GOING GREEN: HOW TO INCORPORATE STAKEHOLDERS' VALUES FOR SUSTAINABILITY

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ABSTRACT

Making decisions about large public works projects requires careful consideration of project objectives, criteria for meeting those objectives, and metrics for comparing alternatives. To successfully implement a project, the objectives and criteria must match the values and perspectives of stakeholders. Stakeholders and public interest groups are increasingly calling for sustainability to serve as a guiding principle for water and wastewater management decisions. For the San Francisco Sewer System Master Plan (SSMP), Carollo Engineers surveyed water and wastewater utilities to learn whether and how they incorporated sustainability into their planning processes, and conducted a literature review on sustainability indicators. This paper presents a summary of the survey and literature review, as well as a description of how that information is being integrated into the SSMP.

KEYWORDS

Sustainability, sustainable development, San Francisco, evaluation criteria, indicators, stakeholder values, master planning

INTRODUCTION

Looking back over the last century, many public agencies were able to implement large infrastructure projects with little public input. However, the current climate of public interest and involvement requires a different approach for public works projects: an approach that takes into account public interest, perspectives and values. Increasingly, stakeholders cite sustainability as an important public value, and insist that it serve as a guiding principle for water and wastewater management decisions. Sustainability is often defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs. Though widely regarded as a worthy goal, sustainability is seldom integrated into water and wastewater planning because of its complex and subjective nature.

The San Francisco Public Utilities Commission has chosen to incorporate sustainability principles into its Sewer System Master Plan (SSMP). In preparation for the SSMP, Carollo Engineers surveyed water and wastewater utilities to learn whether and how they incorporated sustainability into their planning processes, with an emphasis on their selection of decision criteria. We also compiled a comprehensive list of sustainability indicators to serve as a starting point for the SSMP alternatives evaluation criteria. This paper presents a summary of the survey and literature review, as well as a description of how that information is being integrated into the SSMP.

BACKGROUND

San Francisco is known worldwide as a progressive, "green" city – a reputation supported by municipal policies and citizen groups that embrace sustainability, the Precautionary Principle, city greening, and environmental justice. The Sustainability Plan for San Francisco, for example, sets out goals, objectives and actions to move the city toward a more sustainable future. The plan was drafted by community participants in 1996 and later endorsed as city policy by the San Francisco Board of Supervisors. Another example is the Urban Environmental Accords, which Mayor Gavin Newsom signed in 2005, committing "to build an ecologically sustainable, economically dynamic, and socially equitable future for our urban citizens."

The San Francisco Public Utilities Commission (SFPUC) provides water, wastewater, and municipal power services to San Francisco. Within SFPUC, the Wastewater Enterprise operates and maintains the city's water pollution control plants, sewage pumping stations and combined sewer system. The mission of the SFPUC Wastewater Enterprise is to protect public health, public safety, and the environment by providing safe, reliable, cost-effective and efficient collection, treatment and disposal of wastewater and stormwater.

San Francisco has a combined sewer system that has served the city for more than 100 years. The SFPUC seeks to address many challenges facing the combined sewer system, including aging infrastructure; odors and other neighborhood impacts; flooding; and existing and future regulations. The Sewer System Master Plan (SSMP) will develop a roadmap for improving system performance over the next 30 years.

SURVEY OF WATER AND WASTEWATER UTILITIES

Before crafting a decision framework for the SSMP, the project team set out to learn how other utilities had tackled the challenge of operationalizing sustainability. We surveyed several large utilities in the United States to learn whether and how they addressed sustainability in their planning processes. We focused on utilities that were engaged in or had recently completed a large planning process, and those that were similar to San Francisco in scale and complexity. Of those utilities, four stood out as strong examples for incorporating sustainability into large planning efforts.

Case study information was compiled from project documents, conference proceedings, and personal communication with project staff. The following sections summarize what we learned from these utilities.

City of Los Angeles, California: Integrated Resources Plan

In 1999, the City of Los Angeles began developing an Integrated Resources Plan (IRP) to address wastewater management, runoff diversion, water recycling, and conservation through the year 2020. Citizens involved in the Steering Group defined a set of primary objectives, sub-objectives, and quantifiable performance measures that together constituted the evaluation criteria for the IRP. Based on their evaluation criteria, the Steering Group developed a set of guiding principles for the IRP.

