet the Santa Monica Bay Bacteria TMDL. The wet weather options included in this alternative would manage approximately 10 percent of the citywide runoff from a representative ½-inch storm (1,700 MG). *Volume 3: Runoff Management*, Section 4, provides a detailed discussion of the assumed representative storm.

Table 4-1
City of Los Angeles
Integrated Resources Plan (IRP) - *Preliminary Alternatives Matrix*

	Low Cost/Min. Requirements (LCMR)	High Beneficial Use of Water Resources (WR)						High Adaptability (HA)		More De-centralized (MD)	Low Risk (LR)	
Option	**LCMR**	**WR1a**	**WR1b**	**WR2a**	**WR2b**	**WR3a**	**WR3b**	**HA1**	**HA2**	**MD**	**LR1**	**LR2**
Wastewater Treatment												
Tillman - Upgrade treatment (64 mgd) (Advanced Treatment)	64 mgd					64 mgd	64 mgd			64 mgd	64 mgd	64 mgd
Tillman - Upgrade and increase capacity to 80 mgd (Advanced Treatment)								80 mgd				
Tillman - Upgrade and increase capacity to 100 mgd (Advanced Treatment)				100 mgd	100 mgd							
Tillman - Upgrade and increase capacity to 120 mgd (Advanced Treatment)		120 mgd	120 mgd						120 mgd			
Los Angeles-Glendale - Maintain existing capacity (15 mgd) (Title 22)	15 mgd									15 mgd		15 mgd
Los Angeles-Glendale - Increase capacity to 20 mgd (Title 22)		20 mgd	20 mgd	20 mgd	20 mgd							
Los Angeles-Glendale - Increase capacity to 30 mgd (Title 22)						30 mgd	30 mgd					
Los Angeles-Glendale - Upgrade treatment (15 mgd) (Advanced Treatment)											15 mgd	
Los Angeles-Glendale - Upgrade and increase capacity to 30 mgd (Advanced Treatment)								30 mgd	30 mgd			
New Reclamation Plant - Build 10 mgd capacity near downtown (Title 22)				10 mgd	10 mgd							
New Reclamation Plant - Build 30 mgd capacity in valley (Title 22)						30 mgd	30 mgd					
New Reclamation Plant - Build 10 mgd capacity near downtown (Advanced Treatment)										10 mgd		
New Reclamation Plant - Build 30 mgd capacity in valley (Advanced Treatment)										30 mgd		
Hyperion - Maintain existing capacity (450 mgd)		450 mgd	450 mgd	450 mgd	450 mgd			450 mgd	450 mgd	450 mgd		
Hyperion - Increase capacity to 500 mgd	500 mgd					500 mgd	500 mgd					500 mgd
Hyperion - Increase capacity to 550 mgd											550 mgd	
Terminal Island - Maintain existing capacity (30 mgd)	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd
Wastewater Sewer System												
Build new interceptor sewer - Valley Spring Lane Interceptor Sewer	X	X	X	X	X	X	X			X	X	X
Build new interceptor sewer - Glendale Burbank Interceptor Sewer (GBIS)	X	X	X	X	X	X	X	X	X	X	X	X
Build new interceptor sewer - North East Interceptor Sewer (NEIS) Phase 2	X	X	X	X	X	X	X	X	X	X	X	X
Build new interceptor sewer - for New Plant (10 mgd - 2 miles)				X	X					X		
Build new interceptor sewer - for New Plant (30 mgd - 2 miles)						X	X			X		
Build new buried storage tank - 60 MG at Tillman								X	X			
Build new buried storage tank - 20 MG at Los-Angeles Glendale		X*	X*	X*	X*	X*	X*	X*	X*	X*		
Build new buried storage tank - 10 MG at new plant				X*	X*					X*		
Build new buried storage tank - 20 MG at new plant						X*	X*			X*		
Recycled Water (Non-Potable Demands)												
Meet Los Angeles River minimum requirements using treated wastewater	X	X	X	X	X	X	X	X	X	X	X	X
Meet Irrigation/Industry demands using treated wastewater (low/medium/high)	Low	High	Medium	High	High	High	High	Low	Low	Medium	Low	Low
Recharge groundwater basin using treated wastewater			High									
Meet Irrigation/Industry demands using treated runoff (low/medium/high)					Low		Low					
Recharge groundwater basin using treated runoff		High	High	High	High	High	High					
Conservation Programs												
Increase conservation efforts to DWP's planned 2020 levels	X	X	X	X	X	X	X	X	X	X	X	X
Increase conservation efforts further		X	X	X	X	X	X	X	X	X		
Dry Weather Urban Runoff												
Local/Neighborhood Solutions												
Smart Irrigation		X	X	X	X	X	X	X	X	X		
Increase public education and participation	X	X	X	X	X	X	X	X	X	X	X	X
Regional Solutions												
Diversion to Wastewater System (WW) or												
Divert to Urban Runoff Plant or wetlands and Beneficially Use (URP)[1]												
Divert - coastal (10 mgd)	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW
Divert - inland (Bell Creek 2.8 mgd)		WW	WW		URP		URP				WW	
Divert - inland (Browns Creek 3 mgd)		WW	WW		URP		URP				WW	WW
Divert - inland (Aliso Wash 1.8 mgd)		WW	WW								WW	
Divert - inland (Wilbur Wash 1 mgd)					URP		URP				WW	WW
Divert - inland (Limekiln Canyon 1.5 mgd)					URP		URP				WW	WW
Divert - inland (Caballero Canyon 1mgd)		WW	WW								WW	WW
Divert - inland (Bull Creek 2.4 mgd)		WW	WW								WW	WW
Divert - inland (Tujunga Wash 6 mgd)											WW	
Divert - inland (Pacoima Wash 7 mgd)											WW	WW
Divert - inland (Arroyo Seco 5 mgd)											WW	
Divert - inland (Reach 3 LAR 4 mgd)											WW	
Divert - inland (Reach 2 LAR-12 mgd)											WW	
Divert - inland (Burbank Western Channel 1.8 mgd)											WW	
Divert - inland (Compton Creek 2.6 mgd)					URP		URP				WW	
Divert - inland (Ballona Creek 3.3 mgd)					URP		URP				WW	
Divert - inland (Sepulveda Channel 16 mgd)											WW	
Divert - inland (Dominguez Channel 16 mgd)											WW	
Percent of Dry Weather Runoff Managed (of watershed - 97 mgd)	10%	30%	30%	21%	28%	21%	28%	21%	21%	21%	100%	20%
Wet Weather Urban Runoff												
Local/Neighborhood Solutions												
New/Redevelopment Areas - On-site treatment/discharge	X	X	X	X	X	X	X	X	X	X	X	X
New/Redevelopment Areas - On-site percolation	X	X	X	X	X	X	X	X	X	X	X	X
Retrofit Areas - Cisterns (On-site storage/use)												
Residential (Low/Medium/High)		Low	Low	High	High	High	High			High		
Schools (Low/Medium/High)		Low	Low	High	High	High	High			High		High
Government (Low/Medium/High)		Low	Low	High	High	High	High			High		High
On-site percolation (infiltration trenches/basins, reduce paving/hardscape)												
Residential		X	X	X	X	X	X			X		
Schools		X	X	X	X	X	X			X		X
Government		X	X	X	X	X	X			X		X
Commercial		X	X	X	X	X	X			X		
Rec/Cemetaries		X	X	X	X	X	X			X		X
Neighborhood recharge												
Vacant Lots (East Valley) (Low/Medium/High)		Medium	Medium	Low	Low	Low	Low	High	High	Low		High
Parks/Open Space (East Valley) (Low/Medium/High)		Medium	Medium	Low	Low	Low	Low	High	High	Low		High
Abandoned Alleys (East Valley) (Low/Medium/High)		Medium	Medium	Low	Low	Low	Low	High	High	Low		High
Regional Solutions												
Non-urban regional recharge		X	X	X	X	X	X					
Runoff treatment and beneficial use/discharge												
Treat and benefical use/discharge (coastal area)	X	X	X	X	X	X	X	X	X	X	X	X
Treat and benefical use/discharge (all areas)											X	
Percent of Representative storm (1/2-inch) managed (of citywide 1,700 mgd)	10%	48%	48%	58%	58%	58%	58%	39%	39%	55%	100%	42%
Current/Anticipated Regulations Level of Compliance												
California Toxics Rule	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Current Total Maximum Daily Loads (TMDLs) - Bacteria (Santa Monica Bay), Trash	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Future Total Maximum Daily Loads (projection)	No	Partial	Partial	Partial	Partial	Partial	Partial	Partial	Partial	Partial	Yes	Partial

Notes:
*Storage for daily (diurnal) peaks
[1]Flows indicated assume no smart irrigation. Implementing smart irrigation citywide would reduce total dry weather runoff estimates by ~11 mgd

Definitions of areas of focus:
Low Cost/Minimum Requirements: alternative includes lower cost solutions or low initial investment by meeting minimum requirements.
High Beneficial Use of Water Resources: alternatives that include high levels of recycled water, conservation, and beneficial use of runoff that reduces use of imported water.
High Adaptability: alternatives that are most able to adjust to changing conditions, such as population, wastewater flows and regulations.
More Decentralized: alternatives with solutions based on many small-scale projects centered on small neighborhoods, households or even individuals, rather than fewer and larger regional projects.
Lower Risk: alternatives that are lower in risk from a regulatory perspective (LR1) or in terms of ease of implementation from a technical, environmental and/or political and public acceptance perspective (LR2).

4.3 Description of High Beneficial Use of Water Resources Alternatives (WR)

"High beneficial use of water resources" refers to those alternatives that include high levels of recycled water, conservation, and beneficial use of runoff. There are six alternatives (WR1a, WR1b, WR2a, WR2b, WR3a and WR3b) that satisfy the characteristics of "high beneficial use of water resources." Minor variations exist between each alternative and are detailed in Appendices C through H.

WR - Wastewater Management

Because these alternatives focus on high beneficial use of water resources, the wastewater treatment options were selected to produce as much recycled water as possible "upstream" in the system, because the treatment sites are closest to the irrigation and industrial demands and for non-potable water and they would allow distribution to be accomplished as much as possible.

Alternative WR1a

For WR1a, the alternative includes:

- Expand and upgrade Tillman from 64 mgd (assumed existing capacity) to 120 mgd and upgrade Tillman to advanced treatment. A portion of the Tillman effluent (approximately 27 mgd) would continue to go to the Los Angeles River through Lake Balboa and Wildlife Lake, with the remaining effluent would be used to meet high levels of irrigation and industrial non-potable demands in the San Fernando Valley. Because the tributary wastewater flows for year 2020 to Tillman are estimated at 104 mgd, approximately 9 mgd of dry weather runoff in the Tillman shed would be diverted to Tillman for treatment and reuse (see dry weather runoff discussion, below, under Runoff Management).

- Increase LAG capacity from 15 mgd to 20 mgd, and operate it as a Title 22 plant only, maximizing the use of recycled water in the summer/dry months, and minimizing treatment/discharging back to the sewer during wet conditions. To equalize diurnal wastewater flows and maximize recycled water during peak demands, approximately 20 MG of buried storage would be included at LAG. (Note: maintaining LAG as a Title 22 plant maximizes the volume of recycled water available to meet non-potable demands because there is no reduction in effluent due to membrane performance/brine production.)

- Hyperion Treatment Plant: no change or expansion.

- Non-Potable Demands: Increase recycled water use at all facilities to meet high levels of irrigation and industrial use, up to 64,000 acre-feet per year.

This alternative would provide some sewer system relief due to the expansion of Tillman. While it would not eliminate the need for VSLIS, GBIS and NEIS II, it could reduce the diameter of the VSLIS line. The 20 MG equalization storage tank for daily (diurnal) peaks at LAG would to provide a more consistent flow. As a Title 22 plant, the expanded LAG plant would not provide any relief to the sewer system in wet weather.

Alternative WR1b

Alternative WR1b is functionally the same as WR1a, except for the end use of the recycled water produced at Tillman. For Alternative WR1b, a portion of the Tillman effluent would continue to go to the Los Angeles River, some effluent would be connected to industrial and irrigation demands, and the remaining advanced treated recycled flow being sent to the Pacoima and Hansen spreading grounds in the east valley for groundwater recharge.

Alternative WR2a

For WR2a, the alterative includes:

- Expand and upgrade Tillman from 64 mgd to 100 mgd and upgrade to advanced treatment and a new 10 mgd plant near downtown (Title 22) and include 10 MG of storage to equalize diurnal flows. Because the tributary wastewater flows for year 2020 to Tillman are estimated at 104 mgd, no additional dry weather diversions would be needed to supplement the tributary wastewater flow to Tillman under this alternative.
- Increase LAG capacity from 15 mgd to 20 mgd and operate it as a Title 22 plant. To equalize diurnal flows, approximately 20 MG of storage would be included at LAG.
- Hyperion Treatment Plant: No changes or expansion.
- Non Potable Demands: Increase recycled water use at all facilities to meet high levels of irrigation and industrial use, up to 60,000 acre-ft/yr.

This alternative would provide some sewer system relief due to the expansion of Tillman. While it would not eliminate the need for VSLIS, GBIS and NEIS II, it could reduce the diameter of the VSLIS line to the same extent as Alternative WR1a. The 20 MG equalization storage tank for daily (diurnal) peaks at LAG provide a more consistent influent flow to the plant and would not provide any wet weather relief to the sewer system. As a Title 22 plant, the expanded LAG plant would not provide any relief to the sewer system in wet weather.

Alternative WR2b

Alternative WR2b is functionally the same as Alternative WR2a, except that an additional 8,000 acre-feet per year of non-potable demands are being supplied using treated runoff, rather than treated wastewater (see dry weather discussion below).

Alternative WR3a

For alternative WR3a, the alternative includes:

- Maintain Tillman capacity at 64 mgd and upgrade level of treatment to advanced treatment.

- Build new 30 mgd Title 22 plant in the Valley, near Valley Spring Lane and Foreman Avenue. Include 20 MG of storage to equalize diurnal flows.
- Expand LAG from 15 mgd to 30 mgd and operate it as a Title 22 plant. To equalize diurnal flows, approximately 20 MG of storage would be included.
- Expand Hyperion from 450 to 500 mgd (ADWF). For the flow balance under this alternative, only 475 mgd (ADWF) would actually be treated in year 2020 at Hyperion.
- Non-Potable Demands: Increase recycled water use from Tillman, LAG and the new plant to meet high levels of irrigation and industrial use, up to 63,000 acre-ft/yr.

This alternative would not provide any sewer system relief downstream of Tillman. The Tillman plant would maintain its current capacity; upgrading to advanced treatment would increase the return flows to the sewer system due to brine discharge. New interceptor sewers (VSLIS, GBIS and NEIS II) would be needed to convey flows downstream to Hyperion. As Title 22 plants, LAG and the new valley treatment plant would not provide any wet weather relief to the sewer system. Diurnal storage also would not provide sewer system relief during wet weather.

Alternative WR3b

Alternative WR3b is functionally the same as Alternative WR3a, except that an additional 8,000 acre-feet per year of non-potable demands are being supplied water using treated runoff, rather than treated wastewater.

WR - Runoff Management

Because the suite of WR alternatives focus on high beneficial use of water resources, the runoff management options were selected to capture and beneficially use runoff for on-site use and/or percolation into the groundwater table.

As can be seen in Table 4-1, each of the WR alternatives implement dry weather runoff management through smart irrigation and diversion of 10 mgd of coastal flow to the wastewater system. Additionally, two of the alternatives (WR1a and WR1b) include inland diversions of dry weather flows to the wastewater system while two other alternatives (WR2b and WR3b) include several new Urban Runoff Plants (URPs) to treat and beneficially use dry weather runoff to meet recycled water demands.

For wet weather flows, each of the alternatives do the following:

- Meet SUSMP requirements at new and redevelopments through on-site percolation or treatment and discharge;
- Retrofit implementation of on-site percolation at residences, schools, cemeteries, government, commercial, and recreational facilities;

- Provide coastal treatment and beneficial use/discharge; and
- Provide regional recharge.

To varying degrees based on each alternative, the following options are also included:

- Implementation of cisterns at residential properties,
- Implementation of cisterns at schools,
- Implementation of cisterns at government facilities; and
- Neighborhood recharge.

As summarized in Table 4-1, the WR alternatives would manage between 21 and 30 percent of the total estimated dry weather runoff generated in the watershed (which is 97 mgd), and between 48 and 58 percent of the estimated citywide runoff from a representative ½-inch storm (1,700 MG).

4.4 Description of High Adaptability Alternatives (HA)

"High Adaptability" refers to alternatives that are more adaptable in terms of their ability to respond to changing conditions (e.g., changes in predicted flows, advent of new technologies, and changes in regulations.) There are two alternatives (HA1 and HA2) in this area, and the details can be found in Appendices I and J.

HA - Wastewater Management

Alternative HA1

Alternative HA1 focuses on adaptability, therefore the wastewater treatment options were selected to include some expansion upstream to higher treatment levels (110 mgd, advanced treatment) while maintaining Hyperion at existing capacity. Increasing the level of treatment upstream would allow the City to be adaptable to changing (i.e., more stringent) regulations affecting the treatment plants that discharge to the Los Angeles River.

Maintaining Hyperion at 450 mgd (ADWF) would allow space for approximately 100 mgd of additional capacity, which could be designed to meet more stringent requirements in the future. This alternative also would include increase and upgrade of Tillman capacity from 64 mgd to 80 mgd (advanced treatment), and increase and upgrade of LAG capacity from 15 to 30 mgd (advanced treatment).

This alternative would also include 60 MG of buried wet weather wastewater storage upstream in the system at Tillman, which would provide greater relief to the sewer system by eliminating the need for construction of the VSLIS.

Although Alternative HA1 would produce recycled water upstream in the system, it was assumed that this effluent would accommodate only the low levels of non-potable irrigation and industrial demands. This arrangement would allow the City to adapt to changing demands for recycled water.

Alternative HA2

Alternative HA2 is functionally the same as Alternative HA1 except that the additional upstream capacity would be approximately 150 mgd (120 mgd at Tillman and 30 mgd at LAG, both with advanced treatment). This alternative actually results in a year 2020 estimated flow of only 414 mgd (ADWF) at Hyperion. This alternative was "designed" to truly focus on expansion upstream to provide capacity relief to the sewer system. This alternative would provide the greatest flexibility and adaptability to changing flows throughout the system. But the downside is that it doesn't maximize capacity at existing treatment facilities.

HA - Runoff Management

Because this suite of alternatives focuses on high adaptability, runoff management included options that could be utilized regardless of changes in the regulatory environment. For the dry weather runoff portion, both alternatives are identical: they include implementing smart irrigation citywide and diverting coastal runoff to the wastewater system to manage dry weather runoff. For wet weather, they both meet SUSMP requirements with on-site percolation or treatment and discharge, and they implement neighborhood recharge.

As shown in Table 4-1, "Rainbow Chart", the HA alternatives manage around 21 percent of the total estimated dry weather runoff generated in the watershed (which is 97 mgd), and about 39 percent of the estimated citywide runoff from a representative ½-inch storm (1,700 MG).

4.5 Description of More Decentralized Alternative (MD)

"More decentralized" refers to alternatives that emphasize localized solutions rather than fewer and larger regional projects. Details on the MD alternative can be found in Appendix K.

MD - Wastewater Management

Because this alternative focuses on smaller-scale projects centered on neighborhoods, Alternative MD would include adding more smaller treatment plant expansions and/or additions throughout the City, upgrading Tillman (64 mgd with advanced treatment), maintaining the existing capacity at LAG (15 mgd, Title 22), and adding two new reclamation plants (10 mgd near downtown, advanced treatment and 30 mgd in the valley, advanced treatment).

The more decentralized MD alternative would not provide any additional treatment relief for the upstream sewer system. The new interceptor sewers VSLIS, GBIS and NEIS II would be needed to convey flows downstream to Hyperion. As a Title 22 plant, LAG would not provide any wet weather relief to the sewer system. Diurnal storage would not provide sewer system relief during wet weather.

Advanced treatment at the new valley and downtown treatment plants will allow discharge to the Los Angeles River, thereby providing some relief to the downstream sewer system. Currently, this alternative does not reflect a reduction of the NEIS II or GBIS design capacities because the extent and locations of capacity relief have not been evaluated.

Although Alternative MD produces recycled water upstream in the system, it was assumed that the level of reuse would be at a moderate level, 50,000 acre-fee per year, compared to the WR alternatives. Only irrigation and industrial demands would be served recycled water under this alternative.

MD - Runoff Management

Managing runoff under the concept of a decentralized alternative includes management at the most upstream point within each watershed. This alternative would be similar to the WR alternatives, but without the regional options such as regional recharge and City-wide diversion or urban runoff plants (URPs).

The MD alternative would manage approximately 21 percent of the total estimated dry weather runoff generated in the watershed (which is 97 mgd), and around 55 percent of the estimated citywide runoff from a representative ½-inch storm (1,700 MG).

4.6 Description of Lower Risk Alternatives (LR)

"Lower risk" refers to those alternatives that present fewer and smaller risks from either a regulatory perspective or from ease-of-implementation perspective. Because these two definitions of low risk may be somewhat different definitions, two separate low risk alternatives were created:

- Alternative LR1 focuses primarily on low risk in terms of projected regulatory compliance, that is, the ability to comply with what is assumed to be the most stringent possible future requirements. Detailed information on this alternative can be found in Appendix L.

- Alternative LR2 focuses primarily on low risk in terms of implementation hurdles. In other words, the goals of LR2 are to avoid implementability concerns such as capturing all wet and dry weather runoff, etc. Detailed information on this alternative can be found in Appendix M.

LR - Wastewater Management

For the wastewater system, minimal changes were assumed upstream, except upgrading Tillman to advanced treatment at existing capacity (64 mgd) and upgrading LAG to advanced treatment at existing capacity (15 mgd). Instead, Hyperion would be expanded to build out (full secondary) capacity (550 mgd) (ADWF). Therefore, less reliance on changing permit requirements upstream are included in this alternative. Note that, as discussed below, the Hyperion expansion to

550 mgd is a result of the significant increase in flow from dry weather diversions (estimated at 82 mgd).

Alternative LR1

In Alternative LR1, LAG would be upgraded with advanced treatment and would operate as a discharge plant, thereby providing some potential relief to the downstream sewer system. However, because the amount of relief is unknown, this alternative did not reflect a reduction of the NEIS II design capacity. The LR1 alternative would require additional conveyance capacity to convey flows downstream to Hyperion, so new interceptor sewers VSLIS, GBIS and NEIS II would be needed. Because Alternative LR1 produces less recycled water upstream in the system, the recycled wastewater would be connected to the only the most cost effective non-potable irrigation and industrial demands and would yield the same amount of reuse as the LCMR Alternative.

Alternative LR2

For the wastewater system, Alternative LR2 would be generally similar to Alternative LR1, with minimal expansions upstream in the system. However, under LR2 there is less diversions of dry weather urban runoff into the sewer. Therefore, LAG would continue to operate as a Title 22 plant (rather than be upgraded to an advanced treatment plant). Even with this reduced amount of advanced treatment upstream (i.e., 64 mgd rather than 79 mgd), the needed ADWF capacity at Hyperion would be reduced to 500 mgd (rather than 550 mgd under LR1).

In Alternative LR2, LAG operates as a Title 22 plant and will therefore not provide any relief to the downstream sewer system during wet weather. The recycled water level for LR2 would be the same as in LR1.

LR - Runoff Management

Alternative LR1

For Alternative LR1, minimizing the risk of non-compliance with potential regulations would require a municipal management approach that would minimize reliance on runoff management at individual residences. For dry weather conditions, this alternative would divert all dry weather runoff to the wastewater system. For wet weather conditions, this alternative would treat and discharge, or beneficial use, the entire City-wide targeted wet weather runoff amount.

The LR1 alternative would manage 100 percent of the total estimated dry weather runoff generated in the watershed through diversion and treatment at the plants (which is 97 mgd), and 100 percent of the estimated citywide runoff from a representative ½-inch storm (1,700 MG).

Alternative LR2

For alternative LR2, minimizing the risk associated with implementation would utilize an approach that de-emphasizes the construction of large, regional facilities. This alternative would include diverting coastal flows, as well as a portion of some inland flows, to manage dry weather flows. For wet weather, this alternative would use a combination of SUSMP on-site percolation or treatment; cisterns; on-site percolation at publicly owned facilities only (i.e. schools, government facilities); neighborhood recharge; and coastal treatment and discharge or beneficial.

The LR2 alternative manages about 20 percent of the total estimated dry weather runoff generated in the watershed (which is 97 mgd), and approximately 42 percent of the estimated citywide runoff from a representative ½-inch storm (1,700 MG).

Section 5
Evaluation of Preliminary Alternatives

5.1 Introduction

As shown in Figure 5-1, evaluating the preliminary alternatives in the context of the IRP objectives is an important step in the process of defining the four draft alternatives that will undergo the environmental documentation and financial analysis. The preliminary alternatives, described in Section 4, were evaluated using a decision analysis process that included objectives and performance measures described in Section 3 and direct feedback from Steering Group members regarding the options that they prefer.

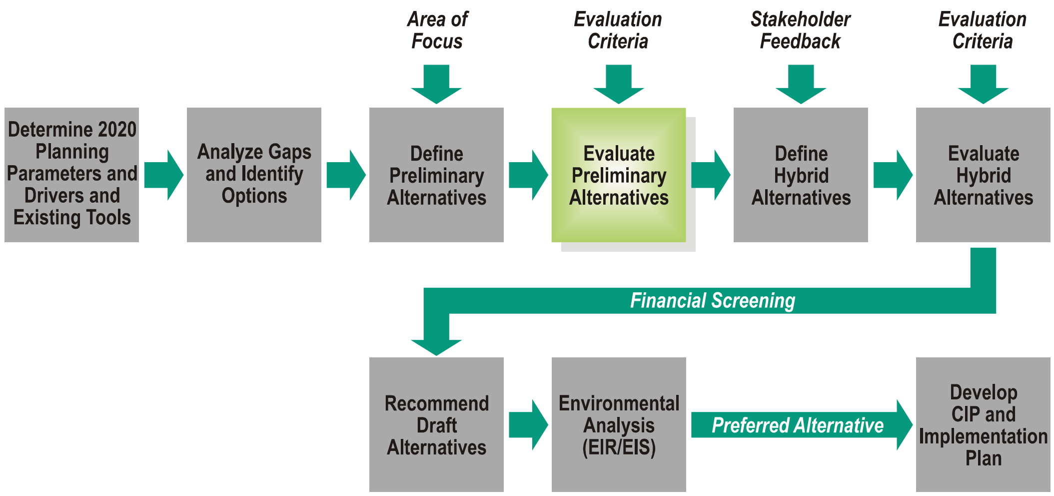


Figure 5-1
IRP Process Chart – Evaluate Preliminary Alternatives

The preliminary alternatives were each constructed with a clear emphasis on a particular focus (i.e., high adaptability, water resources, etc.), as described in Section 4. The main purpose in evaluating these alternatives was to determine which elements of each alternative provided the greatest levels of satisfaction in meeting the objectives and preferences of the Steering Group. These "best" elements would then be used to develop a new set of "hybrid" alternatives. The hybrid alternatives are discussed in Sections 6 and 7.

5.2 Decision Modeling

The alternatives analysis approach required a decision model to process the complex technical information and to synthesize it according to the objectives and preferences of each Steering Group member that participated in the surveys. Decision modeling is a tool used to aid in selecting one or more preferred alternatives - a process that rapidly increases in complexity as the numbers of alternatives, evaluation criteria, and stakeholders increase.

Decision modeling helps "organize" the decision making process, and its results stimulate constructive discussion. Models serve this purpose by providing weighted scores for each alternative according to a set of evaluation criteria. These consistent, quantified evaluation results allow for direct comparison of alternatives. The decision model results allow for comparison of alternatives during group discussions while retaining information about the preferences of individual stakeholders.

An interactive workshop process was used to provide technical background to help Steering Group members understand the issues; to discuss results of the decision model; and to obtain valuable feedback from Steering Group members. Steering Group input was provided both generally (as part of the workshop) and individually (through the use of surveys). Since not all of the Steering Group members participated in the surveys for the decision model, the open discussions during and after the workshops (with follow up phone calls and feedback forms) were of great value for the preliminary alternative analysis. The decision model provided a clear basis for all discussions since the weighted scores that were generated by the modeling process helped to clarify the differences between alternatives for the Steering Group participants. Additionally, the discussions surrounding the decision model results provided insight regarding the factors of importance in selecting types of projects used to meet the City's needs.

The decision model used for the IRP simulated an alternative evaluation based upon multiple criteria (objectives, sub-objectives and performance measures), described in Section 3. Comprehensive technical analyses of the preliminary alternatives provided numeric performance measure results (i.e., "report cards").

For each stakeholder, the IRP decision model results provided a comparison of alternatives that incorporates that stakeholder's individual preferences. Using these results, it is possible to more accurately predict which of the complex alternatives a particular stakeholder is likely to favor, given their preferences. Results were used as a starting point for discussion and for the development of additional alternatives ("hybrids") for consideration. Section 6 discusses hybrid alternatives development.

5.2.1 Calculation of Scores

The IRP decision model calculated an individual member's scores for the preliminary alternatives using the following components:

- Results from technical analyses which evaluated the performance (i.e., the performance measures values or "report card") of each of the alternatives according to the objectives and sub-objectives selected by the Steering Group (the "report card" for an alternative). The objectives and strategies were collected through the workshop process;

- The performance preference information which evaluated how changes in the performance of an alternative would affect a Steering Group Member's satisfaction level. The satisfaction levels for each objective and sub-objective were generated from Steering Group members who completed an individual satisfaction survey; and

- The objective weightings, which measured the importance that each Steering Group member placed on the objective. The relative weighting of objectives against one another was also generated for each Steering Group member who completed an individual "weighting" survey.

Figure 5-2 depicts the relationship of these components. As this conceptual figure shows, the decision model first reads the performance measure value (step 1) for an objective (or sub-objective) for a particular alternative (i.e., its "report card.) For each Steering Group member, the model then "looks up" the level of satisfaction associated with the performance measure value (step 2). The model multiplies the satisfaction level by the appropriate weighting to generate a score associated with that objective (step 3). This process is repeated for each objective and sub-objective to get a total score for the alternative (step 4). The model then repeats the process for each alternative for each Steering Group member (step 5).

Results are always generated at the individual level. However, the number of Steering Group members for which a particular alternative appears as the top one, or in the top five scores, is tracked and recorded.

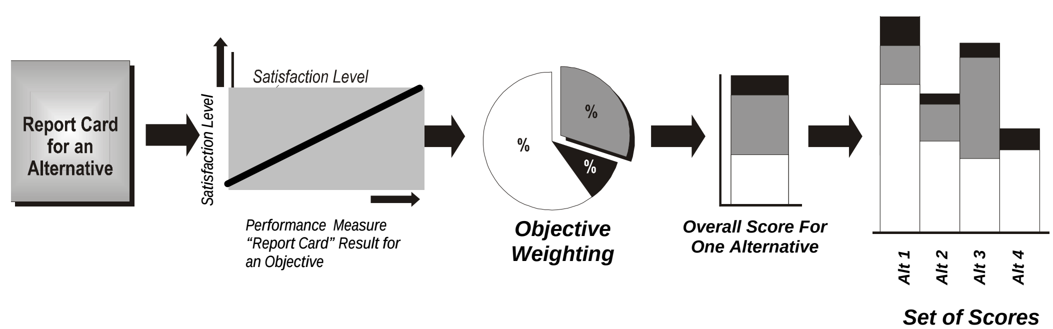


Figure 5-2
Decision Model Steps

5.3 Preliminary Alternative Report Cards

As shown in Figure 5-2, the first step in the decision model process was to determine the "report cards" or raw performance measure data for each alternative. Section 3 included a discussion of the performance measures selected for this analysis. This subsection describes the report card data for each of the fourteen performance measures. For each, the applicable "report card" data from each alternative is identified, and the preliminary alternative report cards are compared to one another. Discussion on why a particular alternative performs the way it does is also included. It should be noted that for some performance measures, a higher report card value reflects more effectively meeting the objective, while for other performance measures, a lower report card value reflects more effectively meeting the objective. For example, an alternative with the greatest amount of runoff managed most effectively meets the sub-objective of protecting the public from environmental health hazards related to water. Conversely, the alternative with the lowest cost most effectively meets the objective of enhancing cost efficiency.

5.3.1 Report Card for the Objective "Protect Health and Safety of Public"

A major objectives of the IRP is to "Protect Health and Safety of Public." As discussed in Section 3, the objective "Protect Health and Safety of Public" has several sub-objectives. The main sub-objective that could change from alternative to alternative was the sub-objective "Protect the Public from Environmental Health Hazards Related to Water (1.4)." The performance of each alternative in achieving this objective is measured by the amount (volume) of runoff managed. Because environmental health hazards related to water are associated with the amount of dry and wet weather runoff, the higher the amount of runoff managed, the better this objective is achieved. As detailed in Section 4 of *Volume 3: Runoff Management*, the data for water qualities and quantities were obtained from the County of Los Angeles monitoring data for the Los Angeles River and Ballona Creek. Dry weather runoff volumes were calculated based on City-wide land use and runoff rates and the amount of runoff diverted, treated or benefically reused under each alternative. For wet weather conditions, the representative criteria selected was the relative proportion of runoff from a selected storm event of ½-inch (approximately the target event to meet the Santa Monica Bay Beaches TMDL) that would be diverted, treated or beneficially reused under each alternative. For the sake of relative performance comparison, this single event runoff volume was assumed to occur in one day, and the volume converted to a flow rate in mgd to add to the dry weather flow rate. Using this measure, the total targeted runoff that could be managed is 97 mgd for dry weather runoff and 1,700 mgd for wet weather runoff, for a total of 1,797 mgd combined.

For each alternative, the IRP team estimated the amount of runoff that is managed from the Los Angeles River, Ballona Creek, Santa Monica Bay and Dominguez Channel Watersheds for both dry weather and wet weather conditions. The amount of runoff managed for each alternative will vary depending on the number of subwatersheds that would be diverted to the sewer or to urban runoff plants; and on the amount of runoff captured through implementation of local, neighborhood and regional solutions that would be implemented.

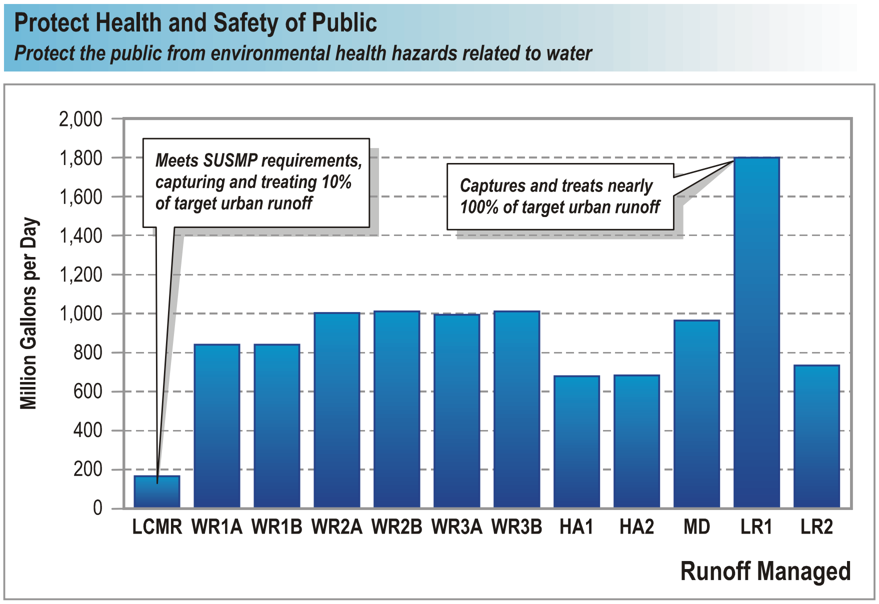


Figure 5-3
Report Card Summary for Protect Health the Public from Environmental Health Hazards Related to Water (Runoff Managed)

Figure 5-3 shows the total amount of dry and wet weather runoff managed in year 2020 for each alternative. As shown in the figure, the amount of dry and wet weather runoff managed varies for each alternative in year 2020. The higher (taller) bars in the chart reflect a greater volume of runoff managed, which reflects more protection of the health and safety of the public. The shorter bars in the chart reflect a smaller volume of runoff managed, which reflects less protection of health and safety. The figure shows a comparison of the preliminary alternatives for this performance measure:

- Alternative LR1 (low risk) shows the most protection of public health and safety (compared to the other alternatives), because nearly 100 percent of the target runoff is managed by means of treatment or diversion.
- Alternative LCMR (low cost/minimum requirements) shows the least protection of public health and safety (compared to the other alternatives), because it manages 10 percent of the target runoff, in accordance with the Standard Urban Storm Water Mitigation Plan (SUSMP) requirements.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

5.3.2 Report Cards for the Objective "Effectively Manage System Capacity"

As discussed in Section 3, the objective "Effectively Manage System Capacity" has several sub-objectives. The main sub-objective that could change from alternative to alternative was the sub-objective "Enhance the efficient use of system assets (2.2)." To measure efficient use of system assets, the IRP team selected two performance measures: (1) miles of additional sewer pipelines and (2) acres of additional process area required for wastewater treatment. These two performances measures were combined into one index that relates miles of new sewer pipelines and new wastewater process capacity to overall efficiency (index = 0 to 10 (most efficient)). The intent of this performance measure is to measure the level of construction that will need to take place in the sewer system and the wastewater treatment plants. The rationale for this performance measure is that an efficient operation will effectively use the existing capacity in the sewers and wastewater treatment plants, thus requiring less construction of additional capacity.

The other sub-objective under "Effectively Manage System Capacity" must be equally met by each alternative, and therefore was not assigned specific performance measures. The sub-objective was "Provide for adequate wastewater treatment and discharge (2.1)."

5.3.2.1 Miles of Additional Sewer Pipelines

The City of Los Angeles has approximately 6,500 miles of major interceptor and outfall sewers, 46 pumping stations, and over 600,000 service connections. Of the 6,500 miles of sewers, approximately 170 miles are large diameter sewers, which are the focus of this IRP analysis.

The IRP team estimated the miles of additional sewer pipelines for each alternative using the City's hydraulic model of the sewer system (MOUSE model). The units for the raw performance measure were inch-miles, which is the length of the sewer multiplied by the diameter. This distinction between inch-miles and miles is important because many of the alternatives have the same length of new sewers, but very different diameters. The raw quantities ranged from 766 inch-miles (Alternatives HA1 and HA2) to 1,844 inch-miles for Alternative MD. The actual length of the additional sewers ranged from 9.6 miles for Alternatives HA1 and HA2 to 20.6 miles for Alternative MD.

Table 5-1 presents a summary of the report card data for new sewer pipelines for each alternative.

Table 5-1 Report Card Summary for "Effectively Manage System Capacity" – Additional Sewer Pipelines		
IRP Alternative	**Length of New Sewers (miles)**	**Length x Diameter of New Sewers (inch-miles)**
LCMR	17	1,670
WR1a	17	1,579
WR1b	17	1,579
WR2a	17	1,579
WR2b	17	1,579
WR3a	17	1,670
WR3b	17	1,670
HA1	10	766
HA2	10	766
MD	21	1,844
LR1	17	1,670
LR2	17	1,670

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

5.3.2.2 Additional Process Area Required for Wastewater Treatment

The City of Los Angeles has four wastewater treatment plants: Hyperion Treatment Plant, Donald C. Tillman Water Reclamation Plant, Los Angeles-Glendale Water Reclamation Plant and Terminal Island Treatment Plant.

The additional treatment process area required to meet the projected year 2020 flows was estimated using typical engineering standards and data from the existing treatment plant processes. The raw performance values ranged from 4.4 acres for Alternative LCMR to 10.3 acres for Alternative HA2. Note that for the expansion of existing treatment plant facilities, the expansions fit within the existing plant site (and within the existing berm at Tillman).

Table 5-2 presents a summary of the report card data for additional wastewater treatment process area for each alternative.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

5.3.2.3 Wastewater System Efficiency Index

As discussed earlier, the two performances measures were combined into one index that relates miles of new sewer pipelines and new wastewater process capacity to overall efficiency (index = 0 to 10 (most efficient)).

Table 5-2
Report Card Summary for "Effectively Manage System Capacity" – Additional Wastewater Treatment Process Area

IRP Alternative	Additional Process Area (acres)
LCMR	4.4
WR1a	8.3
WR1b	8.3
WR2a	7.3
WR2b	7.3
WR3a	9.1
WR3b	9.1
HA1	5.2
HA2	10.3
MD	8.3
LR1	7.3
LR2	4.8

The importance of combining the wastewater collection and wastewater system improvements in a single index is that the planning for these systems is usually addressed in conjunction, since they are dependent on each other. The way to optimize the overall system may require expansions of in the sewer system to a single, downstream plant. On the other hand, expanding wastewater treatment plants upstream decreases the need for sewer system expansion. Thus, to evaluate system efficiency it is necessary to look at wastewater treatment and sewer system collectively.

