File No. 091307 Committee Item No. 1
Board Item No. ____________

COMMITTEE/BOARD OF SUPERVISORS

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Committee: Government Audit and Oversight **Date** December 16, 2009

Board of Supervisors Meeting **Date** ____________

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OTHER **(Use back side if additional space is needed)**

* ☒	☐	"Sharp Park Conceptual Restoration Alternatives Report"
☒	☐	"Sharp Park Mitigation Bank Financial Viability and Analysis Report"
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Completed by: Alisa Somera **Date** December 11, 2009
Completed by: ____________ **Date** ____________

An asterisked item represents the cover sheet to a document that exceeds 25 pages.
The complete document can be found in the file and the online version.

Financial Viability and Analysis

Sharp Park Mitigation Bank
San Mateo County, California

Prepared by

Westervelt Ecological Services
600 North Market Blvd., Suite 3
Sacramento, California, 95834
November 6, 2009

FINANCIAL VIABILITY AND ANALYSIS
SHARP PARK MITIGATION BANK

EXECUTIVE SUMMARY

A mitigation bank is a viable mechanism for habitat restoration and could be a potential source of funding for the no-golf alternative for the restoration of Sharp Park. However, when weighing this financial mechanism against other potential sources of funding, the City of San Francisco should give significant consideration to the following constraints:

Recreational Use: Species fatality and disturbance to their habitats as a result of recreational activities is a known threat to many listed species, including the SFGS and CRLF. Therefore, mitigation banks are required to exclude all recreation within their boundaries. In rare instances, limited recreation is allowed, but this is generally limited to private use or low impact, guided tours.

Financial Risk: As demonstrated in Attachment A, the City would have to cover all of the upfront costs required to set up a bank. Not only would the City be responsible for the upfront costs, the City also would have to generate the majority of funds upfront. It is also important for decision-makers to note that mitigation banks cannot be funded with federal or state grants. Finally, there is no guarantee that the City would recoup all of its investment because the sale of mitigation credits is entirely dependent on market demand.

Additional Requirements: There is some speculation that regulatory agencies may also require additional restoration work, above and beyond what is proposed in the no-golf or 9-golf alternatives, for bank approval. This may significantly increase the costs of creating a bank at Sharp Park.

Ongoing Management and Maintenance: In addition to the capital costs required to restore Sharp Park, the 'soft costs' associated with a Sharp Park mitigation bank would likely be higher at this site than at most other mitigation banks due to the public visibility of the site, the high utilization of the area for recreation, and the sensitivity of the habitat. These issues would require the City to dedicate significant resources towards public involvement and outreach throughout the approval process and operation of the bank. Additionally, the ongoing maintenance, management, and enforcement required for the operation of a bank may be substantial. These aspects of long-term site management, in addition to chronic dredging and sediment removal events, imply that the land management endowment required by the regulatory agencies (see Attachment A) may be sizeable in order to accommodate significant annual yields to implement all of the above actions.

PURPOSE OF THE REPORT

This report was developed by Westervelt Ecological Services (WES) for Tetra Tech, Incorporated (Tetra Tech) to evaluate the economic viability of establishing the Sharp Park Mitigation Bank (Bank) for the City of San Francisco (City) on the Sharp Park Golf Course, located in the City of Pacifica, San Mateo County, California. At issue are the opportunities and constraints associated with the establishment and operation of a Bank at this location and the costs associated with these factors. WES is aware that there are several alternatives being considered for this property; however, this report exclusively focuses on only two of these existing alternatives. Namely, these include the redesign of existing facilities to limit golf to a 9-hole course with the associated 65.1-acre Bank on the balance of the property (9-hole) or the elimination of golf entirely from Sharp Park, thus resulting in the establishment of a 121.6-acre Bank that would encompass all of the current golf course grounds.

This report does not examine the appropriateness of the contents of each proposal (e.g., should a freshwater wetland be expanded or should a coastal dune environment be allowed to return).

OVERVIEW OF MITIGATION AND CONSERVATION BANKING

Mitigation and conservation banking developed in California in the mid-1990's in order to provide offsets to species and wetland resources that may result from development activities, as regulated by the California Department of Fish and Game (CDFG), U.S. Fish and Wildlife Service (Service), U.S. Army Corps of Engineers (Corps), U.S. Environmental Protection Agency (EPA) and, in the San Francisco Bay area, the Regional Water Quality Control Board (RWQCB). While the term "conservation bank" implies credit sales to offset species impacts as described within the federal Endangered Species Act (ESA) or CDFG guidelines, "mitigation bank" is more generally applied for offsets to impacts of wetland resources, as regulated by the Corps, *or* combined wetland and species offsets for both ESA and Corps impacts. While traditionally developers were required to perform all resource mitigation at, or near, the site of impact activities, preservation projects in the vicinity of large scale development areas resulted in small isolated preserves that were often biologically and financially unsustainable. Therefore, specific conservation and mitigation banking policies were first established by State and Federal agencies in 1995 to assist in the preservation of larger and more interconnected offset areas. Through the evolution of these initial policies, a state-wide template for banking was developed for California in April, 2008 (Service, *in litt.* 2009).

Conservation and mitigation banks operate by selling "credits" to developers for "unavoidable impacts" related to a development project, which represents a set amount of impacts to species or wetland resources. In general, one credit is equal to one acre. The number of credits required by each developer is determined by the developer and the regulating entity (e.g. CDFG, Service, or Corps). In exchange for each credit purchased, the banking entity ensures that a suitable preservation property is purchased, entitled, and managed in perpetuity, thus fulfilling developer requirements under ESA and Corps regulations as defined by section 404 of the Clean Water Act. Within this assessment, it was assumed that Sharp Park would sell credits for both wetland and species resources, thus serving as a combined mitigation bank, with primary clients assumed to be associated with larger infrastructure development projects.

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Figure 1
Sharp Park

BACKGROUND ON SHARP PARK

Location

Sharp Park is an approximately 400-acre property, located in San Mateo County, California. It is bound to the north and east by urban development associated with the City of Pacifica as well as by State Highway 1, which bisects Sharp Park into eastern and western segments. Mori Point, owned and managed by the National Park Service as part of the Golden Gate National Recreation Area (GGNRA), abuts the property to the south, while the western boundary of the property is defined by an earthen sea wall that separates the Park from a small beach and the Pacific Ocean. Freshwater wetlands located on the site are generally limited to the southwestern portion of the property and include Horse Stable Pond, Laguna Salada, and a small canal system that connects Laguna Salada to Horse Stable Pond. Sanchez Creek runs along the southern boundary of the property, spanning portions of both the eastern and western segment of the Park (**Figure 1**). Nested within this larger property is a 121.6-acre public golf course which runs throughout the center of the larger Sharp Park parcel.

History

Sharp Park, formerly part of the San Pedro Rancho, was granted to the City for the explicit purpose of providing a "public park or public playground" area in 1917 (San Mateo County, 1917). As such, by 1931, the golf course had become established within the site, covering roughly the same area that continues to be utilized for play today. Though the original course was designed by Alistair McKenzie, a well known golf course architect of the era, many of the original holes have since been altered due to frequent flooding by Sanchez Creek and the occasional overtopping of the sea wall, which was built in 1941 to avoid flooding and damage to the course (Tetra Tech 2009a). The most dramatic overtopping of the wall occurred in 1983, at which time large portions of the existing sea wall embankment was eroded and high quantities of saline water entered the onsite freshwater features (Service, 1985).

Species

The property resides within a defined core habitat area for the federally threatened California red-legged frog (*Rana aurora draytonii*) (Service, 2002) and contains one of only six large recognized populations of the federally endangered and State fully protected San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) (Service, 1985). Though observations of both species have been recorded throughout the site, most of these animals are concentrated or around the aforementioned on-site freshwater wetland features (Swaim, 2008).

In addition to these on-site aquatic habitat areas, numerous listed species observations have been made at Mori Point, directly to the south of the property, where State and federal grants have been utilized to improve conditions for both the California red-legged frog (CRLF) and San Francisco garter snake (SFGS) in recent years. Due to these factors, activities within the Sharp Park property and the surrounding GGNRA lands are closely regulated by Service and CDFG under the auspices of the ESA and California Endangered Species Act (CESA) respectively.

Current Conditions
Today, many of the onsite wetlands have become degraded, having become overgrown with cattails (*Typha* spp.) and bulrushes (*Scirpus* spp.) and filled with large quantities of sediment, likely running off from the surrounding urban landscape. This has led to a reduction in suitable aquatic habitat for both CRF and SFGS populations on the Sharp Park site. Additionally, chronic storm events, leading to the overtopping of the sea wall, in concert with the constant addition of sea spray, due to the proximity of the site to the Pacific Ocean, have resulted in the salinization of several wetland features within the Sharp Park property, decreasing the habitat value of these areas for listed species (Tetra Tech, 2009a). Suitable upland habitat for these animals is also extremely limited on the property as many areas are either being utilized as golf course fairways or are covered by dense stands of invasive species such as ice plant (*Malephora* spp.), eucalyptus (*globules* spp.), and Monterey cypress (*Cupressaceae Cupressus macrocarpa*) (Tetra Tech, 2009a; Swaim, 2008). Indeed, the alteration of much of the site's upland habitat has resulted in the preliminary conclusion that an absence of uplands, as opposed to wetlands, is the primary limiting factor for both the CRLF and SFGS within the property (Swaim, 2008).

Regulatory Environment
In 2005, to address these habitat challenges, the City began to work toward improving on-site conditions for listed species and their habitats. Restoration alternatives created during this process have primarily focused on the implementation of recommendations outlined within a 2008 report issued by Swaim Biological (Swaim, 2008). Additionally, as the SFGS is a fully protected species under CESA law, any alternative implemented by the City requires a recovery action permit; thus, CDFG and Service input has also been utilized to help guide the development of a habitat improvement plan.

Restoration Alternatives
As a result of information provided by Swaim Biological and agency staff, restoration alternatives were developed and presented by Tetra Tech and its consultants for City review. However, due to the quantity of habitat necessary for Bank viability, WES examined only the 9-hole solution, which would limit play to a 9-hole course plus a driving range with the preservation of 65.1 acres for species habitat, and a "no-golf" proposal, which would remove all golf from Sharp Park, and preserve 121.6 acres of species habitat within the Park. All preserved habitat in both options were assumed to be maintained and protected in perpetuity per current State guideline requirements (Service *in litt*. 2009).

Both the 9-hole and no-golf alternatives include the creation of pedestrian pathways in the vicinity of Laguna Salada to provide recreational opportunities, and the dredging of onsite wetlands to improve breeding and foraging habitat for the CRF and SFGS, respectively. Divergence between these proposals includes a difference in the quantity of restored and preserved upland habitat areas, with the 9-hole solution protecting approximately 40.5 acres of additional upland habitat and the no-golf solution protecting approximately 93.6 additional acres (Tetra Tech, 2009a). Further, under the 9-hole solution, Sanchez Creek would likely be day lighted (removed from culverts) within the western-most portion of the site in order to maintain golf infrastructure in the eastern parts of the site. Under the no-golf solution, the Creek may be day lighted throughout its entire Sharp Park reach as no golf infrastructure protection will be required (Tetra Tech, 2009a).

METHODS OF MITIGATION EVALUATION

Through the economic viability evaluation process, only the no-golf and 9-hole alternatives were examined as these were the only alternatives assumed to provide enough value to onsite resources to justify bank establishment under current resource demands and estimated costs. To accomplish this task, the following methods were implemented:

- Gather and Review Existing Information – WES obtained and reviewed historic and ecological information from outside sources including Tetra Tech, Swaim Biological and the City, as cited throughout this document. Designs and construction costs for the no golf and 9-hole alternatives were developed by Tetra Tech and provided to WES for the development of the attached pro forma. **WES did not participate in the formation of any technical or cost data or design plans associated with this analysis.** However, WES did a preliminary review to determine if any adjustments could be made to each alternative. Through the review, WES believes that additional wetland rehabilitation credits (four additional credits for the 9-hole alternative, eight additional credits for the no golf alternative) may be a viable addition to current alternative designs.

- Interview Agency Staff and Potential Clients – WES interviewed representatives from the CDFG, RWQCB, Service, EPA, and Corps (the Interagency Review Team, or IRT, collectively) to determine opportunities and constraints associated with bank implementation. Similar interviews took place with the California Coastal Commission (CCC), as well as with private- and semi-public infrastructure entities associated with future development in the region to determine local credit demand. Regulatory determinations and cost and demand quotes from agency staff or other entities are not specifically cited within this document due to the continuing evolution of State and federal agency policies in regards to mitigation banking and the potential sensitivity of cost information in the bidding process for upcoming large-scale projects. WES also utilized company experience in guiding assumptions for the report as the WES has over 60 years of combined experience in mitigation banking in California.

- Compile Opportunities and Constraints – Information gathered from interviews as well as technical documents provided by the City and its representatives was reviewed and compiled.

- Generate Financial Pro Forma for the No Golf and 9-Hole Alternatives– Based on compiled opportunities and constraints analysis, a financial model was created to evaluate the economic viability of the bank for both alternatives (**Attachment A**).

EVALUATION OF ALTERNATIVES

During the course of interviews conducted for this report, a number of opportunities and constraints were identified in relation to establishing the Bank within the property site.

Opportunities

Opportunities on the site can be divided into species and wetland resources for each of the two alternatives analyzed and the economic benefits for the City that may result from implementing either the no golf or 9-hole alternatives to the Sharp Park property.

Species Resources

Based on preliminary analysis, Sharp Park provides distinct biological and regulatory opportunities. This can be attributed to numerous observations of SFGS and CRF individuals throughout the site and the specific identification of the property as an area vital to the survival of the SFGS (Service, 1985). Additionally, the establishment of a bank on the property will assist in achieving several recovery goals specified within the SFGS Recovery Plan (Service, 1985). These factors combine to make the preservation of the property appealing from both a regulatory and recovery perspective. Further, due to the acknowledged high value of the property, it may also indicate that a larger service area (geographic area(s) within which impacts that occur may be mitigated or compensated through credit purchase from the bank) may be approved for a bank established at this location. As a larger service area allows for a larger clientele base to which credits can be sold, an augmented service area may improve the economic viability for the Bank.

Implementation of either the 9-hole or no-golf alternative would also address current species constraints on the site as identified by Swaim Biological (Swaim, 2008). As such, these activities would meet many of the goals of the recovery action that the City has been developing with CDFG and the Service, thus improving conditions for local listed species while increasing the likelihood of IRT approval. However, opportunities associated with this may vary slightly between the two alternatives.

9-hole Alternative

Though many of the current aquatic habitat constraints related to listed species habitat would be met under the 9-hole alternative, some constraints on the development of suitable upland habitat would still exist as this option continues to permit golf and its associated activities on approximately 55 acres of the Park. Additionally, while initial restoration efforts may be implemented under a recovery action permit through the CDFG and the Service as part of minimizing take during normal golf course operations, this recovery action agreement may sunset upon Bank approval. Thus, any future operations and maintenance associated with the upkeep of the remaining 9-hole course may require additional measures beyond Bank management.

No-golf Alternative

Under the no golf alternative, the amount of upland habitat for CRLF and SFGS would increase to include additional portions of the Park. Therefore, Bank approval under this scenario may be permitted to be consolidated with recovery permit actions currently being pursued with Service and CDFG staff. However, because of the high public visibility and use of the site, implementation of a no-golf solution may be difficult.

In either scenario it is important to note however that, if State or federal grants are utilized to fund portions of the current recovery action, parts or perhaps the entire site would be excluded from inclusion within a bank.

<u>Wetland Resources</u>

According to the *Final Rule on Compensatory Mitigation for Losses of Aquatic Resources* (Corps, 2008), service areas for wetland impacts require these areas to be based on national hydrologic unit codes (HUC). In general, mitigation banks in the San Francisco Bay area use smaller, more specifically defined HUCs in determining their service area. However, due to a lack of mitigation banks on the San Francisco Peninsula, a larger HUC, and therefore a larger service area, may be permitted. Thus, the Bank could service additional clients beyond the immediate vicinity.

Wetland opportunities on the site in both the no golf and 9-hole alternatives include the day lighting of portions of Sanchez Creek for the purposes restoring and enhancing wetland features which historically existed on the site in order to increase creek function and reduce flooding. Though both options would provide additional benefits for water resources in the area, the extent of rehabilitation benefits differs between these options.

9-hole Alternative

Under the 9-hole alternative, the degree of riparian restoration would be limited by the continuation of golf practices. However, limited day lighting of the final stretches of Sanchez Creek may still provide a benefit in reducing flooding in the area as well as improving local water quality.

No-golf Alternative

Under the no-golf alternative, additional areas for wetlands restoration may be available which, though located in an urban environment, would likely provide significant benefits for the surrounding region. The no-golf alternative may also allow opportunities for the construction of several new CRLF breeding ponds beyond the 100-year floodplain currently projected with sea level rise (Tetra Tech 2009c). However, as upland habitat is the primary limiting factor on the site for both the SFGS and CRLF (Swaim, 2008), it is uncertain if the construction of additional ponded areas would be beneficial for local listed species.

Overall, IRT members were positive about Bank establishment on the site as preserving this area would likely provide great value to listed species and wetland resources in the region. Though the IRT expressed greater interest in the implementation of the no-golf alternative, the 9-hole option was still considered potentially viable by IRT participants due to the high number of ecological resources found within the property and its proximity to National Park Service lands at Mori Point.

Economic

Under the Corps' most recent mitigation guidelines, mitigation banks receive first "preference" for unavoidable project impacts to wetlands (Corps, 2008). Further, while, endangered species compensation is not a formal requirement of the ESA or CESA, it is often required by the Service for projects that "may adversely affect" or are "likely to adversely affect" listed species or their habitats. Though the Service has no requirement that off-sets for these projects occur at a bank, they do state that, "lots of times it's better to have larger areas protected under conservation banks" than in small areas carved out of a development footprint (Service web app).

Currently, there are no wetland or species mitigation banks located in San Mateo or Santa Cruz counties, thus providing market incentive for bank establishment in the area based on current Corps and Service policies. This can be demonstrated by the strongly expressed desire of two large infrastructure organizations to have a pre-established and cost effective mitigation alternative in the area, as many infrastructure projects in the region have the potential to adversely affect CRLF or SFGS individuals or their habitats, including wetland resources.

This desire for easy mitigation is due, in part, to the high cost of land in portions of San Mateo and Santa Cruz counties in conjunction with the difficulties in acquiring small parcels of land within the large property holdings common within region. Further, in general, the same quantity of resources necessary to develop mitigation for a single project is needed for the development of an entire mitigation bank project. Thus, establishing a bank in the area is a more efficient way to implement mitigation for entities involved in regular project development.

Constraints

Although IRT representatives were generally receptive to the conceptual development of the Sharp Park mitigation bank, several potentially significant constraints were identified during interviews with agency staff. Specifically, these included recreational use of the area, maintenance of on-site resources, and State and federal regulations. Further, cost estimates associated with project implementation reviewed by WES may present challenges to project implementation under either the 9-hole or no golf alternative.

Recreational Use

Species fatality and disturbance to their habitats as a result of recreational activities is a known significant threat to many listed species, including SFGS and CRLF. For example, bicycle and off-highway vehicle (OHV) use in the region surrounding Sharp Park has resulted in the known fatalities of several SFGS, even in locations where these activities are prohibited (Service, 2006). Further, although passive recreation, such as jogging and walking, do not present many direct threats to the SFGS or CRLF, these activities are often accompanied by dogs which may crush or dislodge CRLF eggs or deter movement of either species in upland areas (Swaim, 2008). Therefore, in general, banks are required to exclude all recreation within their boundaries. In rare instances, limited recreation is allowed, but this is generally limited to private use or low impact, guided tours. Thus, the level of applicability of this constraint may vary between alternatives.

9-hole Alternative

According to requirements set forth in the deed conveying the property to the City, it must remain "a public park, or a public playground" or it will revert to the State of California, with the same use restrictions (San Mateo County, 1917). Under the 9-hole alternative, this requirement would be addressed under the continuing use of a portion of the property as a golf course. .

No golf Alternative

The no golf alternative provide for planned pedestrian pathways around Laguna Salada. However, extensive use of these areas may result in further take of listed species and thus these activities may be prohibited from the site by State and federal agencies if the Bank were to become established.

Management and Maintenance of On-site Resources

In the years since the establishment of Sharp Park, on-site resources for species and their habitats have become increasingly degraded due to the sedimentation of wetlands, human impacts, and the over topping of the sea wall (Tetra Tech, 2009a). Though current designs for the no golf and the 9-hole plans address some of these issues, such as the creation of sediment basins and dredging of wetland habitats, impacts to habitat resulting from human activates and ocean surges will likely continue. Thus, high levels of on-going management will likely be required in the future. Additionally, chronic dredging or sea wall restoration may require additional permitting which will result in additional staff and financial resources.

State and Federal Regulations:

Foreseeable regulatory constraint within the Sharp Park property may include aspects of species and wetland enhancement actions associated with Bank implementation for either the 9-hole or no-golf alternative.

Species

Primary constraints associated with the enhancement of species habitat for both restoration alternatives are focused on the "fully protected" status of the San Francisco garter snake. The classification of the SFGS under CESA signifies that no action can be undertaken or permitted that may result in direct take of the species unless it is associated with an approved recovery action (CDFG, 2003). Thus, CDFG involvement with Bank establishment may be limited to an advisory role versus true signatory approval. Though this may not impact the ability for species off-sets to occur within the Sharp Park property, as required by the Service, it may add additional time and resources to Bank implementation than would normally be anticipated.

Wetlands

Regulatory constraints for the project may also exist in relation to onsite wetland enhancements under both the no golf and 9-hole alternatives. Current designs include the fill of 1.5 acres of existing wetlands for the purposes of creating additional uplands and improving listed species habitat (Tetra Tech, 2009a). Though some new wetland restoration is described within Tetra Tech documents for both the 9-hole and no-golf alternatives to offset this fill, additional onsite mitigation, may be required under 404 regulations. Further, as Sharp Park occurs entirely within the Coastal Zone, implementation of activities associated with the dredging, filling, and creation of new wetlands within this area may require extensive onsite mitigation and permitting under State laws.

Cost Constraints

Costs associated with the Sharp Park mitigation bank will likely be higher at this site than at other locations in California due to the public visibility of the site, the high utilization of the area, and the sensitivity of the habitat. The public visibility of the site as a public golf course, recreation area, and listed species habitat near a large urban center indicates that a high level of public involvement and outreach will be necessary. Therefore, a well-implemented public outreach plan will be necessary for Bank implementation. This may require the organization and attendance of public meetings by City staff as well as the production of literature, websites, and public comment response plans throughout Bank approval and operation.

Additionally, construction costs associated with the site may be higher than at other locations. For example, current construction proposals state that all dredge material from initial wetland rehabilitation will remain onsite (Munro *in litt*. 2009). Although this will greatly reduce the overall costs of project construction (Tetra Tech, 2009b), additional technical studies may be required on this material to ensure high quality habitat for listed species is preserved and maintained. Further, any dredged materials removed from the site will likely require hauling to an off-site location over 20 miles away, thus greatly increasing costs both for Bank implementation and future Bank management (Tetra Tech, 2009b).

Further, cost estimates used in evaluating this report demonstrate that partially maintaining golf on the site under the 9-hole alternative will result in increased costs as the redesign and construction of the course, as well as the maintenance and management of even a reduced golf area, are expected to be significantly higher than implementing the no golf solution (Tetra Tech 2009b).

The high utilization of Sharp Park and neighboring Mori Point for recreation may also require additional maintenance and management than most bank sites. In general, areas with public access often require frequent rubbish removal, fence maintenance, and invasive plant control, among other items. Further, more controversial actions may become necessary such as animal control and predator management to protect listed species on the site, potentially necessitating additional public outreach by the City. These aspects of long-term site management, in addition to chronic dredging and sediment removal events, imply that the non-wasting endowment required by the IRT may be sizeable in order to accommodate significant annual interest yields to implement these actions.

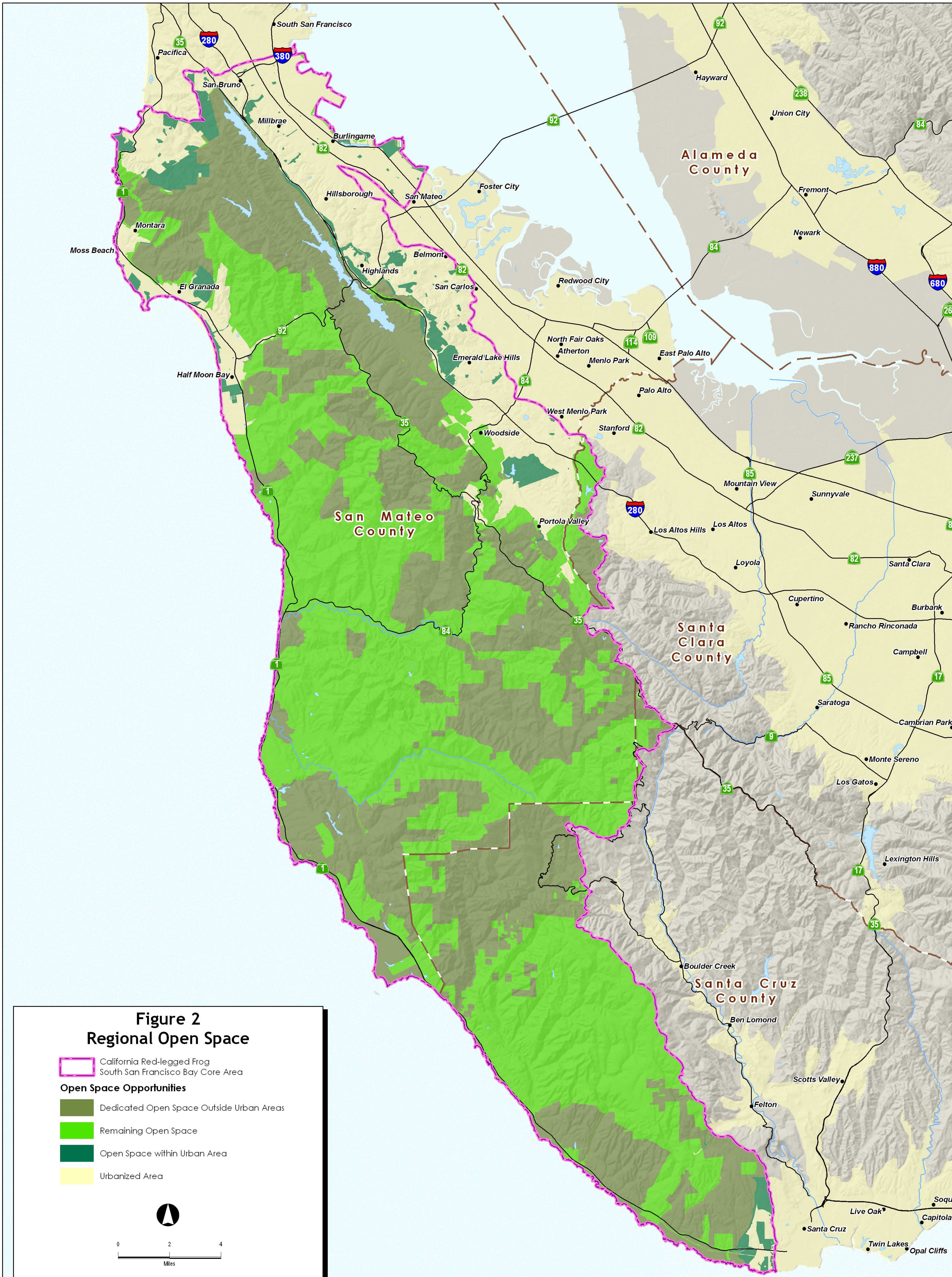
For example, the first two banks approved under current IRT templates for California, have required approximately $600,000 and a $1.2 million endowment to ensure appropriate management is continued in perpetuity. It is important to note that recreation was not a component of either scenario.

Economic

Due to growth constraints in the region in concert with the strong regulatory environment (e.g. Coastal Zone permits) in much of San Mateo and Santa Cruz counties, big development projects requiring substantial amounts of mitigation are rare and typically only performed in association with public infrastructure projects as opposed to large scale residential development. For example, the primary three development projects requiring 10 acres or more of mitigation in the previous 15 years have been associated with public transportation organizations including Cal Trans (Devil's Slide), the Bay Area Regional Transit District (Millbrae line extension), and San Francisco International Airport (SFO Master Plan).

Further, though a larger service area for both species and wetland resources increases the client base, due to the large quantities of open space within this region, most projects are able to avoid or minimize their effects to species and wetland resources, without needing to implement mitigation (**Figure 2**). In discussions with several of these organizations, it was stated that, though projects requiring mitigation of 20 acres may occur every five years on average for all entities interviewed, no more than one- to two- acres of project offsets are generally needed on an annual basis for each individual organization. Because of these minimal requirements for mitigation, the majority of these projects have been allowed to mitigate within the development project footprint.

Additionally, though large tracts of potential habitat in San Mateo and northern San Cruz counties range from $35,000 to $100,000 per acre (California Wildlife Conservation Board, 2007 a and b; California Wildlife Conservation Board, 2008), interviews with local land conservancy entities indicate that non-developable open space lands (e.g., agriculture and open space zoned areas) generally cost around $10,000 per acre for purchase. Thus, costs for unavoidable impacts may be kept lower for most regional projects. However, as previously stated, acquiring smaller properties for use as mitigation can be challenging and many of these parcels may be unreliable for supporting resources required for adequate for mitigation.


South San Francisco
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North Fair Oaks
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East Palo Alto
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Mountain View
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Los Altos Hills
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Loyola
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Santa Clara County
Santa Cruz County
Figure 2
Regional Open Space
California Red-legged Frog
South San Francisco Bay Core Area
Open Space Opportunities
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ECONOMIC MODEL

The opportunities and constraints related to the site led to the development of a business and financial model that includes the types of mitigation credits available, the potential pricing of these credits, and mitigation demand as well a standard contingency error for the model. The examination of these factors resulted in the development of a pro forma for both the no golf and 9-hole alternatives, which are included within this report as **Attachment A**.

Credit Types

Based on interviews conducted with federal and State agencies, likely available offsets at the site would be limited to wetland restoration and enhancement credits for impacts to Corps jurisdictional features, and species credits for impacts to SFGS and CRLF individuals and their habitats. Due to the currently suitable ratio of wetland-to-upland species habitats within the project area, wetland restoration and enhancement on the site would likely focus on restoring the riparian corridor to historic conditions to improve dispersal for species and reduce flooding.

Further, due to the lack of appropriate salinity levels and tidal action necessary for the development of appropriate habitat for the salt marsh harvest mouse (*Reithrodontomys raviventris*) within Sharp Park, or at any location in western San Mateo County (Service, 1984), credits for this species were not considered. Additionally, although the western pond turtle (*Actinemys marmorata)*, San Francisco forktail damselfly (*Ischnura gemina*), and salt marsh common yellow throat have been identified on the site (Swaim, 2008) the CDFG has not been known to allocate compensation credits for these species. Therefore, based on the current designs developed by Tetra Tech (Tetra Tech 2009a) plus additional riparian restoration incorporated by WES to assist in the viability of the project, a total of 60.1 acres of CRLF and/or SFGS credits and 5.0 acres of other waters wetland credits are believed to be available under the 9-hole alternative. Similarly, 111.6 acres of combined species credits and 10.0 acres of wetland credits are believed to be available under the no golf alternative (**Attachment A**).

Mitigation Pricing

Mitigation pricing can be divided into banking prices, in which credits are available to all project proponents, and permittee responsible pricing, in which the developer creates their own mitigation property on a project by project basis.

<u>Banking Prices</u>

Mitigation bank credits in the San Francisco Bay Area range from $300,000 to $400,000 for wetlands (e.g., Burdell Ranch Mitigation Bank in Marin County, Springtown in Alameda) and $20,000 to $30,000 for species (e.g., Ohlone Preserve Conservation Bank in Alameda County).

<u>Permittee Responsible</u>

Though land prices for land that cannot be developed may be relatively inexpensive, the overall cost for individual mitigation projects varies greatly based on the value of the land where project offsets will occur, the availability of land on which appropriate mitigation can occur, and the types of impacts being mitigated. Therefore, general, prices in San Mateo County for permittee-responsible mitigation may range from $180,000 to $400,000. Costs exceeding $1 million related to individual mitigation projects have been noted in published reports in the San Francisco Bay Area (e.g., Bay Bridge expansion project), but projects of this magnitude are rare and are generally associated with the tidal reaches of the San Francisco Bay.

Further, though the large amount of available open space lands in San Mateo County and northern Santa Cruz County generally act to keep prices for credits below what may be anticipated due to higher land values in certain locations, the absence of an existing bank and the desire to have a simplified mitigation and land acquisition process open for the public, presents the opportunity for somewhat higher priced credits at Sharp Park compared with other locations. Therefore, based on interviews with public sector infrastructure entities as well as the professional experience of WES staff, the market would likely support the sale of wetland credits at $350,000 per credit. Similarly, the local market would likely support a combined species credit price of $125,000 per credit. Thus, per **Attachment A**

Total Gross Revenues:

9-Hole Alternative: $9,835,000
($7,977,000 for 60 species credits @ $125,000 per credit)
($1,858,000 for 5 wetlands credits @ $350,000 per credit)

No Golf Alternative: $18,256,000
($15,992,000 for 110 species credits @ $125,000 per credit)
($2,264,000 for 10 wetlands credits @ $350,000 per credit

Mitigation Demand (Based on Past Projects)
There is limited demand for mitigation in San Mateo and Santa Cruz counties. The lack of large-scale development projects, a very restrictive permitting environment and an abundance of open space and agricultural lands are the primary reasons that a mitigation bank site would have limited demand. Interviews with mitigation users highlighted that few large-scale projects requiring greater than 3 acres of mitigation occur annually within the San Mateo and northern Santa Cruz regions. Further, the high quantity of open space in the area allows for numerous mitigation opportunities other than Sharp Park (**Figure 2**). Thus, these factors imply a limited demand for mitigation or compensation in the area. Therefore, for the financial model, the sale of 1.0 acre of wetland and 12.02 acres of species credits was estimated to occur, on average, each year for the 9-hole alternative, which assumes a 2- to 3-acre yearly demand per large infrastructure entity plus a one time 20-acre mitigation demand during the bank's projected 5-year life span (**Attachment A**). Similarly, the annual sale of 2.0 acres per year of wetland credits and 11.16 acres of species credits was assumed for the no golf alternative with the retention of the 20-acre mitigation demand per five-year period, which would occur twice over the 10-year lifespan of the larger 121.6 acre bank proposal (**Attachment A**). Therefore, an evaluation of the demand for credits at the Bank would be as follows:

Annual: 11 to 12 credits per year for species and 1 for wetlands (9-hole alternative)*
11 to 12 credits per year for species and 2 for wetlands (no golf alternative)*

Infrequent: one "20 acre" project every 5 years

Overall: 65.1 credits in 5 years (9-hole alternative)
121.6 credits in 10 years (no golf alternative)

* Though the general demand is 2- to 3-acres per agency per year, it was assumed that multiple agencies would be required to mitigate for this quantity on an annual basis. Additionally, clientele may increase for the Bank if an easily accessible mitigation alternative is available for the region.

Standard of Error/Contingency

All business forecasts related to development projects come with various standards of error or contingency factors to address uncertainty in future project costs or revenues. Given the amount of uncertainty related to market prices and demand, it is generally acceptable to apply a 20- to 30- percent contingency to all the prices and revenues associated with this project. For example, it is possible that species credits could range from as low as $87,500 per credit to as high as $162,500.

Further, these numbers may vary in true application depending on the requirements of the IRT, the involvement of City representatives, and the general public. For example, by retaining the majority of sediment on the project site per the most recent Tetra Tech guidance (Munro, *in litt*. 2009), additional technical studies may be required.

Additionally, all cost estimates utilized in creating this report were based on figures provided by Tetra Tech (2009b; Munro *in litt.* 2009), and were not evaluated for accuracy by WES. Therefore, alterations in cost estimates related to construction, maintenance, and technical studies associated with bank establishment and implementation may vary drastically from the figures used in the financial evaluation reviewed in this report, resulting in higher costs and subsequent reduced returns for the City.

Finally, it should be noted that, from a banking perspective, the ability to include additional wetland mitigation credits on the site would be extremely valuable to the viability of the bank. However, given species constraints as well as the potentially high costs of creating wetlands (seasonal and/or riparian) within the project site, a more detailed analysis would be necessary to determine the overall net value associated with the establishment of additional wetland credits.

CONCLUSION

Based on the opportunities and constraints for the site and the associated discussion of these items, **Attachment A** of this document was developed to demonstrate the financial viability of the 9-hole and no golf alternatives, respectively. As demonstrated within this attachment:

- The City would receive approximately $9.8 million in gross revenue, but lose $790,000 in net revenues from the “9 Hole” alternative.
- Under the “No Golf” alternative, the City would gross approximately $18 million, with a gain of $4,950,000 in net revenue.

Overall, there is general support for the implementation of additional restoration Sharp Park from the regulatory and biological perspective. However, this report raises several issues related to feasibility of site restoration and long-term maintenance, and the related costs from those activities. Thus, due to the questions raised and the relatively low returns related to either alternative, further site assessment and financial analysis would be appropriate before a determination on the feasibility of establishing a mitigation bank could be made.

