City of Los Angeles
Integrated Resources Plan

Sustainability Analysis

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Prepared for

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

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Final Draft Report

Contents

List of Figures

List of Tables

Executive Summary

ES.1 Objectives

The Los Angeles Department of Public Works, Bureau of Sanitation (Bureau) requested an independent assessment of the sustainability of alternatives proposed under its Integrated Resources Plan (IRP) for the Wastewater, Runoff Management, and Recycled Water Programs. This IRP analysis presents a framework of indicators as a basis for measurement of the sustainability of the integrated system proposed in the four draft alternatives developed under the IRP and as an aid for selecting capital improvement alternatives for further evaluation.

A core emphasis of this analysis is that these three systems are not isolated, but interact strongly with social, economic, and environmental systems. A systems-based approach for assessing these interactions and comparing various alternative technologies and approaches in the context of sustainability is needed to ensure continuous improvement in the performance of the three systems. Indicators must be capable of measuring the sustainability of the systems as they currently exist and predicting the sustainability of alternatives under the IRP. To accomplish these objectives, this analysis provides: 1) a benchmark measure of the sustainability of the current systems; 2) measurements of four IRP alternatives; and 3) recommendations for future measurement, analysis, and reporting as IRP implementation is undertaken.

The sustainability analysis involved 6 steps:

1. Review of the literature to find which indexes have been used in the past to assess the sustainability of water, wastewater, and runoff infrastructure.

2. Selection of a subset of the indexes that were appropriate for the systems managed by the Bureau and for the local conditions.

3. Choice of a short list of indexes that are applicable.

4. Interviews with Bureau personnel, personnel in other City departments, and stakeholders to gather data to support index calculation.

5. Evaluation of data and calculation of indicators for the baseline year.

6. Evaluation of the likely performance of the four IRP draft alternatives, and scoring IRP performance relative to the baseline year.

ES.2 Definition of Sustainability

To effectively define and measure sustainability, it is necessary to take a view beyond the core infrastructure and conveyance aspects of the wastewater and runoff management systems. The ecological, social, and economic systems impacted by the wastewater, runoff management, and recycled water systems extend throughout the watershed of the Los Angeles River and smaller adjacent systems. The interactions among the elements in these systems can be strong as illustrated:

- Development changes the quantity and quality of wastewater and stormwater flows.
- Construction of new facilities can improve or reduce the quality of life for nearby residents.
- Community behavior changes runoff water quality and volumes.
- Economic prosperity in the region requires effective and economical wastewater and runoff management.

Evaluation of environmental impacts was confined to the local watershed and some of the most critical external impacts are evaluated in general terms.

ES.3 Indicators

ES.3.1 Indicator Framework Development

Indicators should be designed to function as part of a process of continuous improvement. The sustainability indicators for this analysis have been designed to meet several specific criteria. They are intended to be:

- Genuine measures of sustainability
- Comprehensive
- Applicable to the range of alternatives being considered
- Meaningful and relevant to all stakeholders
- Relevant over time
- Convenient to use

Based on the best currently available information and a number of assumptions about future impacts, a scoreable index approach will allow this analysis to reflect more accurately the performance of the Bureau and the IRP alternatives than other modeling techniques.

To measure continuous improvement toward sustainability, a baseline measure must be created for each indicator. The baseline year was Fiscal Year 2002/2003 (FY 02/03), which for the City corresponds to July 1, 2002 through June 30, 2003.

ES.3.2. Indicators

A scoreable index similar in nature to an index created by Delft's Hydraulic Laboratory, in the Netherlands was developed. It consists of seven categories of indicators adapted from the literature for the IRP.

The seven categories are:

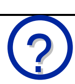
- Social Impacts
- Economic Development
- Natural Resource Consumption
- Environmental Pollution
- Urban Ecology
- System Adaptability and Flexibility
- Institutional Capacity

Indicators are measured in both qualitative and quantitative terms.

ES.3.3 Indicator Assessment

Assessment of the wastewater, runoff management, and recycled water systems over a wide range of criteria has led to an indicator framework that includes both qualitative and quantitative indicators. Each of the seven indicator categories are treated equally in the scoring process as there are uncertainties and assumptions inherent in the use of weighting factors. This analysis uses symbols to score the IRP alternatives relative to the baseline year for each sub-indicator as described in Table ES-1.

Table ES-1
Scoring Methods

Analysis Symbol	Symbol Explanation
	Strong Positive Trend: Analysis suggests substantial progress towards sustainability over the baseline is likely. The Bureau will be making substantial progress toward sustainability with full implementation of the IRP or ongoing Bureau activities.
	Positive Trend: Analysis suggests some progress towards sustainability over the baseline is likely. The Bureau will need to reassess throughout implementation.
	Same as Baseline: Analysis suggests future outcomes are likely to be equivalent to the baseline. Maintaining the baseline does not necessarily produce sustainability. The Bureau should be aware that problems may emerge in the long-term. Future integrated planning may address making progress on these indicators.
	Negative Trend: Analysis suggests there is likely to be deterioration from the baseline. The analysis serves as a warning that problems may be on the horizon. The Bureau may need to pay particular attention to address emerging issues during IRP implementation.
	Additional Planning Needed: Analysis suggests that there is insufficient planning to estimate progress against the baseline. The Bureau may need to undertake additional integrated planning efforts.
	Insufficient Data: There is currently insufficient data to measure the baseline reliably. Future efforts should be directed to generating baseline data.

ES.3.4 Life-Cycle Assessment

This analysis has used Life-Cycle Assessment (LCA) methodologies to capture the indirect impacts of the wastewater and runoff management systems. LCA is a comprehensive environmental impact methodology that was initially designed to trace the environmental impacts of products and processes. The purpose of the LCA model is to drive design of products with the intent of lowering overall environmental impacts. Estimates can be based upon either process or economic input data.

Measurement of net use of energy, water, and materials on a system-wide basis is required, because the wastewater and runoff management systems may both consume and produce energy, water, and materials. The energy and materials data become inputs to LCA models to develop life-cycle inventories for resources and pollution.

ES.4 Indicator Scores

Each of the indicators and sub-indicators were evaluated using the aforementioned scoreable index. A comprehensive table of the results is provided in Section 10 in Table 10-1.

ES.4.1 Social Impact

A system is functioning in a socially sustainable manner if:

- Its presence contributes to the welfare of society,
- Those who are affected by it have some control over its actions,
- Impacts of the system are distributed with a reasonable degree of equity.

Indexes can be developed to ensure that the inequities are not excessive and that they do not reinforce existing patterns of inequity. This study focuses on four specific indicators of social impacts:

- Beneficial neighborhood impacts,
- Adverse neighborhood impacts,
- Customer satisfaction, and
- Public input in Bureau operations and the IRP process.

For the majority of sub-indicators in this category, there is either too much uncertainty in what might happen through the IRP implementation process or it was assumed, based on the best available information, that IRP implementation would generate results for all four alternatives that would be comparable to the baseline. In examining the two indicator elements that demonstrated differences between alternatives, IRP Alternatives 2 and 4 are best with respect to distributing the impact of Urban Runoff Plants (URPs) equitably across the City's diverse racial and ethnic landscape. Alternative 3, however, has the best performance in terms of increasing equity in park access. Decision-makers must weigh priorities given the potential to mitigate adverse impacts from URPs versus the potential to increase equity in access to open space.

ES.4.2 Economic Development

For the Economic Development indicator, this analysis seeks to connect choices made for the wastewater and runoff management systems to local economic development. This analysis focuses on three specific indicators that seek to connect choices made for the wastewater and runoff management systems to local employment, the efficiency of the Bureau's investment, and operation and maintenance (O&M) activities:

- Local Employment: How many people work?
- Local Employment: Who works?
- Efficiency

Dependent upon the sub-indicators examined as part of this analysis, all four IRP alternatives are either expected to perform the same or at this stage of the implementation plan not enough details have been developed to make a reasonable determination of which alternative will perform in the most sustainable fashion. The only clear differences are in potential indirect employment. Alternatives 2 and 4 would likely generate more indirect employment impacts than Alternatives 1 and 3, based on net capital expenditures. However, uncertainty over whether the jobs are local, long term, or short term suggests that Alternatives 2 and 4 may not be significantly more sustainable in their economic development impact.

ES.4.3 Natural Resource Consumption

This indicator assesses natural resource consumption. Natural resource consumption refers to the use of fuel, water, minerals, and materials that are provided by nature and consumed in water, wastewater and runoff management activities. While the wastewater treatment system uses many types of resources, two are of dominant concern when considering sustainability and serve as specific indicators:

- Water
- Fossil fuel consumption

Determining the most sustainable alternative for this indicator depends on whether one considers water consumption or fossil fuel consumption to be more important. If net water use is of primary concern, then Alternatives 2 and 4 perform best, with Alternative 4 having the lowest projected per-capita net water use of all the alternatives. However, these two alternatives are anticipated to consume more natural resources in the future, because of increased water reclamation and treatment of runoff. If Alternatives 2 and 4 include constructed wetlands rather than URPs (or even have half of the dry runoff managed by wetlands instead of URPs), the energy use, and thus natural resource consumption, would be lower, improving the performance of these alternatives for the natural resource indicator as well.

Future energy efficiency could further improve if it is considered during development of detailed IRP implementation plans. Los Angeles is in an arid region where water supplies are a critical and ongoing issue and there are uncertainties in current energy demand predictions. Based on the best currently available information at the time of this analysis, Alternatives 2 and 4 would be preferred for this indicator.