The index was determined by calculating a score from 0 to 10 for each system, individually. For wastewater treatment, the score was assigned proportionally based on the process area required. The alternative with the lowest area required received a score of 10, and the alternative with the highest area required received a 0. The rest of the alternatives were assigned a score between 0 and 10, proportionally. The same minimum-maximum approach was used for the sewer system based on the miles of pipelines required for conveyance. The aggregated efficiency index was calculated as the average of the treatment and sewer system indices.

Figure 5-4 shows the wastewater system efficiency index. The index varies for each alternative in year 2020. The taller bars in the chart reflect a relatively more efficient use of existing wastewater sewer and treatment facilities (requiring less new sewer and/or treatment area), while the shorter bars in the chart reflect a relatively less efficient use of existing wastewater sewer and treatment facilities (requiring more new sewer and/or treatment area).

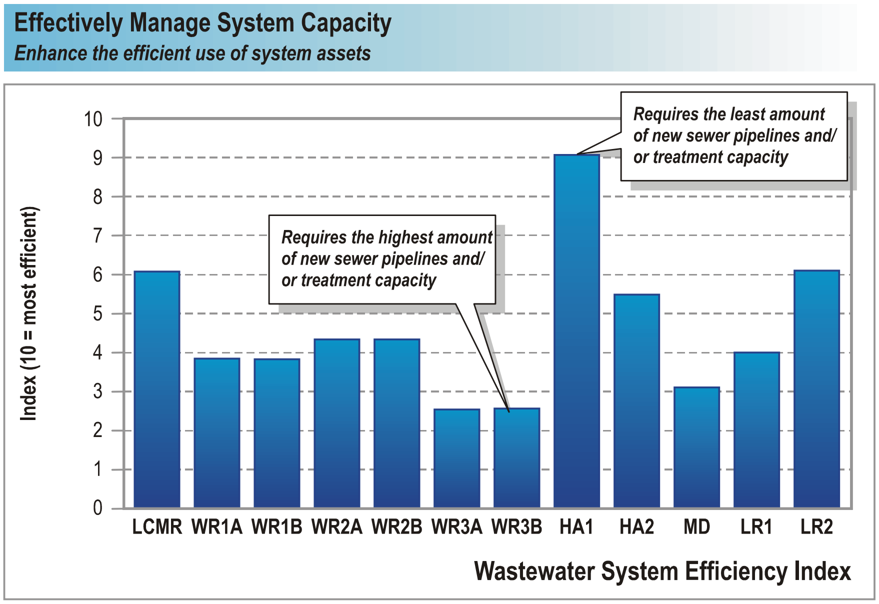


Figure 5-4
Report Card Summary for Enhance the Efficient Use of System Assets (Wastewater System Efficiency index)

Alternative HA1 (high adaptability) requires the least amount of new sewer pipelines and/or treatment area. This alternative includes adding a 7,300 feet extension to the Glendale Burbank Interceptr Sewer (GBIS), and buried storage tanks at Tillman to store wastewater during peak flows. These two new facilities replace the need to construct a new, much longer, 44,600 feet Valley Spring Lane Interceptor Sewer (VSLIS), which would connect Tillman to GBIS. Therefore, this alternative reflects a more efficient use of the existing wastewater system compared to the other alternatives.

Conversely, Alternative WR3b (water resources) requires the most new sewer pipelines and/or treatment area. This alternative maximizes efficient use of water resources, includes a new water reclamation plant and provides for an expansion of LAG to provide more recycled water. However, since this alternative does not include advanced treatment for Los Angeles River discharge at both the new water reclamation plant and at LAG, expansion is also required at Hyperion. New interceptor sewers are also required. Therefore, this alternative reflects a less efficient use of the existing wastewater system compared to other alternatives.

5.3.3 Report Cards for the Objective "Protect the Environment"

As discussed in Section 3, the objective "Protect the Environment" has several sub-objectives. The main sub-objectives that could change from alternative to alternative were the sub-objectives, "Protect the ocean, beaches and watersheds and their beneficial uses (3.2)", "Enhance the efficient use of natural resources (3.4)", "Promote water self-sufficiency (3.5)", and "Protect air quality (3.6)."

5.3.3.1 Report Cards for the Sub-Objective "Protect the Ocean, Beaches, and Watersheds and their Associated Beneficial Uses"

This sub-objective has an emphasis on water quality, as was the case for the sub-objective of "Protect the Public from Environmental Health Hazards Related to Water." This sub-objective, however, reflects the goals for environmental protection, rather than public health. The IRP team selected two performance measures under this sub-objective as indicators of the level of environmental protection:

- Reduction in pollutant loading
- Amount of dry weather urban runoff managed

Reduction in Pollutant Loading to Receiving Waters

The average reduction in pollutant loading to water bodies during wet weather events is a performance measure used to evaluate each alternative based on the objective to "protect the oceans, beaches and watersheds and their beneficial uses." The average reductions in pollutant loading to the Los Angeles River, Ballona Creek, Santa Monica Bay, Dominguez Channel and Long Beach were estimated for each alternative and were then compared.

Wet weather runoff conveys pollutants to the Los Angeles River, Ballona Creek, Santa Monica Bay, Dominguez Channel and Long Beach. These pollutants include trash, pesticides, herbicides, fertilizers, oils, animal waste (bacteria), yard trimmings and leaves, pollutants from the air, hazardous products and sediment. For the IRP, total suspended solids (TSS) was selected as an "indicator" pollutant to measure the reduction in the level of pollutants in the oceans, beaches and watersheds. To derive a relative comparison index, the maximum target for pollutant removal was calculated as the mass load of total suspended solids (TSS) associated with runoff generated from ½-inch of rainfall. Using TSS water quality data from the County of Los Angeles, an estimate of 4.27 millions pounds per event was calculated as the maximum amount that would be reduced if the runoff from the entire ½-inch storm over the entire City was captured and treated or reused.

To translate the pollutant loading per storm event into an annual pollutant loading reduction, the County of Los Angeles daily rainfall data was used collected over the past eleven years. Based on this eleven years of daily rainfall data, on average there are 26 rain days in the City, and on average 11 of these storm events exceed a ½-inch. Therefore, the first ½-inch of storm events, with 4.27 million pounds per event (of ½-inch) results in a TSS pollutant loading of 23,500 tons/year. This would be the maximum targeted amount that could be reduced annually.

The reduction of pollutants is influenced by the amount of wet weather runoff that is managed either with local/neighborhood solutions or regional solutions. As shown in Figure 5-5, the average reduction in pollutant loading for year 2020 varies for each alternative.

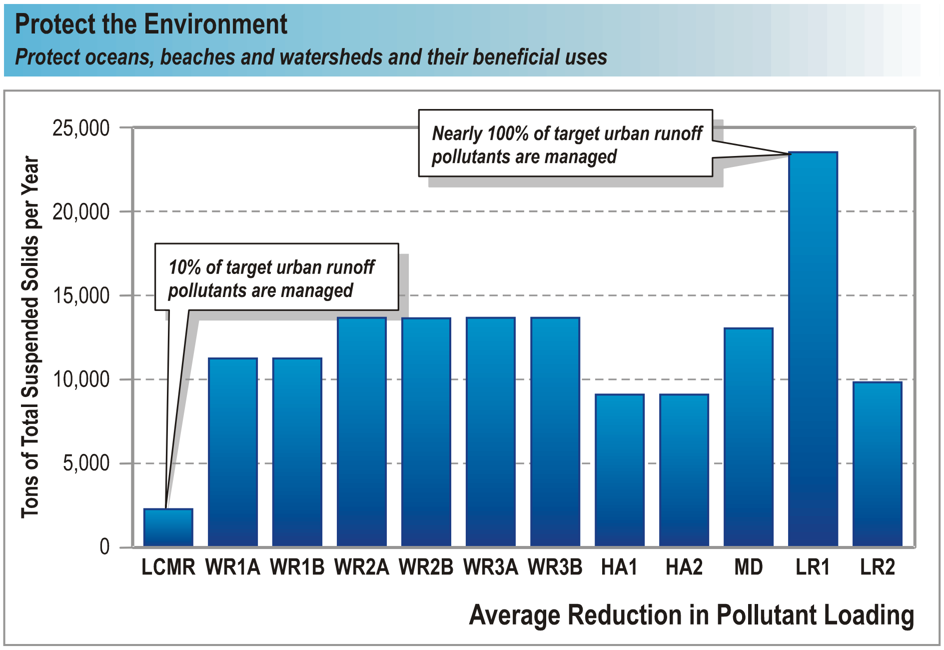


Figure 5-5
Report Card Summary for Protect the Oceans, Beaches and Watersheds (Average Reduction in Pollutant Loading)

The higher values in the figure reflect a greater reduction of pollutants, and a presumed greater protection of oceans, beaches and watersheds. The lower values reflect relatively less reduction of pollutants or less presumed protection of oceans, beaches and watersheds.

As shown in Figure 5-5, Alternative LR1 (Low Risk) provides the most protection of oceans, beaches and watersheds, because the alternative includes 100 percent treatment of runoff from the representative ½-inch storm, thereby reducing all of the maximum targeted pollutant loading of approximately 23,500 tons/year by 100 percent (though larger storms will contribute to the overall pollutant loading within the watersheds and at the beaches).

Alternative LCMR (Low Cost/Minimum Requirements) provides the least amount of protection of oceans, beaches and watersheds. Though this alternative meets the current TMDL requirements for the Santa Monica Bay, it only includes treatment of 10 percent of runoff from the representative 0.5-inch storm. This is a reduction of approximately 10 percent of the pollutants, or 2,200 tons/year.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

Amount of Dry Weather Runoff Managed

The performance measure that evaluates the amount of dry weather urban runoff managed is part of the objective to "protect the ocean, beaches and watersheds and their associated beneficial uses." Therefore, the higher the amount of dry weather urban runoff managed, the better this performance measure is met. As detailed in Section 4 of *Volume 3: Runoff Management*, the total targeted dry weather urban runoff to be managed is 97 mgd.

Figure 5-6 below presents the total amounts of dry weather runoff managed for each alternative. For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

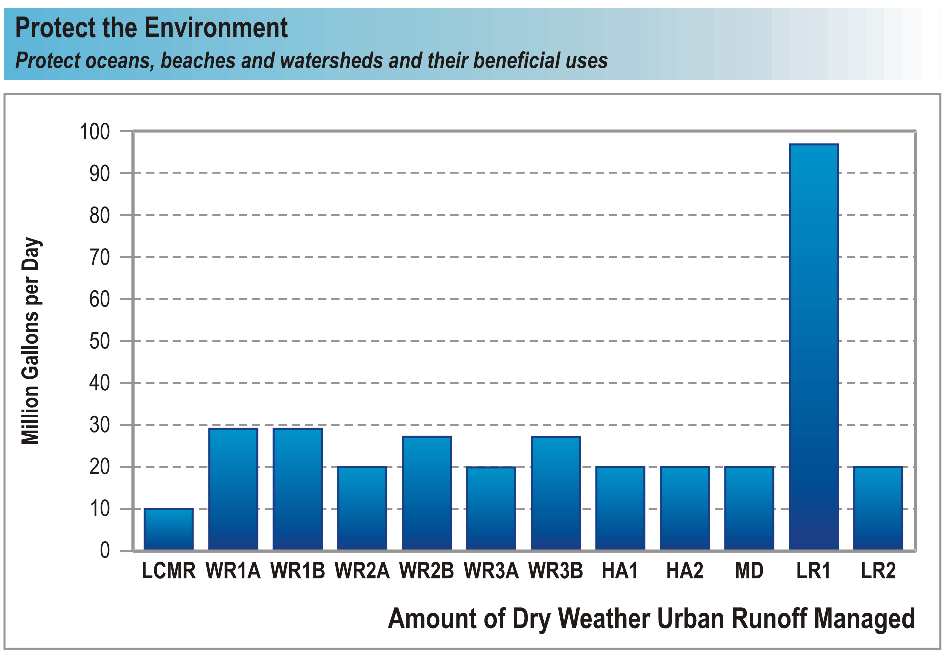


Figure 5-6
Report Card Summary for Protect the Oceans, Beaches and Watersheds (Amount of Dry Weather Urban Runoff Managed)

As shown in Figure 5-6, Alternative LR1 (Low Risk) manages nearly 100 percent of the targeted dry weather urban runoff and thus provides the most protection for the environment. Alternative LCMR (Low Cost/Minimum Requirements) manages only about 10 percent of the targeted dry weather urban runoff and provides the least amount of protection of the environment. The remaining alternatives manage between 20 percent and 30 percent of the total targeted runoff volume.

5.3.3.2 Report Cards for the Sub-Objective "Enhance the Efficient Use of Natural Resources"

As discussed in Section 3, the focus of this sub-objective is the reuse of wastewater and beneficial use of runoff. Therefore, the IRP team selected three performance measures under this sub-objective as indicators of the level of efficient use of natural resources:

- Potable water demand reduced through conservation programs
- Amount of treated wastewater recycled
- Amount of runoff beneficially used

All three performance measures potentially offset water demands and are therefore appropriate measures of the efficient use of water as a resource.

Potable Water Demand Reduced through Conservation Programs

The amount of potable water demand reduced through conservation programs is a performance measure used to compare the ability of each alternative to "enhance the efficient use of natural resources." The self-sufficiency of the City's water system is directly associated with effectiveness of water conservation programs and the resultant amount of potable water demand reduced. As such, the greater the amount of potable water demand reduced through conservation, the better this objective is met.

As described in detail in Appendices B through M of this document, each alternative continues the increased implementation of the water conservation efforts that have been in place in the City since 1991. An optional conservation effort, included in nine of the twelve alternatives, is the increased implementation of smart irrigation programs. The nine alternatives that include smart irrigation show greater reduction in potable water demand, as presented in Figure 5-7.

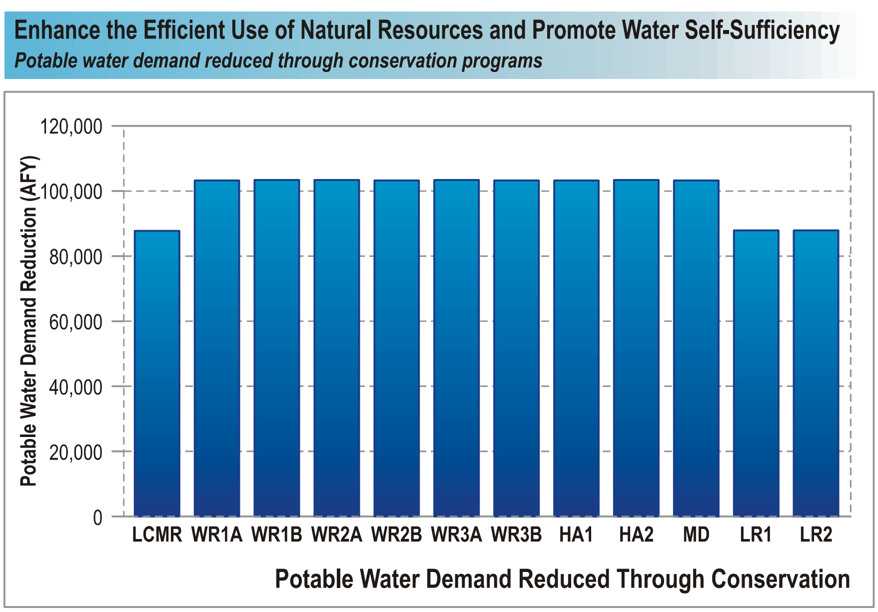


Figure 5-7
Report Card Summary for Enhancing the Efficient Use of Natural Resources (Potential Potable Water Demand Reduced Through Conservation)

As shown in Figure 5-7, Alternatives LCMR (Low Cost/Minimum Requirements), LR1 (Low Risk 1) and LR2 (Low Risk 2) achieve approximately 87,000 acre-ft/yr of reduction in potable water demand through conservation. These alternatives continue the water conservation efforts that have been in effect since 1991. With the information that was provided from DWP, this reduction in potable water demand was calculated as a result of the implementation of a conservation program that includes residential conservation measures and commercial/industrial/governmental conservation measures.

DWP's 2000 Urban Water Management Plan estimated savings in the year 2020 after the implementation of this program of 87,400 acre-ft/yr. *Volume 2: Water Management*, Section 5 further describes these conservation efforts.

Another estimate was performed for a program that extends the smart irrigation features, based on the expected unit savings of smart irrigation. It is estimated that an additional 15,800 acre-ft/yr in conservation could be achieved, for a total of 103,200 acre-ft/yr in the year 2020. Therefore, the implementation of smart irrigation results in approximately 18 percent more reduction of potable water demand. This approach could over-estimate water savings since the number of City properties with underground irrigation systems and automatic controllers is unknown. In addition, future implementation would depend on available funding, customer acceptance, reliability, and commercial availability of smart irrigation controllers. More detailed studies would be needed to determine the full benefits of a smart irrigation program.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

Amount of Recycled Water (Treated Wastewater) Used

The amount (or volume) of recycled water (treated wastewater) used by year 2020 was the second performance measure selected to determine how well an alternative meets the sub-objective of enhancing the efficient use of natural resources.

The traditional sources of water for the City of Los Angeles (surface water supplies from the Owens Valley; imported water from the Colorado River; imported water from Northern California via the State Water Project; and local groundwater) are becoming increasingly limited due to competition, environmental regulations and cost. To augment these supplies, the City has been expanding upon its existing recycled water program. This program utilizes treated wastewater for non-potable demands, such as landscape irrigation, industrial processes, and seawater barrier (that protects the region's groundwater from seawater intrusion). The potential amount of recycled water used is dependent on the amount of recycled water available to be reused (i.e., the size of the upstream water reclamation plants) and the location of potential non-potable demand customers. *Volume 2: Water Management* discusses the method used to estimate demands for recycled water. As discussed in the next section, the City is also considering the beneficial use of dry and wet weather runoff.

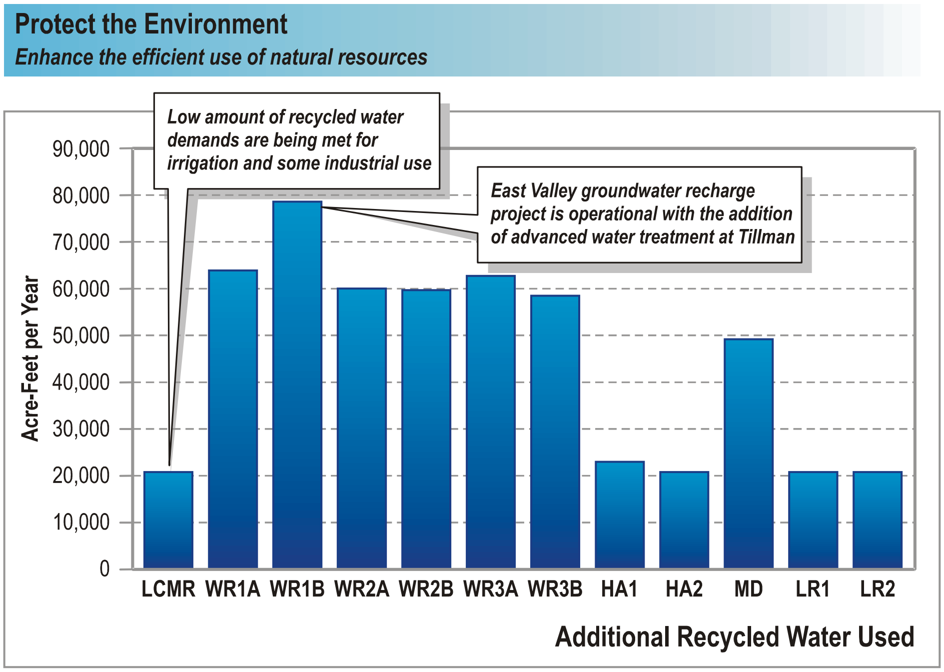


Figure 5-8
Report Card Summary for Enhancing the Efficient Use of Natural Resources (Additional Recycled Water Used)

As shown in Figure 5-8, the potential amount of use for recycled water varies for each alternative by the year 2020. The higher (taller) bars in the figure project a greater volume of recycled water being used by 2020 (reflecting a more efficient use of natural resources). The lower (shorter) bars in the chart project a smaller volume of recycled water being used by 2020 (reflecting a less efficient use of natural resources). Typically, one acre-foot of water supplies two average Southern California families for one year.

Figure 5-8 shows a comparison of the preliminary alternatives for this performance measure.

- The WR (water resources) alternatives (WR1a, 1b, 2a, 2b, 3a, & 3b) most efficiently use natural resources compared to the other alternatives, because they use more recycled water. Alternative WR1b includes the highest amount of recycled water used, because it assumes that the East Valley groundwater recharge project is operational with the addition of advanced treatment at Tillman.

- Alternative LCMR (low cost/minimum requirements) least efficiently uses natural resources compared to other alternatives because it provides only a minimum amount (low level, comparatively) of recycled water usage.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

Amount of Dry and Wet Weather Urban Runoff Beneficially Used

The amount of beneficially used dry and wet weather runoff is the third performance measure used to compare the ability of each alternative to "enhance the efficient use of natural resources" as a means of protecting the environment.

For the IRP, "beneficial use" of dry weather runoff is defined as the runoff managed from those options that either reduce the volume of runoff generated (i.e., through the use of smart irrigation controllers) or those that divert and treat runoff in dedicated urban runoff plants and then use the effluent to meet non-potable demands. For a detailed description of these components in each alternative, refer to Appendices B through M.

The "beneficial use" of wet weather runoff is defined as the runoff managed from those options that percolate runoff into the groundwater table or capture runoff and use it for irrigation. These options include cisterns, neighborhood recharge, and regional recharge. For a detailed description of these components in each alternative, refer to Appendices B through M.

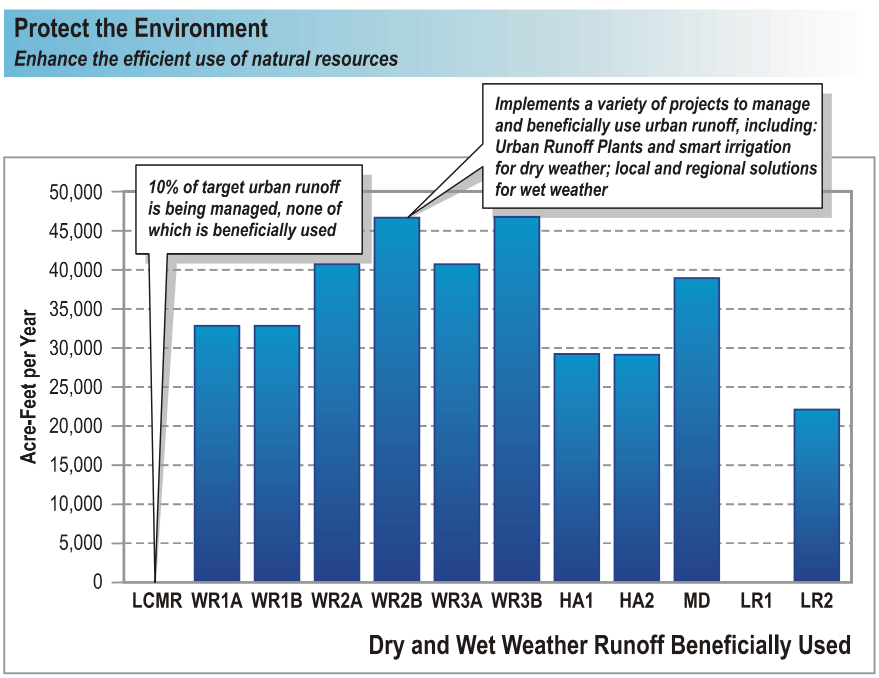


Figure 5-9
Report Card Summary for Enhancing the Efficient Use of Natural Resources (Dry and Wet Runoff Beneficially Used)

As shown in Figure 5-9, the amount of runoff that is beneficially used varies for each alternative in year 2020. Larger volumes of beneficially used runoff, represented by higher (taller) bars, reflect a more efficient use of natural resources. Smaller volumes of beneficially used runoff, represented by lower (shorter) bars, reflect a less efficient use of natural resources.

Alternatives WR2b and WR3b (Water Resources) beneficially uses the highest amount of dry and wet weather runoff. As described in detail in Appendices B through M of this document, these alternatives include ubran runoff plants and smart irrigation controllers for dry weather runoff, and cisterns and neighborhood and regional recharge for wet weather runoff.

In contrast, Alternatives LCMR (Low Cost/Minimum Requirements) and LR1 (Low Risk) beneficially use no dry or wet weather runoff. These alternatives do not include options that provide a beneficial use of runoff.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

5.3.3.3 Report Card for the Sub-Objective "Promote Water Self-Sufficiency

This performance measure indicates how self-sufficient the City is in terms of water supply. It is measured in the cost savings due to a reduction in bringing imported water to Los Angeles. To estimate this performance, each alternative's volume of recycled water, conservation, and runoff that is beneficially used was added together. This amount reflects the total potable water demand that could be offset. Table 5-3 shows these volumes.

Table 5-3
Potable Water Demand Offset

IRP Alternative	Recycled Water (acre-ft/yr)	Conservation[1] (acre-ft/yr)	Runoff[2] (acre-ft/yr)	Total (acre-ft/yr)
LCMR	20,800	87,000	0	107,800
WR1a	64,100	87,000	32,900	184,000
WR1b	78,900	87,000	32,900	198,800
WR2a	59,900	87,000	40,800	187,700
WR2b	59,700	87,000	46,600	193,300
WR3a	63,000	87,000	40,800	190,800
WR3b	58,600	87,000	46,600	192,200
HA1	20,800	87,000	29,100	136,900
HA2	20,800	87,000	29,100	136,900
MD	49,500	87,000	39,000	175,500
LR1	20,800	87,000	0	107,800
LR2	20,800	87,000	22,100	129,900

Notes:
1 –not including smart irrigation (per 2000 UWMP)
2 –includes for dry weather: smart irrigation, diversion to URPs with reuse; for wet weather: cisterns, neighborhood recharge, and regional recharge.

Because imported water from the Metropolitan Water District (MWD) is the most expensive source of fresh water, MWD's future cost of providing this water was multiplied by the total volume of potable supply offset. This results in a total annual cost savings, expressed in future 2020 dollars, to the City.

The projection of MWD's future cost of imported water was based on the agency's most recent draft financial plan. This plan projected water rates for the next 10 years, when the bulk of its capital improvement program will be complete. After 2010, projected rates were extrapolated using inflation. By 2020, the average cost of MWD's imported water was estimated to be $372 per acre-foot.

Figure 5-10 presents a summary of the cost savings due to imported water reductions.

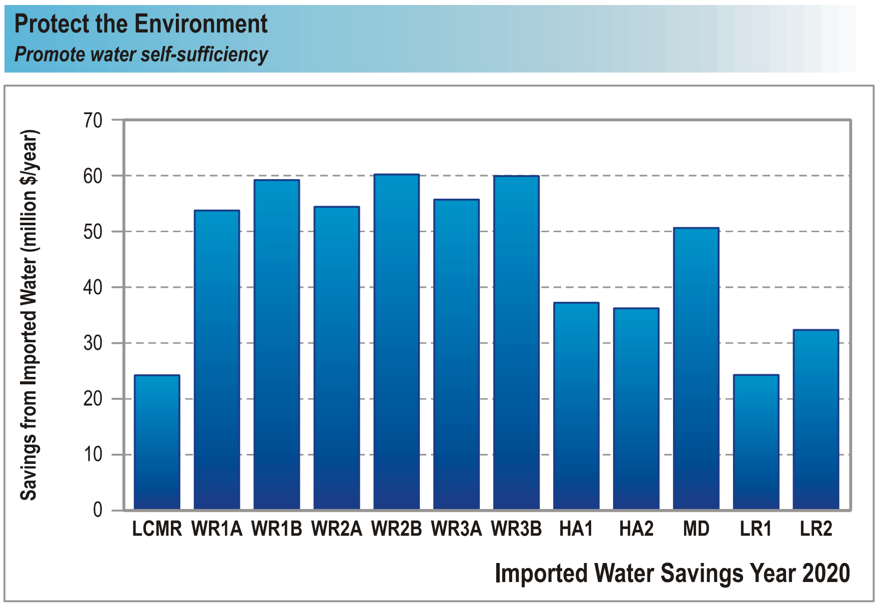


Figure 5-10
Report Card Summary for Promote Water Self–Sufficiency (Imported Water Savings)

As shown in Figure 5-10, WR2b has the greatest cost savings due to imported water reductions. This alternative implements the highest levels of additional recycled water and conservation, as well as using urban runoff for beneficial uses. The LC1 and LR1 alternatives have the lowest cost savings as these alternatives only implement some additional levels of recycled water, but no additional conservation or beneficial reuse of urban runoff.

The capital and operation and maintenance costs for generating and distributing recycled water or beneficially using runoff are included as performance measures for the subobjective "Provide Services Cost Effectively." See Sub-section 5.3.4.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

5.3.3.4 Report Card for the Sub-Objective Protect Air Quality

The estimated amount of additional energy projected is a performance measure used to measure the ability of each alternative to "protect air quality" as a means of protecting the environment. For the IRP, the estimated total net energy projected was selected as an indirect measurement of air pollution, because power plants are a significant source of air pollution.

The amount of additional energy projected in each alternative due to energy-intensive projects, such as treatment plants and pump stations, are presented in Figure 5-11.

Since more energy used suggests more pollution, the lower (shorter) bars in the chart reflect better protection of air quality by year 2020.

For wastewater treatment, the additional energy requirements are based on current usage at the plants, which is increased to account for the projected increases in flow at the facilities. Additional energy usage is also added for new processes needed to provide advanced treatment at the upstream water reclamation plants. Table 5-4 summarizes the energy requirements for each alternative.

For the sewage collection system, energy will be needed to pump sewage into and/or out of storage tanks but the energy use is relatively low compared to the energy needs of the treatment plants. The energy use would be intermittent and short duration and dependent on storm intensity and frequency. In some years the storage may not be activated.

For the recycled water system, all future energy requirements are based on the amount of pumping required to serve the projected demands. Variations in elevations between the treatment plants and users, friction losses in the pipelines, and maintaining a minimum level of standard service pressure are considered in estimating the total required energy for future recycled water systems. Table 5-4 summarizes the energy requirements for each alternative.

For runoff, future energy requirements are based on the energy required to: pump runoff to urban runoff plants and the energy used within the plant (both dry and wet weather runoff), pumping at the diversions to wastewater (dry weather) and cistern pumping (wet weather). Table 5-4 summarizes the energy requirements for each alternative.

Table 5-4
Proposed Energy Usage in 2020

IRP Alternative	Wastewater (kW-hr/yr)	Recycled Water (kW-hr/yr)	Runoff (kW-hr/yr)					TOTAL (kW-hr/yr)
			Diversion to WW (Dry Weather)	URPs (Dry Weather)	URPs (Wet Weather)	Cisterns (Wet Weather)	Runoff Subtotal	
LCMR	160,000,000	36,300	300,000	-	16,640,000		16,940,000	177,000,000
WR1a	280,000,000	293,600	540,000	-	15,080,000	187,740,000	203,360,000	483,700,000
WR1b	280,000,000	139,100	540,000	-	15,080,000	187,740,000	203,360,000	483,500,000
WR2a	244,000,000	218,900	270,000	-	12,480,000	187,740,000	200,490,000	444,700,000
WR2b	244,000,000	374,700	270,000	7,560,000	12,480,000	187,740,000	208,050,000	452,400,000
WR3a	206,000,000	164,700	270,000	-	12,480,000	187,740,000	200,490,000	406,700,000
WR3b	206,000,000	458,800	270,000	7,560,000	12,480,000	187,740,000	208,050,000	414,500,000
HA1	244,000,000	36,300	270,000	-	16,640,000		16,910,000	261,000,000
HA2	321,000,000	36,300	270,000	-	16,640,000		16,910,000	337,900,000
MD	237,000,000	243,700	270,000	-	12,480,000	187,740,000	200,490,000	437,700,000
LR1	212,000,000	36,300	2,910,000	-	176,592,000		179,502,000	391,500,000
LR2	168,000,000	36,300	600,000	-	15,808,000	2,607,500	19,015,500	187,100,000

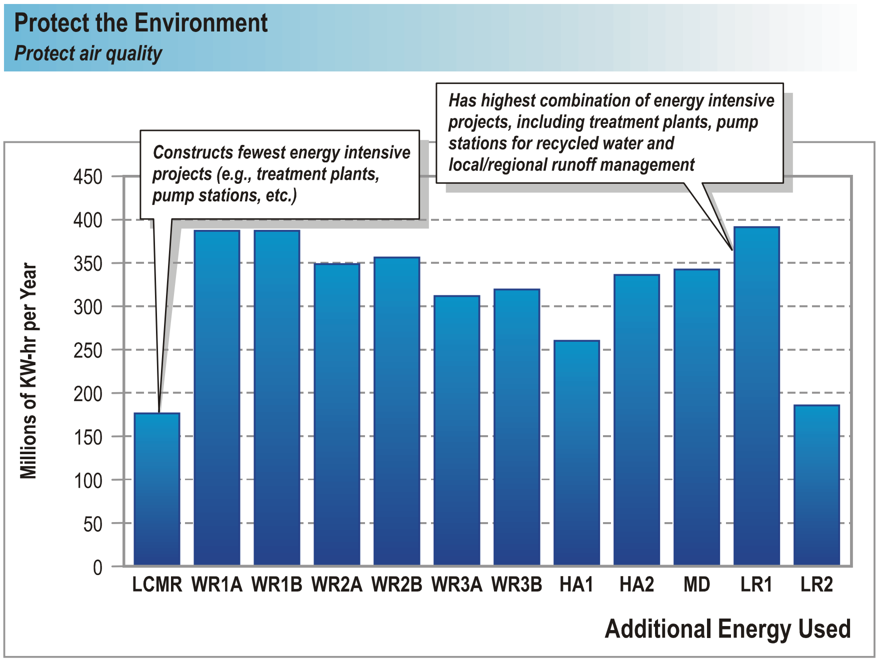


Figure 5-11
Report Card Summary for Protect Air Quality (Additional Energy Used)

As shown in Figure 5-11, Alternatives LCMR (Low Cost/Minimum Requirements) and LR2 (Low Risk) provide the most protection of air quality compared to other alternatives, because they construct the fewest energy-intensive projects (e.g., treatment plants, pump stations, etc.).

Alternative LR1 provides the least amount of protection of air quality compared to other alternatives because it includes the largest combination of energy-intensive operations including wastewater treatment, dry weather urban runoff plants, pumping for recycled water, and local/regional runoff management.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

5.3.4 Report Cards for the Objective "Enhance Cost Efficiency"

As discussed in Section 3, the objective "Enhance Cost Efficiency" has several sub-objectives. The main sub-objectives that could change from alternative to alternative were the sub-objectives, "Provide services cost effectively (4.1)" and "Maximize external funding opportunities (4.3)."

5.3.4.1 Report Card for the Sub-Objective "Provide Services Cost Effectively"

This performance measure is an indicator of how much the alternative will cost. It is expressed as an average monthly cost for all water services (water supply, wastewater, and stormwater) for a single-family residence. Currently, the average monthly cost for single-family residences is $63. It should be noted that a single-family resident does not see this cost on one bill. Water and wastewater are usually billed bi-monthly on the same statement, while stormwater is billed annually on property tax statements. Two cost data inputs are needed to estimate the future monthly costs for all water services for an average single-family residence—they being capital costs and annual O&M costs.

Figure 5-12 shows these cost data inputs, presented in 2004 dollars. It should be noted that these costs represent the additional costs due to IRP investments. Not included in these future costs are the costs associated with the City's baseline Capital Improvement Program (CIP), which are significant and needed for rehabilitation of the current system, near-term regulatory and system requirements, and security purposes. The details of the baseline CIP are included in *Volume 5: Adaptive Capital Improvement Program.* Also not included are the costs that could be necessary to meet future TMDLs, which have yet to be regulated for water quality protection.

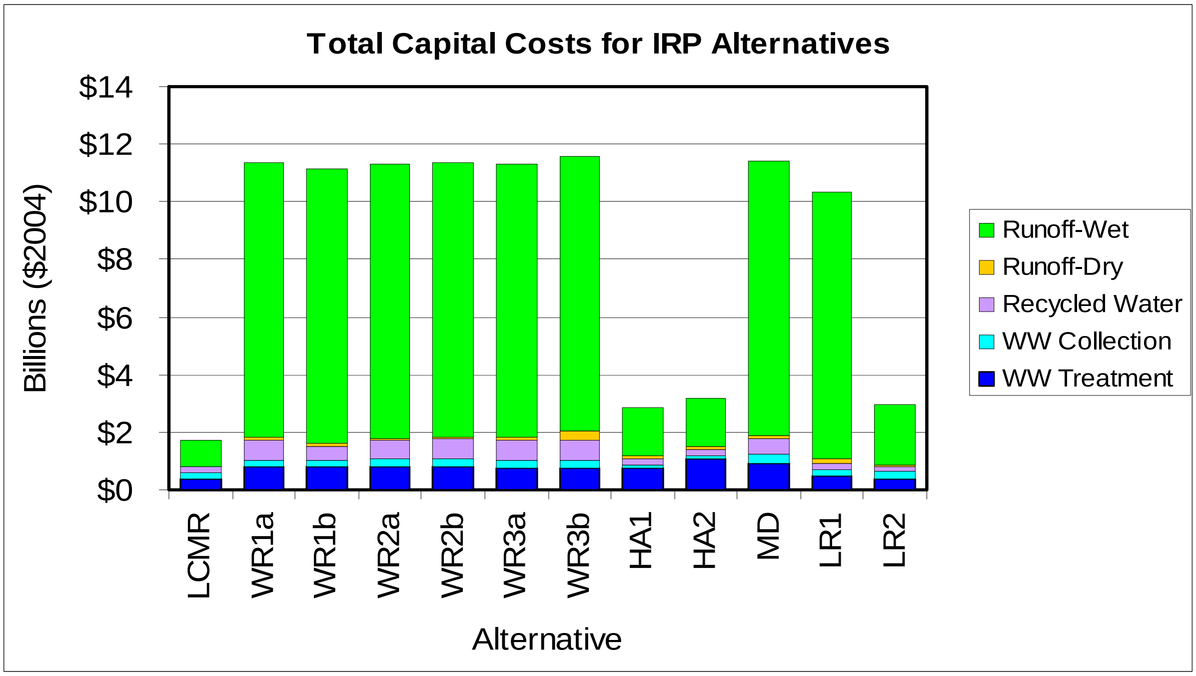
The first step to determining the future monthly costs for an average single-family residence is to escalate the capital and O&M costs to 2020 dollars using a 3 percent annual inflation rate. Then the 2020 capital costs for each alternative were financed at 5 percent for 30 years in order to get an annualized capital cost. These were then added to the 2020 annual O&M costs for each alternative in order to get total annualized costs. The total annualized cost was then allocated to single-family residences based on historical financial allocations. The total annualized costs (capital plus O&M) were divided by the projection of single-family residences of 590,000, then divided by 12 months in order to get the additional monthly water cost due to IRP investments. By adding the current monthly water cost of $63, a total monthly water services cost for an average single-family customer is derived (again, noting that this total is only reflective of IRP investments and does not include baseline CIP costs or costs associated with future TMDLs). Finally, the imported water cost savings shown in Figure 5-10 where converted into a monthly single-family cost reduction and subtracted from the total monthly cost in order to get a net monthly water services cost. Table 5-5 summarizes these calculations.

Table 5-5
Summary of Single-Family Monthly Water Services Cost Calculation

IRP Alternative	Additional Costs Due to IRP Investments ($2020) [1]					Monthly Water Services Cost for an Average Single-Family Customer		
	Capital Cost ($ millions)	Annual O&M Cost ($ millions)	Total Annualized Cost [2] ($ millions)	Allocated Annualized Cost [3] ($ millions)	Projected Single-Family Homes [4]	Add'nal [5]	Total [6]	Net [7]
LCMR	$3,473	$186	$412	$162	590,000	$23	$86	$80
WR1a	$22,964	$293	$1,787	$787	590,000	$111	$174	$161
WR1b	$22,532	$293	$1,759	$776	590,000	$110	$173	$158
WR2a	$22,939	$284	$1,776	$783	590,000	$111	$174	$160
WR2b	$23,048	$284	$1,783	$786	590,000	$111	$174	$159
WR3a	$22,952	$275	$1,768	$781	590,000	$110	$173	$159
WR3b	$23,454	$283	$1,808	$800	590,000	$113	$176	$161
HA1	$5,730	$254	$627	$255	590,000	$36	$99	$89
HA2	$6,422	$285	$703	$279	590,000	$39	$102	$93
MD	$23,080	$281	$1,782	$784	590,000	$111	$174	$161
LR1	$20,988	$818	$2,183	$987	590,000	$139	$202	$197
LR2	$6,020	$179	$570	$237	590,000	$33	$96	$89

Notes:
1 IRP investments do not include future costs associated with the City's baseline CIP or future TMDLs.
2 Represents annualized capital costs (capital costs financed at 5% for 30 years) plus annual O&M costs.
3 Allocation of total annualized costs to single-family customers based on historical financial allocations for water, wastewater, and stormwater.
4 Based on SCAG projections.
5 Allocated annualized costs divided by 12 months, divided by projected single-family homes.
6 Adds current monthly water services cost of $63 to get total for IRP investments.
7 Subtracts imported water cost savings (shown in Figure 5-10) in order to get net monthly costs.

