

Assessment of Water Addition Scenarios to Lake Merced Services Work Plan

Description of Services

Contractor agrees to perform said services all in accordance with the terms of its proposal dated July 18, 2002 incorporated by reference as though fully set forth herein.

Contractor, EDAW/Talavera Richardson, A Joint Venture (EDAW), proposes to assess the environmental impacts and regulatory requirements of implementing the water addition scenarios identified in the *Assessment of Water Addition Scenarios to Lake Merced*, Luhdorff & Scalmanini, May 2002. The goal of water additions to Lake Merced is to protect and enhance the existing beneficial uses.

This work will address the amount of water that can be added, without significant environmental impact, to raise and maintain lake level beginning in autumn 2002 and continuing until the completion of the SFPUC Chloramine Conversion Project; source water is assumed to be dechlorinated SFPUC imported surface water discharged to the lake via the existing infrastructure at the Lake Merced Pump Station.

Subcomponents of this project will entail developing a “roadmap” which will identify all the environmental, regulatory and operational issues that will need consideration to increase the lake level. Once the Chloramine Conversion Project has been completed, additional water sources will be necessary to maintain the level of Lake Merced. Aspects of this project will address the feasibility and environmental effects of using recycled water, treated storm water, imported surface water and groundwater as sources of water to raise and maintain water levels at Lake Merced. Upon the completion of the SFPUC Chloramine Conversion Project, SFPUC imported surface water will no longer be available as a source. The supplier of recycled water will either be either the City of Daly City or City & County of San Francisco, and the supplier of treated storm water will be the City of Daly City. Water delivery systems are unknown at this time.

Scope of Work and Technical Approach

Task 1 – Work Plan Development

The development of a work plan includes the following subtasks:

- 1.1 Review available literature and existing survey data
- 1.2 Develop draft work plan
- 1.3 Conduct/attend meetings and/or interviews with City staff, local experts, lake stakeholders
- 1.4 Identify important data gaps
- 1.5 Revise work plan in response to feedback from City and other stakeholders

Deliverables: Data Gaps Report and Draft & Finalized Work Plan

Approach

The EDAW team has met with staff to refine the overall work program presented herein. The EDAW team has reviewed the extensive amount of existing information of Lake Merced. This information includes baseline aquatic, terrestrial, and aerial surveys. Since the extent and quality of the existing data and information are not completely known to the project team, this task forms the foundation of the investigation. During meetings with SFPUC staff, issues pertaining to the adequacy of mapping, the adequacy of existing models, the type of CEQA review, and coordination with MEA have been addressed resolved.

Subtask 1.1 - Literature and Data Review

Wetlands and Terrestrial Resources

EDAW biologists compiled and reviewed background information regarding biological resources within

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the Lake Merced project area. The primary sources of information included the Significant Natural Resource Areas Management Plan, Survey Results for California Red-legged Frog, Fish Species of Lake Merced, Lake Merced, 1998 Baseline Natural Resources Inventory prepared by Trihey and Associates, and the California Natural Diversity Data Base. The local Audubon Society, Cal Trout, the lake concessionaires, staff of the San Francisco's Significant Natural Areas Program, other organizations, and knowledgeable individuals have been contacted to update the natural resource information of Lake Merced.

Hydrology

HydroConsult (HCE) reviewed the available information on the hydrologic system of Lake Merced, including the Luhdorff and Scalmanini report. The review included SFPUC data on historic lake levels and the relationship to precipitation. One of the objectives included the identification of both historic lake levels and the relationship to inflow sources and outflow that affect the lake level. HCE reviewed the existing hydrological model for Lake Merced. New modeling is not proposed as part of this scope of work. The analysis was directed to the following inputs:

- Monthly lake inflows from local runoff, overflow from Vista Grande Canal, and water additions;
- Stage/storage curve (lake volume at different water levels)
- Hydraulic interaction between the north, south and impound lakes
- Interaction with the Westside Basin aquifer (to the extent that it is already quantified)
- Estimates of monthly water availability in the short term and long-term.

Aquatic Resources

Available existing survey data and literature pertaining to Lake Merced was reviewed and summarized. Hagar Environmental Science (HES) worked with the project team to identify sources of relevant information. Potential sources of information included reports and summaries of California Department of Fish and Game monitoring activities, electrofishing surveys, and any special studies including aquatic habitat inventories, fish population censuses, migration/spawning surveys, and other sources. Local experts, such as CalTrout and lake concessionaires, were contacted. Based on the information gathered, data gaps were identified and the need for additional field surveys or fisheries analyses was addressed.