The first two phases of the IRP, during which criteria were defined and alternatives were evaluated, did not explicitly cite sustainability. However, the evaluation criteria and guiding principles did address many important elements of sustainability including:

- environmental quality (impacts to water and air quality),
- resource use (water conservation and reuse, biosolids reuse, energy, materials, land area), and
- social issues (environmental justice, job creation, public land enhancements, education) (CH:CDM, 2004).

After narrowing the IRP alternatives to four draft alternatives, the City funded an independent assessment of the sustainability of those alternatives (Vos et al., 2005). The analysis consisted of: 1) determining sustainability indicators, 2) establishing a baseline measure for the sustainability of the existing system, 3) evaluating the sustainability of the four IRP alternatives, and 4) recommending future measurement, analysis, and reporting. Sustainability was defined and measured against three over-arching categories: economy, ecology, and society.

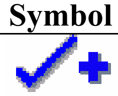
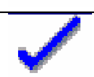
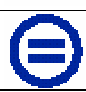
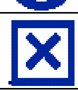
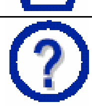
Both quantitative and qualitative measures were chosen, all of which would be compared to baseline conditions to evaluate whether an alternative would move the city toward or away from the desired outcome. Scoreable index indicators of sustainability were used rather than absolute measures. Life-Cycle Assessment (LCA) methodologies were used to “capture the indirect impacts” of the wastewater treatment system. All indicators considered were given equal weight in the evaluation, allowing tradeoffs between different priorities to be evident. The sustainability indicators chosen for the LA IRP project are shown in Table 1. Scoring symbols, shown in Table 2, illustrated an alternative’s effects or highlighted the need for more data or planning.

One outcome of the sustainability assessment was the development of baseline data, which will allow the city to track its progress towards sustainability. The assessment also identified areas that would require additional information (Vos et al., 2005). Project staff felt that the sustainability assessment boosted community support by allowing an independent and transparent evaluation.

Table 1: Sustainability Indicators for the LA IRP (Vos et al., 2005)

Category	Indicator
Social Impacts	Beneficial neighborhood impacts
	Adverse neighborhood impacts
	Customer satisfaction
	Public input in Bureau operations and the IRP process
Economic Development	Effect on local employment, both direct and indirect
	Efficiency of the Bureau's investment
	Operation and maintenance (O&M) activities
Natural Resource Consumption	Water usage
	Fossil-fuel use
Environmental Pollution	Criteria air pollutants that contribute to regional smog
	Global climate forcing gases
	Wastewater effluent
	Runoff discharge to receiving waters
	Biosolids management, including handling, transportation and reuse
Urban Ecology	Parks, open space, and habitat restoration
	River revitalization
	Effects on marine ecosystems
System Adaptability and Flexibility	Groundwater protection and stormwater runoff infiltration
	Demand-side management (as opposed to traditional supply side management)
	Emerging issues
Institutional Capacity	Interagency partnerships
	Data availability
	Public education efforts
	Price signals and full cost accounting
	City of LA green buildings
	Continuous improvement at the facility level

Table 2: Sustainability Scoring Symbols (Vos et al., 2005)

Analysis Symbol	Symbol Explanation
	Strong Positive Trend: Analysis indicates substantial progress will be made towards sustainability over the baseline
	Positive Trend: Analysis indicates substantial progress will be made towards sustainability over the baseline
	Same as Baseline: Analysis indicates future outcomes are likely to be equivalent to the baseline (no deterioration)
	Negative Trend: Analysis indicates future deterioration from the baseline
	Additional Planning Needed: Analysis indicates that additional planning is necessary to estimate progress against the baseline
	Insufficient Data: There are currently insufficient data or models to measure baselines or outcomes reliably

King County, Washington: Regional Wastewater Services Plan and Facility Siting

King County's Regional Wastewater Services Plan (RWSP), completed in 1999, outlined projects and programs to ensure sufficient wastewater treatment capacity until 2020. Like the Los Angeles IRP, the RWSP did not explicitly cite sustainability as a guiding principle or objective but indirectly addressed many important elements of sustainability. Objectives for the RWSP, shaped by input from wastewater stakeholders, addressed cost to ratepayers; risk and uncertainty; flexibility; impacts to the natural environment; public health and safety; and equity and fairness (King County, 1999).