Figure 5-13 presents a summary of the net single-family monthly water services costs for the alternatives. As shown in this figure, the LCMR alternative has the lowest estimated monthly cost. This is because this project only implements what is required to meet minimum regulatory requirements and water management objectives. The LR1 alternative has the highest cost as it implements a number of expensive runoff treatment and diversion projects to manage almost 100 percent of the target urban runoff (both dry and wet). Because the LR1 alternative treats almost 100 percent of the target runoff, it most likely represents the cost needed for full compliance with future TMDLs.



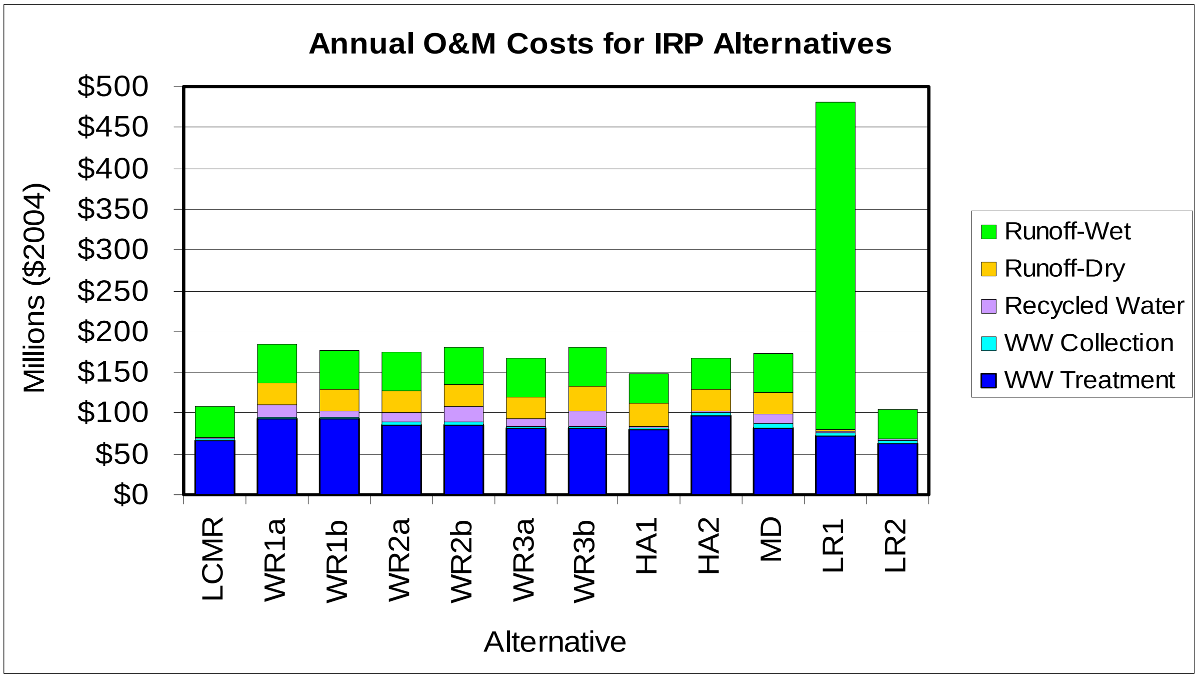


Figure 5-12
Capital and O&M Costs for IRP Alternatives

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

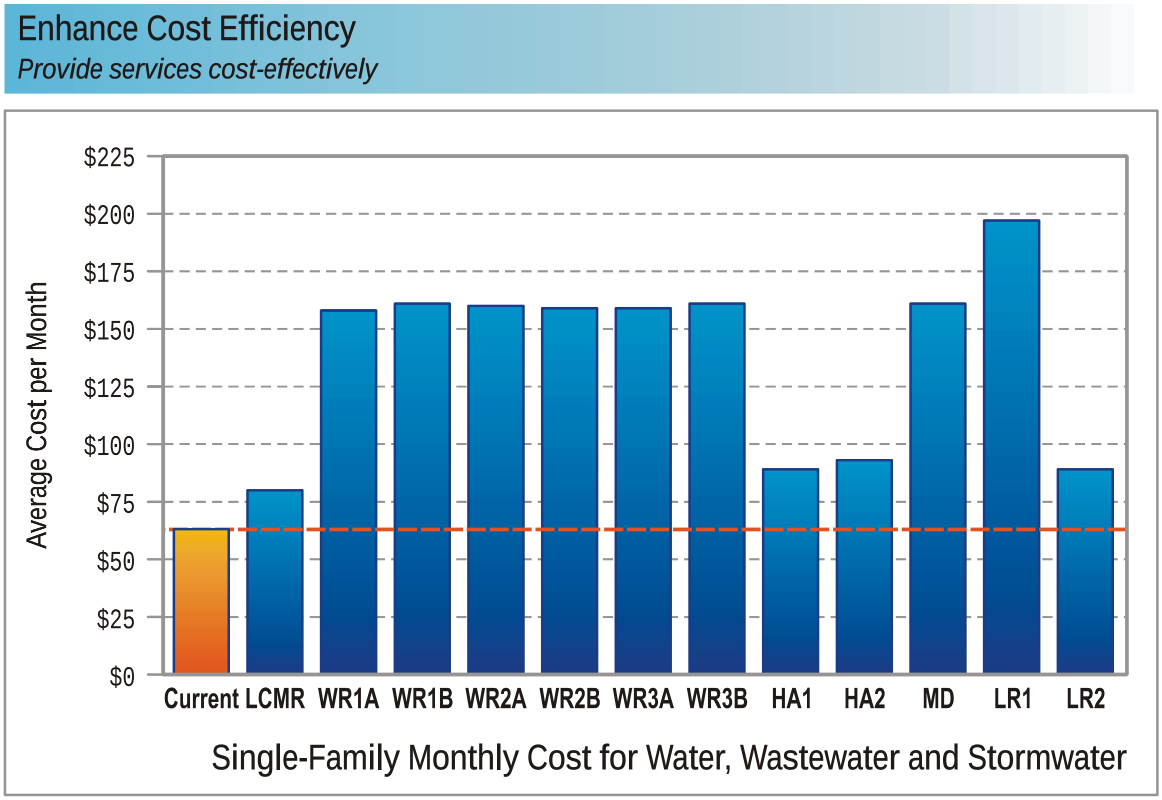


Figure 5-13
Report Card for Provide Services Cost Effectively (Single-Family Monthly Cost for Water Services)

5.3.4.2 Report Card for the Sub-Objective "Maximize External Funding Opportunities"

One important indicator of cost efficiency is the likelihood of the City receiving outside funding for its water resources projects. Based on research of available outside funding, each type of project (water supply, wastewater, and runoff) was given a score that indicates the likelihood of receiving outside funding. Those projects such as recycled water, urban runoff for beneficial use, and groundwater management received the highest score, while more traditional projects such as wastewater treatment plants and collection systems received the lowest score. When the wastewater, recycled water and runoff components were combined, forming comprehensive alternatives, a weighted average score was calculated. Refer to appendices B through M for the details on the components of each alternative.

As shown in Figure 5-14, water resources Alternatives WR2a through WR3b have the highest potential for getting outside funding, whereas the LCMR alternative has the lowest potential.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

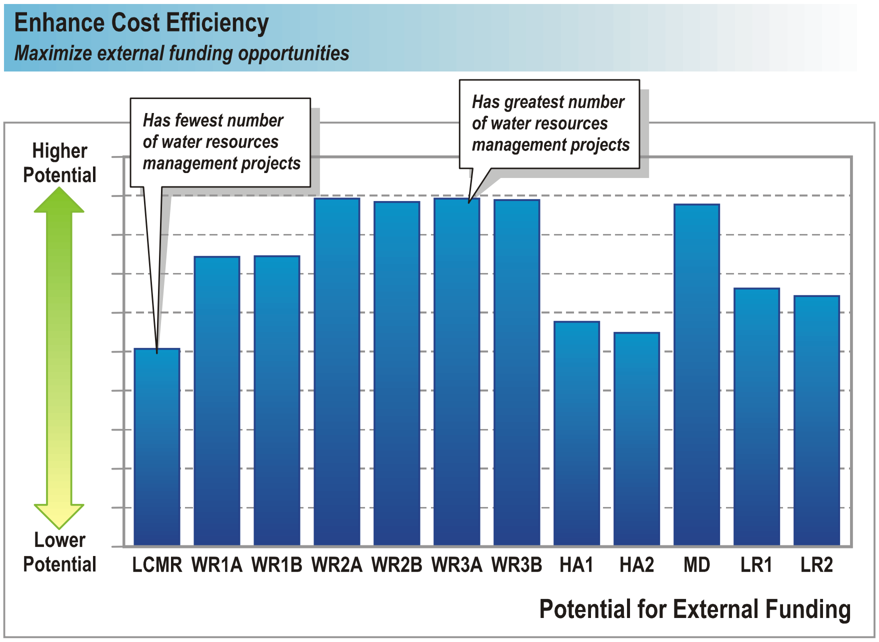


Figure 5-14
Report Card Summary for Maximize External Funding Opportunities (Provide for External Funding)

5.3.5 Report Card for the Objective "Protect Quality of Life"

As discussed in Section 3, the objective "Protect Quality of Life" has several sub-objectives. The main sub-objectives that could change from alternative to alternative were the sub-objectives, "Promote environmental justice (5.1), "Maximize economic benefits to Los Angeles (5.2)" and "Enhance public lands where possible (5.4)."

5.3.5.1 Report Card for the Sub-Objective "Promote Environmental Justice"

The principles of environmental justice are aligned with the quality of life of the low income and minority population in Los Angeles. The first principle of environmental justice is to avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.

In order to catagorize minority and low-income population, The Office of Management and Budget (OMB) issued Policy Directive 15, Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity, in 1997, establishing five minimum categories for data on race. Executive Order 12898 and the Department of Transportation (DOT) and Federal Highway Administration (FHWA) Orders on Environmental Justice address persons belonging to any of the following groups:

- Black - a person having origins in any of the black racial groups of Africa.
- Hispanic - a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.

- Asian - a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent.

- American Indian and Alaskan Native - a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition.

- Low-Income - a person whose household income (or in the case of a community or group, whose median household income) is at or below the U.S. Department of Health and Human Services poverty guidelines.

Since the 1997 creation of these abovementioned categories for data on race, the OMB, in its Bulletin No. 00-02, "Guidance on Aggregation and Allocation of Data on Race for Use in Civil Rights Monitoring and Enforcement," issued March 9, 2000, provided guidance on the way Federal agencies collect and use aggregate data on race. Added to the previous standard delineations of race/ethnicity was the category of:

- Native Hawaiian or Other Pacific Islander - a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

Considering that the goal of environmental justice is to avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations, environmental impacts must be defined. For this initial alternatives screening, an "impact" is defined as a long-term impact that involved the physical presence of major facilities such as:

- Wastewater treatment plants (new or expansions)

- Wastewater collection system facilities

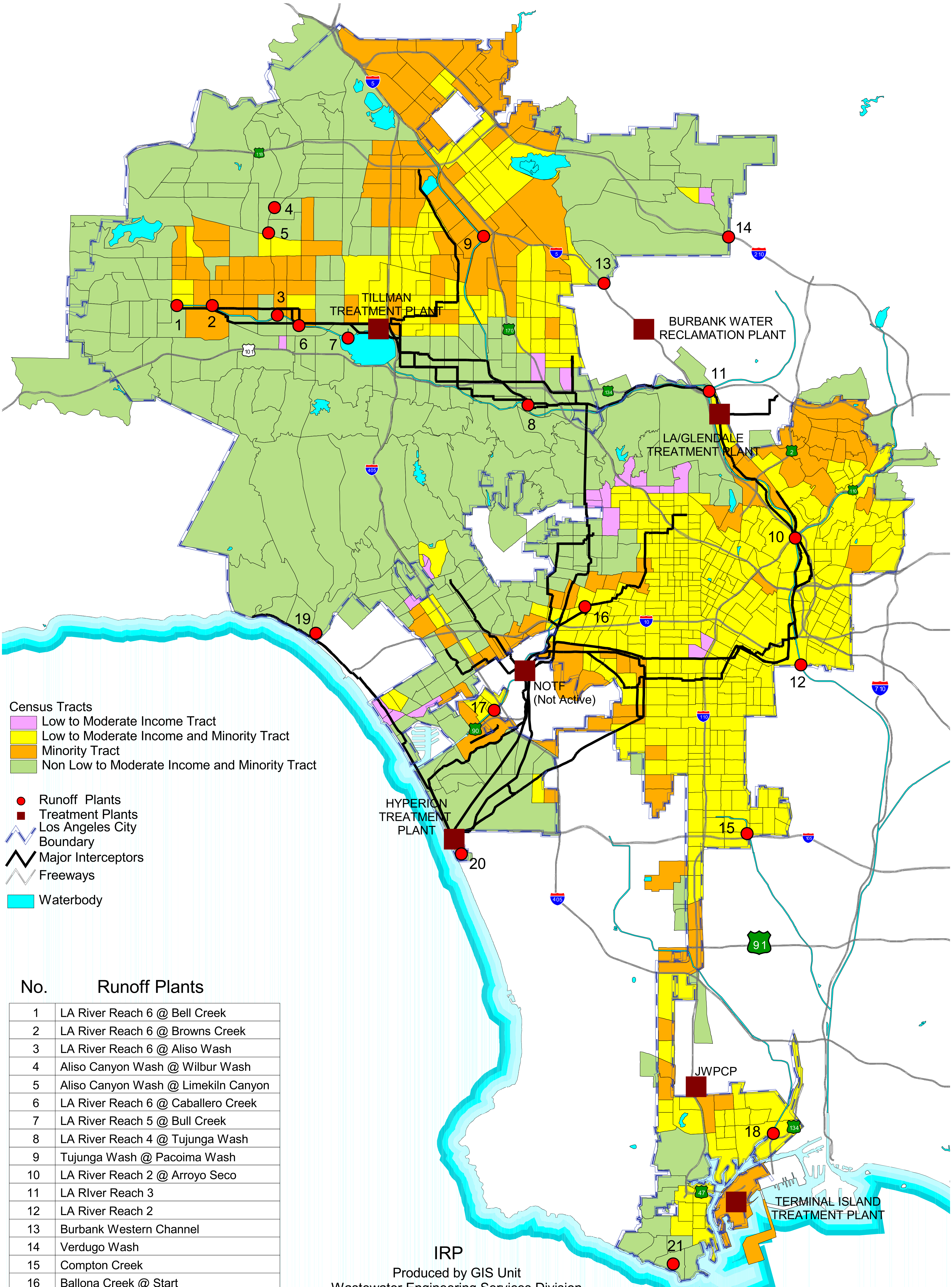
- Runoff treatment plants

The planning department of the City provided Geographic Information System (GIS) - based information on low-to-moderate (low/mod) income census tracts and information on census tracts by proportion of ethnicity.

The census tracts that contain 51 percent or more population in low/mod income group were considered low-income tracts.

Based on the descriptions of minority communities from the federal government, the minority census tracts were defined as census tracts with 51 percent or higher minority population (i.e., census tracts with 49 percent or lower white-non-Hispanic population). Figure 5-15 presents the low/mod income tracts in the City as well as the minority census tracts, as defined in the IRP.

Low to Moderate Income and Minority Tracts and New Runoff Facilities



No.	Runoff Plants
1	LA River Reach 6 @ Bell Creek
2	LA River Reach 6 @ Browns Creek
3	LA River Reach 6 @ Aliso Wash
4	Aliso Canyon Wash @ Wilbur Wash
5	Aliso Canyon Wash @ Limekiln Canyon
6	LA River Reach 6 @ Caballero Creek
7	LA River Reach 5 @ Bull Creek
8	LA River Reach 4 @ Tujunga Wash
9	Tujunga Wash @ Pacoima Wash
10	LA River Reach 2 @ Arroyo Seco
11	LA RIver Reach 3
12	LA River Reach 2
13	Burbank Western Channel
14	Verdugo Wash
15	Compton Creek
16	Ballona Creek @ Start
17	Ballona Creek @ Sepulveda Channel
18	Dominguez Channel
19	Santa Monica Bay 1 (SMB!)
20	Santa Monica Bay 2 (SMB2)
21	Santa Monica Bay 3 (SMB3)

IRP
Produced by GIS Unit
Wastewater Engineering Services Division
Bureau of Sanitation

Created 10/15/03

Thomas Bros Data reproduced with permission granted by THOMAS BROS MAP

Figure 5-15
Low to Moderate Income and Minority Tracts

In the City, approximately 68 percent of the census tracts are minority tracts, regardless of income. Approximately 53 percent are low-moderate income, regardless of ethnicity. When combined, approximately 70 percent of the census tracts in Los Angeles fall in the category of low-mod income or minority, as defined in the IRP, which suggests a strong correlation between minorities and low-moderate incomes. In terms of area, the low-mod/minority census tracts represent about 46 percent of the total area of the city.

The wastewater treatment plants (new and expansions), sewer system facilities and runoff treatment plants were plotted against the low/mod-minority census tracts and the impacted census tracts were counted. The following presents the results of the census tract analysis. Alternatives with fewer impacts to low income and minority communities reflect greater levels of environmental justice and protection of quality of life.

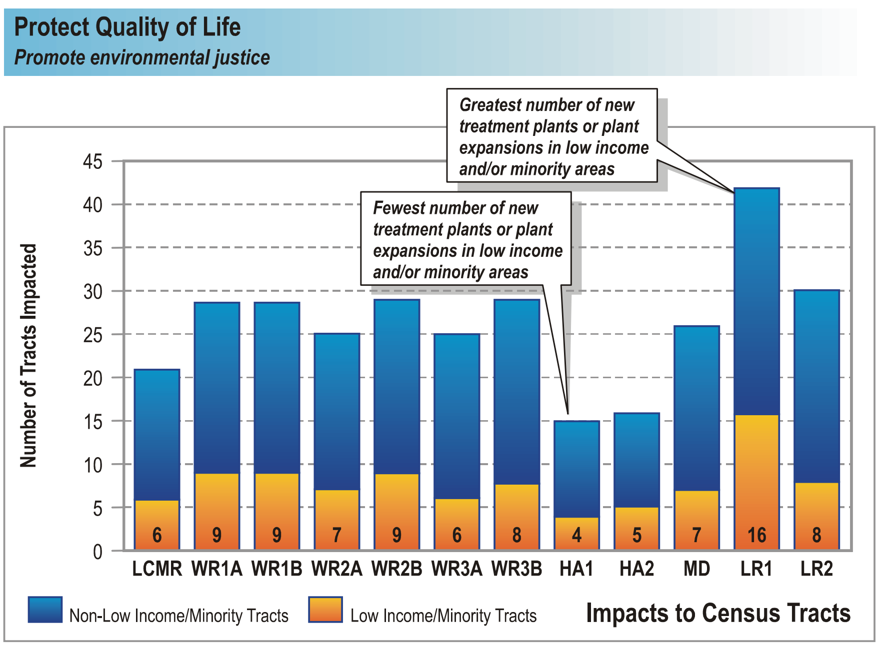


Figure 5-16
Report Card Summary for Promote Environmental Justice (Impacts to Census Tracts)

As shown in Figure 5-16, alternative LR1 would require the greatest number (16) of new treatment plants, plant expansions, or sewers in low income and/or minority areas. This alternative is, compared to the rest of the preliminary alternatives, the least aligned with the principles of environmental justice. Alternative HA1 would require the fewest number (4) of treatment plants or plant expansions in low income and/or minority areas.

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

A more detailed analysis of environmental justice will be conducted during the Environmental Analysis (EIR).

5.3.5.2 Report Card for the Sub-Objective "Maximize Economic Benefits to Los Angeles"

In economic development studies, more jobs are considered to reflect more economic benefits, which are aligned with the objective of protection of quality of life. In the IRP, each preliminary alternative would generate a different amount of jobs since they involve a different level of investment in infrastructure. Capital investment projects generate jobs directly related to design and construction activities. The creation of these types of jobs has a ripple effect in the economy, generating non-construction related jobs that can be measured using standard economic methods.

In this performance measure, one job measures one person working for one year. It includes the work specifically related to construction, but also the administrative work and engineering work. It also includes the jobs created to fabricate the equipment necessary for the facilities and the construction (many of these jobs would not be in Los Angeles), and the food, hotels, retail, sales, accounting, etc., that result from one person having an income for a year. These are, therefore, not public positions only, but mostly private sector jobs in the areas of manufacturing and services.

This performance measure uses information specific for the City of Los Angeles, based on a study prepared by the City as part of the Bond Acceleration Program (City of Los Angeles Department of Public Works, March 1993. City of Los Angeles Bond Acceleration Program. Bureau of Engineering. Prepared for the Mayor's office). The study prepared for the City of Los Angeles concludes that construction expenditures in the order of $710 million would result in the creation of 21,300 jobs, or approximately 30 jobs per million dollars of investment. For the IRP, the capital costs of the preliminary alternatives were used as the basis for calculating the number of jobs potentially generated, based on the factor of 30 jobs per million dollars of investment obtained from the information on the Bond Acceleration Program report. The capital costs for each alternative are presented in Appendices B through M. Figure 5-17 presents the results of the analysis for the preliminary alternatives.

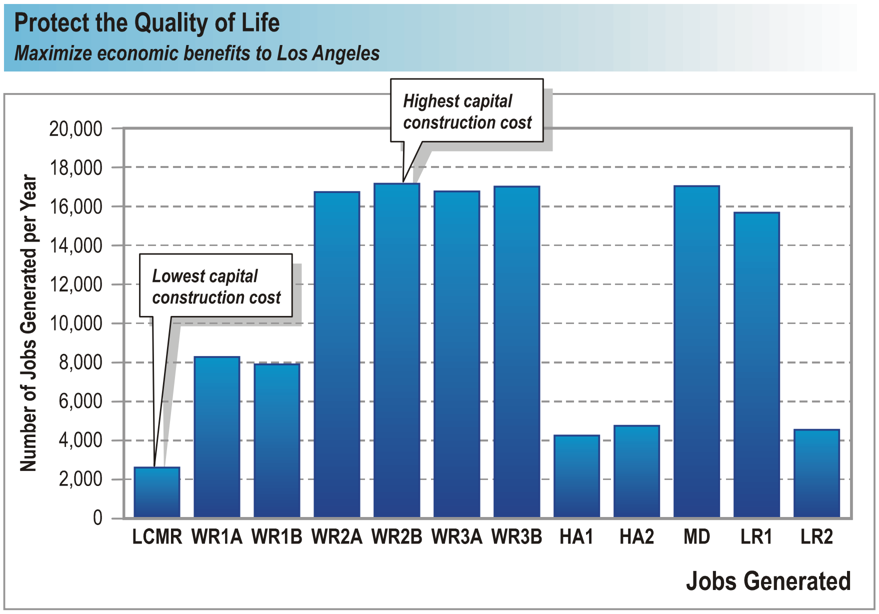


Figure 5-17
Report Card Summary for Maximize Economic Benefits to Los Angeles (Jobs Generated)

The total number of jobs created in the 20-year period would vary between 54,000 (2,700 jobs per year) and 343,000 (17,000 jobs per year) for the LCMR and the WR2b alternatives, respectively. One job measures one person working for one year (i.e., a situation where a person holds a job for 5 years counts as 5 jobs).

For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

5.3.5.3 Report Card for the Sub-Objective "Enhance Public Lands where Possible"

As discussed in Section 3, the focus of this sub-objective is increasing green space in Los Angeles. Therefore, the IRP selected a performance measure that looks at the total acres of vacant lots and/or abandoned alleys converted to neighborhood recharge areas and parks. This performance measure reflects the level of enhancement of the public lands by accounting for the acreage that would potentially be improved as a result of the implementation of the alternatives.

For the IRP, the runoff management option of converting vacant lots and abandoned alleys into neighborhood recharge facilities with parks and green space is considered an enhancement of public lands. The greater the amount of public land that is enhanced this way, the better the objective of protecting the quality of life is met. The amount of public lands that are enhanced for neighborhood recharge facilities (i.e. acres of positive impact) is estimated for each alternative in the figure above. Table 5-6 shows the calculations for the area for each alternative.

Table 5-6
Positive Impacts on Public Lands, Total Area by Alternative

Alternative	Flow to Neighborhood Recharge (mgd)	Flow to Neighborhood Recharge (ft^3)[1]	Area required with 2 ft/day infiltration (ft^2)[2,3]	Total Area (acres)[1]	Positive Impact Area (Area that is Vacant Lots/Abandoned Alleys) (acres)[1]
LCMR	0	0	0	0	0
WR1a & WR1b	390	52,135,590	26,067,795	598	450
WR2a & WR3a	326	43,580,006	21,790,003	500	380
WR2b & WR3b	326	43,580,006	21,790,003	500	380
HA	498	66,573,138	33,286,569	764	580
MD	326	43,580,006	21,790,003	500	380
LR1	0	0	0	0	0
LR2	473	63,231,113	31,615,557	726	550

Notes:
1. 1 MG = 133681 ft^3; 1 acre = 43,560 ft^2
2. Infiltration rate of 2 ft/day assumed based on the "Sun Valley Park Drain and Infiltration Study, 2004.
3. Based on GIS data, it is assumed that 76% of the total area used for neighborhood recharge would be from vacant lots and abandoned alleys.

As shown in Figure 5-18, Alternatives HA1 and HA2 (High Adaptability) are most effective in enhancing the public lands and protecting the quality of life. As described in detail in Appendices B through M of this document, High Adaptability alternatives include the most amount of neighborhood recharge facilities.

Alternatives LCMR (Low Cost/Minimum Requirements) and LR1 (Low Risk) do not enhance any public lands because they do not include any of the neighborhood recharge options. Therefore, they are least effective in meeting the objective of protecting the quality of life. For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

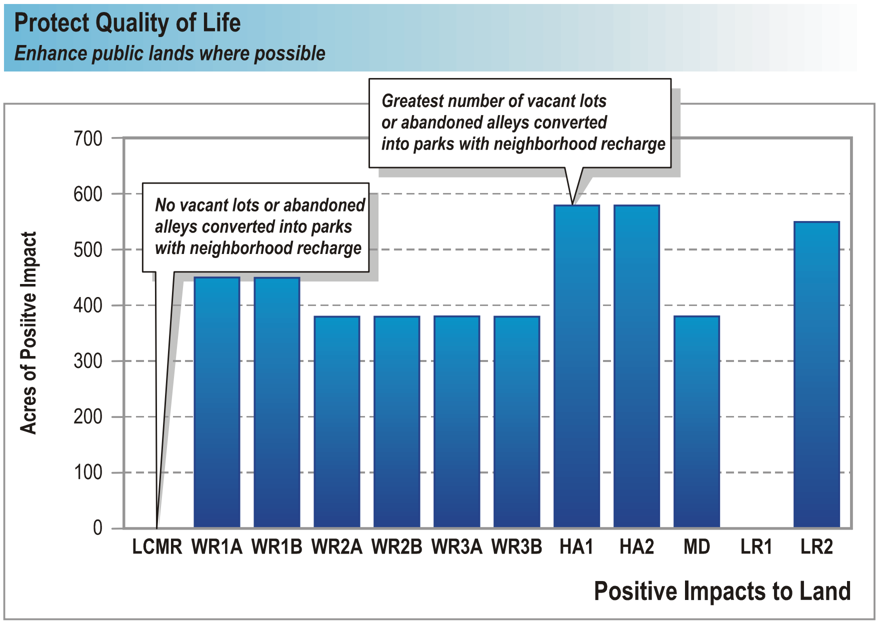


Figure 5-18
Report Card Summary for Enhance Public Lands Where Possible (Positive Impacts to Land)

5.4 Ranking of Preliminary Alternatives

As discussed in Subsection 5.2, the IRP team used the report card data for each alternative and the preference information obtained from the Steering Group to calculate scores for each alternative.

There are five basic steps for the scoring of alternatives:

- First, the technical analysis provides information about the performance of the alternative in the report card.
- Next, we use that information in the report card to translate the performance into a score that reflects the level of satisfaction that the alternative provides by accomplishing the objective. In order to do that, we asked Steering Group members to fill out the "Performance Preference Survey" (see Appendix A).
- In the third step, we take into account the weight (the relative importance) of a given objective, using the information provided by Steering Group members in the "Weighting Matrix Survey." (see Appendix A).
- We repeat these steps for each objective and performance measure, and, we add all the results to obtain the total score of the alternative.
- Finally, we compare each alternative to one another, based on their total score. Figure 5-19 presents an example of the calculation.

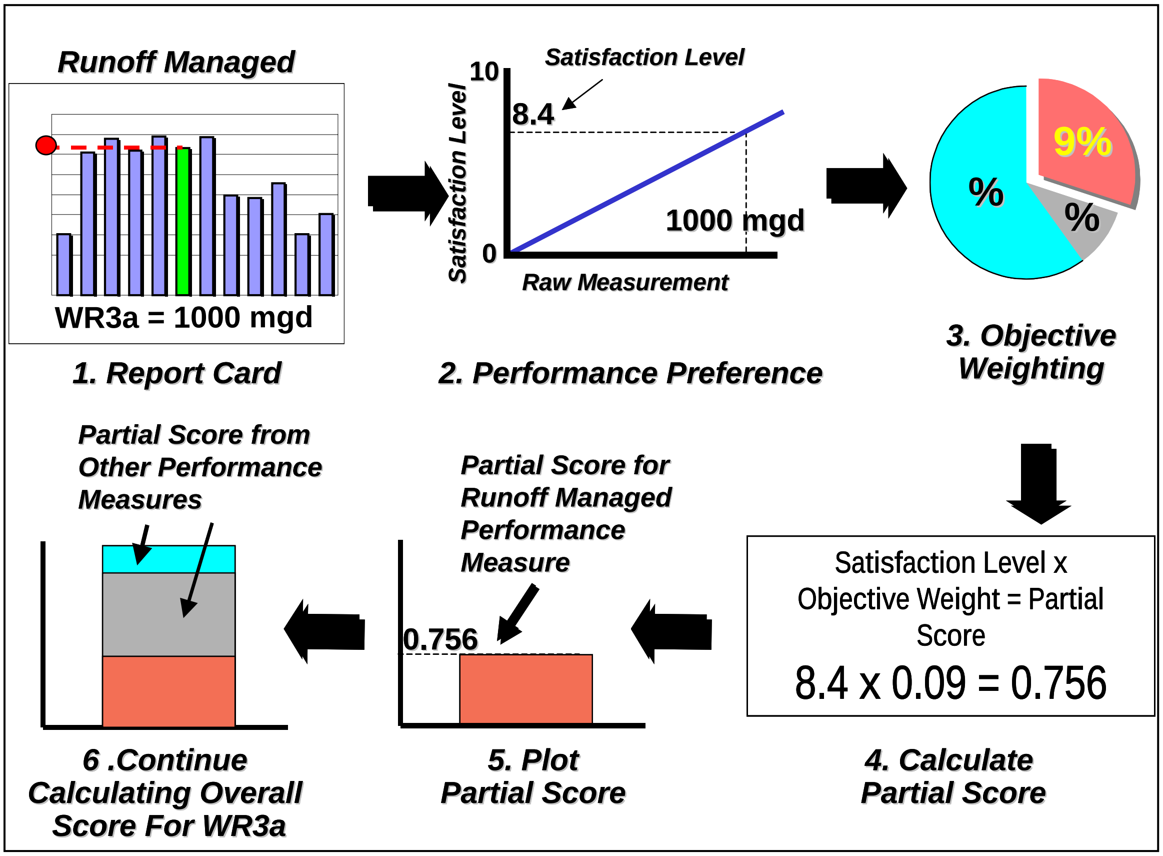


Figure 5-19
Example of How Scores are Calculated

After preparing scores for each of the Steering Group members (56), the number of times each alternative was ranked highest by each Steering Group member was counted. Figure 5-20 shows the results of this analysis. The figure shows that 20 Steering Group members ranked Alternative HA1 the highest, according to the survey preference information provided to the team. Alternative WR3b was the next highest, with 5 members ranking it highest. No members ranked LCMR, WR1a or MD the highest.

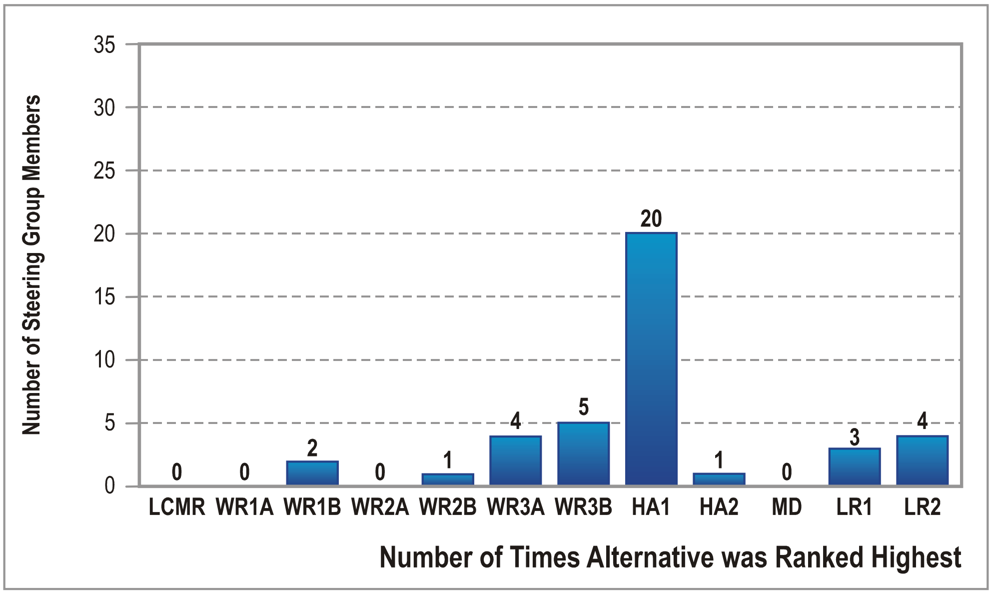


Figure 5-20
Number of Times Alternative Ranked Highest

Figure 5-21 presents a summary of the number of times each alternative ranked in the top two for each Steering Group member. As shown in the figure, 26 members ranked HA1 in the Top 2, 13 member ranked LR2 in the top 2 and 11 member ranked WR3b in the top 2. Again, no members ranked LCMR, WR1a or MD in the top 2.

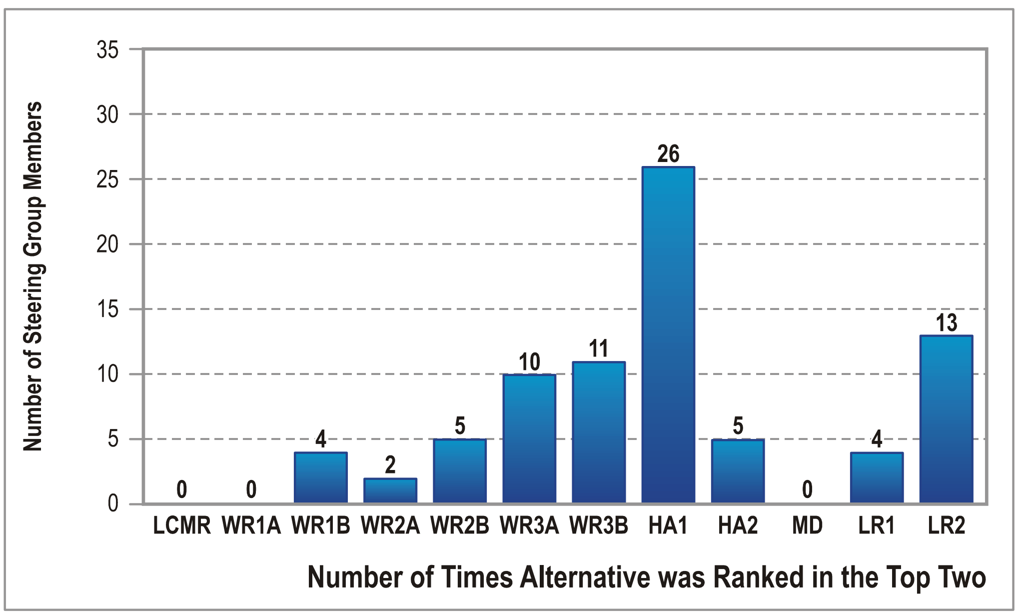


Figure 5-21
Number of Times Alternative Ranked in the Top Two

Using this analysis, the IRP team concluded that HA1 was the top ranking preliminary alternative. Alternatives LCMR, WR1a and MD consistently ranked the lowest. Of the water resources alternatives, WR3a and WR3b ranked the highest.

5.5 Feedback from Steering Group

The results of the analysis were presented to the Steering Group members, and discussed during and after Workshop 8. The feedback from the stakeholders was, in some cases, very specific on a particular issue (e.g., maximizing the use of recycled water, maximizing the use of neighborhood recharge options, uncertainty on population projections, etc.), but feedback was also provided in more general terms about the methodology used, the alternatives presented and the results of the analysis.

In general, there was agreement with the results that were presented in Workshop 8, with some general feedback from Steering Group members. This feedback can be grouped into comments on the following areas:

- Lack of clarity regarding the options included in each alternative: some Steering Group members felt that a graphical map representation of the alternatives and more detail as to the elements included in each one of the preliminary alternatives was necessary to agree or disagree with the decision model results

- Alternative HA1 does not include sufficient levels of wastewater recycling and urban runoff beneficially used: Alternative HA1, with the highest score for the majority of Steering Group members, was perceived as falling short of implementing projects that are preferred by a great number of stakeholders.

- Decision-making methodology should not be the sole basis for short-listing alternatives: the decision model was perceived by some Steering Group members as a valuable tool for organizing and processing information, but with limitations regarding its comprehensiveness and the ability to reflect all the things that are important to the Steering Group members. Additionally, many Steering Group members felt that the results of the decision model were not entirely representative of the whole group, even though a great number of them participated by filling out the surveys.

- Need to look at the benefits in relation to the costs: many Steering Group members felt that the analysis needed to include a more explicit comparison of the benefits and the costs included in each alternative.

- None of the alternatives presented is completely satisfactory, so there is a need to develop new alternatives: many Steering Group members felt that none of the 12 preliminary alternatives included their desired level of implementation of options, or their desired combination of options.

This feedback, used in conjunction with the information obtained from the decision model, was valuable in the development of hybrid alternatives. The process for developing the hybrid alternatives is presented in Section 6.

Section 6
Hybrid Alternatives

6.1 Introduction

Developing and evaluating alternatives is an essential task of the IRP, since the process will ultimately result in the selection of a preferred alternative, and the preferred alternative will be the basis for the Capital Improvement Program (CIP) and financial plan.

Up to this point, several steps have been taken to create a set of alternatives that will continue on to the final stages of the evaluation process. These steps include creating a set of twelve preliminary alternatives that were designed to push the envelope (see Section 4). These alternatives were evaluated based on the preferences defined by the Steering Group (see Section 5). The preliminary alternatives were presented to the Steering Group for comments and feedback. Using information gained from this process, the IRP team created hybrid alternatives for further evaluation. Figure 6-1 summarizes this approach.

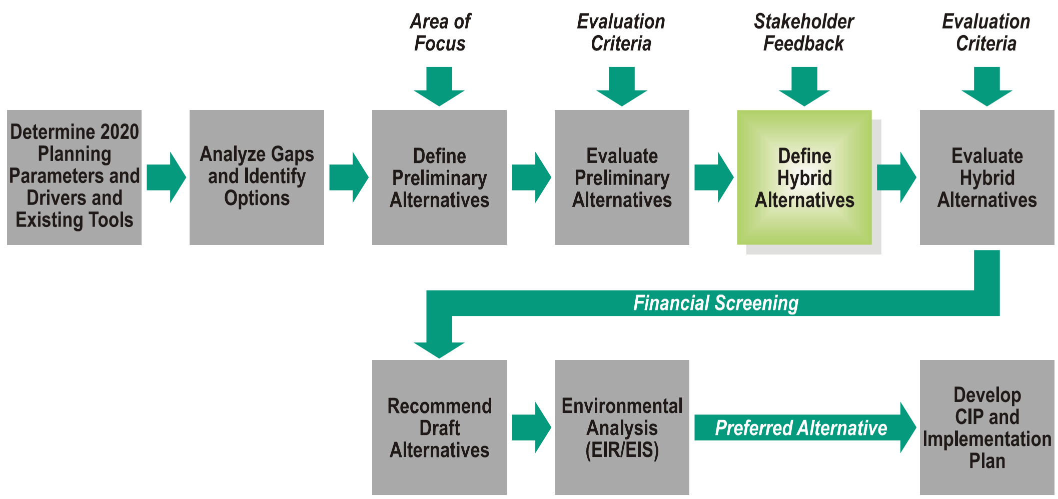


Figure 6-1
Alternatives Analysis Approach – Defining Hybrid Alternatives

The hybrid alternatives are described in this section. Section 7 presents a discussion of the evaluation of hybrid alternatives.

6.2 Approach to Creating Hybrid Alternatives

To create the hybrid alternatives, the team sought feedback from the Steering Group and identified key concepts to carry forward. The goal was to create alternatives that combined the best elements of the preliminary alternatives, thereby allowing them to perform better than the original preliminary alternatives.