Water Quality

Merritt Smith Consulting (MSC) summarized the analysis results described in *Water Quality Investigation and Assessment Report: Potential Water Quality Effects In Lake Merced From Enhanced Ammonia Inputs* (October 2001). This report describes the results of a detailed analysis of water quality impacts of several water discharge scenarios to Lake Merced. Depending on how the operating condition is defined (in terms of flow, frequency, and quality of discharge), the impact to water quality is expected to have already been evaluated in or be similar to alternatives evaluated in the October 2001 report. The October 2001 analysis (and the knowledge of Lake Merced gained by conducting the analysis) facilitates evaluation of the operating condition impacts directly on nutrients and algae, and indirectly on dissolved oxygen, water depth and temperature. MSC also evaluates the potential impacts of contaminant sources in the lake and along the potential inundation zones of the shore area.

Other Information Review

EDAW has reviewed the available information on other resources and issues, such as soils (from the CDM-Trihey & Assoc, 1999 Report), land use and plans for the area, pertinent policies in the Comprehensive Plan Elements, recreational use data, SFPUC plans and programs and other information of relevance.

Subtask 1.3 – Meetings

Key members of the EDAW+T&R team attended a kick-off coordination meeting with SFPUC staff. During this meeting we exchanged information, set protocols for communication and information

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management, and discuss project goals and general approaches upon which to base the work plan.

Team members have set up additional meetings with SFPUC staff and have contacted SFPUC staff to receive needed information. This includes more detailed information regarding lake chemistry.

A meeting was held with the Lake Merced Task Force to receive their input on the issues and suggestions for approaches to the evaluation.

Draft work plans have been presented to SFPUC staff.

A meeting was held that discussed the SFPUC's and LMTF comments on the draft work plan.

Subtask 1.4 - Identify important data gaps for further investigation

Following the literature review and development of project goals, the team identified significant data gaps that could affect the evaluation of alternatives. EDAW specified what information is lacking and its significance, methods to fill the gap, and a schedule and cost.

Deliverable: Memorandum identifying data gaps and recommendations for providing missing information.

Subtask 1.5 Revise work plan

As noted, following receipt of the comments on the draft work plan, the team will make revisions and submit a revised work plan to the SFPUC for final approval. EDAW will work with City staff to resolve any differences in opinion of the reviewers regarding the substance of the work plan. The resolution of the issues will be documented separately or as an appendix to the work plan.

Task 2 - Baseline Field Surveys

The RFP indicates the potential need to “supplement existing information, if necessary, with new baseline field surveys focused on data needed for analysis of proposed alternatives and providing a baseline for future monitoring.”

Aquatic Surveys (stratified by lake and wetland habitat zones)

- Phytoplankton and zooplankton
- Benthic invertebrates
- Fish
- Physical and Chemical Water Quality profiles.

Wetland & Terrestrial Surveys

- Validate existing vegetation mapping [subtask 2.1]
- Review newly developed topographic map, at 1.0 ft contour intervals, for accuracy and suitability [subtask 2.2]
- Belt transects to measure percent cover by plant species vs. topographic position (with a focus on wetland and riparian vegetation) [subtask 2.3]
- Bird, mammal, reptile and amphibian utilization by vegetation / cover types and topographic zonation [subtask 2.4]
- GIS analysis to look at general spatial patterns, and to provide a basis for extrapolating from site-specific vegetation transect and wildlife survey data to the full project site [subtask 2.5]
- Conduct focused surveys, if needed, for special status species in areas that might be affected by

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proposed lake level changes [subtask 2.6]

- Conduct a land use survey of the lake edge and immediate environs [subtask 2.7]
- Prepare sampling protocol for synoptic survey to identify anoxic conditions [subtask 2.7]

Deliverables: GIS Topographic Overlays and Technical Memorandum

Approach for Task 2 Baseline Field Surveys – Aquatic Surveys

EDAW assumes that an evaluation of lake aquatic resources could be conducted using existing information about the aquatic resources, and the physical and chemical water quality conditions. Existing literature will be reviewed in Task 1 and if critical gaps in the data are then noted, additional fieldwork will be proposed. This fieldwork could entail surveys of phytoplankton and zooplankton, benthic invertebrates, and fish to determine species composition and abundance. In addition, data on the physical and chemical characteristics will be correlated with the data on plankton, benthic invertebrates and fish.

At this time, the only additional water quality data needed is the results from a synoptic survey designed to identify anoxic conditions in South Lake Merced.

Approach for Task 2 Baseline Field Surveys – Wetland and Terrestrial Surveys

A biological analysis including mapping was completed by Trihey and Associates in 1998. More recent information has been developed by San Francisco Recreation and Parks. The extent of the bulrush and willow vegetation types could have changed since that time. The RFP recognizes the potential need to supplement existing information, if necessary, with new baseline field surveys focused on data needed for analysis of proposed alternatives and providing a baseline for future monitoring.

In contrast to the aquatic surveys discussed above, the wetland and terrestrial environment is likely to have changed since the report by Trihey and Associates in 1998. However, the degree of change is not expected to be large. In addition, in order to establish an adequate monitoring regime to assess effects of hydrologic change, baseline surveys are necessary. Because of the possibility of change of wetland extent, field surveys are important to quantify impacts to the existing vegetation types. To ensure an accurate and reproducible database from the field mapping, the surveys will include recording location and elevation data using high resolution Global Positioning Satellite (GPS) equipment.