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ATTACHMENT A

SHARP PARK MITIGATION BANK
Financial Viability and Analysis Report
Financial Projections (1)

Prepared by Westervelt Ecological Services, LLC

Dollars in thousands, unless noted		**Alternative 1 9-Hole Golf**		**Alternative 2 No Golf**
INCOME STATEMENT ANALYSIS (2)				
Credits				
Riparian / Seasonal Wetlands		5.00		10.00
CA RLF / SFGS		60.10		111.60
Revenue				
Riparian / Seasonal Wetlands	$	1,858	$	2,264
CA RLF / SFGS	$	7,977	$	15,992
Total Revenues	$	9,835	$	18,256
DIRECT COSTS ESTIMATE				
Land & Commissions		-		-
Conservation Easement	$	(215)	$	(315)
Design & Construction†	$	(8,179)	$	(9,638)
Endowment (3)†	$	(580)	$	(1,147)
Entitlement	$	(500)	$	(500)
Legal	$	(150)	$	(150)
Miscellaneous Technical Studies (4)	$	(400)	$	(550)
Total Direct Costs	$	(10,024)	$	(12,300)
OPERATING EXPENSES ESTIMATE				
Marketing	$	(295)	$	(548)
Monitoring (5)	$	(150)	$	(150)
Pre-Endowment Maintenance (5)†	$	(156)	$	(308)
Insurance	$	-	$	-
Property Taxes	$	-	$	-
Other Operating Expenses	$	-	$	-
Total Operating Expenses	$	(601)	$	(1,006)
FINANCIAL SUMMARY				
EBIT	$	(790)	$	4,950
Internal Rate of Return (projected, after-tax)		-4.0%		8.6%

NOTES

(1) Assumes a 10-Year operational period
(2) Assumes no competition
(3) See report for additional information on endowment funding
(4) See report for additional information on technical studies
(5) Assumes a 5-Year establishment O&M period

Westervelt Ecological Services - Sharp Park Alternative 1 (9-Hole) **11/6/2009**

Financial Projections

Dollars in thousands, unless noted

	Years 2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL	TARGET
INCOME STATEMENT ANALYSIS													
CREDITS													
Riparian/Seasonal	-	-	-	1.00	1.00	1.00	1.00	1.00	-	-	-	5.00	5.0
RLF/SFGS	-	-	-	12.02	12.02	12.02	12.02	12.02	-	-	-	60.10	60.1
Oak	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Credits	-	-	-	13.02	13.02	13.02	13.02	13.02	-	-	-	65.10	
PRICE (3% annual increases)													
Riparian/Seasonal	-	-	-	350	361	371	382	394	406	-	-	N/A	
RLF/SFGS	-	-	-	125	129	133	137	141	145	-	-	N/A	
Oak	-	-	-	-	-	-	-	-	-	-	-	N/A	
REVENUES													
Riparian/Seasonal	-	-	-	350	361	371	382	394	-	-	-	1,858	
RLF/SFGS	-	-	-	1,503	1,548	1,594	1,642	1,691	-	-	-	7,977	
Oak	-	-	-	-	-	-	-	-	-	-	-	-	
Other Revenue	-	-	-	-	-	-	-	-	-	-	-	-	
Total Revenues	-	-	-	1,853	1,908	1,965	2,024	2,085	-	-	-	9,835	
DIRECT COSTS													
Land & Commissions	-	-	-	-	-	-	-	-	-	-	-	-	
Conservation Easement	-	-	-	(40)	(42)	(43)	(44)	(46)	-	-	-	(215)	
Design & Construction	-	-	-	(1,541)	(1,587)	(1,634)	(1,683)	(1,734)	-	-	-	(8,179)	
Endowment	-	-	-	(109)	(113)	(116)	(119)	(123)	-	-	-	(580)	
Entitlement	-	-	-	(94)	(97)	(100)	(103)	(106)	-	-	-	(500)	
Legal	-	-	-	(28)	(29)	(30)	(31)	(32)	-	-	-	(150)	
Miscellaneous Technical Studies	-	-	-	(75)	(78)	(80)	(82)	(85)	-	-	-	(400)	
Total Direct Costs	-	-	-	(1,888)	(1,945)	(2,003)	(2,063)	(2,125)	-	-	-	(10,024)	
OPERATING EXPENSES													
Marketing (3%)	-	-	-	(56)	(57)	(59)	(61)	(63)	-	-	-	(295)	
Monitoring	-	-	-	(30)	(30)	(30)	(30)	(30)	-	-	-	(150)	
Pre-Endowment Maintenance†	-	-	-	(31)	(31)	(31)	(31)	(31)	-	-	-	(156)	
Insurance	-	-	-	-	-	-	-	-	-	-	-	-	
Property Taxes	-	-	-	-	-	-	-	-	-	-	-	-	
Other Operating Expenses	-	-	-	-	-	-	-	-	-	-	-	-	
Total Operating Expenses	-	-	-	(117)	(118)	(120)	(122)	(124)	-	-	-	(601)	
EBIT	-	-	-	(152)	(155)	(158)	(161)	(164)	-	-	-	(790)	
Income Tax Savings (Liability) @ 0.0%	-	-	-	-	-	-	-	-	-	-	-	-	
Interest Expense	-	-	-	-	-	-	-	-	-	-	-	-	
AFTER-TAX INCOME	-	-	-	(152)	(155)	(158)	(161)	(164)	-	-	-	(790)	
CAPITAL EXPENDITURES													
Land & Commissions	-	-	-	-	-	-	-	-	-	-	-	-	
Conservation Easement	-	-	(15)	(30)	(50)	(30)	(30)	(30)	(30)	-	-	(215)	
Design & Construction†	-	-	-	(8,179)	-	-	-	-	-	-	-	(8,179)	
Endowment *	-	-	-	(87)	(145)	(87)	(87)	(87)	(87)	-	-	(580)	
Entitlement	-	(200)	(250)	(50)	-	-	-	-	-	-	-	(500)	
Legal	-	(50)	(50)	(50)	-	-	-	-	-	-	-	(150)	
Miscellaneous Technical Studies **	-	(200)	(100)	(100)	-	-	-	-	-	-	-	(400)	
Total Capital Expenditures	-	(450)	(415)	(8,496)	(195)	(117)	(117)	(117)	(117)	-	-	(10,024)	
AFTER-TAX INCOME	-	-	-	(152)	(155)	(158)	(161)	(164)	-	-	-	(790)	
CASH FLOW ADJUSTMENTS	-	(450)	(415)	(6,608)	1,750	1,886	1,946	2,008	(117)	-	-	0	
CASH FLOW	-	(450)	(415)	(6,760)	1,595	1,728	1,785	1,844	(117)	-	-	(790)	
Internal Rate of Return (After-Tax)	-4.0%												

* See report for additional information on endowment funding

** See report for additional information on technical studies

† Financial estimates provided by Tetra Tech

Westervelt Ecological Services - Sharp Park Alternative 2 (No Golf) **11/6/2009**

Financial Projections

Dollars in thousands, unless noted

	Years 2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	TOTAL	TARGET
INCOME STATEMENT ANALYSIS																
CREDITS																
Riparian/Seasonal	-	-	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-	10.00	10.0
RLF/SFGS	-	-	-	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	11.16	-	111.60	111.6
Oak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Credits	-	-	-	12.16	12.16	12.16	12.16	12.16	12.16	12.16	12.16	12.16	12.16	-	121.60	
PRICE (3% annual increases)																
Riparian/Seasonal	-	-	-	350	361	371	382	394	406	-	-	-	-	-	N/A	
RLF/SFGS	-	-	-	125	129	133	137	141	145	149	154	158	163	-	N/A	
Oak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N/A	
REVENUES																
Riparian/Seasonal	-	-	-	350	361	371	382	394	406	-	-	-	-	-	2,264	
RLF/SFGS	-	-	-	1,395	1,437	1,480	1,524	1,570	1,617	1,666	1,716	1,767	1,820	-	15,992	
Oak	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Other Revenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Revenues	-	-	-	1,745	1,797	1,851	1,907	1,964	2,023	1,666	1,716	1,767	1,820	-	18,256	
DIRECT COSTS																
Land & Commissions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Conservation Easement	-	-	-	(30)	(31)	(32)	(33)	(34)	(35)	(29)	(30)	(30)	(31)	-	(315)	
Design & Construction	-	-	-	(921)	(949)	(977)	(1,007)	(1,037)	(1,068)	(879)	(906)	(933)	(961)	-	(9,638)	
Endowment	-	-	-	(110)	(113)	(116)	(120)	(123)	(127)	(105)	(108)	(111)	(114)	-	(1,147)	
Entitlement	-	-	-	(48)	(49)	(51)	(52)	(54)	(55)	(46)	(47)	(48)	(50)	-	(500)	
Legal	-	-	-	(14)	(15)	(15)	(16)	(16)	(17)	(14)	(14)	(15)	(15)	-	(150)	
Miscellaneous Technical Studies	-	-	-	(53)	(54)	(56)	(57)	(59)	(61)	(50)	(52)	(53)	(55)	-	(550)	
Total Direct Costs	-	-	-	(1,176)	(1,211)	(1,247)	(1,285)	(1,323)	(1,363)	(1,122)	(1,156)	(1,191)	(1,226)	-	(12,300)	
OPERATING EXPENSES																
Marketing (3%)	-	-	-	(52)	(54)	(56)	(57)	(59)	(61)	(50)	(51)	(53)	(55)	-	(548)	
Monitoring	-	-	-	(30)	(30)	(30)	(30)	(30)	-	-	-	-	-	-	(150)	
Pre-Endowment Maintenance†	-	-	-	(62)	(62)	(62)	(62)	(62)	-	-	-	-	-	-	(308)	
Insurance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Property Taxes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Other Operating Expenses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Operating Expenses	-	-	-	(144)	(146)	(147)	(149)	(151)	(61)	(50)	(51)	(53)	(55)	-	(1,006)	
EBIT	-	-	-	425	441	457	473	490	599	493	508	524	539	-	4,950	
Income Tax Savings (Liability) @ 0.0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Interest Expense	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
AFTER-TAX INCOME	-	-	-	425	441	457	473	490	599	493	508	524	539	-	4,950	
CAPITAL EXPENDITURES																
Land & Commissions	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Conservation Easement	-	-	(15)	(45)	(75)	(45)	(45)	(45)	(45)	-	-	-	-	-	(315)	
Design & Construction†	-	-	-	(9,638)	-	-	-	-	-	-	-	-	-	-	(9,638)	
Endowment *	-	-	-	(172)	(287)	(172)	(172)	(172)	(172)	-	-	-	-	-	(1,147)	
Entitlement	-	(200)	(250)	(50)	-	-	-	-	-	-	-	-	-	-	(500)	
Legal	-	(50)	(50)	(50)	-	-	-	-	-	-	-	-	-	-	(150)	
Miscellaneous Technical Studies **	-	(250)	(150)	(150)	-	-	-	-	-	-	-	-	-	-	(550)	
Total Capital Expenditures	-	(500)	(465)	(10,105)	(362)	(217)	(217)	(217)	(217)	-	-	-	-	-	(12,300)	
AFTER-TAX INCOME	-	-	-	425	441	457	473	490	599	493	508	524	539	-	4,950	
CASH FLOW ADJUSTMENTS	-	(500)	(465)	(8,929)	849	1,030	1,068	1,106	1,146	1,122	1,156	1,191	1,226	-	0	
CASH FLOW	-	(500)	(465)	(8,504)	1,290	1,487	1,541	1,596	1,745	1,616	1,664	1,714	1,766	-	4,950	
Internal Rate of Return (After-Tax)	8.6%															

* See report for additional information on endowment funding

** See report for additional information on technical studies

Sharp Park Conceptual Restoration Alternatives Report

November 2009

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Sharp Park Conceptual Restoration Plan
Executive Summary

BACKGROUND

Sharp Park is a 417-acre multiple use facility owned and maintained by the City of San Francisco, Recreation and Parks Department (SFRPD), and located in Pacifica, CA. One of the park's most prominent natural features is a wetland complex located at the west end of the park. The wetland complex consists of a lagoon (Laguna Salada), a pond (Horse Stable Pond), and a channel that connects the two bodies of water. The US Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) have identified the wetland complex at Sharp Park as important habitat for the endangered and fully protected San Francisco garter snake (SFGS) *(Thamnophis sirtalis tetrataenia)* and the California red-legged frog (CRLF) *(Rana draytonii)*. Habitat quality for the SFGS and CRLF in the wetland complex has been steadily diminishing for several reasons, including sedimentation, reduced open water habitat, overgrowth of emergent wetland plant communities, and lack of adjacent upland habitat.

PURPOSE

Both the USFWS and CDFG have recommended that SFRPD develop recovery actions to ensure the continued survival of populations of the SFGS and CRLF in Sharp Park. The purpose of preparing this conceptual plan is to develop and evaluate various alternatives for restoring SFGS and CRLF habitat within the wetland complex, the area surrounding the wetland complex, and the entire golf course area. The primary goal of each conceptual alternative was to propose an effective way of increasing upland habitat adjacent to existing or proposed wetland habitat, to restore the quality of existing wetland habitat, and to evaluate and respond to the changes such actions would require of the existing golf course design and operation.

METHODS

Studies were performed to assess the presence or absence of the SFGS and CRLF, and to evaluate the quality of their habitat within the wetland complex. These studies are reported in Appendix C of the conceptual planning report. Hydrologists prepared studies to assess the hydrological features of the wetland complex and to assist in making restoration recommendations (Appendix A). A golf course designer prepared various realignment options for the 18-hole and 9-hole alternatives and worked with the restoration planners to accommodate needed habitat expansion areas. A local engineering firm prepared topographic and bathymetric maps of the wetland complex and surrounding area.

The information in these studies was used to define the problem and develop measures to enhance the quality of habitat for the SFGS and CRLF, to reduce the potential that these species would be harmed by golf course practices or by other park users, and to assess the differences in habitat value between an 18-hole golf course, a 9-hole golf course, and golf course closure.

ALTERNATIVES

The common component of all alternatives is restoration of the wetland complex. Under all alternatives, similar features are proposed to restore wetland habitat and reduce the potential for recurrence of the problems that now occur, which include sedimentation, eutrophication due to dead and decaying vegetation, loss of open water habitat, and flooding of fairways. Implementing the restoration actions below would accomplish the main goal of the project, which is to enhance CRLF and SGFS habitat.

- **Dredging to remove sediment and decaying vegetation**. The areas that are currently open water within the lagoon would be deepened by up to 2 feet, and open water areas within the pond by up to 3 feet.
- **Recontouring the shoreline to create shallow water habitat**. The eastern edge of the lagoon, the edges of the connecting channel, and the north and south edges of the pond would be contoured to create shallow water habitat (1-3' deep) to allow for CRLF breeding habitat.
- **Creation of an upland peninsula.** A peninsula of approximately 2 acres will be created in the middle of the lagoon to create additional upland habitat for the SFGS and shallow water habitat for the CRLF.
- **Construction of upland mounds**. Upland mounds will be created on the east and south sides of the lagoon and in the dispersal corridor between the lagoon and the pond.
- **Pump Operations.** Altering the methods of operating pumps and other measures to control hydrological features is proposed under all alternatives.
- **Upland/Aquatic linkage and habitat segment.** A habitat linkage area between the lagoon and the pond would be constructed with native upland vegetation and mounds designed to allow SFGS movement and resting between the lagoon and the pond.
- **Completion of a Compliance Plan.** SFRPD has completed a compliance plan that is designed to avoid mortality and injury of SFGS and CRLFs resulting from maintenance and operations of the golf course (SFRPD 2009).
- **Closure of Hole 12.** Hole 12 would be closed under all alternatives to allow for creation of an upland habitat corridor between the lagoon and the pond/Mori Point area.
- **Catchment Basins**. To slow the rate of sedimentation from upstream sources, sediment catchment basins would be installed in two locations, one near the mouth of Sanchez Creek and the other on City of Pacifica property just outside the northern boundary of the Sharp Park.
- **Fencing**. All alternatives include installation of a post and rail fence along the seawall to the west of the lagoon, according to the Draft Compliance Plan. The wetland complex would also be fenced to discourage intrusion by humans or domestic animals, although the configuration of the fence may vary according to the alternative.
- **Revegetation**. Uplands, wetland, and shallow aquatic areas would be revegetated with an appropriate mix of native plant species.

DESCRIPTION OF ALTERNATIVES

Alternative A18

This alternative is intended to fulfill the recovery goals for the snake and frog while maintaining as much of the current golf course configuration as possible. In addition to the measures described above, Holes 10 and 13 would be slightly shortened and/or narrowed, and a new hole would be created near the rifle range/ archery course east of Highway 1. The area on the west side of the lagoon would be restored from its degraded condition to native upland habitat. Portions of the fairways in holes 10, 14 and 15 would be raised to 10.0' NAVD 88 from their current elevation of between 6.5' and 9.0', and hole 18 would be raised to allow a 2% slope relative to hole 14. In addition to the restoration of the entire wetland complex, this alternative would result in restoration or creation of 10.7 acres of California red-legged frog breeding / San Francisco garter snake primary foraging habitat and 23.4 acres of San Francisco garter snake upland basking / retreat habitat, all of which would be found either adjacent to the wetland complex or between the pond and the lagoon. Estimated construction costs for this alternative range from $5.9M (all excavated materials reused onsite) to $11.3M (all excavated materials hauled offsite).

Alternative A-9

This alternative is intended as a compromise between golf considerations and expanded upland areas east of the main body of the lagoon, and to increase opportunities for recreational pursuits other than golf. In addition to implementing the measures common to all alternatives, all holes bordering the wetland complex would be closed and restored to coastal scrub/shrub habitat. Three holes (1, 8, and 9) would remain west of Highway 1, along with a driving range and teaching area, and two new holes would be constructed at the rifle range. All existing holes east of Highway 1 would remain in their current location. In addition to the restoration of the entire wetland complex, this alternative would result in restoration or creation of 10.7 acres of California red-legged frog breeding / San Francisco garter snake primary foraging habitat and 44.3 acres of San Francisco garter snake upland basking / retreat habitat, much of which would be constructed at a greater distance from the wetland complex than the upland habitat restored under Alternative A18. Estimated costs for this alternative range from $7.8M (all excavated materials reused onsite) to $15.6M (all excavated materials hauled offsite).

No Golf Alternative (Alternative A-0)

This alternative was developed with the goal of maximizing the amount of available upland habitat for the snake and frog in the absence of golf operations. Because the lack of suitable upland habitat was identified as the limiting factor for the snake, the golf areas would be converted into uplands. Enhancements to wetland areas in lower Sanchez Creek and the wetland complex would be identical to those in Alternatives A18 and A9. Water from Sanchez Creek would be captured in two shallow ponds to provide additional breeding habitat for the CRLF. In addition to the restoration of the entire wetland complex, this alternative would result in restoration or creation of 11.3 acres of California red-legged frog breeding / San Francisco garter snake primary foraging habitat and 97.4 acres of San Francisco garter snake upland basking / retreat habitat, much of which would be constructed at a greater distance from the wetland complex than the upland habitat restored under Alternatives A18 or A9. Estimated costs for this alternative range from $9.0M (all excavated materials reused onsite) to $22.2M (all excavated materials hauled offsite).

FINDINGS AND CONCLUSIONS

Habitat requirements of the SFGS vary throughout the year, and include foraging habitat and nearby upland retreats located in underground burrows and soil crevices, typically located in a grassland-shrub community. Upland habitat for this species at Sharp Park is restricted to a small area south of Horse Stable Pond. The lack of suitable upland habitat is therefore a primary limiting factor in ensuring the persistence of the SFGS at Sharp Park. The SFGS population may have also been affected by wave overwash, collecting, predation, and golf course maintenance practices.

The CRLF usually occurs in or near quiet permanent water of streams, marshes, ponds, and lakes, in habitats characterized by dense, shrubby riparian vegetation. The primary limiting factor for the CRLF in the Sharp Park wetland complex is a vegetation structure that is not conducive to successful breeding and/or recruitment of larval stages into the adult population. The dense emergent vegetation found in the lagoon and pond combined with little remaining open water offers poor habitat for the survival of egg masses or tadpoles.

With no action, the future of SFGS at Sharp Park is, at best, uncertain. Although historically SFGS have existed at Sharp Park while it functioned as a golf course, conditions of the wetland and adjacent uplands are far less favorable than in the past. Though beneficial, increasing CRLF breeding habitat alone will not increase the distribution and carrying capacity of the SFGS, due to the limited availability of upland habitat in Sharp Park. Increasing SFGS use of the area north of Horse Stable Pond, the areas adjacent to Laguna Salada, and the connecting canal will require maintaining undisturbed upland habitat in and between these areas. These enhancements can be accomplished without significant changes to the golf course design or to the movement of golfers on the course.

All three alternatives will achieve the habitat goals. The main differences between the various alternatives are the degree of upland habitat that would be created east of the wetland complex, the costs to implement the respective alternatives, and the tradeoff between the amount of habitat and the degree to which golf opportunities are lost. Implementing Alternative A-18 would be the least costly alternative, would result in the least impact to golf, and would restore the least amount of upland habitat. Implementing Alternative A-9 would cost more and restore more upland habitat than Alternative A-18 but would cost less and restore less upland habitat than the No Golf Alternative. Implementing the No Golf Alternative would have the highest costs, would result in the greatest impact to golf, and would restore the greatest amount of upland habitat of the three alternatives. However, because the best upland habitat for the SFGS is that which is found near water bodies, much of the upland habitat located east of the wetland complex would be of lower value than that located immediately adjacent to the wetland complex. Therefore, from a habitat restoration standpoint, converting uplands immediately adjacent to the wetland areas would result in the greatest net benefit to the SFGS per acre of enhanced habitat. Focusing restoration efforts on these areas also would result in the least amount of lost golf opportunities since more distant habitat would remain available for golf.

Although the value of the habitat gained through the No Golf Alternative would diminish with increasing distance from the wetland complex, the cost of restoring this habitat would not. Considering that there are limited funds available for a myriad of restoration projects in the Bay Area, extra money that would be required to restore habitat further from the wetland complex may be better spent elsewhere. Furthermore, because of the close proximity of Sharp Park to urban features including housing, highways, major roads, and businesses and the intrinsic threats posed by them to the SFGS, more extensive upland restoration carries its own risks. Restoring uplands and locating additional wetland further to the east of the wetland complex would potentially increase the chance of take of this species by drawing the SFGS away from the relatively protected existing wetland complex into areas that would likely be extensively used by hikers, mountain bikers, and dog walkers. Finally, in the event of a seawall breach or overtopping of the seawall by storm surge, it is the connection to upland habitat at Mori Point, rather than restored golf areas east of the lagoon, that will be of critical importance to the SFGS. This fundamental aspect is met by all alternatives.

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List of Acronyms

California Department of Fish and Game	(CDFG)
California Red Legged Frog	(CRLF)
California Environmental Quality Act	(CEQA)
City of San Francisco, Recreation and Parks Department	(SFRPD)
Clean Water Act	(CWA)
Endangered Species Act	(ESA)
Environmental Impact Report	(EIR)
Golden Gate National Recreation Area	(GGNRA)
Kamman Hydrology and Engineering, Inc.	(KHE)
National Wetland Inventory	(NWI)
Nationwide Permit	(NWP)
Phil Williams and Associates et al.	(PWA)
Regional Water Quality Control Board	(RWQCB)
San Francisco Garter Snake	(SFGS)
San Francisco Recreation and Parks Department	(SFRPD)
Significant Natural Resource Areas Management Plan	(SNRAMP)
Significant Natural Resource Areas Program	(SNRAP)
Swaim Biological, Inc.	(SBI)
US Army Corps of Engineers	(USACE)
US Fish and Wildlife Service	(USFWS)

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1. INTRODUCTION

Sharp Park is a 417-acre multiple use facility owned and maintained by the City of San Francisco, Recreation and Parks Department (SFRPD). Its main use is as an 18-hole golf course, of which 14 holes are on the west side of Highway 1, and 4 holes are east of Highway 1. Sharp Park also offers an archery course, opportunities for bird watching, and walking and cycling on the seawall that is found on the west side of the park. Sharp Park is located in San Mateo County near the City of Pacifica, California (Figure 1).

One of the most significant features of Sharp Park is a wetland complex at the west end of the park. The wetland complex consists of Laguna Salada, Horse Stable Pond, and a channel about 1,000 feet long that connects the two water bodies (Figure 2). Laguna Salada (the lagoon) is a large freshwater lagoon of approximately 27 acres which offers open water and marsh habitat for numerous wildlife species. Horse Stable Pond (the pond) is smaller than the lagoon but still offers viable wildlife habitat. Although the connecting channel is shallower than the lagoon and the pond and is overgrown with emergent vegetation, it still offers a viable aquatic corridor between the pond and lagoon under most conditions.

The US Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) have identified the wetland complex at Sharp Park as important habitat for the endangered and fully protected San Francisco garter snake (SFGS) *(Thamnophis sirtalis tetrataenia)* and the California red-legged frog (CRLF) *(Rana draytonii)*. Although historically these species have existed at Sharp Park while it functioned as a golf course, conditions of the wetlands and adjacent uplands are far less favorable in than in the past. Both agencies have recommended that SFRPD enhance habitat conditions in and around the wetland to ensure the viability of the population of the populations of these species that are found there, and take measures to reduce the possibility of harm to these species (referred to as "take").

This conceptual plan was originally conceived to serve as a template to restore the wetland complex and immediate upland area as part of a recovery action recommended by CDFG and USFWS. In response to later events, the scope of this plan was increased to encompass restoration alternatives throughout the park, focusing mainly on the wetland complex and on those areas used for golf. Ultimately, 3 restoration alternatives were developed, including an 18-hole alternative, a 9-hole alternative, and a No Golf Alternative, under which the entire golf course would be closed and restored to native habitat.

The primary goal of each conceptual alternative was to propose an effective way of increasing upland habitat adjacent to existing or future aquatic habitat, to restore the quality of the wetlands, and to evaluate and respond to the consequences of such a change to the existing golf course design and operation. The objectives of this conceptual restoration plan are to describe the existing resources, develop possible restoration alternatives, assess the extent to which each alternative could increase the value and extent of habitat for the SFGS and CRLF, to give an estimate of construction costs for each alternative, and to describe the process that would need to occur to partially or completely restore the wetland complex and golf areas. Changes in mowing, golf operations, and maintenance practices that are intended to reduce the chance of take of listed species were addressed as part of a separate compliance plan completed by SFRPD in 2009.

The wetland restoration components are similar across all alternatives, but the degree of upland restoration varies considerably for each alternative. The primary components of the restoration plan are as follows:

> **Dredging.** Much of the wetland complex would be dredged to remove accumulated sediments and biomass. Dredging various parts of the wetland and open water areas will inhibit the growth of the type of emergent vegetation that now fills in the wetland complex. Dredging plans will be designed to maximize foraging and breeding habitat for the SFGS and CRLF, while minimizing future maintenance requirements, resulting in lower costs to the City as well as reduced habitat disturbance in the future. Dredge spoils will be reused onsite to the degree possible.

Project Location

Sharp Park Conceptual Restoration Plan

Pacifica, CA

Figure 1

TETRA TECH

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Sharp Park General Features

Sharp Park Conceptual Restoration Plan

Pacifica, CA

Figure 2

TETRA TECH

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Habitat Conversion The main limiting factor in terms of habitat for the SFGS is lack of suitable upland habitat immediately adjacent to the lagoon. The SFGS needs basking and resting habitat, with escape cover (vegetation) and burrows for retreat from daily thermal extremes, at or near its main foraging habitat, which is found where frogs congregate. All alternatives call for converting some areas of the golf course and the existing wetlands to upland habitat needed by the SFGS for basking and resting, and allowance for development of rodent burrow complexes in appropriate locations. The main objective would be to establish a habitat linkage for SFGS between the lagoon and the pond and adjacent upland areas at Mori Point, located south of the wetlands complex. Wetlands that are converted to uplands during this process would be replaced onsite.

Public access to sensitive wetland and upland areas would be controlled by installation of a post and rail fence, but would also be enhanced under some alternatives by creation of a walking trail around all or part of the lagoon, a boardwalk over wetlands and uplands between the lagoon and the pond, and interpretive signs or kiosks at various vantage points. Restoring an upland peninsula in the center of the lagoon will increase valuable edge and shallow water habitat over current conditions.

As the public agency charged with providing and maintaining recreational facilities for the City of San Francisco, SFRPD balances resource management with recreational concerns. To help meet this goal, SFRPD created the Significant Natural Resource Areas Program (SNRAP). The SNRAP manages 31 natural areas, 30 of which are within the City of San Francisco and one (the wetland complex at Sharp Park) in Pacifica. The mission of this program is to preserve, restore, and enhance the Natural Areas and promote environmental stewardship of these areas.

Under this program, the wetland complex is being and will be managed and protected for the natural and human values it provides. Therefore, every effort has been made to develop a conceptual plan that would maintain and restore viable, high-value habitat for the SFGS and CRLF while retaining as many recreational features as possible. Management planning for the wetland complex and all other Natural Areas managed under this program is detailed in the Significant Natural Resource Areas Management Plan (SNARMP, SFRPD 2006). The plan is intended to guide natural resource protection, habitat restoration, trail and access improvements, and maintenance activities over the next 20 years.

SFRPD is in the process of preparing an Environmental Impact Report (EIR) in accordance with the California Environmental Quality Act (CEQA) to assess the potential effects of implementing the SNARMP. Assessing the environmental, cultural, recreational, and economic effects of implementing the recommended wetland restoration actions within the natural areas at Sharp Park will be an integral part of the EIR. Consideration of actions proposed outside of the natural areas would occur during separate CEQA documentation.

1.1 Preparation of the Conceptual Plan

This conceptual plan was created as a collaborative effort between SFRPD, Swaim Biological, Nickels Golf, and Tetra Tech, Inc. Public agencies including California Department of Fish and Game and US Fish and Wildlife Service were involved from the earliest phases of the project, and assisted with setting the goals of the project. Staff from the Golden Gate National Recreation Area (GGNRA) and the City of Pacifica added local knowledge and planning assistance during the conceptual planning process.

Tetra Tech is an environmental consulting firm with staff that specialize in preparation of natural resource management plans and wetland restoration plans. For this project, Tetra Tech is assisting SFRPD with project management, restoration design, engineering and cost estimating, assessment of general biological resources, and regulatory compliance and permitting. Tetra Tech's team includes Swaim Biological, who surveyed the wetland complex area for the presence of SFGS and CRLF and their habitat, and assisted in preparing recommendations for restoration of habitat; Kamman Hydrology, who assessed and reported the hydrological features of the park, and provided recommendations for various restoration alternatives; and Nickels Golf Group, who prepared the golf course realignment alternatives. A local engineering firm was hired to prepare a topographical map of the wetland complex.

As part of the preparation of this conceptual plan, studies were completed to document topographic and hydrologic conditions and to determine the extent to which the marsh complex and surrounding areas are used by the snake and the frog during their lifecycle. At the same time, a golf course designer prepared a number of alternative golf course alignments that could be implemented to adjust the amount of available habitat while maintaining an attractive and challenging golf environment. A wetland delineation was conducted to determine the extent to which wetlands or other waters of the US under the jurisdiction of the US Army Corps of Engineers are found in the project area.

The information in these studies was used to develop measures to increase or maintain the amount and quality of habitat for the SFGS and CRLF, to reduce the potential that these species would be harmed by golf course practices or by other park users, and to assess the differences in habitat value between an 18-hole golf course, a 9-hole golf course, and golf course closure. One 18-hole alternative (Alternative A18) and one 9-hole alternative (Alternative A9) were brought forward for assessment. A single alternative (the No Golf Alternative) was also developed to assess closing the golf course and converting the fairways to upland habitat. The alternatives are described in detail in Section 4.

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2. HISTORICAL CONDITIONS

Prior to the development of the Sharp Park Golf Course beginning in the 1920s, the Laguna Salada site was characterized by ranch lands, sand dunes, and a large lagoon (PWA 1992). Although it is likely that some freshwater wetlands existed behind the dunes, the common name of Laguna Salada (Salty Lagoon) suggests that the lagoon was formerly brackish to saline. In one of the early photographs of the region, a small channel that connected the lagoon with the Pacific Ocean can be seen, along with a shoreline of relatively low relief.

A direct hydrologic connection between the lagoon and the ocean was eliminated with the construction of the golf course and the seawall. To avoid flooding the golf course, tidal exchange was eliminated and runoff from the watershed has been pumped into the ocean from a location at the pond since 1941. The elimination of saline water allowed the establishment of saline-intolerant vegetation such as cypress, grasses, and shrubs for bank stabilization and landscaping purposes. However, salts in bottom sediments persist and make the lagoon and the pond slightly saline, a condition which increases as water levels decline throughout the drought period (Kamman 2009). An abandoned gravity flow outlet which was once used to convey overflow from the pond to the ocean is still in place, but the outboard end is covered by several feet of sand. It is possible that small amounts of seawater enter the pond through this pipe during very high tides.

Considerable shoreline erosion has occurred along the Laguna Salada shoreline since completion of the Sharp Park Golf Course in 1932. This unarmored earthen seawall was constructed between 1941 and 1952 to prevent waves from overtopping the shoreline and damaging the golf course (PWA 1992). This embankment was repeatedly breached by storm waves, allowing the former natural process of wave overwash to occur and damage fairway landscaping.

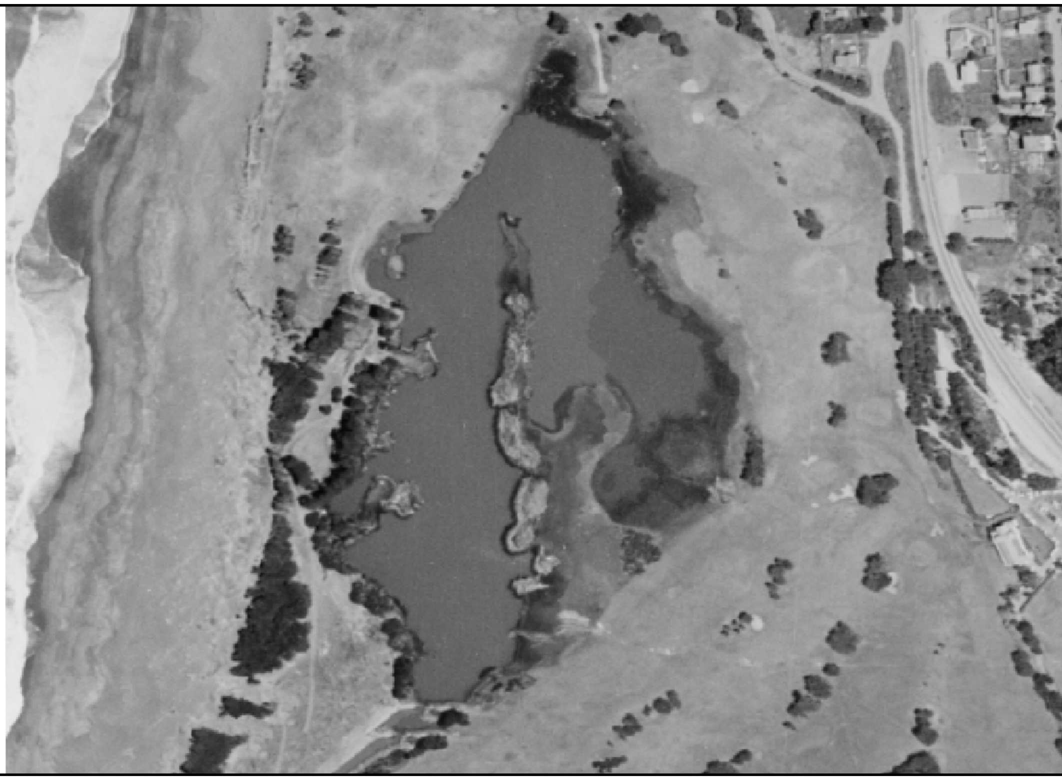
The most severe erosion occurred in 1983 when most of the embankment was eroded and wave overwash carried sand onto the golf course fairways and into the lagoon. It was estimated that nearly half of the 200-300 feet of shoreline lost between 1931 and 1984 occurred between 1978 and 1984, and largely due to the 1983 event (PWA 1992). The seawall was rebuilt after this event, and is being assessed by geotechnical experts under separate contract with SFRPD.

Flooding of the golf course has been a recurrent problem since the 1940s. In 1958, most of the golf course was submerged by a combination of wave overwash and storm inflows. In addition to damaging the golf course, increased salinity due to overwash may have been lethal to the CRLF and may have resulted in a near lack of SFGS prey during periods when the lagoon was too saline. A pump system was installed in 1941 to control the water level in the lagoon by pumping runoff to the ocean. Since the 1940s, the pump system has been augmented to pump up to 11,500 gallons per minute (GPM). Simulated storm models (Appendix A) show that this capacity is exceeded by rainfall events at or greater than 2-year recurrence intervals.

A defunct gravity flow drain is located at the pond, but currently does not function to remove stormwater. Reconstructing this drain would involve placing a new pipe through the seawall, over or through the beach on concrete footings placed on bedrock, and extending far enough into the surf to ensure that the outlet would not become buried in sand. Estimated costs for rebuilding this feature are between $400-800k. Rebuilding this structure would help to alleviate some of the flooding problems that are attributed to pump limitations.

The presence of the SFGS at Laguna Salada was documented as early as 1946 (Fox 1951). Although the CRLF was not considered rare at the time, their presence was also documented in 1946 as one was present in the stomach contents of an SFGS at the lagoon (Wade Fox, unpublished field notes). Comparing recent survey reports (Swaim, 2004 and 2008) to earlier reports (Fox 1951) indicates that the population of SFGS at Laguna Salada and likely at Horse Stable Pond has declined since early records of the presence and abundance of this species were recorded in 1946. This may be due to many factors including the sedimentation of the lagoon, the conversion of upland habitat surrounding the exterior of the lagoon to golf fairways and greens, and illegal collecting of the species until listing in 1973. Barry (1978) suggested illegal collecting was one of the main factors in the decline of SFGS there, based on his interviews with reptile dealers. Field notes maintained by Wade Fox and obtained from the Museum of Vertebrate Zoology indicated that as early as 1946, the lack of upland habitat for SFGS was apparent. However, conditions were still such that Fox collected 44 specimens of SFGS at the lagoon over 1946 and 1947, over 15 years after the golf course was built and operating. In 1979, 37 SFGS were located in the wetland area adjacent to Horse Stable Pond and 46 in the Mori Point "bowl area" (Barry 1979). This indicates that at that time, the wetland complex, primarily Horse Stable Pond, was still supporting a relatively abundant population of SFGS. It was not until after the 1983 storms that a precipitous decline in SFGS in the Horse Stable Pond and Mori Point area was documented (McGinnis 1986; 1988, 1991, 1997).

Ongoing sedimentation of the lagoon has increased as sediment from the watershed is no longer flushed into the ocean during tidal surges or large storms. Sediment sources include erosion of dirt roads and parking areas, as well as natural input from erosion of Sanchez Creek and lightly vegetated hillsides. This has resulted in a higher bottom elevation of the wetland complex over time, allowing shallow emergent vegetation to spread at the expense of open water. Aerial photographs of the lagoon in 1956 and 2007 show the extent to which the open water part of the lagoon has converted to vegetated wetland (Figure 3).



1956

2005

Aerial Photos From 1956 And 2005

Sharp Park Conceptual Restoration Plan

Pacifica, CA

Figure 3

TETRA TECH

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3. EXISTING CONDITIONS

Assessment of historic aerial photographs of the Laguna Salada area indicates that prior to development of the Sharp Park Golf Course and the seawall located west of the wetland complex, environmental conditions at the project site were representative of a coastal lagoon system. Environmental changes during subsequent decades have modified the hydrologic characteristics of the system by isolating the lagoon and adjacent wetlands from the ocean.

The wetland complex at Sharp Park provides extensive habitat for the SFGS and the CRLF. SFGS habitat quality in the marsh complex is enhanced by its proximity to upland areas at Mori Point, located to the south of the lagoon and pond (Figure 2). The SFGS has been identified at Laguna Salada since at least 1940 (Fox 1951), but the importance of the population that occupies the area has gained more attention in recent years since the successful restoration of SFGS habitat at Mori Point and as other important habitat areas have been reduced in size or value.

Sharp Park's location near several open space areas makes it an important part of the overall distribution of SFGS and CRLF on the San Francisco Peninsula. The Golden Gate National Recreation Area (GGNRA) borders Sharp Park on the southwest and supports SFGS and CRLF. Habitat enhancement projects in 2004, 2005, and 2007 increased the amount of breeding habitat for CRLF and foraging habitat for SFGS at Mori Point. Trapping studies conducted in 2004, 2006, and 2008 have shown that the new ponds are being used by resident SFGS populations (Swaim Biological, Inc. 2008). Additional CRLF habitat is found at Sweeney Ridge, which lies to the east and southeast and provides habitat for the CRLF. SFGS were recently reconfirmed at the north end of San Andreas Reservoir, just east of Sweeney Ridge (SBI 2008 [unpublished]). To the north of Sharp Park, Milagra Ridge in the GGNRA supports CRLF and contains habitat suitable to support SFGS. To the south, beyond Mori Point, the Calera Creek watershed supports a large population of CRLF and also includes potential habitat for the SFGS. Individual SFGS and CRLFs probably move between some or all of these sites, and Sharp Park provides suitable habitat for dispersal and foraging for both species, as well as being a source population for CRLF.

3.1 WATERSHED CHARACTERISTICS

The natural watershed of Sanchez Creek includes 844 acres (1.3 square miles) (PWA 1992). The watershed consists of moderate to steep slopes in the upper watershed (Sweeney-Minchizo soil series) and flatter floodplain terraces (Tunites or Lockwood soil series) near the coast (PWA 1992). Most of the flatter terraces have been developed for residential, road, or golf course use, while most of the upper watershed remains undeveloped. The watershed is drained by Sanchez Creek, which extends approximately 1.7 miles between Horse Stable Pond and the watershed divide. Annual precipitation in the area ranges from about 29.5 inches annually at the coast to 30.5 inches annually at the watershed divide.

3.2 TOPOGRAPHY

Topographic information was reproduced on AutoCAD drawings that reflect the locations of thousands of vertical points taken by a roving, survey-grade GPS. Points were tied to five control points which were checked with a Total Station unit. Points in aquatic areas were taken by surveyors in a boat using a rod and level. In aquatic areas, bathymetry lines were produced at 0.5 foot contour intervals, and topographic lines outside of aquatic areas were produced at 1.0 foot contour intervals (Figure 4). Because the project originally only included the marsh complex and its immediate surroundings, topographic and bathymetric information at these contour intervals is not available beyond these areas. USGS topographic contour maps at 5 foot contours have been used for other aspects of the conceptual plan, including development of alternative fairway alignments east of Highway 1.

The bathymetric survey determined the range of depths for all the aquatic features at the project site. The aquatic features including Laguna Salada and surrounding wetlands range from 0 to 7.5 feet (NAVD 88). The aquatic features including Horse Stable Pond and surrounding wetlands range from 3 to 9.5 feet (NAVD 88). The open water portion of the connecting channel ranges from 3 to 7 feet (NAVD 88). Cross sections and profile locations are shown in Figure 5, and topography/bathymetry at each cross section and along the profile is depicted in Figures 6-11.

3.3 HYDROLOGY

In combination with topography, the hydrology of the wetland complex creates the physical habitat which supports the vegetation and wildlife resources in this area. Water levels in the wetland complex, which is found in the lowest part of the park, are maintained primarily by groundwater, but are augmented in the rainy season by storm flows. The main components of the hydrologic system are described below.

Laguna Salada

Laguna Salada, the main component of the wetland complex, consists of an open water pond and adjacent emergent wetland occupying about 27 acres. The lagoon has a bottom elevation of between 0 and 2.5 feet, and is up to 7.5 feet deep under normal circumstances.