6.2.1 Steering Group Feedback

The IRP team sought feedback from the Steering Group using several methods including:

- Presentation and discussion at Workshop 8
- Presentation and discussion at follow-up workshop
- Mailed surveys
- Emailed comments
- Phone conversations
- One-on-one meetings

In general, the team heard the following major comments from the Steering Group:

- General agreement with results presented in Workshop 8
- Summary of Comments on the Process:
  1. Decision-making methodology should not be the sole basis for short-listing alternatives
  2. Need to look at the benefits in relation to the costs
- Summary of Comments on the Alternatives:
  1. Alternative HA1 does not include sufficient levels of wastewater recycling or urban runoff beneficially used
  2. Need to develop new alternatives that try to maximize benefits within reasonable costs

6.2.2 Key Concepts in Creating Hybrid Alternatives

Using feedback from the Steering Group and staff, the IRP team identified key concepts to be considered when creating hybrid alternatives.

6.2.2.1 Wastewater Story

The following were identified as key concepts for the wastewater system:

- Need more treatment capacity due to increased flows and runoff management
- Do not need a brand new plant, it is more cost effective and less disruptive to add treatment capacity at the existing plants

- Adding capacity of existing facilities (e.g., Tillman, LAG or Hyperion) has tradeoffs such as costs and flexibility

Based on these concepts, the hybrid alternatives build on three series of wastewater treatment combinations:

1) Expand Hyperion to 500 mgd and upgrade Tillman to advanced treatment

2) Expand Tillman to 80 mgd and LAG to 30 mgd (and upgrade both to advanced treatment)

3) Expand Tillman to 100 mgd (advanced)

Figure 6-2 below shows the three wastewater combinations.

Figure 6-2
Wastewater Components in Hybrid Alternatives

For each of the wastewater combinations, the same collection system components are included. These are described below:

- Build new Glendale Burbank Interceptor Sewer (GBIS)
- Build new North East Interceptor Sewer (NEIS) Phase 2
- Either build a new 60 million gallon (MG) buried wet weather storage tank with real-time control at Tillman or construction of the Valley Spring Lane Interceptor Sewer (VSLIS)

The NEIS Phase 2 project is included in the City's baseline CIP, however, the odor control portion of this project will be identified as part of the IRP.

6.2.2.2 Water Management Story

For the water components, the following were identified as key concepts that were important to the Steering Group member, staff, and the technical team:

- Increase levels of conservation
- Increase recycled water use
- Beneficially use runoff
- Balance costs

Based on these concepts, a series of options for meeting the water management needs were defined. While for the wastewater system each of the three options were on an either/or basis, for the water management, these three options build upon one another, indicating varying levels of water management. These include three levels of recycled water, dry weather runoff and wet weather runoff options:

- A - Meet minimum (current) regulatory requirements with coastal diversions and treatment; meeting DWP's currently planned recycled water program.
- B –Provide additional benefits: in addition to the previous task, add smart irrigation and some urban runoff reuse plants for dry weather runoff, add some neighborhood recharge for wet weather runoff, and add additional recycled water.
- C –Provide more benefits: in addition to the previous tasks, add additional urban runoff reuse plants and/or wetland treatment for dry weather runoff, add cisterns and regional recharge for wet weather and add higher levels of recycled water.

The City is not actively pursuing groundwater recharge of recycled water as part of the hybrid alternatives under the IRP. However, the City will continue to collaboratively work with sister agencies, professional organizations and community stakeholders to monitor the latest advances in water quality improvement technology, review treatment effectiveness and water quality information, address community concerns, and identify additional opportunities for efficient management of water resources.

For future reference, Appendix R contains a brief technical analysis of the impact of using recycled water for groundwater recharge in these hybrid alternatives.

6.2.2.3 Leadership Projects

In addition to each of the options included in the alternatives, for each series of alternatives, leadership projects were identified where there was a need for further investigation on the technicalities, implementability, constraints, effectiveness, etc. of the option prior to full scale implementation. These projects are detailed in Subsection 6.7.

6.2.3 Matrix of Hybrid Alternatives

The team combined the three wastewater combinations with the three levels of water management components to create a total of nine hybrid alternatives. Table 6-1 presents a summary of the general components of each hybrid alternative.

Table 6-1
Matrix of Hybrid Alternatives

		Water Management		
		A (Minimum Levels)	**B (Additional Benefits)**	**C (More Benefits)**
	Wastewater	■ Recycled ~20,000 acre-ft/yr (~40,000 homes) ■ Dry Runoff:10% ■ Wet runoff: 10%*	■ Recycled ~40,000 acre-ft/yr (~80,000 homes) ■ Dry runoff:30% ■ Wet runoff: 40%*	■ Recycled 45,000 - 60,000 acre-ft/yr (~120,000 homes) ■ Dry runoff:40% ■ Wet runoff: 50%*
1	Expand Hyperion to 500 mgd & upgrade Tillman	Hyb1A	Hyb1B	Hyb1C
2	Expand Tillman to 80 mgd and Expand LAG to 30 mgd (advanced)	Hyb2A	Hyb2B	Hyb2C
3	Expand Tillman to 100 mgd (advanced)	Hyb3A	Hyb3B	Hyb3C

Note: *Percent of estimated runoff generated from a ½ inch storm

Figure 6-3 includes the "Rainbow Chart" that details all of the options included in each of the hybrid alternatives. The following subsections discuss these components in greater detail.

6.3 Description of Hybrid Alternatives - Hyb1

Hybrid Alternative Series 1 includes Alternatives Hyb1A, Hyb1B, and Hyb1C. Figure 6-4 is a map showing the components in Hyb1A, Hyb1B, and Hyb1C. Appendix N provides more details on the Hyb1 alternatives.

6.3.1 Hyb1 – Wastewater Management

The Hyb1 alternatives include wastewater treatment and conveyance projects required to expand Hyperion to 500 mgd and upgrade Tillman to advanced treatment by year 2020. Hyb1A, Hyb1B, and Hyb1C focus on maximizing the use of existing process capacity at the Hyperion Treatment Plant near El Segundo. Existing capacity upstream in the system would be maintained [upgrade the Donald C. Tillman Water Reclamation Plant (Tillman) to advanced treatment, but maintain the Los Angeles-Glendale Water Reclamation Plant (LAG) as a Title 22 plant]. A higher percentage of wastewater than other alternatives would be conveyed to Hyperion requiring an expansion to 500 million gallons per day (mgd) by increasing the capacities of secondary clarifiers and digesters only. Tillman would be upgraded to advanced treatment to allow continued discharge of at least 30 mgd to the Los Angeles River.

Table 6-2 presents a summary of the wastewater treatment components included in Hybrid Alternatives Hyb1A, Hyb1B, and Hyb1C.

Table 6-2
Wastewater Treatment Components in Hybrid Alternatives Hyb1A, Hyb1B, and Hyb1C

Component	Hydraulic Capacity (mgd)			Level of Treatment (Effluent)	
	Current	Add'l	Total	Current	New
Donald C. Tillman Water Reclamation Plant	64 mgd	0 mgd	64 mgd	Title 22 with Nitrification & Denitrifcation[1]	Advanced Treatment[2]
LAG Water Reclamation Plant	15 mgd	0 mgd	15 mgd	Title 22 with Nitrification & Denitrifcation	Title 22 with Nitrification & Denitrifcation
Hyperion Treatment Plant	450 mgd	50 mgd	500 mgd	Secondary	Secondary
Total Hyperion Service Area	--	--	546 mgd[3]	--	--
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Advanced Treatment	Advanced Treatment

Notes:
1 As discussed in *Volume 1: Wastewater Management*, for the IRP it was assumed that the nitrification/denitrifcation projects currently under construction will result in a reduction of total capacity at Tillman by 0 to 20 percent (assumed 20 percent, from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 0 to 25 percent (assumed 25 percent, from 20 mgd to 15 mgd).
2 For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).
3 The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For the Hyb1 series, the effective capacity is 46 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 500 mgd at Hyperion = 546 mgd.

Figure 6-3
City of Los Angeles
Integrated Resources Plan (IRP) - *Hybrid Alternatives Matrix*

1	Option	LCMR	WR3a	HA1	LR1	Hyb1A	Hyb1B	Hyb1C	Hyb2A	Hyb2B	Hyb2C	Hyb3A	Hyb3B	Hyb3C
2	**Wastewater Treatment**													
3	Tillman - Upgrade treatment (64 mgd) (Advanced Treatment)	64 mgd	64 mgd		64 mgd	64 mgd	64 mgd	64 mgd						
4	Tillman - Upgrade and increase capacity to 80 mgd (Advanced Treatment)			80 mgd					80 mgd	80 mgd	80 mgd			
5	Tillman - Upgrade and increase capacity to 100 mgd (Advanced Treatment)											100 mgd	100 mgd	100 mgd
6	Tillman - Upgrade and increase capacity to 120 mgd (Advanced Treatment)													
7	Los Angeles-Glendale - Maintain existing capacity (15 mgd) (Title 22)	15 mgd				15 mgd	15 mgd	15 mgd				15 mgd	15 mgd	15 mgd
8	Los Angeles-Glendale - Increase capacity to 20 mgd (Title 22)													
9	Los Angeles-Glendale - Increase capacity to 30 mgd (Title 22)		30 mgd											
10	Los Angeles-Glendale - Upgrade treatment (15 mgd) (Advanced Treatment)				15 mgd									
12	Los Angeles-Glendale - Upgrade and increase capacity to 30 mgd (Advanced Treatment)			30 mgd					30 mgd	30 mgd	30 mgd			
13	New Reclamation Plant - Build 10 mgd capacity near downtown (Title 22)													
14	New Reclamation Plant - Build 30 mgd capacity in valley (Title 22)		30 mgd											
15	New Reclamation Plant - Build 10 mgd capacity near downtown (Advanced Treatment)													
16	New Reclamation Plant - Build 30 mgd capacity in valley (Advanced Treatment)													
17	Hyperion - Maintain existing capacity (450 mgd)			450 mgd					450 mgd	450 mgd	450 mgd	450 mgd	450 mgd	450 mgd
18	Hyperion - Increase capacity to 500 mgd	500 mgd	500 mgd			500 mgd	500 mgd	500 mgd						
19	Hyperion - Increase capacity to 550 mgd				550 mgd									
20	Total Effective Hyperion Service Area Treatment Capacity[2] (mgd)	546	546	529	607	546	546	546	529	529	529	521	521	521
21	Terminal Island - Maintain existing capacity (30 mgd)	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd
22	**Wastewater Sewer System**													
23	Build new interceptor sewer - Valley Spring Lane Interceptor Sewer	X	X		X									
24	Build new interceptor sewer - Glendale Burbank Interceptor Sewer (GBIS)	X	X	X	X	X	X	X	X	X	X	X	X	X
25	Build new interceptor sewer - North East Interceptor Sewer (NEIS) Phase 2	X	X	X	X	X	X	X	X	X	X	X	X	X
26	Build new interceptor sewer - for New Plant (10 mgd - 2 miles)													
27	Build new interceptor sewer - for New Plant (30 mgd - 2 miles)		X											
28	Build new buried storage tank - 60 MG at Tillman[3]			X		X	X	X	X	X	X	X	X	X
	Build new buried storage tank - 10 MG at Los-Angeles Glendale					X*	X*	X*	X*	X*	X*	X*	X*	X*
29	Build new buried storage tank - 20 MG at Los-Angeles Glendale		X*	X*										
30	Build new buried storage tank - 10 MG at new plant													
31	Build new buried storage tank - 20 MG at new plant		X*											
32	**Recycled Water (Non-Potable Demands)**													
33	Meet Los Angeles River minimum requirements using treated wastewater	X	X	X	X	X	X	X	X	X	X	X	X	X
34	Meet Irrigation/Industry demands using treated wastewater	X	X	X	Low	X	X	X	X	X	X	X	X	X
37	Recharge groundwater basin using treated wastewater													
39	Meet Irrigation/Industry demands using treated runoff (low/medium/high)						Low	Low		Low	Low		Low	Low
42	Recharge groundwater basin using treated runoff		High											
43	**Conservation Programs**													
44	Increase conservation efforts to DWP's planned 2020 levels	X	X	X	X	X	X	X	X	X	X	X	X	X
45	Increase conservation efforts further		X	X			X	X		X	X		X	X
46	**Dry Weather Urban Runoff**													
47	***Local/Neighborhood Solutions***													
48	Smart Irrigation		X	X			X	X		X	X		X	X
49	Increase public education and participation	X	X	X	X	X	X	X	X	X	X	X	X	X
50	***Regional Solutions***													
51	Diversion to Wastewater System (WW) or Divert to Urban Runoff Plant or wetlands and Beneficially Use (URP)[1]													
52	Divert - coastal (10 mgd)	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW
53	Divert - inland (Bell Creek 2.8 mgd)				WW									
54	Divert - inland (Browns Creek 3 mgd)				WW			WW			URP[4]			URP[4]
55	Divert - inland (Aliso Wash 1.8 mgd)				WW									
56	Divert - inland (Wilbur Wash 1 mgd)				WW			WW			URP[4]			URP[4]
57	Divert - inland (Limekiln Canyon 1.5 mgd)				WW			WW			URP[4]			URP[4]
58	Divert - inland (Caballero Canyon 1mgd)				WW			WW			URP[4]			URP[4]
59	Divert - inland (Bull Creek 2.4 mgd)				WW			WW			URP[4]			URP[4]
60	Divert - inland (Tujunga Wash 6 mgd)				WW									
61	Divert - inland (Pacoima Wash 7 mgd)				WW			WW			URP[4]			URP[4]
62	Divert - inland (Arroyo Seco 5 mgd)				WW									
63	Divert - inland (Reach 3 LAR 4 mgd)				WW									
64	Divert - inland (Reach 2 LAR-12 mgd)				WW									
65	Divert - inland (Burbank Western Channel 1.8 mgd)				WW									
66	Divert - inland (Compton Creek 2.6 mgd)				WW		URP	URP		URP	URP		URP	URP
67	Divert - inland (Ballona Creek 3.3 mgd)				WW		URP	URP		URP	URP		URP	URP
68	Divert - inland (Sepulveda Channel 16 mgd)				WW									
69	Divert - inland (Dominguez Channel 16 mgd)				WW									
73	Percent of Dry Weather Runoff Managed (of watershed - 97 mgd)	10%	21%	21%	100%	10%	26%	42%	10%	26%	42%	10%	26%	42%
75	**Wet Weather Urban Runoff**													
76	***Local/Neighborhood Solutions***													
77	New/Redevelopment Areas - On-site treatment/discharge	X	X	X	X	X	X	X	X	X	X	X	X	X
78	New/Redevelopment Areas - On-site percolation	X	X	X	X	X	X	X	X	X	X	X	X	X
79	Retrofit Areas - Cisterns (On-site storage/use)													
80	Residential		X											
81	Schools		X					X			X			X
82	Government		X					X			X			X
83	On-site percolation (infiltration trenches/basins, reduce paving/hardscape)													
84	Residential		X											
85	Schools		X					X			X			X
86	Government		X					X			X			X
87	Commercial		X											
88	Rec/Cemetaries		X											
89	Neighborhood recharge													
90	Vacant Lots (East Valley) (Low/Medium/High)		Low	High			High	Med		High	Med		High	Med
91	Parks/Open Space (East Valley) (Low/Medium/High)		Low	High			High	Med		High	Med		High	Med
92	Abandoned Alleys (East Valley) (Low/Medium/High)		Low	High			High	Med		High	Med		High	Med
102	***Regional Solutions***													
106	Non-urban regional recharge		High					Med			Med			Med
107	Runoff treatment and beneficial use/discharge													
108	Treat and beneficial use/discharge (coastal area)	X	X	X	X	X	X	X	X	X	X	X	X	X
109	Treat and beneficial use/discharge (all areas)				X									
110	Percent of Representative storm (1/2-inch) managed (of citywide 1,700 mgd)	10%	58%	39%	100%	10%	39%	47%	10%	39%	47%	10%	39%	47%
111	**Current/Anticipated Regulations Level of Compliance**													
112	California Toxics Rule	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
113	Current Total Maximum Daily Loads (TMDLs) - Bacteria (Santa Monica Bay), Trash	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
114	Future Total Maximum Daily Loads (projection)	No	Partial	Partial	Yes	No	Partial	Partial	Partial	Partial	Partial	Partial	Partial	Partial

115 **Notes:**
116 *Storage for daily (diurnal) peaks
117 [1]Flows indicated assume no smart irrigation. Implementing smart irrigation citywide would reduce total dry weather runoff estimates by ~11 mgd
118 [2]Effective Capacity is the total treatment capacity, minus solids and brine return flows to the sewer
119 [3]Includes new GBIS extension from NOS to GBIS.
120 [4]Runoff is treated and discharged. Runoff can potentially be treated and beneficially used if future demands are identified.
121 **Definitions:**
122 LCMR - Low Cost/Minimum Requirements: alternative includes lower cost solutions or low initial investment by meeting minimum requirements.
123 WR - High Beneficial Use of Water Resources: alternatives that include high levels of recycled water, conservation, and beneficial use of runoff.
124 HA - High Adaptability: alternatives that are most able to adjust to changing conditions, such as population, wastewater flows and regulations.
125 LR - Lower Risk: alternatives that are lower in risk from a regulatory perspective (LR1) or in terms of ease of implementation from a technical,
126 environmental and/or political and public acceptance perspective (LR2).

Hyb1A, Hyb1B, and Hyb1C would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors or storage facilities would be required as described below and shown in Figure 6-4:

- Build new Glendale Burbank Interceptor Sewer (GBIS) between Toluca Lake and LAG
- Build new North East Interceptor Sewer (NEIS) Phase 2, located south of LAG
- Either build a new 60 million gallon (MG) buried wet weather storage tank with real-time control at Tillman or construct the Valley Spring Lane Interceptor Sewer (VSLIS) between Tillman and Toluca Lake

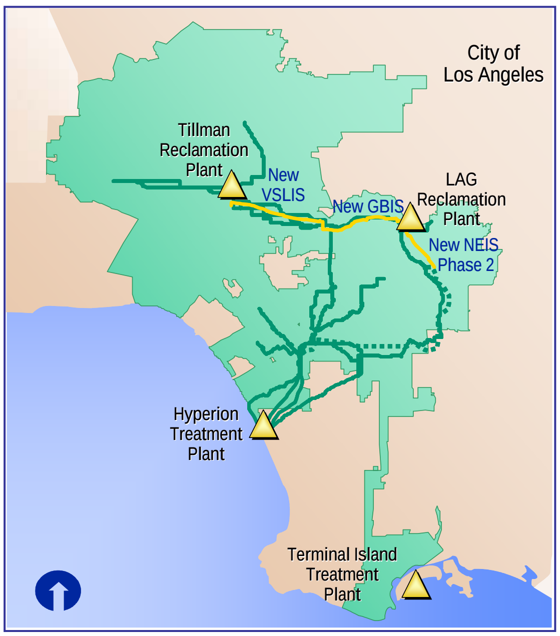


Figure 6-4
New Sewers in Alternative Hyb1A, Hyb1B, and Hyb1C

It is assumed that Title 22 plants will provide no capacity relief to the sewer system, since there will be no discharge out of the system other than through service to recycled water end users. During wet weather, these end users may not require recycled water (e.g., for irrigation use), so the entire flow through LAG would be returned to the sewer system for conveyance downstream to Hyperion. Therefore, LAG as a Title 22 plant will not provide any relief to the sewer system during wet weather.

For biosolids management, Hyb1A, Hyb1B, and Hyb1C assume 100 percent beneficial reuse of Class A exceptional quality (EQ) biosolids through land application.

6.3.2 Hyb1 – Water Resources

Water resources components include recycled water, dry weather runoff management and wet weather runoff management, and water conservation.

6.3.2.1 Hyb1 - Recycled Water

As discussed earlier, Hyb1A, Hyb1B, and Hyb1C have different target levels of recycled water usage, which build from each previous alternative.

Table 6-3 provides a summary of the potential recycled water use for Hyb1A, Hyb1B, and Hyb1C. As shown in the table, the total amount of wastewater effluent recycled under Hyb1C does not meet the initial target of 45,000 – 60,000 acre-feet/year via conventional recycled water users due to limitations in the available effluent from the existing treatment plants under this alternative.

Table 6-3
Summary of Potential Additional Recycled Water
For Alternatives Hyb1A, Hyb1B, and Hyb1C

Plant	Level of Treatment	Area of Use	Use	Volume (acre-feet/yr)		
				Hyb1A	Hyb1B	Hyb1C
Tillman	Advanced Treatment (MF/RO)	San Fernando Valley	Industrial and Irrigation	10,600	11,400	11,400
LAG	Title 22 w/ Nitrogen removal	Downtown	Industrial and Irrigation	2,800	5,400	5,400
Hyperion	Title 22[1]	Westside	Industrial and Irrigation	4,300	12,500	12,500
Terminal Island	Advanced Treatment (MF/RO)	Harbor	Industrial and Irrigation	4,000	9,400	9,400
Sub-Total (WW Only)	--	--	--	21,700	38,700	38,700
Urban Runoff Plants (Stormwater)	Title 22	Ballona and Compton Creeks	Industrial and Irrigation	0	3,300	3,300
Total Reused	--	--	--	21,700	42,000	42,000

Note:
[1]Assumed that secondary effluent from Hyperion would be delivered to West Basin for additional treatment before reuse

Figure 6-5 presents the recycled water usage from wastewater treatment plants for Hyb1A, Hyb1B, and Hyb1C in a comparison chart.

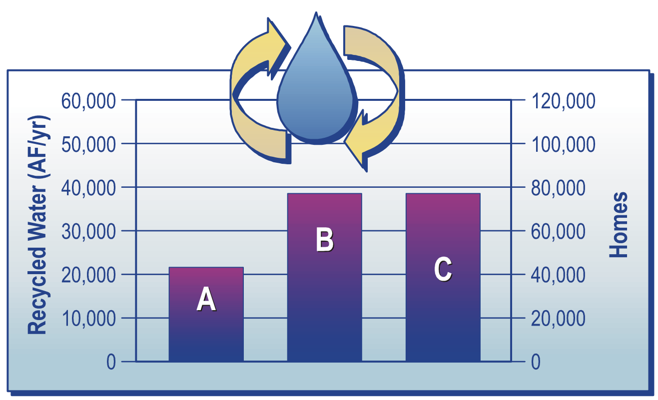


Figure 6-5
Recycled Water Usage from Wastewater Treatment Plants by 2020
for Alternatives Hyb1A, Hyb1B, and Hyb1C

6.3.2.2 Hyb1 - Dry Weather Runoff Management

As discussed earlier, Hyb1A, Hyb1B, and Hyb1C have different target levels of dry weather runoff management, which build from each previous alternative. The target dry weather runoff managed for Hyb1A through Hyb1C ranges between 10 and 40 percent of the average dry weather runoff produced in the City.

Dry weather runoff can be managed through diversions to the wastewater system for treatment, through diversions to urban runoff plants for treatment and reuse or discharge back to the storm drain system, or through treatment wetlands. Runoff can also be reduced by establishing smart irrigation controllers to eliminate overwatering of greenspace. Table 6-4 provides a summary of the dry weather runoff management for Hyb1A, Hyb1B, and Hyb1C by year 2020.

Table 6-4
Summary of Dry Weather Runoff Managed by 2020
For Alternatives Hyb1A, Hyb1B, and Hyb1C

Option	Area	Use	Volume Managed		
			Hyb1A	Hyb1B	Hyb1C
Reduction (Conservation) Using Smart Irrigation					
Smart Irrigation	Citywide	--	--	11 mgd	11 mgd
Diversion to Wastewater System					
Coastal Area	Westside	Treat and Discharge	10 mgd	9 mgd	9 mgd
Browns Creek	Valley	Treat and Discharge	--	--	3 mgd
Wilbur Wash	Valley	Treat and Discharge	--	--	1 mgd
Limekiln Canyon	Valley	Treat and Discharge	--	--	1.5 mgd
Caballero Canyon	Valley	Treat and Discharge	--	--	1 mgd
Bull Creek	Valley	Treat and Discharge	--	--	2.4 mgd
Pacoima Wash	Valley	Treat and Discharge	--	--	7 mgd
Diversion to Urban Runoff Plant for Reuse					
Compton Creek	Southside	Reuse	--	2 mgd	2 mgd
Ballona Creek	Westside	Reuse	--	3 mgd	3 mgd
Total Dry Weather Runoff Managed (mgd)			10 mgd	25 mgd	41 mgd
Percent of Dry Weather Runoff Managed (of watershed – 97 mgd)			10%	26%	42%

Figure 6-6 presents dry weather runoff management for Hyb1A, Hyb1B, and Hyb1C in a comparison chart.

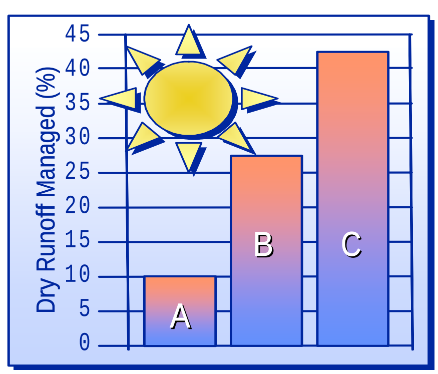


Figure 6-6
Dry Weather Runoff Management by 2020 for Alternatives Hyb1A, Hyb1B, and Hyb1C

6.3.2.3 Hyb1 – Wet Weather Runoff Management

As discussed earlier, Hyb1A, Hyb1B, and Hyb1C have different target levels of wet weather runoff management, which build from each previous alternative. The target additional wet weather runoff management for Hyb1A through Hyb1C ranges between 10 and 50 percent of the runoff from a ½ inch storm over the watershed.

Wet weather runoff can be managed through on-site storage/use (cisterns), on-site percolation, regional recharge, and treatment through urban runoff plants. Table 6-5 provides a summary of the wet weather runoff management for Hyb1A, Hyb1B, and Hyb1C by year 2020. Figure 6-7 presents wet weather runoff management for Hyb1A, Hyb1B, and Hyb1C in a comparison chart.

Table 6-5
Summary of Wet Weather Runoff Managed by 2020
For Alternatives Hyb1A, Hyb1B, and Hyb1C

Option	Area	Use	Volume Managed		
			Hyb1A	**Hyb1B**	**Hyb1C**
On-site Percolation					
Schools	East Valley	Beneficial Use	--	--	3 mgd
Government	East Valley	Beneficial Use	--	--	1 mgd
Neighborhood - Vacant Lots	East Valley	Beneficial Use	--	360 mgd	220 mgd
Neighborhood - Parks/open space	East Valley	Beneficial Use	--	120 mgd	70 mgd
Neighborhood - Abandoned alleys	East Valley	Beneficial Use	--	18 mgd	10 mgd
Non-urban regional recharge	East Valley	Beneficial Use	--	--	245 mgd
On-site Storage / Use (Cisterns)					
Schools	Citywide	Beneficial Use	--	--	49 mgd
Government	Citywide	Beneficial Use	--	--	31 mgd
On-site Treat and Discharge					
New/Redevelopment Areas	Citywide	Treat and Discharge	2 mgd	2 mgd	2 mgd
Regional Solutions					
Urban runoff plants[1]	Westside (coast)	Treat and Discharge	160 mgd	160 mgd	160 mgd
Total Wet Weather Runoff Managed (mgd)			162 mgd	660 mgd	791 mgd
Percent of Runoff from ½ inch storm citywide (1,700 mgd)			10%	39%	47%

Notes:
[1] For the IRP, it was assumed that three urban runoff plants would be needed to meet the Santa Monica Bay Beaches Wet Weather Bacteria TMDL. As required by the Santa Monica Bay Beaches Wet Weather Bacteria TMDL, an Implementation Plan was developed with stakeholder and Regional Board involvement, which was submitted to the Regional Board in July 2005. The recommendations from the approved Implementation Plan will supersede the assumed projects for the IRP.

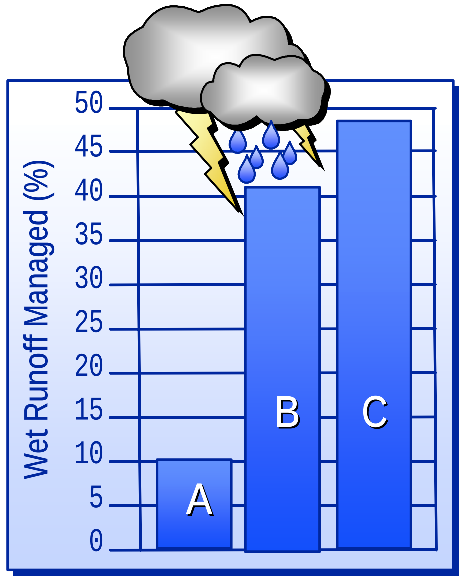


Figure 6-7
Wet Weather Runoff Management by 2020 for Alternatives Hyb1A, Hyb1B, and Hyb1C

6.4 Description of Hybrid Alternatives – Hyb2

Hybrid Alternative Series 2 includes Alternatives Hyb2A, Hyb2B, and Hyb2C. Figure 6-8 is a map showing the components in Hyb2A, Hyb2B, and Hyb2C. Appendix O provides more details on the Hyb2.

6.4.1 Hyb2 – Wastewater Management

The Hyb2 alternatives include maintaining the current wastewater treatment at Hyperion, expanding the conveyance system, and upgrading the Tillman and the Los Angeles-Glendale Plant to advanced treatment. Hyb2A, Hyb2B, and Hyb2C focus on maximizing the use of the existing process capacity at the Hyperion Treatment Plant near El Segundo while expanding upstream. Note that since all biosolids are treated at Hyperion, additional digester capacity will be required. Tillman will be expanded to a capacity of 80 mgd and upgraded to advanced treatment while still continuing to discharge at least 30 mgd to the Los Angeles River. LAG will be expanded to a capacity of 30 mgd and upgraded to advanced treatment.

Table 6-6 presents a summary of the wastewater treatment components included in Hybrid Alternatives Hyb2A, Hyb2B, and Hyb2C.

Table 6-6
Wastewater Treatment Components in Hybrid Alternatives Hyb2A, Hyb2B, and Hyb2C

Component	Hydraulic Capacity (mgd)			Level of Treatment (Effluent)	
	Current	Add'l	Total	Current	New
Donald C. Tillman Water Reclamation Plant	64 mgd	16 mgd	80 mgd	Title 22 with Nitrification & Denitrifcation[1]	Advanced Treatment[2]
LAG Water Reclamation Plant	15 mgd	15 mgd	30 mgd	Title 22 with Nitrification & Denitrifcation	Advanced Treatment[5]
Hyperion Treatment Plant	450 mgd	0 mgd	450 mgd	Secondary	Secondary
Total Hyperion Service Area	--	--	529 mgd[3]	--	--
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Advanced Treatment	Advanced Treatment

Notes:
[1] As discussed in *Volume 1: Wastewater Management*, for the IRP it was assumed that the nitrification/denitrifcation projects currently under construction will result in a reduction of total capacity at Tillman by 0 to 20 percent (assumed 20 percent, from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 0 to 25 percent (assumed 25 percent, from 20 mgd to 15 mgd).
[2] For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).
[3] The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For the Hyb1 series, the effective capacity is 46 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 500 mgd at Hyperion = 546 mgd.

Like the Hyb1 series, Hyb2A, Hyb2B, and Hyb2C would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors or storage facilities would be required including, GBIS, NEIS Phase 2, and VSLIS or storage. There are shown in Figure 6-5.

For biosolids management, Hyb2A, Hyb2B, and Hyb2C assume 100 percent beneficial reuse of Class A EQ biosolids through land application.

6.4.2 Hyb2 – Water Resources

Water resources components include recycled water, dry weather runoff management and wet weather runoff management, and water conservation.

6.4.2.1 Hyb2 - Recycled Water

As discussed earlier, Hyb2A, Hyb2B, and Hyb2C have different target levels of recycled water usage, which build from each previous alternative.

Table 6-7 provides a summary of the potential recycled water use for Hyb2A, Hyb2B, and Hyb2C.

Table 6-7
Summary of Potential Additional Recycled Water
For Alternatives Hyb2A, Hyb2B, and Hyb2C

Plant	Level of Treatment	Area of Use	Use	Volume (acre-feet/yr)		
				Hyb2A	Hyb2B	Hyb2C
Tillman	Advanced Treatment (MF/RO)	San Fernando Valley	Industrial and Irrigation	10,600	17,600	17,600
LAG	Title 22 w/ Nitrogen removal	Downtown	Industrial and Irrigation	2,800	5,400	10,400
Hyperion	Title 22[1]	Westside	Industrial and Irrigation	4,300	12,500	12,500
Terminal Island	Advanced Treatment (MF/RO)	Harbor	Industrial and Irrigation	4,000	4,000	9,400
Sub-Total (WW Only)	--	--	--	21,700	39,500	49,900
Urban Runoff Plants (Stormwater)	Title 22	Ballona and Compton Creeks	Industrial and Irrigation	0	3,300	3,300
Total Reused	--	--	--	21,700	42,800	53,200

Notes:
[1]Assumed that secondary effluent from Hyperion would be delivered to West Basin for additional treatment before reuse

Figure 6-9 presents the recycled water usage from wastewater treatment plants for Hyb2A, Hyb2B, and Hyb2C in a comparison chart.

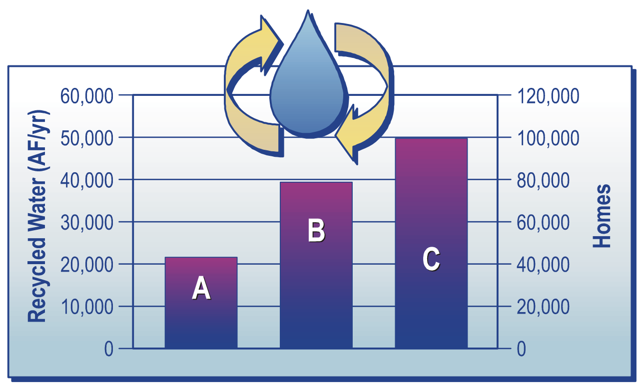


Figure 6-9
Recycled Water Usage from wastewater treatment plants by 2020 for Alternatives Hyb2A, Hyb2B, and Hyb2C

6.4.2.2 Hyb2 - Dry Weather Runoff Management

As discussed earlier, Hyb2A, Hyb2B, and Hyb2C have different target levels of dry weather runoff management, which build from each previous alternative. The target dry weather runoff managed for Hyb2A through Hyb2C ranges between 10 and 40 percent of the average dry weather runoff produced in the City.

Dry weather runoff can be managed through diversions to the wastewater system for treatment, through diversions to urban runoff plants for treatment and reuse or discharge back to the storm drain system, or through treatment wetlands. Runoff can also be reduced by establishing smart irrigation controllers to eliminate overwatering of greenspace. Table 6-8 provides a summary of the dry weather runoff management for Hyb2A, Hyb2B, and Hyb2C by year 2020.

Table 6-8
Summary of Dry Weather Runoff Managed by 2020
For Alternatives Hyb2A, Hyb2B, and Hyb2C

Option	Area	Use	Volume Managed		
			Hyb2A	Hyb2B	Hyb2C
Reduction (Conservation) Using Smart Irrigation					
Smart Irrigation	Citywide	--	--	11 mgd	11 mgd
Diversion to Wastewater System					
Coastal Area	Westside	Treat and Discharge	10 mgd	9 mgd	9 mgd
Diversion to Urban Runoff Plant for Reuse					
Compton Creek	Southside	Reuse	--	2 mgd	2 mgd
Ballona Creek	Westside	Reuse	--	3 mgd	3 mgd
Diversion to Urban Runoff Plant or Constructed Wetlands					
Browns Creek	Valley	Treat and Discharge	--	--	3 mgd
Wilbur Wash	Valley	Treat and Discharge	--	--	1 mgd
Limekiln Canyon	Valley	Treat and Discharge	--	--	1.5 mgd
Caballero Canyon	Valley	Treat and Discharge	--	--	1 mgd
Bull Creek	Valley	Treat and Discharge	--	--	2.4 mgd
Pacoima Wash	Valley	Treat and Discharge	--	--	7 mgd
Total Dry Weather Runoff Managed (mgd)			10 mgd	25 mgd	41 mgd
Percent of Dry Weather Runoff Managed (of watershed – 97 mgd)			10%	26%	42%

Figure 6-10 presents dry weather runoff management for Hyb2A, Hyb2B, and Hyb2C in a comparison chart.

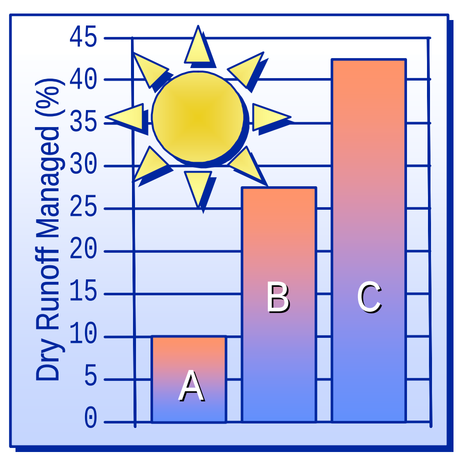


Figure 6-10
Dry Weather Runoff Management by 2020 for Alternatives Hyb2A, Hyb2B, and Hyb2C

6.4.2.3 Hyb2 – Wet Weather Runoff Management

As discussed earlier, Hyb2A, Hyb2B, and Hyb2C have different target levels of wet weather runoff management, which build from each previous alternative. The target additional wet weather runoff management for Hyb2A through Hyb2C ranges between 10 and 50 percent of the runoff from a ½ inch storm over the watershed.

Wet weather runoff can be managed through on-site storage/use (cisterns), on-site percolation, regional recharge, and treatment through urban runoff plants. Table 6-9 provides a summary of the wet weather runoff management for Hyb2A, Hyb2B, and Hyb2C by year 2020.

Table 6-9
Summary of Wet Weather Runoff Managed by 2020
For Alternatives Hyb2A, Hyb2B, and Hyb2C

Option	Area	Use	Volume Managed		
			Hyb2A	Hyb2B	Hyb2C
On-site Percolation					
Schools	East Valley	Beneficial Use	--	--	3 mgd
Government	East Valley	Beneficial Use	--	--	1 mgd
Neighborhood - Vacant Lots	East Valley	Beneficial Use	--	360 mgd	220 mgd
Neighborhood - Parks/open space	East Valley	Beneficial Use	--	120 mgd	70 mgd
Neighborhood - Abandoned alleys	East Valley	Beneficial Use	--	18 mgd	10 mgd
Non-urban regional recharge	East Valley	Beneficial Use	--	--	245 mgd
On-site Storage / Use (Cisterns)					
Schools	Citywide	Beneficial Use	--	--	49 mgd
Government	Citywide	Beneficial Use	--	--	31 mgd
On-site Treat and Discharge					
New/Redevelopment Areas	Citywide	Treat and Discharge	2 mgd	2 mgd	2 mgd
Regional Solutions					
Urban runoff plants[1]	Westside (coast)	Treat and Discharge	160 mgd	160 mgd	160 mgd
Total Wet Weather Runoff Managed (mgd)			162 mgd	660 mgd	791 mgd
Percent of Runoff from ½ inch storm citywide (1,700 mgd)			10%	39%	47%

Notes:
[1] For the IRP, it was assumed that three urban runoff plants would be needed to meet the Santa Monica Bay Beaches Wet Weather Bacteria TMDL. As required by the Santa Monica Bay Beaches Wet Weather Bacteria TMDL, an Implementation Plan was developed with stakeholder and Regional Board involvement, which was submitted to the Regional Board in July 2005. The recommendations from the approved Implementation Plan will supersede the assumed projects for the IRP.

Figure 6-11 presents wet weather runoff management for Hyb2A, Hyb2B, and Hyb2C in a comparison chart.

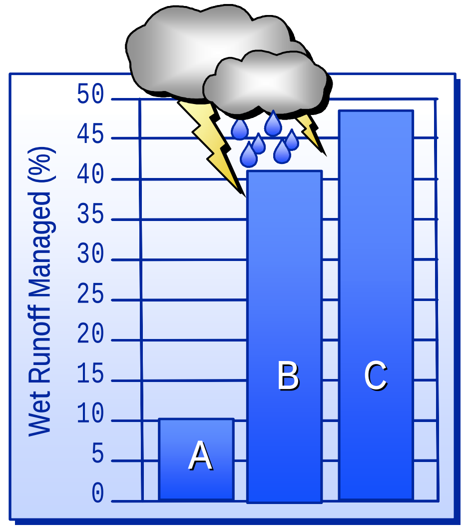


Figure 6-11
Wet Weather Runoff Management by 2020 for Alternatives Hyb2A, Hyb2B, and Hyb2C

6.5 Description of Hybrid Alternatives – Hyb3

Hybrid Alternative Series 1 includes Alternatives Hyb3A, Hyb3C, and Hyb3C. Figure 6-12 is a map showing the components in Hyb3A, Hyb3C, and Hyb3C. Appendix P provides additional details on the alternatives.