ES.4.4 Environmental Pollution

Environmental pollution is an important category because of local air pollution problems and the primary mission of the Bureau is to reduce pollution loadings to receiving waters. As a consequence, there are several sub-indicators in this category:

- Criteria air pollutants that contribute to regional smog
- Global climate forcing gases
- Wastewater effluent
- Runoff discharges to receiving waters
- Biosolids management, including handling, transportation and reuse

All of the alternatives are expected to have nearly equal performance for environmental pollution. Alternatives 2 and 4 will release more criteria air pollutants and global warming gases because they use more electricity. However, the electricity will be used for pumping reclaimed wastewater for uses that will offset imported water demands. All of the alternatives will contribute to a well-established long term trend of reducing pollutant discharges from wastewater outfalls. All include provisions for improvement in runoff management, but Alternative 3 manages a smaller amount than the other three alternatives. Runoff management is impeded by a lack of information on the effectiveness of the technologies, concentrations, distributions of the pollutants, and the difficulty and expense of implementing solutions region-wide. All alternatives will equally generate and manage biosolids with 100 percent reuse of biosolids through composting and farm application. The City should look to diversify its biosolids management and set goals for reusing a greater percentage of biosolids within the City.

ES.4.5 Urban Ecology

As defined in this analysis, urban ecology includes parks and open space, river revitalization, native habitat, and protection of urban marine ecosystems. This section focuses on aggregate amounts of land that the Bureau and IRP alternatives can transform with the goal of improving the urban ecosystems of Los Angeles as part of water management throughout the City. This analysis uses following types of urban ecosystems as sub-indicators:

- Parks, open space, and habitat restoration,
- River revitalization, and
- Effects on marine ecosystems.

For the majority of sub-indicators in this category, there is either much uncertainty or it was estimated, based on the best available information, that the IRP for all four alternatives cause little change. In examining the two indicator elements that demonstrated differences between alternatives, IRP alternative 3 would perform the best if one were most interested in open space benefits. Alternatives 1, 2 and 4 appeared to be the best performing alternatives in terms of marine ecosystem effects.

ES.4.6 System Adaptability and Flexibility

Moving the operations and management of the WWTS and runoff management system in a more sustainable direction is a complicated process that will not have a definitive endpoint and will depend in part on how IRP project elements are implemented. Such a path will require innovative technologies, some of which are perhaps not yet developed. It will also depend on cost and technical issues that are currently not understood. To achieve sustainability in the future, it is important for the Bureau to identify and test new approaches to prepare for future demands. Sustainability also will require a readiness to adapt to changing environmental conditions, including emerging threats to clean water. As a consequence, the Bureau should have systems that track, identify, and respond to these challenges as they emerge.

This section of the sustainability analysis explores a number of pertinent questions related to resiliency or flexibility in the current operation of the water, wastewater and runoff management system and the IRP alternatives. This analysis used the following sub-indicators:

- Groundwater protection and stormwater runoff infiltration
- Demand-side management
- Permeable surfaces
- Emerging issues

For the majority of sub-indicators in this category, there is either too much uncertainty in what might happen through IRP implementation or it was assumed, based on the best available information, that IRP implementation would generate results for all four alternatives that would be comparable to the baseline. IRP Alternatives 2 and 4, given their higher levels of anticipated water recycling levels, would be anticipated to perform slightly better within this indicator. However, the IRP alternatives did not take into account many of the sub-indicators during the planning process.

ES.4.7 Institutional Capacity

Increasing the sustainability of the wastewater, recycled water, and runoff management system requires building the capability to make continual sustainability improvements in operations at many scales, from the plant level, to the Bureau, to the entire City government, and finally reaching out to the residents of Los Angeles. This indicator category seeks to measure capacity for sustainability improvements at these levels. The particular sub-indicators in this category include:

- Interagency partnerships
- Data availability
- Public education efforts
- Pricing signals and full cost accounting
- Green building programs
- Continuous improvement at the facility level

It is recognized that these sub-indicators refer to the Bureau as a whole and therefore will not distinguish among the four IRP alternatives. However, they represent important characteristics of the Bureau that will inevitably affect the sustainability of the chosen alternative. Therefore, this analysis has found that all four IRP alternatives would be expected to perform identically for this category as the institutional capacity indicator deals with issues and challenges to overall Bureau management rather than items specific to IRP implementation. Both the City and the IRP process itself have made important progress toward sustainability in several of these areas. However, more planning is needed, most notably in public education efforts and continuous improvement systems at the facility level. There are also important needs for further data development related to achieving IRP objectives and for future sustainability analysis.

ES.5 Conclusion

All of the elements that are critical to conducting a sustainability analysis were not evaluated at the time of this analysis as the implementation plans for each alternative require further development and refinement. Further development and refinement will not occur until final alternative is selected and will be completed for the final alternative only. Additionally for some indicators, all four alternatives have the same score, so there is no obvious difference among their impacts. Therefore, the uncertainty at this stage prevents the formation of a definitive statement that one particular alternative will be the most sustainable.

ES.5.1 IRP Alternative Scores

The preferred alternative varies dependent upon the desired goals of the Bureau, City, and its residents. If the Bureau, the City, and residents are chiefly concerned with total water use, runoff management and treatment (and thus reduced impacts on the LA River and Santa Monica Bay), and the social impacts of siting new infrastructure, then Alternative 4 is the preferred alternative. Adding economic efficiency and total cost to the above criteria makes Alternative 2 the preferred alternative. If however, one is more concerned with increasing the amount of open space, increasing percolation areas, and natural resource consumption, then Alternative 3 is the preferred alternative. However, these results will vary once the implementation plans for the final alternative are refined.

ES.5.2 Future Measurement and Analysis

Continuous assessment and evaluation during the implementation and operation of the preferred alternative is necessary to ensure continuous sustainability improvement in the systems. This will require tracking additional information through updated data collection efforts. Additionally, this may require tracking data that is not currently used to operate the systems, such as tracking the volume of sewage spills in conjunction with the existing measurement of tracking the number of sewage spills. These additional efforts will allow the City to conduct more detailed analyses in the future and measure progress against baseline data.

Section 1
Introduction

1.1 Objectives

The Los Angeles Department of Public Works, Bureau of Sanitation (Bureau) requested an independent assessment of the sustainability of alternatives proposed under its Integrated Resources Plan (IRP) for the Wastewater, Runoff Management, and Recycled Water Programs. The IRP is intended as an integration of the City of Los Angeles water (water reuse/recycling and water conservation), wastewater (collection, treatment, and biosolids) and runoff (dry weather and wet weather) service functions. By using this 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. Completion of the IRP will result in a Facilities Plan encompassing each of the integrated service functions, Capital Improvement Program, an Environmental Impact Report, Financial Plan, and a Public Outreach Program. This IRP analysis presents a framework of indicators as a basis for measurement of the sustainability of the integrated system proposed in the IRP and as an aid for selecting capital improvement alternatives for further evaluation.

The IRP will set into motion a substantial capital improvement program designed to meet the future needs of the City for wastewater, runoff management, and water systems. It will describe capital improvements and management measures for wastewater collection and treatment, biosolids, dry and wet weather runoff, recycled water, and water conservation.

The Bureau presently operates wastewater and runoff management systems that engage in all of these activities to an extent, but not in a fully integrated manner. Additionally, the Department of Water and Power operates the water system, including distribution of recycled water and water conservation programs. The City's wastewater treatment system is referred to here as the "WWTS." A core emphasis of this analysis is that these three systems are not isolated, but interact strongly with social, economic, and environmental systems. A systems-based approach for assessing these interactions and comparing various alternative technologies and approaches in the context of sustainability is needed to ensure continuous improvement in the performance of the three systems. Indicators must be capable of measuring the sustainability of the systems as they currently exist and predicting the sustainability of alternatives under the IRP.

To accomplish these objectives, this analysis provides: 1) a benchmark measure of the sustainability of the current systems; 2) measurements of four IRP alternatives; and 3) recommendations for future measurement, analysis, and reporting as IRP implementation is undertaken.

1.2 Defining a Sustainable Wastewater and Runoff Management System

Application of the World Commission on Environment and Development definition of sustainability (WCED, 1987) is appropriate for the Bureau. Under their definition a department is working in a sustainable fashion if it is meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. Lundin et al., (1999) have provided a definition of sustainability for urban water systems: they should "not have negative environmental effects even over a long time perspective, while providing required services, protecting human health and the environment with a minimum of scarce resource use".

More specifically, sustainability is not a fixed state, but is rather an emergent property of a complex system (Allenby, 1999; Ashley et al., 1999). To encourage sustainability, the IRP should provide the framework to set into motion an iterative process in which the needs of a city, that is continuing to develop socially and economically, are met without increasing demands on natural resources or outputs of pollution above levels generated by the existing wastewater system (Task Committee, 1997; Loucks and Gladwell, 1999).

To effectively define and measure sustainability, it is necessary to take a view beyond the core infrastructure and conveyance aspects of the wastewater and runoff management systems. The ecological, social, and economic systems impacted by the wastewater, runoff management, and recycled water systems extend throughout the watershed of the Los Angeles River and smaller adjacent systems. The interactions among the elements in these systems can be strong as illustrated:

- Development changes the quantity and quality of wastewater and stormwater flows.
- Construction of new facilities can improve or reduce the quality of life for nearby residents.
- Community behavior changes runoff water quality and volumes.
- Economic prosperity in the region requires effective and economical wastewater and runoff management.

Indeed, it can be argued that impacts of the system extend far beyond the boundaries of the City. Water conservation efforts within the system will reduce imported water demands and their ecological impacts in Northern California and the Mono Basin and trash control in the runoff management system will reduce the severity of trash in the central Pacific Ocean. To specify all of these elements and impacts was beyond the scope of this analysis. Instead, evaluation of environmental impacts was confined to the local watershed and some of the most critical external impacts are evaluated in general terms.