A major outcome of the RWSP was a directive to construct a new wastewater treatment facility, now known as Brightwater. The decision framework for siting the new facilities explicitly adopted sustainability as a project goal, as shown in Table 3. Within the sustainability category, specific goals encouraged reuse of recycled water, biosolids and methane; use of recycled materials in construction; and green building (LEED silver rating) (King County, 2001). Community and environmental site screening criteria used for Brightwater are shown in Table 4.

Table 3: Project Goals for Brightwater Siting (King County, 2001)

Environment / Public Health	Preserve and enhance the natural environment
	Remain consistent with comprehensive plans
	Protect air and water quality
	Protect public health
Technical	Assure efficient and reliable treatment
	Use existing public facilities and land
	Meet the schedule
	Balance risk, flexibility and long-term cost
	Meet regulations
Sustainability	Encourage reuse - recycled water, biosolids and methane
	Use recycled materials in construction - strive to achieve LEED silver rating.
Financial	Maintain reasonable rates
	Maintain the budget
	Save costs
	Achieve reasonable lifetime costs
Community	Create a public amenity - enhance quality of life in the local community and minimize impacts to the social environment
	Seek partnerships
	Site facilities equitably - Ensure that no racial, cultural or class group is disproportionately impacted by essential public facility siting or expansion decisions.

Table 4: Brightwater Facilities Site Screening Criteria (King County, 2001)

Community policy site screening criteria	
Community Impacts	Be compatible with surrounding land and marine uses.
	Mitigate potential impacts to the community such as noise, visual, odor and traffic effects.
	Be consistent with the Growth Management Act.
Cultural Resources	Minimize impacts to known significant cultural resources.
Community Amenity	Enhance and provide benefit to the community, through appropriate and effective mitigation.
	Enhance and provide benefit to the environment, such as habitat, wetlands, surface waters, groundwater, or cultural resources through appropriate mitigation of project impacts.
Environmental site screening criteria	
Biological resource protection	Minimize adverse effects to biological resources including threatened, endangered and candidate species; and any officially designated local natural resources.
	Minimize effects on sensitive near-shore and offshore marine resources.
Water resources protection	Protect municipal drinking water wells and potable groundwater resources.
	Minimize adverse effects to local surface waters.
	Avoid risk during a flood event.
Human health	Meet state and federal laws that protect public health.
Contamination	Minimize disruptions or mobilization of hazardous materials into the environment.
Note: technical and financial site screening criteria are excluded from this table	

City of Petaluma, California: Water Recycling Facility Master Plan

The goal of a recent City of Petaluma project was to develop an ecologically and economically sustainable water recycling facility. Sustainability principles were incorporated into the evaluation of alternatives, facility planning, design, and construction (Holmes et al., 2004).

Sustainability criteria for the project were developed using principles from The Natural Step. The Natural Step (TNS) is a widely used framework for defining a sustainable system and identifying actions to move toward sustainability. TNS offers four criteria, called system conditions, that a society or system must meet to be sustainable. These four system conditions are as follows:

1) materials from the earth's crust must not increase in the biosphere,
2) man-made materials must not increase in the biosphere,
3) nature's basis for productivity must not be impoverished (over-harvested), and
4) resources must be used fairly and equitably.

Criteria for evaluating the water recycling facility alternatives, developed in part by input from citizens and City Council members, are illustrated in Figure 1. For each category, a set of criteria and metrics was developed to compare the performance of alternatives, as shown in Table 5 for the sustainability category. To allowing easier direct comparison of alternatives, sustainability metrics were 'normalized' using the Ecological Footprint. The Ecological Footprint is a calculation of the amount of land (in acres) required to produce all the materials consumed in the construction and operation of a facility over its life, plus the land required to sequester or absorb all the wastes produced.