Horse Stable Pond

Horse Stable Pond, located at the south end of the wetland complex, consists of an open water pond and a freshwater wetland, which extends between the shoreline levee on the west and about 500 feet east to the housing subdivision. The pond is considerably smaller and shallower than the lagoon, with bottom elevations between 3 and 5 feet and typical water depths ranging from 1 to 3 ft.

Horse Stable Pond is fed by Sanchez Creek, which enters from the east, and Laguna Salada, which enters from the north via a connecting channel. Some surface water likely also enters from Mori Point, located to the south.

Connecting Channel

A meandering channel approximately 1,000 ft. long connects the lagoon with the pond and allows for bidirectional flow under all but the lowest water levels. Although the true bottom of this channel is at approximately 3’ (NAVD 88), dead and decaying vegetation has raised the functional floor and provides a platform from which rooted emergent grows across most of the channel.

Sanchez Creek

Sanchez Creek is about 1.5 miles long and drains the 844 acre (1.3 sq. mile) watershed. The creek flows under Highway 1 just south of the Fairway Drive exit and is alternately culverted and daylighted across the golf course. Under original conditions, Sanchez Creek was approximately 5-7 feet wide and had a narrow riparian zone on either side.

Topography And Bathymetry

Topography displayed at 1.0' intervals
Bathymetry displayed at 0.5' intervals

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Pacifica, CA

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Figure 4

Legend

Contours

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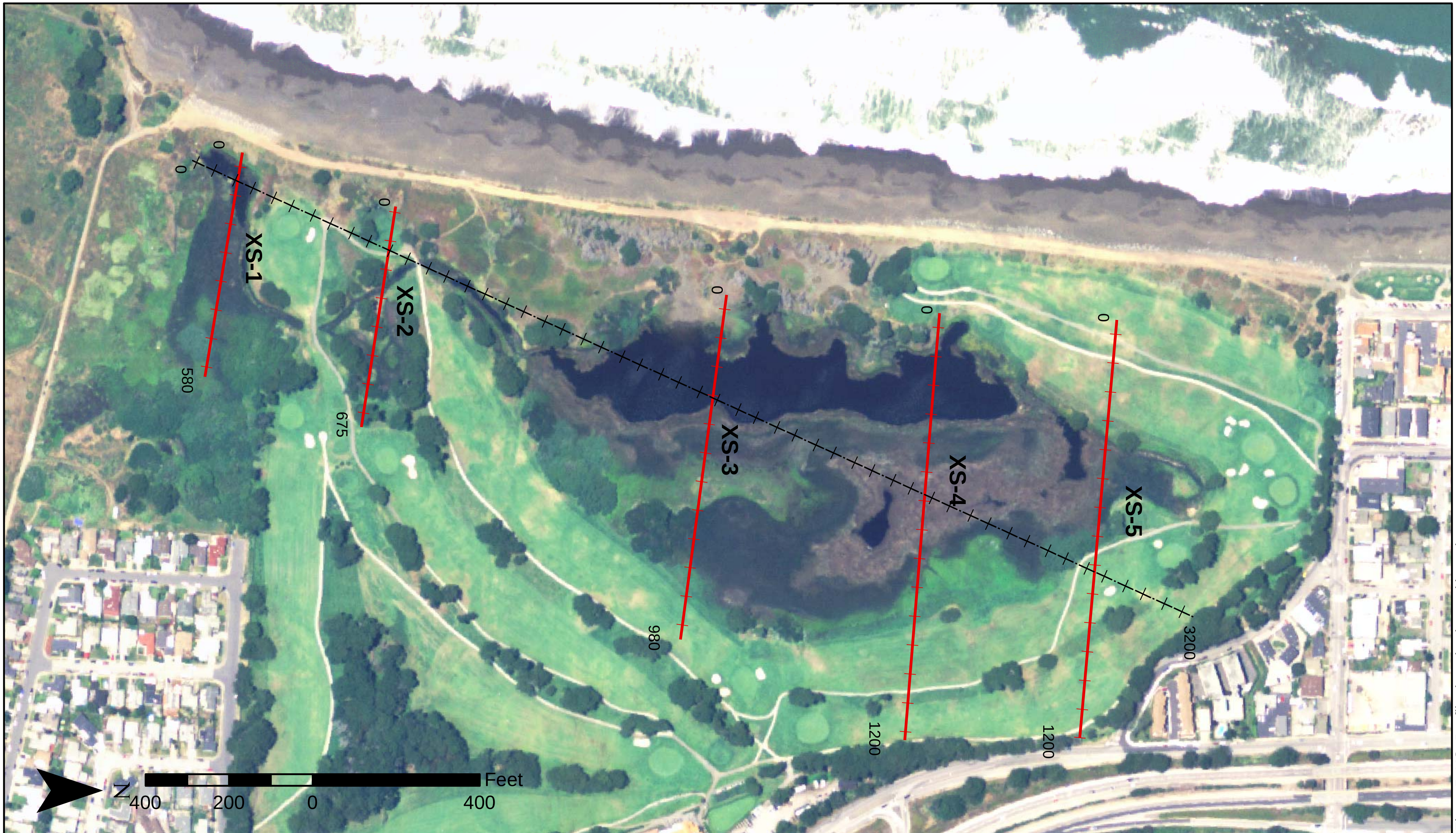

Cross Section And Profile Locations

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Figure 5

TETRA TECH

-+-+-	Profile
—+—	Cross Section

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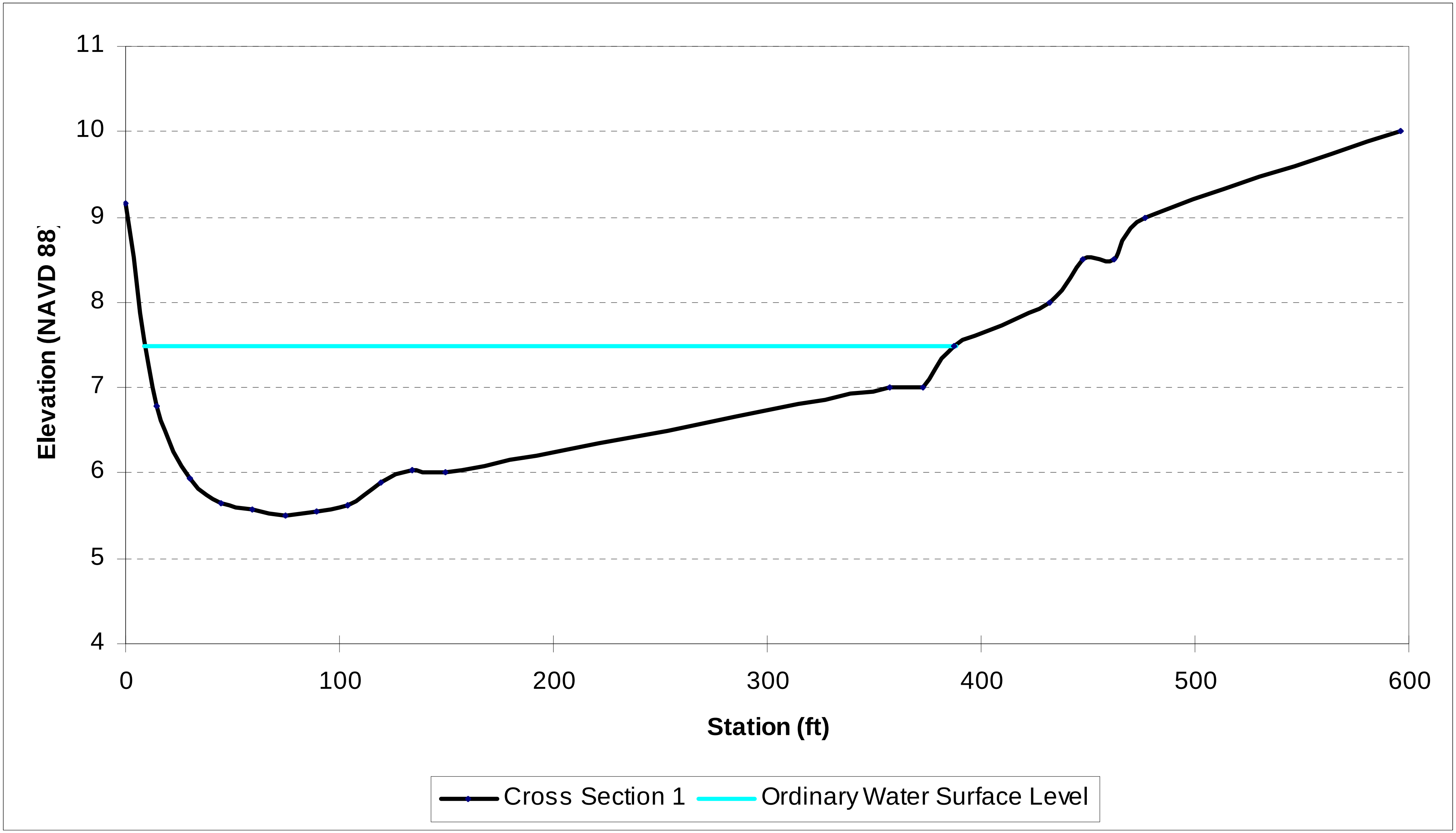

Cross Section 1
(Refer to Figure 5 for cross section locations)

Figure 6

Sharp Park Conceptual Restoration Plan
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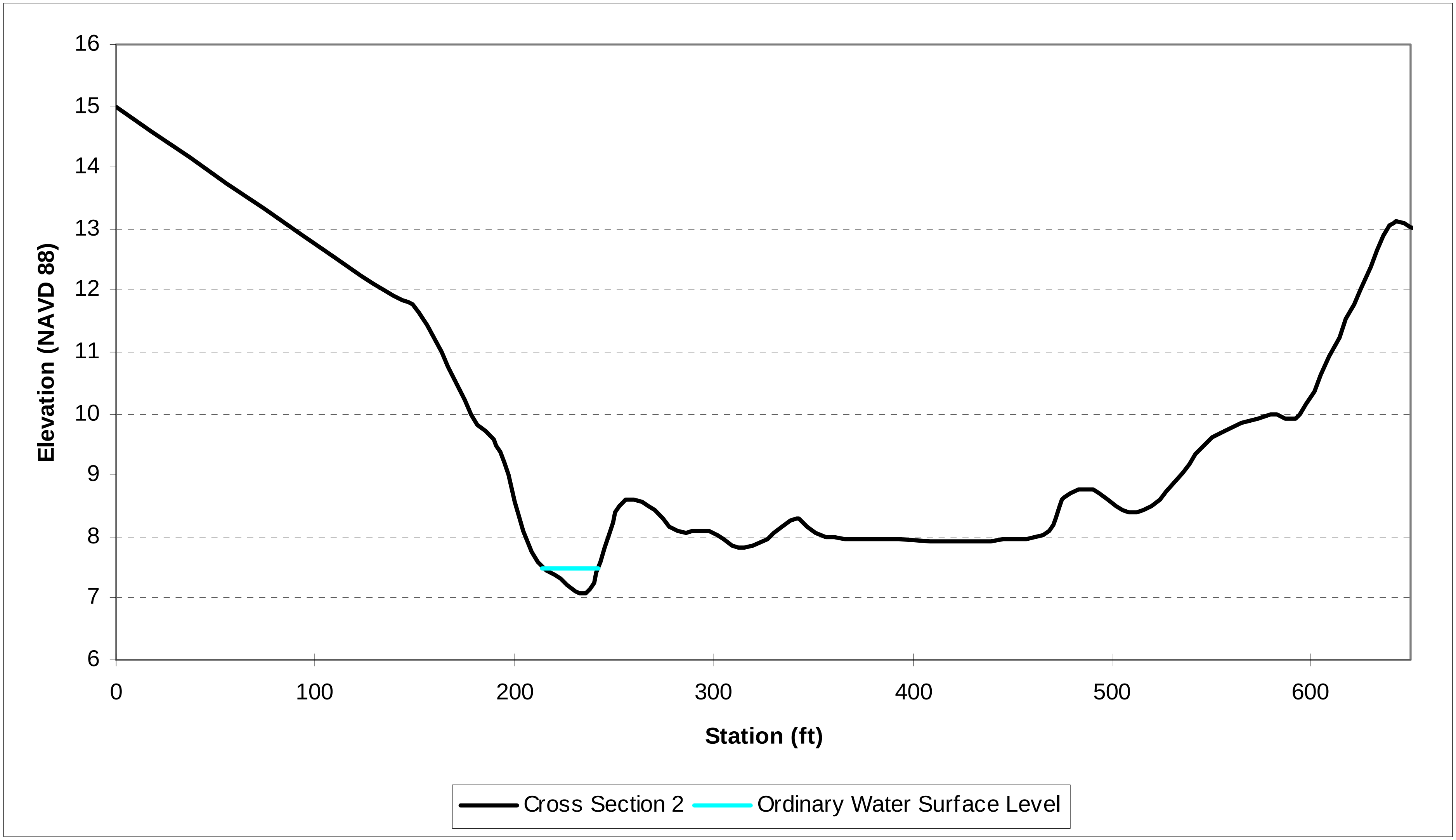

Cross Section 2
(Refer to Figure 5 for cross section locations)

Sharp Park Conceptual Restoration Plan

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Figure 7

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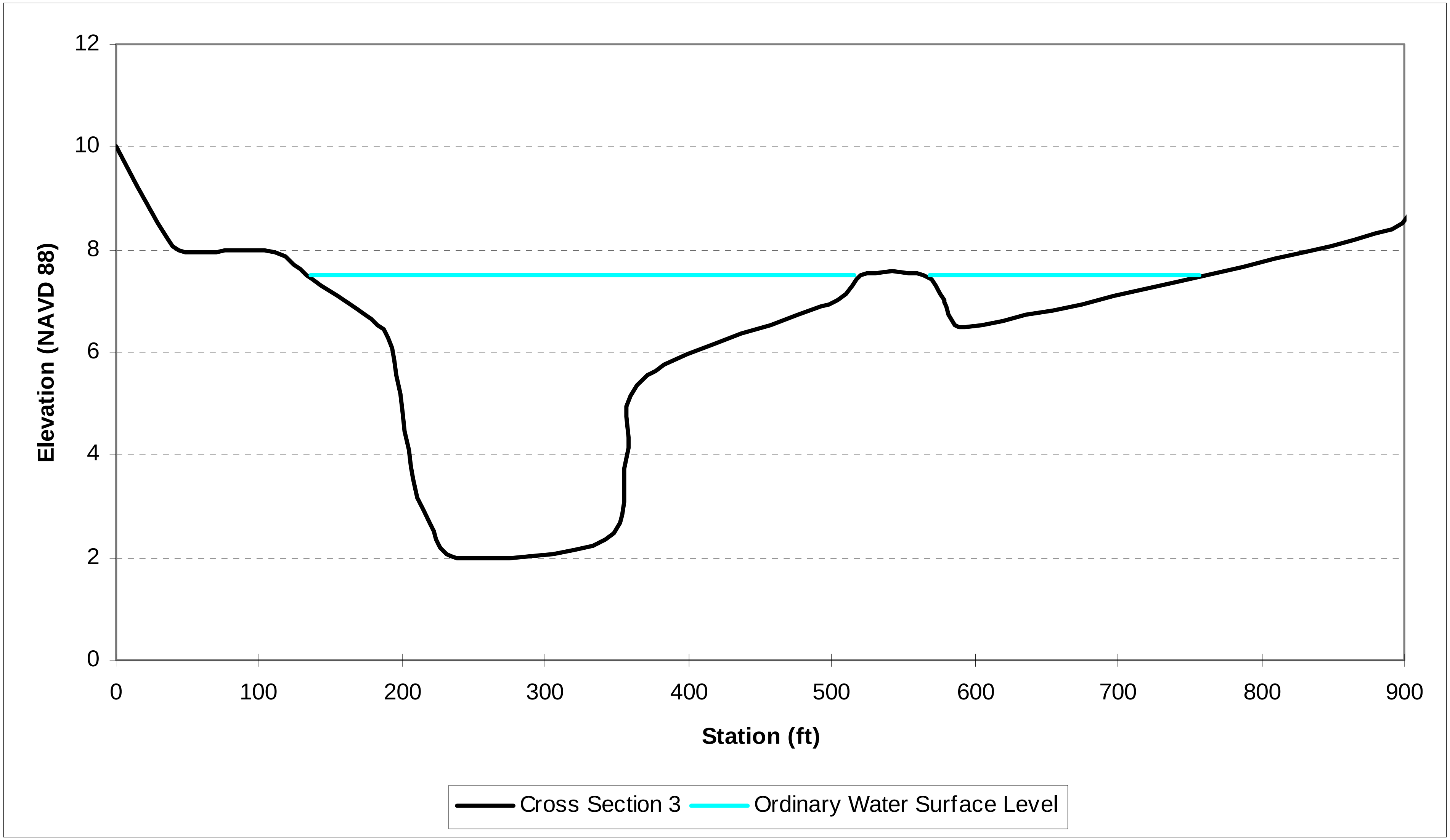

Cross Section 3
(Refer to Figure 5 for cross section locations)

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Figure 8

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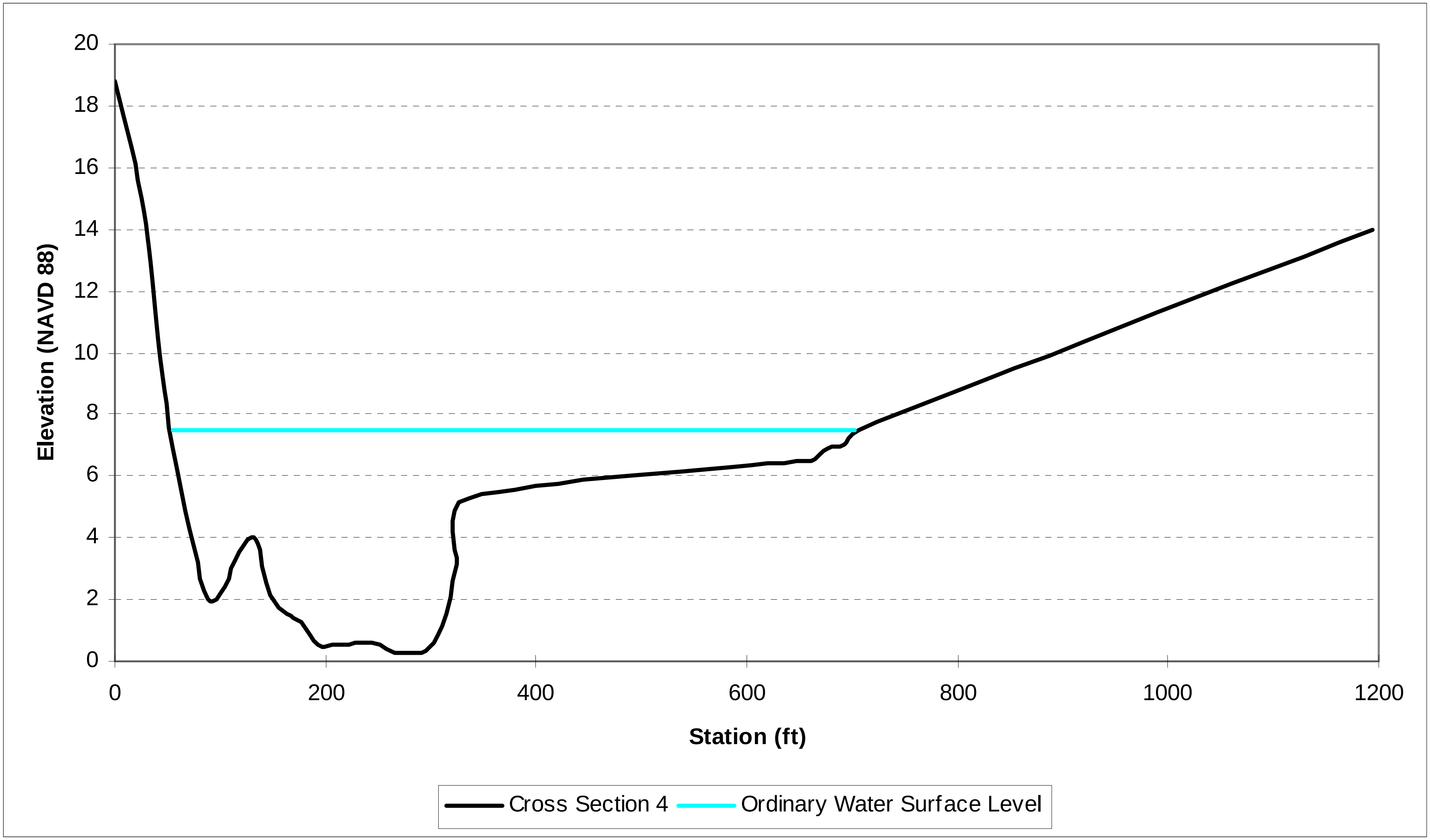

Cross Section 4
(Refer to Figure 5 for cross section locations)

Figure 9

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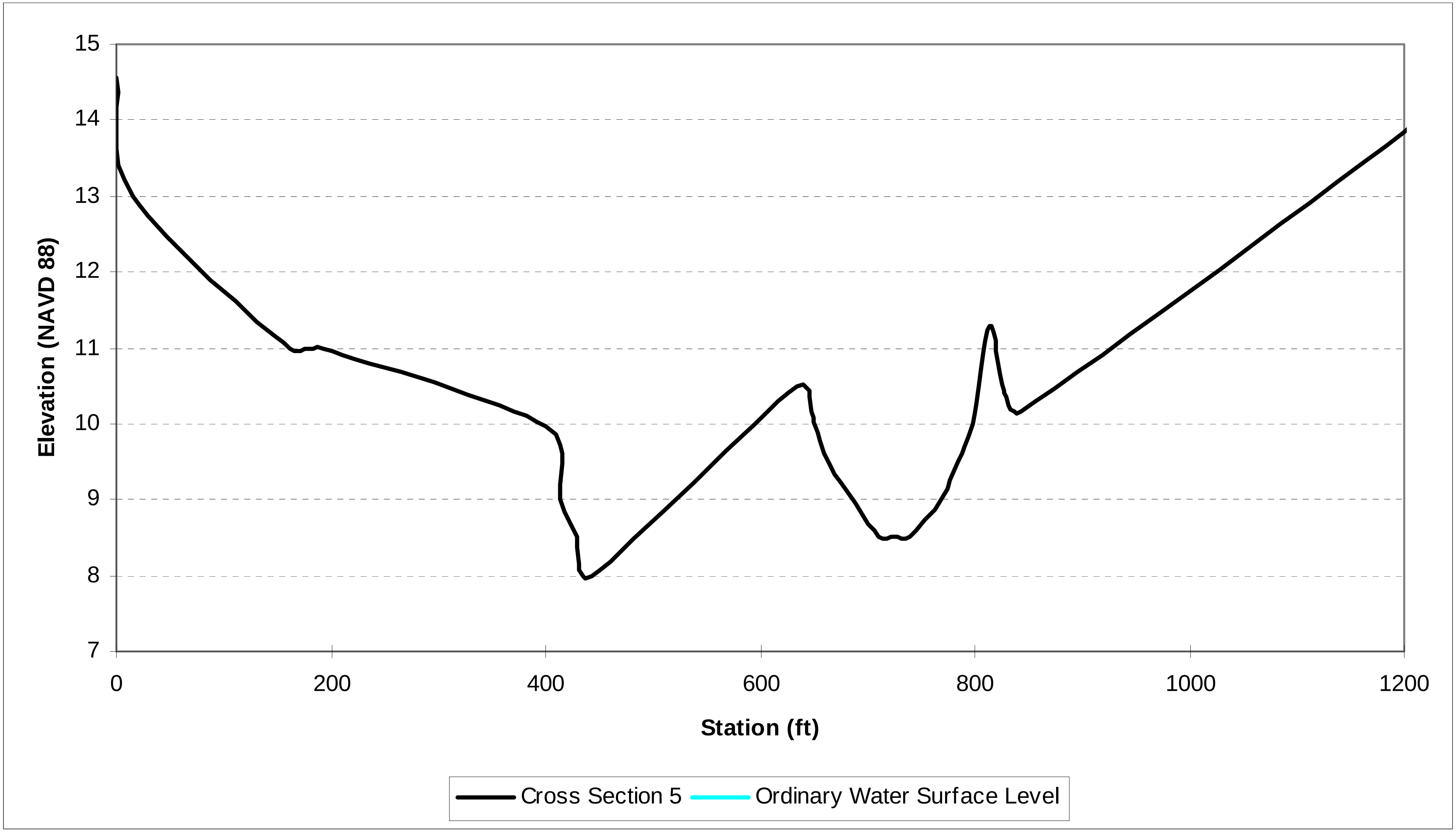

Cross Section 5
(Refer to Figure 5 for cross section locations)

Figure 10

Sharp Park Conceptual Restoration Plan
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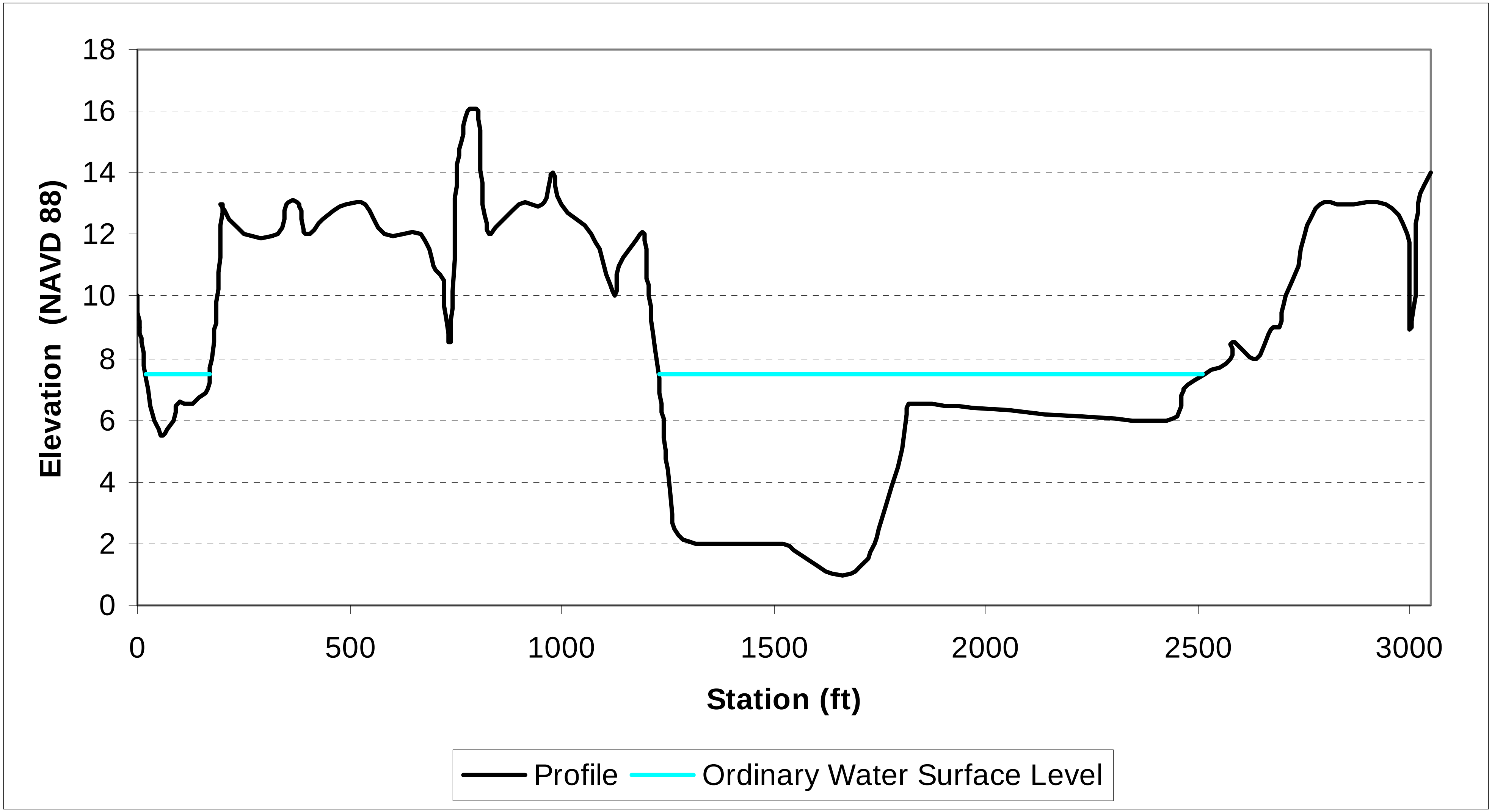

Profile of Wetlands Complex
(Refer to Figure 5 for cross section locations)

Figure 11

Sharp Park Conceptual Restoration Plan
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Pacific Ocean/Seawall

Coastal sediment processes, including littoral sand transport, ocean wave transport (on- and off-shore), and wind blown sand create the beach and dunes along the west side of Laguna Salada (PWA 1992). A compacted earthen seawall was significantly reconstructed by the City of San Francisco in 1989 to reduce the damage from wave overtopping. The seawall performs its role of preventing tidal inundation and flooding of the study area under most conditions, but has been overtopped during very high storm surges, including events in 1956 and 1983.

For the purposes of this restoration plan, it is assumed that the seawall is stable and will continue to provide the wetland complex with a high level of protection from tidal inundation. The integrity of the seawall is being assessed by a geotechnical team under separate contract with SFRPD.

Water Quality

With the exception of salinity concentrations, water quality has not been identified as a limiting factor in the habitat value of the wetlands complex. Salinity concentrations were modeled under a variety of conditions, and were found to be below the threshold at which they would harm amphibians or other wildlife (Kamman 2009). Although water quality may be affected by nutrients carried by runoff from the golf course or by petroleum-based pollutants and heavy metals carried by runoff from Highway 1, water quality is being assessed under a separate contract and complete information is not yet available.

Sea Level Rise

Sea levels are projected to rise by up to 1.4 meters by 2100 (CA Natural Resources Agency 2009). Mean Higher High Water (MHHW) elevations under current conditions as well as those projected for the years 2030, 2040, and 2100 are illustrated in Figure 12. Although floods occurring under predicted sea levels at 2100 would not cover a significantly larger area of Sharp Park than would a flood occurring under current conditions, the seawall would be put under more stress and would likely be overtopped more frequently, placing wildlife in the wetlands complex at greater risk of harm due to greatly increased salinity levels.

Hydrologic Evaluation

Kamman Hydrology and Engineering, Inc. (KHE) performed a hydrological evaluation of the marsh complex and watershed during an entire hydrological cycle in 2008 and 2009. The purpose of the hydrological assessment was to improve understanding of the hydrologic processes which affect the distribution of ecological habitats in the wetland system and flooding of the adjacent golf course. Two of the main objectives behind the formulation of the hydrological study were to determine how to regulate water levels to avoid flooding parts of Holes 10, 12, 14, and 15 and to avoid stranding CRLF egg masses.

Much of what is currently known about the hydrology of the wetland complex was presented by Phil Williams and Associates et al. (PWA) in an earlier resource enhancement plan (PWA 1992). The PWA report includes a description of historical conditions at the site as well as results from a hydrologic monitoring study during the period 1990-1991. The KHE study aimed to expand on the findings of the earlier research to reflect current conditions at the site and to extend those findings into a suite of analytical models to be used in the planning and design for restoration alternatives.

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Sea Level Rise Projections Over 100 Years

This figure shows the portions of Sharp Park that would be inundated if the seawall were breached or were not present. Inundated areas are estimated based on projected sea level rise scenarios.

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Sharp Park Conceptual Restoration Plan

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Figure 12

	MHHW_2000		MHHW_2040
	MHHW_2030		MHHW_2100

KHE maintained a hydrologic monitoring network at the site during the period April 2008 to April 2009. Field data collection focused on understanding the variability of water level and salinity in the wetland complex. Monitoring data were utilized to characterize current site conditions and to calibrate analytical models for additional investigation. Three specific analytical modeling tools were developed:

- A water budget model to investigate the seasonal variations of water supply and demand at the site.
- A salinity mass balance model to investigate the sources and relative impact on water quality.
- A hydraulic model to simulate the water level response in the wetland system to winter storm runoff.

Key findings of the report, in terms of relevance to SFGS and CRLF habitat and restoration design are as follows:

- The marsh system is not water limited, and water surface levels are maintained by groundwater even in very dry years. Increases in precipitation and runoff to the system only increase the amount of water that must be pumped out of the system. This is important in that it indicates that increasing the system's storage capacity through extensive dredging will not result in diminished water levels or compromised water quality.
- Although dense vegetation in the eastern part of the lagoon may slightly reduce the rate of drainage to the greater lagoon area and thus to the pumps in Horse Stable Pond, dense vegetation does not significantly contribute to water levels that encroach onto the golf fairways. Water surface elevations that result in standing water on the fairways result from inadequate pumping rates during periods of storm flows. Flooded fairways occur during dry months as well, possibly from poor drainage of golf course irrigation runoff or from input of runoff from the adjacent community, which would enter through a culvert at the north end of the lagoon. Poor drainage may be resulting from buildup of sediment in the main channel that separates the eastern half of the lagoon from the open water portion (west side) of the lagoon.
- Salinity varies according to the volume of water in the marsh complex at any given time. Salinity results from salts in the soils and water of the lagoon that are residual from the time that the lagoon was tidally inundated, and from salts deposited during subsequent overtopping of the seawall.
- Elevated salinity was found at a seep at the base of the seawall on the western edge of the pond (Wayne 2008). This saline water may have seeped through the seawall during sustained high tides, or may enter the pond through an abandoned culvert that once conveyed overflow from the pond to the ocean. Salinity from this seep is localized and is not of sufficient quantity to increase salinity levels in the rest of the pond (Kamman 2009). No other evidence of salt water intrusion through the seawall was found.

The complete hydrological report is found in Appendix A.

3.4 SEDIMENT

The wetland complex is at the hydrologic terminus of an 844-acre coastal watershed. The watershed includes one primary drainage, Sanchez Creek, and a smaller subbasin to the north that enters the main lagoon via a small, roadside swale and culvert. Neither of these waterways are gauged. Sanchez Creek drains to the pond, and the small swale drains to the main lagoon. Construction of the seawall has prevented sediment loads from exiting the watershed as they normally might have during storm events (high flows, tidal flushing, etc.).

As part of the engineering design for this project, a sediment yield analysis is being prepared. The primary objective of the sediment yield analysis is to better understand the rate at which sediment is transported to the wetland complex from the watershed. Annual sediment delivery rates, i.e., sediment yields, are estimated in order to support design of sediment detention and removal facilities. The location and capacity of sedimentation basins will be designed to consider removal effectiveness and facility maintenance.

The approach to the sediment yield analysis includes a first-cut level of analysis based on the Revised Universal Soil Loss (RUSLE) methodology to estimate the long-term average annual soil loss from the tributary area. To the extent possible, existing information and studies and knowledge of the site will be used to guide estimation of parameters. Additionally, the Modified Universal Soil Loss Equation (MUSLE) is being used to predict soil erosion from the 2-, 5-, 10-, 25-, 50-, and 100-year storm events. Results from RUSLE and MUSLE will be compared to local or regional sediment yield data to evaluate the level of certainty in the yield estimates for the wetland complex. Uncertainties in sediment yield estimates will be taken into consideration during design through factors of safety and use of other conservative design parameters.

Data sources include existing reports, hydrologic analysis of the watershed, field reconnaissance, vegetation maps, land use maps, soil maps, and precipitation records. Total suspended sediment estimates will use, in part, the results of water samples pulled at Sanchez Creek and the sub-basin channel during a storm in winter of 2008.

3.5 VEGETATION

The majority of the Sharp Park study area is planted with golf course grasses including Kentucky bluegrass *(Poa pratensis)*, ryegrass *(Lolium* sp.), and kikuyu *(Pennisetum clandestinum)*, separated by occasional stands of Monterey cypress *(Cupressus macrocarpa)*. Although none of these grasses are native to the study areas, kikuyu in particular is considered a highly invasive weed and is very difficult to manage (Randall 2002). Areas used for golf are constantly disturbed by visitors and maintenance staff, and also have very minimal vegetative diversity. Therefore, they generally provide low value habitat and are only used by generalist species such as robins and starlings, which are adapted to these conditions. Primary habitat areas are found at the lagoon, the pond, the connecting canal, Sanchez Creek, and the uplands on GGNRA property found south of the pond. These areas provide habitat for six special status species as recognized by the State of California and US Fish and Wildlife Service: San Francisco forktail damselfly *(Ischnura gemina)*, California red-legged frog, western pond turtle *(Clemmys marmorata)*, San Francisco garter snake, salt marsh common yellowthroat *(Geothlypus tricha)s* and dusky-footed woodrat *(Neotoma fuscipes)*.

The construction of the Sharp Park Golf Course replaced native coastal scrub and grasslands, as well as artichoke farms (Sweeney 2008). Sanchez Creek, which runs through the golf course, has been culverted west of Highway 1. The stream remains daylighted east of Highway 1 except in the rifle range area, where it is also culverted. Some riparian scrub vegetation is found along the edges of Sanchez Creek east of the highway, and the stream is largely shaded in this area by large Monterey cypress trees. Freshwater marsh is found at the edges of the pond, the lagoon, and in the canal. Coastal scrub, dead Monterey cypress, and weedy, non-native plant species including iceplant are found to the west of the lagoon and wet meadow to the south and east. Most of the golf course is east of the lagoon; however, two holes are present in the area located northwest of the lagoon.

South of the pond are formerly grazed uplands which now consist of ruderal vegetation such as invasive weeds. To the west of the lagoon is a sparsely vegetated ~8 meter (~25 foot) high levee. Sand dunes interspersed with sections of golf course and marsh plants lie along the base of the levee on the landward side (PWA 1992).

In September 2008, a wetland delineation was performed to identify the wetland resources and other "Waters of the United States" that would fall under the jurisdiction of the U.S. Army Corps of Engineers (USACE) at the wetland complex. Wetlands in the study area were identified using NWI maps, soil survey information, and site observations. Potential wetlands were delineated in the field using the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Environmental Laboratory 2008). Tetra Tech staff also prepared informal field maps of vegetation community types during several reconnaissance level field surveys.

Plant Community Descriptions

Several types of wetland plant communities were identified in the marsh complex, and upland and ruderal communities were identified around the marsh complex. Wetland habitat types include freshwater marsh, willow scrub, and wet meadow. Other habitat types include foredune, ruderal, and riparian. These habitat types are described below. Other plant communities including mixed conifer forest, Monterey cypress forest, eucalyptus forest, and coastal scrub/grassland were identified at the far eastern part of the project area and at nearby Mori Point. All habitat types are displayed at the community level in Figure 13.