The following approaches address each of the subtasks in the RFP. The subtasks are described below.

Subtask 2.1 - Validate Existing Vegetation Mapping

An EDAW botanist will conduct a field verification of existing vegetation maps. The validation will be done by comparing the observed vegetation with the vegetation map prepared in the 1999 Trihey & Associates report and the more recent mapping by SF Recreation and Parks Significant Natural Areas Program. The boundaries of the different vegetation types will be verified during fieldwork. At this time, EDAW has no reason to believe that vegetation cover would have changed substantially since 1998 when the Trihey & Assoc. surveys were made. In the event that EDAW's biologists identify notable differences in the vegetation cover and the mapped information, then it may be necessary to re-do the mapping in those areas.

Subtask 2.2 – Aerial Photography and Topographic Mapping.

New aerial photography will be needed. EDAW-Talavera & Richardson will assist the SFPUC in determining any specifications for new aerial photography as needed. A new topographic map, at 1.0 ft. contour intervals, will be developed using the new aerial photography, under separate contract with Towill, Inc. A draft map is scheduled to be completed by February 2003. EDAW will review the photography and

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topographic map files for their relative accuracy and suitability for purposes of the study undertaken by the SFPUC.

Subtask 2.3 - Belt Transects

Permanent transects will be established to record the change in the vegetation as the level of the water rises. These transects could be surveyed yearly. Each point along the transects will have a known elevation and location recorded using GPS equipment. This will allow us to extrapolate change in vegetation to areas outside of the transects based on elevation.

The transects would run perpendicular to the topographic gradient leading to each of the separate lakes of Lake Merced. The transects would be perpendicular to the shoreline and run from upland areas to the lower extent of wetland vegetation. The belt transects would be at least 3 feet wide and the boundaries between the vegetation types would be mapped on the transects. Locational data will be recorded using GPS technology. Transects would be established in each of the three lakes (North, South, and Impound lakes, including the northeast and northwest portion of North Lake). Because depth of inundation affects the distribution of the wetland vegetation types, the transects will be established in areas with shallow slopes, steep slopes, and intermediate slopes.

Data collected will include the cover of each of the species in a particular portion of the transects and depth. Collecting this type of data will allow us to correlate vegetation with depth and slope steepness. (Steepness will be determined by using the existing topographic map). As the water level rises, EDAW will be able to predict the change in the vegetation. In order to get the most accurate information regarding elevational change of the wetland vegetation (with increase in water level) a team of surveyors will measure the depth at each of the vegetation boundaries along the established transects. EDAW botanists will locate the survey points and Talavera and Richardson will coordinate the survey effort.

Data from two transects will be gathered for each of the three slope steepness categories from each lake. A minimum of two transects is necessary to be able to verify that the vegetation types occur at the same level for a particular category of slope steepness. Data will be collected from more than two transects for each of the three slope steepness categories if there is high variability. A minimum of 6 transects (two transects for each of the three slope steepness categories) will be collected from each of the following lakes that comprise Lake Merced: northeast lake, northwest lake, South Lake and Impound Lake.

It is important to gather the transect data from representative areas from each of the lakes. It is also important to take the data from different slopes in order to determine how the vegetation changes as water level rises. Slope steepness may affect cover of different wetland vegetation types. Taking data from a variety of points to encompass the variability of the response to change of the level of the lake will allow us to make the most accurate extrapolation of vegetational change.

Subtask 2.4 - Bird, Mammal, Reptile, and Amphibian Utilization

Although Lake Merced is known to provide habitat for a number of bird species, the lake's urban surroundings are expected to limit the diversity of more sedentary wildlife, including reptiles, amphibians, and mammals. Therefore, it is anticipated that existing information, data collected during vegetation transects, and field assessment of wildlife habitat suitability would be sufficient to predict what non-focal wildlife species would be associated with the different vegetation types and which species could be affected by changes in lake level. It is assumed that existing information on bird utilization of habitats at Lake Merced and field assessment of habitat suitability will also be adequate to predict species distribution and potential effects of lake level changes. As a result, standardized baseline wildlife surveys are not included in this scope of work. If it is determined that such surveys are required, these services could be provided under an amendment to this scope of work.

Subtask 2.5 - GIS Analysis

An accurate, properly scaled topographic map of Lake Merced presents a key data gap that will limit the

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accuracy of the work. A new topographic map, at 1.0 foot contour interval, is being developed under separate contract. A draft of the new topographic map is anticipated in February 2003. As the new topographic map is not available at this time, the existing topographic map (10 foot contour interval, developed by San Francisco Recreation & Park Department) will be used to present the Task 2 data. When the new topographic map is made available in 2003, the data layers will be transferred to the new topographic map for purposes of analysis as part of Task 3.