Figure 1: Alternatives Evaluation Criteria, Petaluma Water Recycling Facility Project (City of Petaluma, 2000)

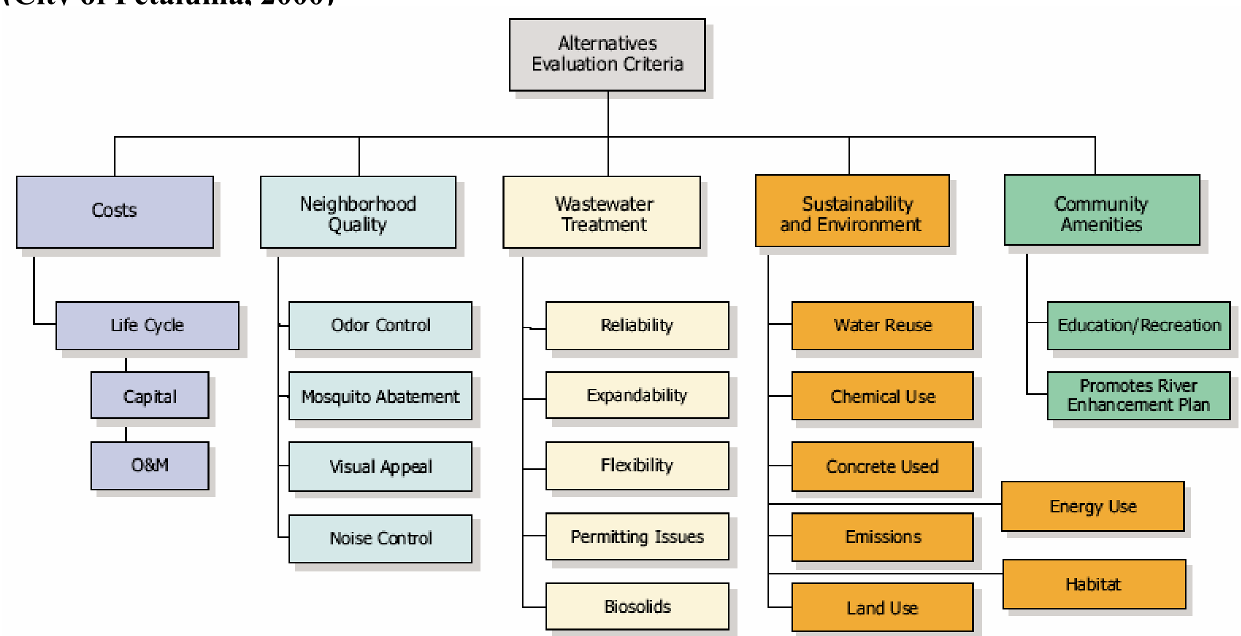


Table 5. Sustainability Metrics, Petaluma Water Recycling Facility Project (City of Petaluma, 2000)

Sub-criteria	Metric	Description
Reuse	All meet	All alternatives will reuse tertiary effluent
Energy Use	kWh	Initial energy to construct facilities
		Annual operating energy requirement
Chemical Use	Tons/yr	Tons/yr of chemicals used by type of chemical
Concrete Use	Cubic yards	Volume of concrete used to construct facilities
Emissions	Tons/yr	Tons/yr of carbon dioxide and methane released
	Yes/no	Other greenhouse gases produced?
Land Use	Acres	Number of acres of open space converted to treatment
		Number of acres dedicated to open space
Habitat	Excellent, average, marginal	Classification of habitat value before and after conversion to treatment (e.g. created wetlands, natural wetlands, agricultural land)
Ecological Footprint	Acres	All energy used in operation, construction, production of materials/chemicals converted to the amount of acres of land (trees) to absorb carbon dioxide produced.

San Francisco, California: Local Water Supply Alternatives Analysis

The San Francisco Public Utilities Commission (SFPUC) Water Enterprise recently conducted an analysis of local water supply alternatives as part of its Integrated Water Resources Plan. Sustainability was included as a criterion for evaluating local water supply and demand management alternatives (SFPUC, 2005).

Performance criteria were developed to match each of the SFPUC's water supply objectives, as shown in Table 6. The performance of individual water supply and demand management alternatives was evaluated using a set of guidance questions. Guidance questions for the objective, "Responsible management of entrusted resources," are shown in Table 7. The questions were answered as "more favorable", "moderately favorable", or "less favorable".