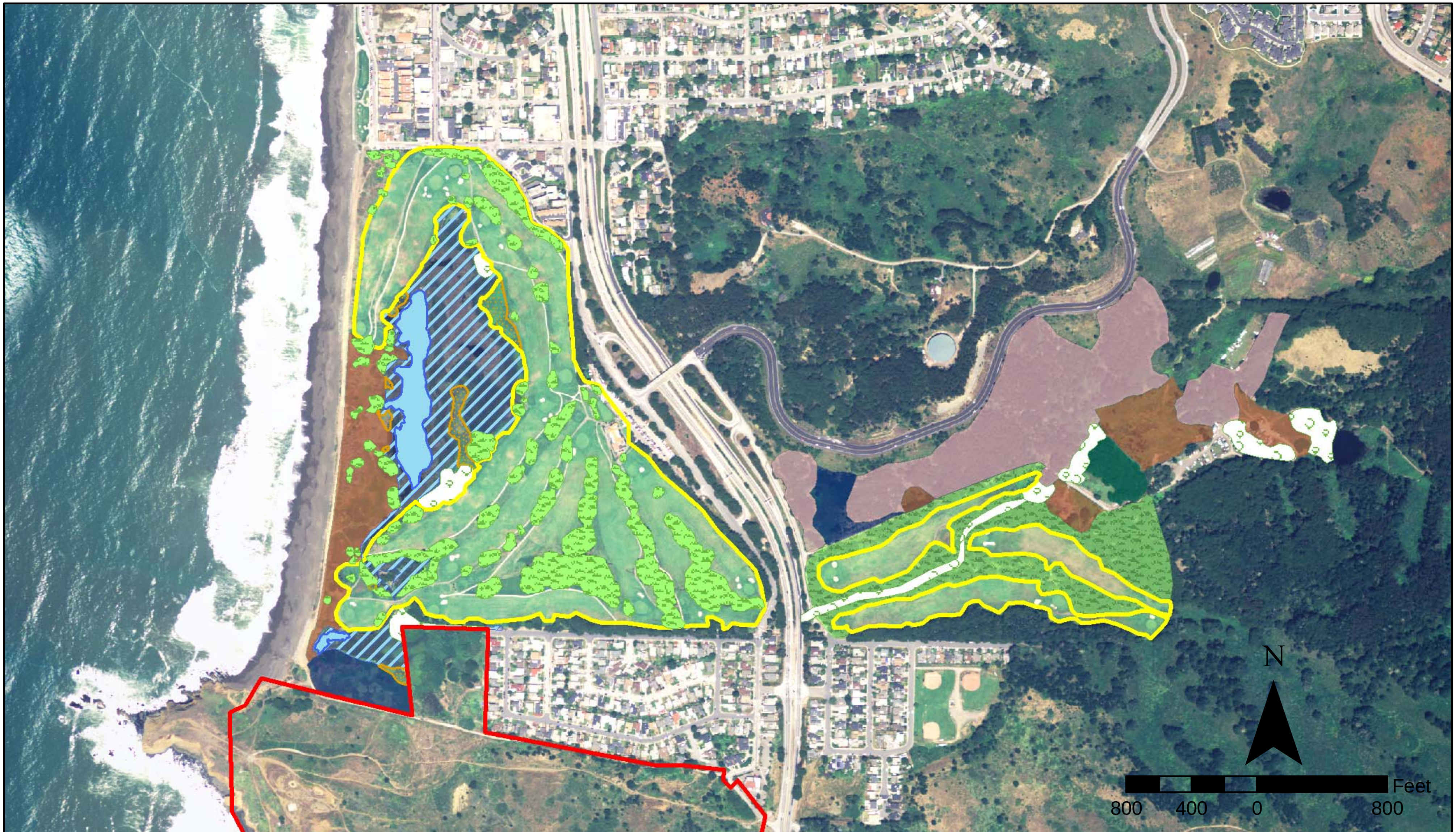
Freshwater Marsh

Freshwater marsh within the study area includes vegetated areas within and adjacent to Laguna Salada and Horse Stable Pond and the connecting channel (Tetra Tech 2008). Dominant vegetation within the freshwater marsh areas include bulrush *(Scirpus s*p.), cattail *(Typha angustifolia),* and coastal cinquefoil *(Potentilla anserina),* all of which are obligate wetland species. Cattails and bulrush have steadily encroached on much of what was formerly open water habitat in the eastern portion of Laguna Salada and in the connecting channel between the lagoon and the pond (Tetra Tech 2008). A small pond containing emergent vegetation was observed within the willow scrub area south of the golf course on GGNRA lands. GGNRA staff enhanced this pond by deepening an existing wetland to provide suitable breeding habitat for California red-legged frogs (Tetra Tech 2008).

Regular golf course maintenance appears to be controlling the growth of wetland habitat in some areas adjacent to the lagoon, as remnants of some hydrophytic plant communities were observed in lower elevation mowed areas (Tetra Tech 2008). Wetland vegetation has been encroaching onto the golf areas as poor drainage on the north and northwest parts of the lagoon has allowed for a larger flooded area.

Willow Scrub

Willow scrub within the study area was located south of the Sharp Park golf course, to the east of Horse Stable Pond, and near the archery range (Tetra Tech 2008). Small areas of this habitat type are also found on the northeast and southeast sides of Laguna Salada and along Sanchez Creek, east of Highway 1. The willow scrub communities are characterized by a dense overstory of arroyo willow *(Salix lasiolepis)* and sitka willow *(S. sitchensis),* which are both facultative wetland species, with an understory composed of obligate hydrophytes, such as panicled bulrush *(Scirpus microcarpus)* and coastal cinquefoil *(Potentilla anserina)* (Tetra Tech 2008).



General Habitat Types

Sharp Park Conceptual Restoration Plan
Pacifica, CA

Figure 13

- Willow Scrub
- Wet Meadow
- Freshwater Marsh
- Unvegetated Pond/Open Water
- Coastal Scrub/Grassland
- Eucalyptus Forest
- Mixed Conifer/Laurel
- Monterey Cypress
- Ruderal
- GGNRA
- Golf Area

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Wet Meadow

Wet meadow occurs on the east side of Laguna Salada where the fairways flatten out at the edges of Holes 14 and 15, and also where a swale forms a meadow directly east of and adjacent to Horse Stable Pond. Dominant plants in this area include Baltic rush *(Juncus balticus)*, spreading rush *(J. patens),* bulrush *(Scirpus americanus)*, curly dock *(Rumex crispus)*, and coastal cinquefoil. Coyote bush *(Baccharis pilularis)* occurs on the hummocks amid the wetlands, which may be evidence that uplands were once present near the lagoon. Wet meadow vegetation grades to riparian willows (*Salix* spp.) and cattails (*Typha* spp.) near Sanchez Creek.

Wet meadow also occurs along the east side of the lagoon as well as on a peninsula of higher ground in the middle of the lagoon. Salt concentrations in the soils in these areas, residual to the time when the lagoon was open to tidal action, are probably responsible for the occurrence of some salt marsh plants including saltgrass *(Distichlis spicata)*, fleshy jaumea *(Jaumea carnosa)*, and Virginia pickleweed *(Salicornia virginica)*. Salt tolerant plant species are also found at the edge of the pond.

Ruderal Vegetation

Ruderal vegetation is found in the areas around the parking lot, in the upland habitat south of the pond and west of the lagoon, at the site of the closed rifle range, and at the archery range (Tetra Tech 2008). The vegetation in these areas includes primarily invasive forbs such as wild radish *(Raphanus sativus),* curly dock *(Rumex crispus),* and wild oats *(Avena barbosa)* (Tetra Tech 2008).

The hills on Mori Point are covered with non-native annual grasses mixed with invasive forbs including wild radish, bristly ox tongue *(Picris echioides)*, and sweet fennel *(Foeniculum vulgare)* with a few Monterey cypress (PWA 1992, Tetra Tech 2008).

In addition to maintained tees, greens, fairways, and sand traps, the golf course roughs include many non-native plants. Where the fairways border the lagoon, wet meadow and marsh plants function as hazards for the golf course. Between the holes (in the rough) are various non-native grasses.

Foredune

The western portion of the lagoon has undergone considerable disturbance, both from periodic high tides and storms and from development of the golf holes that were once there. The 25-foot high seawall supports only sparse ruderal vegetation. At its base, sands support foredune species and, closer to the lagoon, salt marsh species. Areas of bare sand are interspersed with patches of foredune plants. Residual soil salts are probably responsible for the occurrence of these species, since the lagoon itself supports freshwater marsh species. Species observed include coastal sand verbena *(Abronia latifolia)*, silver bur ragweed *(Ambrosia chamissonis),* ice plant (*Mesembryanthemum* sp.), and New Zealand spinach *(Tetragonia expansa)*.

Riparian

West of Highway 1, Sanchez Creek has been channelized and runs through a corridor southeast of the lagoon, parallel to Fairway Drive. In open areas the banks are partially vegetated with plantain (*Plantago* sp.), panicled bulrush *(Scirpus microcarpus)*, knotweed *(Polygonum* sp.), and broom (*Cytisus* sp.) (PWA 1992). A dense overstory of Monterey pine *(Pinus radiata)* and Monterey cypress cover much of its course in this area and as a result, there is little riparian vegetation. Near the end of Fairway Drive, the creek is culverted under the golf course. When it emerges from the culvert it flows under a thicket of willows. The stream then flows west through a dense stand of cattails and enters the pond (PWA 1992).

Wetlands

Wetlands in the study area were identified using National Wetland Inventory (NWI) maps, soil survey information, and site observations. Potential wetlands were delineated in the field using the routine on-site method (level 2), as outlined in Section D of the Wetlands Delineation Manual (Environmental Laboratory 1987). This method is referred to as the three-parameter approach because it uses three criteria—presence of hydrophytic (water adapted) vegetation, hydric soils, and wetland hydrology. The three-parameter approach determines whether an area is a jurisdictional wetland under normal conditions. Jurisdictional wetlands are regulated by the USACE under Section 404 of the Clean Water Act (CWA) and by the Regional Water Quality Control Board under Section 401 of the CWA.

A total of 27.42 of acres of Waters of the US were delineated within the study area (Appendix B, Figure 3). Jurisdictional areas were classified into four habitat types: freshwater marsh, willow scrub, wet meadow, and unvegetated pond (open water). The amount of each jurisdictional habitat type within the study area is shown in Table 1, below.

Table 1. Wetlands and Other Waters in the Wetlands Complex

Habitat Type	Jurisdictional Determination	Area (Acres)
Freshwater marsh	Wetlands	19.56
Willow scrub	Wetlands	0.93
Wet meadow	Wetlands	2.44
Unvegetated pond	Other Waters of the US	4.49
Total wetlands/waters		27.42

3.6 Sensitive Wildlife Resources

Swaim Biological conducted surveys for the SFGS and CRLF at or near the wetland complex as part of this project in 2008, and in 2004, 2006, and 2008 as part of another project. Visual survey locations included the following aquatic habitats and associated uplands: Horse Stable Pond, Laguna Salada, the canal connecting Horse Stable Pond and Laguna Salada, Sanchez Creek west of Highway 1, and Arrowhead Lake east of Highway 1 and the archery range. Aside from determining the presence or absence of these species, one of the main objectives of the surveys was to identify limiting factors for the SFGS and CRLF and their prey species. The complete survey report is found in Appendix C.

California Red-legged Frog

Habitat Requirements

This species usually occurs in or near quiet permanent water of streams, marshes, ponds, and lakes (Stebbins 2003, NatureServe 2009) typically ~0.7 meter (2.3 foot) deep, in habitats characterized by dense, shrubby riparian vegetation (Hayes and Jennings 1988). During the dry summer months, California red-legged frogs estivate in small mammal burrows, leaf litter, or in other moist sites in or near riparian areas (~30 meters; 100 feet) (USFWS 1996). Individuals may range far from water along riparian corridors and in damp thickets and forests. The California red-legged frog is generally found near water but often disperses to upland habitat after rains (Stebbins 2003). Although frogs at most locations remain at the breeding site year-round, long-distance movements of up to 2.2 miles to and from non-breeding sites have been observed (Bulger et al. 2003). Lack of a dispersal corridor leading to other viable habitat means that frogs found in the wetland complex at Sharp Park are unlikely to migrate.

Breeding occurs in permanent or seasonal water of ponds, marshes, or quiet stream pools, and sometimes in lakes (Fellers, in Jones et al. 2005). Eggs are often attached to emergent vegetation where they float at the surface (Hayes and Miyamoto 1984). CRLF typically breeds during or shortly after large rainfall events in late winter or early spring (Hayes and Miyamoto 1984, USFWS 1996). The breeding period lasts about 1 to 2 weeks and eggs hatch in 6 to 14 days. Larvae metamorphose in 3.5 to 7 months after hatching but occasionally overwinter (Fellers et al. 2001). Larval mortality tends to be very high within this species. Sexual maturity is reached in 3 to 4 years and individuals may live 8 to 10 years.

Diet for the California red-legged frog includes various terrestrial and aquatic invertebrates, mainly invertebrates of shoreline or water surface. Diet of large adults also includes small vertebrates. Larvae eat algae, organic debris, plant tissue, and other minute organisms (NatureServe 2009).

Local Occurrence

A total of 85 CRLF egg masses were located in or near the study area (SBI 2008). The highest concentration was in Horse Stable Pond, with 57 masses being located. Twenty egg masses were found in portions of Laguna Salada and four were found in the canal. East of Highway 1, four egg masses were found in Arrowhead Lake (SBI 2008). No egg masses were found in Sanchez Creek or in areas of extremely dense emergent vegetation that lacked open water (SBI 2008).

Areas that are suitable for foraging and basking but where no sign of breeding was observed include Sanchez Creek and portions of Laguna Salada, notably the north end. Juvenile and adult CRLFs were concentrated in and around the pond, the canal, and lower Sanchez Creek (SBI 2008). In these areas, CRLFs have been observed basking or sitting under vegetation next to the water. However, they were not observed in extremely dense cattails or bulrushes (SBI 2008).

The primary limiting factor for the CRLF in the wetlands complex is a vegetation structure that is inappropriate and not optimal for successful breeding and/or recruitment of larval stages into the adult population. The dense emergent vegetation combined with little remaining open water offers poor habitat for the survival of egg masses or tadpoles. Tadpoles hatched from eggs deposited on flooded areas of the golf course have been stranded in these areas due to their inability to penetrate the dense vegetation at the edge of the lagoon (Wayne 2008).

Locally, high salinity in the study area would lead to severely compromised habitat. One-hundred percent of CRLF egg masses die at salinity levels of 4.5 parts per thousand (ppt) (Jennings and Hayes 1990), and larvae cannot survive in concentrations higher than 7.0 ppt (USFWS 2002). The presence of egg masses in Laguna Salada, the canal, and Horse Stable Pond suggest salinity levels of less than 4.5 ppt are present during the breeding season. Although loss of CRLFs or their eggs due to salinity increases has not been documented at Laguna Salada in the past, the potential for this occurrence has led to the recommendation that any frog ponds created at Sharp Park be situated above the 100-year storm surge elevation that is predicted under current conditions and under projected conditions 30, 40, and 100 years in the future.

San Francisco Garter Snake

Habitat Requirements

The habitat requirements of the SFGS vary throughout the year, and multiple habitat types are used on a seasonal and often daily basis. From spring through early fall SFGS are found in wetland areas where they forage for frogs, tadpoles, and small fish. During these months they makes daily movements between foraging habitat and nearby upland retreats located in underground burrows and soil crevices, typically located in a grassland-shrub community. Grassy hillsides, floating algae, and rush mats also are used at this time for basking and mating. Beginning in mid- to late fall they may move to more distant uplands and winter underground retreats. Here they remain relatively inactive during the winter months versus the rest of the year. SFGS have been seen in all months of the year during warm weather, including individuals foraging in ponds during February. In some populations where uplands immediately adjacent to the aquatic habitat are suitable for winter retreats, SFGS will take advantage of these closer burrows (Larsen 1994).

Local Occurrence

Under current conditions, high quality upland habitat for the SFGS at Sharp Park is restricted to a small area south of Horse Stable Pond. Laguna Salada and the connecting channel contain functionally little or no adjacent SFGS upland habitat that is secure from daily human disturbance and exposure to predators (SBI 2009). This lack of suitable upland habitat with disturbance by golf activity during the day minimizes the connectivity between the aquatic habitats in Horse Stable Pond and Laguna Salada and deters occupancy by the snake in all but the southernmost portion of the park. The edges of Laguna Salada currently are the most likely routes for SFGS to follow, and movement through these areas could expose snakes to mortality from predation, mowing, and being crushed by golf carts and people. The lack of suitable upland habitat that would be used on a regular basis is therefore a limiting factor in ensuring the persistence of the SFGS at Sharp Park. Upland habitat that would be suitable for winter retreats is also limited as any that exists immediately adjacent to the lagoon would be subject to the flooding that occurs each winter.

For SFGS that travel to the lagoon from uplands near the pond or Mori Point, the extremely dense structure of the aquatic vegetation combined with little open water/emergent vegetation edge habitat at the lagoon provides extremely poor foraging habitat (SBI 2009). The deterioration of breeding habitat due to inappropriately dense vegetation also limits CRLF productivity at Laguna Salada.

Arrowhead Lake supports a breeding population of California red-legged frogs and Pacific chorus frogs, and is bounded by dense riparian vegetation, providing suitable foraging habitat for the San Francisco garter snake. Although no San Francisco garter snakes were observed there during these surveys, Arrowhead Lake and the surrounding uplands may be used as habitat. There is a historical record of SFGS on the parcel north of and adjacent to Sharp Park with no barriers between. San Francisco garter snakes are also known to occupy the SFPUC watershed land to the east around San Andreas Reservoir below Sweeney Ridge.

Survey Results

SBI conducted visual surveys in 2008 specifically for SFGS in March, April, and May of 2008. No SFGS were observed during visual surveys, which included the areas around lower Sanchez Creek, the lagoon, the canal, and the pond. However, the abundance of prey items in these areas, their proximity to recent observations of the snake at Mori Point and the pond (SBI 2006), and historical occurrence suggest that they are likely to be used by SFGS for foraging and movement. Five SFGS were trapped at a nearby wetlands at Mori Point in 2008 (SBI unpubl. data) and in wetland habitats south of the golf course and east of Horse Stable Pond. On July 9th, 2008, Golden Gate National Recreation Area biologists reported seeing a SFGS in the 'north pond', a few hundred feet east of Horse Stable Pond (S. Bennett in litt 2008).

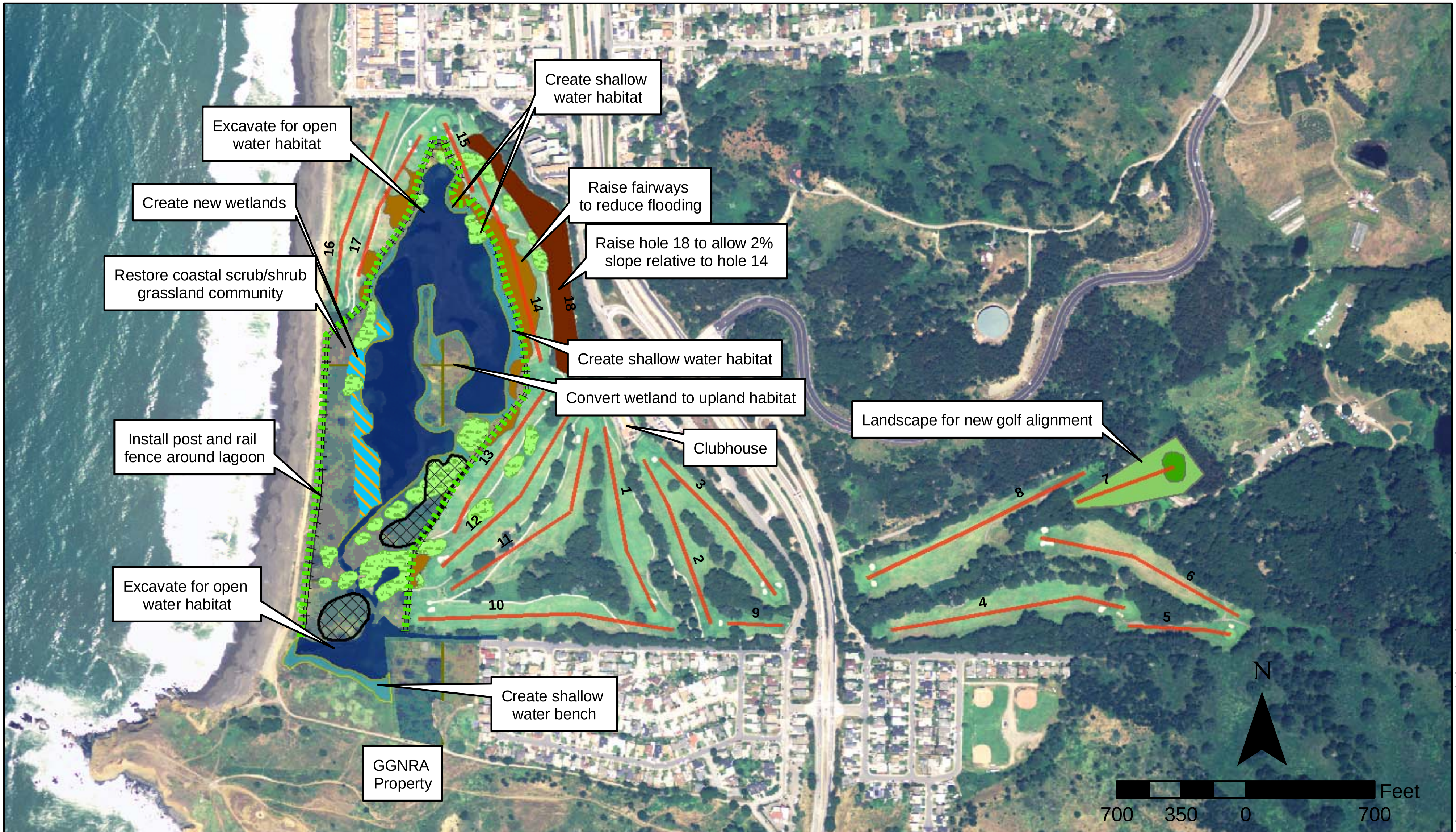
4. CONCEPTUAL PLANNING

During planning for the recovery effort, several broad goals were identified by SFRPD and through agency input. Those are as follows:

- Maintain and restore habitat for listed species, particularly the SFGS and CRLF;
- Meet the recommendations of the SFGS Recovery Plan (USFWS 1985);
- Restore functional wetland and upland habitat that is high-value and low maintenance;
- Comply with the requirements of state and federal regulations, including ESAs and the Clean Water Act; and,
- Preserve and enhance recreational opportunities that correspond to the listed species goals.

A series of conceptual alternatives have been created to detail proposed conditions that are predicted to occur under various alternatives and to assess whether each alternative would meet the recovery goals (Figures 14-16). A habitat assessment model was completed for existing conditions and for conditions that are projected to develop under each conceptual plan. Figure 17 shows habitat quality under existing conditions, and Figures 18-20 show projected habitat quality for the SFGS and CRLF under Alternatives A18, A9, and No Golf, respectively. Table 3 compares the amount of habitat for each species under the various alternatives compared to the projected costs. A detailed cost estimate is provided in Appendix D, and the process of determining costs is explained in Section 4.9.

Each alternative differs in the extent of upland habitat that would be restored as well as the alignment and location of golf holes. A gradient of measures is proposed under various alternatives, ranging from an alternative that would restore the wetlands and minimal surrounding upland habitat to a more comprehensive alternative that would also restore the wetlands but would also include a much greater amount of upland restoration as well as excavation of frog ponds and daylighting of Sanchez Creek. Alternatives include maintaining an 18-hole golf course, closing 9 holes and creating a 9-hole course with a driving range, and closing the park to golf while still allowing other recreational opportunities on the site. All alternatives share the same goal, which is to enhance habitat for the SFGS and CRLF, and share the same restoration features in and around the wetlands complex: creation of upland basking and retreat habitat adjacent to the wetlands, excavation of excess sediment and decaying vegetation from the wetlands complex, creation of an upland corridor between the pond and the lagoon, and recontouring the shoreline to create shallow water habitat.



Conceptual Alternative A18

Sharp Park Conceptual Restoration Plan

Pacifica, CA

Figure 14

TETRA TECH

[legend symbol]	Fairways	[legend symbol]	Raise to 10' Contour	[legend symbol]	Coastal Shrub/Grassland	[legend symbol]	Open Water
[legend symbol]	Fence	[legend symbol]	Upland Mounds for SFGS Habitat	[legend symbol]	New Wetlands	[legend symbol]	Convert to Golf Holes
[legend symbol]	Habitat Boundary	[legend symbol]	Remove Non-Native Trees	[legend symbol]	Shallow Water Habitat		

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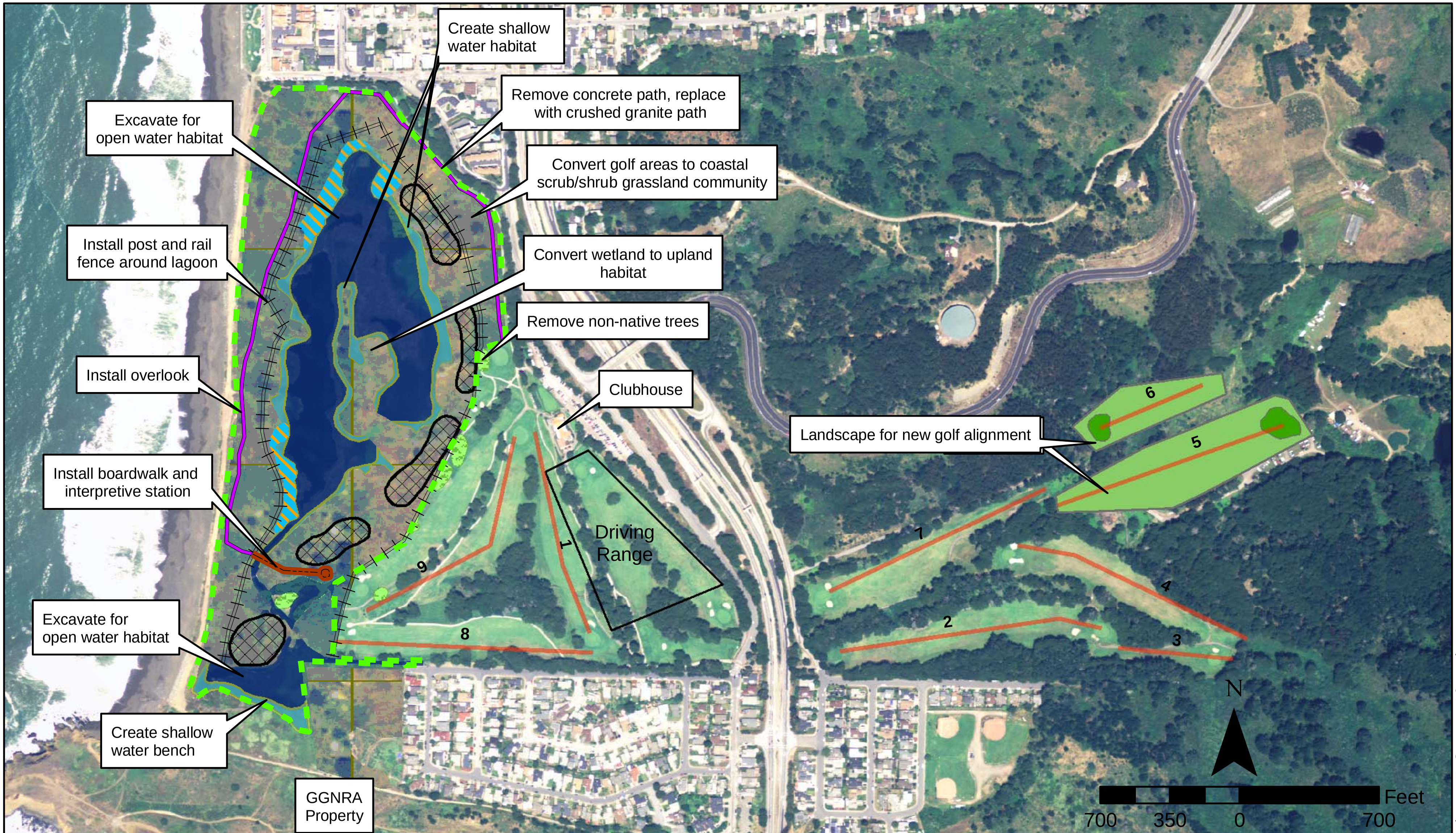

Conceptual Alternative A9

Sharp Park Conceptual Restoration Plan

Pacifica, CA

Figure 15

TETRA TECH

Boardwalk
Fence
Fairways
Habitat Boundary
New Wetlands
Upland Mounds for SFGS Habitat
Coastal Shrub/Grassland
Shallow Water Habitat
Open Water
Remove Non-Native Trees
Convert to Golf Holes

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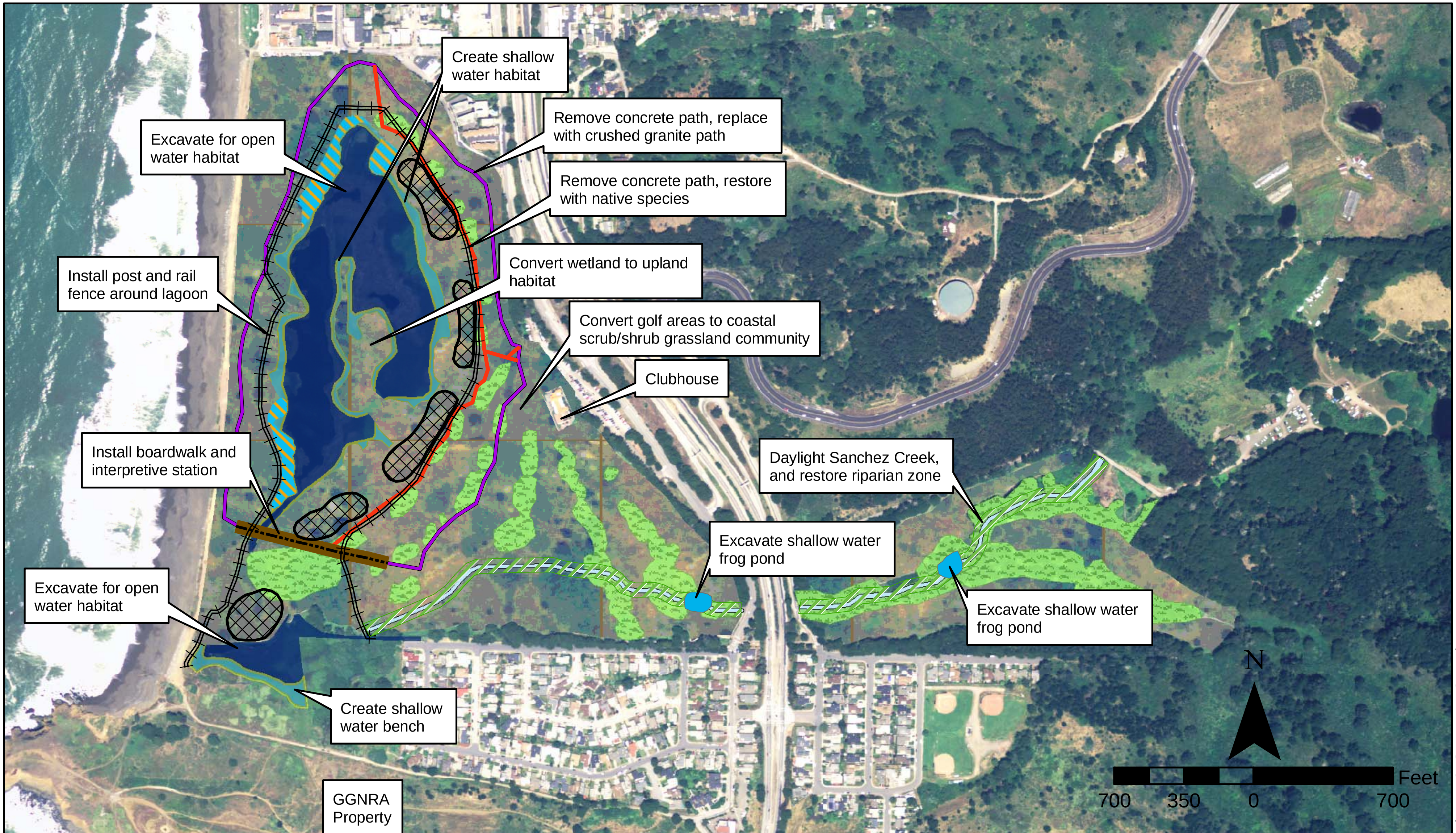

No Golf Alternative

Figure 16

Sharp Park Conceptual Restoration Plan

Pacifica, CA

	Boardwalk	Riparian Habitat	Remove Non-Native Trees	Open water
	Daylight Sanchez Creek	Upland Mounds for SFGS Habitat	Coastal Shrub/Grassland	
Fence	Frog pond	New Wetlands	Shallow Water Habitat	

TETRA TECH

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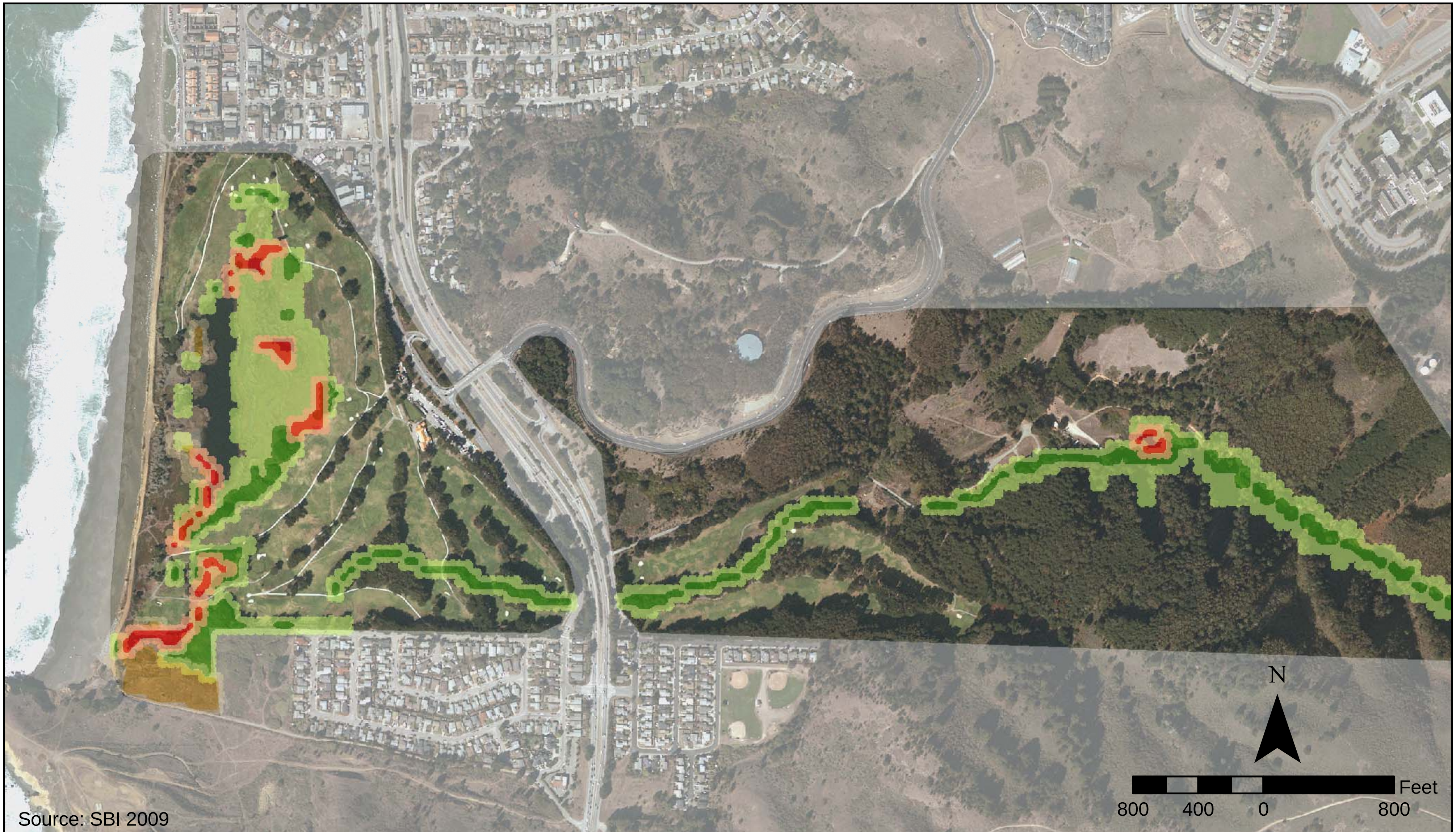

Habitat Quality Under Existing Conditions

Sharp Park Conceptual Restoration Plan

Pacifica, CA

Habitat Quality for the California Red-legged Frog and the San Francisco Garter Snake at Sharp Park

Figure 17

TETRA TECH

CRLF breeding / SFGS primary foraging habitat
- Highly Suitable
- Moderately Suitable

CRLF non-breeding / SFGS movement and secondary foraging habitat
- Highly Suitable
- Moderately Suitable

SFGS upland (retreat and basking) habitat
- Highly Suitable
- Moderately Suitable

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Habitat Quality Projection, Alternative A18

Sharp Park Conceptual Restoration Plan
Pacifica, CA

Habitat Quality Projection for the California Red-legged Frog and the San Francisco Garter Snake at Sharp Park

Figure 18

TETRA TECH

CRLF breeding / SFGS primary foraging habitat
- Highly Suitable
- Moderately Suitable

SFGS upland (retreat and basking) habitat
- Highly Suitable
- Moderately Suitable

CRLF non-breeding / SFGS movement and secondary foraging habitat
- Highly Suitable
- Moderately Suitable

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Habitat Quality Projection, Alternative A9

Habitat Quality Projection for the California Red-legged Frog and the San Francisco Garter Snake at Sharp Park

TETRA TECH

Figure 19

Sharp Park Conceptual Restoration Plan

Pacifica, CA

CRLF breeding / SFGS primary foraging habitat
- Highly Suitable
- Moderately Suitable

CRLF non-breeding / SFGS secondary foraging habitat
- Highly Suitable
- Moderately Suitable

SFGS upland (basking and retreat) habitat
- Highly Suitable
- Moderately Suitable

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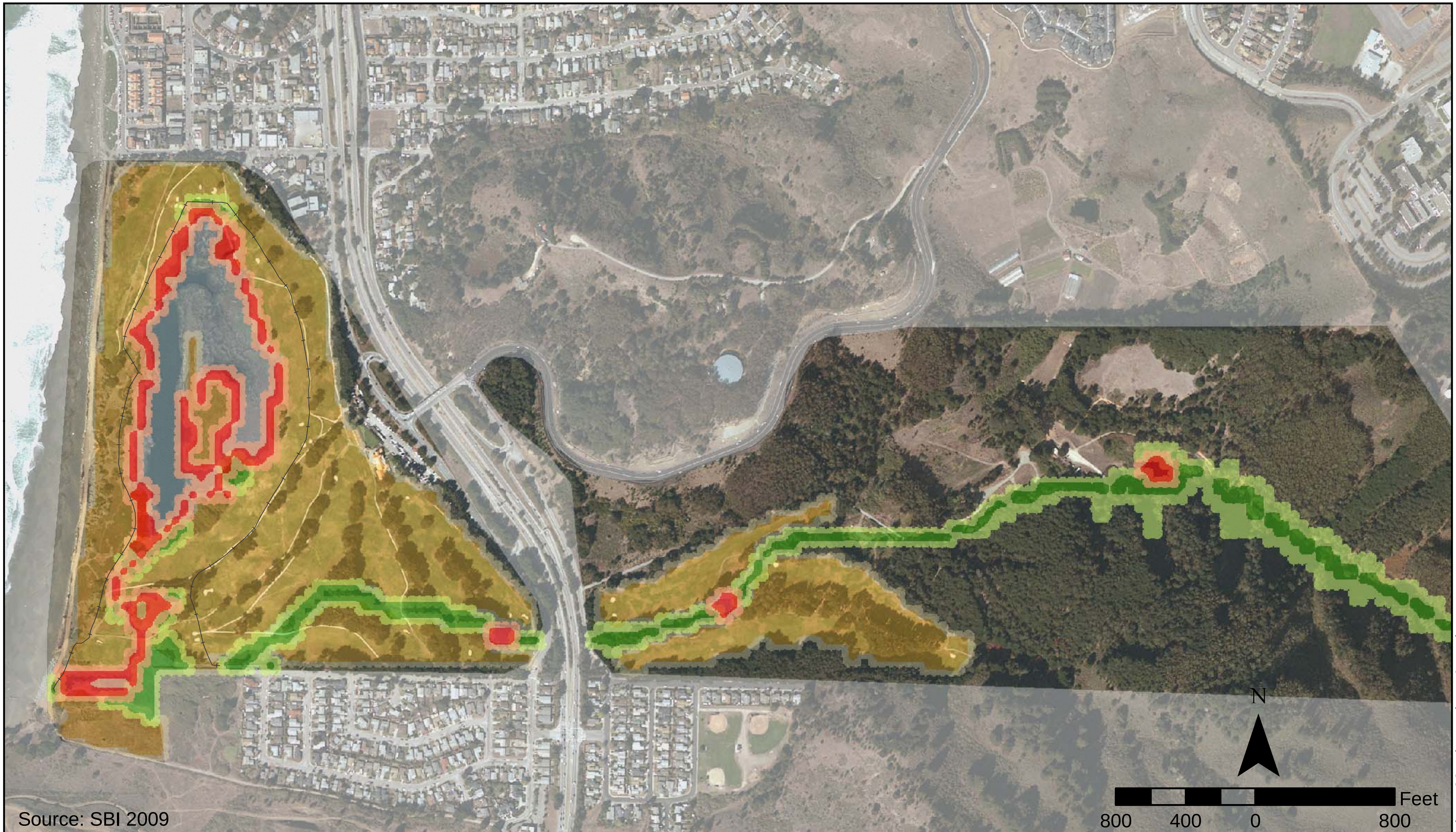

Habitat Quality Projection, No Golf Alternative

Sharp Park Conceptual Restoration Plan

Pacifica, CA

Habitat Quality Projection for the California Red-legged Frog and the San Francisco Garter Snake at Sharp Park

Figure 20

CRLF breeding / SFGS primary foraging habitat
- Highly Suitable
- Moderately Suitable

SFGS upland (basking and retreat) habitat
- Highly Suitable
- Moderately Suitable

CRLF non-breeding / SFGS secondary foraging habitat
- Highly Suitable
- Moderately Suitable

TETRA TECH

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4.1 Project Constraints

A number of physical, recreational, and biological factors influenced the design of this conceptual plan and in some cases limited or defined the extent of the proposed restoration. These included, but were not limited to, the following:

- *CRLF breeding habitat requirements* SFRPD closely monitors and regulates pumping from Horse Stable Pond into the ocean to avoid stranding CRLF egg masses at that breeding site. This occurs during the entire breeding period for the CRLF (generally December through March). This practice, in part, has resulted in water backing up onto the course flooding large portions of Holes 10, 14, and 15, and cutting off Hole 12 with a large pool of water around the culverted section of the connecting channel. The results of this are three-fold: 1) It eliminates all or portions of these holes from play, sometimes for extended periods 2) CRLFs sometimes lay their eggs during wet periods in the shallow pools that form in the flooded fairways. When the water levels drop, these egg masses can be stranded on dry ground and desiccate. Even if water persists long enough for eggs to hatch in these areas, most tadpoles would have limited mobility in the dense vegetation in the marsh area and may be stranded well before metamorphosis, and 3) Any potential SFGS upland available in areas not in play on the course is also flooded.