GIS will be used to demonstrate results of vegetation mapping, vegetation transects, and focused surveys. It is assumed that existing vegetation layers will be provided to the team and that these layers are compatible with Talavera & Richardson's GIS software. As T&R has worked previously for the SFPUC, EDAW believes there is no incompatibility of the platforms and software.

Vegetation communities and locations of suitable habitat for focal species and documented occurrences of these species will be mapped as layers in the GIS. Results from vegetation transects and focused surveys will be provided in a database that is linked to the spatial data to allow for extrapolation of information from specific locations to the entire project area. This will be particularly useful in extrapolating from the vegetation and elevation data from the transects to model vegetation change in response to rising water levels.

Deliverable: GIS Layers

Prepared GIS layers demonstrating the results of vegetation mapping, vegetation transects, and focused surveys. GIS layers will be presented using both the 10 foot contour interval map (developed by SF Recreation & Park Department) and the new 1 foot contour interval map (being developed by the SFPUC, draft map anticipated to be completed by February, 2003).

Subtask 2.6 - Focused Biological Surveys

An EDAW wildlife biologist and an EDAW botanist will consult with SFPUC personnel and local natural resource experts to develop a list of species for which focused surveys will be conducted. This would include special-status species, and may include other species of local interest and invasive species of management concern that have potential to be affected by changes in lake level. Based on EDAW's current knowledge of the project area and its associated resources, focused surveys are expected to be warranted for San Francisco lessingia, San Francisco Bay spineflower, Kellogg's horkelia, San Francisco owl's-clover, San Francisco garter snake, California red-legged frog, western pond turtle, and saltmarsh common yellowthroat. Although Trihey and Associates indicate San Francisco garter snake and California red-legged frog are not expected to occur in the lake, focused surveys have not been conducted to confirm absence, and such confirmation of presence or absence is recommended in order to facilitate future environmental impact assessment and permitting processes. Focused survey efforts will be concentrated within the area surrounding Lake Merced that would be subject to inundation or otherwise affected by increased lake levels. Focused surveys will be conducted by EDAW wildlife biologists and botanists. For these surveys, it is not anticipated that any handling of species will be required. In the event that handling proves necessary, EDAW biologists are approved for each sensitive species except San Francisco garter snake. While unlikely, should a possible San Francisco garter snake be identified, then an additional survey conducted by specialists, Karen Swain or Sam McGuinness, would have to be carried out (Surveys by these specialists are not included in our scope or budget at this time.)

Deliverable: Technical Memorandum

A technical memorandum will be prepared that provides a summary of existing biological resources information and results of additional biological surveys and GIS analysis. The report will present and discuss results of vegetation map verification, vegetation transects, focused surveys, and GIS analysis (using both the 1.0 and 10.0 foot contour interval maps). Potential impacts to these biological resources from changes in lake level will also be described and evaluated in relation to the survey results.

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Subtask 2.7 – Land Use and Water Quality Surveys

EDAW will conduct a land use survey of the lake edge and immediate environs to identify recreational activities and uses of the site and existing facilities. The survey results will be summarized in a technical memorandum. The EDAW-Talavera & Richardson team will assist City staff in identifying the scope of the requested synoptic survey of anoxic conditions (identified data gap). The City will be responsible for conducting the survey and will provide the data to the EDAW-Talavera & Richardson team.

Deliverable: Technical Memorandum and Synoptic Survey Protocol for Anoxic Conditions

A technical memorandum will be prepared that summarizing recreational activities and uses of the Lake site and existing facilities. A protocol for a synoptic survey for anoxic conditions will be developed.

Subtask 2.8 – Meetings and Coordination

Attend up to two coordination meetings with SFPUC staff and one meeting with the City Attorney's Office to discuss the work program and the approach to individual tasks, record meeting notes.

Subtask 2.9 – Review Work Plan

Review existing Task 1 work plan. EDAW completed a revised work plan, dated August 22, 2002, incorporating comments recorded at the August 13, 2002 joint meeting of the Water & Nature Subcommittees of the Lake Merced Task Force. Following additional comments from the Lake Merced Task Force and participants of the Cal Trout Inc./Lake Merced mediation sessions, the SFPUC developed a pilot program for limited water additions to the lake. The purpose of this pilot program is to study the lake and the groundwater response to discrete water additions; empirical results from the pilot program will be used to develop lake level management strategies. The pilot program was developed with and endorsed by both the Lake Merced Task Force and the Cal Trout Inc./Lake Merced mediation participants. Environmental review was conducted on the pilot program; it was determined that the program was exempt under State Guidelines Section 15301.(b), (h) Existing Facilities and 15304 (d) Minor Alterations to Land & Water. As a consequence of the decision to implement the pilot program, the work plan is undergoing a second revision to refocus the work plan on open-impact evaluation of alternatives and to integrate the existing Phase 1 and Phase 2 into a single work program.