Table 6: Objectives and Performance Criteria for SF Local Water Supply Analysis (SFPUC, 2005)

Objective	Criteria
Affordability	Cost
	Rate Impacts
	Implementation Time
Reliability	Flexibility
	Potential Implementation Risks
	Public Acceptance
	Reliability
	Water Quality
	Yield
Responsible Management of Entrusted Resources	Efficient Water Use
	Environmental Stewardship
	Sustainability

Table 7: Guidance Questions for the Objective: "Responsible Management of Entrusted Resources" (SFPUC, 2005)

Criteria	Guidance Questions
Efficient Water Use	Does the option increase the efficient use of the SFPUC's supply (i.e. increase re-use or decrease per capita use)? If so, how? How much? Does the option promote public awareness of the value of water and the need for efficient water use? If so, how? Does the quality of water provided by this option match specific intended use?
Environmental Stewardship	Does the option reduce the impact to natural resources? How? Does the option reduce the impact to the aesthetic environment? How? Does the option provide increased environmental benefits? Can the option be implemented without generating waste? If not, what and how much waste will be generated? Can the option be implemented without increasing chemical use? If not, what and how much chemical will be used?
Sustainability	Does this option represent a sustainable process? How? Does the option save energy or decrease energy use? How and how much? Does the option contribute to achieving the goals of the sustainability plan for San Francisco?

SUSTAINABILITY INDICATORS

Before establishing evaluation criteria for the SSMP, the project team asked the question: How do you measure sustainability? To answer that question, we reviewed relevant literature (e.g. Weighert and Steinberg, 2002; Lundin et al., 1999; Balkema et al., 2002; ASCE, 1998) and compiled a comprehensive list of sustainability indicators. The intent of the list was to provide a starting point for SSMP evaluation criteria.

Indicators are measurable qualities (both quantitative and qualitative) that reveal the contribution of a system toward sustainability goals. In the case of the SSMP, we were particularly interested in sustainability indicators that could be used to screen and compare wastewater management alternatives. We therefore focused on indicators that were appropriate to the wastewater sector and that could differentiate between alternatives. In addition to compiling sustainability indicators, we also noted how the indicators were organized and presented.

Our review illuminated some important considerations when choosing indicators. Sustainability indicators should be clearly linked to project goals and objectives, and those goals and objectives should be connected to a vision of a sustainable system. The Natural Step and other frameworks, along with input from local stakeholders, can be used to shape the vision and define project goals and objectives.

We found three commonly used methods for including sustainability in the evaluation process:

1) as a separate criteria alongside more conventional criteria (environmental impacts, technical, economic);
2) as a separate evaluation process altogether; or
3) as an all-encompassing framework for the evaluation criteria.

The first method is demonstrated by the King County criteria for siting Brightwater and by the San Francisco PUC criteria for evaluating local water supply options. Both planning projects created a separate category for sustainability.

The second method is demonstrated by the Los Angeles IRP sustainability assessment. Rather than incorporating sustainability into the IRP planning process, the City of Los Angeles commissioned an independent evaluation of the sustainability of their four draft IRP alternatives.

The third method is the most common in the literature on sustainability indicators. In this approach, sustainability is not separate from economic or technical criteria but rather encompasses those criteria in addition to more long-term and global indicators. For example, the Triple Bottom Line approach optimizes sustainability by considering the social, economic and environmental needs and effects.

The literature and case studies we reviewed offered several suggestions for how to select sustainability indicators. Sustainability indicators should be:

- Sufficiently comprehensive to cover all relevant aspects of sustainability, including those difficult to quantify;
- Non-redundant;
- Relevant to the “decision domain” of the agency, without losing the links to long-term and global issues that are at the heart of sustainability;
- Applicable to the range of alternatives being considered;
- Qualitatively or quantitatively measurable;
- Meaningful and relevant to stakeholders – criteria and their related performance measures should be transparent and easily understood; and
- Concise enough to be manageable and effective for communication.

A shortened version of the comprehensive list of sustainability indicators, with emphasis on the issues most relevant to urban wastewater systems, is presented in Table 8.

SUSTAINABILITY WITHIN THE SAN FRANCISCO SSMP

At the time of this publication, the objectives and evaluation criteria for the SSMP had not yet been finalized. Therefore, this section will describe the process being used to arrive at evaluation criteria, along with the draft criteria that are not yet finalized.