1.3 Criteria for Choosing Indicators

Sustainability is a broad concept, with many components. Therefore, it is important to have indicators that can be applied periodically to gauge progress and to assess planning options for the future. Indicators should be designed to function as part of a process of continuous improvement. The sustainability indicators for this analysis have been designed to meet several specific criteria. They are intended to be:

- Genuine measures of sustainability. Efforts by the Bureau to improve its scores on the indexes will have the effect of improving the sustainability of their facilities and procedures.
- Comprehensive. The important aspects of sustainability will be covered so that desired performance characteristics or outcomes are not ignored. If used consistently, they should provide early warning of developing issues.
- Applicable to the range of alternatives being considered. In particular, they must reflect the performance of the Bureau in the many environmental systems in which the Bureau plays a part.
- Meaningful and relevant to all stakeholders. If the Bureau has improved its ratings, the evidence should be clear and convincing for the people of Los Angeles (not just to sustainability specialists) that sustainability is being improved. Overly complex or obscure indexes might create confusion and distrust—indeed, the public may consider them opaque simply because there are too many of them (Ashley and Hopkinson, 2002).
- Relevant over time. The Bureau will use the indicators to strengthen and adapt its planning to changing technological and environmental conditions. They will also allow for different levels of analysis, from general assessments to detailed information on particular technologies or programs.
- Convenient to use. This assessment of the Bureau's performance with respect to the indexes will utilize data that are currently being collected. This analysis has also identified a number of data elements that are more directly related to measuring progress toward sustainable operations. Thus, when necessary, the indicators should shape future information gathering so that the data needed to assess and design for sustainability will be available.

1.4 Developing the Indicators Framework

A multitude of indicator frameworks exist. These frameworks seek to examine sustainability at many scales, including global, national, local, and project levels. At global and national levels a common approach is to create absolute measures of sustainability. These measures attempt to relate damage to ecosystems to the levels of population and mix of technologies employed at a certain scale. A common methodology is the pressure-state-response model (Trzyna, 1995). In these models, specific pressures of populations and technologies are related to the state of particular ecosystems. The model then sketches responses, and attempts to predict sustainability by creating feed-back loops of pressure, state, and response.

For a number of reasons, the use of absolute indicators is not appropriate to evaluate the sustainability of the IRP or the City's wastewater, runoff management, and recycled water systems. First, the Bureau operates at a scale where it is not possible to fully identify and separately define direct and indirect impacts on ecosystems related to Bureau operations. Bureau operate in tandem with other agencies, local businesses, and public activities create long chains of impacts where responsibility is not easily assigned. Second, pressure-state-response models are driven in large part by population size, and exogenous factors beyond the control of the Bureau and influence of the IRP. Finally, most pressure-state-response models are designed primarily around water provision systems, not the wastewater and runoff management systems that are the focus of this analysis.

A leading alternative to an absolute indicator is a scoreable index indicator. The typical approach for a scoreable index is to generate a list of desired outcomes, and measure progress towards those outcomes. A scoreable index is more appropriate than the use of absolute indicators when evaluating large scale wastewater and runoff management operations, such as those of the Bureau. Based on the best currently available information and a number of assumptions about future impacts, a scoreable index approach will allow this analysis to reflect more accurately the performance of the Bureau and the IRP alternatives than other modeling techniques.

To accomplish the goal of measuring continuous improvement toward sustainability, a baseline measure must be created for each indicator. Trends indicating increasing or declining sustainability in each indicator category in the IRP can be projected to the extent that the nature of the future system can be anticipated. In this analysis we have chosen a recent "baseline" year, and where data allow, we anticipate improvements or declines in sustainability that will occur by the year 2020, which is the target date for planning in the IRP. Most financial and performance data for departments in the City are gathered on a fiscal year basis, thus the fiscal year was chosen as the unit of measure for this analysis. The baseline year was Fiscal Year 2002/2003 (FY 02/03), which for the City corresponds to July 1, 2002 through June 30, 2003.

Four draft alternatives for the IRP were defined in the Bureau's *IRP Facilities Plan (July 2006)* after a lengthy analysis of preliminary alternatives resulting in hybrid alternatives that included substantial input from community stakeholders. Nine hybrid alternatives were derived from the best elements of the preliminary alternatives as determined by the IRP stakeholder process. These were further evaluated using preference information from the stakeholder process to arrive at the four draft alternatives:

- Alternative 1 includes expansion of the Hyperion Treatment Plant to allow for growth, and includes moderate potential for water resources projects.

- Alternative 2 includes expansion of the Tillman and Los Angeles-Glendale Water Reclamation Plants, with high potential for water resources projects.
- Alternative 3 proposes only expansion of the Tillman Water Reclamation Plant, with moderate potential for water resources projects.
- Alternative 4 includes expansion of the Tillman Water Reclamation Plant and high potential for water resources projects.

Common components for all the alternatives include:

- Increase in water conservation through the use of “smart” irrigation systems.
- Diversion of coastal dry weather runoff to the wastewater treatment system.
- Development of projects for recharge of wet weather runoff, with Alternative 3 proposing the greatest effort for “neighborhood recharge”.
- Construction of three sections of sewer between Eagle Rock and the Tillman Treatment Plant to provide increased capacity.
- Infrastructure to provide for increased irrigation and industrial reuse of recycled wastewater.

Alternative 3 is projected to provide the greatest volume of recharge of wet weather runoff through the use of “neighborhood recharge” options. Alternatives 2 and 4 are projected to provide more recycled wastewater than Alternatives 1 and 3.

Tables 1-1 through 1-3 provide a brief summary of the four alternatives. See IRP Facilities Plan, Volume 4: Alternatives Development and Analysis (July 2006) for a detailed discussion.

Table 1-1
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 221	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 1-2
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						
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 1-3
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 (Hyb3C)	Alt 4 (Hyb4C)
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 Runoffs Plants1	Westside	Treat and Discharge	160 mgd	160 mgd	160 mgd	160 mgd
Total Wet Weather Runoff Managed (mgd)			**791 mgd**	**791 mgd**	**791 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 and Implementation Plan was developed with Stakeholder and Regional Board Involvement, which was submitted to the Regional Board on July 2005. The recommendations from the approved Implementation Plan will supersede the assumed projects for the IRP.

Section 2
Overview of the Sustainability Indicators

2.1 Introduction to the Index

To assess sustainability in water infrastructure projects similar to the IRP, a scoreable index was created by the Delft's Hydraulic Laboratory, in the Netherlands. The Delft's sustainability index consists of five equally weighted categories and 19 measures (Loucks and Gladwell, 1999). This type of index is appropriate as the basis for designing the framework for evaluation of the Bureau and the IRP alternatives because the water infrastructure systems it was designed to assess have scales similar to that of the Bureau's wastewater and runoff management systems. Additionally, the scoreable index meets most of the previously described criteria for indicators that were established for this evaluation.

The index developed for the analysis of the IRP is similar to the Delft index. It consists of seven categories of indicators adapted from the literature for the IRP. The seven categories are:

- Social Impacts
- Economic Development
- Natural Resource Consumption
- Environmental Pollution
- Urban Ecology
- System Flexibility and Adaptability
- Institutional Capacity

In terms of quantification, the choice of the seven categories is important because it enables a more detailed analysis of each major aspect of sustainability in the City's wastewater and runoff management systems. The significance of each category and brief description of what it measures are further described below.

2.1.1 Indicator 1: Social Impacts

The first indicator measures the relationship of the residents of Los Angeles to the wastewater and runoff management systems. In particular, this analysis examines whether the burdens and benefits of the system are equitably distributed, as well as the extent of stakeholder involvement in the IRP process and other wastewater system activities.

2.1.2 Indicator 2: Economic Development

This category measures how the wastewater and runoff management systems contribute to the economy of the City. One important measure will be the degree to which the system generates employment. Another important measure will be the contribution the systems make to the City's economy through its own economic efficiency and provision of valuable services.

2.1.3 Indicator 3: Natural Resource Consumption

The consumption of natural resources is an important indicator of sustainability. In the case of non-renewable natural resources (such as fossil fuels) it is necessary to reduce and eventually eliminate consumption over a time horizon of several decades to allow industrial systems to adapt to new, renewable sources without going out of business. In the case of renewable resources such as water, sustainable use would not exceed replacement or regeneration rates of the resources that are being consumed.

2.1.4 Indicator 4: Environmental Pollution

Pollution generated by the system is an important indicator of sustainability. For example, accumulation of global climate forcing gasses in the stratosphere threatens to change climates on a global scale. Also, air pollution is of particular concern in the Los Angeles region as a result of a combination of factors including population, geography, and weather. Reducing pollution of local water resources is already recognized as a primary mission of the Bureau.

2.1.5 Indicator 5: Urban Ecology

This indicator assesses the ways in which the footprint of the City relates to its native ecosystems. It includes provision of parks and open spaces for residents of the City and habitat that supports biodiversity in the City (Shane and Graedel, 2000). The IRP represents a significant opportunity to achieve both clean water goals and urban ecosystem improvements through approaches to integrated design. This analysis has sought to measure some of these integrated benefits.

2.1.6 Indicator 6: System Adaptability and Flexibility

This indicator measures the flexibility and adaptability of systems to changing environmental and technological conditions (Loucks and Gladwell, 1999). It is an important measure of sustainability because it encourages continuous improvement and promotes innovation, while embracing the unpredictability of future environmental and technological conditions. It builds in a step-by-step approach that leaves room for assessment and adaptability.

2.1.7 Indicator 7: Institutional Capacity

The final indicator category recognizes that the IRP and the drive for sustainability represent a new focus for wastewater and runoff management and policy. The sustainability of the IRP depends ultimately upon building the institutional capacity and political will to support this process. Such capacity comes from staff training and commitment, public education, pricing signals, data development, and interagency partnerships.

2.2 City of Los Angeles Wastewater, Runoff Management, and Recycled Water Systems

The wastewater, runoff management, and water systems are defined in Figure 2-1 on the following page. The figure depicts the cycle of water and illustrates its path through the systems with its eventual reuse or discharge to surface waters (rivers and the ocean). Each box in the figure denotes infrastructure or programs for the known alternatives for water management: water conservation (i.e., source reduction), wastewater treatment, distributed infrastructure that captures and recycles water, green infrastructure that reduces urban runoff, and recycled water infrastructure constructed at major wastewater treatment plants. Different environmental impacts arise from construction and operation of programs or infrastructure in each of these boxes. Most impacts will reflect on indicators in more than one category. For example, if energy use changes, both the use of non-renewable resources and the output of pollution will be affected as Subindicators 3.2, 4.1, and 4.2 will take into account). To account for this, calculations will be made on a system-wide basis. The results of each calculation will be reflected as summary measures in each indicator category. Details for calculations are provided in the appendices of this document.