- *Presence of the seawall* A seawall separates the western edge of Sharp Park from the ocean and beach. Although members of the public suggested that a restoration option may include breaching the seawall to allow Sanchez Creek to run freely into the ocean, this option was considered infeasible for several reasons. The seawall plays a significant role in maintaining public safety by alleviating flooding during storm surges, and also keeps seawater out of the marsh complex, where saline water could harm resident reptiles and amphibians.

- *Sharp Park Clubhouse* The clubhouse is a historic feature, and its removal as a restoration feature was not considered as an option. Therefore, restoration plans were created assuming that the clubhouse and associated parking area would remain in place.

- *Archery Range* An archery range is located east of Highway 1 near the defunct rifle range. All plans were created to limit effects to the archery range or its access points.

- *Re-use of dredge spoils* It is assumed that some of the spoils removed during dredging of parts of the marsh complex would be used to restore fairways to upland habitat or to serve as the substrate for creation of new golf holes under some of the alternatives. However, spoils with greater than 50% organic material are deemed unsuitable for golf course substrate due to the potential for uneven settling, therefore organic sediments would only be spread where upland habitat is proposed.

- *Highway 1* Highway 1 provides a barrier to migration of the SFGS from the upper part of the park to the marsh complex and vice versa. Although a tunnel under the highway allows travel between the eastern and western parts of the park, the tunnel is not considered to be a viable corridor for migration of the snake. CRLF may have a low but significant flow of genetic exchange through culverts under Highway 1 and potentially overland.

- *Golf course history and alignment requirements* The golf course is a well known example of the design of Alistair McKenzie, a well known golf course architect who designed courses in the 1920s and 1930s. Although the prevailing goal in creating these conceptual plans was to enhance habitat value and diminish potential for harm to snakes and CRLF s, every effort was made to preserve the vision of Dr. MacKenzie and to minimize the need to substantially reconfigure the golf alignment. Furthermore, golf courses are generally constructed to follow a standard sequence of difficulty (par) from hole to hole, a factor that was considered in the various designs.

- *Mitigation for impacts to wetlands* Under all alternatives, an upland pensinsula will be created in the middle of the lagoon. Because this will result in fill of up to 2 acres of wetlands, 2 acres of wetlands must be created from the upland edges of the lagoon, which in some cases may encroach on existing fairways. By mitigating for impacts to wetlands and complying with other permit conditions required by the US Army Corps of Engineers (USACE) and the Regional Water Quality Control Board (RWQCB), SFRPD maintains compliance with Sections 404 and 401 of the Clean Water Act.

4.2 HABITAT CONSIDERATIONS

Historically, SFGS habitat at Sharp Park was concentrated in and around Laguna Salada and Horse Stable Pond. Habitat in these areas has become degraded over time as a result of sedimentation and excessive plant growth, flooding by seawater, and a variety of human impacts.

Both the SFGS and CRLF would benefit from the restoration of productive breeding and foraging habitat in each of these aquatic features. This could be accomplished by creating open water habitats adjacent to emergent vegetation in Laguna Salada, the canal, lower Sanchez Creek, and Horse Stable Pond. Because of their historic occupancy and the presence of features that currently support the SFGS, the conceptual plans were developed with the primary goal of restoring and enhancing habitat in these areas. Although CRLF are known to breed in Arrowhead Lake east of Highway 1, enhancements to the eastern portion of the park were not prioritized because there is no current evidence of occupation by the SFGS at Arrowhead Lake, nor is there a connection to the SFGS population at Mori Point. Each conceptual plan includes enhancements to wetland areas of the pond, the canal, and the lagoon in order to increase CRLF breeding and SFGS foraging habitat.

In order to address the shortage of suitable upland habitat for the SFGS, however, changes to the use of land adjacent to the wetland complex are required. The primary goal of each conceptual alternative was to propose an effective way of increasing upland habitat adjacent to existing or future aquatic habitat, and to evaluate the consequences of such a change to the existing golf course design and operation.

Restoration Options

Under all alternatives, creating new uplands west of Highway 1 would require the conversion of Hole 12 to wildlife habitat that includes both enhanced wetland and upland features. The two former golf holes west of Laguna Salada taken out of play after saltwater flooding in the 1980s currently contain non-native plants and bare, sandy ground that provide little habitat value for the snake and frog. These areas could be converted into upland habitat for the SFGS if CRLF breeding habitat that is free from predatory fish and which contains shallow water and emergent vegetation is also created in adjacent parts of Laguna Salada. Upland habitat created in these areas however would be susceptible to pedestrian trespassing, off-leash dog activity, potential saltwater spray, and may be prone to future flooding. Locating newly-created upland habitat on Laguna Salada's southeast and northeast sides instead would reduce some of the risks of impact by pedestrians, pets and ocean water, but would require one or more golf holes to be modified or relocated, and could increase impacts by golf course maintenance activities such as mowing. Creating SFGS upland habitat on the east side of the lagoon rather than the west side would allow for creation of new wetlands on the west side of the lagoon to mitigate for wetlands that are filled during planned restoration activities.

Creating upland habitat on the east side of Highway 1 would not benefit snakes and frogs in the areas where they primarily occur. Success criteria would be expected to require that SFGS either colonize the area by crossing the highway, an event that probably occurs rarely and presents substantial hazards to snakes that attempt it or by moving into the area from the Crystal Springs watershed. Connectivity to the Crystal Springs watershed to the east is limited by the unsuitable nature of the dense stands of eucalyptus and mixed evergreen forest and lack of distinct hydrologic connection with optimal foraging opportunities for promoting longer movements of SFGS. The exception to this could benefit CRLF and would occur under the No Golf Alternative, in which frog ponds would be created along Sanchez Creek, one of which would be constructed east of Highway 1. Sufficient CRLF populations in the immediate area are present and would be very likely to colonize new ponds on Sanchez Creek.

4.3 Golf Course Planning Considerations

Developing viable design solutions for a reconfigured Sharp Park Golf Course involves tying together golf course playability, endangered species habitat requirements, the original vision of Dr. Alister MacKenzie, and the unique physical and natural components of site.

Redesigning the layout and design of the golf course included understanding the evolution of the original layout dating back to 1931. Since the course was constructed it has changed due to storms off the Pacific Ocean and construction of roads. The result is that four of the oceanfront holes were relocated to the east side of the park and a sea wall protects the golf course from the ocean.

Presently there are 11 holes that are in the original location plus a shortened par three with an original green complex. Over most of the past 80 years the typical MacKenzie characteristics have almost disappeared but can still be seen.

Alternative A18 keeps almost all of the original holes and would accomplish the goal of creating viable upland SFGS adjacent to the wetlands. To maintain an 18-hole regulation course on this property, it is important to keep the existing 18th hole in place because the course needs to return to the clubhouse. A scorecard showing the final lengths and pars of each hole under Alternative A18 is shown as Appendix E.

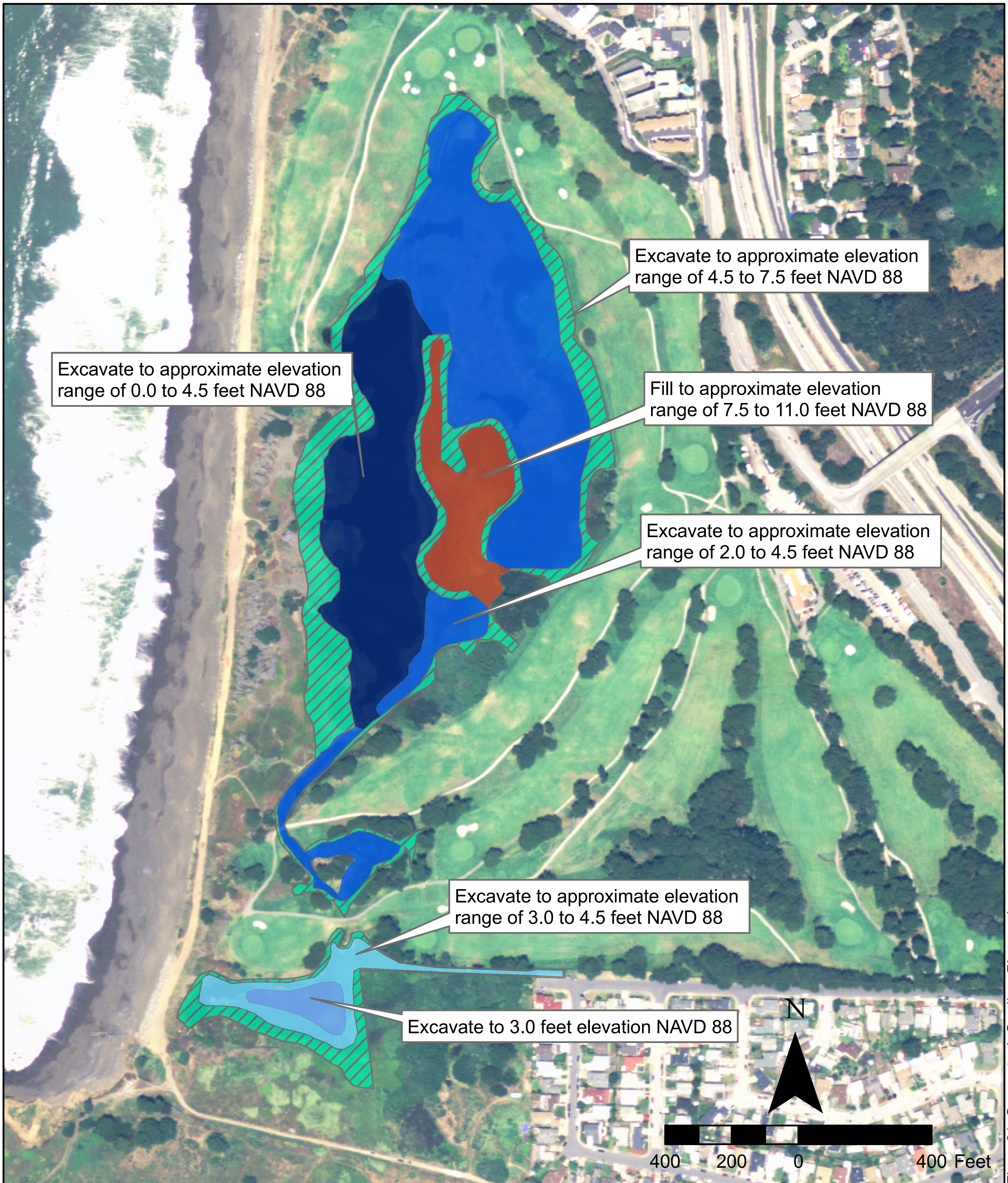
The proposed 9-hole alternative would eliminate golf around the lagoon by eliminating two golf holes and replacing the two holes at the rifle range. The 9-hole alternative would also add a driving range and practice hole.

4.4 Features Common to All Alternatives

The common component of all alternatives is restoration of the wetlands complex. Under all alternatives, the same features are proposed to restore wetland habitat and reduce the potential for recurrence of the problems that now occur, which include sedimentation, eutrophication due to dead and decaying vegetation, loss of open water habitat, and flooding of fairways. Implementing the restoration actions below would accomplish the main goal of the project, which is to enhance CRLF and SGFS habitat. The main components of the wetland restoration are as follows:

- **Dredging to remove sediment and decaying vegetation**. The areas that are currently open water within the lagoon would be deepened by up to 2 feet, and open water areas within the pond by up to 3 feet (Figure 21). Dredging to this extent would bring bottom elevations in the lagoon to 0' NAVD 88 at the deepest part of the lagoon, and down to +2' NAVD 88 in the pond. The eastern portions of the lagoon and pond as well as the connecting channel would be excavated up to 6 feet in the centers to restore open water habitat and to ensure that ample edge habitat consisting of open water/emergent vegetation interface and wetland/upland interface would persist for the foreseeable future. Deepening these areas will ensure persistence of open water habitat by discouraging the growth of dense stands of bulrush and cattails that are overgrowing the wetlands and diminishing habitat quality for the SFGS and CRLF.

- **Recontouring the shoreline to create shallow water habitat**. The eastern edge of the lagoon, the edges of the connecting channel, and the north and south edges of the pond would be contoured to create shallow water habitat (1-3' deep) to allow for CRLF breeding habitat. Shallower water (<1') will allow for growth of vegetation upon which frogs can attach egg masses, while deeper water (1-3') will allow for areas of open water or areas floating emergent vegetation.



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Wetland Grading Plan

Sharp Park Conceptual Restoration Plan

Pacifica, CA

Figure 21

TETRA TECH

- **Creation of an upland peninsula.** A peninsula of approximately 2 acres will be created in the middle of the lagoon and shallow water habitat for the CRLF. The peninsula is intended to address the shortage of upland SFGS habitat, and offer additional shallow water habitat at its edges for CRLF breeding. The peninsula will be constructed to be high enough above ordinary high water and the water table that it will develop an upland plant community and allow squirrels and other rodents to establish burrows which would later be used by the SFGS.

- **Construction of upland mounds**. Upland mounds will be created on the east and south sides of the lagoon and in the dispersal corridor between the lagoon and the pond.

- **Pump Operations.** Altering the methods of operating pumps and other measures to control hydrological features is proposed under all alternatives. The main purpose of altering pump operations is to be able to better control water levels without stranding CRLF egg masses, and thereby reduce the extent of golf course flooding. The main feature of this action is to cycle the pumps more frequently so that they turn on when the water is at a lower level than they currently do. The main disadvantage of cycling the pumps more frequently is that they will likely wear out more quickly than they would under current conditions. The need to operate the pumps more frequently could be reduced by raising the level of fairways that flood, as proposed under Alternative A18.

- **Upland/Aquatic linkage and habitat segment.** A habitat linkage area between the lagoon and the pond would be constructed with native upland vegetation and mounds designed to attract the SFGS. Construction of this corridor will require closing Hole 12 and revegetating the area with native upland species. The corridor would be bisected by the connecting channel, which will provide CRLF breeding habitat and SFGS foraging habitat. The habitat linkage will allow the SFGS population to inhabit a contiguous habitat segment area with features that will provide suitable habitat for SFSG on a year round basis between the lagoon and Mori Point without disturbance from humans or mowing equipment.

- **Completion of a Compliance Plan.** SFRPD has completed a compliance plan that is designed to avoid mortality and injury of SFGS and CRLFs resulting from maintenance and operations of the golf course (SFRPD 2009). Features of the compliance plan include increase monitoring to determine the earliest incidence of CRLF egg deposition, restrictions on mowing, gopher trapping, or repairs in sensitive areas, restrictions on use of particular types of herbicides, and increased stewardship training. Compliance planning is occurring under a separate process than the restoration planning described in this report.

- **Closure of Hole 12.** Due to its position directly between the lagoon and the pond, Hole 12 would be closed under all alternatives. Closing this hole would allow for creation of an uninterrupted habitat corridor between the lagoon and the pond and would also reduce the amount of human intrusion into areas that might be transited by SFGS. Hole 12 would be replaced under each alternative, although the exact alignments vary.

- **Catchment Basins**. To slow the rate of sedimentation from upstream sources, sediment catchment basins would be installed in two locations, one near the mouth of Sanchez Creek and the other on City of Pacifica property just outside the northern boundary of the Sharp Park.

- **Fencing**. A post and rail fence would also be installed to discourage human and pet intrusion into the restored habitat area, although the alignment of the fence in areas away from the seawall may vary according to the different alternatives. All alternatives include fencing along the seawall to the west of the lagoon, according to the Draft Compliance Plan.

- **Revegetation**. Uplands, wetlands, and shallow aquatic areas would be revegetated. The proposed plant palette includes aquatic, wetland, transitional and upland plant species known to occur in areas adjacent to Laguna Salada or similar habitat types. These plants occupy different strata to maximize habitat for a variety of species, particularly the SFGS and the CRLF, for cover, basking, and foraging. More specifically, emergent and floating-leaved species were selected to minimize the growth of non-native *Typha angustifolia* that currently provides poor CRLF habitat. Increased emergent and floating-leaved vegetation should also provide increased habitat for the San Francisco forktail damselfly. Sources of information include the recovery plans for the SFGS (USFWS 1985) and the CRLF (USFWS 2002). Table 2 lists plant species that are recommended for revegetation of all areas.

Table 2. Native Plant Species Recommended for Revegetation

Type	Scientific Name	Common Name
Transitional	*Juncus patens*	Spreading Rush
Transitional	*Rubus ursinus*	CA Blackberry
Transitional	*Scrophularia californica*	Beeplant
Transitional/Wetland	*Rumex salicifolius*	Willow Dock
Transitional/Wetland	*Salix lasiolepis*	Arroyo Willow
Transitional/Wetland	*S. sitchensis*	Sitka willow
Upland	*Achillea millefolium*	Yarrow
Upland	*Anaphalis margaritacea*	Pearly everlasting
Upland	*Argentina anserina*	Silverweed cinquefoil
Upland	*Artemisia californica*	CA Sagebrush
Upland	*Baccharis pilularis*	Coyote Bush
Upland	*Bromus carinatus var. maritimus*	CA Brome
Upland	*Castilleja wightii*	Indian Paintbrush
Upland	*Clarkia rubicunda*	Farewell to Spring
Upland	*Danthonia californica*	Oatgrass
Upland	*Diplacus aurantiacus*	Orange Bush Monkeyflower
Upland	*Dudleya farinosa*	Liveforever
Upland	*Festuca rubra*	Red Fescue
Upland	*Leymus triticoides*	Creeping Rye/Beardless Rye
Upland	*Mimulus aurantiacus*	Sticky Monkey Flower
Upland	*Nassella pulchra*	Purple Needle Grass
Upland	*Rhamnus californica*	Coffeeberry
Upland	*Sidalcea malviflora*	Checkerbloom
Wetland	*Eleocharis macrostachya*	Common Spikerush
Wetland	*J. effusus*	Rush
Wetland	*Sagittaria latifolia*	Broad-leaved Arrowhead
Wetland	*Scirpus microcarpus*	Small-fruited Bullrush
Wetland/Aquatic	*Potamogeton diversifolius*	Waterthread Pondweed
Wetland/Aquatic	*Potamogeton nodosus*	Long-leaved Pondweed
Wetland/Aquatic	*Sparganium angustifolium*	Narrowleaf Burreed
Wetland/Aquatic	*S. eurycarpum*	Broad-fruit Burreed
Wetland/Aquatic	*Typha latifolia*	Cattail
Wetland/Aquatic	*Zizania palustris*	Wildrice

Habitat features in restored upland areas would be the same under all alternatives, with the main difference being the extent of restored area. Ruderal areas and areas currently used for golf would all be restored as native coastal scrub/grasslands, although some of the uplands would be restored specifically for SFGS basking habitat.

- **Maintenance and Monitoring**. Assuming that the alternatives are designed and implemented correctly, success of any of the restoration alternatives will depend on the degree of maintenance and monitoring that occurs. Monitoring is recommended on a yearly basis, and maintenance needs will be determined by the results of the monitoring efforts. Monitoring for the following should occur on a yearly basis:
    - **Use by Listed Species** Since this is a recovery action for the SFGS, monitoring for use of restored areas by SFGS and the CRLF should be the major monitoring priority. As wetland and upland communities develop after restoration, habitats for SFGS and CRLF are anticipated to gradually develop as well. Surveys should begin prior to construction, and should continue after construction to document the extent of viable habitat and the population health of these species. Surveys should be coordinated with USFWS and CDFG to ensure compliance with endangered species laws and regulations.
    - **Invasive Plant Species** Since most of the habitat surrounding Sharp Park has been altered by the presence of non-native species, some of which are noxious invasive species, it is likely that restored areas will also be colonized by these species. Due to the relatively large area of restoration and the high labor needs associated with controlling invasive species, it is recommended that resources be applied to controlling the most noxious invasive species, including perennial pepperweed *(Lepidium latifolium),* gorse *(Ulex europaeus)*, reed canary grass *(Phalaris arundinaceae)*, and various types of thistle.
    - **Vegetation Cover** Percent vegetation cover in restored upland areas should be monitored at 6 month intervals for the first three years, and on a yearly basis thereafter. Wetland areas should be monitored to ensure that the target plant communities are developing and to ensure that areas do not become overgrown. Native species should be replanted yearly or as needed to provide a competitive edge over non-native species.
    - **Non-native Wildlife and Feral Species** Habitat restoration can be successful only if predation from non-native or feral species such as cats, bullfrogs, red foxes, and predatory fish can be minimized. Although predatory fish will be eliminated when the wetland complex is drained for construction, it is possible that new specimens will be deposited there later. Red foxes and feral cats have been seen at the site, and should be trapped and removed if they are identified as being threats to the SFGS or CRLF. Bullfrogs, which prey on CRLFs and juvenile SFGS in other areas, have not been identified in significant numbers at Sharp Park, but should be monitored for.
    - **Impacts from Human Use** Changing the use of lands immediately adjacent to the wetlands complex from primarily golf to other forms of recreation will affect the patterns of human use. Human incursion into restored uplands may affect SFGS in these areas, particularly by people on mountain bikes or those who allow dogs into the area, and should be monitored closely.
    - **Sediment** Although some sediment input into the wetlands system is desirable, controlling excessive sedimentation is one of the keys to ensuring that the current problem of overgrowth of emergent species in wetland areas does not occur in the foreseeable future. Sediment basins proposed for the north end of the park and on Sanchez Creek should be monitored for effectiveness on a yearly basis, and will likely need to be cleaned out at least

once every five years. Cross sections of the aquatic areas should be taken at established locations every five years to measure sediment accretion.

- **Water Quality** Water quality parameters to be monitored should include salinity, presence of heavy metals, dissolved oxygen, and input of fertilizers or herbicides from runoff or use of recycled water. Measurements should be taken at primary input locations and in the connecting channel. If water quality deficiencies are persistent and affect habitat quality for the SFGS and CRLF, remedial actions will be implemented as needed.
- **Construction Monitoring** A qualified biologist would be onsite during construction to monitor for sensitive species that may enter the construction area. The construction area should be surveyed for listed species prior to construction, and any specimens found in the construction footprint should be trapped and relocated. The biological monitor must be given authority to shut down construction in the event that listed species are found in the construction area.

4.5 ALTERNATIVES

The following alternatives have been considered in this report:

18-Hole Alternative (Alternative A18)

Alternative A18 is the conceptual plan that was under design for recovery of the SFGS and the CRLF prior to consideration of restoring greater Sharp Park (Figure 14). This alternative is intended to fulfill the recovery goals for the snake and frog while maintaining as much of the current golf course configuration as possible.

Under this alternative, Hole 12 would be closed and restored as coastal scrub/grassland habitat. Holes 10 and 13 would be shortened, and a new hole would be created near the rifle range/ archery course east of Highway 1. No new holes would be restored on the west side of the lagoon; instead, this area would be restored from its degraded condition to native upland habitat. Portions of the fairways in holes 10, 14, and 15 would be raised to 10.0' NAVD 88 from their current elevation of between 6.5' and 9.0' to prevent flooding on the fairways and also to discourage frogs from depositing egg masses in locations where the resulting tadpoles may end up being stranded. The fairway, green and tee areas of hole 18 would be raised to allow a consistent 2% slope from the east side of hole 18 to the west side of hole 14. No boardwalk would be created under this alternative, as there would be no need to cross the restored habitat area between the lagoon and pond. Several Monterey cypress trees would be removed from fairways east and north of the lagoon, as well as from the ruderal habitat west of the lagoon.

SFRPD would develop a new 165 yard, par three hole (Hole 7) after the existing 6th hole and in the location of the current organic waste site and rifle range. This hole would replace the existing 12th hole which would be removed to allow habitat creation between the lagoon and the pond. The new hole will be 165 yards from the back tee and play slightly uphill. The bunkering and sculptured contouring would be characteristic of design strategy and aesthesis of Dr. Alister MacKenzie.

The length of the hole is approximate and would become the second longest par three on the course. This length helps provide a variety of distances of par threes which is desirable for a regulation golf course.

9-Hole Alternative (Alternative A9)

This alternative is intended as a compromise between golf considerations and expanded upland areas east of the main body of the lagoon, and to increase opportunities for recreational pursuits other than golf. Under this alternative, all holes bordering the wetland complex would be closed and restored to coastal scrub/shrub habitat (Figure 15). Three holes (1, 8, and 9) would remain west of Highway 1, along with a driving range and teaching area, and two new holes would be constructed at the rifle range. All existing holes east of Highway 1 would remain in their current location. Excess spoils from excavation of the lagoon would be deposited on the rifle range after remediation. Numerous Monterey cypress trees would be removed under this alternative. A concrete golf cart path would be removed and replaced with a crushed granite path that would start near the clubhouse, proceed around the north end of the lagoon, and end at an observation point and interpretive center located on a boardwalk that would extend into the marsh.

This alternative creates a driving range where existing holes #2 and #3 are located. To accommodate this range, and remove all golf around the lagoon, two new holes would be built at the east end of the golf course. The new holes would start after the existing 6th hole and be built on the site of the organic waste dump and the defunct rifle range.

> Hole 4 – Par 4, 400 yards. This would be an uphill hole playing longer than the 400 yards and has the potential to be a challenging par 4.
>
> Hole 5 – Par 3, 175 yards. This mid to long length par three would play slightly downhill. The setting would be very appealing with a natural area on the left and hills on the right.

No Golf Alternative

A single no golf alternative was developed (Figure 16). This alternative was developed with the goal of maximizing the amount of available upland habitat for the snake and frog in the absence of golf operations. Because the lack of suitable upland habitat was identified as the limiting factor for the snake, the golf areas would be converted into uplands. Enhancements to wetland areas in lower Sanchez Creek, Horse Stable Pond, and Laguna Salada would be identical to those outlined in the other concept plans. Water from Sanchez Creek would be captured in two shallow ponds to provide additional breeding habitat for the CRLF.

Under this alternative, all golf holes would be closed and the fairways would be restored to native coastal scrub/shrub habitat. Sanchez Creek would be daylighted as far east as the defunct rifle range and riparian habitat would be restored along the stream. Two shallow ponds would be constructed on Sanchez Creek to enhance CRLF habitat away from the marsh complex. These ponds would be constructed above the 100-year flood elevation that would occur under projected sea-level rise scenarios. A crushed granite walking path would replace concrete golf cart paths and would be extended to encompass the entire lagoon. No bicycles would be allowed on these paths. Visitors would cross the marsh and upland dispersal zone on a boardwalk that would span the entire habitat zone between the lagoon and the pond.

Maintenance of the restored area would still need to occur, and the pumps would need to be operated in the same manner that they currently operate during the winter.

4.6 Potential Impacts of Restoration

If implemented, these plans could cause a number of temporary and permanent effects to natural resources and recreational opportunities at the park. The full range of potential effects will be assessed during preparation of CEQA documentation and will be addressed directly during the permitting phase of the project. The following have been identified as potentially occurring:

- *Take of listed species*. Although this project is considered a recovery action for listed species, accomplishing this goal will require a great deal of earthmoving and alteration of existing resources. Extensive human presence during construction, use of heavy excavating and earth-moving equipment, and noise can all harm wildlife species by interrupting their foraging or breeding habits or by resulting in direct harm to individuals.

- One of the first tasks that would occur during construction would be to drain the lagoon and the pond, which would discourage SFGS and CRLFs from remaining in the project area, reducing the potential for harmful effects to these species. However, although every effort would be made to capture and relocate sensitive wildlife resources prior to construction, the possibility of harm to listed species remains. Impacts to listed species would be addressed extensively during the Section 7 consultation process with USFWS and during similar consultation with CDFG, and standard and specific practices to minimize the potential for take will be developed at that time. Furthermore, impacts to listed species during construction will be offset in the long term by increasing the quantity and quality of their habitat in the marsh complex area.

- Under the 9-hole alternative, a walking path would encircle most of the lagoon area, enhancing opportunities for exercise and wildlife viewing. Under the No Golf alternative, the walking path would encircle the entire lagoon. The absence of golf operations would remove potential threats to wildlife posed by mowing and potential harm and harassment by players, but management for other threats would be required. Under both alternatives, the walking path would be located in the restored upland area, giving humans and dogs relatively unrestricted access to the area that is being restored for SFGS upland habitat. Although signs would be installed asking visitors to remain on the path, incursions into habitat areas would likely occur. Increased casual use of this area could increase disturbance of the SFGS, particularly by dogs and feral cats, which would be unlikely to use this area if it remained a golf course. Mountain biking would pose a threat to snakes basking on or attempting to cross trails.

- *Impacts on Recreation*. Although some recreational pursuits, such as bird watching, would likely be enhanced by the proposed restoration, other recreational aspects of the marsh area could be temporarily or permanently diminished. Dog walking would continue to be an unauthorized activity, and due to the greater presence of sensitive resources and higher potential for damage to egg masses after restoration, enforcement of this restriction, including issuance of tickets, will be increased.

- The most extensive impacts upon recreational resources would occur as a result of converting the golf course to a 9-hole course or by closing the golf course completely. A 9-hole course would be much less attractive to golfers than an 18-hole course, and a No Golf alternative would force golfers to find another course altogether.

- *Impacts to Visual Resources*. Extensive excavation and regrading of the marsh complex would occur and may have short term negative effects on local scenery. However, the marsh complex would be allowed to fill with water immediately upon completion of construction, and the visual impacts would subside at that time. Long-term effects from restoration of the wetlands complex would likely be positive as there would be a larger expanse of visually appealing open water. Some impacts to the viewshed would likely occur with the installation of a driving range, which would require construction of a chain link fence barrier at the south end of the course to keep golf balls from entering the residential area located south of the park.

- *Impacts to Wetlands*. Impacts to wetlands would occur during construction and as a result of creating an upland island in the middle of the lagoon. It is estimated that up to 1.5 acres will be filled during construction, an amount that would subsequently be recreated on the west and south sides of the marsh complex. Ultimately, there would be no net loss in amount or function of wetlands, and the end result would be restored wetland that provides better functions in terms of water quality benefits and wildlife habitat. Impacts to wetlands will be addressed during the Section 404 and 401 permitting processes and during preparation of a Lake and Streambed Alteration Agreement.

4.7 RESTORATION BENEFIT ASSESSMENT

To aid in evaluating the relative benefits of each alternative, SBI developed a habitat scoring system combined with a GIS model to determine the extent and quality of habitat that would be available to the SFGS and CRLF under each alternative. The scoring system was developed to characterize optimal habitat based on habitat correlates of the CRLF and SFGS from published literature, recorded observations of the species at the site during past surveys, and experience with these species at other sites in the region.

An aerial photograph of the site was divided into equal-sized cells, each 15 X 15 meters or about 1/20th acre, and a standardized scoring system was applied to each cell. Each cell was ranked least suitable (0), moderately suitable (1), or highly suitable (2) based on the presence of the 11 habitat characteristics included in the scoring system. Next, a raster surface consisting of cells, each with a habitat type and score associated with it was created over the photograph. Cells that were scored as containing high-quality habitat were summed in order to calculate the number of total acres of each habitat type in the photograph, and accuracy was verified with field visits to the site. This process was repeated using a concept drawing for each alternative to estimate the amount of habitat that would be created or lost under each alternative. Habitat quality under existing conditions is shown in Figure 17. Habitat quality projections for proposed alternatives are shown in Figures 18 through 20. Table 3 summarizes the results of the habitat quality assessment.

The following categories of habitat types were used in the analysis:

CRLF breeding and SFGS primary foraging habitat. Optimal habitat of this type contains water that persists long enough to facilitate CRLF tadpole development. It also would contain a mix of open water and emergent plant growth, as well as areas of shallow water extending at least one meter from shore. Wetlands in Horse Stable Pond and the connecting channel are examples of this habitat type.

SFGS upland retreat and basking habitat. Optimal upland habitat would consist of grassland or similar vegetation contacting CRLF breeding / SFGS foraging habitat with bushes providing some cover. Rodent burrows or large soil crevices would be present in soil that remains unsaturated throughout winter to provide upland retreats. Under existing conditions, this type of habitat is limited to an area south of Horse Stable Pond.

CRLF non-breeding and SFGS movement and secondary foraging habitat. Habitat containing year-round water or moisture but that is unsuitable for CRLF breeding was considered optimal non-breeding habitat so long as it also contained sufficient cover from predators, and was not separated from breeding habitat by a significant barrier or distance. Examples of this habitat type include dense shrubs located a short distance from water and riparian corridors. SFGS use this habitat type for movement and may forage here, though less frequently than in wetlands where CRLF breeding takes place.

Table 3. Habitat Quality Assessment and Projection Summary

Alternative	Available High-Quality Habitat (Acres) /(Increase over existing conditions)			Advantages for Habitat Quality	Disadvantages for Habitat Quality
	B/F	Up	N/F		
Existing conditions	3.9 (*)	3.8 (*)	13.9 (*)		Virtually no suitable SFGS upland habitat Little upland connectivity between HSP and LS
All Restoration Alternatives				Significant increase in uplands over existing conditions within LS and adjacent areas Increased CRLF breeding / SFGS foraging habitat in LS Adequate connectivity between HSP and LS Elimination of predatory fish Reduction of impacts of park visitors through fencing, signs	Golf operations would pose an ongoing potential threat to individual snakes, except under the No Golf Alternative
A18	10.7 (+6.8)	23.4 (+19.6)	10.0 (-3.9)	See above	SFGS foraging habitat on west and north sides of LS are adjacent to golf course
A9	10.7 (+6.8)	44.3 (+40.5)	10.1 (-3.8)	See above	Footpath through upland areas could result in pedestrian / pet impacts in habitat areas
No Golf	11.3 (+7.4)	97.4 (+93.6)	12.9 (-1.0)	See above, and Increased CRLF breeding / SFGS foraging habitat in LS, additional breeding ponds to mitigate potential future sea level rise Increased SFGS habitat east of Highway 1 Increased habitat by daylighting portions of Sanchez Creek	Footpath through upland areas could result in pedestrian / pet impacts in habitat areas

B/F = California red-legged frog breeding / San Francisco garter snake primary foraging habitat
Up = San Francisco garter snake upland basking / retreat habitat
N/F = California red-legged frog non-breeding / San Francisco garter snake secondary foraging habitat

Of the three habitat types mentioned above, CRLF non-breeding and SFGS movement and secondary foraging habitat is considered the least valuable in this location. This is because the moisture and cover that characterize high quality non-breeding habitat also would be available year-round at Laguna Salada, Horse Stable Pond, and the canal. For this and many other frog populations the shallow water and emergent vegetation which characterize high quality breeding habitat effectively function as non-breeding habitat outside of the breeding season. Furthermore, while some frogs at the site are likely to move relatively long distances from their breeding habitat, most probably stay or make only short movements from the water bodies. At one breeding site in Santa Cruz County as many as 80-90% of CRLF were found to remain there year-round (Bulger et al. 2003) although this number is probably very site-specific. While maintaining non-breeding and movement habitat also is important to ensure the survival of local CRLF populations by protecting individuals prone to long distance dispersal (Fellers and Kleeman 2007) addressing the lack of core breeding habitat should be the first priority for CRLF habitat enhancement at Sharp Park. Therefore habitat creation at this site emphasizes providing breeding habitat where moisture and cover persist year-round, and replacing non-breeding habitat with habitat of this type is considered to be a positive tradeoff.

Likewise, while the SFGS may occasionally use typical CRLF non-breeding habitats including riparian forest (SBI 2008), its primary upland habitat consists of grassland or similar areas with some shrubs and underground retreats. Therefore, replacement of CRLF non-breeding and SFGS movement and secondary foraging habitat with upland basking and retreat habitat is considered to be a positive tradeoff for the SFGS as well.

It is also important to note that while the No Golf Alternative offers by far the greatest amount of SFGS upland basking and retreat habitat, much of the newly created upland habitat is located relatively far from the marsh complex. These areas are unlikely to be used as frequently as similar upland areas closer to water, and evidence from another site suggests that extensive upland areas would not be required to maintain a stable population of SFGS. As an example of this, the West-of-Bayshore parcel located in Millbrae, California supports a large population of SFGS despite upland habitat at that site being limited to a relatively narrow area directly adjacent to the canals and marshes. The average total width of the 180-acre parcel is only about 750 feet, and a significant proportion of the area (more than 44%) is covered by wetlands. Consequently, few upland areas at the site extend farther than 350 feet from the wetlands, and most upland areas are considerably closer. Despite the relatively small amount of available upland habitat at that site (about 100 acres of upland vs. 80 acres of wetlands), the SFGS population was estimated to consist of several hundred individuals, and appears to be similar to when it was first estimated in 1994 (SBI 2009).

Under the No-Golf Alternative upland habitats would be created up to 800 feet from the main wetland complex. Upland habitat restored under the No-Golf Alternative east of Highway 1 would be located even farther from the existing wetlands in an area where there have been several studies with a negative finding for SFGS, and barriers to dispersal mean that colonization by SFGS is not guaranteed. While SFGS may eventually use these areas, distant uplands are less likely to be used extensively by the SFGS when suitable habitat exists nearby highly productive wetlands. Therefore, alternatives that concentrate upland basking and retreat habitat near the marsh complex may offer a comparable amount of highly utilized upland habitat in critical areas as does the No Golf Alternative.

Each alternative, including those that retain golf at the park, would provide a several-fold increase in high quality upland habitat over the 3.8 acres currently available, and each would be sufficient to allow the SFGS to persist at the site (Table 3). Alternative A18 would result in 23.4-acres of upland habitat located mainly south and west of the lagoon. Under Alternative A9, 44.3 acres of upland habitat would be distributed mainly around the perimeter of the lagoon. Each of these also would provide uninterrupted areas for SFGS to make seasonal movements to and from high quality winter uplands that will be created between Horse Stable Pond and the lagoon and to the slopes at Mori Point to the south.

4.8 Construction Sequence and Timeline for Implementation

A phased approach to construction was assessed. Under a phased approach, the most pressing tasks would be completed first, with other tasks to follow as funding allowed. The most pressing tasks in this plan are to dredge or excavate to improve water flow and to complete the restoration of the wetland complex and uplands on the east side of the lagoon and between the lagoon and the pond. Restoration of upland areas beyond the areas immediately adjacent to the lagoon or in the dispersal corridor south of the lagoon are considered to be of less importance, and could be constructed at a later time.

A phased approach would likely present a significant increase in the overall budget for the project. There are at least three reasons for this. The first is that the cost of mobilizing and demobilizing equipment, construction crews, traffic control staff, and other staff and equipment is a significant part of the estimated project cost. This cost would only be incurred a single time if the entire project were constructed at once, whereas it would be incurred multiple times under a phased approach. Furthermore, the least cost construction scenario would include re-use of much of the excavated material, which would be of such quantity that it would be impossible to stockpile it for later use. Therefore, it would need to be reused at the same time that it was excavated. A phased approach would make this impossible, necessitating offsite disposal of all excavated materials. Finally, the estimated construction costs for the various alternatives are based on 2009 prices and prevailing wages, which will increase each year after 2009. Therefore, the estimated cost for the same project will be higher in 2010 than the price estimated for 2009.

Under a single phase approach, the wetland complex would be restored first. Numerous steps need to occur before this can happen. Once a preferred alternative has been selected from the conceptual plan, the alternative will go through 30%, 60%, 90% and final design. Each of these levels of design can take several months. Permit applications will likely be prepared at the 30% design level and submitted shortly thereafter. The process of acquiring Section 7, Section 404, and Section 401 permits can take up to a year. Once designs are completed and permits have been secured, a bid package will be sent to prospective contractors, who will submit bids, and the winning contractor will contract with SFRPD and any other project sponsors to construct the project. It is recommended that the project be constructed during the dry period and after the CRLF and SFGS breeding seasons are over. Assuming that the project is designed during the winter and spring of 2010 and permit applications are being reviewed during the spring and summer of 2010, it is likely that the earliest possible opportunity to construct the project would be in summer of 2011.