Task 3 - Develop a conceptual model

In this task, EDAW will develop a conceptual model using GIS topographical overlays to identify areas of inundation as a result of rising lake level as well as assess the feasibility and timing required to re-establish lake levels higher than present. Except for the new topographic map (1.0 foot contour interval), this assessment will use only previously developed information including the Luhdorff & Scalmanini evaluation, any additional modeling evaluations prepared by City, available hydrologic and bathymetric data for the lake, potential regulatory restrictions, based on EDAW's initial contacts with Department of Fish and Game, and information provided by SFPUC regarding available system capacity and facilities planned for deliveries.

The following subtasks will be included in Task 3

- 3.1 Develop a conceptual model of lake level and hydroperiod (e.g., timing, depth, frequency and duration of inundation) interactions
- 3.2 Correlate current vegetation with hydrologic (e.g., lake levels, hydroperiod) and topographic conditions
- 3.3 Each of the potential water sources will be described and discussed including use of SFPUC imported surface water, treated storm water, recycled water, and groundwater.
- 3.4 Participate in coordination meetings with the SFPUC, including a presentation to the Lake Merced Task Force.

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Deliverables: GIS Topographic Overlays and Technical Memorandum

Subtask 3.1 – Conceptual Hydrologic Models and Maps

The lake level has changed during historic times due to natural and human induced events. Analysis of the below subject areas will help the City determine how rapidly and how high to raise the level of the lake and which water source would be most appropriate.

- HCE will define quantity, quality and timing of short-term deliveries of imported surface water from the SFPUC system. The evaluation will focus on possible lake level increases above the assumed base level elevation that could be achieved with a program similar to SFPUC's 1997-2001 program of lake augmentation, with planned implementation in Fall 2002. (Any planned implementation will consider the potential for a large amount of rainfall due to the projected El Nino event this winter.)
- The recently completed evaluation by Luhdorff & Scalmanini calculates the time required to fill the lake to target levels 2, 4, 6 and 8 feet above current conditions. This study takes into account potential constraints in water deliveries due to available capacity in the SFPUC system. It did not assess potential delivery constraints due to regulatory restrictions or environmental constraints on deliveries.
- HCE will review the existing models used by the City for analysis of water levels and the lake-aquifer system. No new model will be developed at this time; however, the existing models will be modified to reflect the hydroperiod and include surface water hydrology (inflows and outflows).
- Using the new topographic map, Talavera and Richardson will input lake level data into the GIS, including the base level and increments at 2, 4, 6 and 8 feet. These map models will form the basis of later impact analyses.

Subtask 3.2 – Lake Level and Vegetation Correlation

Once EDAW has verified the vegetation mapping of the margins of Lake Merced and the locations of special-status species EDAW will overlay the rising water levels on the vegetation map. In addition, EDAW will overlay the vegetation map on the newly developed 1-foot contour map for distribution to the community in an effort to facilitate the discussion of how rising water levels will impact the physical and visual lake environment.

EDAW will describe the existing vegetation and conditions and develop a model, by using a GIS analysis, of the response of the vegetation to rising water levels. This model will be based on the vegetation's tolerance to inundation and competitive abilities of one vegetation type compared to others. The modeling will incorporate considerations of fluctuating water levels related to seasonal precipitation and evapotranspiration.

Deliverable: Vegetation maps overlaid on the new topographic map, dated 2003.

Subtask 3.3 – Review and Assess the Operational, Environmental, and Regulatory Issues

Each of the potential water sources will be described and discussed including use of SFPUC imported surface water, treated storm water, recycled water, and groundwater.

Operational

EDAW will work with SFPUC staff and its consultants and North San Mateo County Sanitation District to describe the proposed facilities, their operational characteristics and comparative costs. The objective will be to describe all project facilities and operations as they relate to the desired goal of raising lake level under the constraints of regulatory requirements, adopted plans and programs and/or potential environmental impacts. The need for any additional facilities necessary to deliver water to Lake Merced

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and the need for any additional treatment of the water that would go to Lake Merced will also be described for this task.

Environmental

Water Quality

Merritt-Smith Consulting will assess the impacts of recycled water and treated storm water on the quality of water in Lake Merced. The effect of the different nutrient constituents in the source water on nutrient cycling and related effects will be examined and related to impacts on algal growth and aquatic ecological health. MSC will assess nutrients, dissolved oxygen, and temperature in Lake Merced and relate these to the criteria established by the San Francisco Bay Regional Water Quality Control Board for the lake as well as general aquatic system quality. The analysis will include different lake levels. The October 2001 analysis (and the knowledge of Lake Merced gained by conducting the analysis) will facilitate evaluation of the impacts directly on algal growth, nutrient concentration, dissolved oxygen, and temperature.