Another important point is that the indicators will recognize interactions across the systems. For example, if investments are made in water conservation, environmental impacts should be reduced upstream, in water provision, and downstream, in wastewater treatment. Another example is that water reuse will reduce the energy required for energy-intensive water importation (Haggin, 1991). Thus, water reuse projects may receive an estimated "credit" across several programs or infrastructures.

The sustainability analysis involved 6 steps:

1. Review of the literature to find which indexes have been used in the past to assess the sustainability of water, wastewater, and runoff infrastructure.

2. Selection of a subset of the indexes that were appropriate for the systems managed by the Bureau and for the local conditions.

3. Choice of a short list of indexes that are applicable.

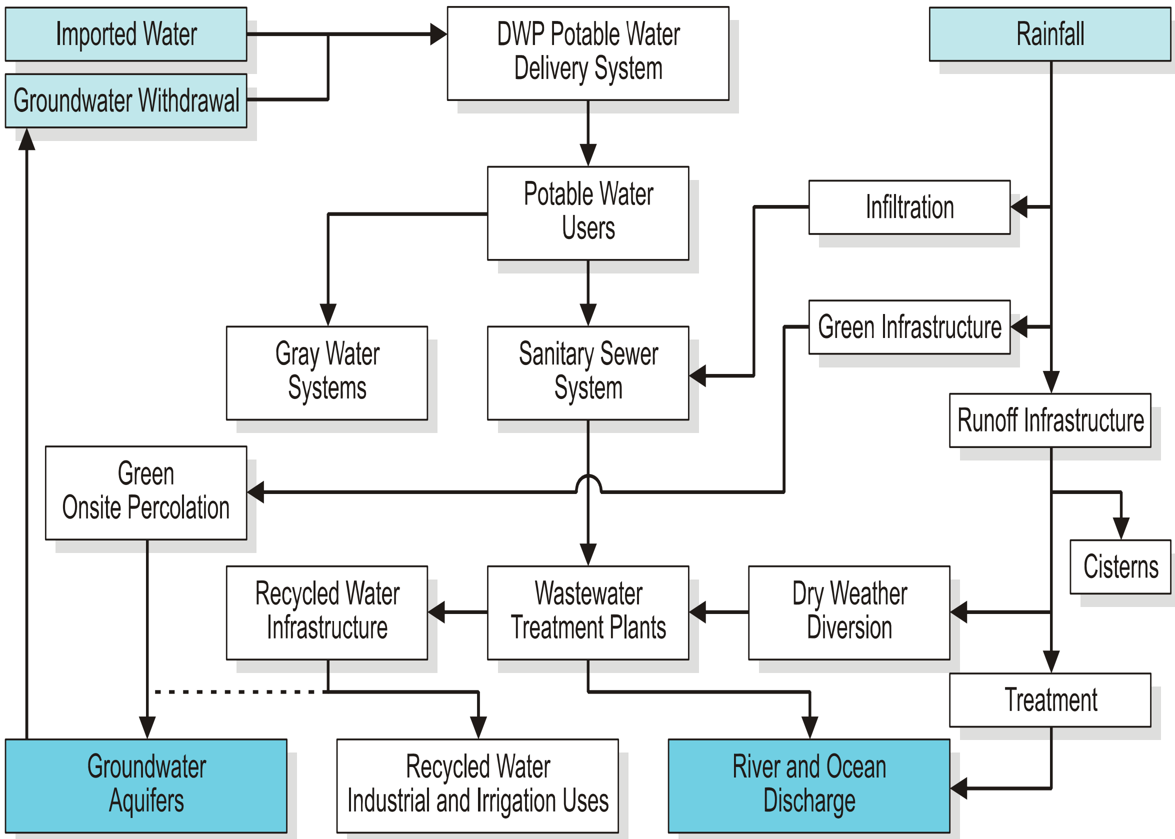
4. Interviews with Bureau personnel, personnel in other City departments, and stakeholders to gather data to support index calculation.

5. Evaluation of data and calculation of indicators for the baseline year.

6. Evaluation of the likely performance of the four IRP draft alternatives, and scoring IRP performance relative to the baseline year.

Figure 2-1

Water, Wastewater and Stormwater Infrastructure



2.3 Assessing the IRP Alternatives

Assessment of the wastewater, runoff management, and recycled water systems over a wide range of criteria has led to an indicator framework that includes both qualitative and quantitative indicators.

2.3.1 Quantitative Indicators

The objective of this analysis is to measure improvement or erosion of the sustainability of the systems with respect to the baseline over time. Thus, the index will be quantified relative to the benchmark measure established for the City's wastewater, runoff management, and recycled water systems during the baseline year, FY 02/03.

Expenditures form the basis for a number of calculations in this analysis. Therefore, the expenditure benchmark is based on the previously identified baseline of FY 02/03. In terms of expenditures, the IRP alternatives are assessed for fiscal year 2020.

2.3.2 Qualitative Indicators

Although some indicators can be empirically measured based on current information, there are others that do not lend themselves to easy quantification. In particular, the flexibility and institutional capacity indicators have historically demonstrated themselves to be difficult to quantify. However, qualitative analysis can lead to subjective quantification, and it is important to provide values for these indicators so that they are not disadvantaged in providing the overall assessment of sustainability.

One issue that deserves careful analysis is the sensitivity of the overall systems to population growth. Although we have assumed that the systems must be made sustainable regardless of the population growth of the service areas, the ability to achieve continued sustainability will become increasingly difficult as population increases. The sensitivity of the indicators to population growth projections have been considered, and this analysis has reported these findings along with the indicators for each IRP alternative.

2.3.3 Scoring the IRP Alternatives

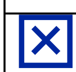
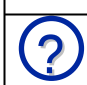
Each of the seven indicator categories are treated equally in the scoring process as there are uncertainties and assumptions inherent in the use of weighting factors. To be truly effective, weighting factors must reflect both the perception of IRP process stakeholders and take into account local and regional issues. A weighting factor would also face the difficulty of making meaningful comparisons across very different objectives (e.g., reducing air pollution to creating interagency partnerships). As a result, and due to a significant number of data gaps and uncertainties, this analysis has not sought to weight the indicators or to otherwise represent any difference in their importance.

This analysis uses symbols to score the IRP alternatives relative to the baseline year for each sub-indicator. Table 2-1 describes the scoring methods that were used in analyzing the IRP alternatives. Symbols have been developed as an alternative to a weighted index approach. The typical approach of a weighted index is to produce a list of desired outcomes, and develop measures for those outcomes. Weighting is used to combine results from all the indexes and produce an overall indicator or "score" for the analysis.

The symbols have been chosen to effectively and clearly communicate to the public and officials areas where progress towards sustainability is projected to occur and where further work is required to achieve sustainability. The symbol for insufficient data is particularly useful for highlighting areas where additional data mining is required to establish a baseline to effectively analyze the systems or further development of programs is required. For example, at the time of this analysis, the IRP was still under development and a preferred alternative had not been selected. Therefore, only limited details were available in some instances and an insufficient data symbol was assigned. Details of the preferred alternative will be further developed during the IRP implementation process. Also, for the baseline year the

City did not readily have all the data in a useable format required to effectively measure indicators for the baseline year. The indicators were developed specifically for this analysis and thus the City did not have a reason to track this information. The score for insufficient data covers both of these cases.

Table 2-1
Scoring Methods

Analysis Symbol	Symbol Explanation
	Strong Positive Trend: Analysis suggests substantial progress towards sustainability over the baseline is likely. The Bureau will be making substantial progress toward sustainability with full implementation of the IRP or ongoing Bureau activities.
	Positive Trend: Analysis suggests some progress towards sustainability over the baseline is likely. The Bureau will need to reassess throughout implementation.
	Same as Baseline: Analysis suggests future outcomes are likely to be equivalent to the baseline. Maintaining the baseline does not necessarily produce sustainability. The Bureau should be aware that problems may emerge in the long-term. Future integrated planning may address making progress on these indicators.
	Negative Trend: Analysis suggests there is likely to be deterioration from the baseline. The analysis serves as a warning that problems may be on the horizon. The Bureau may need to pay particular attention to address emerging issues during IRP implementation.
	Additional Planning Needed: Analysis suggests that there is insufficient planning to estimate progress against the baseline. The Bureau may need to undertake additional integrated planning efforts.
	Insufficient Data: There is currently insufficient data to measure the baseline reliably. Future efforts should be directed to generating baseline data.

2.4 Use of Life-Cycle Assessment

This analysis has used Life-Cycle Assessment (LCA) methodologies to capture the indirect impacts of the wastewater and runoff management systems. LCA is a comprehensive environmental impact methodology that was initially designed to trace the environmental impacts of products and processes. The purpose of the LCA model is to drive design of products with the intent of lowering overall environmental impacts. The primary advantage of LCA is that it moves beyond “end-of-pipe” assessments. “End-of-pipe” assessments do not take into account pollution generated by a particular product upstream of the system being analyzed. Pollutant quantities associated with products upstream of the system may equal or exceed pollutant quantities measured at the “end-of-pipe” (Curran, 1996). Increasingly, LCA is being applied to assessment of infrastructure or urban waste management systems (Tukker, 2000; Powell, 2000).

One advantage to LCA methods is that a number of data sources have been developed with which to make estimates. Estimates can be based upon either process or economic input data. For example, if the dollar values are known for purchases of chemicals in treatment plants, an estimate of the pollution created from producing those chemicals can be derived from existing data and models. Similarly, if the total amount of gasoline consumed is known, or the total amount of electrical energy consumed is known, process models can estimate natural resource consumption and pollution outputs.