6.5.1 Hyb3 – Wastewater Management

The Hyb3 alternatives include wastewater treatment and conveyance projects required to upgrade Tillman to advanced treatment by year 2020. Hyb3A, Hyb3B, and Hyb3C focus on upgrading Tillman while maximizing the use of existing process capacity at Hyperion. LAG will also remain unchanged as a Title 22 plant. Tillman would be upgraded to advanced treatment to allow continued discharge of at least 30 mgd to the Los Angeles River. Note that since all biosolids are treated at Hyperion, additional digester capacity will be required.

Table 6-10 presents a summary of the wastewater treatment components included in Hybrid Alternatives Hyb3A, Hyb3B, and Hyb3C.

Table 6-10
Wastewater Treatment Components in Hybrid Alternatives Hyb3A, Hyb3B, and Hyb3C

Component	Hydraulic Capacity (mgd)			Level of Treatment (Effluent)	
	Current	Add'l	Total	Current	New
Donald C. Tillman Water Reclamation Plant	64 mgd	36 mgd	100 mgd	Title 22 with Nitrification & Denitrifcation[1]	Advanced Treatment[2]
LAG Water Reclamation Plant	15 mgd	0 mgd	15 mgd	Title 22 with Nitrification & Denitrifcation	Title 22 with Nitrification & Denitrifcation
Hyperion Treatment Plant	450 mgd	0 mgd	450 mgd	Secondary	Secondary
Total Hyperion Service Area	--	--	521 mgd[3]	--	--
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Advanced Treatment	Advanced Treatment

Note:
1 As discussed in *Volume 1: Wastewater Management*, for the IRP it was assumed that the nitrification/denitrifcation projects currently under construction will result in a reduction of total capacity at Tillman by 0 to 20 percent (assumed 20 percent, from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 0 to 25 percent (assumed 25 percent, from 20 mgd to 15 mgd).
2 For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).
3 The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For the Hyb1 series, the effective capacity is 46 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 500 mgd at Hyperion = 546 mgd.

Like the Hyb1 series, Hyb3A, Hyb3B, and Hyb3C would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors or storage facilities would be required including, GBIS, NEIS Phase 2, and VSLIS or storage. There are shown in Figure 6-5.

It is assumed that Title 22 plants will provide no capacity relief to the sewer system, since there will be no discharge out of the system other than through service to recycled water end users. During wet weather, these end users may not require recycled water (e.g., for irrigation use), so the entire flow through LAG would be returned to the sewer system for conveyance downstream to Hyperion. Therefore, LAG as a Title 22 plant will not provide any relief to sewer system during wet weather.

For biosolids management, Hyb3A, Hyb3B, and Hyb3C assume 100 percent beneficial reuse of Class A EQ biosolids through land application.

6.5.2 Hyb3 – Water Resources

Water resources components include recycled water, dry weather runoff management and wet weather runoff management, and water conservation.

6.5.2.1 Hyb3 - Recycled Water

As discussed earlier, Hyb3A, Hyb3B, and Hyb3C have different target levels of recycled water usage, which build from each previous alternative.

Table 6-11 provides a summary of the potential recycled water use for Hyb3A, Hyb3B, and Hyb3C.

Table 6-11
Summary of Potential Additional Recycled Water
For Alternatives Hyb3A, Hyb3B, and Hyb3C

Plant	Level of Treatment	Area of Use	Use	Volume (acre-feet/yr)		
				Hyb3A	Hyb3B	Hyb3C
Tillman	Advanced Treatment (MF/RO)	San Fernando Valley	Industrial and Irrigation	10,600	20,800	25,500
LAG	Title 22 w/ Nitrogen removal	Downtown	Industrial and Irrigation	2,800	2,800	5,400
Hyperion	Title 22[1]	Westside	Industrial and Irrigation	4,300	12,500	12,500
Terminal Island	Advanced Treatment (MF/RO)	Harbor	Industrial and Irrigation	4,000	4,000	9,400
Sub-Total (WW Only)	--	--	--	21,700	40,100	52,800
Urban Runoff Plants (Stormwater)	Title 22	Ballona and Compton Creeks	Industrial and Irrigation	0	3,300	3,300
Total Reused	--	--	--	21,700	43,4004 3,400443	56,100

Notes:
[1]Assumed that secondary effluent from Hyperion would be delivered to West Basin for additional treatment before reuse

Figure 6-12 presents the recycled water usage from wastewater treatment plants for Hyb3A, Hyb3B, and Hyb3C in a comparison chart.

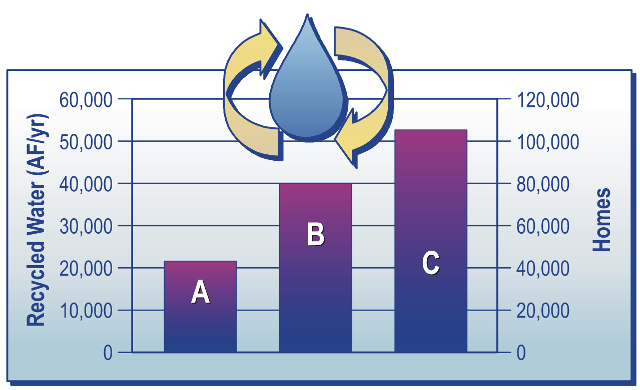


Figure 6-12
Recycled Water Usage from Wastewater Treatment Plants by 2020
for Alternatives Hyb3A, Hyb3B, and Hyb3C

6.5.2.2 Hyb3 - Dry Weather Runoff Management

As discussed earlier, Hyb3A, Hyb3B, and Hyb3C have different target levels of dry weather runoff management, which build from each previous alternative. The target dry weather runoff managed for Hyb3A through Hyb3C ranges between 10 and 40 percent of the average dry weather runoff produced in the watershed.

Table 6-12 provides a summary of the dry weather runoff management for Hyb3A, Hyb3B, and Hyb3C by year 2020.

Table 6-12
Summary of Dry Weather Runoff Managed by 2020
For Alternatives Hyb3A, Hyb3B, and Hyb3C

Option	**Area**	**Use**	**Volume Managed**		
			Hyb3A	**Hyb3B**	**Hyb3C**
Reduction (Conservation) Using Smart Irrigation					
Smart Irrigation	Citywide	--	--	11 mgd	11 mgd
Diversion to Wastewater System					
Coastal Area	Westside	Treat and Discharge	10 mgd	9 mgd	9 mgd
Diversion to Urban Runoff Plant for Reuse					
Compton Creek	Southside	Reuse	--	2 mgd	2 mgd
Ballona Creek	Westside	Reuse	--	3 mgd	3 mgd
Diversion to Urban Runoff Plant or Constructed Wetlands					
Browns Creek	Valley	Treat and Discharge	--	--	3 mgd
Wilbur Wash	Valley	Treat and Discharge	--	--	1 mgd
Limekiln Canyon	Valley	Treat and Discharge	--	--	1.5 mgd
Caballero Canyon	Valley	Treat and Discharge	--	--	1 mgd
Bull Creek	Valley	Treat and Discharge	--	--	2.4 mgd
Pacoima Wash	Valley	Treat and Discharge	--	--	7 mgd
Total Dry Weather Runoff Managed (mgd)			10 mgd	25 mgd	41 mgd
Percent of Dry Weather Runoff Managed (of watershed – 97 mgd)			10%	26%	42%

Figure 6-13 presents dry weather runoff management for Hyb3A, Hyb3B, and Hyb3C in a comparison chart.

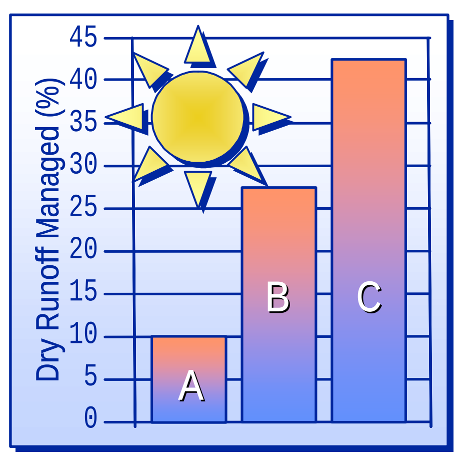


Figure 6-13
Dry Weather Runoff Management by 2020 for Alternatives Hyb3A, Hyb3B, and Hyb3C

6.5.2.3 Hyb3 – Wet Weather Runoff Management

As discussed earlier, Hyb3A, Hyb3B, and Hyb3C have different target levels of wet weather runoff management, which build from each previous alternative. The target additional wet weather runoff management for Hyb3A through Hyb3C ranges between 10 and 50 percent of the runoff from a ½ inch storm over the City.

Wet weather runoff can be managed through on-site storage/use (cisterns), on-site percolation, regional recharge, and treatment through urban runoff plants. Table 6-13 provides a summary of the wet weather runoff management for Hyb3A, Hyb3B, and Hyb3C by year 2020. Figure 6-14 presents wet weather runoff management for Hyb2A, Hyb2B, and Hyb2C in a comparison chart.

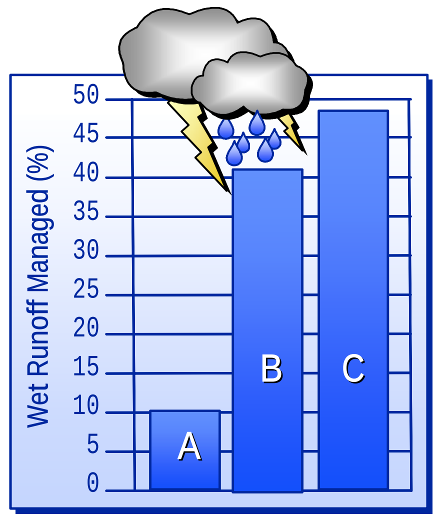


Figure 6-14
Wet Weather Runoff Management by 2020 for Alternatives Hyb3A, Hyb3B, and Hyb3C

Table 6-13
Summary of Wet Weather Runoff Managed by 2020
For Alternatives Hyb3A, Hyb3B, and Hyb3C

Option	Area	Use	Volume Managed		
			Hyb3A	Hyb3B	Hyb3C
On-site Percolation					
Schools	East Valley	Beneficial Use	--	--	3 mgd
Government	East Valley	Beneficial Use	--	--	1 mgd
Neighborhood - Vacant Lots	East Valley	Beneficial Use	--	360 mgd	220 mgd
Neighborhood - Parks/open space	East Valley	Beneficial Use	--	120 mgd	70 mgd
Neighborhood - Abandoned alleys	East Valley	Beneficial Use	--	18 mgd	10 mgd
Non-urban regional recharge	East Valley	Beneficial Use	--	--	245 mgd
On-site Storage / Use (Cisterns)					
Schools	Citywide	Beneficial Use	--	--	49 mgd
Government	Citywide	Beneficial Use	--	--	31 mgd
On-site Treat and Discharge					
New/Redevelopment Areas	Citywide	Treat and Discharge	2 mgd	2 mgd	2 mgd
Regional Solutions					
Urban runoff plants[1]	Westside (coast)	Treat and Discharge	160 mgd	160 mgd	160 mgd
Total Wet Weather Runoff Managed (mgd)			162 mgd	660 mgd	791 mgd
Percent of Runoff from ½ inch storm citywide (1,700 mgd)			10%	39%	47%

[1] For the IRP, it was assumed that three urban runoff plants would be needed to meet the Santa Monica Bay Beaches Wet Weather Bacteria TMDL. As required by the Santa Monica Bay Beaches Wet Weather Bacteria TMDL, an Implementation Plan was developed with stakeholder and Regional Board involvement, which was submitted to the Regional Board in July 2005. The recommendations from the approved Implementation Plan will supersede the assumed projects for the IRP.

6.6 Cost Estimates for Hybrid Alternatives

Costs for the hybrid alternatives were estimated much in the same manner as with the preliminary alternatives described in Section 5. Capital costs and O&M costs were developed for the various projects included within each of the hybrid alternatives. For a detailed description of the components of each alternative, refer to Appendices B through M of this document.

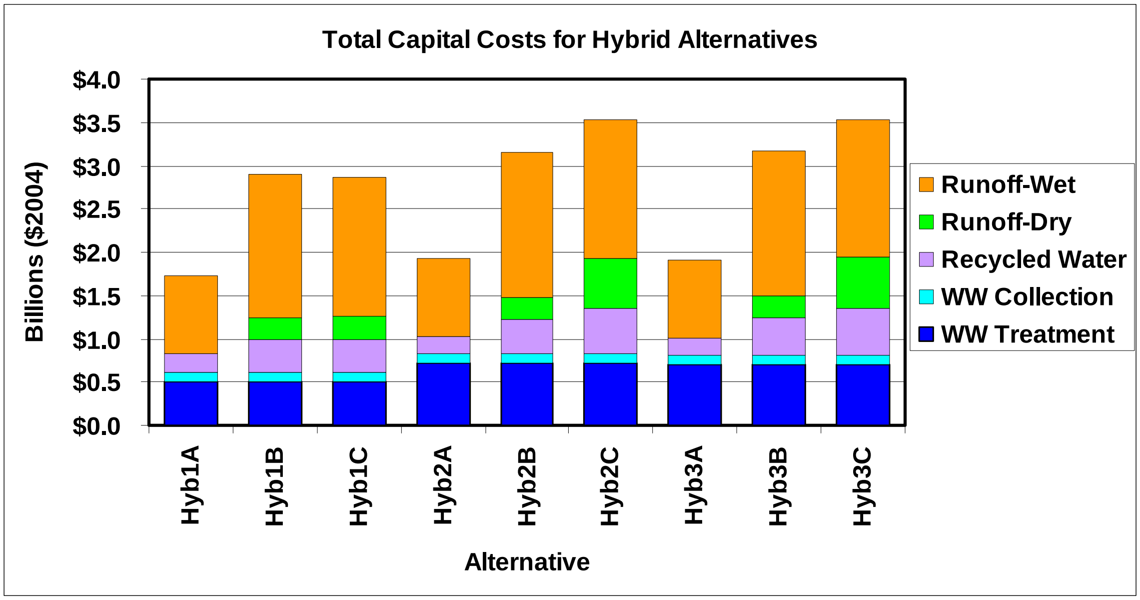
Figure 6-15 shows the capital and O&M costs, presented in 2004 dollars, for the hybrid alternatives. It should be noted that these costs represent the additional costs due to IRP investments. Not included in these future costs are the costs associated with the City's baseline Capital Improvement Program (CIP), which are significant and needed for rehabilitation of the current system, near-term regulatory and system requirements, and security purposes. The details of the baseline CIP are included in *Volume 5: Adaptive Capital Improvement Program.* Also not included are the costs that could be necessary to meet future TMDLs, which have yet to be regulated for water quality protection.

To compare the hybrid alternatives, a total monthly cost for all water services (wastewater, stormwater, and water) was constructed for an average single-family residence. Table 6-14 summarizes this cost calculation.

Table 6-14
Summary of Single-Family Monthly Water Services Cost Calculation

IRP Alternative	Additional Costs Due to IRP Investments ($2020) [1]					Monthly Water Services Cost for an Average Single-Family Customer		
	Capital Cost ($ millions)	Annual O&M Cost ($ millions)	Total Annualized Cost [2] ($ millions)	Allocated Annualized Cost [3] ($ millions)	Projected Single-Family Homes [4]	Add'l [5]	Total [6]	Net [7]
Hyb1A	$3,498	$164	$391	$155	590,000	$22	$85	$80
Hyb1B	$5,893	$227	$610	$257	590,000	$36	$99	$89
Hyb1C	$5,805	$223	$601	$252	590,000	$36	$99	$87
Hyb2A	$3,923	$184	$439	$171	590,000	$24	$87	$82
Hyb2B	$6,375	$247	$662	$274	590,000	$39	$102	$91
Hyb2C	$7,158	$250	$715	$298	590,000	$42	$105	$92
Hyb3A	$3,874	$185	$437	$170	590,000	$24	$87	$82
Hyb3B	$6,409	$248	$665	$275	590,000	$39	$102	$91
Hyb3C	$7,166	$251	$717	$299	590,000	$42	$105	$92

Notes:
1 IRP investments do not include future costs associated with the City's baseline CIP or future TMDLs.
2 Represents annualized capital costs (capital costs financed at 5% for 30 years) plus annual O&M costs.
3. Allocation of total annualized costs to single-family customers based on historical financial allocations for water, wastewater, and stormwater.
4 Based on SCAG projections.
5 Allocated annualized costs divided by 12 months, divided by projected single-family homes.
6 Adds current monthly water services cost of $63 to get total for IRP investments.
7 Subtracts imported water cost savings in order to get net monthly costs.



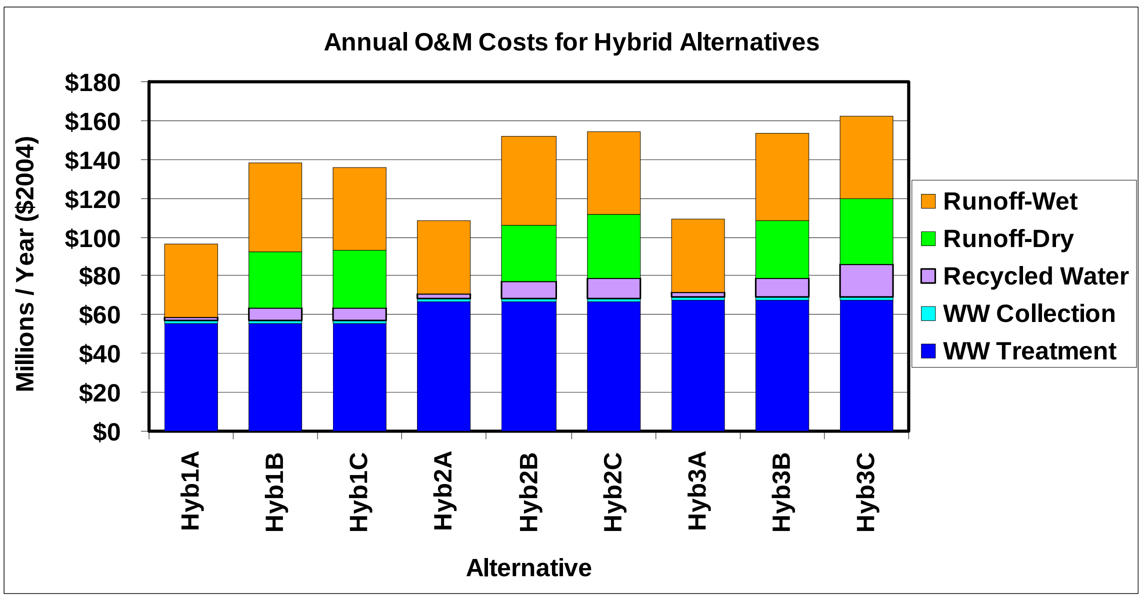


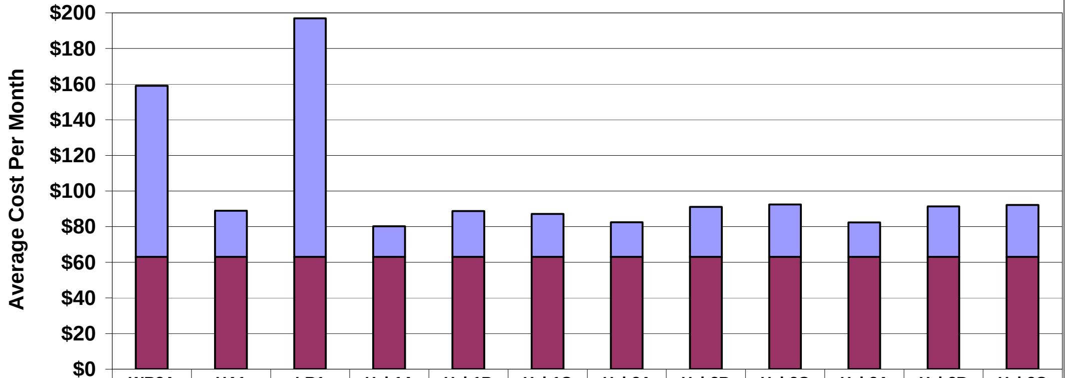
Figure 6-15

Capital and O&M Costs for Hybrid Alternatives ($2004)

6.7 Description of Hybrid Alternatives - Summary

An overall summary of the costs and benefits for the hybrid alternatives is shown in Figure 6-16. Also shown in Figure 6-16 are three of the preliminary alternatives (WR3A, HA1, and LR1) for comparison purposes. WR3A was one of the alternatives that had the most water resources benefits (e.g., high levels of recycled water, and beneficial re-use of urban runoff). HA1 was one of the highest scoring alternatives according to many stakeholders' preferences. LR1 was a low risk alternative that treated 100 percent of dry and wet weather runoff. This alternative would be the closest alternative that would comply with all future TMDLs.

Single-Family Monthly Cost for Water, Wastewater, and Stormwater *



	WR3A	HA1	LR1	Hyb1A	Hyb1B	Hyb1C	Hyb2A	Hyb2B	Hyb2C	Hyb3A	Hyb3B	Hyb3C
Add'l	$96	$26	$134	$17	$26	$24	$19	$28	$29	$19	$28	$29
Current	$63	$63	$63	$63	$63	$63	$63	$63	$63	$63	$63	$63
Total	$159	$89	$197	$80	$89	$87	$92	$91	$92	$82	$91	$92

Alternative

				Expand Hyperion to 500 mgd Upgrade Tillman (no capacity increase)			Expand & upgrade Tillman to 80 mgd Expand & upgrade LAG to 30 mgd			Expand & upgrade Tillman to 100 mgd		
Benefits	**WR3A**	**HA1**	**LR1**	**Hyb1A**	**Hyb1B**	**Hyb1C**	**Hyb2A**	**Hyb2B**	**Hyb2C**	**Hyb3A**	**Hyb3B**	**Hyb3C**
Potential Potable Water Demand Reduction through Conservation[1] (AF/Yr)	109,800	109,800	87,300	87,400	103,200	103,200	87,400	103,200	103,200	87,400	103,200	103,200
Potential Additional Recycled Water Usage (AF/Yr)	63,000	23,200	20,800	21,700	38,700	38,700	21,700	42,800	49,900	21,700	40,100	52,800
DWUR Managed (% of watershed - 97 mgd)	21%	21%	100%	10%	26%	42%	10%	26%	42%	10%	26%	42%
WWUR Managed (% of citywide 1,700 mgd)	58%	40%	100%	10%	40%	49%	10%	40%	49%	10%	40%	49%
DWUR and WWUR Beneficially Used (AF/Yr)	40,800	29,100	0	0	32,500	37,700	0	32,500	37,700	0	32,500	37,700
Positive Impacts on Public Lands (acres)	400	580	0	0	580	353	0	580	353	0	580	353
				Minimum Commitments	Additional Benefits	More Benefits	Minimum Commitments	Additional Benefits	More Benefits	Minimum Commitments	Additional Benefits	More Benefits
				Recycled Water, Dry Weather and Wet Weather Runoff Options								

* Does not include baseline CIP costs, new costs for future TMDLs (except LR1), or budget for leadership projects.

[1]Future implementation would depend on available funding, customer acceptance, reliability, and commercial availability of smart irrigation controllers. More detailed studies would be needed to determine the full benefits of a smart irrigation program.

Acronyms

DWUR- Dry Weather Urban Runoff
WWUR-Wet Weather Urban Runoff
AF/Yr- Acre-feet per year *(One AF/Yr provides enough water to supply two average single-family homes).*
MGD- Million gallons per day
LAG-Los Angeles-Glendale Water Recycling Plant

Figure 6-16
Summary of Costs and Benefits for Hybrid Alternatives

6.8 Leadership Projects

In addition to each of the options included in the alternatives, for each series of alternatives, leadership projects were identified. The vision for leadership projects is as follows:

> *Leadership projects will inspire and engage our community to embrace sustainable practices of water resource management. Leadership projects should be highly visible, and innovative, creating dramatic improvements in the quality of our water resources, open space, and economic base. Developing and implementing these projects should exemplify a new way of business for public works projects that is coordinated and partnership-based across community, city and regional interests.*

Leadership projects are projects that require study before large-scale implementation. They allow the City to confirm the "implementability" of a promising approach from technological, operability, results verification, scale-up effect, and public acceptance perspectives; and from City policy and agency coordination perspectives.

The types of leadership projects could include policy changes, full-scale projects (which can be implemented immediately Citywide and may be necessary to implement an alternative), and demonstration projects (which are visionary projects that require study before assuming large scale implementation.

Table Nos. 6-15 through 6-17 include summaries of potential leadership projects for the City to consider. For the IRP cost analysis, a budget of $4.4 million per year was included in each alternative for leadership projects. The actual timing of leadership projects will depend on available funding and regulatory drivers.

Table 6-15
Potential Water Leadership Projects

Leadership Project Descriptions		Policy Change	Study/Pilot Scale Project	Demonstration Scale Project	Full Scale Project
Individual Metering of Apartments					
	Conduct study and develop policy that requires developers to implement for all new apartment buildings	X			
	Existing Apartment Retrofit Pilot Project (one 10-unit building)		X		
Low flow fixture and appliances					
	Ongoing research and investigation				
Smart Irrigation					
	Develop incentive program for various users	X			
	Develop policy requiring implementation for large development and public facilities	X			
	Freeway/Road Medians Demonstration			X	
	Park Site (s) Implementation				X
	City-owned Properties Implementation				X
	Commercial Site (s) Implementation				X
Waterless Urinals					
	Waterless urinal study				
Note: Project selection and timing are subject to available funding and Council approval.					

Table 6-16
Potential Dry and Wet Weather Runoff Leadership

Leadership Project Descriptions	Policy Change	Study/Pilot Scale Project	Demonstration Scale Project	Full Scale Project
Green Streets				
A Study on Current Technology, Implementation Challenges, and Demonstration Locations		X		
Demonstration project for residential street greening.			X	
Demonstration project for thoroughfare greening.			X	
Green Roofs				
A Study on Current Technology, Implementation Challenges, and Demonstration Locations				
Dry Weather Runoff				
Concept Design Report for Diversion of DWUR to Sewer Upstream of Tillman.		X		
Concept Design Report for Urban Runoff Plant (URP).		X		
Constructed Wetlands Demonstration project adjacent to the LA River.			X	
Constructed Wetlands demonstration project for a vacant lot.			X	
Planning of dry weather URP		X		
Pilot one URP			X	
Design/Construct Ballona Creek URP				X
Design/Construct Browns Creek URP				X
Design/Construct Caballero Canyon URP				X
Design/Construct Compton Creek URP				X
Design/Construct Limkiln Canyon URP				X
Design/Construct Pacoima Wash URP				X
Design/Construct Bull Creek URP				X
Design/Construct Wilbur Wash URP				X
New Parks /Open Space with Stormwater Capture & Percolation				
Abandoned Alley Demonstration Project (greening & recharge) Planning		X		
Abandoned Alley Demonstration Project (greening & recharge)			X	
Abandoned Alley Full-Scale Implementation (greening and recharge)				X
Parks/Open Space Demonstration Project (greening & recharge) Planning		X		
Parks/Open Space Demonstration Project (greening & recharge)			X	
Parks/Open Space Full-Scale Implementation				X
Powerline Easement Demonstration Project(s) in Sun Valley Watershed (greening & recharge)			X	
Vacant lot in the East Valley Demonstration Planning		X		
Vacant lot in the East Valley Demonstration.			X	
Vacant lots in the East Valley Full-Scale Implementation				X

Table 6-16
Potential Dry and Wet Weather Runoff Leadership

Leadership Project Descriptions	Policy Change	Study/Pilot Scale Project	Demonstration Scale Project	Full Scale Project
New Parks/Open Space with Stormwater Capture, Storage, Reuse				
A Study on Current Technology, Implementation Challenges, and Demonstration Location(s)		X		
Abandoned Alley Demonstration Project (greening & reuse) Planning		X		
Abandoned Alley Greening Demonstration Project (greening & reuse)			X	
LA River Greening Demonstration Project (greening & reuse)			X	
Powerline easement demonstration project(s) (greening & reuse)			X	
Pavement Reduction				
Develop policy encouraging the use of landscaping (especially with native plants)	X			
Develop policy reducing the area on private properties that can be paved (i.e., change/support landscape ordinance)	X			
Porous Pavement				
Conduct Study on Current Technology, Implementation Challenges, Demonstration Location, Investigation of Current Paving Ordinances		X		
Develop policy requiring porous pavements in all new public facilities and large developments (greater than 5 acres)	X			
Residential Streets Demonstration Project			X	
Sidewalks, Parking lots, Alleys and Playgrounds Demonstration Project			X	
Sidewalks, Repair Program - Integrate porous pavements	X			
Stormwater Capture and Percolation				
Non-urban regional recharge study and planning		X		
Full-scale implementation non-urban regional recharge				X
Stormwater Capture, Use and/or Percolation				
Commercial or Government site planning		X		
Commercial site(s) Demonstration			X	
Develop policy to encourage meeting SUSMP regulations through beneficial use, rather than treat/discharge	X	X		
Government Sites Demonstration			X	
Government Sites Full-Scale Implementation at government sites.				X
Residential Block (or "micro" watershed) (50 homes) Demonstration			X	
School Sites Demonstration project and/or monitoring at existing installations (i.e. Broadous).			X	
School Sites Full-scale implementation				X
Santa Monica Bay Bacteria TMDL		X	X	X

Notes:
Project selection and timing are subject to available funding and Council approval.

Table 6-17
Potential Wastewater Leadership Projects

Leadership Project Descriptions		Policy Change	Study/Pilot Scale Project	Demonstration Scale Project	Full Scale Project
Biosolids					
	TIRE Demonstration Project			X	
	TIRE Full-Scale Project				X
Grey Water Systems					
	A Study of Current Technology, Implementation Challenges, and Demonstration Location		X		
	Commercial site demonstration			X	
	Government building demonstration			X	
	Residential site (block level) demonstration			X	
	WERF studies/projects		X		
Wastewater Treatment and Conveyance					
	A Study on Brine Disposal		X		
	Advanced Treatment feasibility study and pilot testing at Tillman LAGWRP, and/or TITP.		X		
	Glendale-Burbank Interceptor Sewer (GBIS)				X
	HTP Digesters (4 total)				X
	LAGWRP 10 Million Gallon Storage Tank with Real Time Control				X
	New Odor Scrubber Technology Pilot Testing at Tillman.		X		
	Pharmaceuticals/Endocrine Disrupter Destruction Study – Look for benefits of using oxidation addition (ozone/peroxide) and UV/natural sunlight.		X		
	TWRP 60 Million Gallon Storage Tank with Real Time Control				X
	TWRP MF/RO Phase 1				X
	TWRP MF/RO Phase 2				X
	TWRP MF/RO Phase 3				X
	TWRP Secondary Treatment Phase 2				X
	TWRP Secondary Treatment Phase 3				X
	TWRP UV Phase 1				X
	TWRP UV Phase 2				X
	TWRP UV Phase 3				X
	Ultra Violet (UV) Disinfection Pilot Testing at Tillman, LAGWRP, and/or TITP.		X		
	Wet Weather Wastewater Storage at Tillman VS. VSLIS Concept Report.		X		

Note:
Project selection and timing are subject to available funding and Council approval.

Section 7
Evaluation of Hybrid Alternatives

7.1 Introduction

As shown in Figure 7-1, evaluating the hybrid alternatives in the context of the IRP objectives is an important step in the process of defining the four draft alternatives that will undergo the environmental documentation and financial analysis.

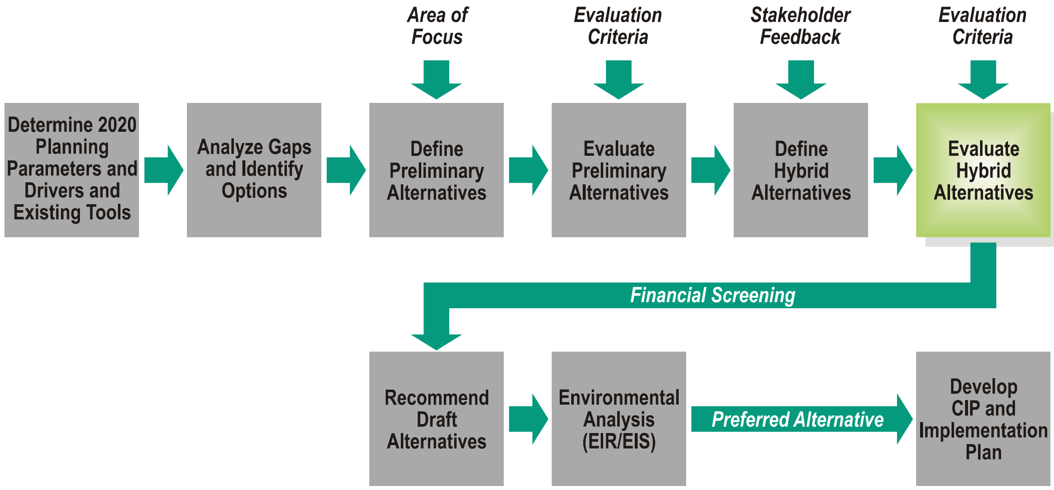


Figure 7-1
Alternatives Analysis Approach – Evaluating Hybrid Alternatives

Using feedback from the Steering Group and staff, the IRP team created nine hybrid alternatives that combined the best elements of the preliminary alternatives, thereby allowing them to perform better, for many of these objectives, than the original preliminary alternatives. Section 6 includes a discussion of the components of these hybrid alternatives in detail. This section includes a discussion of the approach used to evaluate the hybrid alternatives and develop a short-list of hybrid alternatives recommended to continue through the environmental documentation process.

7.2 Approach to Evaluating Hybrid Alternatives

One of the common comments received from the Steering Group on the preliminary alternatives was that the process used to evaluate the alternatives was complicated and difficult to follow. Instead, people suggested using a simpler cost-benefit approach to evaluate alternatives. Therefore, to evaluate the hybrid alternatives, the team used a simpler method to evaluate the hybrid alternatives. The team used a quadrant analysis method to evaluate the costs and benefits of the alternatives. The concept of the quadrant analysis is to use a grid to plot the benefits and costs of each alternative. As shown in Figure 7-2, different quadrants are more optimal to be in. For example, the upper left quadrant (shown in green in the figure) is most 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.

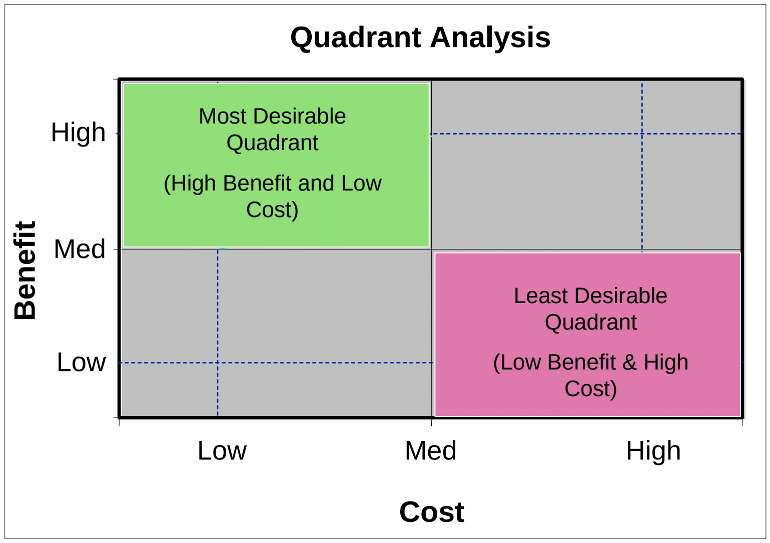


Figure 7-2
Quadrant Analysis Approach to Evaluating Alternatives

When plotting the benefits and costs on the quadrant chart, any alternatives in the most desirable quadrant (high benefit and low cost) would be considered "clear winners". If compared to the clear winner an alternative has a higher cost but the same or lower benefit, then it would be considered a "clear loser." Similarly, if compared to the clear winner an alternative has a lower benefit for the same cost, then it would be considered a clear loser. If costs are of concern, then a potential second choice would be an alternative with lower costs (compared to the clear winner) and slightly lower benefits. If costs are not of concern, then a possible second choice would be an alternative that had higher costs (compared to the clear winner) and slightly higher costs. Figure 7-3 illustrates an example of the clear winner, clear loser and potential second choice concepts.

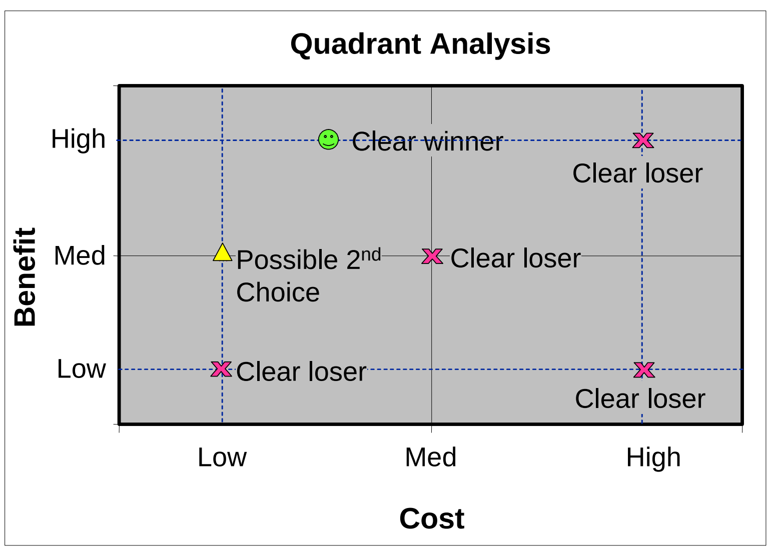


Figure 7-3
Quadrant Analysis – Illustration of Clear Winners, Clear Losers, and Possible 2nd Choices

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

- Defined the benefits for the separate service functions (i.e., wastewater, recycled water and dry and wet runoff management).
- Plotted the benefits and costs for each hybrid alternative on the quadrant chart for each separate service function. For comparison purposes, several preliminary alternatives were also plotted on the quadrant chart, specifically HA1 (high adaptability), WR3A (high beneficial use of water resources) and LR1 (low risk in terms of regulatory compliance). These preliminary alternatives that were plotted represented some of the top scoring alternatives using the stakeholder preferences and their relative performance against the objectives.
- 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.

7.3 Wastewater Analysis

7.3.1 Definition of Wastewater Benefits

The first step in evaluating the hybrid alternatives was to define the wastewater benefits. One of the IRP's guiding principles is to treat more wastewater upstream in the system to offer greater opportunities for system operational flexibility and beneficial use of treated effluent. See Figure 7-4.

Therefore, for the quadrant analysis, a high benefit was assigned to alternatives that enhanced capacity at existing upstream treatment plants (e.g., Tillman and/or LAG); a medium benefit was assigned to alternatives that enhanced capacity at Hyperion; and a low benefit was assigned to alternatives that built new plants.

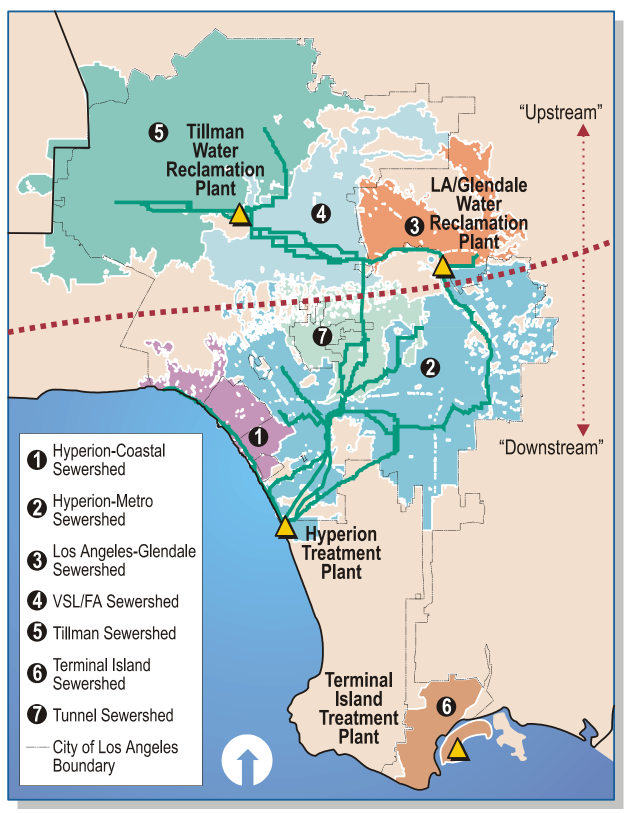


Figure 7-4
New upstream facilities will offer greater system operational flexibility

7.3.2 Wastewater Results

Using the benefits defined in subsection 7.3.1, the team assigned wastewater costs and benefits scores for the hybrid alternatives and selected preliminary alternatives. Table 7-1 presents a summary of the results.