MSC will review the adequacy of the data on water quality parameters such as

- Algal growth nutrients
- Algae production
- Water clarity
- Temperature
- Dissolved oxygen

MSC also will review key water quality characteristics of the water supply alternatives including:

- Source water quality
- Discharge location
- Discharge flow
- Discharge frequency, timing

Water Supply Systems

To address longer-term lake augmentation, using sources of supply, such as tertiary-treated reclaimed water, storm water or other sources, MSC and HCE will define the work elements, level of effort and schedule necessary to identify:

- Timing and quantities of deliveries for different supply options;
- Types of facilities required for conveyance and treatment of water supply;
- Planning-level capital and operating costs of facilities;

MSC and HCE will review reports and documents from past groundwater and water quality assessments of Lake Merced, including:

- Earlier modeling results and models.
- Documents developed by CH2M-Hill for Daly City, including Vista Grande stormwater evaluation and Corollo Engineers for the recycled water source project; groundwater modeling operation and recycled water alternatives
- Regulatory permits and requirements for past lake filling programs.
- Hydrologic data and assessments.

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Groundwater

EDAW will coordinate with Luhdorff & Scalmanini for technical support to determine the feasibility of groundwater as a source water.

Deliverable: Technical Memorandum & GIS Overlays

EDAW will prepare a Technical Memorandum describing conceptual water sources, vegetation description and correlation of vegetation with alternative lake levels. The memorandum will summarize vegetative tolerances and adaptation to changed water levels and water quality. The memo will be supported by GIS map products. The Memorandum also will describe potential alternative water sources, their supply and water quality characteristics and limitations for use as a water source for Lake Merced.

Subtask 3.4 – Project Coordination and Meetings

EDAW will participate in up to two coordination meetings with the SFPUC. As requested, EDAW may make one presentation to the Lake Merced Task Force to describe work progress.

Task 4 - Assess Environmental Impacts

In this task, EDAW will assess environmental impacts of increased water levels, above ambient conditions, on aquatic and terrestrial habitats, water quality, and beneficial uses including recreational uses. Impacts will be calculated by using the models developed in Task 3 for 4 different levels. EDAW will identify up to six indicator species. To select these species, EDAW biologists will contact CDFG and SF Recreation and Parks for input on desired focal species.

Effects on Beneficial Uses

This will entail documenting the beneficial uses and determining the effect of changing the level of Lake Merced on each use. Beneficial uses would include wildlife habitat, bird watching, outdoor recreation, and others identified in the *Water Quality Control Plan, San Francisco Bay Basin (Region 2)*, California State Water Resources Control Board, June, 1995

Aquatic Resources

Cold water aquatic species such as trout require water that is both cold and well oxygenated. Adding water to the lake can increase the amount of deeper, cold water habitat that can be utilized by trout; however, that is beneficial only if it is of suitable quality. If more nutrients, such as nitrogen and phosphorous, enter the lake through the addition of relatively nutrient-rich water, increases in productivity (eutrophication) may result. Although the process is complex and difficult to predict precisely, eutrophication could encourage the growth of more food items for fish, such as phytoplankton, zooplankton, small forage fishes, and aquatic insects. However, there is also the potential for increased eutrophication to promote photosynthesis and the increase of algal biomass, which eventually sinks to the lake bottom. There the detritus is consumed by bacteria, using the available oxygen during the process, and creating anoxic conditions in the deeper waters. Additionally, bacterial decomposition of the detritus also favors the formation of hydrogen sulfide, which is toxic to both invertebrates and fish. Trout may therefore become “squeezed out” between anoxic water at greater depth and water that is too warm near the surface.

In order to evaluate the potential effects, and assist in the selection of sound management alternatives, a clear understanding of the lake’s fisheries resources will be one of the key factors. The analysis must also consider changes in water quality conditions that influence these species with particular attention to factors such as temperature and nutrients.

This task will synthesize information developed in Tasks 1 and 3 on the status and condition of fisheries resources with information on the type, location, and magnitude of projected future lake level augmentation strategies to identify potential impacts on these species. Impact analysis will consider changes in water

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quality (e.g., temperature, dissolved oxygen, and pH) and water quantity (e.g., lake surface level, and lake strata) to evaluate changes or shifts of the habitats of key (up to six) fish species. This task will involve close coordination with the hydrologic modeling task and will use the results of that modeling. Effects of the project alternatives to existing and potential beneficial uses of fishery resources will be determined largely through projected changes in water quality conditions.

The impact analysis will consider changes in water quantity (e.g., lake surface level, lake strata) to evaluate changes or shifts of the habitats of key species. The potential for the added water to produce a stratified water column in the lake will be addressed. This task will involve close coordination with and rely upon the hydrologic and water quality modeling task. Effects to existing and potential beneficial uses of fishery resources will be determined largely through projected changes in water quality conditions.

HES will coordinate with MSC regarding assessing impacts to the fishery from nutrient loading. The impact analysis to the fishery will consider changes in water quality (parameters identified in Subtask 3.3, e.g., temperature, dissolved oxygen, pH) and water quantity (e.g., lake surface level, lake strata) to evaluate changes or shifts of the habitats of key aquatic species. Effects to existing and potential beneficial uses of fishery resources will be determined largely through projected changes in water quality conditions.