2.5 System-Wide Measurements of Energy, Water, and Materials

To calculate the net use of energy, water, and materials on a system-wide basis, it is necessary to have data that will drive indicators within the natural resource consumption and pollution categories. Measurement of net use is required, because the wastewater and runoff management systems may both consume and produce energy, water, and materials. The energy and materials data become inputs to LCA models to develop life-cycle inventories for resources and pollution. In the pollution output category, these figures will be added to end-of-pipe calculations for specific facilities or processes.

Section 3
Social Impacts (Indicator 1)

A system is functioning in a socially sustainable manner if:

- Its presence contributes to the welfare of society
- Those who are affected by it have some control over its actions, and
- Impacts of the system are distributed with a reasonable degree of equity.

Facilities and procedures that are not managed in a fair and equitable manner will be unsustainable because they will lack political support from the public. Further, actual or potential impacts should be transparent. Decisions must be made with public input, and in such a way that the input is given serious consideration. It is inevitable that the external burdens of the system will not be distributed exactly as the benefits are distributed.

Indexes can be developed to ensure that the inequities are not excessive and that they do not reinforce existing patterns of inequity. This study focuses on four specific indicators of social impacts:

- Beneficial neighborhood impacts,
- Adverse neighborhood impacts,
- Customer satisfaction, and
- Public input in Bureau operations and the IRP process.

3.1 Beneficial Neighborhood Impacts (Subindicator 1.1)

3.1.1 Background

The IRP presents opportunities to change typically negative impacts into positive impacts at the local level and reverse historic inequities in access to parks in the City while reducing pollutants in runoff. At first glance, the IRP alternatives may seem to result in unequally distributed adverse impacts, with greater impacts on those neighborhoods in the City where treatment plants are expanded or new conveyance infrastructure is proposed. However, these negative impacts may be offset by beneficial impacts associated with the creation of green infrastructure in neighborhoods. Green infrastructure designed to recharge groundwater and treat or reduce runoff may benefit neighborhoods. If the Bureau works in partnership with other agencies to create green wastewater and runoff infrastructure, many projects could also serve dual uses as fields, pocket parks, and riverside green space. There are marked historical inequities in race, ethnicity and class in access to parks in the City of Los Angeles (Wolch et al., 2002). Therefore this measure focuses on the Bureau's and the IRP's role in increasing equity in the distribution of new open space.

This indicator closely fits with the *IRP Facilities Plan: Volume 4 - Alternatives Development and Analysis* sub-objective 5.4, "Enhance public lands where possible" (see *IRP Facilities Plan: Volume 4: Alternatives Development and Analysis*, Section 3 for additional discussion). Sustainability indicator 5.1 (see Section 7) also examines open space benefits created by the Bureau through implementation of the IRP. The focus in this indicator is on total open space created and on equity in access to new open space by City residents.

3.1.2 Indicator Baseline

A key indicator of social sustainability in open space planning is access to parks within one-quarter mile of the residence. Many studies suggest that when park access is further than one-quarter mile from a resident's home, it is far less likely that residents will use the parks (Wolch et al. 2002). This is particularly true among residents who depend upon public transportation. Although there are many confounding factors that affect park access in diverse and geographically large cities, such as Los Angeles, the quarter-mile criterion is a reasonable proxy for access.

GIS-analysis by Wolch et al. (2002) showed that only about 25 percent of residents in the City live in census tracts with quarter-mile park access in the baseline year[1]. In terms of race and ethnicity, the study by Wolch et al. (2002) indicated that areas of the City with high concentrations of Latinos, African-Americans and Asian / Pacific Islanders have much lower levels of per capita access. The study also found that current mechanisms of park funding, particularly at the state level, reinforce rather than reduce inequity in access.

Wolch et al. (2002) also provided data by calculating parks and open space acreage per 1000 people in census tracts where various ethnic and racial groups are "dominant" (see Table 3-1)[2]. The numbers include populations and acreages for open space of all types captured by the quarter-mile buffer. The study found a disparity between census tracts where the Caucasian population is dominant (about 30 acres per 1000 people), and tracts where minority groups are dominant (about 0-2 acres per 1000 people).

As of the baseline year, all open space managed by the Bureau is located in one area of the City, adjacent to an area in which large amounts of open space already are managed by other agencies. In the past the Bureau has not used the wastewater and runoff management systems as a means to help remedy the inequity in park access in the City. However, with the IRP the Bureau will seek to enhance public lands where possible.

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[1] This figure is obtained by summing figures given in the Wolch et al. (2002) for sub-populations with 1/4-mile access (922,682) and dividing by the total population (3,699,645).

[2] Dominance is defined as 75 percent or more of the total population. Data are also included for tracts that contain 50-75 percent of the population in question and the numbers reflecting poor equity in access do not change dramatically.

Table 3-1 Baseline for Parks and Open Space	
Baseline	**Indicator**
Equity in Park Access	25 percent of residents live in census tracts with ¼-mile access to parks and open space. Acres per 1000 people in: White-dominated tracts (31.8) Latino-dominated tracts (0.6) African-American-dominated tracts (1.7) Asian & Pacific Islander-dominated tracts (0.3)
Increased access due to Bureau of Sanitation projects.	None

3.1.3 IRP Alternatives Development and Analysis

The IRP has a performance measurement sub-objective of "enhancing public lands where possible." This sustainability indicator seeks to account for potential improvements in the equity in access to land that might result from the implementation of the neighborhood recharge projects in the draft IRP alternatives.

The Bureau has an opportunity through the IRP to increase overall access to parks and open space. In fact, the opportunity for the IRP to make measurable change against the city-wide baseline in the area of equity in park access is actually greater than in per capita open space overall. Even small amounts of open space that are carefully targeted can increase the proportion of census tracts with at least some quarter-mile access. Similarly, in tracts with quarter-mile access to only 0-2 acres of open space per 1,000 people, a few IRP projects that create open space could make a substantial difference for residents in those areas.

Actual sites for open space projects will be chosen during IRP implementation development. Thus, currently there are no data available with which to reliably measure the performance of the alternatives against the baseline. The measures reported in Table 3-1 reflect this need for data development during IRP implementation. However, initial planning reflected in IRP meetings indicates that increasing equity in access will be taken into account during implementation. IRP planning has already identified small acres of remnant or vacant land that are likely to be available in areas where residents have low access to parks. These identified areas are under primary consideration.

The IRP has determined that runoff management/groundwater percolation projects are unsuitable for areas in the "Los Angeles Coastal Basin". This includes all areas outside the San Fernando Valley. Initial investigations of soil types in the City shows that land outside the San Fernando Basin is less than ideal for percolation-type projects. Many of the census tracts with no or low access to parks are located outside of the San Fernando Basin. Future research and planning might further investigate soil types in the Coastal Basin to determine the feasibility of runoff management/groundwater recharge projects on a local scale in the Coastal Basin.

The IRP has the opportunity to increase park access in the San Fernando Valley Basin through the development of runoff management/groundwater percolation projects. For example, the IRP has identified the eastern portion of the San Fernando Valley as a primary area for groundwater recharge due to the wide availability of appropriate soil types. Wolch et al. (2002) identified several Latino-dominant census tracts in this same area that have little or no quarter-mile access to parks. The overlapping areas include the communities of Sun Valley, Arleta-Pacoima, and Sylmar.

This analysis recognizes that it is not the primary mission of the Bureau or the wastewater or runoff management systems to increase equity in park access. It is beyond the scope of this analysis to predict what the other departments tasked with creating and maintaining parks and open space may or may not accomplish by 2020 in terms of progress on equity in access to parks. Thus, the analysis makes no projection for the proportion of census tracts with quarter-mile access in 2020. Additionally, this analysis has not included an analysis of the extent of equity in access by racial and ethnic group in 2020.

Table 3-2 presents a summary of the analysis of the IRP alternatives in terms of equity in park access. As shown in the table, it is suggested that with implementation of any of the alternatives, a positive trend towards sustainability (in terms of equity in park access) is likely. IRP Alternative 3, with increased neighborhood-level runoff percolation projects, reflects a strong positive trend.

Table 3-2
Analysis of Equity in Park Access

Alternative	Increased Access Due to IRP Projects
IRP Alternative 1	✓
IRP Alternative 2	✓
IRP Alternative 3	✓+
IRP Alternative 4	✓

See Table 2-1 for explanation of symbols

3.1.4 Future Measurement and Analysis

It is recommended that maps indicating areas without quarter-mile access be created and used during development of detailed implementation plans to choose open space sites that will increase park access. Future development and maintenance of maps indicating areas of the City without quarter-mile park access will allow quantification of the Bureau's role in subsequent sustainability indicator assessments. Additional mapping efforts to site Bureau facilities that would create open space could also take into account equity in access by racial and ethnic groups.

3.2 Adverse Neighborhood Impacts (Subindicator 1.2)

3.2.1 Background

Constructing and operating the preferred IRP alternative could create neighborhood impacts that are perceived by the public as adverse. These impacts could include: wastewater system overflows, number of service requests for the wastewater and runoff management systems, and any siting of infrastructure (e.g., urban runoff plants) that disproportionately impacts low income areas.

3.2.2 Indicator Baseline

The baseline measurement includes the number of wastewater and stormwater system service requests, number of wastewater overflow incidents, and an assessment of odor complaints for FY 02/03.

3.2.2.1 Number of Wastewater and Stormwater System Service Requests

The number of annual service requests is a proxy measure for the number of days the wastewater and runoff management system in Los Angeles is under repair. Table 3-3 summarizes Bureau service request activity for the fiscal years between 2000 and 2003. The number of service requests includes both wastewater and stormwater requests. For FY 02/03, approximately 37 percent of requests dealt with stormwater, the remainder addressed wastewater issues.

Table 3-3

Los Angeles Wastewater and Runoff Management Service Requests

	Total Number of Service Requests	Service Requests per 100 miles of Sewers
2000-2001	8,704	13.4
2001-2002	5,589	8.6
2002-2003	7,675	11.8

The number of service requests has varied considerably between years, for a three-year average of 7,322 service requests and an average of 11.3 requests per 100 miles of sewer.