Table 7-1
Hybrid Alternative Analysis – Wastewater Costs and Benefits

	Wastewater Costs		Wastewater Benefits	
Alternative[1]	Results	Capital Cost ($ mil)[2]	Results	Why
Hyb1A	Low	$631	Med	Expands Hyperion
Hyb1B	Low	$631	Med	Expands Hyperion
Hyb1C	Low	$631	Med	Expands Hyperion
Hyb2A	Med-High	$841	High	Expands upstream at Tillman and LAG
Hyb2B	Med-High	$841	High	Expands upstream at Tillman and LAG
Hyb2C	Med-High	$841	High	Expands upstream at Tillman and LAG
Hyb3A	Med	$817	High	Expands upstream at Tillman
Hyb3B	Med	$817	High	Expands upstream at Tillman
Hyb3C	Med	$817	High	Expands upstream at Tillman
HA1	Med-High	$864	High	Expands upstream at Tillman and LAG
WR3A	High	$1,030	Low	Expands upstream at Tillman, LAG and new plant
LR1	Low-Med	$722	Med	Expands Hyperion

Notes:
[1] For detailed discussion of components of each alternative, see Section 6.
[2] Capital costs are presented in 2004 dollars.

Figure 7-5 shows the quadrant chart for the wastewater benefits and costs. As shown in the figure, Hyb3A, Hyb3B and Hyb3C are the clear winners, because they provide high benefit with medium costs. If costs are a primary concern, then Alternatives Hyb1A, Hyb1B and Hyb1C are potential second choices, because they provide medium benefits with low costs. The remaining alternatives are clear losers compared to Hyb3A, Hyb3B, and Hyb3C, because they provide equal benefits at higher costs, or lesser benefits at equal costs.

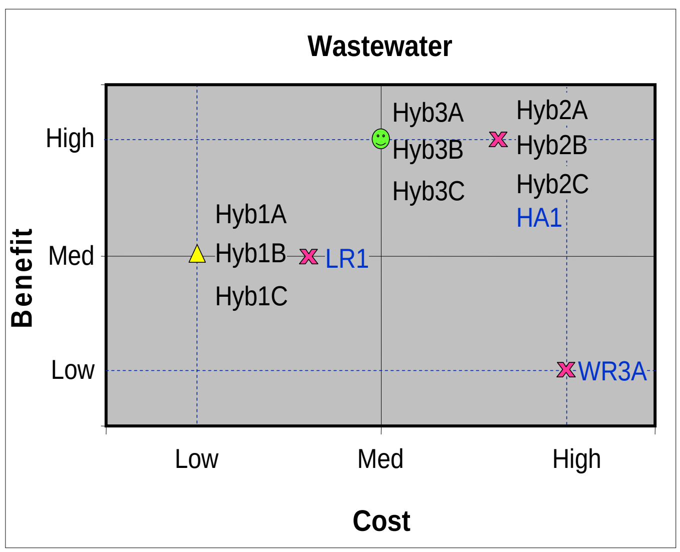


Figure 7-5
Wastewater Quadrant Chart

7.4 Recycled Water Analysis

7.4.1 Definition of Recycled Water Benefits

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.

7.4.2 Recycled Water Results

Using the benefits definitions defined in subsection 7.4.1, the team assigned recycled water costs and benefits scores for the hybrid alternatives and selected preliminary alternatives. Table 7-2 presents a summary of the results.

Table 7-2
Hybrid Alternative Analysis – Potential Recycled Water Costs and Benefits

Alternative[1]	Recycled Water Costs		Recycled Water Benefits	
	Results	Capital Cost ($ mil)[2]	Results	Why (volume)
Hyb1A	Low	$206	Low	21,700 AF/yr
Hyb1B	Med	$374	Med	38,700 AF/yr
Hyb1C	Med	$374	Med	38,700 AF/yr
Hyb2A	Low	$206	Low	21,700 AF/yr
Hyb2B	Med	$402	Med	39,500 AF/yr
Hyb2C	Med-High	$516	Med-High	49,900 AF/yr
Hyb3A	Low	$206	Low	21,700 AF/yr
Hyb3B	Med	$443	Med	40,100 AF/yr
Hyb3C	Med-High	$544	Med-High	52,800 AF/yr
HA1	Low	$198	Low	20,800 AF/yr
WR3A	High	$675	High	63,000 AF/yr
LR1	Low	$198	Low	20,800 AF/yr

Notes:
[1] For detailed discussion of components of each alternative, see Section 6.
[2] Capital costs are presented in $2004 dollars.

Figure 7-6 shows the quadrant chart for the recycled water benefits and costs. As shown in the figure, Hyb2C and Hyb3C are the winners, because they provide med-high benefits with medium-high costs. Hyb1B, Hyb1C, Hyb2B, and Hyb3B are possible second choices if cost is a concern.

If cost is not a concern, then WR3A is a possible second choice. The remaining alternatives are clear losers because they provide lesser benefits then the clear winning or possible second choice alternatives.

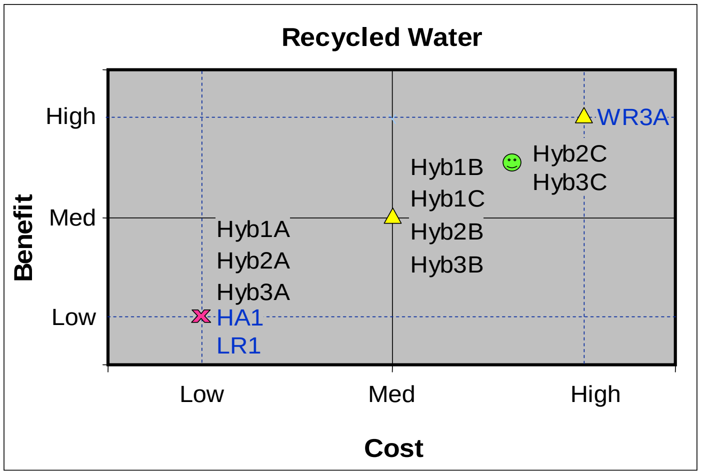


Figure 7-6
Recycled Water Quadrant Chart

7.5 Runoff Management Analysis

7.5.1 Definition of Runoff Management Benefits

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, local/neighborhood solutions (cisterns, on-site percolation, neighborhood recharge), and non-urban regional recharge.

7.5.2 Runoff Management Results

7.5.2.1 Dry Weather Runoff

Using the benefits defined in subsection 7.5.1, the team assigned dry weather runoff management costs and benefits scores for the hybrid alternatives and selected preliminary alternatives. Table 7-3 presents a summary of the results.

Table 7-3
Hybrid Alternative Analysis – Dry Weather Runoff Costs and Benefits

Alternative[1]	Dry Runoff Costs		Dry Weather Runoff Benefits		
	Results	Capital Cost ($ mil)[2]	Results	Why (volume)	Why (beneficial use)
Hyb1A	Low	$0	Low	Low – 10 percent	Low – Diversions to wastewater
Hyb1B	Med	$250	Med-High	Med - 26 percent	High – Smart irrigation & reuse through URPs
Hyb1C	Med	$274	High	High - 42 percent	High – Smart irrigation & reuse through URPs
Hyb2A	Low	$0	Low	Low – 10 percent	Low – Diversions to wastewater
Hyb2B	Med	$250	Med-High	Med - 26 percent	High – Smart irrigation & reuse through URPs
Hyb2C	High	$591	High	High - 42 percent	High – Smart irrigation & reuse through URPs
Hyb3A	Low	$0	Low	Low – 10 percent	Low – Diversions to wastewater
Hyb3B	Med	$250	Med-High	Med - 26 percent	High – Smart irrigation & reuse through URPs
Hyb3C	High	$591	High	High - 42 percent	High – Smart irrigation & reuse through URPs
HA1	Low-Med	$101	Low	Low – 10 percent	Low – Diversions to wastewater
WR3A	Low-Med	$101	Med	Med – 21 percent	Med – Smart irrigation and diversions
LR1	Low-Med	$137	Med	High – 100 percent	Low – all treat and discharge

Notes:
[1] For detailed discussion of components of each alternative, see Section 6.
[2] Capital costs presented in $2004.

Figure 7-7 shows the quadrant chart for the dry weather runoff benefits and costs. As shown in the figure, Hyb1C is the clear winner, because it provides high benefit with medium costs. If costs are a primary concern, then Alternatives WR3A and LR1 are potential second choices, because they provide medium benefits with low-medium costs. The remaining alternatives are clear losers compared to Hyb1C, because they provide equal benefits at higher costs; lesser benefits at equal or higher costs; and low benefits at low costs.

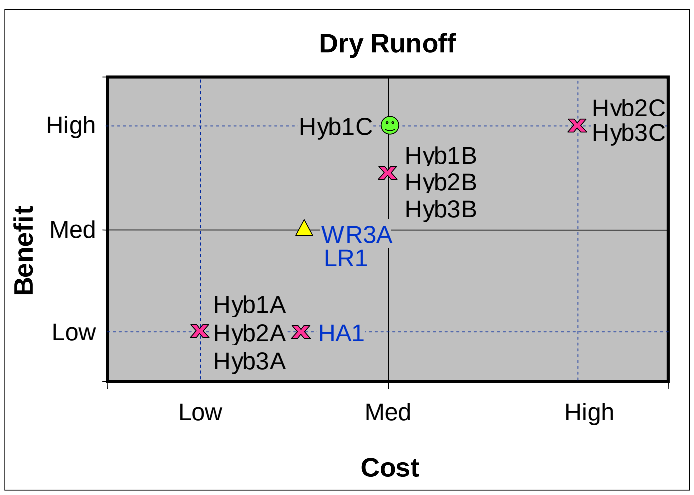


Figure 7-7
Dry Weather Runoff Quadrant Chart

7.5.2.2 Wet Weather Runoff

Using the benefits definitions defined in subsection 7.5.1, the team assigned wet weather runoff management costs and benefits scores for the hybrid alternatives and selected preliminary alternatives. Table 7-4 presents a summary of the results.

Table 7-4
Hybrid Alternative Analysis – Wet Weather Runoff Costs and Benefits

	Wet Runoff Costs		Wet Weather Runoff Benefits		
Alternative[1]	**Results**	**Capital Cost ($ mil)**[2]	**Results**	**Why (volume)**	**Why (beneficial use)**
Hyb1A	Low	$902	Low	Low – 10 percent[3]	Low – Mostly treat and discharge
Hyb1B	Med	$1,666	Med	Med – 39 percent[3]	Med – Neighborhood recharge
Hyb1C	Med	$1,597	Med - High	High – 47 percent[3]	High – Onsite percolation and storage/use
Hyb2A	Low	$902	Low	Low – 10 percent[3]	Low – Mostly treat and discharge
Hyb2B	Med	$1,666	Med	Med – 39 percent[3]	Med – Neighborhood recharge
Hyb2C	Med	$1,597	Med - High	High – 47 percent[3]	High – Onsite percolation and storage/use
Hyb3A	Low	$902	Low	Low – 10 percent[3]	Low – Mostly treat and discharge
Hyb3B	Med	$1,666	Med	Med – 39 percent[3]	Med – Neighborhood recharge
Hyb3C	Med	$1,597	Med - High	High – 47 percent[3]	High – Onsite percolation and storage/use
HA1	Med	$1,666	Med	Med – 39 percent[3]	Med – Neighborhood recharge
WR3A	High	$9,523	High	High – 58 percent[3]	High – Onsite percolation and storage/use
LR1	High	$9,303	Med	High – 100 percent[3]	Low – Mostly treat and discharge

Notes:
[1] For detailed discussion of components of each alternative, see Section 6.
[2] Capital costs are presented in $2004.
[3] Percent of estimated runoff generated from a ½ inch storm citywide.

Figure 7-8 shows the quadrant chart for the dry weather runoff benefits and costs. As shown in the figure, Hyb1C, Hyb2C and Hyb3C are the clear winners, because they provide medium-high benefits with medium costs. If costs are not major contributor, then WR3A is a potential second choice because it provides higher benefits than Hyb1C, Hyb2C and Hyb3C, but with higher costs. The remaining alternatives are clear losers compared to Hyb1C, Hyb2C and Hyb3C, because they provide lesser benefits at higher costs; lesser benefits at equal costs; and low benefits at low costs.

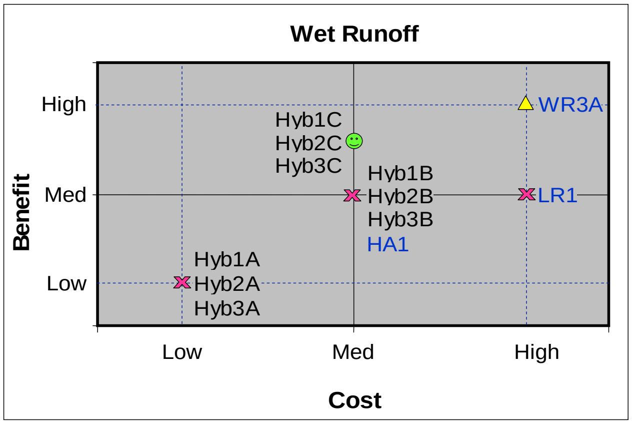


Figure 7-8
Wet Weather Runoff Quadrant Chart

7.6 Integrated Results

After evaluating the hybrid alternatives for each service function, the next step was to consider the alternatives as an integrated system. The team compared each of the service function quadrant charts (Figures 7-5 through 7-8) and counted the number of times each alternative was a clear winner or second choice (see Figure 7-9).

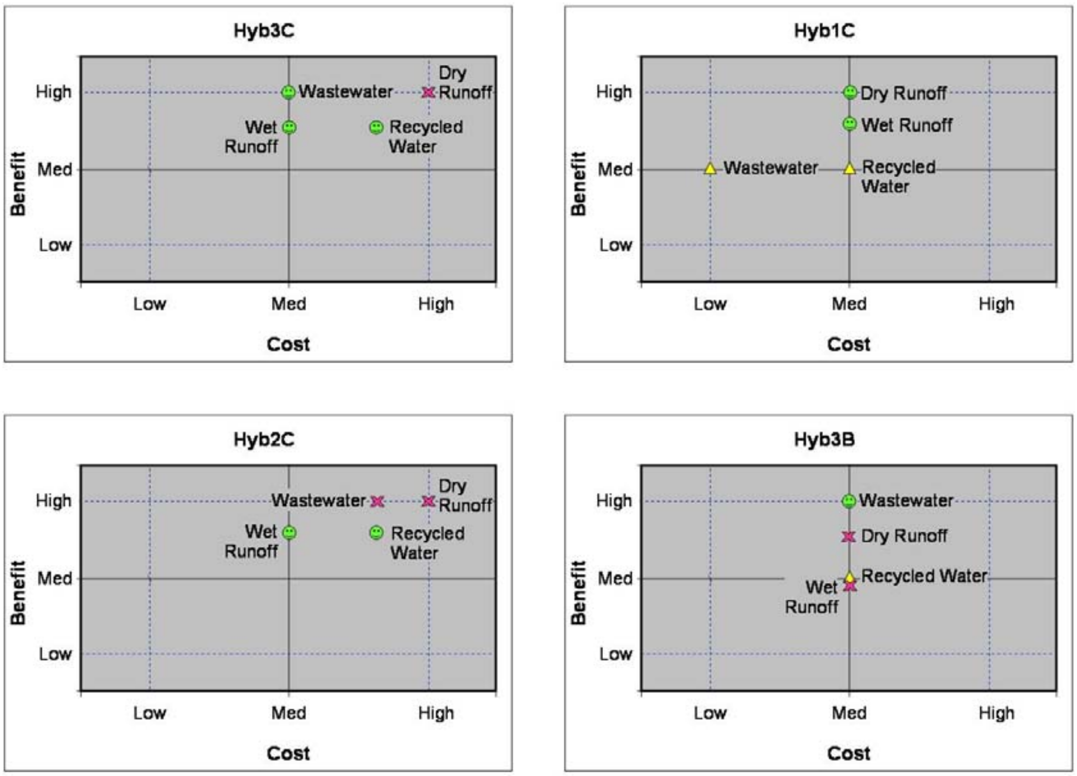


Figure 7-9
Integrated Quadrant Analysis

All configurations of the wastewater system (e.g., Series 1, 2 and 3) had top performing alternatives. Within these wastewater configurations, the "C" series water management alternatives performed better, while the "A" series performed lesser when looking at all service functions combined.

Based on this analysis, as well as the desire to have alternatives that spanned the possible range of options for the environmental review process, the four top-scoring alternatives were Hyb3C, Hyb1C, Hyb2C, and Hyb3B. Figure 7-10 presents these four alternatives and how they scored relative to the four service functions.

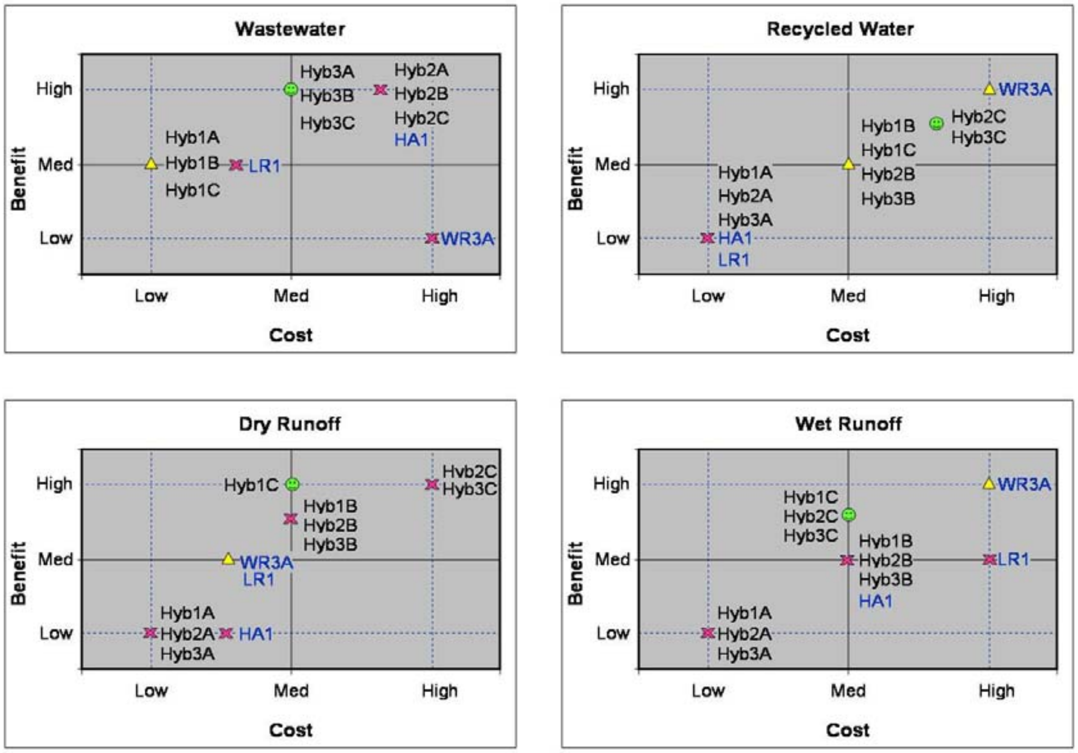


Figure 7-10
Four Top Performing Alternatives

In summary, the alternatives performed:

- Alternative Hyb3C (clear winner for wastewater, recycled water and wet weather runoff)
- Alternative Hyb1C (clear winner for both dry and wet weather runoff, and possible second choice for wastewater and recycled water)
- Alternative Hyb2C (clear winner for wet weather runoff and recycled water)
- Alternative Hyb3B (clear winner for wastewater, and possible second choice for recycled water)

Another important consideration is confirming that each of these top hybrid alternatives performs better than the preliminary alternatives. Figure 7-11 presents a summary of the costs and benefits of each hybrid alternative and selected preliminary alternatives.

As shown in the figure, Alternatives Hyb1C, Hyb2C, Hyb3B and Hyb3C provide more recycled water benefits than LR1 or HA1, and Hyb3C provides the same recycled water benefits as WR3A. Hyb1C, Hyb2C, Hyb3B and Hyb3C also provide more beneficial reuse of runoff than LR1 and HA1, with Hyb1C, Hyb2C, and Hyb3C approaching the runoff benefits of WR3A. However, all the hybrid alternatives provide these benefits at a cost comparable to the HA1 alternative, which is about $24 to $29 additional per month for an average single-family customer (in year 2020 dollars). This is significantly less than the WR3A and LR1 alternatives, which would add $96 to $134 more per month for an average single-family customer.

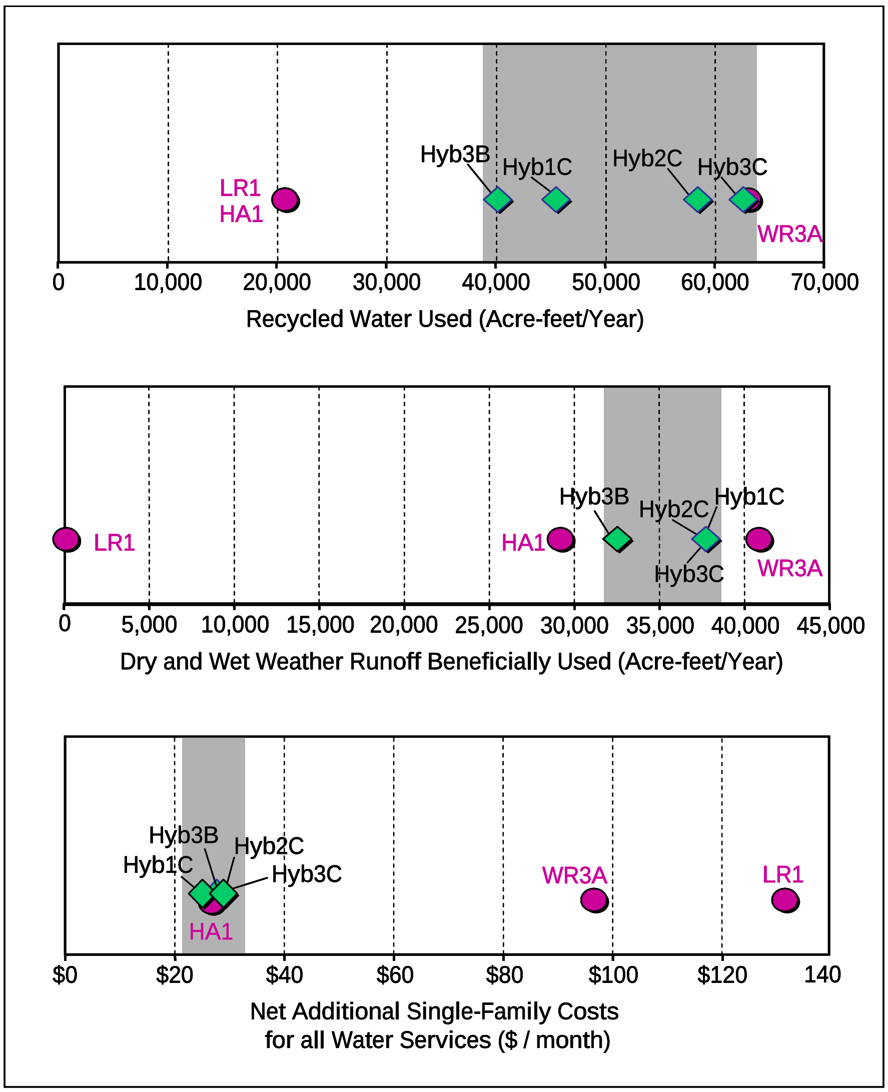


Figure 7-11
Summary of Benefits and Costs for Top Performing Hybrid Alternatives

Section 8
Recommended Draft Alternatives

8.1 Introduction

Los Angeles is facing a number of challenges. These include a growing population (estimated 19% increase by 2020), an aging infrastructure for wastewater and stormwater, pollution of our beaches and waterways, a shortage of parks and open space (9% in Los Angeles, compared to New York and San Francisco's 25%), a dependence on imported water, and a shortage of available funding.

These challenges are going to require bold solutions for the wastewater, stormwater and recycled water programs. Although these solutions will lead to increases in wastewater and stormwater rates, and other short-term impacts as we build these projects; the long-term benefits of an integrated multi-benefit approach will outweigh these.

This section presents a summary of the recommended draft alternatives for the IRP. These recommended draft alternatives will undergo additional environmental analysis through the development of an Environmental Impact Report (EIR). As shown in Figure 8-1, through the environmental analysis process, a preferred alternative will be selected, which will be the basis for the City's Capital Improvement Program (CIP).

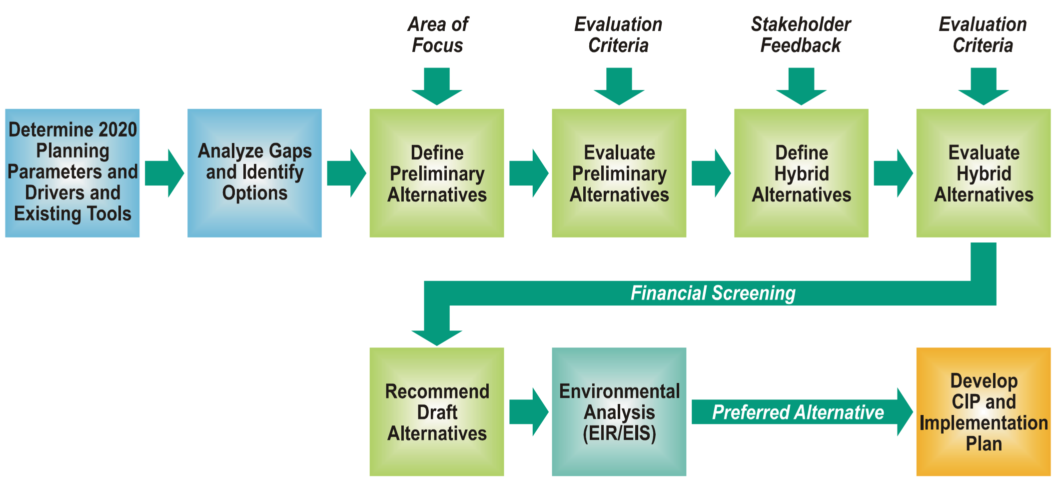


Figure 8-1
IRP Approach to Creating Alternatives

8.2 Recommended Draft Alternatives for Environmental Analysis

Using preference information from the IRP Steering Group (see Section 7), the following draft alternatives are recommended to continue through the environmental impact analysis and financial analysis:

- Alternative 1 (Hyb1C): Hyperion Expansion with moderate potential for water resources projects
- Alternative 2 (Hyb2C): Tillman and Los Angeles Glendale Water Reclamation Plant expansions with high potential for water resources projects
- Alternative 3 (Hyb3B): Tillman expansion with moderate potential for water resources projects
- Alternative 4 (Hyb3C): Tillman expansion with high potential water resources projects

These alternatives reflect a full spectrum of wastewater assumptions, provide leadership in water resources and balance today's financial realities. Figure 8-2 provides a snapshot of the projects included in each of these alternatives. The IRP newsletter describing the four alternatives is included in Appendix Q.

In developing these recommended draft alternatives from the hybrid alternatives, the following additional projects were added to all four alternatives, based on updated data and information:

- ***Secondary Clarifiers at Hyperion:*** Two new 50 mgd secondary clarifier modules to bring existing secondary clarifier capacity up to 450 mgd. As discussed in *Volume 1 (Wastewater Management)*, subsection 7.3.8.4, the existing secondary clarifier capacity ranges from 350 to 450 mgd, depending on the success of operation in selector-mode. To be conservative, the lower capacity was assumed, which results in the minimum need for 2 secondary clarifier modules for all alternatives.

- ***Solids Handling/Truck Loading Facility at Hyperion:*** A new truck loading facility to consolidate the biosolids handling processes into one building to accommodate dewatering, biosolids storage and truck loading.

- ***Digesters at Hyperion:*** Up to 12 new digesters at Hyperion (4-6 for future capacity, plus 6 additional for flexibility and redundancy).

- ***Wastewater Storage at Tillman and Valley Spring Lane Interceptor Sewer***: To provide operational flexibility during wet weather conditions, both storage and a new interceptor sewer are included in all alternatives.

The costs of these elements will be included in *Facilities Plan, Volume 5 (Adaptive Capital Improvement Program)* and the *Financial Plan*.

Alternative 1 (Hyb1C) – Hyperion Expansion and Moderate Potential for Water Resources Projects

Wastewater
- Expand Hyperion Treatment Plant to 500 mgd
- Build new digester tanks, solids handling facility, & secondary clarifiers at Hyperion
- Upgrade Tillman to advanced treatment
- Build 5 MG diurnal storage and 5 MG recycled water storage at LAG
- Build 60 MG wastewater storage at Tillman
- Build New Sewers:
  - Glendale-Burbank Interceptor Sewer (GBIS)
  - Northeast Interceptor Sewer (NEIS) Phase 2
  - Valley Spring Lane Interceptor Sewer (VSLIS);

Recycled Water
- Use up to 38,700 acre-feet/year (42,000 including reuse of dry weather runoff) of recycled water for irrigation and industrial users; and provide baseline flows to LA River.

Conservation
- Increase efforts beyond planned 2020 levels

Dry Weather Runoff
- Reduce dry weather runoff by installing "Smart Irrigation" devices
- Divert dry weather runoff from coastal area, Browns Creek, Wilbur Wash, Limekiln Canyon, Caballero Canyon, Bull Creek, and Pacoima Wash to sewer system and convey to Hyperion for treatment.
- Divert dry weather runoff from Compton Creek and Ballona Creek and treat/beneficially use through urban runoff plants

Wet Weather Runoff
- Onsite treatment/discharge or percolation for new or redeveloped areas
- Retrofit for onsite storage (cisterns) and beneficial use of runoff at schools and government properties
- Retrofit for onsite percolation of runoff at schools and government properties
- Onsite percolation of runoff in vacant lots, parks/open space, and abandoned alleys in the East Valley (moderate level of implementation)
- Regional recharge of runoff in spreading basins in the East Valley
- Urban runoff plants on the Westside.

Leadership Projects
- Full scale and pilot

Alternative 4 (Hyb3C) – Tillman Expansion and High Potential for Water Resources Projects

Wastewater
- Expand and upgrade Tillman to 100 mgd
- Build 5 MG diurnal storage and 5 MG recycled water storage at LAG
- Build 60 MG wastewater storage at Tillman
- Build new digester tanks, solids handling facility, & secondary clarifiers at Hyperion
- Build New Sewers:
  - Glendale-Burbank Interceptor Sewer (GBIS)
  - Northeast Interceptor Sewer (NEIS) Phase 2
  - Valley Spring Lane Interceptor Sewer (VSLIS)

Recycled Water
- Use up to 52,800 acre-feet/year (56,000 including reuse of dry weather runoff) of recycled water for irrigation and industrial users; and provide baseline flows to LA River.

Conservation
- Same as Alt 1

Dry Weather Runoff
- Same as Alt 2

Wet Weather Runoff
- Same as Alt 1 or Alt 2

Leadership Projects
- Full scale and pilot

Alternative 2 (Hyb2C) – Tillman and LAG Expansion and High Potential for Water Resources Projects

Wastewater
- Expand and upgrade Tillman to 80 mgd
- Expand and upgrade LAG to 30 mgd
- Build 5 MG diurnal storage and 5 MG recycled water storage at LAG
- Build 60 MG wastewater storage at Tillman
- Build new digester tanks, solids handling facility, & secondary clarifiers at Hyperion
- Build New Sewers:
  - Glendale-Burbank Interceptor Sewer (GBIS)
  - Northeast Interceptor Sewer (NEIS) Phase 2
  - Valley Spring Lane Interceptor Sewer (VSLIS)

Recycled Water
- Use up to 49,900 acre-feet/year (53,000 including reuse of dry weather runoff) of recycled water for irrigation and industrial users; and provide baseline flows to LA River.

Conservation
- Same as Alt 1

Dry Weather Runoff
- Reduce dry weather runoff by installing "Smart Irrigation" devices
- Divert dry weather runoff from coastal area to sewer system and convey to Hyperion for treatment
- Divert dry weather runoff from Browns Creek, Wilbur Wash, Limekiln Canyon, Caballero Canyon, Bull Creek, and Pacoima Wash to urban runoff plants or constructed wetlands for treatment and discharge back to creeks.
- Divert dry weather runoff from Compton Creek and Ballona Creek and treat/beneficially use through a constructed wetlands or urban runoff plant

Wet Weather Runoff
- Same as Alt 1

Leadership Projects
- Full scale and pilot

Alternative 3 (Hyb3B) – Tillman Expansion and Moderate Potential for Water Resources Projects

Wastewater
- Expand and upgrade Tillman to 100 mgd
- Build 5 MG diurnal storage and 5 MG recycled water storage at LAG
- Build 60 MG wastewater storage at Tillman
- Build new digester tanks, solids handling facility, & secondary clarifiers at Hyperion
- Build New Sewers:
  - Glendale-Burbank Interceptor Sewer (GBIS)
  - Northeast Interceptor Sewer (NEIS) Phase 2
  - Valley Spring Lane Interceptor Sewer (VSLIS)

Recycled Water
- Use up to 40,100 acre-feet/year (43,000 including reuse of dry weather runoff) of recycled water for irrigation and industrial users; and provide baseline flows to LA River.

Conservation
- Same as Alt 1

Dry Weather Runoff
- Reduce dry weather runoff by installing "Smart Irrigation" devices
- Divert dry weather runoff from coastal area to sewer system and convey to Hyperion for treatment.
- Divert dry weather runoff from Compton Creek and Ballona Creek and treat/beneficially use through urban runoff plants

Wet Weather Runoff
- Onsite treatment/discharge or percolation for new or redeveloped areas.
- Onsite percolation of runoff in vacant lots, parks/open space, and abandoned alleys in the East Valley (high level of implementation)
- Urban runoff plants on the Westside.

Leadership Projects
- Full scale and pilot

Figure 8-2
IRP Recommended Draft Alternatives

8.2.1 Alternative 1: Hyperion Expansion and Moderate Potential for Water Resources Projects (Hyb1C)

Alternative 1 (formerly Hyb1C) focuses on expansion at the Hyperion Treatment Plant in Playa del Rey adjacent to El Segundo to maximize the use of existing world-class facilities. Other major construction would include a major new sewer between Eagle Rock and the Tillman Water Reclamation Plant in Van Nuys, and upgrading treatment systems within Tillman. This sewer work would continue the replacement of an aging arterial pipeline (built in the 1920s) that has been ongoing for the last decade. This alternative would include several opportunities to reclaim/reuse wastewater effluent, conserve water, and beneficially reuse urban runoff from stormwater and dry weather activities (which will help reduce pollution and the amount of imported water that Los Angeles uses).

Figure 8-3 is a map showing the proposed location of Alternative 1 projects. The following subsections provide additional descriptions of the components in Alternative 1.

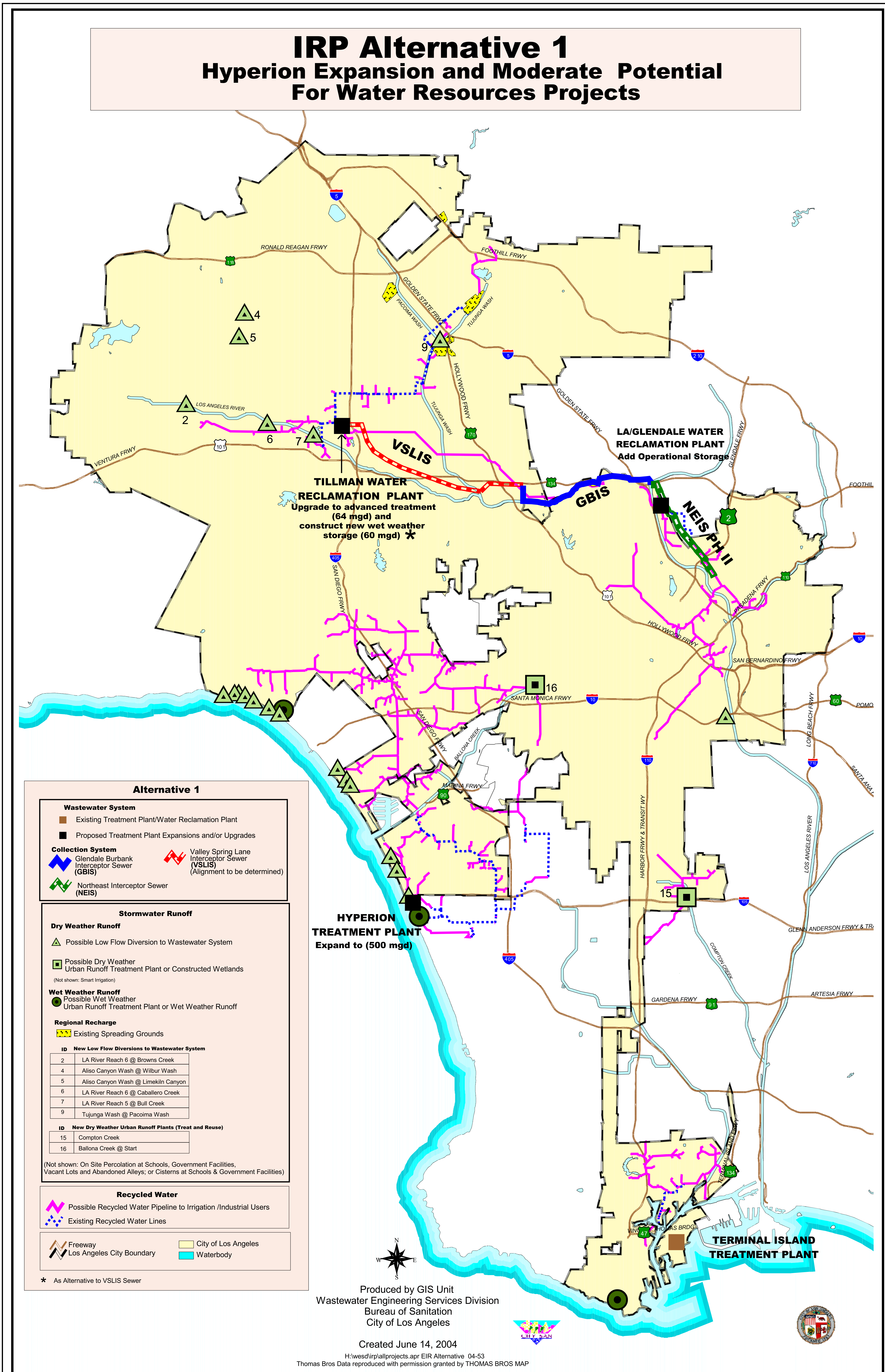


Figure 8-3
IRP Alternative 1
Project Location Map

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8.2.1.1 Alternative 1 – Wastewater Management

Alternative 1 includes wastewater treatment and conveyance projects required to expand Hyperion to 500 mgd and upgrade Tillman to advanced treatment by year 2020. Alternative 1 focuses on maximizing the use of existing process capacity at the Hyperion Treatment Plant near El Segundo. Existing capacity upstream in the system would be maintained [upgrade the Tillman to advanced treatment, but maintain the Los Angeles-Glendale Water Reclamation Plant (LAG) as a Title 22 plant].

A higher percentage of wastewater than other alternatives would be conveyed to Hyperion requiring an expansion to 500 million gallons per day (mgd) by increasing the capacities of secondary clarifiers and digesters only. The baseline CIP includes building a new solids handling/truck loading facility at Hyperion. Tillman would be upgraded to advanced treatment to allow continued discharge of at least 30 mgd to the Los Angeles River. Table 8-1 presents a summary of the wastewater treatment components included in Alternative 1.

Table 8-1
Alternative 1 (Hyperion Expansion and Moderate Potential For Water Resources Projects)
Wastewater Treatment Components

Component	Hydraulic Capacity (mgd)			Level of Treatment (Effluent)	
	Current	Add'l	Total	Current	New
Donald C. Tillman Water Reclamation Plant	64 mgd	0 mgd	64 mgd	Title 22 with Nitrification & Denitrifcation[1]	Advanced Treatment[2]
LAG Water Reclamation Plant	15 mgd	0 mgd	15 mgd	Title 22 with Nitrification & Denitrifcation	Title 22 with Nitrification & Denitrifcation
Hyperion Treatment Plant	450 mgd	50 mgd	500 mgd	Secondary	Secondary
Total Hyperion Service Area			546 mgd[3]		
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Advanced Treatment	Advanced Treatment

In Alternative 1, a portion (approximately 25 mgd) of the Hyperion service area capacity would be used to treat dry weather urban runoff. See Table 8-3.

The following is a summary of the specific wastewater treatment options included in Alternative 1:

- New advanced treatment facilities (assumed microfiltration (MF), reverse osmosis (RO) and ultraviolet (UV) disinfection) at Tillman

[1] As discussed in *Volume 1: Wastewater Management*, for the IRP it was assumed that the nitrification/denitrifcation projects currently under construction will result in a reduction of total capacity at Tillman by 0 to 20 percent (assumed 20 percent, from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 0 to 25 percent (assumed 25 percent, from 20 mgd to 15 mgd).
[2] For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).
[3] The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For Alternative 1, the effective capacity is 46 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 500 mgd at Hyperion = 546 mgd.