Terrestrial Biology

The effect of lake level on wetland vegetation, terrestrial vegetation, birds nesting in wetland and affected upland vegetation, and special-status species will be assessed. The results of the optional field surveys will be used for the impact analysis. An example of a species that might be affected is the salt marsh common yellowthroat that nests in the wetland vegetation at Lake Merced. A reduction of its wetland habitat could result in a reduction in the number of nesting birds at Lake Merced. A review of historic vegetation will be conducted using historical photography, if available. The historical vegetation can be compared to the map of the current vegetation. The historic habitat conditions for these species will be discussed.

A key element of this task will be the identification of impact significance criteria. Specifically, EDAW will identify the threshold at which impact to habitats and the focal species may result in substantial effects on them and/or induce the need for lengthy regulatory reviews and permitting. The thresholds will relate both to direct losses of habitat related to the amount and rate of habitat change induced by changes in lake level and indirect effects induced by alteration of environmental quality (e.g., water quality, increased recreation access to sensitive habitat, etc.). This assessment will be based both on predictive ecological models as well as qualitative evaluation of potential environmental changes and uses.

Water Quality

Merritt-Smith Consultants will address the effects of the increases of the water level on water quality (parameters identified in Subtask 3.3). These impacts are largely assumed to be beneficial. The effect of the different lake levels will be examined for algal growth, nutrients, dissolved oxygen, and temperature. This analysis will utilize the results described by Luhdorff & Scalmanini in *Assessment of Water Addition Scenarios Lake Merced* (May 2002) and *Water Quality Investigation and Assessment Report: Potential Water Quality Effects In Lake Merced From Enhanced Ammonia Inputs* (October 2001). These reports provide a detailed analysis of water supply feasibility and hydroperiod and water quality impacts of several scenarios of water discharge to Lake Merced. The October 2001 analysis (and the knowledge of Lake Merced gained by conducting the analysis) will facilitate evaluation of the impacts directly on algal growth, nutrient concentration dissolved oxygen, and temperature. MSC also will identify and evaluate any water quality issues related to materials that may be inundated by a raised lake level, e.g., the clay pigeon wastes at the Pacific Rod & Gun Club, animal and human wastes, garbage, decaying vegetation in the lake, etc.

Coordination will occur between the water quality analyses, the aquatic biology analysis, and the hydrological analysis.

Hydrological Modeling

The general hydrology of Lake Merced will be discussed regarding relationships between lake level, rates

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of inflow and outflow, and lake nutrient concentrations. Coordination will occur between HCE and MSC pertaining to water quality issues.

Other

Impacts on recreational facilities and uses, including existing shoreline uses and shoreline management activities, etc. will be assessed. Impacts on lake recreational users will be discussed. Other uses, whether permitted or unauthorized, e.g., homeless encampments, will be discussed.

Task 4 - Technical Memorandum

Subtask 4.1 – Prepare Technical Memorandum

In this technical memorandum, EDAW will:

- Describe the results of reviews and analyses conducted in Tasks 3 and 4.
- Provide baseline aquatic and terrestrial habitat data
- Identify potentially important habitat areas
- Compare past, present, and proposed future conditions
- Compare the impacts of different water-level scenarios & water source alternative based on affected habitat
- Discuss potential impacts on existing and potential beneficial uses
- Summarize key findings in matrix format for each water level, source water, and evaluation criteria, for sample matrix see Attachment No. 1

Peer-review of the draft and final technical memorandum will be conducted by a third party, e.g., Alex Horne, Ph.D. (University of California, Berkeley) or a scientific peer with comparable professional credentials. The memorandum also will be given to the Lake Merced Task Force for review and comment. It is assumed that the Task Force comments will be consistent (that is, differences in opinions will be resolved by the Task Force so that comments are presented as one voice of the reviewers). Following receipt of comments, EDAW will make revisions to the Technical Memorandum. We assume one round of revision.

Subtask 4.2 – Coordination and Meetings

EDAW will participate in a review meeting with SFPUC staff on the draft Technical Memorandum. EDAW will attend one meeting of the LMTF to receive comments on the Draft Technical Memorandum. EDAW will participate in one meeting with SFPUC staff to evaluate the LMTF and peer review comments.

Deliverable: Draft and Final Technical Memorandum; documentation of peer-review comments.

Task 5 – Develop an in-field monitoring program

Subtask 5.1 Prepare In-Field Monitoring Technical Memorandum

This task entails developing a monitoring program to monitor impacts of increasing the level of Lake Merced. The monitoring methodology will be based on the transects established as part of Task 2. The boundaries between different wetland vegetation types and the adjacent upland vegetation are dependent of the water gradient which is affected by the water level. As the water level changes, the gradient and the location of the vegetation boundaries will change. This task will determine the frequency of monitoring.

In addition to monitoring the location of the vegetation boundaries that are affected by changing water levels, EDAW will monitor the effect of changing water levels on special-status species. This monitoring may be especially important for the special-status salt marsh common yellowthroat because it nests at Lake Merced. The results of our surveys in Task 2 can be compared to results of monitoring visits after the level of Lake Merced has changed. The monitoring program will be directed to an adaptive management strategy.