3.2.2.2 Annual Sewer Spills

In 2002 the City of Los Angeles Board of Public Works adopted a motion setting a goal to reduce wastewater spills by 25 percent by December 2005. The goal was set to formalize a comprehensive Bureau program started in 2001 to reduce wastewater spills. The Bureau is conducting a series of programs to reduce spills by focusing on cleaning sewer lines and combating the two major causes of spills: tree roots, and fats, oils and grease (FOG).

As seen in Table 3-4, current efforts by the Bureau have reduced sewer spills by 12 percent between 2001 and 2003. (Bureau of Sanitation Spill Reduction Annual Progress Report, 2003). It is worth noting that the total in 1999-2000 was 617 spills.

Table 3-4
Los Angeles WWTS Spills

	TOTAL SPILLS	Annual Percent Reduction	Total Percent Reduction
2000-2001	687	-	-
2001-2002	647	5.8 percent	5.8 percent
2002-2003	614	5.1 percent	10.6 percent

In addition to the total number of spills, it is essential to get a sense of the magnitude of those spills. For FY 02/03, 18 percent of spills were Category II spills, the rest of the spills were Category I spills. [3] Less than 50 percent of total spills reached the storm drains.

3.2.2.3 Siting of New Infrastructure

This analysis assumed the baseline for new wastewater and runoff management infrastructure to be zero. Any future IRP wastewater and runoff management infrastructure plans or projections are compared to that benchmark.

3.2.3 IRP Alternatives Development and Analysis

Because sewer spills and wastewater system repair are not explicitly addressed by the IRP, all four IRP alternatives were assumed to perform in a similar manner as indicated in Table 3-5. Siting of new infrastructure would be different between alternatives, as is detailed below.

[3] Category I spills are smaller than 1,000 gallons. Category II spills are larger than 1,000 gallons or spills larger than 500 gallons that reach the storm drains.

Table 3-5
Analysis of Adverse Neighborhood Impacts

	Number of Sewer Spills	Percent - Category 1 Spills	Percent - Category 2 Spills	Number of Service Requests	Siting New Infrastructure
IRP Alternative 1	✓	?	?	?	✓
IRP Alternative 2	✓	?	?	?	✓+
IRP Alternative 3	✓	?	?	?	✓
IRP Alternative 4	✓	?	?	?	✓+
See Table 2-1 for explanation of symbols					

3.2.3.1 Number of Services Requests

The *IRP Facilities Plan Volume 4: Alternatives Development and Analysis* states "…to relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors or storage facilities would be required" (for all 4 proposed alternatives). Two new large diameter sewers Glendale-Burbank Interceptor Sewer (GBIS) and Northeast Interceptor Sewer Phase II (NEIS) are included in all four alternatives, and should lead to fewer overflows. The interceptor sewers planned for the IRP are designed to complement ongoing maintenance and repair programs conducted by the Bureau.

Although improvements should be expected, given the variation in the number of requests in the years preceding the baseline, it is impossible to predict future performance with precision as indicated by the unknown score in Table 3-5. It will therefore be critical to continue to track and report these incidents compare the results against the baseline.

3.2.3.2 Annual Sewer Spills

The Bureau has clearly reduced the overall number of spills occurring each year, through FY 02/03. Given recent trends and the Bureau's Investment in its rehabilitation program, this analysis has assumed that the number of spills will continue to decline under all four alternatives.

In implementing IRP infrastructure over the coming years, it will be important to continue to reduce the number of spills. Zero (or near-zero) spills is an ultimate goal for a sustainable system. However, in the interim, the Bureau should seek to continuously reduce the number of spills, even beyond the 25 percent reduction goal established by the Board of Public Works. Similar to the number of service requests, it will be critical to continue to track and report spills and compare those results against the baseline.

The City has recently entered into an agreement with the United States Environmental Protection Agency that requires the City to implement efforts to reduce spills. These efforts will include thousands of miles of sewer cleaning over the next 10 years, along with projects for rehabilitation and replacement of facilities.

There was no reasonable way to estimate the number or percentage of Category I and II spills in the future for any of the four IRP alternatives, so they have been scored as unknown in Table 3-5. However, it is important for the Bureau to continue to track and report the number of spills in these categories.

3.2.3.3 Siting of New Infrastructure

In terms of adverse impacts, this analysis also takes into account how infrastructure siting could disproportionately impact local communities. While recognizing that all four alternatives will include construction of sewer lines and cistern installation, this analysis has focused on above ground structures, specifically the potential siting of Urban Runoff Plants (URPs).

Alternatives 2 and 4 will manage higher volumes of dry weather runoff through URPs and therefore more equally distribute the impact of new URP facilities across socio-economic sections of the City. While Alternatives 1 and 3 include fewer URPs, the two proposed could be located in the center of low-income census tracts, with no URPs in moderate (or higher) income areas.

3.2.4 Future Activity and Analysis

Future performance measures in this area should consider reporting the total volume of spills in addition to the number of spills that might occur each year. If the number of sewage spills decreases by 50 percent over the next 10 years, but the volume of sewage released in those spills remains the same or does not decrease by a comparable amount, the actual effect, or outcome of spill reduction activities can be limited. Thus, it would be reasonable for the Bureau to establish goals to reduce both the number and severity (total volume or net impact) of sewer overflow events. This could provide information on the extent to which the Bureau’s root control, FOG control, or stormwater infiltration and inflow programs are influencing the number and quality of overflow events.

In addition, the environmental justice impact of the spills should be accounted for in the Bureau’s future performance measurement. The *IRP Facilities Plan: Volume - Alternatives Development and Analysis* had a performance measurement objective to “promote environmental justice.” However, the intent of that measure is on the long-term impact of major facilities on minority and low-income populations. If the total number of sewage spills decreased citywide while low income and minority communities continue to experience spills at the current rate, the change could not be considered equitable.

The analysis conducted for siting of new IRP infrastructure takes into account that potential adverse neighborhood impacts of URPs will be mitigated during implementation as part of the environmental impact reporting process. The sustainability analysis also recognizes that URPs offer the benefit of recycled water for irrigation and industrial use in the vicinity of neighborhoods where they are constructed. As is discussed in detail in Section 7 (Urban Ecology), if constructed wetlands are built instead of URPs, or are included in some part of the URPs treatment chain, the outcome of this analysis, with respect to the social impacts of siting IRP infrastructure, could change considerably. Constructed wetlands have the potential to create open space and habitat benefits.

3.3 Customer Satisfaction (Sub-indicator 1.3)

3.3.1 Background

Customer satisfaction is an important component of the wastewater treatment system. Sewer conveyance systems need to function reliably and odor from wastewater system facilities and infrastructure should be minimized (if not eliminated). Lacking ability to survey a sample set of Bureau customers, this analysis uses a straightforward measure of the average number of yearly odor complaints to the Bureau.

3.3.2 Indicator Baseline

The baseline for this indicator is the net number of odor complaints to the Bureau, as well as a normalized calculation of complaints (e.g., per capita or per service area). Over the past 4 years, the Bureau has averaged 450 odor complaints per year. Normalized odor complaints (per population (10,000 residents) and per 100 miles of sewer) have also been considered (Table 3-6).

Table 3-6
Los Angeles Wastewater Odor Complaints

	Benchmark Values
Total number of Odor Complaints per year	450 (average value past 4 years)
Odor Complaints Per 10,000 Residents (2003 population)	11.5
Odor Complaints per 100 miles of sewer in Los Angeles	6.9

3.3.3 IRP Alternatives Development and Analysis

The City has a separate odor control plan in place that is outside the IRP planning and development process. Considering the attention that is already being given to the odor issue, this analysis has assumed that this sub-indicator will continue to experience a positive trend for all four alternatives. However, a rigorous per capita or per mile assessment was not possible. This uncertainty is expressed in Table 3-7.

Both a per capita and a per mile assessment for odor complaints are important metrics as they reflect the population density in problematic parts of the system, and the magnitude of the problem for the system as a whole. As the City's odor control management plan is being managed outside of the core IRP process, this analysis has assumed that all four alternatives would perform equally.

Table 3-7
Analysis of Customer Satisfaction

	Total Number of Odor Complaints	Per Capita Odor Complaints	Per Mile Odor Complaints
IRP Alternative 1	✓	?	?
IRP Alternative 2	✓	?	?
IRP Alternative 3	✓	?	?
IRP Alternative 4	✓	?	?

See Table 2-1 for explanation of symbols

Nevertheless, odor incidents and complaints are likely to continue throughout IRP implementation. As the IRP is implemented and new infrastructure (e.g., pipes, urban runoff plants) is built and aging infrastructure is replaced, the Bureau will need to continue to monitor and manage system-wide odor issues and measure and report progress against the current baseline. For example, a program investigating the use of biofilters for control of odors from a new outfall leading to the Hyperion Treatment Plant is underway.

3.3.4 Future Measurement and Analysis

Similar to the sewage spill indicator, the environmental justice impact of odor complaints should be accounted for in the Bureau's future performance measurement. Continuing to decrease the total number of odor complaints will be important. If citywide, the total number of odor complaints continues to decrease, but areas such as "the Maze" continue to experience a disproportionate number of odor complaints, the result would not be considered sustainable due to adverse social equity impacts.

3.4 Public Participation (Subindicator 1.4)

It is important to educate the public and involve them in decisions made about the wastewater treatment and runoff management systems, particularly within their own neighborhoods. This indicator assesses the extent to which the Bureau engages the public in decision-making and implementation.

3.4.1 Indicator Baseline

3.4.1.1 IRP Process

The IRP process itself made an enormous effort to reach out to stakeholders on wastewater, stormwater, and water issues. The greatest success here is perhaps the effort itself. New people are working in partnership with the City of Los Angeles and the Bureau on wastewater issues. Cooperation within local government itself has been enhanced as well.

It is inherent in the nature of public participation that the broader public is reluctant to get involved in early and general planning of the sort done in the IRP. Instead, the public typically waits until issues are more immediate, local, and specific. This makes the job of soliciting public participation very difficult. Due to such difficulties in both securing stakeholder participation and the nature of the IRP participation itself, the success of the public participation effort will depend on ongoing programs of participation early on in implementation.