- New 60 million gallon (MG) buried wet weather storage tank with real-time control at Tillman
- Two new 5 million gallon (MG) storage tanks at LAG (one for diurnal peaks, one for recycled water storage)
- Two new 50 mgd secondary clarifier modules at Hyperion to bring existing secondary clarifier capacity up to 450 mgd, plus one additional 50 mgd secondary clarifier module at Hyperion to expand capacity to 500 mgd
- Up to 12 new digesters at Hyperion (4-6 for future capacity, plus 6 additional for flexibility and redundancy) & new solids handling/truck loading facility at Hyperion

Alternative 1 would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors would be required as described below and shown in Figure 8-4:

- Build new Glendale Burbank Interceptor Sewer (GBIS) between Toluca Lake and LAG
- Build new North East Interceptor Sewer (NEIS) Phase 2, located south of LAG
- Build new Valley Spring Lane Interceptor Sewer (VSLIS) between Tillman and Toluca Lake

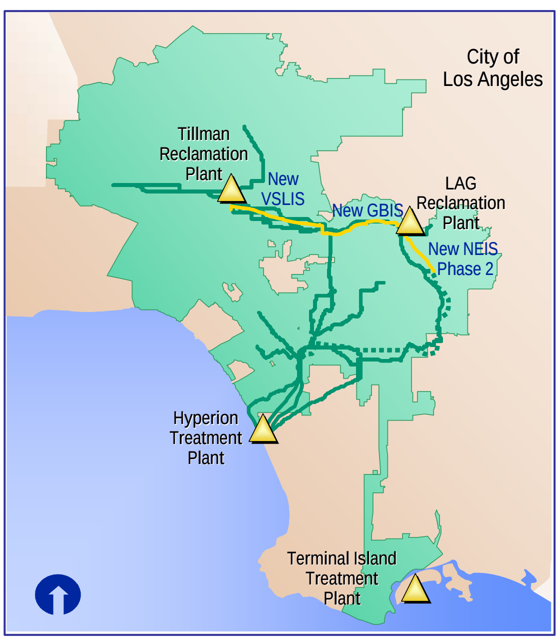

Figure 8-4
New Sewers in Alternatives

It is assumed that Title 22 plants will provide no capacity relief to the sewer system, since there will be no discharge out of the system other than through service to recycled water end users. During wet weather, these end users may not require recycled water (e.g., for irrigation use), so the entire flow through LAG would be returned to the sewer system for conveyance downstream to Hyperion. Therefore, LAG as a Title 22 plant will not provide any relief to the sewer system during wet weather.

For biosolids management, Alternative 1 assumes 100 percent beneficial reuse of Class A exceptional quality (EQ) biosolids through land application.

Figures 8-5 through 8-7 include conceptual site plans for Tillman, LAG and Hyperion.

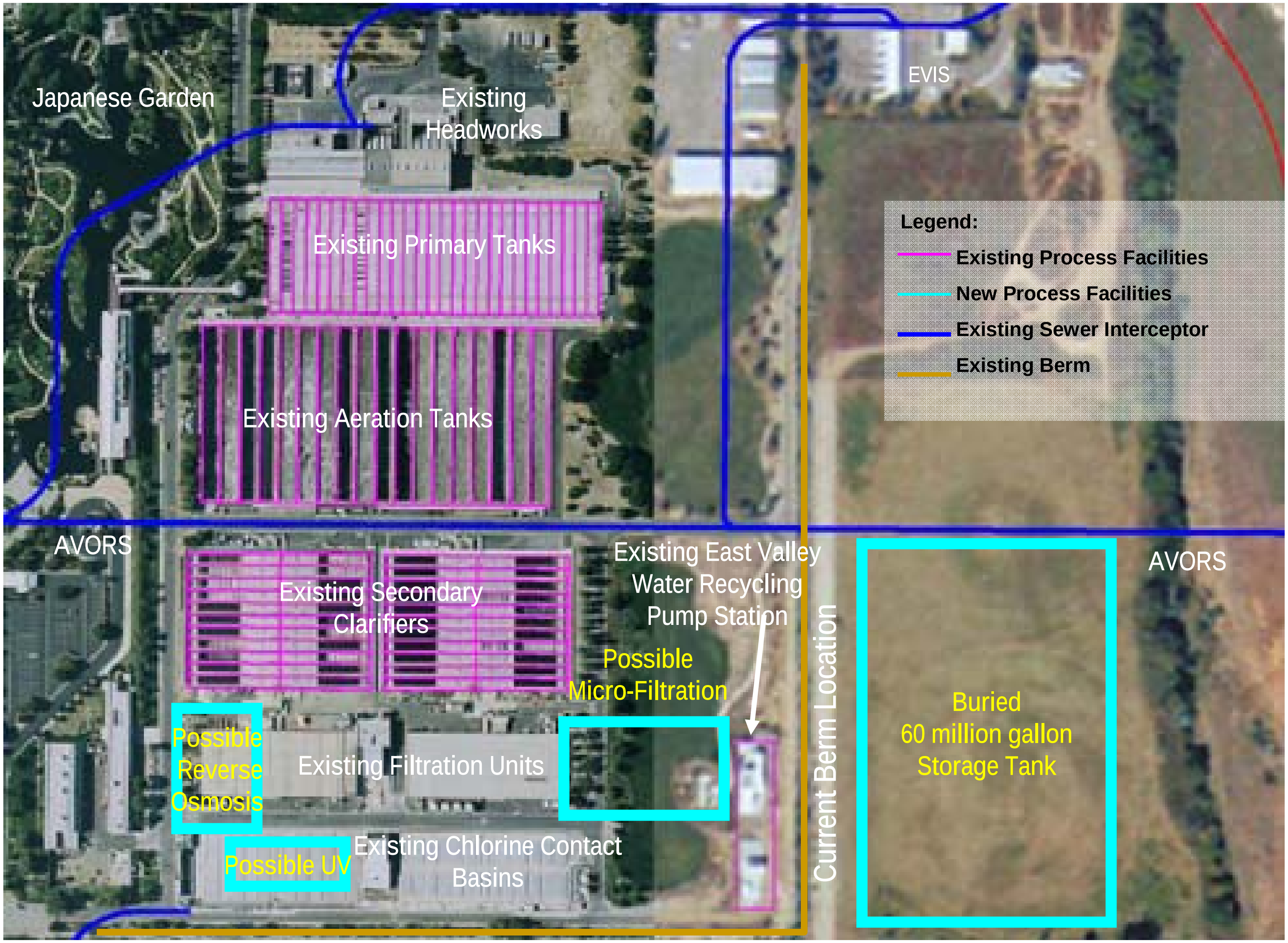

Figure 8-5
IRP Alternative 1 – Treatment Modifications at the Tillman Water Reclamation Plant
Existing 64 mgd with Advanced Treatment

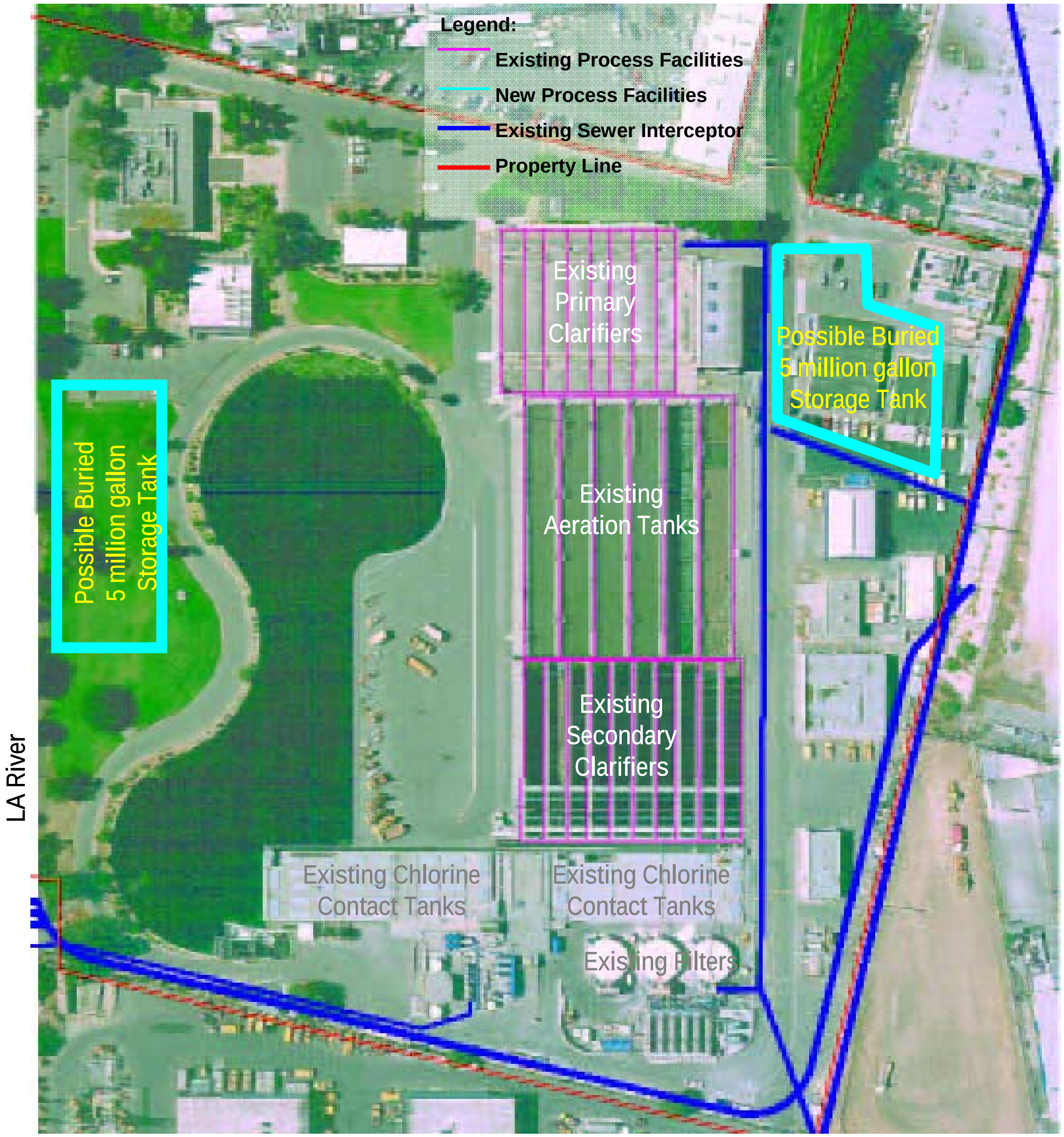

Figure 8-6
IRP Alternative 1 – Treatment Modifications at Los Angeles-Glendale Water Reclamation Plant
Existing 15 mgd with Added Diurnal Storage

Figure 8-7
IRP Alternative 1 – Treatment Modifications at the Hyperion Treatment Plant
Expand to 500 mgd and New Digesters by 2020

8.2.1.2 Alternative 1 – Water Resources

Water resources components include recycled water, dry weather runoff management and wet weather runoff management, and water conservation.

Tables 8-2 through 8-4 provide a summary of the potential water resources projects included in Alternative 1. Section 6 provides detailed discussion on the specific projects in Alternative 1 (Hyb1c).

Table 8-2
Alternative 1 (Hyperion Expansion/Moderate Potential for Water Resources Projects)
Summary of Potential Additional Recycled Water

Plant	Level of Treatment	Area of Use	Use	Volume (acre-feet/yr)
Tillman	Advanced Treatment (MF/RO)	San Fernando Valley	Industrial and Irrigation	11,400
LAG	Title 22 w/ Nitrogen removal	Downtown	Industrial and Irrigation	5,400
Hyperion	Title 22[1]	Westside	Industrial and Irrigation	12,500
Terminal Island	Advanced Treatment (MF/RO)	Harbor	Industrial and Irrigation	9,400
Sub-Total (WW Only)				38,700
Urban Runoff Plants (Stormwater)	Title 22	Ballona and Compton Creeks	Industrial and Irrigation	3,300
Total Reused				42,000

Note:
[1] Assumed that secondary effluent from Hyperion would be delivered to West Basin for additional treatment before reuse

Table 8-3
Alternative 1 (Hyperion Expansion/Moderate Potential for Water Resources Projects)
Summary of Potential Dry Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed
Reduction (Conservation) Using Smart Irrigation			
Smart Irrigation	Citywide	--	11 mgd
Diversion to Wastewater System			
Coastal Area		Treat and Discharge	9 mgd
Browns Creek	11 mgd	Treat and Discharge	3 mgd
Wilbur Wash		Treat and Discharge	1 mgd
Limekiln Canyon	9 mgd	Treat and Discharge	1.5 mgd
Caballero Canyon	Valley	Treat and Discharge	1 mgd
Bull Creek	Valley	Treat and Discharge	2.4 mgd
Pacoima Wash	Valley	Treat and Discharge	7 mgd
Diversion to Urban Runoff Plant for Reuse			
Compton Creek	Southside	Reuse	2 mgd
Ballona Creek	Westside	Reuse	3 mgd
Total Dry Weather Runoff Managed (mgd)			41 mgd
Percent of Dry Weather Runoff Managed (of watershed – 97 mgd)			42%

Table 8-4
Alternative 1 (Hyperion Expansion and Moderate Potential For Water Resources Projects)
Summary of Wet Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed
On-site Percolation			
Schools	East Valley	Beneficial Use	3 mgd
Government	East Valley	Beneficial Use	1 mgd
Neighborhood - Vacant Lots	East Valley	Beneficial Use	220 mgd
Neighborhood - Parks/open space	East Valley	Beneficial Use	70 mgd
Neighborhood - Abandoned alleys	East Valley	Beneficial Use	10 mgd
Non-urban regional recharge	East Valley	Beneficial Use	245 mgd
On-site Storage / Use (Cisterns)			
Schools	Citywide	Beneficial Use	49 mgd
Government	Citywide	Beneficial Use	31 mgd
On-site Treat and Discharge			
New/Redevelopment Areas	Citywide	Treat and Discharge	2 mgd
Regional Solutions			
Urban runoff plants[1]	Westside (coast)	Treat and Discharge	160 mgd
Total Wet Weather Runoff Managed (mgd)			791 mgd
Percent of Runoff from ½ inch storm citywide (1,700 mgd)			47%

Notes:
[1] For the IRP, it was assumed that three urban runoff plants would be needed to meet the Santa Monica Bay Beaches Wet Weather Bacteria TMDL. As required by the Santa Monica Bay Beaches Wet Weather Bacteria TMDL, an Implementation Plan was developed with stakeholder and Regional Board involvement, which was submitted to the Regional Board in July 2005. The recommendations from the approved Implementation Plan will supersede the assumed projects for the IRP.

8.2.2 Alternative 2: Tillman and LAG Water Reclamation Plant Expansions and High Potential for Water Resources Projects (Hyb2C)

Alternative 2 (formerly Hyb2C) focuses on expansion at Tillman in Van Nuys and LAG in Los Angeles near Griffith Park. Other major construction would include a major new sewer between Eagle Rock and Tillman. This alternative would include the highest potential of opportunities to reclaim/reuse wastewater effluent, conserve water, and beneficially reuse urban runoff from stormwater and dry weather activities (which will help reduce pollution and imported water that Los Angeles uses).

Figure 8-8 is a map showing the proposed location of Alternative 2 projects. The following subsections provide additional descriptions of the components in Alternative 2.

8.2.2.1 Alternative 2 – Wastewater Management

Alternative 2 includes maintaining the current wastewater treatment at Hyperion, expanding the conveyance system, and expanding and upgrading the Tillman and the Los Angeles-Glendale Plant to advanced treatment. Note that since all biosolids are treated at Hyperion, additional digester capacity will also be required. The baseline CIP includes building a new solids handing/truck loading facility at Hyperion. Table 8-5 presents a summary of the wastewater treatment components included in Alternative 2.

Table 8-5
Alternative 2 (Tillman and LAG Expansions and High Potential For Water Resources Projects)
Wastewater Treatment Components

Component	Hydraulic Capacity (mgd)			Level of Treatment (Effluent)	
	Current	Add'l	Total	Current	New
Donald C. Tillman Water Reclamation Plant	64 mgd	16 mgd	80 mgd	Title 22 with Nitrification & Denitrifcation[4]	Advanced Treatment[5]
LAG Water Reclamation Plant	15 mgd	15 mgd	30 mgd	Title 22 with Nitrification & Denitrifcation	Advanced Treatment[5]
Hyperion Treatment Plant	450 mgd	0 mgd	450 mgd	Secondary	Secondary
Total Hyperion Service Area			529 mgd[6]		
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Advanced Treatment	Advanced Treatment

In Alternative 2, approximately 9 mgd of the Hyperion service area capacity would be used to treat dry weather runoff. See Table 8-7. The following is a summary of the specific wastewater treatment options included in Alternative 2:

- New secondary treatment and advanced treatment facilities at Tillman
- New 60 million gallon (MG) buried wet weather storage tank with real-time control at Tillman
- New primary, secondary treatment and advanced treatment facilities at LAG
- Two new 5 million gallon (MG) storage tanks at LAG (one for diurnal peaks, one for recycled water storage)
- Two new 50 mgd secondary clarifier modules at Hyperion to bring existing secondary clarifier capacity up to 450 mgd
- Up to 12 new digesters at Hyperion (4-6 for future capacity, plus 6 additional for flexibility and redundancy) and a new solids handling/truck loading facility at Hyperion

Figures 8-9 through 8-11 include conceptual site plans for Tillman, LAG and Hyperion.

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[4] As discussed in *Volume 1: Wastewater Management*, for the IRP it was assumed that the nitrification/denitrifcation projects currently under construction will result in a reduction of total capacity at Tillman by 0 to 20 percent (assumed 20 percent, from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 0 to 25 percent (assumed 25 percent, from 20 mgd to 15 mgd).
[5] For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).
[6] The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For Alternative 2, the effective capacity is 46 mgd at Tillman + 22 mgd at LAG + 450 mgd at Hyperion = 529 mgd.

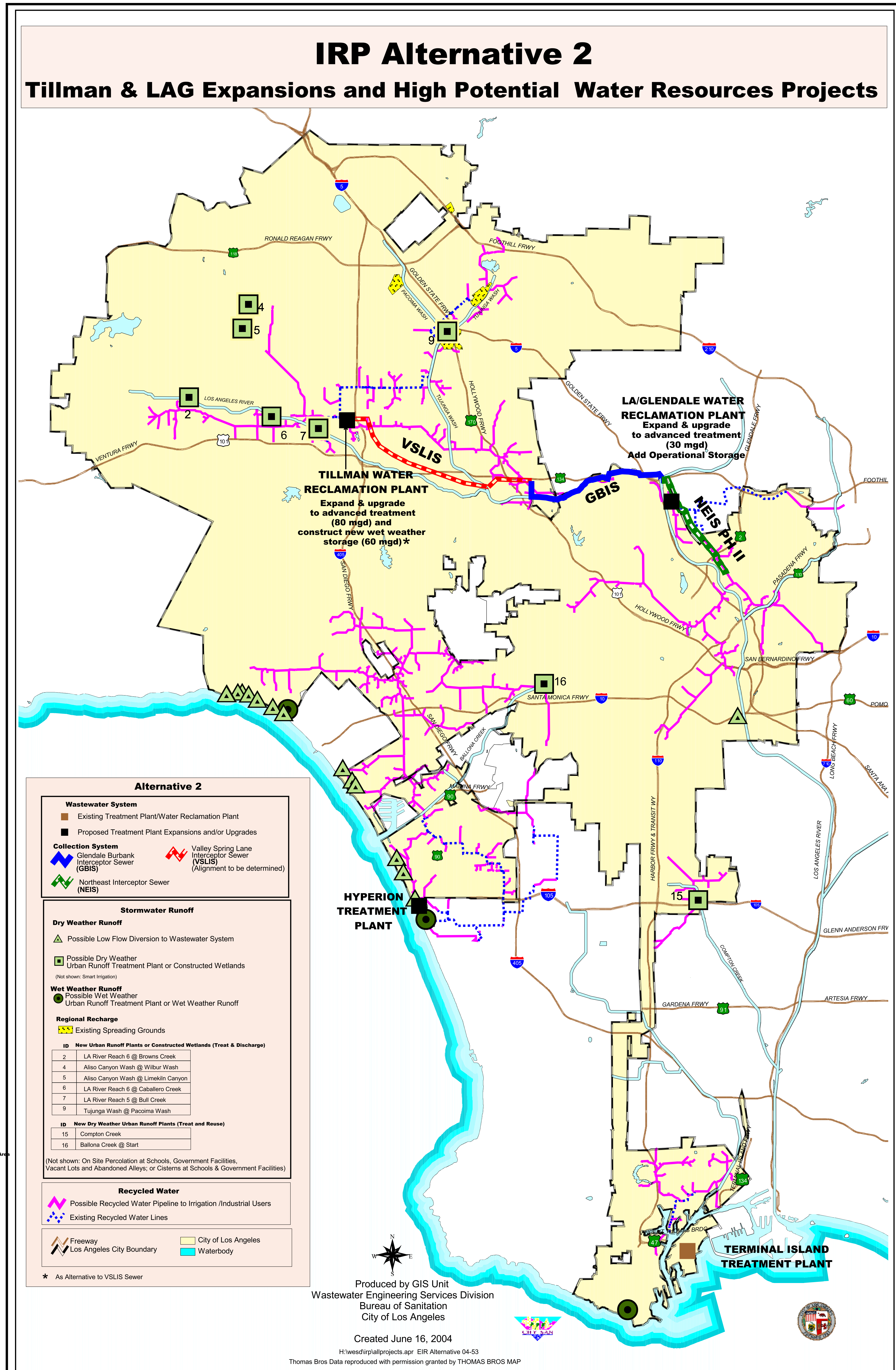

Figure 8-8
IRP Alternative 2
Project Location Map

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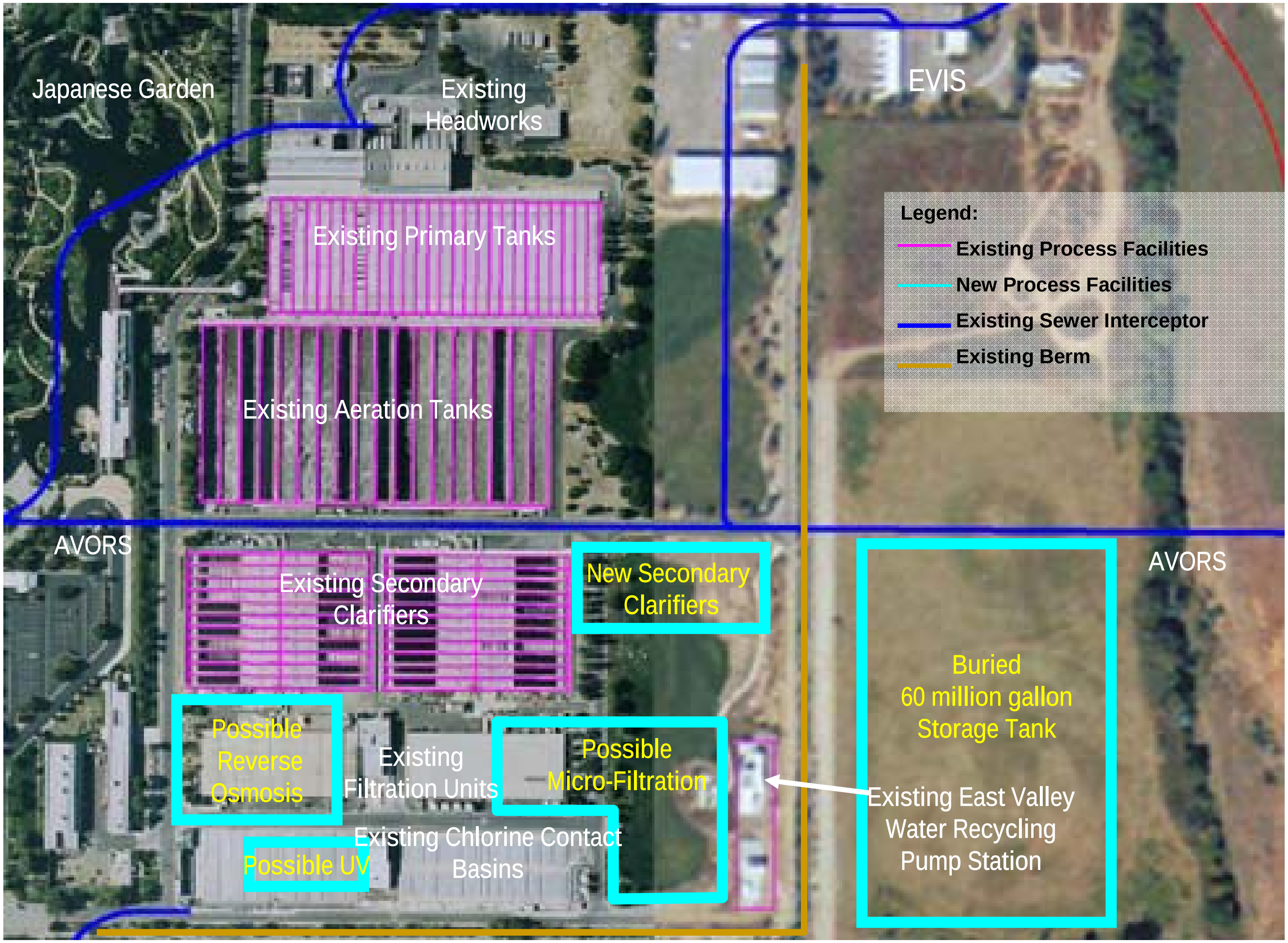

Figure 8-9
IRP Alternative 2 – Treatment Modifications at the Tillman Water Reclamation Plant Expand to 80 mgd with Advanced Treatment

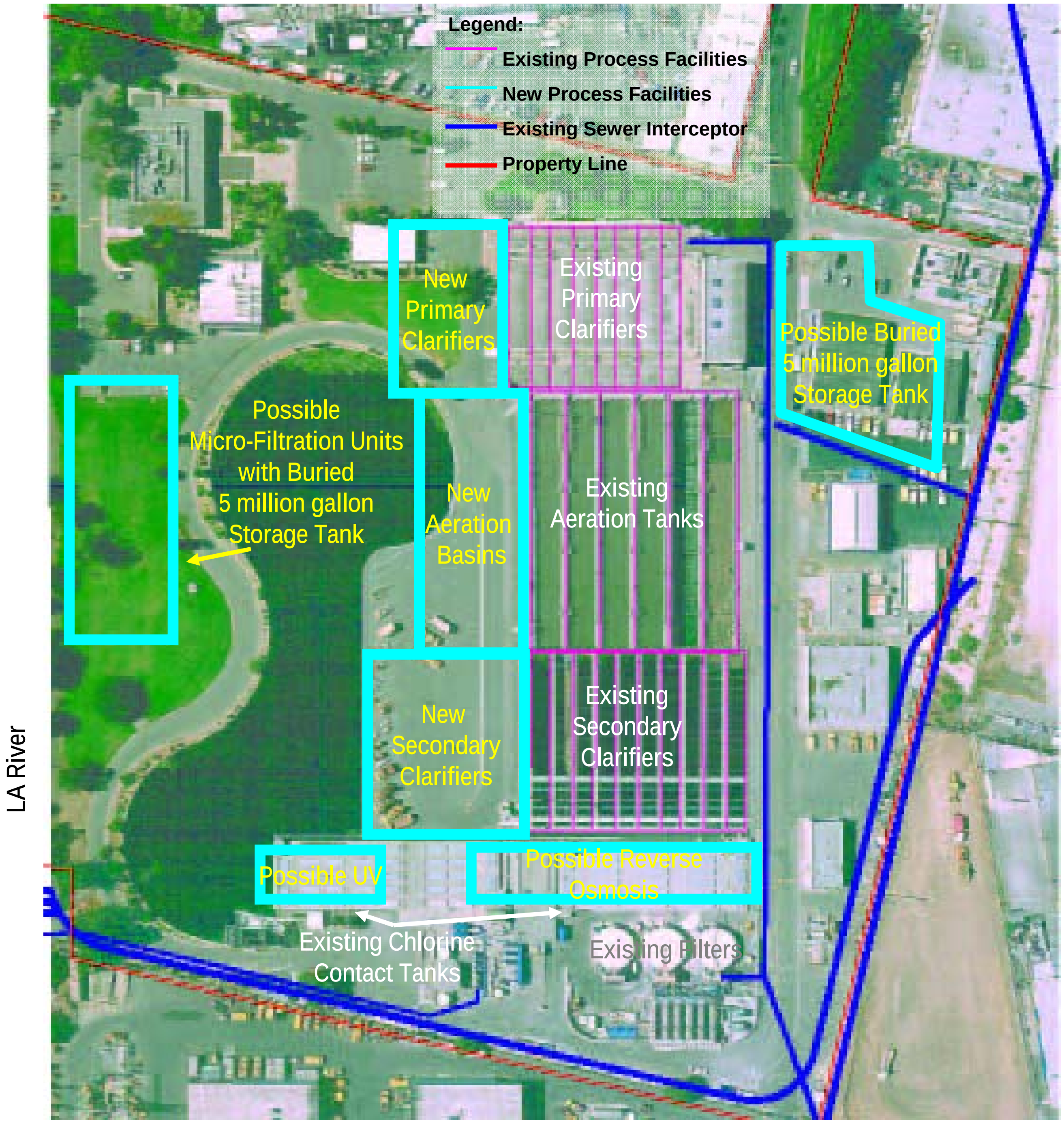

Figure 8-10
IRP Alternative 2 – Treatment Modifications at Los Angeles-Glendale Water Reclamation Plant
Expand to 30 mgd with Advanced Treatment and Added Diurnal Storage

Figure 8-11
IRP Alternative 2 – Treatment Modifications at the Hyperion Treatment Plant
Existing 450 mgd and New Digesters by 2020

Like Alternative 1, Alternative 2 would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors or storage facilities would be required including, GBIS, NEIS Phase 2, and VSLIS. There were shown previously in Figure 8-2. For biosolids management, Alternative 2 assumes 100 percent beneficial reuse of Class A exceptional quality (EQ) biosolids through land application.

8.2.2.2 Alternative 2 – Water Resources

Water resources components include recycled water, dry weather runoff management and wet weather runoff management, and water conservation. Tables 8-6 through 8-8 provide a summary of the potential water resources projects included in Alternative 2. Section 6 provides a discussion of the specific projects in Alternative 2 (Hyb2c).

Table 8-6
Alternative 2 (Tillman and LAG Expansions and High Potential For Water Resources Projects)
Summary of Potential Additional Recycled Water

Plant	Level of Treatment	Area of Use	Use	Volume (acre-feet/yr)
Tillman	Advanced Treatment (MF/RO)	San Fernando Valley	Industrial and Irrigation	17,600
LAG	Title 22 w/ Nitrogen removal	Downtown	Industrial and Irrigation	10,400
Hyperion	Title 22[1]	Westside	Industrial and Irrigation	12,500
Terminal Island	Advanced Treatment (MF/RO)	Harbor	Industrial and Irrigation	9,400
Sub-Total (WW Only)				49,900
Urban Runoff Plants (Stormwater)	Title 22	Ballona and Compton Creeks	Industrial and Irrigation	3,300
Total Reused				53,200

Note: [1]Assumed that secondary effluent from Hyperion would be delivered to West Basin for additional treatment before reuse

Table 8-7
Alternative 2 (Tillman and LAG Expansions and High Potential For Water Resources Projects)
Summary of Potential Dry Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed
Reduction (Conservation) Using Smart Irrigation			
Smart Irrigation	Citywide	--	11 mgd
Diversion to Wastewater System			
Coastal Area	Westside	Treat and Discharge	9 mgd
Diversion to Urban Runoff Plant for Reuse			
Compton Creek	Southside	Reuse	2 mgd
Ballona Creek	Westside	Reuse	3 mgd
Diversion to Urban Runoff Plant or Constructed Wetlands			
Browns Creek	Valley	Treat and Discharge	3 mgd
Wilbur Wash	Valley	Treat and Discharge	1 mgd
Limekiln Canyon	Valley	Treat and Discharge	1.5 mgd
Caballero Canyon	Valley	Treat and Discharge	1 mgd
Bull Creek	Valley	Treat and Discharge	2.4 mgd
Pacoima Wash	Valley	Treat and Discharge	7 mgd
Total Dry Weather Runoff Managed (mgd)			41 mgd
Percent of Dry Weather Runoff Managed (of watershed – 97 mgd)			42%

Table 8-8
Alternative 2 (Tillman and LAG Expansions and High Potential For Water Resources Projects)
Summary of Wet Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed
On-site Percolation			
Schools	East Valley	Beneficial Use	3 mgd
Government	East Valley	Beneficial Use	1 mgd
Neighborhood - Vacant Lots	East Valley	Beneficial Use	220 mgd
Neighborhood - Parks/open space	East Valley	Beneficial Use	70 mgd
Neighborhood - Abandoned alleys	East Valley	Beneficial Use	10 mgd
Non-urban regional recharge	East Valley	Beneficial Use	245 mgd
On-site Storage / Use (Cisterns)			
Schools	Citywide	Beneficial Use	49 mgd
Government	Citywide	Beneficial Use	31 mgd
On-site Treat and Discharge			
New/Redevelopment Areas	Citywide	Treat and Discharge	2 mgd
Regional Solutions			
Urban runoff plants[1]	Westside (coast)	Treat and Discharge	160 mgd
Total Wet Weather Runoff Managed (mgd)			791 mgd
Percent of Runoff from ½ inch storm citywide (1,700 mgd)			47%

Notes:
[1] For the IRP, it was assumed that three urban runoff plants would be needed to meet the Santa Monica Bay Beaches Wet Weather Bacteria TMDL. As required by the Santa Monica Bay Beaches Wet Weather Bacteria TMDL, an Implementation Plan was developed with stakeholder and Regional Board involvement, which was submitted to the Regional Board in July 2005. The recommendations from the approved Implementation Plan will supersede the assumed projects for the IRP.

8.2.3 Alternative 3: Tillman Expansion and Moderate Potential for Water Resources Projects (Hyb3B)

Alternative 3 (formerly Hyb2B) focuses expansion at Tillman in Van Nuys. The expansion can be accomplished and remain within the existing Tillman plant footprint and behind the existing landscaped berm. Other major construction would include a major new sewer between Eagle Rock and the Tillman Plant. This alternative would include a moderate potential of opportunities to reclaim/reuse wastewater effluent, conserve water, and beneficially reuse urban runoff from stormwater and dry weather activities (which will help reduce pollution and the amount of imported water that Los Angeles uses) – a substantial increase over today's situation but not as much as two of the other alternatives.

Figure 8-12 is a map showing the proposed location of Alternative 3 projects. The following subsections provide additional descriptions of the components in Alternative 3.

8.2.3.1 Alternative 3 – Wastewater Management

Alternative 3 includes maintaining the current wastewater treatment at Hyperion, expanding the conveyance system, and expanding and upgrading Tillman to advanced treatment. LAG will also remain unchanged as a Title 22 plant. Note that since all biosolids are treated at Hyperion, additional digester capacity will also be required. The baseline CIP includes building a new solids handing/truck loading facility at Hyperion. A summary of the wastewater treatment components included in Alternative 3 are presented in Table 8-9.

Table 8-9
Alternative 3 (Tillman Expansion and Moderate Potential For Water Resources Projects)
Wastewater Treatment Components

Component	Hydraulic Capacity (mgd)			Level of Treatment (Effluent)	
	Current	Add'l	Total	Current	New
Donald C. Tillman Water Reclamation Plant	64 mgd	36 mgd	100 mgd	Title 22 with Nitrification & Denitrifcation[7]	Advanced Treatment[8]
LAG Water Reclamation Plant	15 mgd	0 mgd	15 mgd	Title 22 with Nitrification & Denitrifcation	Title 22 with Nitrification & Denitrifcation
Hyperion Treatment Plant	450 mgd	0 mgd	450 mgd	Secondary	Secondary
Total Hyperion Service Area	--	--	521 mgd[9]	--	--
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Advanced Treatment	Advanced Treatment

In Alternative 3, approximately 9 mgd of Hyperion capacity would be used to treat dry weather runoff. See Table 8-11. The following is a summary of the specific wastewater treatment options included in Alternative 3:

- New primary treatment, secondary treatment and advanced treatment facilities at Tillman
- New 60 million gallon (MG) buried wet weather storage tank with real-time control at Tillman
- Two new 5 million gallon (MG) storage tanks at LAG (one for diurnal peaks, one for recycled water storage)
- Two new 50 mgd secondary clarifier modules at Hyperion to bring existing secondary clarifier capacity up to 450 mgd
- Up to 12 new digesters at Hyperion (4-6 for future capacity, plus 6 additional for flexibility and redundancy) and a new solids handling/truck loading facility at Hyperion

Figures 8-13 through 8-15 include conceptual site plans for Tillman, LAG and Hyperion.

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[7] As discussed in *Volume 1: Wastewater Management*, for the IRP it was assumed that the nitrification/denitrifcation projects currently under construction will result in a reduction of total capacity at Tillman by 0 to 20 percent (assumed 20 percent, from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 0 to 25 percent (assumed 25 percent, from 20 mgd to 15 mgd).
[8] For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).
[9] The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For Alternative 3, the effective capacity is 71 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 450 mgd at Hyperion = 521 mgd.