4.9 Cost Considerations and Estimated Project Budget

Restoration Cost Considerations

Preliminary cost estimates were developed for each Sharp Park restoration alternative using a unit cost-based approach. The unit cost values were based on recent cost quotations, standards for restoration projects, and recent, and/or location-specific bid sheets or unit cost analysis information. Unit cost values represent equipment, labor, materials, and contractor overhead and profit. These cost estimates are at a preliminary level (approximately a 10 percent design) and are intended to allow comparisons between alternatives. The costs do not account for phased construction (multiple mobilizations), and costs are in 2009 dollars. Summary cost estimates for each alternative appear in Tables 4 and 5.

Quantities were estimated from areas shown on the GIS figures, topographic/bathymetric data generated in and around the wetlands complex, and assumed averaged dimensions (e.g., depths of excavation or fill). Site preparation is represented as a percentage of direct constructions costs. It includes mobilization and demobilization, dewatering and/or diversion, erosion control and BMPs, traffic control, utilities, and general demolition of minor obstructions not accounted for in the major cost item costs. The total site preparation percentage was 17%, as shown on the unit cost breakdown table.

General markups are estimated as a percentage of direct construction cost plus site preparation costs. General markups include a contingency to account for uncertainties in design, topography and other site conditions. Markups also include costs of the design phase of the project and construction management. These markups total 50% as shown in the unit cost table. Real estate acquisition costs are assumed to be zero since all restoration activities occur on existing golf course property.

Operation and maintenance costs are represented as a net present value (NPV) over a 50-year assumed project life. These costs include maintenance of vegetation during the first five years, invasive species maintenance every year for the first five years and as needed after five years, pump maintenance at the Horse Stable Pond pumphouse every other year, wetlands maintenance at years 25 and 50, sedimentation basin maintenance every five years, and culvert maintenance at years 25 and 50. These costs are detailed in the operations and maintenance summary table.

An important cost component of each alternative is the cost to dispose of excess excavation or fill that cannot be reused onsite. For this estimate it was assumed that excavation for haul-away would be disposed in Half Moon Bay, California, at the Ox Mountain Landfill Facility. There is a transfer station located in Pacifica; however, the unit cost to dispose at this location is much higher because it requires rehandling before final disposal at a landfill. The total unit cost of $35 per cubic yard for this line item assumes the following:

- nominal cost of $4 per cubic yard for excavation and loading into 26 cubic yard semi end-dumps,
- semi end-dump haul rate of $130 per hour,
- total one-way distance of 20 miles (combined highway and surface street) between Sharp Park Golf Course and Ox Mountain Landfill,
- disposal fee of $23 per cubic yard including escalation and contractor mark-up per July 2009 quotation from Ox Mountain (operated by Republic Services, Inc.).

In general, alternative project costs are driven by earthwork line items such as excavation and grading. Removing, on average, the top 1.5 feet of sod and topsoil off the fairways to ensure that kikuyu is eradicated is one of the most expensive features of this plan, and dredging/placing organic and mineral sediments from the wetland complex is the other most expensive feature. With variations depending on the type and location of excavation, generally the costs are based on the amount of surface area moved. Because the No Golf Alternative proposes to have the greatest area of fairway excavated, it would have the greatest volume excavated (approximately 303,000 cy) whereas Alternative A18 has the least amount of fairway excavated and therefore the least volume of excavated materials (approximately 126,000 cy).

Materials deemed suitable for reuse as golf course substrate are those with low organic content and high sand/silt content. It was assumed that approximately 50% of excavated material was suitable for reuse as golf course substrate onsite. Under the off-site disposal scenario, the remaining fill requires haul-away and landfill disposal. Under this assumption the cost of hauling and disposing off-site of unsuitable fill is ~$10.0M for the No Golf Alternative and between ~$3.8M and $5.5M for Alternatives A18 and A9. If all excavated fill is reused onsite the cost of this task is reduced for each alternative by up to 56%. Further design stages should verify assumptions made in estimating cut and fill quantities and lagoon water surface elevations, as well as the estimated excavation and grading unit costs.

Another element that differentiates the alternatives is the amount of planned riparian and coastal scrub/shrub restoration. The No Golf Alternative requires the greatest amount of riparian and coastal scrub/shrub restoration due to the removal of the golf greens, totaling 94 acres, which is over double the amount of the other three alternatives. Additionally, the No Golf Alternative requires importing nearly three times as much topsoil fill than the other alternatives.

Revegetation costs include mulch/topsoil as needed. Earthwork costs assume no contaminated material. If contaminated materials are encountered, additional costs will be incurred for treatment and/or transport to an appropriate disposal facility.

A final element that differs among alternative designs is the demolition and reconstruction of the golf cart path. Under the No Golf Alternative the entire cart path would be demolished and reconstructed for recreational use. Under Alternative A9, only 20% of the cart path would be demolished and reconstructed. Alternative A18 does not require any work on the cart path and therefore does not incur a cost for this action.

Under all action alternatives, some of the construction, revegetation, monitoring, and maintenance tasks could be performed by SFRPD staff, volunteers, interns, and students. SFRPD staff operate medium-duty equipment such as backhoes and dump trucks, and could perform tasks such as daylighting Sanchez Creek, excavating and maintaining sediment basins, and maintaining the connecting channel. SFRPD also has biological and natural resources management staff that can prepare and implement revegetation and invasive species control plans, monitor egg masses, CRLF populations, and vegetative conditions, and organize interns or volunteers to control invasive species or perform revegetation or other maintenance tasks. The Natural Areas Program also maintains close ties with area colleges, and can likely enlist the assistance of graduate students who could perform thesis work by monitoring vegetative succession, wildlife populations, sedimentation, or other aspects of the post-restoration process that need to be observed, recorded, and assessed in order to determine the success of the project and apply adaptive management as needed.

GOLF COURSE REALIGNMENT COST CONSIDERATIONS

Preliminary cost estimates were developed for each of the Sharp Park Golf Course Alternatives. For a majority of the estimates a unit cost-based approach was used. The unit cost values were based on recent cost quotations, and recent local actual costs analysis information. Unit cost values represent equipment, labor, materials, and contractor overhead and profit. The costs assume all work for each phase will occur at the same time and not result in multiple mobilizations.

These estimates include work that is necessary for the proposed conceptual changes addressed in each alternative. Other course improvements such as bunkers, irrigation, drainage etc. that may need to be implemented are not included in the concepts or cost estimate.

The work addressed and quantities were estimated based on the layout of each alternative. The size of greens, tees, bunkers, irrigation, grading, drainage, grassing, cart path and landscaping are based on the conceptual layout and accepted parameters for golf holes. The work includes greens constructed to USGA recommendations, sand based tees and bunkers built to minimize maintenance. Soil amendment and additional drainage is proposed in newly constructed areas to assist in turf quality and playability.

The alternative project costs were driven by the size of the area being newly constructed or reconstructed and the size and number of golf course features. The construction areas would utilize suitable fill material generated by the habitat restoration process. The cost of moving the material is included in the restoration estimates. The cost to grade the soil into golf course features is included in the golf course estimate.

Both alternatives suggest creating new golf on the east side of the existing golf course and include removal of existing mature vegetation, mostly eucalyptus trees. The costs include hauling away the trees. One alternative provides for the realignment of the archery club access road to allow the construction of a new green.

The inclusion of netting for a driving range is a major component of the nine hole project cost. The costs were based on a generalized netting layout to protect the parking lot and the adjacent golf hole.

ESTIMATED COSTS

Estimated costs reported here include site preparation, construction, and general markups but do not include long-term operations and maintenance. An estimated cost schedule, including maintenance costs, is given in Appendix D.

Table 4. Construction Costs – Offsite Disposal

	NO GOLF	A18	A9
Site Preparation	$2,789,875	$1,056,040	$1,549,454
Restoration Construction	$12,753,248	$4,872,183	$7,114,973
Golf Hole Construction	n/a	$1,612,755	$1,711,750
General Markups	$7,771,561	$3,770,489	$5,188,089
Total	**$ 23,314,684**	**$ 11,311,467**	**$15,564,266**

Table 5. Construction Costs – Excavated Materials Reused Onsite

	NO GOLF	A18	A9
Site Preparation	$858,361	$330,772	$498,867
Restoration Construction	$5,121,184	$2,017,719	$3,006,509
Golf Hole Construction	n/a	$1,612,755	$1,711,750
General Markups	$2,989,773	$1,980,623	$2,608,563
Total	**$ 8,969,318**	**$ 5,941,869**	**$ 7,825,689**

4.10 REGULATORY PROCESS

Many of the resources found in the wetlands complex and surrounding areas are protected under one or more state or federal regulations. These regulations are enforced by agencies including the USFWS, US Army Corps of Engineers (USACE), CDFG, and the Regional Water Quality Control Board (RWQCB). Table 6 describes the permits that may be needed for this project and the conditions under which they would be required. Permit applications are generally prepared after the 30% designs for the project have been completed.

This project will require significant consultation with the USACE and RWQCB. As the federal agency charged with enforcement of Section 404 of the Clean Water Act, USACE may permit this project under a Nationwide Permit (NWP) that allows fill of wetlands for restoration projects that result in greater amounts of restored wetlands, or under an Individual Permit. Under this or separate permit, USACE may also comment on the proposed reuse of dredged materials for restoration, as proposed under all alternatives. A Section 401 Water Quality Certification will be requested from RWQCB for impacts to wetlands, habitat, and water quality. Likely concerns during this process involve water quality effects that may arise during draining of the wetlands complex prior to construction, as well as the fate of decant water resulting from placement of dredge spoils in upland locations.

In addition to wetlands regulation, the main regulatory programs guiding this plan are the Federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA), as well as the California provisions for fully-protected species. Although the City of San Francisco is carrying out the restoration of the wetland complex on a voluntary basis, as the owner of Sharp Park, the City must still comply with these regulatory programs in carrying out the alternatives set forth in this plan. Under the ESA, implementation of the plan may require consultation or permitting from the USFWS. Under CESA, implementation of the plan may require consultation or permitting from the CDFG

Table 6. State and Federal Permits That May Be Required for Plan Implementation

Agency	Permit/Approval	Required for
Federal Agencies		
USFWS/NMFS	Incidental Take Permit, Biological Opinion	Federal projects that may affect species listed as endangered, threatened, or proposed under the federal Endangered Species Act (16 USC 1531-1544)
USACE/EPA	Individual /Nationwide Section 404 Permit	Discharge of Dredge/fill into Waters of the U.S., including wetlands
	Section 10 Permit	Construction in navigable waters (may not apply to this project)
State Agencies		
California Coastal Commission	Coastal Zone Consistency Determination	Land development within the coastal zone including grading, removing, placement, and extraction of any earth material; and harvesting of major vegetation
CDFG	Section 2080 Permit (Endangered Species Management)	Activity where a species listed as candidate, threatened, or endangered under the California Endangered Species Act may be present in the project area and state agency is acting as lead agency for CEQA compliance
	Section 2081 Incidental Take Permit	Needed if it is determined through the Section 2080 Permit process that the proposed project may result in take of a state-listed species
	Lake/Streambed Alteration Agreement (California Fish and Game Code 1602)	Change in natural state of a river, stream, lake (includes road or land construction across a natural streambed)
State Water Resources Control Board	Construction Activities Storm Water General Permit	Stormwater discharges associated with construction
Regional Water Quality Control Board	Waste Discharge Requirements (Water Code 13000 et seq.)	Discharge of waste that might affect groundwater or surface water (nonpoint source) quality
	401 Certification (Clean Water Act, 33 USC 1341; required if the project needs a USACE Section 404 Permit)	Discharge into Waters of the US, including wetlands
State Historic Preservation Office	Section 106 (National Historic Preservation Act, PL 89-665, 16 U.S.C. 470 et seq.)	Projects that may impact a historic property within the area of potential effect.

Specific measures to avoid potential adverse effects on the CRLF and the SFGS during enhancement activities would be developed in consultation with the USFWS and CDFG. The following general measures provide guidelines for implementation of the conceptual restoration enhancement plan:

- Prior to any ground-disturbing activity, a qualified biologist should provide environmental awareness training for all workers who will be on site. The training should include a brief overview of the ESA, a description of the CRLF and SFGS, what steps should be taken to avoid impacts to their habitats, and what to do if an individual frog or snake is found.
- A temporary exclusion fence should be installed to prevent listed species from entering the work area. The placement of the fence would be directed by a qualified biologist in consultation with the USFWS and CDFG.
- Following installation of the exclusion fence and at least 6 weeks prior to construction, a trapping program will be conducted to remove all listed species from the area to be impacted.
- A qualified biologist should monitor all work activities on site. The monitor would verify that exclusion fence, erosion control measures and any other environmental protection measures are properly installed.
- Work should be confined to the smallest area possible to safely complete the project. Workers should be instructed to stay within the work corridor and limits should be clearly marked.
- Vehicle refueling and maintenance should be conducted a minimum of 150 feet from aquatic habitats and other sensitive areas identified by a qualified biologist.
- Construction activities should be done during the dry season (June 1 through October 15).
- If a CRLF or SFGS is found inside a work area a USFWS and CDFG-authorized biologist should relocate it out of harms way.

5. CONCLUSIONS

With no action, the future of SFGS at Sharp Park is, at best, uncertain. Although historically SFGS have existed at Sharp Park while it functioned as a golf course, conditions of the wetlands and adjacent uplands are far less favorable than in the past. During the past several decades sedimentation of the lagoon and flooding of the surrounding uplands has reduced available habitat. Saline overwash from Pacific storms in the early 1980s probably caused a sharp reduction in both the SFGS population and its prey base. The current population is more a reflection of these historic events than of direct impacts from the golf course, although substantial conflicts do exist, particularly with regard to upland habitat. Mori Point provides nearly all suitable upland habitat used by snakes at Sharp Park, and snakes traveling from these areas to the relatively poor foraging habitat at Laguna Salada face significant hazards. Although these hazards are being addressed and reduced through measures described in the compliance plan, some potential for harm to SFGS from golf operations will always exist. At a minimum the SFGS requires more upland habitat between Horse Stable Pond and Laguna Salada, and would also benefit from having more high quality CRLF breeding habitat in the lagoon.

Though beneficial, due to the limited availability of upland habitat in Sharp Park, increasing the distribution and carrying capacity of the SFGS will not be accomplished by increasing CRLF breeding habitat alone. Increasing SFGS use of the area north of Horse Stable Pond, the areas adjacent to Laguna Salada, and the connecting channel will require maintaining undisturbed upland habitat in these areas. These enhancements can be accomplished without significant changes to the golf course design or to the movement of golfers on the course.

All four conceptual alternatives would accomplish the main goals of restoring, increasing, and diversifying SFGS and CRLF habitat, and meeting the recommendations of the SFGS recovery plan. Under all alternatives, this would be accomplished by:

- Dredging and recontouring the wetlands complex to remove overgrown wetland vegetation, create a mix of shallow water habitat and open water areas, and increase water flow through the wetlands;
- Closing Hole 12 and shortening or narrowing other holes to allow for an SFGS dispersal corridor and upland retreat/basking areas on the east edge of the lagoon, on a peninsula in the center of the lagoon, between the lagoon and the pond, and around the pond;
- Removing non-native Monterey cypress trees to reduce shading in SFGS and CRLF habitat and to reduce perching and spotting locations for predatory birds;
- Installing fencing to restrict intrusions into sensitive habitat and interpretive signs to educate visitors about sensitive wildlife; and
- Developing a water control plan that will alleviate the potential for egg mass and tadpole stranding.

The main differences between the various alternatives are the degree of upland habitat that would be created east of the wetlands complex, the costs to implement the respective alternatives, and the tradeoff between the amount of habitat and the degree to which golf opportunities are lost. Implementing Alternative A18 (with excavation re-use) would be the least costly alternative, would result in the least impact to golf, and would restore the least amount of restored upland habitat for the SFGS. Implementing the No Golf Alternative (with excavation re-use) would have higher costs, would result in the greatest impact to golf, and would restore the greatest amount of upland habitat. Alternative A9 would fall in the middle of the No Golf Alternative and Alternative A18 in terms of cost and amount of restored upland habitat. However, because the best upland habitat for the SFGS is that which is found near water bodies, much of the upland habitat restored east of the wetlands complex under the No Golf Alternative would be of lower value than that located immediately adjacent to the wetlands complex. Therefore, from a habitat restoration standpoint, converting uplands immediately adjacent to the wetland areas would result in the greatest net benefit to the SFGS per acre of enhanced habitat. Focusing restoration efforts on these areas also would result in the least amount of lost golf opportunities since more distant habitat would remain available for golf. While the No Golf Alternative would result in a greater total amount of upland SFGS habitat, the value of the habitat gained through this alternative would diminish with increasing distance from the wetland complex. Furthermore, because of the close proximity of major urban centers including housing, freeways, major roads, and businesses and the intrinsic threats posed by them to the snake, restoring uplands and locating additional wetlands further to the east would potentially increase the chance of take of this species by drawing the SFGS away from the relatively protected existing wetlands complex into areas that would likely be extensively used by hikers, mountain bikers, and dog walkers.

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Sharp Park Conceptual Restoration Alternatives Report

APPENDIX A: HYDROLOGICAL REPORT

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Report for the Hydrologic Assessment and Ecological Enhancement Feasibility Study: Laguna Salada Wetland System Pacifica, California

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1.0 INTRODUCTION

Laguna Salada is the main water body of a freshwater wetland complex covering approximately 25 acres within Sharp Park near the city of Pacifica, California. The site is presently isolated from the ocean by an earthen dike and provides habitat for various freshwater species; most notably the endangered San Francisco garter snake (SFGS) and the threatened California red-legged frog (CRF). The San Francisco Recreation and Parks Department (SFRPD) administers the property and is creating a management plan focused on enhancement of suitable habitats for the SFGS and CRF. Kamman Hydrology & Engineering, Inc. (KHE) has collaborated with a project team led by Tetra Tech, Inc. to assist SFRPD with preparation of the enhancement plan. This report presents the findings of KHE's hydrologic and hydraulic analyses as they relate to proposed ecological enhancements of the Laguna.

1.1 Objectives and Scope

The purpose of this assessment is to improve understanding of the hydrologic processes which affect the distribution of ecological habitats in the wetland system and flooding of the adjacent golf course. Much of what is currently known about the hydrology of the Laguna Salada wetland system was presented by PWA et al. (1992) in an earlier Resource Enhancement Plan. The PWA report includes a description of historical conditions at the site as well as results from a hydrologic monitoring study during the period 1990-1991. The present study aims to expand on the findings of the earlier research to reflect current conditions at the site and to extend those findings into a suite of analytical models that can assist Tetra Tech and the SFRPD in the planning and design for marsh, pond, and stream restoration alternatives.

An approach was developed to address the project objectives with a suite of tasks that included compilation of existing data sources, field data collection, and analytical modeling. KHE maintained a hydrologic monitoring network at the site during the period April 2008 to April 2009. Field data collection focused on understanding the variability of water level and salinity in system. Monitoring data were utilized to characterize current site conditions and to calibrate analytical models for additional investigation. Three specific analytical modeling tools were developed:

- A water budget model to investigate the seasonal variations of water supply and demand at the site.
- A salinity mass balance model to investigate the sources and relative impact on water quality.
- A hydraulic model to simulate the water level response in the wetland system to winter storm runoff.

This report presents findings which focus on understanding existing conditions at the site. We anticipate that the modeling tools developed in this study will contribute to the feasibility assessment of conceptual project alternatives under consideration in the enhancement plan.

1.2 Site Description

The project site is located in San Mateo County near the city of Pacifica, California (Fig. 1). Prior to development of the Sharp Park Golf Course, environmental conditions at Laguna Salada were representative of a coastal lagoon system (Fig. 2). Environmental changes during recent decades have modified the hydrologic characteristics of the system by isolating Laguna Salada and the adjacent wetlands from the ocean. An earthen seawall spanning the western boundary of the site obstructs natural drainage and eliminates the episodic tidal exchange characteristic of a coastal lagoon.

The drainage basin contributing storm runoff to the wetland complex encompasses an area of approximately 980 acres (Fig. 3). There are three inflows of surface water entering the site. Sanchez Creek, augmented in its lower reaches by highway drainage and runoff from a residential neighborhood, is the largest source of storm runoff. The creek flows westerly through the Sharp Park Golf Course before it is directed into a culvert across the #9 fairway that discharges into a channelized drainage and flows into the wetland near Horse Stable Pond. A reservoir in the upper Sanchez Creek watershed stores runoff for a portion of the wet season, thus reducing the area contributing flow to the wetlands. A second inflow collects runoff from a network of storm drains which enter the site near the golf coarse club house via an underground culvert that discharges into the eastern margin of Laguna Salada. A third inflow collects runoff from a network of storm drains that enter the site via an underground culvert that discharges into the northern extent of Laguna Salada. Additional runoff inputs to the site include overland flow across the golf course property and from the Golden Gate National Recreation Area property to the south.

The current wetland system is composed of two freshwater ponds connected by a narrow channel and bordered by emergent wetlands (Fig. 4). Laguna Salada is the larger and deeper of the two remnant ponds, with a bottom elevation ranging between 0 to 2 feet (NAVD 88[1]). The Horse

[1] All elevations in this report reference NAVD 88, a fixed vertical datum. For reference, mean sea level is equivalent to an elevation of 3.26 feet on the NAVD 88 datum at the NOAA tide gaging station at San Francisco.

Stable Pond is located approximately 1,000 feet south of Laguna Salada and is considerably smaller and shallower, with bottom elevations ranging between 3.5 and 5 feet. The connector channel enables bi-directional flow depending on the relative water surface elevations in the two ponds. Portions of the connector channel are very shallow and at extremely low water levels the ponds become hydraulically disconnected.

Drainage from and water levels in the Laguna Salada wetlands are presently maintained by the operation of a pumping station located at the southern extent of Horse Stable Pond. The pumping station contains two pumps; a large pump with a flow capacity of 10,000 gallons per minute (GPM) and a smaller pump with a flow capacity of 1,500 GPM, which transfer excess runoff from the ponds to an outfall on the beach. The probes which trigger the pump operation are adjusted seasonally to control the pumping operations. At the beginning of the wet season the small pump is set to activate when the water surface elevation in Horse Stable Pond exceeds approximately 6.9 feet (NAVD 88) and the large pump is set to activate when the water surface elevation exceeds 7.5 feet (NAVD 88)[2]. The probe settings are adjusted during the CRF egg-laying season in order to maintain a water level above all identified egg masses. Additional adjustments to the probe settings and pond water levels are needed following major rainstorms as subsequent CRF egg laying occurs at higher elevations.

The Sharp Park golf course is irrigated during dry weather periods with freshwater from two sources; runoff captured and stored in a small reservoir on Sanchez Creek located in the hills east of Highway 1 and potable water delivered by a local water agency. There are potential plans to introduce reclaimed water for irrigation of the golf course in the future. It is believed that the majority of applied irrigation is consumptively used, with any excess going towards groundwater recharge. Water budget calculations and analysis monitoring data do not indicate significant contributions of excess irrigation as either surface runoff or groundwater inflow to the wetlands.

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[2] Corresponding gage heights on the staff plate attached to the intake structure are 1.0 and 1.6 feet, respectively. Probe settings provided by Sean Sweeney in an email communication on 11/4/2008.

2.0 SUMMARY OF KEY FINDINGS

Assessment of existing hydrologic conditions focused on characterizing the seasonal and inter-annual variability of water level fluctuations in the Laguna Salada wetland system. Hydrologic monitoring at the site documented water level fluctuations over a range of 3.2 feet during the period April 2008 through February 2009. Observations noted a gradual recession of the water surface elevation in Laguna Salada from 7.3 feet (NAVD 88) in May 2008 to 6.1 feet in October 2008. Rainfall in early November 2008 quickly filled Laguna Salada and the water surface elevation remained near 7 feet (NAVD 88) through the early winter. A storm event in mid-February 2009 increased the water surface to an elevation of 9.3 feet.

Results from a water budget investigation reveal that the system is supplied with adequate water to fill the ponds even in dry years. This study and the previous hydrologic site assessment (PWA, 1992) were both completed during multi-year droughts and reflect "worst-case" scenarios with respect to water supply and water quality conditions in the Laguna Salada wetlands. However, conditions observed and monitored during these studies reflect suitable conditions to sustain desired ecological habitats.

Inter-annual variability of water levels in the wetlands is low due to the operation of the pumping station. Early spring water levels in the pond areas are consistent between dry, normal, and wet water year types because water level is controlled by the pumping station. Dry season losses due to evapotranspiration and seepage do not likely vary much year to year. Surface water inflows associated with winter storm events provide the primary source of water to the wetland system. Groundwater inflow exceeds groundwater outflow (seepage); as a result, groundwater inflows contribute to the overall water budget of the system. As a result of groundwater contributions, dry season water level recession occurs at a slightly slower rate than would be expected due to evapotranspiration losses alone.

The hydraulic connectivity of the wetland system was evaluated by monitoring concurrent water surface elevations in Laguna Salada and the Horse Stable Pond. The connector channel enables hydraulic exchange of water between the pond areas at water surface elevations greater than 6.2

feet (NAVD 88). The connector channel limits the rate at which water can be exchanged between the two pond areas. Dense vegetation growth within the channel creates hydraulic friction that slows the movement of water.

The seasonal variation of salinity in the wetland system was monitored to characterize existing conditions and to assess potential impacts associated with saltwater encroachment. Salinity in the pond areas ranged between 0.7 and 2.5 parts per thousand (ppt) during the monitoring period. Salinity within Laguna Salada appears uniform and well mixed. The total mass of dissolved salts in the wetland system increased by 8 percent (8%) during the monitoring period. Relatively saline groundwater with a salinity of 15 ppt was observed in the sandy flat between Laguna Salada and the seawall,however, measured groundwater gradients indicate net groundwater movement in this area is westward or from the Laguna towards the ocean. The small net increase observed in the total mass of dissolved salts may be explained by short-term encroachments of saltwater towards the wetlands or concentration of salts by evaporation of relatively fresh (low salinity) sources, however, the observed increase falls within the likely range of uncertainty associated with the accuracy of existing data sources and the mass balance calculations. Any encroachment of saltwater in recent years has not produced accumulative effects on the salinity of the pond areas. Salinity observed in 2008 ranged within the values reported by PWA et al. (1992) for observations in 1990-91.

A modeling system was developed to integrate the rainfall-runoff, flood routing, and pond storage characteristics of the wetland system. Findings from the modeling investigation present the water level responses to a range of design storm events based on existing conditions at the site. The model provides an analytical tool which can be utilized in future investigations to evaluate the potential impacts to flood hazards associated with various conceptual design alternatives.

3.0 HYDROLOGIC ASSESSMENT

3.1 Summary of Monitoring Results

KHE collected hydrologic monitoring data at the project site during the period April 2008 through April 2009. Field data were utilized to describe the hydrologic conditions representative of the monitoring period and to calibrate analytical models of hydrologic processes at the site. The primary components of the monitoring network are Solinst-brand Levelogger instruments (devices recording water level and temperature or water level, temperature, and conductance) installed along the west shore of Laguna Salada and along the north shore of Horse Stable Pond. Data recorders were programmed to store readings continuously at 15-minute intervals and suspended inside 2-inch diameter stilling wells by stainless steel cables. Water level monitoring locations are indicated on Figure 4.

Each water level recorder was contained in a stilling well and paired with a staff gage for which the elevations were surveyed relative to the NAVD 88 vertical datum. Adjustment factors to convert gage height (*GH*) readings to NAVD 88 elevations were determined to be *GH* + 2.29 feet for the staff gage in Laguna Salada and *GH* + 0.85 feet for the staff gage in Horse Stable Pond. The observed water level elevations determined from staff gage readings were then compared to the corresponding water depth recorded by the Levelogger instruments to calculate the datum adjustment factors needed to adjust water level data to NAVD 88 elevations. Time series plots of the NAVD 88 water surface elevations for Laguna Salada and Horse Stable Pond over the study period are presented in Figure 5.

Observations during a site reconnaissance in February 2008 noted that the ponds were full and low-lying portions of the adjacent golf course were inundated. Late-Spring 2008 water levels were driven by operation of the pumping station at Horse Stable Pond. The probes controlling the pump were adjusted by staff at Sharp Park on April 10th and again on April 24th reducing water levels in both ponds to an elevation of about 7.4 feet (NAVD 88) by the end of the month. Water levels then maintained a nearly constant elevation throughout the month of May 2008.

Water level recession due to natural seepage and evapotranspiration losses began in early June. Both ponds receded at a nearly constant rate (approximately 1 inch per week) between June 1st and August 31st. Water levels in Horse Stable Pond diverged from those of Laguna Salada beginning in early September. The rate of water level recession for Horse Stable Pond increased to approximately 3 inches per week while Laguna Salada continued to recede at its previous rate of approximately 1 inch per week.

The lowest observed water levels and highest observed salinity occurred during the month of October 2008. Horse Stable Pond receded to its minimum water level of 5.6 feet on October 3rd. Water level then fluctuated in Horse Stable Pond throughout October in response to minor inflows. Laguna Salada maintained a nearly constant water level throughout October 2008 reaching its minimum water level of 6.1 feet on October 30th.

Early winter water levels in November 2008 were controlled primarily by operation of the pumping station in Horse Stable Pond. Water levels in both ponds increased rapidly in response to rain events totaling 1.3 inches on November 1st and 0.3 inches on November 3rd. The pumping station was activated when water level in Horse Stable Pond exceeded an elevation of 7.5 feet. The net water level response from the early November 2008 rainfall increased water levels by 0.8 feet in both ponds. The remainder of November was relatively dry; water levels in both ponds maintained a nearly constant elevation at 6.8 feet (NAVD 88) for the remainder of the month. A slight increase in water level of approximately 0.2 feet was observed during a two-week period in late November and early December. This increase, along with a slight increase in water level in mid-October do not coincide with storm runoff as no significant rainfall was reported for Pacifica.

Monitoring data were not recorded between December 12, 2008 and February 5, 2009 due to equipment failures[3]. Rainfall totals during this early 2009 included 2.3 inches in December, 0.8 inches in January, and 0.4 inches in early February. Water levels in both ponds had increased

[3] Note: additional processing may salvage some data from this period. If available, data will be included in a final version of this report.

slightly to an elevation of 7.2 feet on February 5th. The probes controlling the pumping station had been adjusted during the intervening period due to the presence of CRF egg masses.

Data recorders were reprogrammed during the February 5th site visit. Subsequent rains on February 15th, 16th, and 17th (3-day total of 4.3 inches) increased water levels in the pond to an elevation of 9.3 feet. The larger of the two pumps did not activate during the mid-February storm as expected although the smaller pump did discharge some water from the system. [NOTE: further text and findings forthcoming after final monitoring visit in April 2009].

The April 2008 to March 2009 period was representative of a conditions during a dry water-year type; approximately 16 inches of rain, 64% of the climatic normal, was recorded at Pacifica during the 11 month period. The National Weather Service station at San Francisco reported the driest spring (March-May 2008) on record with 0.47 inches of precipitation. December 2008 and January 2009 precipitation was also below normal.

Groundwater sampling targeted the relatively flat area between Laguna Salada and the seawall. Two piezometers (PZ-1 and PZ-2), or shallow groundwater monitoring wells, were installed in April 2008 (see Fig. 4). Initial groundwater elevations had been measured relative to the top of the piezometer casings (an arbitrary datum). The field task to survey instrument elevations was scheduled for later in the summer at which time the groundwater observations were to be adjusted to NAVD 88 elevations for comparison to water level data in the pond. Unfortunately, vandalism of the piezometers (removal and destruction) rendered much our data unusable in this study. A subsequent piezometer installation in Novermber 2008 (PZ-3; see Fig. 4) utilized a stainless steel casing that was driven into the soil with a slide hammer; a design much more difficult to remove. Groundwater level and basic water quality parameters (temperature, salinity, and pH) were sampled from PZ-3 during the November 11, 2008 site visit and again in February 2009. Groundwater levels and salinity were also measured in shallow wells located immediately east of Horse Stable Pond and within the Mori Point Park property. The locations of the Mori Point wells are also plotted on Figure 4.

3.2 Water Budget

A water budget provides a quantitative accounting of water supplies and demands to a water body. The primary components of the water budet equation are:

$$I - O = \Delta S/\Delta t \qquad \text{(Eq. 1)}$$

where:

I is the volume of inflow,

O is the volume of outflow, and

$\Delta S/\Delta t$ is the net change in the volume of water storage per unit time, t.

Surplus water is stored within the pond/wetland system during periods in which inflow exceeds outflow. Conversely, water is removed from storage during periods in which outflow exceeds inflow. The corresponding rise or fall in water level to a given increase or decrease in storage is also influenced by the topographic characteristics of the storage site

An analytical water budget model was developed to evaluate the seasonal and inter-annual variability of hydrologic conditions. The water budget model discretizes the primary inflow and outflow components into monthly volumes and provides an analytical solution to the water balance equation for each time step. The expanded water balance equation utilized for Laguna Salada takes the form:

$$P + Q_{in} + G_{net} - Q_{out} - ET = \Delta S/\Delta t \qquad \text{(Eq. 2)}$$

where:

P is direct precipitation,

Q_{in} is surface water inflow,

G_{net} is net subsurface (groundwater) inflow (*i.e. inflow – seepage*),

Q_{out} is surface water outflow (discharge from pump station), and

ET is evapotranspiration.

The relationship between pond stage, or water surface elevation, and the available cumulative (Laguna Salada and Horse Stable Pond) water storage capacity was determined by terrain analysis of topographic and hydrographic survey data collected by Lee & Associates in 2008 (Fig. 6). Laguna Salada has a much larger storage capacity than the Horse Stable Pond. At the lowest observed stage during the monitoring period (6.1 and 5.6 feet, respectively for Laguna Salada and Horse Stable Pond), Laguna Salada retained approximately 23 acre-feet[4] of water in storage while the Horse Stable Pond retained less than 0.5 acre-feet of water in storage. At the stage where water begins to spill out of the ponds and flood low-lying portions of the adjacent golf course (approximately 8.5 feet), about 62 acre-feet of water is stored within Laguna Salada and an additional 4 acre-feet is stored with the Horse Stable Pond (cumulative total of 66 acre-feet).

Rainfall at the project site is characterized by wet winters and dry summers. Typically, more than 85% of the annual rainfall occurs during the period between November and March. Data from the National Weather Service station at Pacifica (NWS Coop ID: 46599) reveal a mean annual precipitation of 28.5 inches for the period 1983-2007. Inter-annual variability of rainfall is moderate. The lowest rainfall observed in the last 25 years occurred in 1990 when 15.9 inches were recorded. The highest rainfall observed during this period was 1998 when 46.9 inches were recorded.

Surface water inflows appear to be intermittent or seasonal, with low base flow occurring only during the wet season. No surface inflows were observed during the period April 1 to October 1, 2008 and similar conditions were reported by PWA et al. (1992) for the period 1990-91. The surface inflows are ungaged and few data are available to describe the unimpaired runoff characteristics of coastal watersheds in San Mateo County. A mean annual runoff of 7.9 inches, 28 percent of the mean annual precipitation, was estimated for the project site from a regional rainfall-runoff relation developed for the San Francisco Bay area by Rantz (1974).

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[4] An acre-foot is a standard unit of water volume measurement. It is the volume of water, 43,560 cubic feet, that will cover an area of one acre to a depth of one foot.

Estimates of precipitation and surface inflow values representative of dry, normal, and wet water year types were determined in order to assess inter-annual variability of the water budget. Dry, normal, and wet water years are represented by historical values having a 0.8, 0.5, and 0.2 exceedance probability[5], respectively (Table 1). The ratio of annual precipitation at a given exceedance probability to the long-term mean annual precipitation was multiplied by the mean annual runoff to estimate annual runoff totals for the different water year types.

A seasonal distribution of surface inflow was derived from mean monthly streamflow data at the U.S. Geological Survey gaging station on Pescadero Creek (station ID: 11162500). The resulting distribution curve was modified for the period April to October to reflect the lack of sustained baseflow to the project site during months of low rainfall. The monthly percentage of annual runoff was then multiplied by the estimated annual runoff total to determine a time series of monthly surface inflow for the dry, normal, and wet water year types

Surface water outflows are blocked by the earthen seawall under existing conditions. Excess water is drained from the wetlands via the pumping station in Horse Stable Pond. Pumping is controlled by the adjustment of probes which activate the pumps at a given water level as described above (section 1.2). As such, surface water outflow is estimated in the water budget as the volume of water required in each time step to pump the ponds down to the water level at which the pumps are activated. Water budget modeling assumed that the pumping station maintained water levels at 6.9 feet (NAVD 88) at the beginning of the winter and is adjusted in February to maintain water levels at 7.3 feet.

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[5] An exceedance probability is the probability that a specified variable (e.g., total annual discharge or annual precipitation) will be exceeded during the year. In the context of this discussion, exceedance probability expresses the likelihood of a given value to be exceeded in a given year. When applied to an annual time series, exceedance probabilities of 0.8 and 0.2 can be expected, on average, to be the 2nd wettest and 2nd driest annual totals in any given 10-year period.

Evapotranspiration estimates were determined using the cover coefficient approach as described by Allen (1998). Monthly average reference evapotranspiration values for the Coastal Plains Heavy Fog Belt Zone (DWR, 2005) were multiplied by a cover coefficient which is a lumped parameter used to describe the relative differences between the wetland conditions and the reference crop (grass). The cover coefficient for wetland vegetation ranges seasonally. Data presented by Allen (1998) for a cattail marsh were utilized to derive cover coefficients that ranged from 0.75 during the dormant winter period to 1.25 during the midseason period between May and September. The resulting evapotranspiration estimates range between 0.5 inches in January and 5.8 inches in July.

The groundwater inflow/outflow terms are the most difficult parameters of the water budget to quantify. A conceptual model of surface water-groundwater interactions was developed from a combination of existing data sources and field observations. Shallow groundwater is present to the east and south of the wetland complex. The water table follows a gradient directed toward the ocean and intersects the ground surface at the open water ponds. The rate of groundwater flow is proportional to (1) the slope of the water table, or the hydraulic gradient, and (2) the hydraulic conductivity, or permeability, of the soil materials. The net difference between groundwater inflow and outflow is determined by the relative subsurface conditions east and west of the open water ponds. If the product of the hydraulic gradient and conductivity is greater to the east of the pond, subsurface inflow will exceed outflow and additional water will be stored in the pond/wetland system.

Water level observations recorded from a monitoring well positioned between Laguna Salada and the seawall (PZ-3) reveal shallow groundwater levels approximately 0.5 feet below the water level in the adjacent pond. These observations indicate a hydraulic gradient of approximately 0.002 directed toward the ocean. For comparison, previous monitoring of groundwater wells in the area east of Laguna Salada by PWA (1992) indicated a hydraulic gradient of approximately 0.007 directed toward the pond. All else being equal (i.e. same hydraulic conductivity), if the hydraulic gradient of the groundwater inflow coming from the east exceeds the hydraulic gradient of the outflow directed towards the ocean, then groundwater inflow exceeds groundwater outflow and increases the volume of water stored in the ponds.

The net volume of groundwater inflow (G_{net}) to Laguna Salada was evaluated quantitatively by use of the water budget model. The model was configured to solve the water budget equation for G_{net}:

$$\Delta S/\Delta t + P + Q_{in} - Q_{out} - ET = G_{net} \qquad \text{(Eq. 3)}$$

Precipitation, surface inflow, and surface outflow can be removed from the equation by isolating the data record for the dry summer months in which those terms were observed to equal zero. This simplifies the summer (dry season) water budget equation for the period May through Septhember 2008 as:

$$\Delta S/\Delta t - ET = G_{net} \qquad \text{(Eq. 4)}$$

During the period May – September 2008, water level in Laguna Salada dropped 1.0 feet, however, the estimated evapotranspiration during the same period totaled 1.8 feet. The difference suggests that the summer recession of pond water levels is moderated by a net inflow of groundwater to the pond/wetland complex. A linear relation between stage and G_{net} was developed to quantify groundwater contributions in the water budget analyses. It is likely that the relation becomes nonlinear at low stages because further declines of the pond water level would reverse the hydraulic gradient between the ocean and the ponds.