Stakeholders participated in the IRP at varying levels:

- Tier 1: Steering Group – Participated in 13 ½ day workshops during the day.
- Tier 2: Advisory Group/Community Meetings - participated in evening meetings through the City.
- Tier 3: Information Group -Received newsletters.

The Steering Group participated through a three-step quantitative method to provide input on alternatives:

- First, a major survey instrument was used to gauge the weight or "value" that each stakeholder put on a given objective and/or sub-objective. "Forced-pair comparisons" were used to establish weights for the objectives in the decision-making process. The purpose was to see which objectives mattered most to stakeholders.
- Second, the technical analysis of IRP alternatives generated performance scores for each alternative. For example, these scores answer a question like: "How effectively does the alternative produce enhanced public lands?"
- Third, these performance scores for each sub-objective within each alternative were multiplied by the weighting derived from the survey instrument. The purpose of this was to summarize coherently which IRP alternatives most satisfied the stakeholder's objectives.

This Process was used to evaluate and screen over 20 Alternatives and Recommend 4 Alternatives for further evaluation in an EIR.

3.4.1.2 Stakeholder Diversity

The *IRP Facilities Plan: Volume 4 -Alternatives Development and Analysis* had a performance measurement objective to "promote environmental justice." A fundamental principle of environmental justice is that actions should be taken or implemented to avoid, minimize, or mitigate disproportionate and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.

3.4.2. IRP Alternatives Development and Analysis

3.4.2.1 IRP Process

Because of the perception of stakeholders that the survey-weighted scoring approach was "complicated and difficult to follow," the method of participation was modified when the IRP hybrid alternatives were evaluated. Nine hybrid alternatives were selected using the survey input from stakeholders and four hybrids recommended as draft alternatives for the formal environmental review process were chosen using a "quadrant cost/benefit" analysis method, which were presented at a Steering Group Workshop for Stakeholders comments and discussion.

It is not clear that the forced-pair comparison method was the most appropriate method to establish priorities for the objectives. The objectives are not always binary or zero-sum choices. Rather, objectives reinforce or interfere with one another in complex ways, depending upon the design or technologies chosen for the wastewater system.

3.4.2.2 Stakeholder Diversity

The steering group included people from areas across the City. There were staff members from other local agencies working on wastewater issues, representatives of environmental groups, neighborhood council members, and residents. While there was no official measure of the diversity (e.g., age, ethnicity, place of residence or affiliation) of the steering group, staff did reach out to make sure diverse interests were represented, as well as all Council districts. A measure of diversity of participation would make an important supplement for the performance measure, and also guide future efforts at soliciting participation. In the future, participation might be measured for diversity.

IRP Sub-objective 5.1 is to "promote environmental justice". The operating federal definition of environmental justice includes both reducing disproportionate impacts on minority and low-income people and increasing equity in participation in environmental decision-making. The performance measure for the environmental justice sub-objective is handled fairly comprehensively in terms of disproportionate impacts of IRP activities.

3.4.3 Future Activity and Analysis

Because of the difficulties in securing stakeholder participation and the nature of the IRP participation itself, any analysis of the future effectiveness of Bureau public participation efforts will likely reflect the programs of participation that were used during IRP implementation.

In addition, as Neighborhood Councils mature in the Los Angeles political landscape, they will become an increasingly crucial part of the public participation and outreach programs for the wastewater system. Various City departments and agencies, including the Bureau, are in the process of coordinating communication with the Neighborhood Councils so that council members will not be overwhelmed with superfluous presentations. Nevertheless, throughout much of the IRP implementation, Neighborhood Councils will provide important opportunities for communicating technical information and including the public in decision-making.

3.5 Social Impacts (Indicator 1) Conclusion

For the majority of sub-indicators in this category, there is either too much uncertainty in what might happen through the IRP implementation process or it was assumed, based on the best available information, that IRP implementation would generate results for all four alternatives that would be comparable to the baseline. In examining the two indicator elements that demonstrated differences between alternatives, IRP Alternatives 2 and 4 are best with respect to distributing the impact of URPs equitably across the City's diverse racial and ethnic landscape. Alternative 3, however, has the best performance in terms of increasing equity in park access. Decision-makers must weigh priorities given the potential to mitigate adverse impacts from URPs versus the potential to increase equity in access to open space.

Section 4
Economic Development (Indicator 2)

For the Economic Development indicator, this analysis seeks to connect choices made for the wastewater and runoff management systems to local economic development. Traditional economic indicators focus on the economy in isolation from other areas of people's daily lives. Such indicators often measure all economic activity without regard to whether the activity is helping or harming quality of life or the quality of the local environment. Other categories of indicators in this set tackle broad questions of quality of life and environmental quality. This analysis focuses on three specific indicators that seek to connect choices made for the wastewater and runoff management systems to local employment, the efficiency of the Bureau's investment, and operation and maintenance (O&M) activities.

4.1 Sub-Indicator: Local Employment: How Many People Work?

An important aspect of the Bureau's contribution to the quality of life in the City lies in how it relates to developing local jobs. The Bureau activities and outcomes of the IRP have effects on local jobs, both directly and indirectly. Direct job effects are straightforward. To manage both the scale and volume of activity in the wastewater and runoff management systems, the Bureau requires a large staff. Investment in the wastewater and runoff management systems can generate indirect employment effects in Los Angeles that warrant measurement in the context of sustainability. In addition, the efficiency measure that follows later in this category measures the overall tax burden of the Bureau and the systems on the local economy.

4.1.1 Indicator Baseline

This sub-indicator reports the total number of jobs within the Bureau related to wastewater and stormwater management, as well the percentage of people employed in major categories (professional, technical and managerial) as a percent of total employment for FY 02/03.

4.1.1.1 Direct Employment

The Bureau had 2,695 full time equivalent (FTE) employees for FY 02/03. Of those positions, 1,503 (56 percent of the total) were funded to manage the wastewater and stormwater system in Los Angeles. The rest of the FTEs work in the management of municipal solid waste within the City. The distribution of employment among categories can be found in Table 4-1.

Table 4-1
Bureau of Sanitation Employment Distribution in 2003

Category	Percent Employed
Professional/Managerial	19
Technicians/Engineers	33
Clerical	11
Field Staff and Laborers	37

Because specific numbers for wastewater and runoff management employees were not made available for this analysis, the percentages given here reflect the mix of job categories for the entire Bureau (i.e., both wastewater and solid waste employees).

4.1.1.2 Indirect Employment

The Bureau employment figures do not capture any indirect employment effects of Bureau expenditures in other sectors of the economy. Indirect employment is defined as additional employment that is generated in a local economy, resulting from capital outlays and employment in the wastewater/stormwater system. Indirect employment has been estimated using the same multipliers that are applied to generate employment data in the *IRP Facilities Plan, Volume: Alternatives Development and Analysis*. This formula assumes that for every $1 million in spending by the Bureau, 30 jobs are created. Using this very basic approach, baseline indirect impacts are in the range of 900 jobs created via Bureau capital spending in FY 02/03.

4.1.2 IRP Alternatives Analysis

Assessing the relationship between employment and sustainability is complex. Economic theory provides little guidance about whether it is better for an organization (whether public or private sector) to hire more staff, since this would reduce unemployment, or fewer staff, since this can reduce direct costs and increase organizational operating efficiency. In terms of indicators of sustainability, it is most important to understand the local employment effects for different mixtures of technologies and approaches to the wastewater problem. Some technologies and approaches might provide greater support for local business development and expansion of employment in existing local businesses than other, equally effective means to reduce pollution. More economic analysis will be needed in future iterations of these indicators to shed light on these questions.

The performance measure selected in the analysis of preliminary IRP alternatives for the sub-objective "Maximize Economic Benefits to Los Angeles" (Sub-objective 5.2) measures employment created by the IRP. That IRP measure parallels this sustainability indicator in measuring local employment produced by the wastewater and runoff management systems. One difference is that the IRP analysis focuses only on indirect employment created through new capital spending, while the sustainability indicator recognized the importance of measuring both direct and indirect employment. Table 4-2 summarizes economic development findings for the IRP alternatives.

Table 4-2
Economic Impacts Scores

	Direct Impacts	Indirect Impacts
IRP Alternative 1	?	✓
IRP Alternative 2	?	✓+
IRP Alternative 3	?	✓
IRP Alternative 4	?	✓+

See Table 2-1 for explanation of symbols

By linking spending (i.e., construction expenditures) with local job creation, it is anticipated that all four alternatives will create jobs above the current baseline. Alternatives 2 and 4 are the best performing alternatives from an economic development perspective because total capital spending is higher.

The methodology presented for calculating indirect employment for the *IRP Facilities Plan Volume 4: Alternatives Development and Analysis* does not readily present data necessary for a sustainability analysis. From a sustainability perspective, the number of local jobs created cannot be determined. Estimates in the *IRP Facilities Plan Volume 4: Alternatives Development and Analysis* were not based upon Los Angeles County input-output information. In addition, there was insufficient evidence in the *IRP Facilities Plan Volume 4: Alternatives Development and Analysis* to discern with certainty the time frame for job creation or whether the jobs would be permanent jobs or short-term employment.

Government spending, whether operations or capital improvements, has been shown to act as a stimulus for local employment. Economic models take into account both jobs created by initial spending, the "multiplier" effect of jobs created to support the new economic activity and the added spending by newly employed workers. The *IRP Facilities Plan Volume 4: Alternatives Development and Analysis* relied upon an earlier study on construction expenditures to estimate that 30 new jobs would be created for each 1 million dollars of IRP expenditure.