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Peer-review of the draft and final monitoring program will be conducted by a third party, e.g., Alex Horne, Ph.D. (University of California, Berkeley) or a scientific peer with comparable professional credentials. Review by the Lake Merced Task Force also will be requested.

Deliverable: Technical Memorandum

A Technical Memorandum will be developed that describes the methodology and procedure for in-field monitoring and reporting; including documentation of peer-review comments.

Subtask 5.2 – Coordination and Meetings

EDAW will participate in a review meeting with SFPUC staff on the draft Technical Memorandum. EDAW will attend one meeting of the LMTF to receive comments on the Draft Technical Memorandum. EDAW will participate in one meeting with SFPUC staff to evaluate the LMTF and peer review comments.

Task 6 – Determine the Appropriate CEQA Document and Permit Requirements

EDAW will work with SFPUC and MEA staff to identify the appropriate CEQA document for analyzing effects of increasing the level of Lake Merced using each of the water supply options. The first step would be to meet with SFPUC and MEA staff to determine the CEQA review requirements and process. The determination of significance will also be discussed at this meeting. The proposed project will consist, in part, of the amount of elevation that Lake Merced will be raised and the purity of the water used to increase the lake's elevation. If the source water that is proposed to increase the lake level is particularly nutrient rich, impacts could occur to water quality, the fishery, and beneficial uses. The greater the increase in lake level, presumably, the greater the impact to sensitive biological resources, except perhaps fish resources. The magnitude of the project effects may therefore determine the level of CEQA analysis.

EDAW will assess regulatory permits needed, identify a permitting strategy and plan; discuss and review the schedule with the SFPUC Project Manager.

Optional: Draft Permits

EDAW will develop, if requested, draft permits for the project for review by SFPUC Staff and attend one meeting with each permitting agency. For purposes of general planning, EDAW assumes four permitting agencies will be involved with the project: US Army Corps of Engineers, California Department of Fish & Game, the California Coastal Commission, and the San Francisco Bay Regional Water Quality Control Board. City & County of San Francisco permits also will be discussed.

Task 6.1 Prepare Memorandum

EDAW will prepare a memorandum describing the CEQA options, including the likely type of CEQA document, and permits likely to be required for various lake level and water supply alternatives. The memo will describe the permitting implementation strategy. EDAW will prepare a draft Memorandum, and after receiving SFPUC staff comments, make revisions and prepare the Final Memorandum.

Task 6.2 Coordination and Meeting

EDAW will participate in a review meeting with SFPUC staff on the draft Memorandum.

Task 7- Develop Implementation Schedule

Task 7.1 – Implementation Schedule

EDAW will develop an implementation schedule enumerating all the tasks that would be necessary to raise the level of Lake Merced. This would include the mitigation measures and monitoring that would be necessary as part of the environmental review and permit requirements. It may also include other actions that are outside of the purview of the environmental review process. The shoreline of the lake will be

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examined with staff of the PUC to ensure that all of the actions have been included in the implementation schedule. Staff of the PUC and other knowledgeable individuals including selected stakeholders will be consulted regarding actions needed prior to increasing the water level of Lake Merced. Some actions that might be included are the removal of the clay pigeon wastes from the Pacific Rod & Gun club that lines a portion of the shore of Lake Merced and the removal of tules at selected fishing locations. EDAW will summarize the results in a draft and final Implementation Report.

Task 7.2 Coordination and Meeting

EDAW will participate in a review meeting with SFPUC staff on the draft Implementation Report.

Task 8 – Project Coordination and Public Involvement Meetings

EDAW understands that the SFPUC generally prefers to take a lead role in planning and implementing public involvement meetings. The EDAW team will assist SFPUC staff in identifying the public involvement goals and strategy. EDAW will coordinate with Ward Associates to prepare informational handouts and presentation materials as needed and, if requested, the team can assist in noticing, logistics planning and open house meeting set-up.

EDAW anticipates that the team will be present as information resources, and can serve as facilitators if desired. For purposes of general planning, EDAW assumes that the following team members would be present at the public meetings: Mark Winsor (project manager), Clint Kellner (terrestrial and wetlands biologist), Jeff Hagar (fisheries biologist), Beth Goldstein (hydrologist), and David Smith and Michael Deas (water quality analysts). At this point, EDAW does not know the number of meetings that will be required for this process. For budgeting purposes, we assume two public meetings to present information and receive comment. Printed materials will be provided on a time and materials basis.

EDAW will prepare a written summary of the meetings including comments received. The project manager will prepare a written monthly progress report. The project manager will meet at least monthly with the SF PUC project manager to discuss the status of the work program.

Deliverables: Public Presentation Materials and Monthly Progress Reports

Attachments

- No. 1 Sample Matrix (See Subtask 4.1)
- No. 2 Work Plan Implementation Schedule
- No. 3 Cost Estimate & MBE/WBE Participation Goals