Annual water budgets derived from simulations of dry, normal, and wet water year types are presented in table 2. The normal water year type is represented by the median annual totals of precipitation and runoff. Dry and wet water year types are represented by annual totals of precipitation and runoff with an exceedance probability of 0.8 and 0.2, respectively.

Results from the water balance simulations show that the variation of water year types does not affect the annual change in the volume of water stored in the wetlands. Wet years do not produce an annual increase in water storage and dry years do not lead to an annual decrease in storage. The water budget simulations confirm that adequate water is supplied to the system to maintain the open water ponds during dry years. Increases in precipitation and runoff seem to only affect the volume of water drained from the system via the pumping station in Horse Stable Pond.

Data from the water balance simulations suggest that groundwater contributions effect water levels in the pond/wetland system, however, the magnitude of this effect is not large. During the normal (median) water year type, surface inflows exceed the net volume of groundwater inflow by more than 600 percent (600%) and by 250 percent (250%) during dry year types.

Table 1. Representative values of dry, normal, and wet water year types utilized in modeling the water budget.

Exceedance Probability	Annual Precipitation (inches)	Relation to Mean Annual	Annual Runoff (inches)	Water Year Type
0.80	19.8	69%	5.5	Dry
0.50	29.4	103%	8.1	Normal
0.20	34.6	121%	9.6	Wet

Table 2. Annual water budget for the Laguna Salada wetland complex. AF is Acre-feet.

Water Year	***P* (AF)**	**Q_{in} (AF)**	**Q_{out} (AF)**	***ET* (AF)**	**G_{net} (AF)**	**ΔS (AF)**
Dry	27	104	121	52	42	0
Normal	38	266	294	52	42	0
Wet	49	540	578	52	41	0

3.3 Hydraulic Connectivity

The two main pond areas, Laguna Salada and the Horse Stable Pond, are hydraulically linked by a connector channel. At low water levels (less than 7 feet NAVD 88) the connector channel is approximately 20 feet wide. The channel is shallow; minimum bed elevation ranges between 3.1 and 6.2 feet. The highest point along the longitudinal profile of the channel is located just north of the cart path culvert passing under the 12th fairway of the golf course. When water surface elevations recede below 6.2 feet, the two ponds are hydraulically disconnected. This is evident in the water level data when the pond recession rates for Laguna Salada and Horse Stable Pond diverge in mid-September (Fig. 5).

The channel is spanned in places by emergent vegetation. The dense stems of cattails, in particular, create frictional resistance to the hydraulic exchange of water between the pond areas. Field observations during the monitoring period noted a dense stand of cattails adjacent to the culvert within the connector channel. As water level increases following winter storm events, hydraulic exchange seems to improve as water can pass around the cattail bunches. Once water levels equilibrate between ponds, there is little, if any, circulation or water transfer through the ditch between ponds.

Time series plots of the water surface elevations for Laguna Salada and the Horse Stable Pond illustrate the hydraulic exchange between the two pond areas during a storm event (Fig. 7). The November 1, 2008 rainfall event was the first storm of the monitoring period and brought approximately 1.3 inches of precipitation. Prior to rainfall, the water surface elevations for the two pond areas were in equilibrium at 6.2 feet. The initial water level response of Horse Stable Pond to rainfall was a rapid increase in stage relative to Laguna Salada. Hydraulic resistance in the connector channel noticeably restricted the runoff entering Horse Stable Pond to flow into the larger storage basin of Laguna Salada A burst of rainfall around 7:00 PM increased the water surface in Horse Stable Pond above 7.5 feet and triggered the 10,000 GPM pump. The pump operated for approximately 45 minutes and lowered the water surface in Horse Stable Pond below 6.9 feet at which point the pump shut off. Additional runoff increased water level in Horse Stable Pond by about 0.2 feet before water level in the pond began to recede. Water level in Laguna Salada continued to rise gradually over several hours. Hydraulic exchange between the two pond areas brought the water surfaces back into equilibrium approximately 24 hours after the initial rainfall began.

The November 1 example represents a small rain event that did not trigger a dramatic water level response. Flow in the connector channel was likely directed north (from Horse Stable Pond to Laguna Salada) for the entire event. In a larger storm event that increases water levels in both pond areas above the elevation which activates the pump, flow in the connector channel would be expected to be reversed (i.e. from the Laguna towards Horse Stable Pond). The relatively small storage capacity of Horse Stable Pond causes its water surface to rise rapidly. The relatively large storage capacity of Laguna Salada, in contrast, produces a more moderate response. The hydraulic gradient between the two pond areas initiates flow from Horse Stable Pond towards Laguna Salada when Horse Stable Pond water levels are higher relative to those in the Laguna and from the Laguna towards Horse Stable Pond when the Laguna water levels are higher. As the pumping station lowers the water surface in Horse Stable Pond below that of Laguna Salada, flow in the connector channel responds accordingly. In the absence of additional runoff inputs, the two pond surfaces would be expected to equilibrate and recede until the pumping station is shut off.

4.0 SALINITY ASSESSMENT

Salinity is a measure of the concentration of dissolved salts in water. The salinity characteristics of the pond/wetland system were evaluated by an approach that utilized a combination of field monitoring data and analytical modeling. Monitoring data were collected to describe the seasonal range and variability of salinity. Sampling included measurements from the open water ponds and groundwater monitoring wells. An analytical model was then developed to derive the mass of salt in the pond/wetland system given a known concentration and a known volume of water. Temporal changes in the mass of salts were evaluated to assess the physical processes affecting salinity in the wetland system.

The salinity assessment was developed to test the hypothesis that the seasonal change in salinity was affected by shallow groundwater conditions. Given its location along the coastline, there is the potential for seawater intrusion to increase salinity and alter the habitat conditions of the system. Salinity is expected to increase during the summer when evapotranspiration losses decrease the volume of water in storage and thus increase the concentration of dissolved salts.. If the seasonal variability of salinity is controlled by evapotranspiration, then the overall mass of dissolved salts should remain stable throughout the year even though the concentration may fluctuate. If, however, relatively saline water is being added to the pond during a portion of the year, the mass of dissolved salts in the system could increase over time.

4.1 Salinity Observations

Salinity was calculated from measurements of specific conductivity and temperature. Conductivity measures the ability of a material to carry an electrical current. In general, the higher the concentration of dissolved salts and minerals in the water, the higher the conductivity. A Solinst-brand Levelogger instrument collected water level, temperature, and conductivity readings from Laguna Salada for the period 4/7/2008-8/26/2008. Salinity was calculated from the conductivity data using an equation presented by Schemel (2001). Additional discrete samples of conductivity/salinity were collected using an YSI-brand 556 multi-probe system.

Salinity in the open water ponds generally varied inversely to water level over a range of 0.7 to 2.5 parts per thousand (ppt) during the monitoring period (Figs. 8 and 9). For comparison, PWA et al. (1992) reported a range of salinity between 1.0 and 3.0 ppt during their 1990-1991 study. A sampling investigation on August 20, 2008 collected vertical profiles of salinity at three locations in Laguna Salada accessed by kayak. The sampling locations were spaced evenly along the axis of deepest water (oriented north to south) to sample opposite ends of the pond and the middle. No vertical or spatial variations of salinity were observed on that date.

Initial sampling in Laguna Salada during April 2008 yielded a salinity of 1.3 ppt. The continuous data recorder then indicated a steady increase in salinity through the month of August (see Fig. 9). Discrete measurements indicate that this trend continued through the month of September. The highest recorded salinity in Laguna Salada was 2.3 ppt observed on October 2nd. Additional discrete measurements in November 2008 and February 2009 revealed salinity levels of 2.0 and 1.9 ppt, respectively, for Laguna Salada.

Salinity observations in Horse Stable Pond varied over a slightly higher range. Following the initial observation of 1.2 ppt in April 2008, salinity dropped to 0.8 ppt by the next sample on June 19th. This decline in salinity differs from the expected inverse relationship between water level and salinity. The decline in salinity is likely explained by the rapid drawdown of Horse Stable Pond in late April when the pump failed to shut off as expected and water level dropped 1.8 feet overnight. It is likely that the pond refilled with relatively fresh groundwater from the saturated soils adjacent to the pond. Observations between June and early October display a similar increasing trend to that reported for Laguna Salada with the highest observed salinity, 2.5 ppt, recorded on October 2nd. A subsequent sample on November 11th followed the first storm event of the year and yielded a result of 0.7 ppt. By early February 2009 salinity increased to 1.2 ppt.

Salinity of the groundwater inflows was sampled from monitoring wells on the GGNRA property by Mori Point near the marsh draining into Horse Stable Pond and from ponded water in the drainage channel where Sanchez Creek enters the wetland complex. Observations reveal a groundwater salinity ranging from 0.5 to 0.7 ppt. Initial plans to sample the salinity of groundwater in the area between Laguna Salada and the seawall were inhibited by the vandalism of the piezometers installed in April (PZ-1 and PZ-2). Samples from PZ-3 in mid-November revealed a salinity of 15 ppt; a much higher concentration than the salinity measured in the ponds or in groundwater wells installed between the Laguna and seawall in 1990-91.

4.2 Mass Balance Calculations

The mass of dissolved salts is calculated as the product of salinity and the volume of water stored in the pond/wetland system. Each salinity observation in the open water ponds is paired with a corresponding water level reading. The volume of water in storage at a given water level is obtained from the stage-storage relationship based on topographic and hydrographic survey data collected by Lee & Associates in 2008 (Fig. 6).

Time series plots of salinity, water level, and the calculated mass of dissolved salts are presented in Figures 8 and 9. Results from the mass balance calculations suggest that the total mass of dissolved salts in Laguna Salada increased approximately 11 percent over the monitoring period while the total mass of dissolved salts in Horse Stable Pond decreased approximately 25 percent over the same time interval. Although the data from Horse Stable Pond showed a larger percent of change, the relative contribution from Horse Stable Pond to the total salt budget for the system is minor due to its low storage capacity. The combined data for the total system reveal a net increase of 8 percent between April 7, 2008 and February 5, 2009.

The temporal fluctuations of the total mass of dissolved salts are subtle but reveal additional characteristics of the system. In April 2008, the total mass of dissolved salts in Laguna Salada decreased rapidly following two pumping events which drew down the water level by 0.8 feet. The mass of dissolved salts increased, however, between pumping events and throughout the month of May 2008. Data from summer show a slight decrease from mid-June through August. Subsequent sampling in October, November and February show increases in the total mass of dissolved salts.

Data from the Horse Stable Pond reveal a slightly different pattern. Following the April drawdown event, salinity decreased from 1.2 to 0.7 ppt. The salinity following pumping (0.7 ppt) is equivalent to the salinity measured in groundwater monitoring wells adjacent to the pond on the GGNRA property. Subsequent sampling indicated an increase in the mass of dissolved salts between June and August followed by a decrease between August and early-October. The mass of dissolved salts then maintained a constant level through early-November 2008 and increased before the last sample in early-February 2009.

The suggested decrease in the total mass of dissolved salts in Horse Stable Pond between August and October is questionable. Water level declined during this period, salinity increased, yet total mass of salt decreased. It is likely that the data suggest a decrease in the mass of dissolved salts because the stage-storage relationship underestimates the volume of water in storage at the low water levels observed in September and early-October. Given this observation, data were checked to evaluate whether the stage-storage relation was introducing errors in the calculation. Sampling events on June 19, 2008 and February 5, 2009 were collected at approximately equivalent water levels in the ponds. As such, temporal trends can be assessed without the need to account for the volume of water in storage. Salinity on June 19 was 1.6 ppt in Laguna Salada and 0.8 ppt in Horse Stable Pond. Following the summer drawdown period and subsequent refilling of the ponds due to storm runoff, salinity had increased to 1.9 ppt and 1.2 ppt in Laguna Salada and Horse Stable Pond, respectively. Comparing results from these two dates increases confidence in the calculated results.

4.3 Effect on Wetland Habitats

Observations from the period April 2008 to February 2009 and water/salt budget analyses suggest that groundwater contributions led to small increases in the total mass of dissolved salts in the pond/wetland system. Salinity in the ponds remained slightly brackish throughout the monitoring period and ranged between 0.7 and 2.5 ppt. Shallow groundwater entering the site has a background salinity of about 0.7 ppt. Sampling from the sandy flat between Laguna Salada and the seawall revealed a shallow groundwater salinity of 15 ppt.

There are two existing environmental processes that may have significant impacts on the salinity of the pond/wetland system: (1) the remobilization of salts stored in the adjacent soil materials from previous periods of inundation or wave overwash; and (2) saltwater intrusion of the coastal aquifer. A conceptual model is offered to explain the potential impacts of saltwater intrusion to the wetlands:

- The coastal aquifer is composed of a zone of fresh water (salinity < 1 ppt) to the east, a zone of salt water (salinity > 18 ppt) to the west, and a zone of transition between.
- The zone of transition can be a narrow. Sampling in 2008 revealed shallow groundwater salinity of 15 ppt at a distance of less than 300 feet from the shore of Laguna Salada which had a salinity of 2 ppt.
- Throughout all monitoring periods, the hydraulic gradient of the shallow groundwater outflow from the pond is directed westerly and the fresh water pushes back saltwater from the ocean.
- Under certain conditions, such as rapid drawdown due to pumping or extreme low water during late summer, the hydraulic gradient may reverse and subsurface water of relatively higher salinity may flow into the ponds.

The impact of shallow groundwater contributions to the salinity budget does not appear to be producing any long term trends. Overall, salinity observations from the open water ponds were not significantly higher than observations from 1990-1991 (PWA et al., 1992). It is likely that a high turnover rate associated with high inflows of surface runoff and shallow groundwater from the east continue to flush the system and maintain the slightly brackish condition.

The observation of relatively saline (15 ppt) shallow groundwater in close proximity to the ponds should warrant caution concerning the long term maintenance of freshwater habitats at the site. PWA's (1992) monitoring at a nearby location did not observe salinity greater than 2 ppt. It is possible that the 2008 observation of 15 ppt is indicative of an eastward progression of the transition zone defining the interface between fresh/saline groundwater conditions. It is also possible, however, that this zone fluctuates from year-to-year and that the previous monitoring occurred during a period when the transition zone was located further west. Further monitoring with a more extensive network of monitoring wells would be required address the issue with more confidence. Regardless, water and salt budget analyses indicate that the maximum salinity of groundwater inflow to Laguna Salada did not exceed a salinity concentration of 2.5 ppt during the 2008/09 monitoring period (and was probably much lower), indicating seawater intrusion was not a significant factor or impact to Laguna salinity during the monitoring period.

A future salinity source may be introduced to the Laguna Salada watershed in the form of irrigation with treated effluent. The impact of this potential source of salts was not evaluated as part of this study but should be considered as part of enhancement plan development if treated effluent is used for irrigation in the watershed. Sea level rise and climate change may also alter seasonal and long-term ocean levels and wave energy, potentially reversing shallow groundwater gradients between the lagoon and ocean and allowing more salts to migrate into the Laguna. The existing salinity and water budget models will prove to be useful tools in evaluating and quantifying potential benefits and impacts to wetlands under proposed enhancement plan alternatives.

5.0 STORM RESPONSE MODELING

A modeling system was developed to simulate the water level response to winter storm runoff entering the Laguna Salada wetland complex. The model integrates the rainfall-runoff, flood routing, and pond storage characteristics of the system. Modeling the hydraulic and hydrologic characteristics of the site allows for: (1) evaluation of water operations under existing conditions (e.g. areas of inundation for a given storm magnitude); and (2) evaluation of hydraulic/hydrologic changes associated with enhancment plan alternatives.

5.1 Rainfall-Runoff Simulation

A rainfall runoff model was developed for the drainage basin contributing runoff to the Laguna Salada wetland complex. The model is based on the Natural Resource Conservation Service method (also known as the SCS method) of estimating direct runoff from storm rainfall and was developed with the WinTR-55 computer program. The drainage basin is divided into eight subareas of varying size between 20 and 283 acres. Each subarea is characterized by unique values of surface area, curve number[6], and time of concentration. The calculated weighted curve number for the entire drainage basin is 78.

The model generates hydrographs for each subarea and a composite hydrograph for the cumulative inflow to the wetland complex. Simulated runoff from subareas not directly connected to the wetland complex are routed downstream along the lower portion of Sanchez Creek.

The rainfall runoff model was utilized to develop two sets of inflow hydrographs. The first set represented design storm hydrographs. Published depth-duration-frequency data for the San Francisco Bay region (Rantz, 1971) were consulted to determine the expected 24-hour storm

[6] Curve number is a dimensionless parameter used to describe the hydrologic characteristics of a given land cover and soil type combination.

rainfall totals for a range of storm recurrence intervals between 2- and 100-years (Table 3). An additional baseflow component was added to the storm runoff hydrographs. Baseflow on the rising limb of the hydrograph was set equal to one percent (1%) of the peak flow rate. Baseflow contributions on the falling limb of the hydrographs were set equal to two percent (2%) of the peak flow rate for the 2-, 5-, and 10-year recurrence interval events and five percent of the peak flow rate for the 25-, 50-, and 100-year recurrence interval events. Estimates of baseflow contributions were based on the estimated peak flow response to rainfall on February 15th and 19th 2009 and flow measurements made in Sanchez Creek on the afternoon of February 16th.

The second set of inflow hydrographs generated for the study represented historical (observed) events. As the watershed is ungaged, rainfall-runoff simulations were utilized to estimate inflow hydrographs for discrete storm events observed during the monitoring period. Rainfall data for these events were obtained from weather stations published for Pacifica, California, on the Weather Underground website (http://www.wunderground.com/). The resulting hydrographs were utilized in calibration of a hydraulic modeling component.

Table 3. Rainfall-runoff characteristics of design storms ranging between the 2- and 100-year recurrence interval events.

Return Period (years)	Rainfall Depth (in)	Runoff Depth (in)	Runoff Volume (AF)	Peak Flow Rate (cfs)
2	3.1	1.2	77	136
5	4.0	2.0	127	254
10	4.7	2.5	161	348
25	5.5	3.1	199	468
50	6.1	3.7	238	564
100	6.6	4.1	263	646

5.2 Hydraulic Model Development

The U.S. Army Corps of Engineers' River Analysis System (HEC-RAS) version 4.0 (March 2008) software was used to perform a one-dimensional unsteady flow analysis of the Laguna Salada system. The system consists of two basins, a connector channel linking the two basins, and a water-level activated storm water pumping system which pumps water out of the system into the Pacific Ocean.

Both basins within the system are governed by stage-volume relationships identified by the topographic and hydrographic survey by Lee & Associates in 2008 (Figure 6). Laguna Salada, the larger northernmost basin, contains nearly 12 times the volume of Horse Stable Pond. The Horse Stable pond contains the intake to the storm water pumping system, which controls the water level of the entire system. Parameters determining operations at the pumping station (e.g. flow capacity, water surface elevations to turn the pumps on/off) were based on existing operating criteria provided by SFRPD (Table 4 ; email communication with Sean Sweeny on November 4, 2008).

The connector channel is represented in the model as a series of nine cross-sectional profiles and includes the 48-inch corrugated metal culvert passing under the golf cart path on the 12th fairway. Model cross-sections were extended approximately 2,000 feet allowing for simulated water to spill out of the main channel into the off-channel marsh areas. Flow in the connector channel is bi-directional and is determined by the relative water surface elevations in the two pond areas.

Model simulations were run for a 48-hour period. Inflow hydrographs created from the rainfall-runoff modeling component are routed into the wetland complex at the three points of channelized flow indicated in Figure 4. For each time step during the simulation, the model determines the change in the volume of water in storage for each pond area by balancing the inflow and outflow rates. The relative increase/decrease in water surface elevation is determined from the corresponding stage-volume relationship. Transfer of flow between pond areas via the connector channel is simulated based on the hydraulic gradient at a given time step.

Roughness characteristics of the cross-sectional profiles were calibrated in a simulation of an observed storm event on November 1, 2008. Hydrologic monitoring data revealed that the transfer of water between the two pond areas is slowed by the frictional resistance of the channel boundary and by vegetation growing within the channel (section 3.3). The Manning's roughness coefficient (n) of the channel cross-sections was adjusted through an iterative process until the resulting time series plots of water surface elevations in both the Laguna and pond most closely approximated the observed condition (Fig. 10). A Manning's n value of 0.15 was selected as the best representation of channel roughness characteristics.

Table 4. Pump operation parameters assumed in hydraulic model of existing conditions. WS Elev is water surface elevation (NAVD 88).

	Flow Rate (GPM)	WS Elev On (ft)	WS Elev Off (ft)
Pump #1	10,000	7.5	7.0
Pump #2	1,500	6.9	6.4

5.3 Design Storm Simulations

Design storm simulations utilized the rainfall-runoff and hydraulic models to evaluate the water level response to a range of storm events. Initial model runs focused on simulating existing conditions of the wetland system. All simulations assumed an initial water surface elevation of 6.8 feet (NAVD 88) in both pond areas. The assumed water level approximates conditions when the ponds have filled following previous runoff events and the pump, operating under criteria specified in Table 4, has maintained a water level just below the elevation that would trigger pump activation. It should be noted, however, that the actual water level in the ponds at the beginning of a storm event can vary from the assumed elevation due to: (1) adjustments to the probes controlling the pumping station that increase water levels such that all identified CRF egg masses remain inundated; and/or (2) timing of the storm such that rainfall "piggybacks" on a previous event that triggered an increase in water level.

Results are presented to illustrate the water level response in Laguna Salada to the design storm runoff for rainfall events at recurrence intervals of 2, 5, 10, 25, 50, and 100 years (Fig. 11). The capacity of the pumping station to discharge water from the system is exceeded in all design simulations. The simulated water level responses for the two pond areas display a similar form as that observed in the monitoring data. Flow in the connector channel is bi-directional; flow is directed towards Laguna Salada during the peak of the storm event and reverses flow direction as the inflow rates of storm runoff entering the system decrease and pumps dewater Horse Stable Pond.

The 48-hour simulation periods capture the maximum water surface for rainfall events at a recurrence interval of 10 years or less. Water level continues to increase beyond the 48-hour simulation period for the more extreme storm events, however, the rate of increase at the end of the simulations are minimal. The results are comparable to previous model simulations of the water level response to a 100-year recurrence interval rainfall presented by PWA et al. (1992). PWA predicted a maximum water surface elevation of 13.7 feet NAVD 88 (10.9 feet NGVD 29 as presented in the report). Results from the most recent study suggest a maximum water surface elevation approaching 15 feet NAVD 88 during the 100-year rainfall event. The primary difference between the model presented by this study and earlier results by PWA (1992) is that the PWA data do not include a baseflow contribution to the simulations. At the end of the 24-hour storm event, PWA's discharge data decreases to zero and water level begins to recede. If the baseflow component is removed from the KHE runoff simulations, the model predicts a maximum water surface of approximately 13.5 feet NAVD 88.

Results of the design storm simulations describe the hydraulic processes that contribute to flood hazards of the adjacent properties. Maps illustrating the predicted areas inundated under the design storm simulations depict the potential for widespread flooding of area (Fig. 12). The primary contribution of the storm response modeling investigation is its quantification of hydrologic and hydraulic characteristics based on a given set of assumptions representative of the existing site conditions. The model provides an analytical tool which can be utilized to evaluate the potential impacts to flood hazards associated with various conceptual design alternatives. For example, if physical modifications are proposed that would affect the stage-storage relationship, enhance hydraulic connectivity, or modify the pumping station, the model could be adjusted to reflect the proposed conditions. Results from the proposed condition simulations could then be compared to the existing conditions simulations to evaluate potential impacts to the flood hazards at the site.

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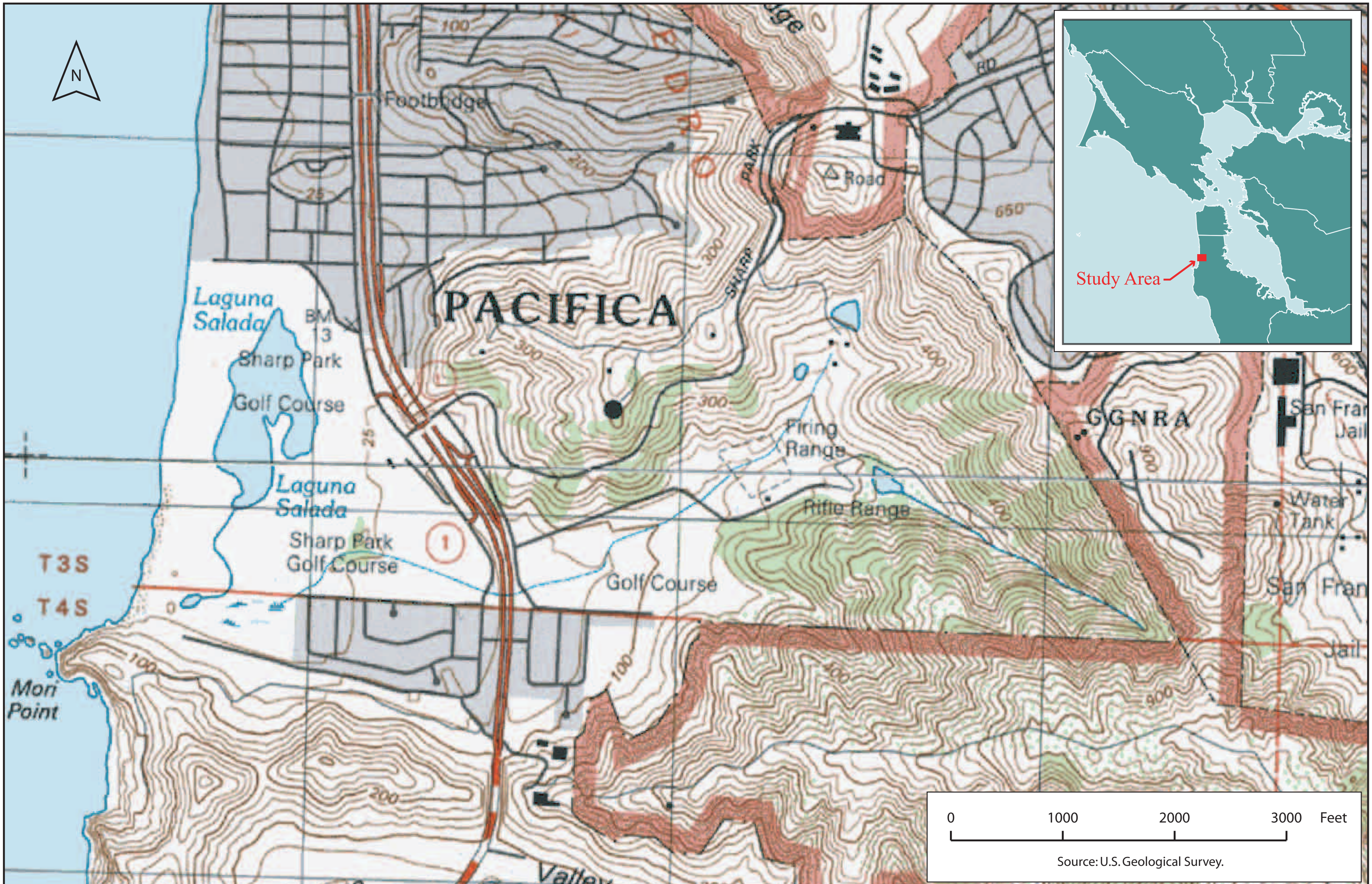
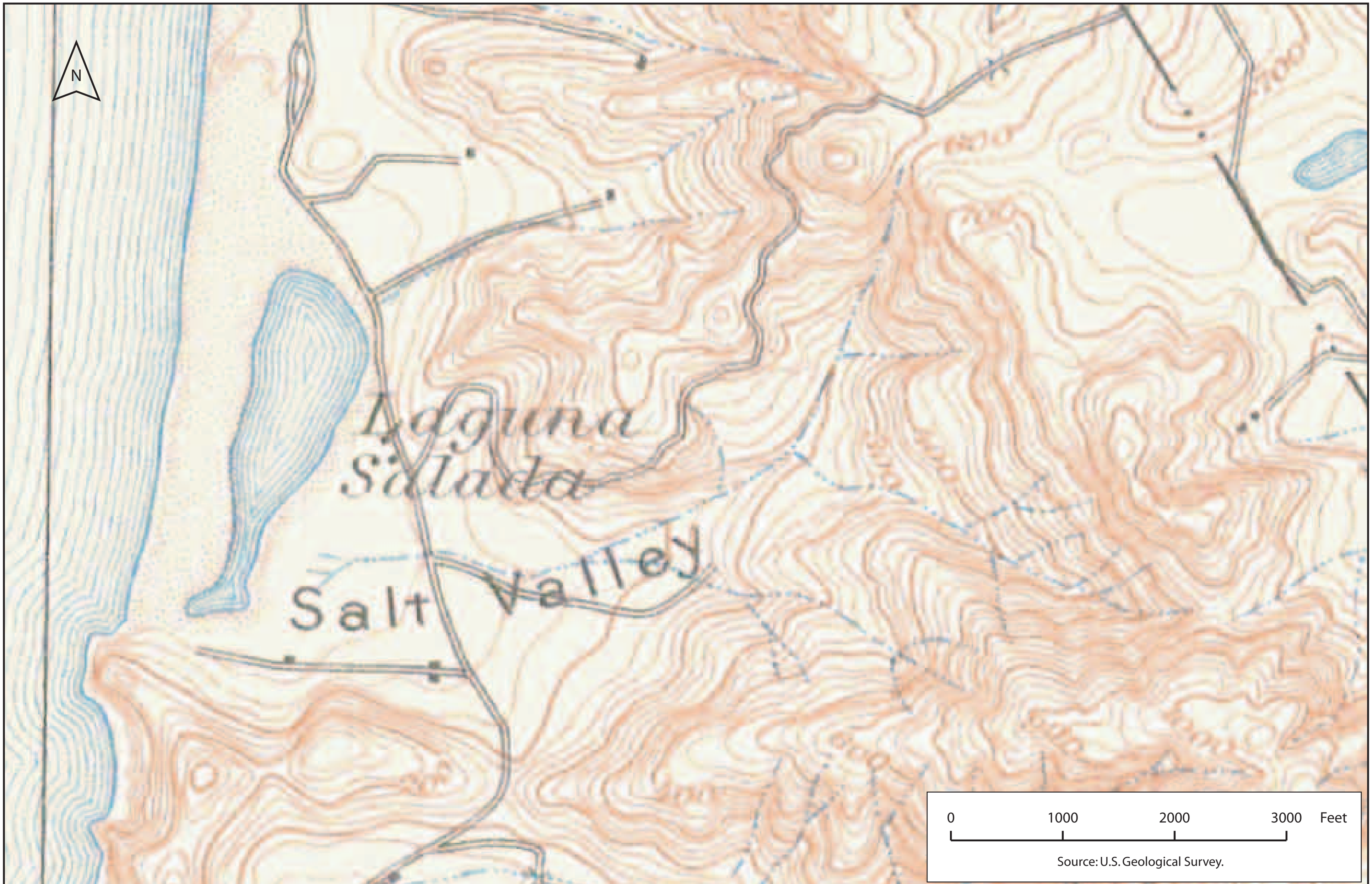


KAMMAN HYDROLOGY & ENGINEERING, INC.

Reference Map of Study Area
Laguna Salada Wetlands

FIGURE

1



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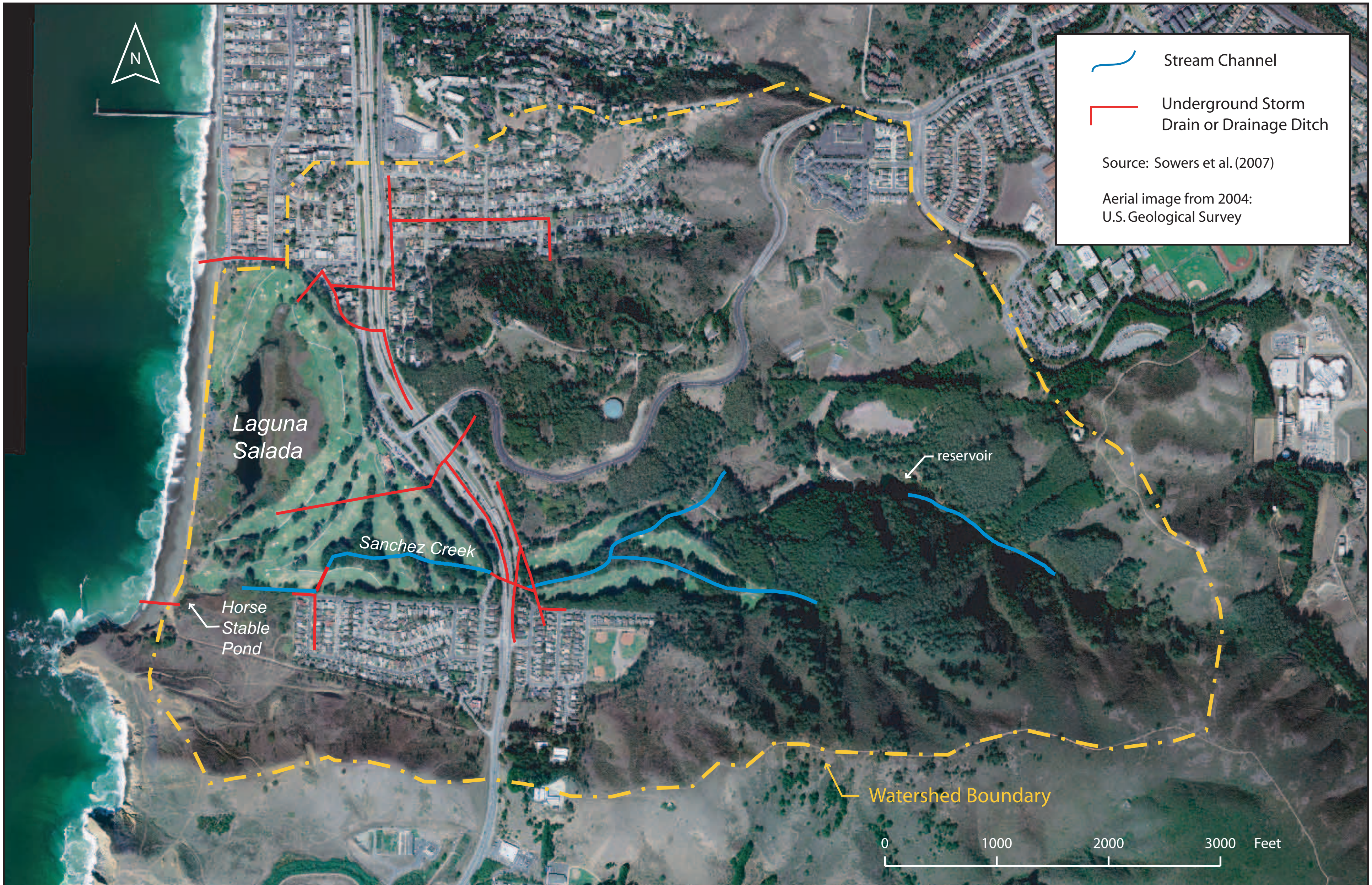
1899 Topographic Map of Watershed Area
Laguna Salada Wetlands

FIGURE 2



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Drainage Network Map
Laguna Salada Wetlands

FIGURE 3

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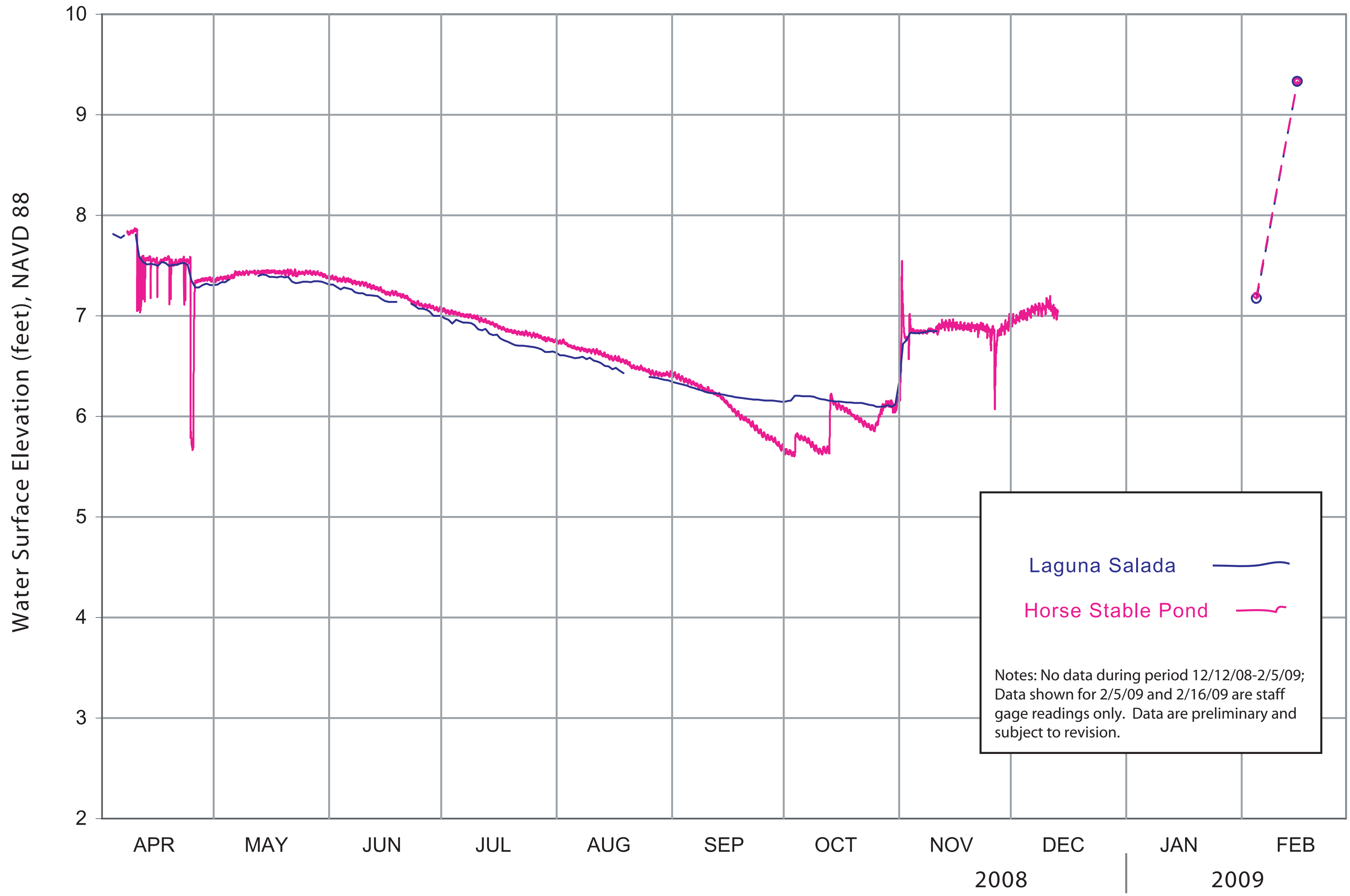
Hydrologic Features and Monitoring Locations
Laguna Salada Wetlands

FIGURE 4



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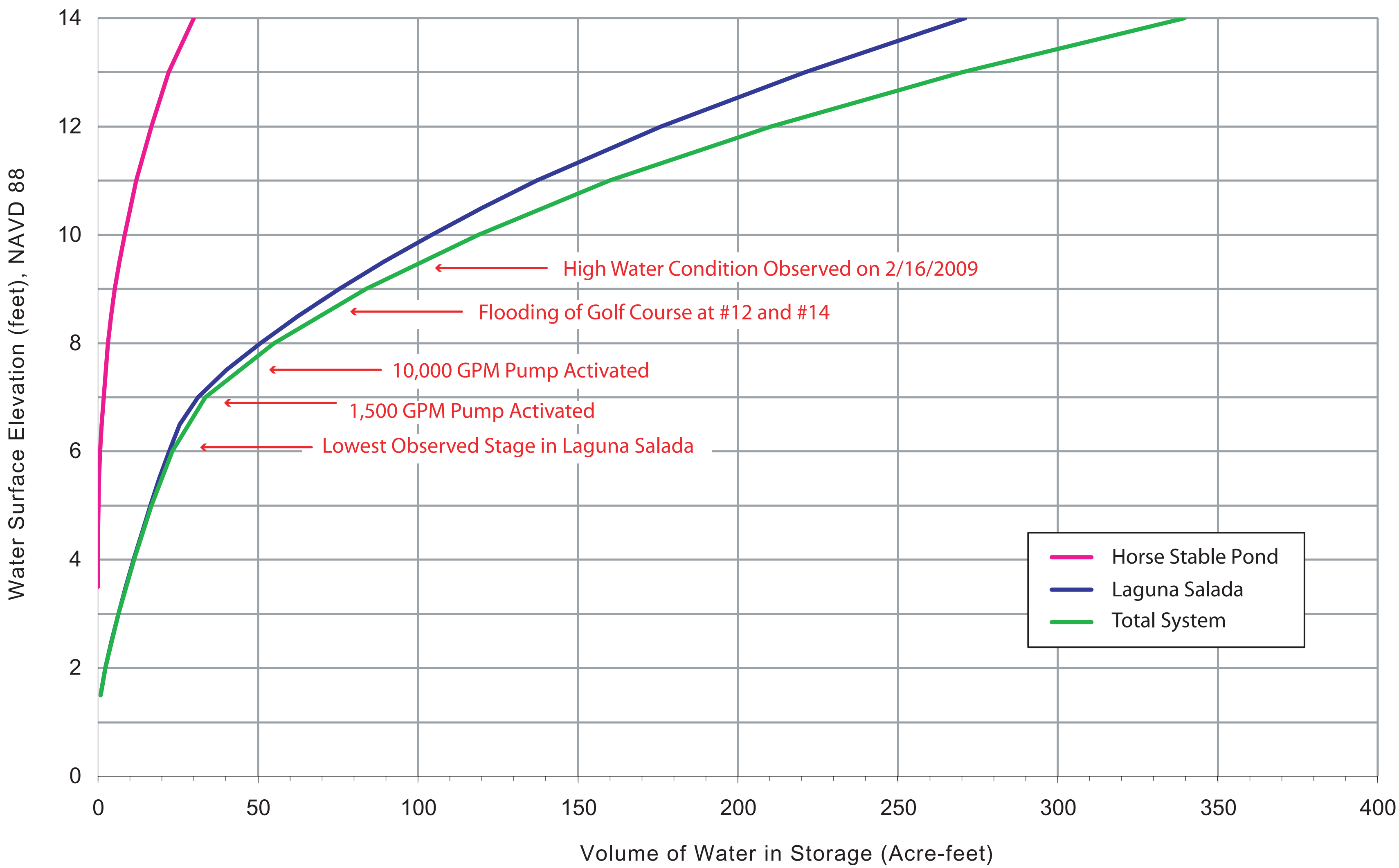
Observed Water Level Fluctuations
Laguna Salada Wetlands

FIGURE 5



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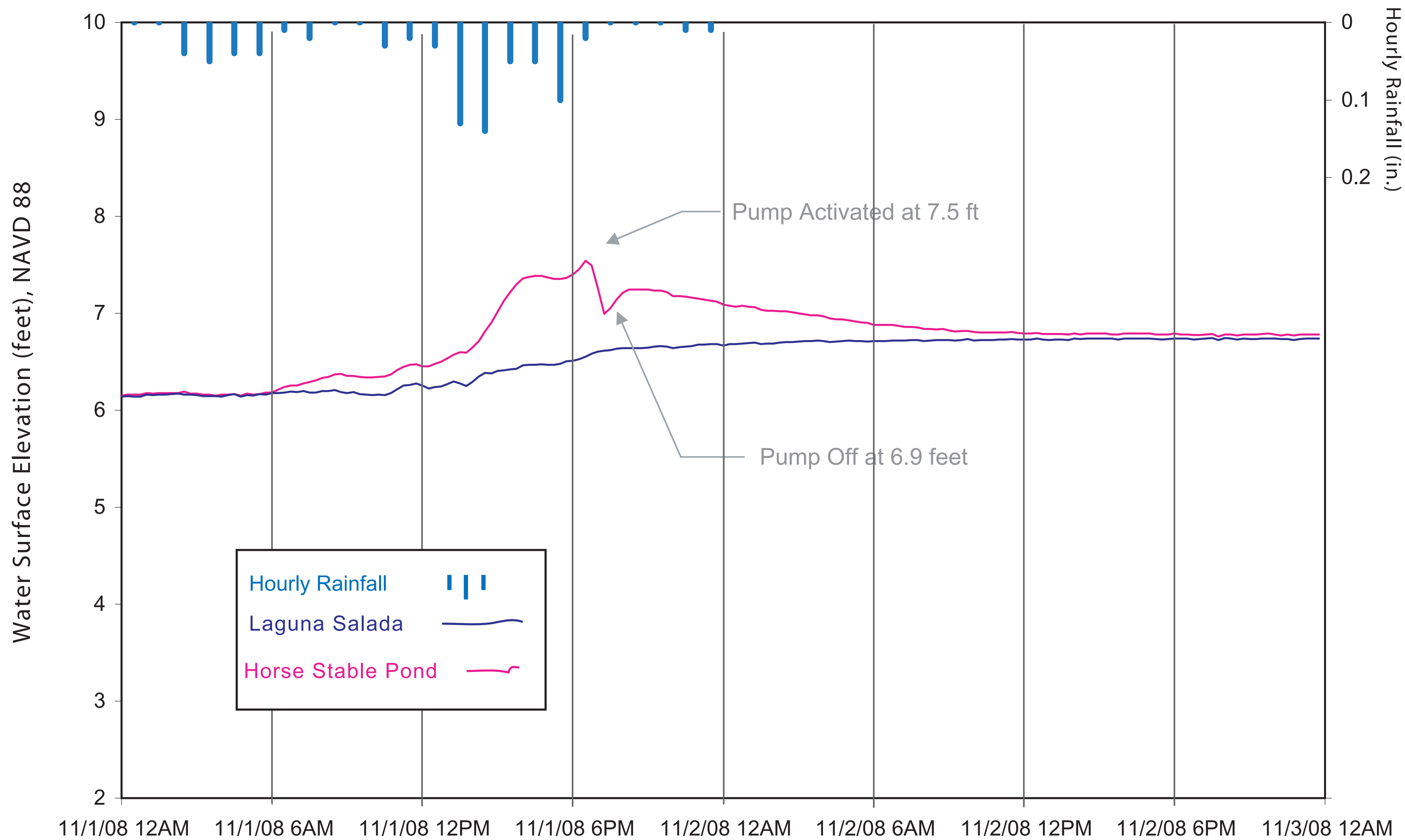
& ENGINEERING, INC.