The first step in developing the decision framework was to establish objectives for the SSMP. To do this, the project team compiled relevant policies, value statements, and meeting notes. While objectives had not been formally drafted, many ideas had been articulated in previous discussions by stakeholders, project staff, and commissioners. From the compiled documents, the project team extracted the values, ideas, and statements that could be translated into project objectives. We then drafted the objectives and distributed the list for review.

The draft SSMP objectives are summarized in Table 9. As can be seen in Table 9, the objectives have been organized into four major categories: 1) technical/functional, 2) economic, 3) social, and 4) environmental. These categories correspond to the Triple Bottom Line approach, plus an additional category (technical/functional) to capture performance objectives that are unique to technological systems.

In parallel with drafting the project objectives, we began to narrow down the comprehensive list of sustainability indicators to those criteria that would best fit the SSMP objectives. We also added to the list criteria that reflected stakeholder values as well as the unique challenges and level-of-service goals for the San Francisco sewer system.

Table 8: Sustainability Indicators and Performance Measures

Category	Indicators/ Criteria	Performance Measures
Public Health and Safety	Exposure risk to chemicals	Type and volume of chemicals stored and handled; proximity of storage sites to residents; transport routes
	Exposure risk to water-borne pathogens and toxins	Street and basement flooding; untreated sewage discharges near recreational areas
Environmental Quality	Water quality	Loading to receiving water (BOD, TSS, N, P, metals, DBPs)
	Air quality	Emission of NO_x, SO_x, VOCs, particulates
	Global climate	Emission of greenhouse gases (CO_2, CH_4)
	Ecological health	Habitat area created or restored; habitat value; impacts on endangered and candidate species
Resource Utilization	Energy use	Net energy use; life-cycle energy consumption (using LCA); percent of energy from renewable sources
	Material use	cu.ft. concrete; length of additional pipeline
	Chemical use	Type and volume of chemicals used
	Land area	Footprint of infrastructure and treatment systems
	Nutrient recovery	Percent of biosolids reused for land application; biosolids quality
	Water Reuse	Percent of wastewater reused; reclaimed water quality
	Energy recovery	kWh electricity production from methane
Social	Neighborhood impacts	Odor intensity; noise level (dB); resident complaints; compatibility with surrounding land and marine uses
	Community amenities	Access to open space, parks, recreation, wildlife viewing; public land enhancements
	Fairness and equity	Distribution of facilities throughout service area; potential impacts on minority and low-income communities; distribution of rate impacts
	Education	Opportunities for public education
	Public acceptance	Level of stakeholder involvement; opinion survey results; willingness to pay
Economic	Cost effectiveness	Present-day value of life-cycle costs
	Affordability	Revenue from reclaimed water sales; potential for outside funding
	Local economic development	Tax revenue; number of jobs created
Functional	Durability	Expected life time
	Reliability	System redundancy; proven technology
	Flexibility/ adaptability	Ability to be adapt to changing conditions (growth, regulations, technology, etc.)
	Ability to implement	Risks for implementation; length of schedule
	Ease of operation	Number of staff; level of training; system complexity

Table 9. DRAFT SFPUC Sewer System Master Plan Objectives(*)

Objective	Criteria (Favors alternatives that…)
Technical/Functional	
Maximize system reliability and redundancy	Are robust against seismic events. Are resistant to operational upsets. Employ proven technologies. Have relatively low risks for implementation associated with land acquisition, permitting, and constructability.
Maximize system adaptability to respond to changing conditions	Can be readily adapted to accommodate changing conditions such as growth, regulatory requirements, recycled water demand, and technological advances.
Economic	
Maximize benefit to cost ratio	Have relatively lower construction, operations and maintenance, and life cycle costs, relative to benefits achieved. Have relatively lower financial impact on ratepayers.
Social	
Minimize neighborhood impacts	Reduce odors, noise, traffic, and visual impacts associated with collection, treatment, and pumping facilities.
Maximize community benefits	Create community amenities.
Maximize public health and safety	Minimize use of chemicals. Minimize initial flooding, and minimize backups from the collection system.
Maximize equity and fairness	Proportionally match burdens and benefits for all neighborhoods. Avoid disproportionate burdens on minority or low-income neighborhoods.
Environmental	
Minimize impacts to the local, natural environment	Cause less impact on local air quality, water quality, and natural habitat during construction and operation of facilities.
Maximize ecological sustainability	Cause less impact on global environmental quality over the life cycle of the system.
(*) SSMP objectives were not yet finalized at the time of publication.	