IRP Alternative 3

Tillman Expansion and Moderate Potential Water Resources Projects

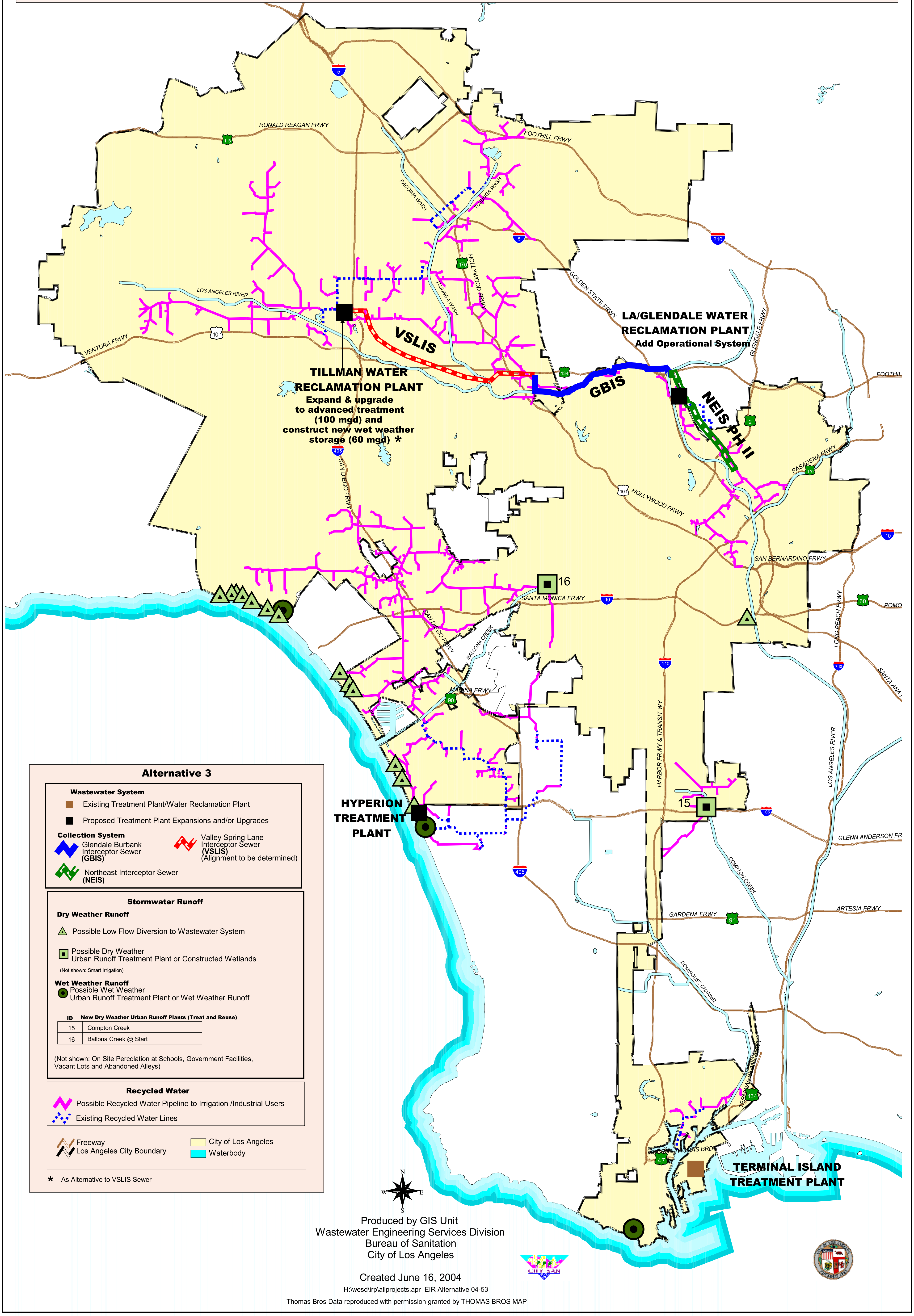

Figure 8-12
IRP Alternative 3
Project Location Map

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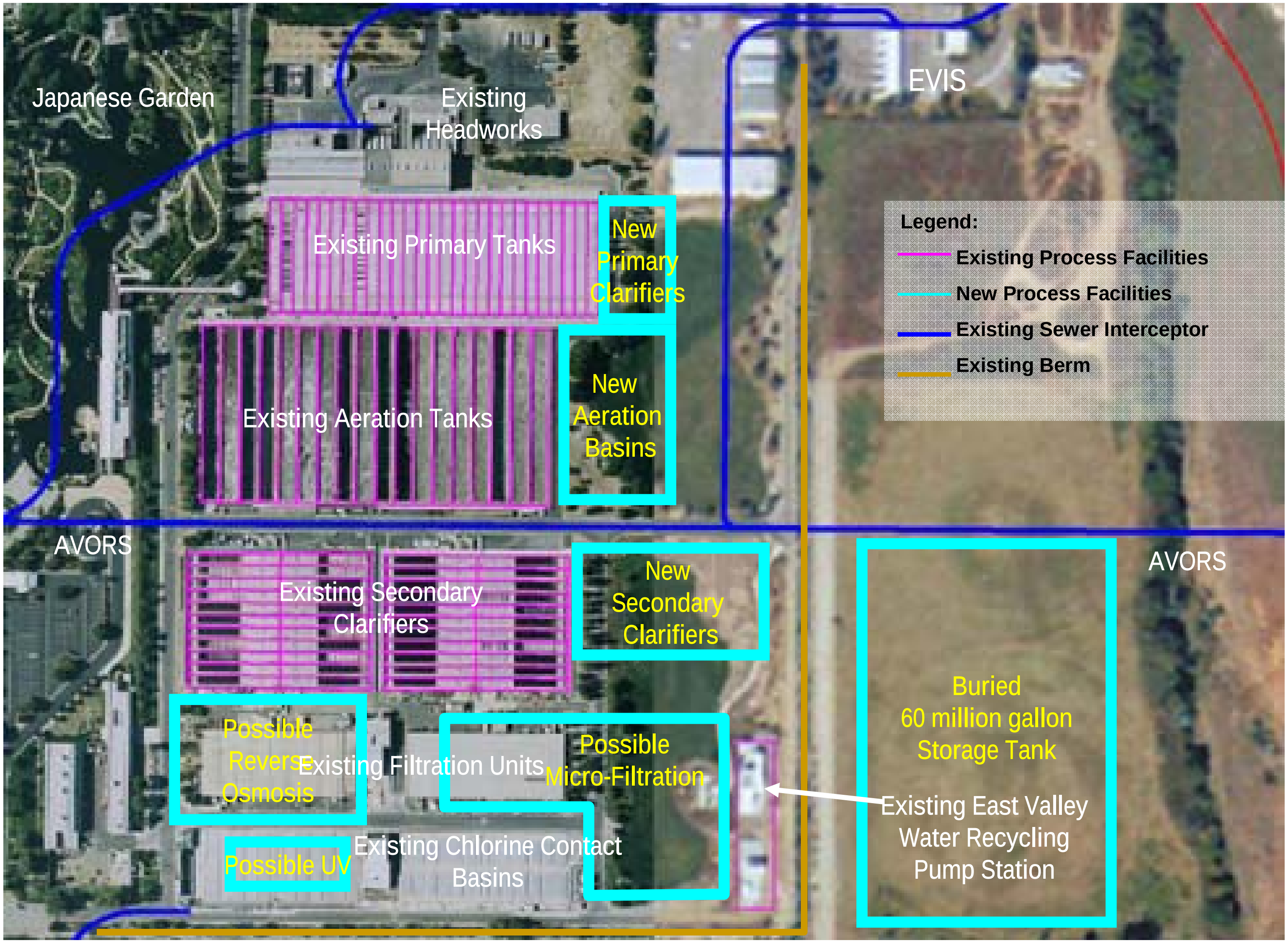

Figure 8-13
Alternative 3 – Treatment Modifications at the Tillman Water Reclamation Plant
Expand to 100 mgd with Advanced Treatment

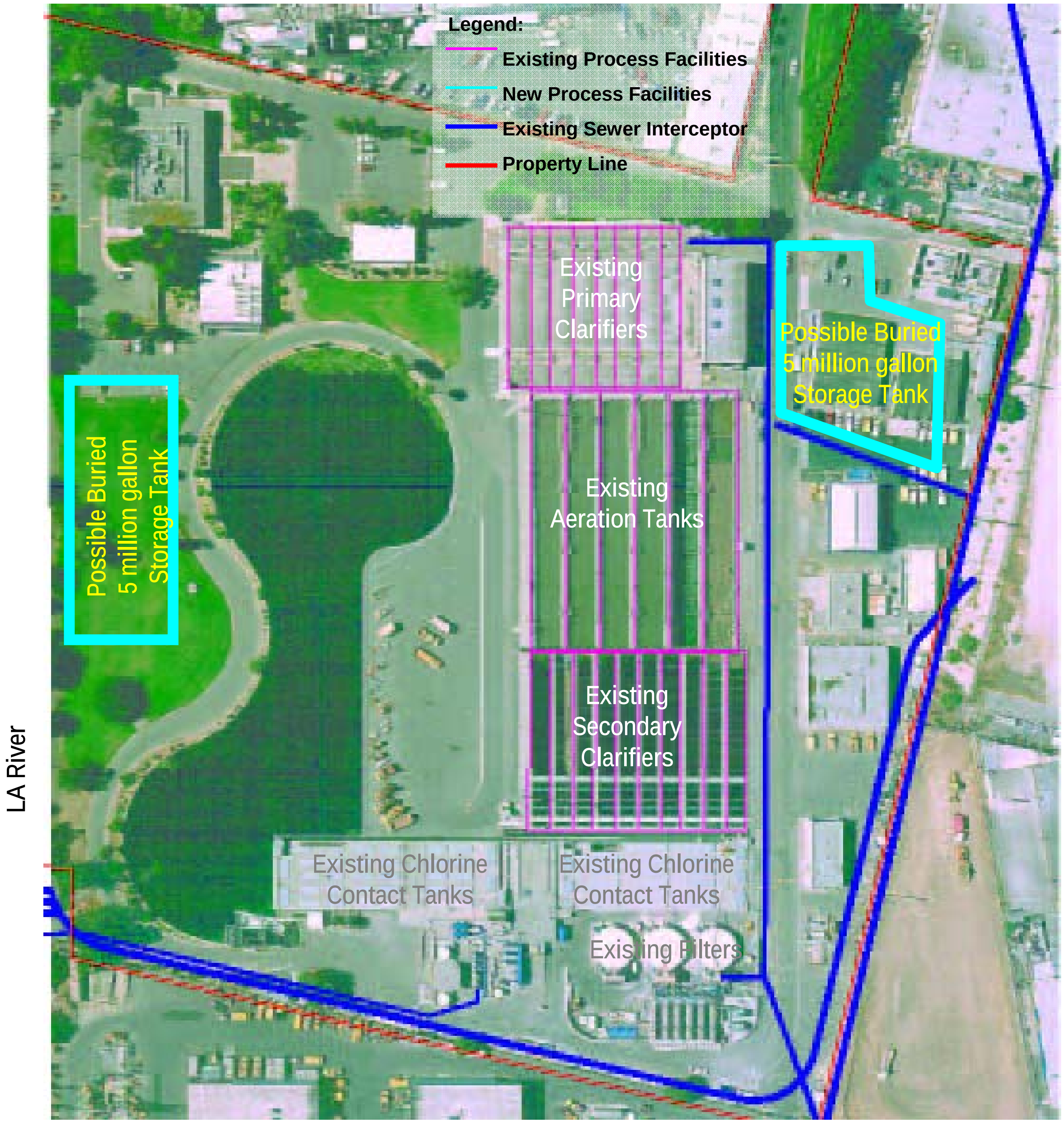

Figure 8-14
IRP Alternative 3 – Treatment Modifications at Los Angeles-Glendale Water Reclamation Plant
Existing 15 mgd with Added Diurnal Storage

Figure 8-15
IRP Alternative 3 – Treatment Modifications at the Hyperion Treatment Plant
Existing 450 mgd and New Digesters by 2020

Like Alternative 1, Alternative 3 would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors would be required including, GBIS, NEIS Phase 2, and VSLIS. There were shown previously in Figure 8-2.

For biosolids management, Alternative 3 assumes 100 percent beneficial reuse of Class A exceptional quality (EQ) biosolids through land application.

8.2.3.2 Alternative 3 – Water Resources

Water resources components include recycled water, dry weather runoff management and wet weather runoff management, and water conservation.

Tables 8-10 through 8-12 provide a summary of the potential water resources projects included in Alternative 3. Section 6 provides detailed discussion on the specific projects in Alternative 3 (Hyb3B).

Table 8-10
Alternative 3 (Tillman Expansion and Moderate Potential For Water Resources Projects)
Summary of Additional Recycled Water

Plant	Level of Treatment	Area of Use	Use	Volume (acre-feet/yr)
Tillman	Advanced Treatment (MF/RO)	San Fernando Valley	Industrial and Irrigation	20,800
LAG	Title 22 w/ Nitrogen removal	Downtown	Industrial and Irrigation	2,800
Hyperion	Title 22[1]	Westside	Industrial and Irrigation	12,500
Terminal Island	Advanced Treatment (MF/RO)	Harbor	Industrial and Irrigation	4,000
Sub-Total (WW Only)				40,100
Urban Runoff Plants (Stormwater)	Title 22	Ballona and Compton Creeks	Industrial and Irrigation	3,300
Total Reused				43,400

[1]Assumed that secondary effluent from Hyperion would be delivered to West Basin for additional treatment before reuse

Table 8-11
Alternative 3 (Tillman Expansion and Moderate Potential For Water Resources Projects)
Summary of Dry Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed
Reduction (Conservation) Using Smart Irrigation			
Smart Irrigation	Citywide	--	11 mgd
Diversion to Wastewater System			
Coastal Area	Westside	Treat and Discharge	9 mgd
Diversion to Urban Runoff Plant for Reuse			
Compton Creek	Southside	Reuse	2 mgd
Ballona Creek	Westside	Reuse	3 mgd
Total Dry Weather Runoff Managed (mgd)			25 mgd
Percent of Dry Weather Runoff Managed (of watershed – 97 mgd)			26%

Table 8-12
Alternative 3 (Tillman Expansion and High Potential For Water Resources Projects)
Summary of Wet Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed
On-site Percolation			
Schools	East Valley	Beneficial Use	--
Government	East Valley	Beneficial Use	--
Neighborhood - Vacant Lots	East Valley	Beneficial Use	360 mgd
Neighborhood - Parks/open space	East Valley	Beneficial Use	120 mgd
Neighborhood - Abandoned alleys	East Valley	Beneficial Use	18 mgd
Non-urban regional recharge	East Valley	Beneficial Use	--
On-site Storage / Use (Cisterns)			
Schools	Citywide	Beneficial Use	
Government	Citywide	Beneficial Use	
On-site Treat and Discharge			
New/Redevelopment Areas	Citywide	Treat and Discharge	2 mgd
Regional Solutions			
Urban runoff plants[1]	Westside (coast)	Treat and Discharge	160 mgd
Total Wet Weather Runoff Managed (mgd)			660 mgd
Percent of Runoff from ½ inch storm citywide (1,700 mgd)			39%

Notes:
[1] For the IRP, it was assumed that three urban runoff plants would be needed to meet the Santa Monica Bay Beaches Wet Weather Bacteria TMDL. As required by the Santa Monica Bay Beaches Wet Weather Bacteria TMDL, an Implementation Plan was developed with stakeholder and Regional Board involvement, which was submitted to the Regional Board in July 2005. The recommendations from the approved Implementation Plan will supersede the assumed projects for the IRP.

8.2.4 Alternative 4: Tillman Expansion and High Potential for Water Resources Projects (Hyb3C)

Alternative 4 (formerly Hyb3C) also focuses expansion at Tillman in Van Nuys. The expansion can be accomplished and remain within the existing Tillman plant footprint and behind the existing landscaped berm. Other major construction would include a major new sewer between Eagle Rock and the Tillman Plant. Like Alternative 2, this alternative would include the highest potential of opportunities to reclaim/reuse wastewater effluent, conserve water, and beneficial reuse of urban runoff from stormwater and dry weather activities (which will help to reduce pollution and imported water that Los Angeles uses. It includes projects to divert urban runoff from creeks for treatment and return as clean water.

Figure 8-16 is a map showing the proposed location of Alternative 4 projects. The following subsections provide additional descriptions of the components in Alternative 4.

8.2.4.1 Alternative 4 – Wastewater Management

The wastewater management projects in Alternative 4 are the same as those in Alternative 3. Alternative 4 includes maintaining the current wastewater treatment at Hyperion, expanding the conveyance system, and expanding and upgrading Tillman to advanced treatment. LAG will also remain unchanged as a Title 22 plant. Note that since all biosolids are treated at Hyperion, additional digester capacity will also be required. Table 8-13 presents a summary of the wastewater treatment components included in Alternative 4.

Table 8-13
Alternative 4 (Tillman Expansion and High Potential For Water Resources Projects)
Wastewater Treatment Components

Component	Hydraulic Capacity (mgd)			Level of Treatment (Effluent)	
	Current	Add'l	Total	Current	New
Donald C. Tillman Water Reclamation Plant	64 mgd	36 mgd	100 mgd	Title 22 with Nitrification & Denitrifcation[10]	Advanced Treatment[11]
LAG Water Reclamation Plant	15 mgd	0 mgd	15 mgd	Title 22 with Nitrification & Denitrifcation	Title 22 with Nitrification & Denitrifcation
Hyperion Treatment Plant	450 mgd	0 mgd	450 mgd	Secondary	Secondary
Total Hyperion Service Area			521 mgd[12]		
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Advanced Treatment	Advanced Treatment

Figures 8-17 through 8-19 include conceptual site plans for Tillman, LAG and Hyperion. The following is a summary of the specific wastewater treatment options included in Alternative 4:

- New primary treatment, secondary treatment and advanced treatment facilities at Tillman
- New 60 million gallon (MG) buried wet weather storage tank with real-time control at Tillman
- Two new 5 million gallon (MG) storage tanks at LAG (one for diurnal peaks, one for recycled water storage)
- Two new 50 mgd secondary clarifier modules at Hyperion to bring existing secondary clarifier capacity up to 450 mgd
- Up to 12 new digesters at Hyperion (4-6 for future capacity, plus 6 additional for flexibility and redundancy) and a new solids handling/truck loading facility at Hyperion

[10] As discussed in *Volume 1: Wastewater Management*, for the IRP it was assumed that the nitrification/denitrifcation projects currently under construction will result in a reduction of total capacity at Tillman by 0 to 20 percent (assumed 20 percent, from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 0 to 25 percent (assumed 25 percent, from 20 mgd to 15 mgd).
[11] For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using MF/RO to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).
[12] The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For Alternative 4, the effective capacity is 71 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 450 mgd at Hyperion = 521 mgd.

IRP Alternative 4

Tillman Expansion and High Potential Water Resources Projects

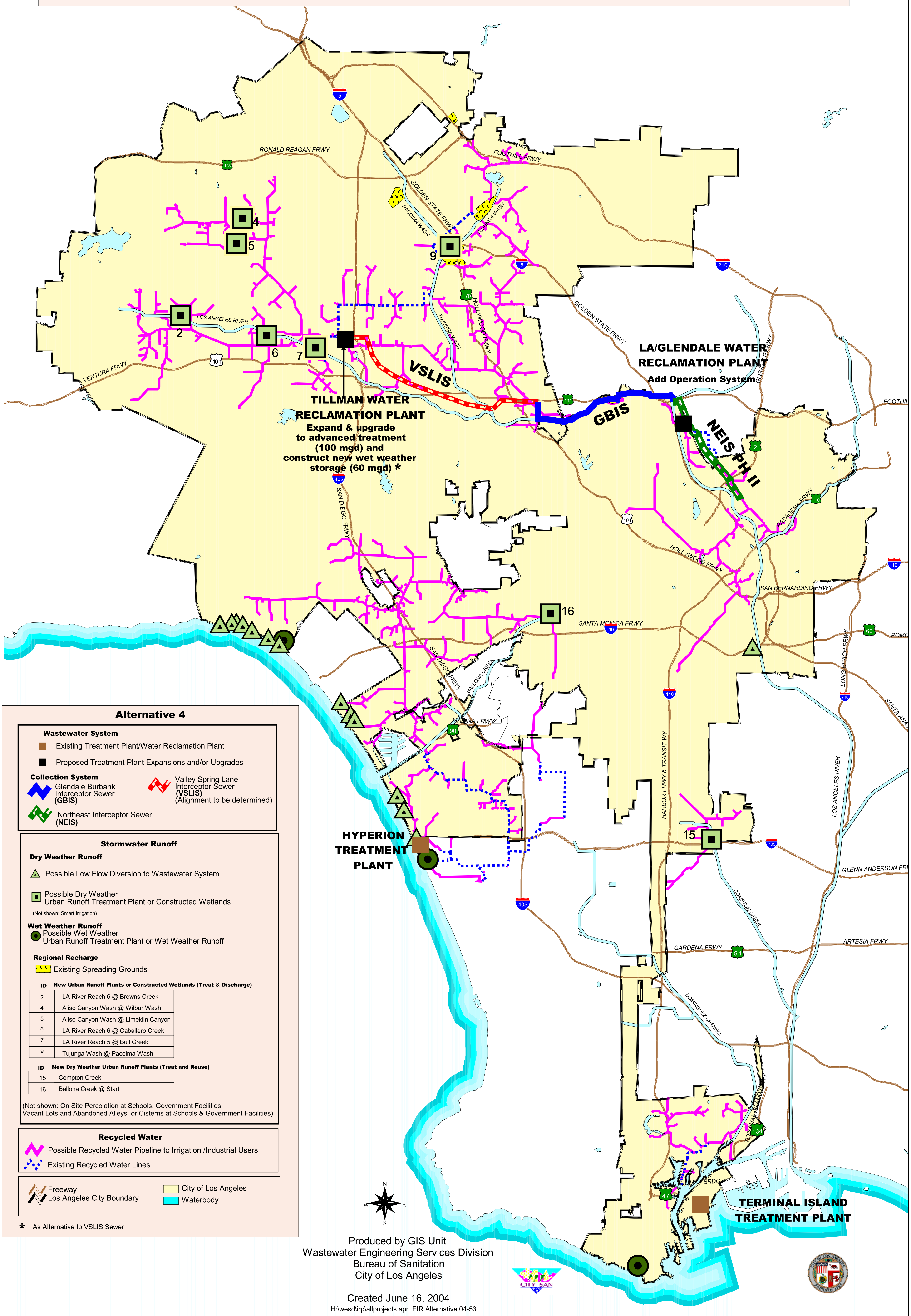

Figure 8-16
IRP Alternative 4
Project Location Map

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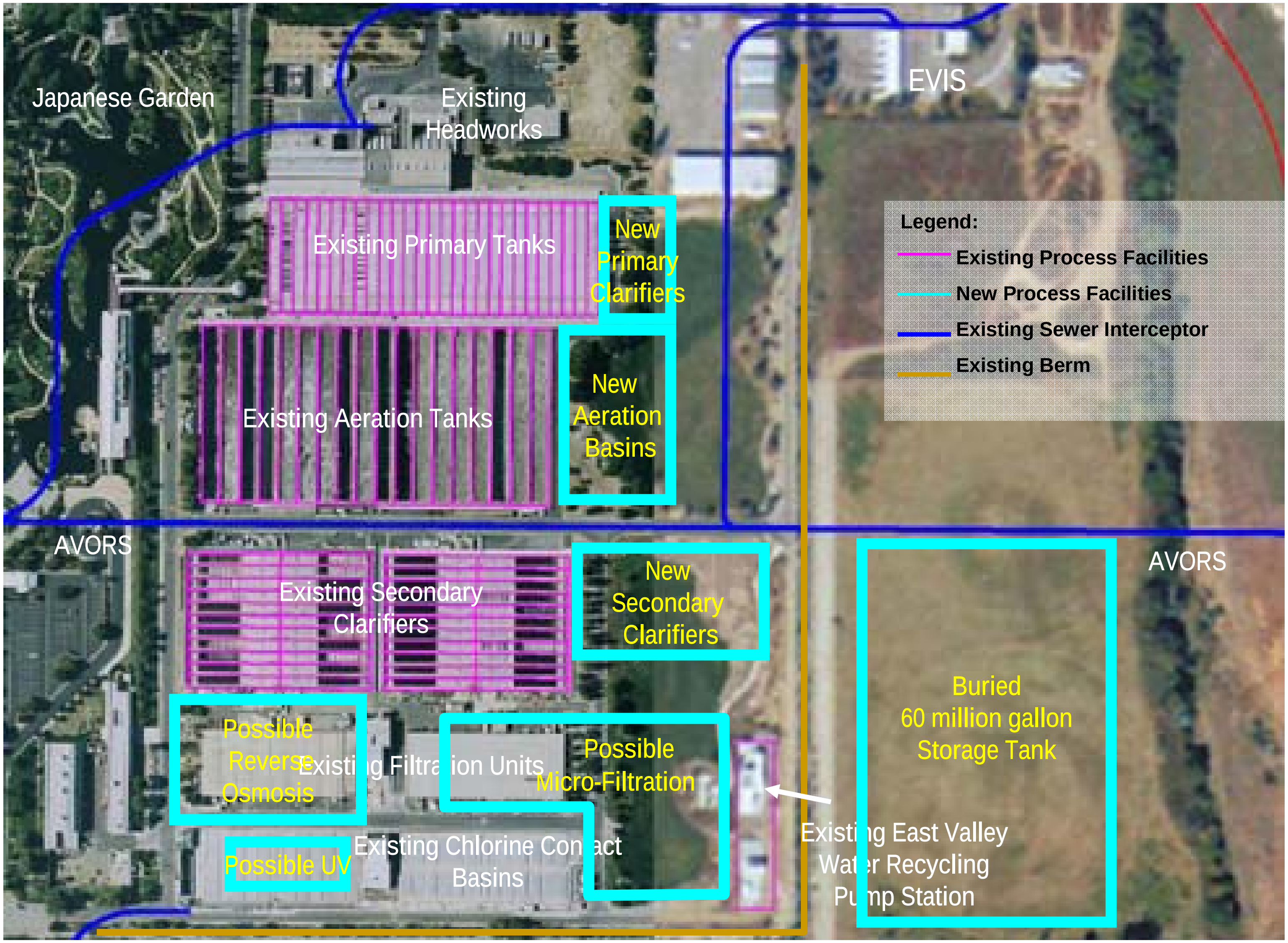


Figure 8-17
Alternative 4 – Treatment Modifications at the Tillman Water Reclamation Plant
Expand to 100 mgd with Advanced Treatment

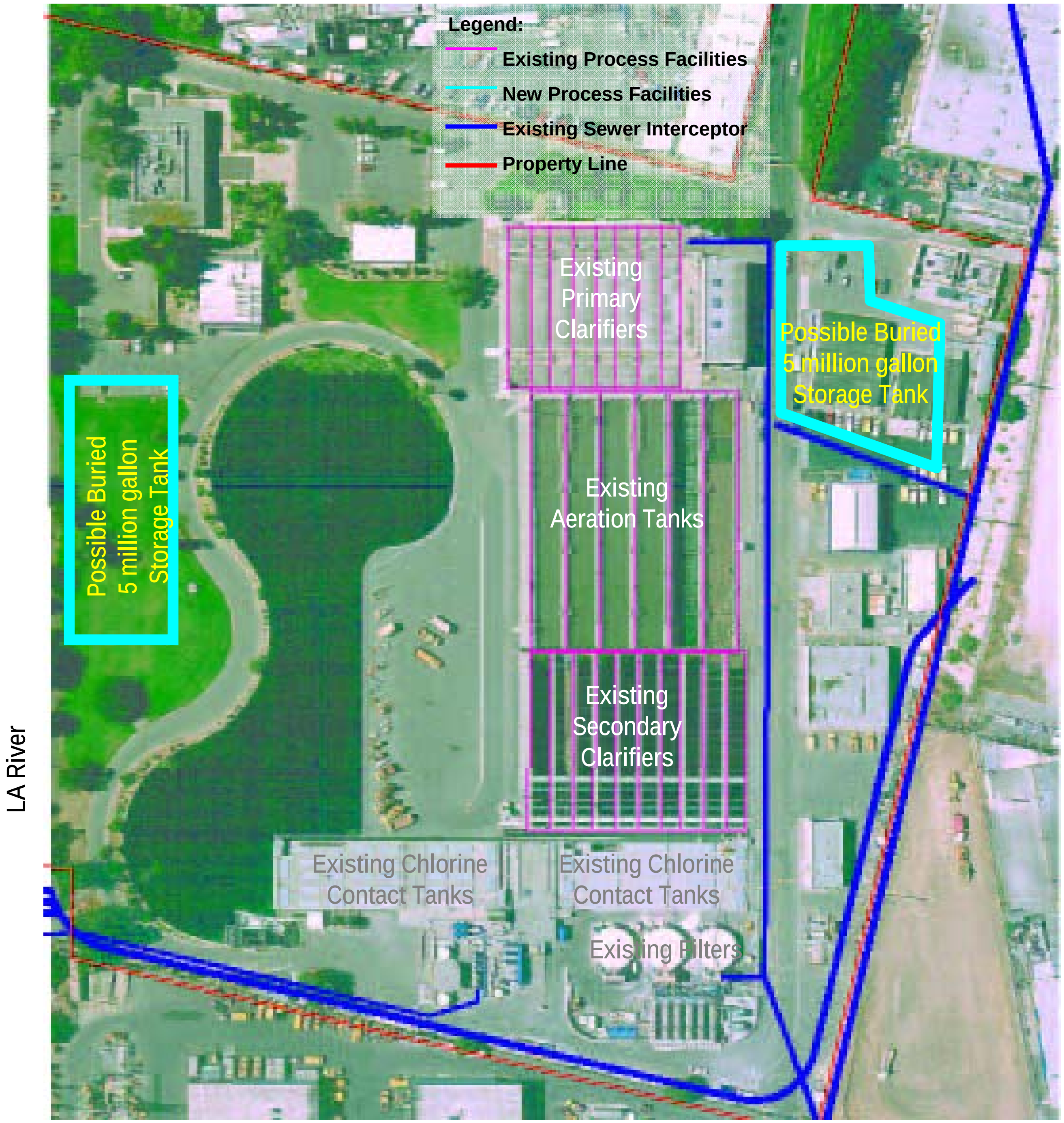


Figure 8-18
IRP Alternative 4 – Treatment Modifications at Los Angeles-Glendale Water Reclamation Plant
Existing 15 mgd with Added Diurnal Storage

Figure 8-19
IRP Alternative 4 – Treatment Modifications at the Hyperion Treatment Plant
Existing 450 mgd and New Digesters by 2020

Like Alternative 1, Alternative 4 would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors facilities would be required including, GBIS, NEIS Phase 2, and VSLIS There were shown previously in Figure 8-2. For biosolids management, Alternative 4 assumes 100 percent beneficial reuse of Class A exceptional quality (EQ) biosolids through land application.

8.2.4.2 Alternative 4 – Water Resources

Water resources components include recycled water, dry weather runoff management and wet weather runoff management, and water conservation. Tables 8-14 through 8-16 provide a summary of the potential water resources projects included in Alternative 4.

Table 8-14
Alternative 4 (Tillman Expansion and High Potential For Water Resources Projects)
Summary of Additional Recycled Water

Plant	Level of Treatment	Area of Use	Use	Volume (acre-feet/yr)
Tillman	Advanced Treatment (MF/RO)	San Fernando Valley	Industrial and Irrigation	25,500
LAG	Title 22 w/ Nitrogen removal	Downtown	Industrial and Irrigation	5,400
Hyperion	Title 22[1]	Westside	Industrial and Irrigation	12,500
Terminal Island	Advanced Treatment (MF/RO)	Harbor	Industrial and Irrigation	9,400
Sub-Total (WW Only)				52,800
Urban Runoff Plants (Stormwater)	Title 22	Ballona and Compton Creeks	Industrial and Irrigation	3,300
Total Reused				56,100

[1]Assumed that secondary effluent from Hyperion would be delivered to West Basin for additional treatment before reuse

Table 8-15
Alternative 4 (Tillman Expansion and High Potential For Water Resources Projects)
Summary of Dry Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed
Reduction (Conservation) Using Smart Irrigation			
Smart Irrigation	Citywide	--	11 mgd
Diversion to Wastewater System			
Coastal Area	Westside	Treat and Discharge	9 mgd
Diversion to Urban Runoff Plant for Reuse			
Compton Creek	Southside	Reuse	2 mgd
Ballona Creek	Westside	Reuse	3 mgd
Diversion to Urban Runoff Plant or Constructed Wetlands			
Browns Creek	Valley	Treat and Discharge	3 mgd
Wilbur Wash	Valley	Treat and Discharge	1 mgd
Limekiln Canyon	Valley	Treat and Discharge	1.5 mgd
Caballero Canyon	Valley	Treat and Discharge	1 mgd
Bull Creek	Valley	Treat and Discharge	2.4 mgd
Pacoima Wash	Valley	Treat and Discharge	7 mgd
Total Dry Weather Runoff Managed (mgd)			41 mgd
Percent of Dry Weather Runoff Managed (of watershed – 97 mgd)			42%

Table 8-16
Alternative 4 (Tillman Expansion and High Potential For Water Resources Projects)
Summary of Wet Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed
On-site Percolation			
Schools	East Valley	Beneficial Use	3 mgd
Government	East Valley	Beneficial Use	1 mgd
Neighborhood - Vacant Lots	East Valley	Beneficial Use	220 mgd
Neighborhood - Parks/open space	East Valley	Beneficial Use	70 mgd
Neighborhood - Abandoned alleys	East Valley	Beneficial Use	10 mgd
Non-urban regional recharge	East Valley	Beneficial Use	245 mgd
On-site Storage / Use (Cisterns)			
Schools	Citywide	Beneficial Use	49 mgd
Government	Citywide	Beneficial Use	31 mgd
On-site Treat and Discharge			
New/Redevelopment Areas	Citywide	Treat and Discharge	2 mgd
Regional Solutions			
Urban runoff plants[1]	Westside (coast)	Treat and Discharge	160 mgd
Total Wet Weather Runoff Managed (mgd)			791 mgd
Percent of Runoff from ½ inch storm citywide (1,700 mgd)			47%

[1] For the IRP, it was assumed that three urban runoff plants would be needed to meet the Santa Monica Bay Beaches Wet Weather Bacteria TMDL. As required by the Santa Monica Bay Beaches Wet Weather Bacteria TMDL, an Implementation Plan was developed with stakeholder and Regional Board involvement, which was submitted to the Regional Board in July 2005. The recommendations from the approved Implementation Plan will supersede the assumed projects for the IRP.

8.2.5 Comparison of Recommended Draft Alternatives

The IRP alternatives reflect a full spectrum of wastewater assumptions, provide leadership in water resources and balance today's financial realities. This subsection provides a side-by-side comparison of the benefits and costs of these alternatives.

Table 8-17 compares the potential additional recycled water use in each alternative.

Table 8-17
Alternatives 1, 2, 3, and 4
Summary of Potential Additional Recycled Water

Plant	Level of Treatment	Area of Use	Use	Volume (acre-feet/yr) Alt 1 (Hyb1C)	Alt 2 (Hyb2C)	Alt 3 (Hyb3B)	Alt 4 (Hyb3C)
Tillman	Advanced Treatment (MF/RO)	San Fernando Valley	Industrial and Irrigation	11,400	17,600	20,800	25,500
LAG	Title 22 w/ Nitrogen removal	Downtown	Industrial and Irrigation	5,400	10,400	2,800	5,400
Hyperion	Title 22[1]	Westside	Industrial and Irrigation	12,500	12,500	12,500	12,500
Terminal Island	Advanced Treatment (MF/RO)	Harbor	Industrial and Irrigation	9,400	9,400	4,000	9,400
Sub-Total (WW Only)				**38,700**	**49,900**	**40,100**	**52,800**
Urban Runoff Plants (Stormwater)	Title 22	Ballona and Compton Creeks	Industrial and Irrigation	3,300	3,300	3,300	3,300
Total Reused				**42,000**	**53,200**	**43,400**	**56,100**

Table 8-18 compares the potential dry weather runoff benefits in each alternative by 2020.

Table 8-18
Alternatives 1, 2, 3 and 4
Summary of Potential Dry Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed Alt 1 (Hyb1C)	Alt 2 (Hyb2C)	Alt 3 (Hyb3B)	Alt 4 (Hyb3C)
Reduction (Conservation) Using Smart Irrigation						
Smart Irrigation	Citywide	--	11 mgd	11 mgd	11 mgd	11 mgd
Diversion to Wastewater System						
Coastal Area	Westside	Treat and Discharge	9 mgd	9 mgd	9 mgd	9 mgd
Browns Creek	Valley	Treat and Discharge	3 mgd	--	--	--
Wilbur Wash	Valley	Treat and Discharge	1 mgd	--	--	--
Limekiln Canyon	Valley	Treat and Discharge	1.5 mgd	--	--	--
Caballero Canyon	Valley	Treat and Discharge	1 mgd	--	--	--
Bull Creek	Valley	Treat and Discharge	2.4 mgd	--	--	--
Pacoima Wash	Valley	Treat and Discharge	7 mgd	--	--	--
Diversion to Urban Runoff Plant or Constructed Wetlands						

Table 8-18
Alternatives 1, 2, 3 and 4
Summary of Potential Dry Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed			
			Alt 1 (Hyb1C)	Alt 2 (Hyb2C)	Alt 3 (Hyb3B)	Alt 4 (Hyb3C)
Browns Creek	Valley	Treat and Discharge	--	3 mgd	--	3 mgd
Wilbur Wash	Valley	Treat and Discharge	--	1 mgd	--	1 mgd
Limekiln Canyon	Valley	Treat and Discharge	--	1.5 mgd	--	1.5 mgd
Caballero Canyon	Valley	Treat and Discharge	--	1 mgd	--	1 mgd
Bull Creek	Valley	Treat and Discharge	--	2.4 mgd	--	2.4 mgd
Pacoima Wash	Valley	Treat and Discharge	--	7 mgd	--	7 mgd
Diversion to Urban Runoff Plant for Reuse						
Compton Creek	Southside	Reuse	2 mgd	2 mgd	2 mgd	2 mgd
Ballona Creek	Westside	Reuse	3 mgd	3 mgd	3 mgd	3 mgd
Total Dry Weather Runoff Managed (mgd)			41 mgd	41 mgd	25 mgd	41 mgd
Percent of Dry Weather Runoff Managed (of watershed – 97 mgd)			42%	42%	26%	42%

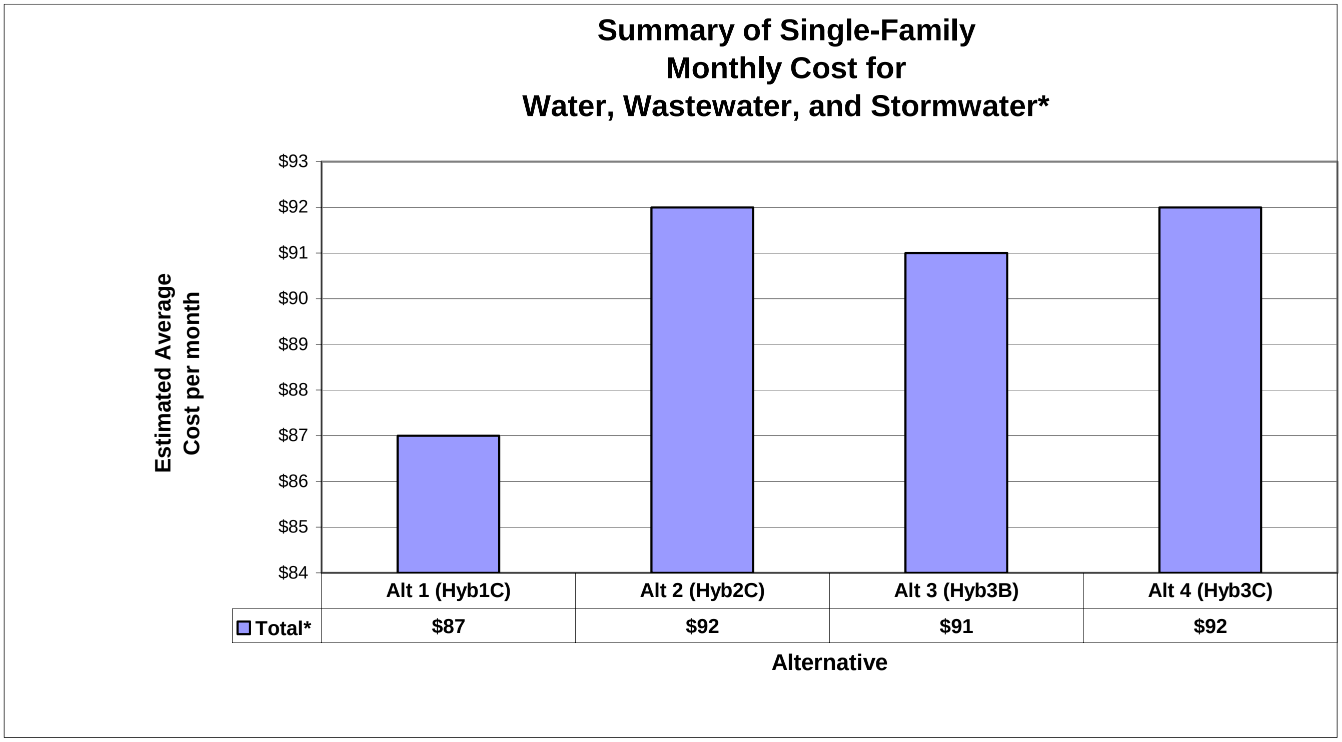
Table 8-19 compares the potential wet weather runoff benefits in each alternative by 2020.

Table 8-19
Alternatives 1, 2, 3 and 4
Summary of Potential Wet Weather Runoff Managed by 2020

Option	Area	Use	Volume Managed			
			Alt 1 (Hyb1C)	Alt 2 (Hyb2C)	Alt 3 (Hyb3B)	Alt 4 (Hyb3C)
On-site Percolation						
Schools	East Valley	Beneficial Use	3 mgd	3 mgd	--	3 mgd
Government	East Valley	Beneficial Use	1 mgd	1 mgd	--	1 mgd
Neighborhood - Vacant Lots	East Valley	Beneficial Use	220 mgd	220 mgd	360 mgd	220 mgd
Neighborhood - Parks/open space	East Valley	Beneficial Use	70 mgd	70 mgd	120 mgd	70 mgd
Neighborhood - Abandoned alleys	East Valley	Beneficial Use	10 mgd	10 mgd	18 mgd	10 mgd
Non-urban regional recharge	East Valley	Beneficial Use	245 mgd	245 mgd	--	245 mgd
On-site Storage / Use (Cisterns)						
Schools	Citywide	Beneficial Use	49 mgd	49 mgd	--	49 mgd
Government	Citywide	Beneficial Use	31 mgd	31 mgd	--	31 mgd
On-site Treat and Discharge						
New/Redevelopment Areas	Citywide	Treat and Discharge	2 mgd	2 mgd	2 mgd	2 mgd
Regional Solutions						
Urban runoff plants[1]	Westside (coast)	Treat and Discharge	160 mgd	160 mgd	160 mgd	160 mgd
Total Wet Weather Runoff Managed (mgd)			791 mgd	791 mgd	660 mgd	791 mgd
Percent of Runoff from ½ inch storm citywide (1,700 mgd)			47%	47%	39%	47%

[1] For the IRP, it was assumed that three urban runoff plants would be needed to meet the Santa Monica Bay Beaches Wet Weather Bacteria TMDL. As required by the Santa Monica Bay Beaches Wet Weather Bacteria TMDL, an Implementation Plan was developed with stakeholder and Regional Board involvement, which was submitted to the Regional Board in July 2005. The recommendations from the approved Implementation Plan will supersede the assumed projects for the IRP.

Figure 8-20 provides an overall comparison of the costs and benefits for the recommended draft alternatives.



Benefits	Alt 1 (Hyb1C)	Alt 2 (Hyb2C)	Alt3 (Hyb3B)	Alt4 (Hyb3C)
Potential Potable Water Demand Reduction through conservation[1] (AF/yr)	103,200	103,200	103,200	103,200
Additional Recycled Water Usage (AF/yr)	38,700	49,900	40,100	52,800
DWUR Managed (% of watershed - 97 mgd)	42%	42%	26%	42%
WWUR Managed (% of citywide 1,700 mgd)	49%	49%	40%	49%
DWUR and WWUR Beneficially Used (AF/yr)	37,700	37,700	32,500	37,700
Positive Impacts on Public Lands (acres)	353	353	580	353

*Does not include baseline CIP costs, new costs for future TMDLs (except LR1), or budget for leadership projects.

[1]Future implementation would depend on available funding, customer acceptance, reliability, and commercial availability of smart irrigation controllers. More detailed studies would be needed to determine the full benefits of a smart irrigation program.

Acronyms
DWUR- Dry Weather Urban Runoff
WWUR-Wet Weather Urban Runoff
AF/yr- Acre-feet per year
MGD- Million gallons per day
LAG-Los Angeles-Glendale

Figure 8-20
Cost and Benefit Summary

8.3 Next Steps

Through the EIR process, a preferred alternative will be selected. This preferred alternative will be the basis for the CIP and final financial analysis. The IRP is a road map that can change course as key triggers are encountered. These triggers include actual population increases, development of new technologies, demonstrated effectiveness of leadership projects, changes in regulatory requirements, availability of project funding, and public acceptance. *Volume 5: Adaptive Capital Improvement Program* will present the CIP and will document the framework for tracking the triggers and adjusting the CIP.