By utilizing a general multiplier for construction expenditures, the *IRP Facilities Plan Volume 4: Alternatives Development and Analysis* correlates more jobs with larger construction expenditures. Modeling was not conducted to differentiate the types of expenditures, or which specific IRP elements might produce more jobs beyond total expenditures. For example, would investments in smart irrigation produce more local jobs than investments in stormwater diversion pipelines and treatment plants? Are there potential future options for biosolids management that could provide additional local employment opportunities? In future examinations of the potential impact of IRP investment decisions and activities, there appear to be a number of additional choices and outcomes that would warrant analysis for their effects on local employment. In addition, it will be important to look at whether jobs are long term or short term and if IRP capital investment can facilitate the creation of new types of jobs in the local economy.

4.1.3 Future Measurement and Analysis

Through the lens of sustainability, detailed economic modeling is important because a key goal for sustainability is to choose technologies and designs that simultaneously help protect environmental quality and enhance local economies. Such modeling was beyond the scope of work for both the *IRP Facilities Plan Volume 4: Alternatives Development and Analysis* and for this sustainability analysis. When choosing technologies during implementation and beyond, the Bureau may wish to commission a more detailed analysis of effects on local employment consider the possibility that the IRP might foster development of new businesses by demanding innovative technologies to handle water recycling or runoff management. For example, the IRP might give rise to new businesses to construct and maintain bio-swales as a runoff management option.

Future analysis might also consider broader economic benefits of the IRP that in turn may influence local economic development and employment. There are a range of economic benefits that may occur because of improvements to the wastewater and runoff management systems. The two most obvious potential benefits would come from the role played by cleaner water as a part of river restoration efforts and in less beach closures resulting from reduced pollution. The Bureau's activities already play a significant role, and will play an increasingly major part in producing clean water for both the Los Angeles River and for local beaches.

The economic benefits of cleaner beaches are already fairly well understood. One challenge in future analyses will be to relate the role of the Bureau in cleaning urban runoff –and thus cleaner beach water– to economic impacts at the beach as well as the economic impacts of new green spaces (percolation zones or riparian areas). The challenge will be to understand the extent of the economic benefits that might be properly attributed to the Bureau's activities.

4.2 Sub-Indicator: Local Employment: Who Works?

An important economic sustainability goal is to provide not only more jobs, but also quality jobs. The benchmark for quality of employment is already strong. All jobs with the Bureau currently come with health and retirement benefits and paid vacation. All Bureau jobs also pay at least a living wage as defined by the Los Angeles City ordinance. In addition, City contractors must pay at least the living wage as defined by the ordinance. In light of these existing program elements, this analysis has measured the diversity of the Bureau's hiring and contracting practices.

4.2.1 Indicator Baseline

This baseline calculation for this indicator examined the diversity of employment within the Bureau in FY 02/03 as well as Bureau contractor selection practices. Diversity is envisioned to include types of jobs as well as ethnic and racial diversity.

4.2.1.1 Employment Diversity

An organization that is diverse can bring together people with various values and points of view that can be harnessed to stimulate creativity within an organization and even encourage new talent to join an organization. In the context of sustainability, it can be important that the people working in an organization reflect the diversity of its customers so that it is able to meet the needs of its diverse customer base. It is important to ensure that workforce diversity is used as a tool to assist in providing more effective services. Understanding diversity gives an organization opportunity to enhance teamwork and productivity, improve customer satisfaction, and foster a more harmonious and content workforce. For FY 02/03, the diversity of Bureau staff is listed in Table 4-3.

Table 4-3
Bureau Employment Diversity

	City of Los Angeles Bureau Employment Baseline (%) (FY 02/03)	City of Los Angeles Current Demographics (%)
Hispanic	25	46.5
Asian	10.4	11
African American	28.7	11
Caucasian	27.6	29.7
Other	8.3	____

While this distribution of diversity does not align with the current demographic trends in the City the benchmark does demonstrate that the Bureau is doing an effective job of incorporating diversity into its employment practices.

4.2.1.2 Contracting Practices

Another aspect of diversity concerns incorporating consideration of women-owned or minority-owned businesses enterprises, along with more traditional criteria such as contractor cost, in contractor selection criteria. Procurement, such as public employment, provides governments with a potentially powerful tool for promoting opportunities for socially and economically disadvantaged companies in general. At present, the Bureau bases contractor selection on the ability to complete the contract (qualifications) and cost. Goals for use of women-owned and minority-owned businesses in consulting projects are also included in contractor selection.

4.2.2 IRP Alternatives Analysis

Neither employment diversity nor contracting practices were addressed explicitly in the IRP or in the *IRP Facilities Plan Volume 4: Alternatives Development and Analysis.* This analysis has assumed that all four IRP alternatives will perform equally well for the two elements included in this indicator. It should be noted that the IRP contract does include specific goals for minority-owned and women-owned business enterprise participation (25.1 percent and 4.4 percent, respectively).

4.2.2.1 Employment Diversity

Alteration of current hiring and retention policies at the Bureau are not anticipated in the future based upon available information. Therefore, it is not expected that the current distribution of employee diversity will dramatically change in the future.

4.2.2.2 Contracting Practices

Contracting practices and contractor selection criteria were not explicitly discussed in the *IRP Facilities Plan Volume 4: Alternatives Development and Analysis*, as reflected in Table 4-4.

Table 4-4
Employment and Contracting Scores

	BOS Employee Diversity	Contracting Practices
IRP Alternative 1	⊜	⊜
IRP Alternative 2	⊜	⊜
IRP Alternative 3	⊜	⊜
IRP Alternative 4	⊜	⊜

See Table 2-1 for explanation of symbols

4.2.3 Future Measurement and Analysis

The Bureau should continue to track and report on employment diversity as IRP implementation unfolds. Future attention could be given to increasing the representation of certain demographic sectors to more equally reflect the changing demographics of Los Angeles.

An Urban Institute study of the share of state and local government contracts won by minority-owned firms found that they receive far fewer government contract dollars than would be expected based on their availability. Minority-owned businesses as a group receive only 57 cents of each dollar they would be expected to receive based on the percentage of all "ready, willing, and able" firms that are minority-owned. (Urban Institute, 1998)

The findings are not to imply that there is discrimination on the part of state and local governments. Additionally these data are not specific to the Bureau. Rather these findings suggest that policies to create opportunities for socially and economically disadvantaged contracting firms may need to be explored more systematically as the Bureau seeks to fill its contracting needs. By continuing to focus beyond cost-based contracting, the Bureau could play an increased role in influencing social equity in the context of sustainability.

4.3 Sub-Indicator: Efficiency

The Bureau's wastewater treatment and runoff management systems contribute to a more sustainable local economy by operating efficiently. The facilities and procedures of the Bureau are supported by taxes and fees. They should be managed so that the economic burden to residents is minimized to the best extent possible given the constraints of wastewater and runoff management systems and Bureau goals. As the Bureau takes on additional objectives for the wastewater and runoff management systems, expenditures to meet those obligations and investments should be undertaken in a manner that is efficient in the use of Bureau resources. The U.S. Interagency Working Group (1998) presents cost calculations as economic indicators in per capita terms. The same approach is used here to correct for the effects of rising population. It is expected that the additional programs and treatment processes required to meet more stringent water quality goals will cost more. Given these goals, increasing per capita costs, especially in the short term, do not necessarily mean the Bureau is less efficient in terms of its operations. The cost per capita, however, should be kept as low as possible, while meeting other goals for the wastewater and runoff management systems.

4.3.1 Indicator Baseline

This indicator has measured the total FY 02/03 cost of maintaining and operating the current wastewater and runoff management systems, normalized per capita. For FY 02/03, the costs for the operation and maintenance of the wastewater system were

$197,516,000 (2003 SCM Fund Statement of Revenues). This amounts to approximately $51 dollars per person spent on annual O&M costs for FY 02/03. Operating revenues (from taxes and fees) also are used to service debt and to defray or supplement the cost of capital improvement projects, which can also increase the cost-effectiveness of wastewater and runoff management activities.

4.3.2 IRP Alternative Analysis

Table 4-5 contains the projected O&M costs for the four draft IRP alternatives as presented in the *IRP Facilities Plan Volume 4: Alternatives Development and Analysis* (Table 6-4).

Table 4-5
Operations and Maintenance Costs

Alternative	Projected O&M	Cost Per Person -- 2002 dollars	Sustainability Analysis
IRP Alternative 1	$223,000,000	$53.1	?
IRP Alternative 2	$250,000,000	$59.5	?
IRP Alternative 3	$248,000,000	$59.0	?
IRP Alternative 4	$251,000,000	$59.8	?

See Table 2-1 for explanation of symbols

The projected total O&M cost and per capita costs are higher than current values for all four IRP alternatives. This assumes the population in 2020 is 4.2 million people, as projected by the Southern California Association of Governments. As a result, this indicator has been scored with questions marks, as there is uncertainty both in actual future O&M costs as well as the population of the City in 2020. Continued monitoring of per capita costs is both appropriate and highly likely to occur. Neither of the four draft alternatives is projected to sharply increase the burden of the wastewater and runoff management systems on the local economy.

4.3.3 Future Measurement

As implementation of the elements of the IRP unfolds, it will be important for the City to continue to manage and operate the wastewater and runoff management systems in a manner that efficiently allocates City resources. In a comprehensive cost-benefit approach, efficiency would be represented not only as cost per capita, but also the value of the ecological services received by the infrastructure investments. While costs per capita will rise, the residents of Los Angeles will also receive better services, including, but not limited to, greater water reuse, more runoff infiltration, and cleaner beaches. As noted above, further economic analysis is required to estimate dollar values for these improved services.

4.4 Economic Development (Indicator 2) Conclusion

Dependent upon the sub-indicators examined as part of this analysis, all four IRP alternatives are either expected to perform the same or at this stage of the implementation plan not enough details have been developed to make a reasonable determination of which alternative will perform in the most sustainable fashion. The only clear differences are in potential indirect employment. Alternatives 2 and 4 would likely generate more indirect employment impacts than Alternatives 1 and 3, based on net capital expenditures. However, uncertainty over whether the jobs are local, long term, or short term suggests that Alternatives 2 and 4 may not be significantly more sustainable in their economic development impact.