From that refined list, we selected performance parameters and units of measure (metrics) that could be used to assess the intended performance of alternatives developed during the master planning process. The draft SSMP evaluation criteria are presented in Table 10. In addition to optimizing performance on the evaluation criteria, all alternatives will be developed with the following common performance features:

- Ability to meet existing and anticipated regulations.
- Sufficient operational resistance to plant upset, including standby facilities to allow for routine maintenance.
- Noise levels not to exceed ambient conditions at the plant and/or facility fence line.
- Treatment plant odors to be undetectable at the plant and/or facility fence line. Collection system odors to be reduced from existing baseline.

Table 10. DRAFT SFPUC Sewer System Master Plan Evaluation Criteria(*)

Master Plan Objectives		Parameter	Unit of Measure
Objective	**Criteria**		
Technical / Functional			
Maximize system reliability and redundancy	Impact from seismic event	Plant and conveyance redundancy	Percentage redundancy for critical facilities
	Proven technology	Operating record	Years of proven operation
	Ability to implement	Professional judgment	Scale of 5 (best) to 1 (worst)
Maximize system adaptability to respond to changing conditions	Flexibility to meet changes in growth, regulatory requirements, reuse water demand, or technological advances	Professional judgment	Scale of 5 (best) to 1 (worst)
Economic			
Maximize Benefit:Cost Ratio	Minimize capital costs	Capital costs	$ (Total project costs)
	Minimize operations and maintenance costs	O&M costs	$ (O&M costs)/year
	Minimize life-cycle costs	Life-cycle costs	$(Total annual costs)
	Minimize rate increase	Residential Sewer Rate	$/month
	Maximize economic benefits relative to costs	Benefit/Cost Ratio	Dimensionless Ratio
Social			
Minimize neighborhood impacts	Minimize traffic	Traffic count	Truck trips/day
	Visual aesthetics	Professional judgment	Scale of 5 (best) to 1 (worst)
Maximize community benefits	Community benefit projects, programs	Investment in community improvements	$ (Total annual costs)
		City tax revenues generated	$/year
Maximize public health and safety	Minimize use of chemicals	Number and volume of chemicals handled per year	Pounds/year Number of Chemicals
	Reduce flooding and sewer backups	Predicted flooding, backups	Number of events/year
Continued on following page			

Table 10. DRAFT SFPUC Sewer System Master Plan Evaluation Criteria(*)

(Continued)

Master Plan Objectives		Parameter	Unit of Measure
Objective	**Criteria**		
Technical / Functional			
Maximize equity and fairness	Address environmental justice issues	Avoid disproportionate burdens on minority or low-income neighborhoods	Ratio of dollars invested in community amenities to dollars expended on treatment and pumping/conveyance facilities
		Develop a fair and equitable rates and charges system	Meets California revenue program requirements (Y/N)
Environmental			
Minimize impacts to the local environment	Minimize loading to receiving waters	Pollutant loading to ocean, bay of BOD, TSS, & TN	Pounds pollutant discharged
	Minimize combined sewer discharges (CSDs)	Frequency and volume of CSDs	MG / year Number / year
	Protect and enhance natural habitat	Wetlands/riparian habitat	Acres
	Maximize resource recovery and reuse	Biosolids reuse	Dry tons/year % Total biosolids
		Water reuse	MG/year, % of total
Maximize ecological sustainability	Minimize life-cycle impacts on the global environment	Ecological footprint	Acres
(*) SSMP objectives, criteria, parameters and metrics were not yet finalized at the time of publication.			

CONCLUSIONS

Sustainability is an increasingly important value to many communities. The information presented here demonstrates ways in which sustainability can be applied in the decision-making process for water and wastewater projects. A range of approaches, including the use of sustainability indicators, are available to evaluate alternatives' relative contributions toward sustainability goals, as well as to track progress toward those goals. These approaches have been evaluated and found useful for various agencies as they worked to satisfy their customers and stakeholders in a quest to become more sustainable.

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