Stage - Volume Rating Curves
Laguna Salada Wetlands

FIGURE
6



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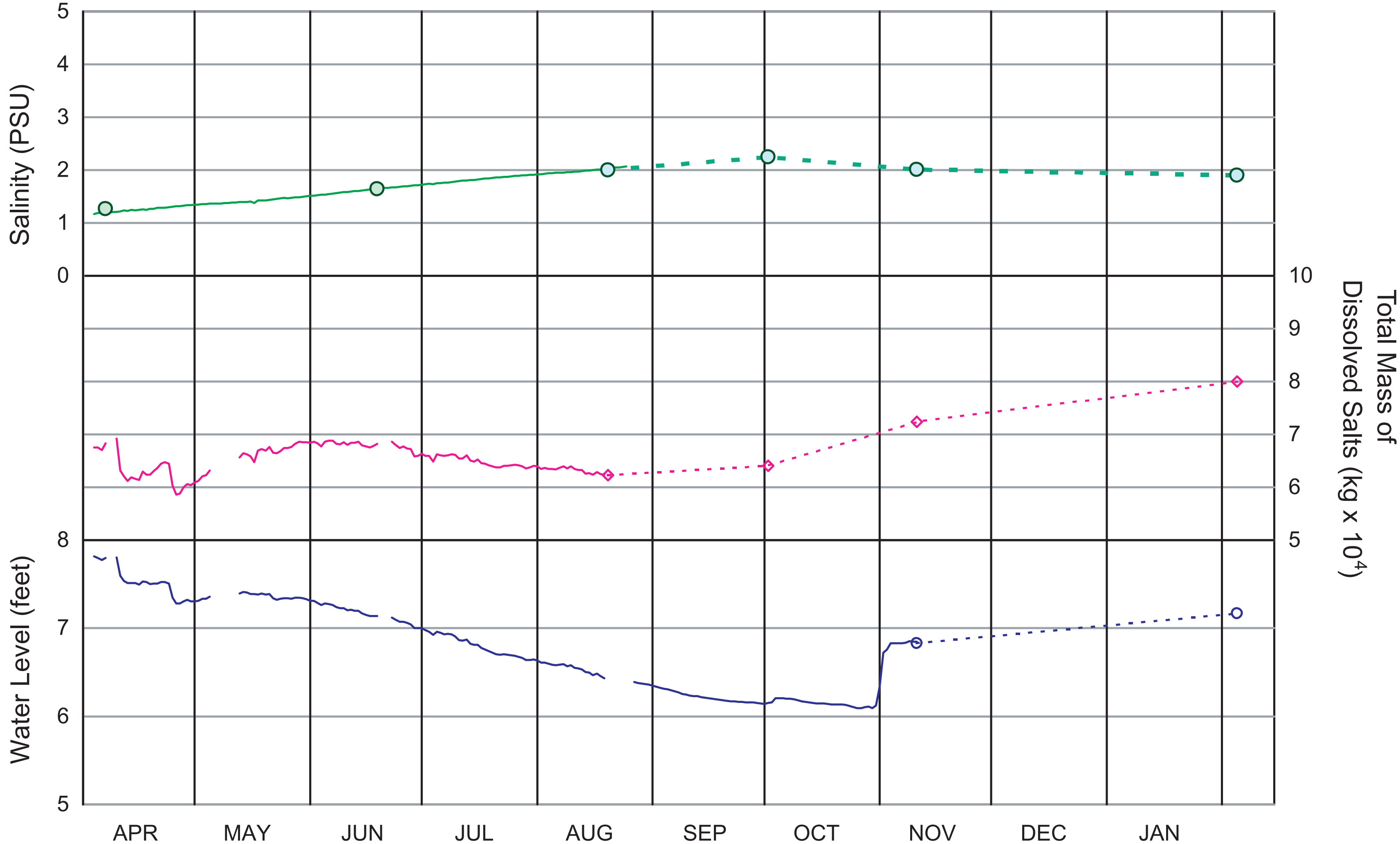
Water Level Response to Nov. 1, 2008 Rainfall Event
Laguna Salada Wetlands

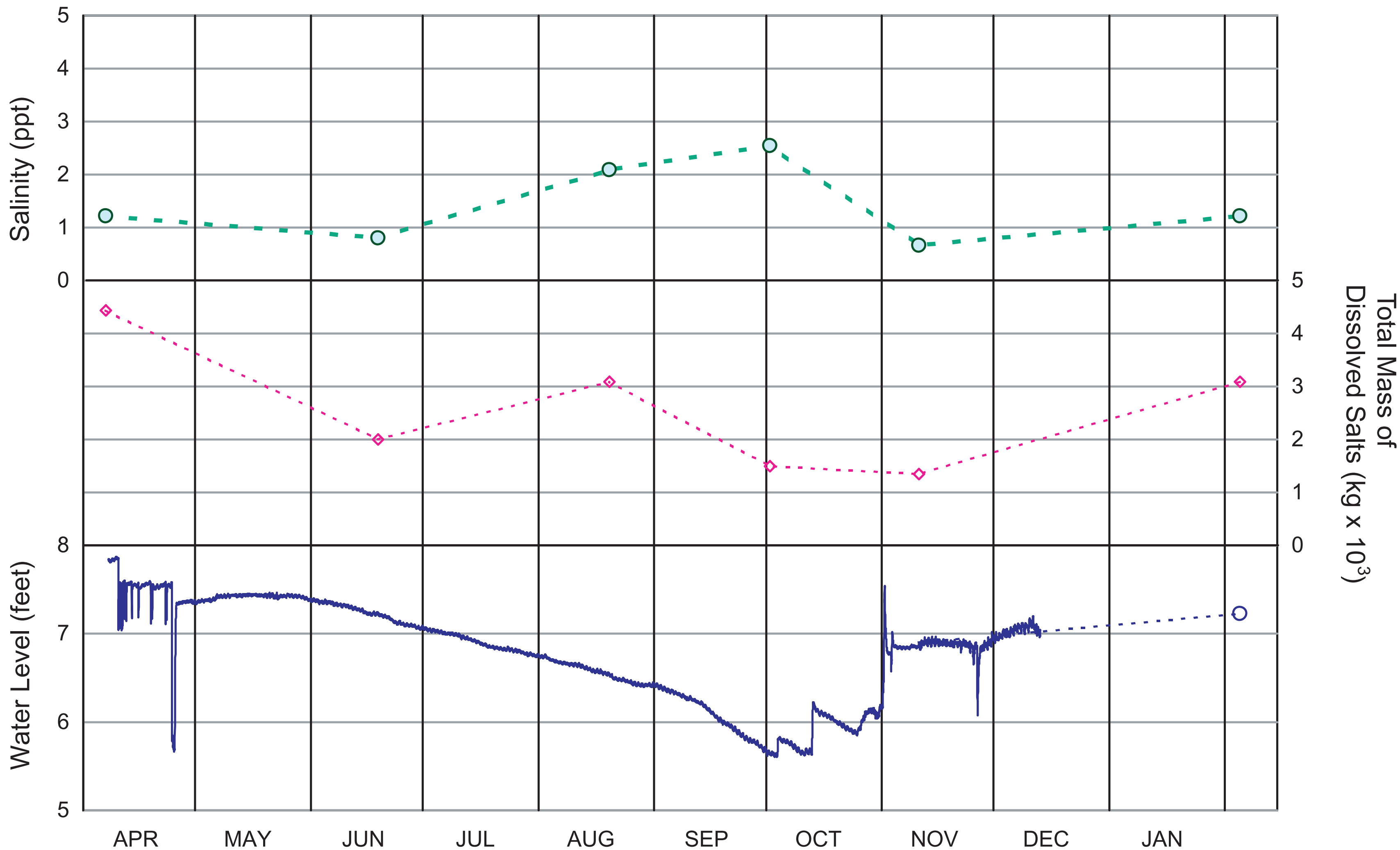
FIGURE 7



KAMMAN HYDROLOGY & ENGINEERING, INC.

Water Level and Salinity Observations: Laguna Salada
Laguna Salada Wetlands

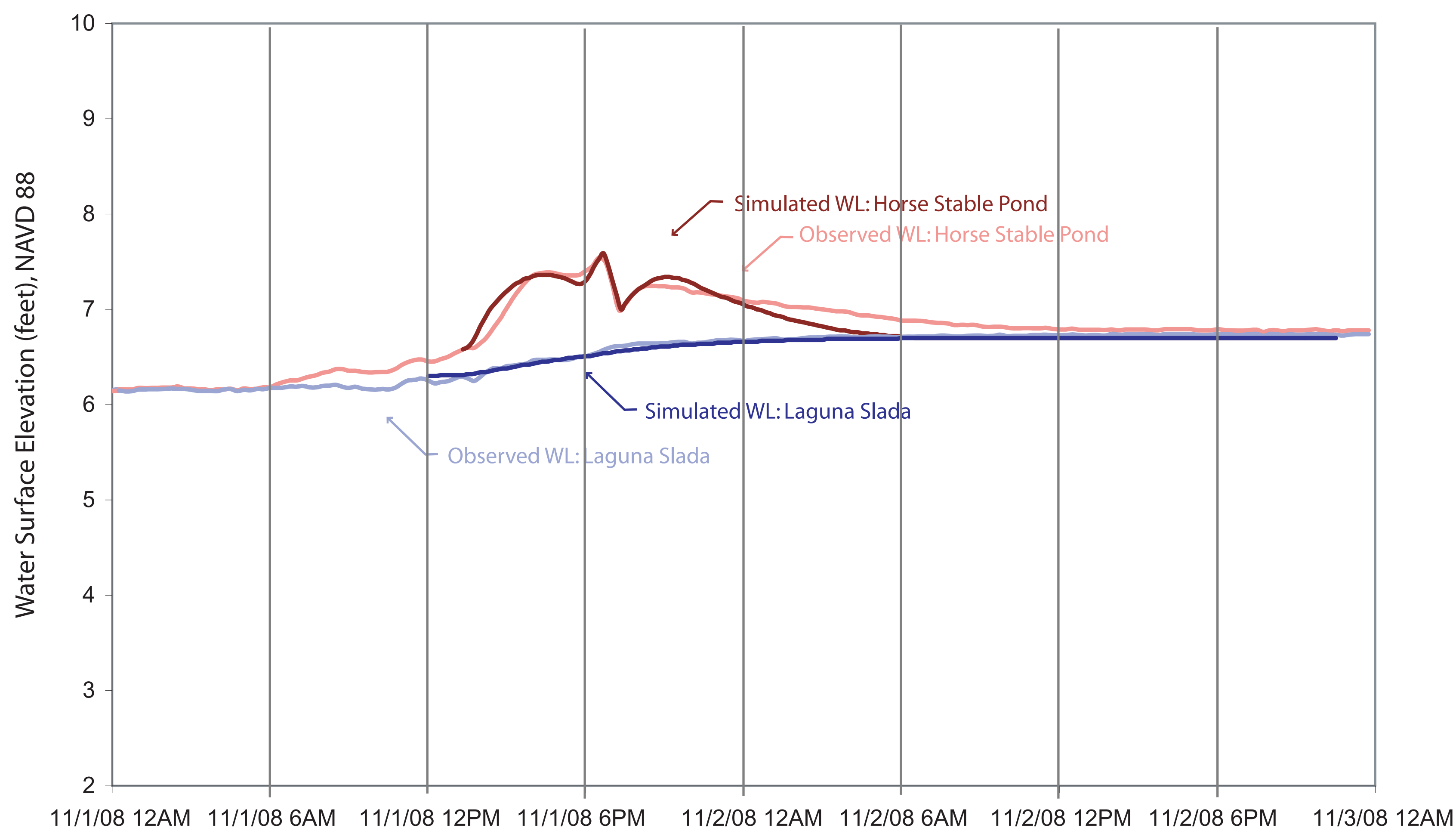
FIGURE 8



KAMMAN HYDROLOGY & ENGINEERING, INC.

Water Level and Salinity Observations: Horse Stable Pond
Laguna Salada Wetlands

FIGURE 9



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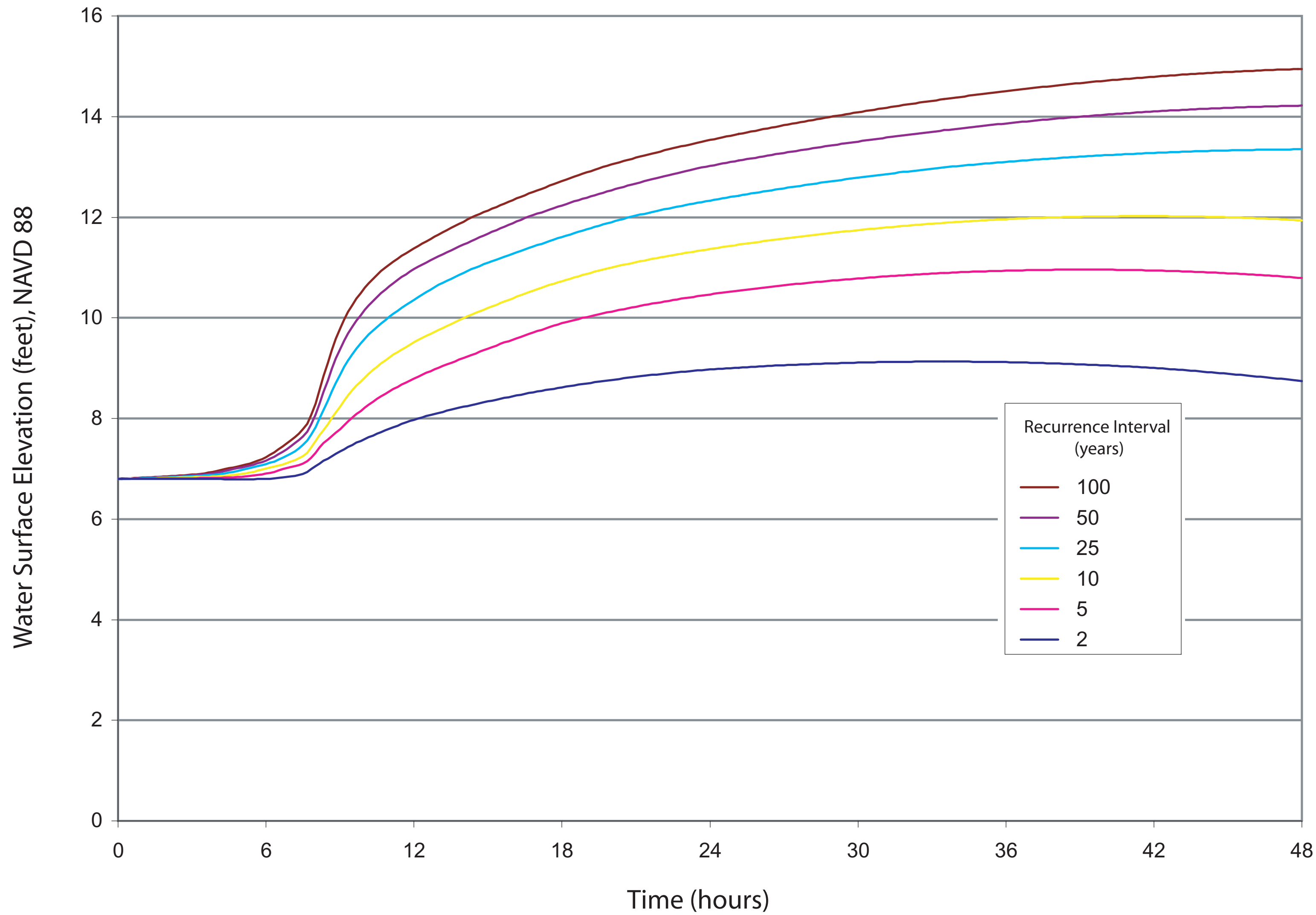
& ENGINEERING, INC.

Hydraulic Model Calibration Results
Laguna Salada Wetlands

FIGURE

10



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Water Level Responses to Design Storm Simulations Laguna Salada Wetlands

FIGURE 11

KAMMAN HYDROLOGY & ENGINEERING, INC.

Simulated Water Surface Elevation and Area of Inundation Laguna Salada Wetlands

FIGURE 12

Sharp Park Conceptual Restoration Alternatives Report

APPENDIX B: WETLAND DELINEATION REPORT

JURISDICTIONAL WATERS OF THE US AND WETLAND DETERMINATION REPORT
Laguna Salada Wetland Restoration and Habitat Recovery Project

September 2008

Prepared for:

San Francisco Recreation and Parks Department

Prepared by:

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SECTION 1
INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

Identified in this report are wetland resources and other "Waters of the United States," potentially under the jurisdiction of the US Army Corps of Engineers (USACE), at Laguna Salada in Pacifica, San Mateo County, California. This delineation report has been prepared in support of the Laguna Salada Wetland Restoration and Habitat Recovery Project.

This report consists of the following:

- Section 1, an introduction describing the purpose and objectives of the wetland delineation and the site location;
- Section 2, a description of the methods used in obtaining background information and collecting data on hydrophytic vegetation, hydric soils, and wetland hydrology in the field;
- Section 3, the results of the wetland delineation, presented in a summary table and in detailed descriptions of vegetation, soils, and hydrology for wetland areas where special conditions may have been present;
- Section 4, references used in the report preparation;
- Section 5, preparers of the report.

1.2 SITE LOCATION AND DESCRIPTION

The San Francisco Recreation and Parks Department (SFRPD) is creating a plan to restore the Laguna Salada wetlands. Laguna Salada is a former saltwater lagoon that has been isolated from the ocean by a dike and now serves as habitat for various freshwater species, most notably the Endangered Species Act (ESA) fully protected San Francisco garter snake (*Thamnophis sirtalis*) and the ESA threatened California red-legged frog (*Rana aurora draytonii*). Due to the presence of these species, the restoration plan is being treated as a recovery effort; therefore, details of the restoration design are focused primarily on restoring habitat for these two species and secondarily on restoring habitat for all other species.

The SFRPD, which administers the land, is preparing this restoration plan as part of the overall Natural Areas Management Plan implementation. The restoration plan and this document are being prepared as part of overall environmental documentation required under the California Environmental Quality Act (CEQA) and in support of various permit applications that will be prepared for the project. Proposed in this portion of the Natural Areas Management Plan Environmental Impact Report work plan are the tasks and methods by which the restoration will occur and by which state and federal permits will be acquired.

Laguna Salada is in Sharp Park in the city of Pacifica, California. It is approximately 15 miles south of San Francisco. See Figure 1 in Appendix A for the project location.

SECTION 2
METHODS

2.1 WETLAND DELINEATION

The study area consisted of the potential footprint of the proposed wetland restoration and habitat recovery project, including Laguna Salada, areas of the Sharp Park golf course adjacent to the lagoon, and the Horse Stable Pond area immediately south of Sharp Park. The following sources were consulted for the delineation:

- USACE Wetlands Delineation Manual (Environmental Laboratory 1987);
- Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Environmental Laboratory 2008);
- Soil Survey for San Mateo County, Eastern Part, and San Francisco County (US Department of Agriculture [USDA] 1991);
- National Hydric Soils List (USDA 2008);
- National Wetland Inventory (NWI) Maps (US Fish and Wildlife Service [USFWS] 2008);
- US Geological Survey topographic maps, San Francisco South quadrangle, 7.5-minute series (US Geological Survey 1980), and Montara Mountain quadrangle, 7.5-minute series (US Geological Survey 1997); and
- National List of Vascular Plant Species that Occur in Wetlands (Reed 1988).

Tetra Tech biologists Kelly Bayer and Meredith Zaccherio conducted the delineation on June 19, 23, and 24, 2008.

In addition, Tetra Tech reviewed the project under the guidance memorandum used by the EPA and USACE to determine which waters are subject to Clean Water Act Section 404 jurisdiction following the Rapanos decision. Per this guidance, agencies will assert jurisdiction over wetlands adjacent to traditional navigable waters, including over adjacent wetlands that do not have a continuous surface connection to traditional navigable waters. Under this guidance, although Laguna Salada does not have a direct surface connection to the adjacent Pacific Ocean, it is subject to Section 404 jurisdiction.

2.2 FIELD PROCEDURES

Potential wetlands in the study area were identified using NWI maps (Appendix A, Figure 2), soil survey information, and site observations. Potential wetlands were delineated in the field using the routine on-site method (level 2), as outlined in Section D of the Wetlands Delineation Manual (Environmental Laboratory 1987). This method is referred to as the three-parameter approach because it uses three criteria—presence of hydrophytic (water-adapted) vegetation, hydric soils, and wetland hydrology. The three-parameter approach determines whether an area is a jurisdictional wetland under normal conditions. Each of these parameters is discussed in the sections that follow.

In most circumstances, all three indicators must be present for the area to be a wetland. Tetra Tech located wetland/upland boundaries by observing changes in vegetation and topography and verified this with data sampling points. These points were chosen in representative areas within each wetland area and in the adjacent uplands. Sampling points were chosen to be as close to the wetland boundary as possible. Information on vegetation, soils, and hydrology was recorded on Western Mountains, Valleys, and Coast Region data forms for each sampling point or discrete area of waters of the US within a given complex (Appendix B).

2.2.1 Special Aquatic Habitat

The survey included a search for special aquatic habitat, which is an area designated by the USACE as being of special ecological value. Such habitat can include sanctuaries and refuges, coral reefs, riffle and pool complexes, and eelgrass beds. No such habitats were identified in the study area; however, the National Park Service (NPS) created a pond as habitat for California red-legged frog within the study area, south of Sharp Park and east of Horse Stable Pond.

2.3 HYDROPHYTIC VEGETATION

Dominant hydrophytic vegetation was used as the initial criterion for assessing a site as a potential jurisdictional wetland area. These species were given facultative, facultative wetland, or obligate wetland plant status. The wetland indicator status of plant species was taken from the National List of Vascular Plant Species that Occur in Wetlands: California (Region 0) (Reed 1988).

2.4 HYDRIC SOILS

Soils were sampled to a depth of 18 inches, unless otherwise noted on the data forms. Hydric soils were determined based on criteria established by the Natural Resources Conservation Service (USDA 2005) and described in the USACE Wetlands Delineation Manual (Environmental Laboratory 1987) and Interim Regional Supplement for the Western Mountains, Valleys, and Coast Region (Environmental Laboratory 2008). Indicators of hydric soils include soil color, mottles, oxidized rhizospheres (root channels), and concretions of iron or manganese. Soil matrix and mottle color were characterized and evaluated using descriptions in the Munsell Soil Color Charts (Kollmorgen Instruments Corp. 1994). Soil classification was based on the San Mateo County, Eastern Part, and San Francisco County (USDA 1991) and on-site identification. A soils map of the area surveyed is found in Appendix C.

2.5 WETLAND HYDROLOGY

Wetland hydrology implies a hydrologic regime involving periodic inundation or soil saturation to the surface for some period during the growing season. Evidence of wetland hydrology, such as saturation, sediment deposition, and scouring, was recorded when observed at each site. Hydrology was determined based on criteria established by the Natural Resources Conservation Service (USDA 2005) and described in the USACE Wetlands Delineation Manual (Environmental Laboratory 1987) and Interim Regional Supplement for the Western Mountains, Valleys, and Coast Region (Environmental Laboratory 2008).

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SECTION 3
RESULTS

3.1 FINDINGS

A total of 30.53 of acres of Waters of the US were delineated within the study area (Appendix A, Figure 3). Jurisdictional areas were classified into four habitat types: freshwater marsh, willow scrub, wet meadow, and unvegetated pond (open water). The amount of each jurisdictional habitat type within the study area is shown below.

Table 1
Habitat Types

Habitat Type	Jurisdictional Determination	Area (Acres)	Sampling Points
Freshwater marsh	Wetlands	19.94	LS-1W, LS-5W, LS-12W, LS-13 W, HSP-2W, HSP-3W, SCE-1W
Willow scrub	Wetlands	3.27	LS-6W, HSP-1W, HSP-4W, HSP-5W, HSP-6W
Wet meadow	Wetlands	2.83	LS-2W, LS-3W, LS-4W, LS-7W, LS-10W, LS-11W
Unvegetated pond	Other Waters of the US	4.49	Not sampled
Total wetlands/waters		30.53	

Wetland delineation data forms are presented in Appendix B.

3.1.1 Plant Communities and Hydrophytic Vegetation

Plant communities potentially subject to the jurisdiction of the USACE include freshwater marsh, willow scrub, and wet meadow. Unvegetated habitat was found within Laguna Salada and Horse Stable Pond. Table 2 is a list of the plant species observed at or near data points.

Table 2
Plant Species Observed at the Site

Scientific Name	Common Name	Wetland Indicator Status
Achillea millefolium	Common yarrow	FACU
Atriplex triangularis (formerly *A. patula*)	Halberd-leaf saltbush	FACW
Avena fatua	Common wild oat	NL
Baccaharis pilularis	Coyote bush	NL
Carex utriculata (formerly *C. rostrata*)	Beaked sedge	OBL
Cortaderia selloana	Pampas grass	NL
Cupressus macrocarpa	Monterey cypress	NL
Daucus carota	Queen Anne's lace	NL
Delairea ordata	Cape ivy	NL
Distichlis spicata	Saltgrass	FACW
Equisetum telmateia	Giant horsetail	OBL
Eucalyptus globulus	Blue gum	NL
Frankenia grandifolia	Alkali heath	FACW
Foeniculum vulgare	Fennel	FACU
Jaumea carnosa	Fleshy jaumea	OBL
Juncus balticus	Baltic rush	OBL
Juncus patens	Spreading rush	FAC
Lolium multiflorum	Italian ryegrass	FAC
Lotus wrangelianus	California lotus	NL
Oenanthe sarmentosa	Water parsley	OBL
Picris echioides	Bristly oxtongue	FAC
Pinus radiata	Monterey pine	NL
Poa pratensis	Kentucky bluegrass	FACU
Potentilla anserina	Silverweed/coastal cinquefoil	OBL
Raphanus sativus	Wild radish	NL
Rubus discolor	Himalayan blackberry	FACW
Rubus vitifolius	California blackberry	FACW
Rumex crispus	Curly dock	FACW
Salicornia virginica	Virginia pickleweed	OBL
Salix lasiolepis	Arroyo willow	FACW
Salix sitchensis	Sitka willow	FACW
Scirpus americanus	Olney's bulrush	OBL
Scirpus californicus	California bulrush	OBL
Scirpus microcarpus	Small-fruit bulrush	OBL
Tropaeolum majus	Garden nasturtium	NL
Typha angustifolia	Narrow-leaf cattail	OBL

Key:
OBL (obligate wetland)—Occurs almost always under natural conditions in wetlands (estimated probability of occurring in wetlands is greater than 99 percent).
FACW (facultative wetland)—Usually occurs in wetlands but occasionally found in non-wetlands (estimated probability of occurring in wetlands is 67 to 99 percent).
FAC (facultative)—Equally likely to occur in wetlands or non-wetlands (estimated probability of occurring in wetlands is 34 percent to 66 percent).
FACU (facultative upland)—Usually occurs in uplands but occasionally found in non-uplands (estimated probability of occurring in uplands is 67 to 99 percent).
NL—Not listed

Sanchez Creek runs though a portion of the study area south of the Sharp Park golf course. Riparian vegetation is limited due to the dense overstory, and most of the creek was difficult to access due to this overstory. Where observable, the creek varies in width and the adjoining banks are typically very steep with little riparian vegetation. The vegetation along the eastern portion of Sanchez Creek that is within the study area, adjacent to Fairway Drive, is significantly disturbed.

Other plant communities not considered to be potentially jurisdictional were observed within and adjacent to the study area. An area characterized by ruderal vegetation and nonnative grassland lies to the south of Horse Stable Pond. The area west of Laguna Salada, between the lagoon and the levee, consists of bare sand interspersed with dune species. Vegetation on the golf course includes maintained grasses on the tees, fairways, and greens. Nonnative grasses are present between holes and in golf course rough areas adjacent to the fairways.

3.1.2 Soils

According to the Soil Survey for San Mateo County, Eastern Part, and San Francisco County (USDA 1991), three soil types are mapped within the study area. The Sharp Park golf course is mapped as Orthents, cut and fill, 0 to 15 percent slopes. The Horse Stable Pond and land to the east is mapped as Candlestick variant loam, 2 to 15 percent slopes. The eastern portion of Sanchez Creek is mapped as Urban land-Orthents, cut and fill complex, 0 to 5 percent slopes. These soil types are not listed as hydric on the National Hydric Soils List (USDA 2008).

3.1.3 Wetland Hydrology

The study area borders the Pacific Ocean. Laguna Salada is a former saltwater lagoon that has been isolated from the ocean by a dike. Laguna Salada is hydrologically connected to Horse Stable Pond via a vegetated swale that runs from the south end of the lagoon south toward Horse Stable Pond and connects to the pond through a culvert that passes under the golf course. Between Laguna Salada and Horse Stable Pond, a portion of the swale loops around a small upland area. Within the study area, Sanchez Creek runs along the southern boundary of a portion of the golf course toward Horse Stable Pond. Sanchez Creek is open along a portion of Fairway Drive and passes through a dense tree overstory before tying into the swale that connects Laguna Salada and Horse Stable Pond. The creek diverges from Fairway Drive in a northeast direction and is culverted under a portion of the golf course. Farther to the east, outside of the project area, Sanchez Creek receives waters from four tributaries.

3.2 OTHER WATERS

Other Waters of the US include seasonal or perennial waters, including lakes, river channels, drainages, ponds, and other surface waters that show an ordinary high-water mark but do not show positive indicators for one or more of the three wetland parameters (hydrophytic vegetation, hydric soil, and wetland hydrology).

3.3 RESULTS

Wetlands

Vegetation

Freshwater Marsh

Freshwater marsh within the study area includes vegetated areas within and adjacent to Laguna Salada and Horse Stable Pond and the swale that connects Laguna Salada and Horse Stable Pond. A small pond containing emergent vegetation was observed within the willow scrub area south of the golf course. The NPS created this pond as habitat for California red-legged frogs.

Dominant vegetation within the freshwater marsh areas consists of bulrush (*Scirpus* sp.), cattail (*Typha angustifolia*), and coastal cinquefoil (*Potentilla anserina*), all of which are obligate wetland species. Regular golf course maintenance appears to be altering the natural vegetative cover of some areas adjacent to Laguna Salada, as remnants of some hydrophytic species were observed in lower elevation mowed areas.

Willow Scrub

Willow scrub within the study area was located south of the Sharp Park golf course, to the east of Horse Stable Pond. A small area of this habitat type is also found on the northeast side of Laguna Salada.

The willow scrub communities were characterized by a dense overstory of arroyo willow (*Salix lasiolepis*) and sitka willow (*S. sitchensis*), which are both facultative wetland species, with an understory composed of obligate hydrophytes, such as small fruit bulrush (*Scirpus microcarpus*) and coastal cinquefoil (*Potentilla anserina*).

Wet Meadow

Wet meadow occurs on the east side of Laguna Salada, in a couple of small areas on the west side of the lagoon and to the southeast of Horse Stable Pond.

Vegetation in the wet meadow areas includes baltic rush (*Juncus balticus*), spreading rush (*J. patens*), bulrush (*Scirpus americanus*), curly dock (*Rumex crispus*), and coastal cinquefoil (*Potentilla anserina*). Saltmarsh plants, including saltgrass (*Distichlis spicata*), fleshy jaumea (*Jaumea carnosa*), and Virginia pickleweed (*Salicornia virginica*), were observed in some wet meadows surrounding Laguna Salada. Residual salts in the soils or saltwater intrusion may be responsible for these occurrences. A saltwater intrusion study is being conducted as part of the Laguna Salada restoration study.

Soils

Confirmation of hydric soils is problematic throughout the study area. This is likely due to problematic site conditions, combined with the nature of the soil material. None of the soils within the study area are listed as hydric by the county soil survey. Indicators of hydric soils, such as redox features, were observed at only a few sample points. Soils adjacent to Laguna

Salada appear to be disturbed and are likely fill material. Textures range from coarse sandy loam at Laguna Salada to silty clay in the Horse Stable Pond area. Saturation and inundation of areas adjacent to Laguna Salada and Horse Stable Pond is variable by season and is altered by pumping to keep the golf course from flooding. For most sample locations, soils are assumed to be functioning as hydric due to the presence of hydrophytic vegetation and wetland hydrology.

Hydrology

Wetland hydrology was determined by the presence of a variety of indicators, including surface water, drift deposits, drainage patterns, algal mats, aquatic invertebrates, geomorphic position, and saturated soils within 12 inches of the surface in excavated pits. Hydrology in the willow scrub and wet meadows was primarily indicated by saturation.

Other Waters of the US

Unvegetated Pond

The unvegetated portion of the study area included the open water areas within Laguna Salada and Horse Stable Pond.

The surface in this area was unvegetated and therefore does not meet standard wetland vegetation criteria. These areas are likely permanently inundated at a depth that does not support emergent vegetation.

Soils

Soils of the unvegetated pond areas were assumed to be hydric, based on permanent inundation, and they were not sampled.

Hydrology

Based on site observations and aerial photographs, these areas are assumed to be permanently flooded.

Jurisdictional Status Determination

The freshwater marsh, willow scrub, and wet meadow in the study area were determined to be jurisdictional wetlands because of the presence of hydrophytic vegetation, a presumption of hydric soils, and obvious indicators of hydrology. For areas in which golf course maintenance appeared to be altering the vegetative cover, best professional judgment was used to determine the extent to which hydrologic conditions would likely support a predominance of hydrophytic vegetation. This was usually evident by examining site topography and the plant composition in mowed areas.

In addition, a wet meadow to the southeast of Horse Stable Pond was determined to be jurisdictional, although neither hydric soils nor wetland hydrology could be confirmed in the field. The water table in this area differs significantly by season. During a preliminary site visit conducted by Tetra Tech in February 2008, site observations indicated wetland hydrology would likely be present in this area. Ponds here often overflow during the winter, and the surrounding soils are saturated (Bennett 2008). At the time of the field delineation, the surface soils in this area were extremely hard and dry, but vegetation was predominantly hydrophytic. A portion of this land is the property of the NPS as part of Mori Point within the Golden Gate National Recreation Area. The NPS performed a wetland delineation on its property in 2007 for restoration activities proposed at Mori Point. The delineation report indicates that hydric soils and wetland hydrology were confirmed within the NPS-owned portion of the wet meadow (Parravano 2007). The extent of wet meadow southeast of Horse Stable Pond, as represented in Figure 3 (Appendix A), was based on a review of the NPS delineation and on aerial photographs and site observations made during Tetra Tech's field delineation, including site topography and plant composition.

The unvegetated pond areas were determined to be other Waters of the US because of a presumption of hydric soils and obvious indicators of hydrology.

SECTION 4
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SECTION 5
LIST OF PREPARERS

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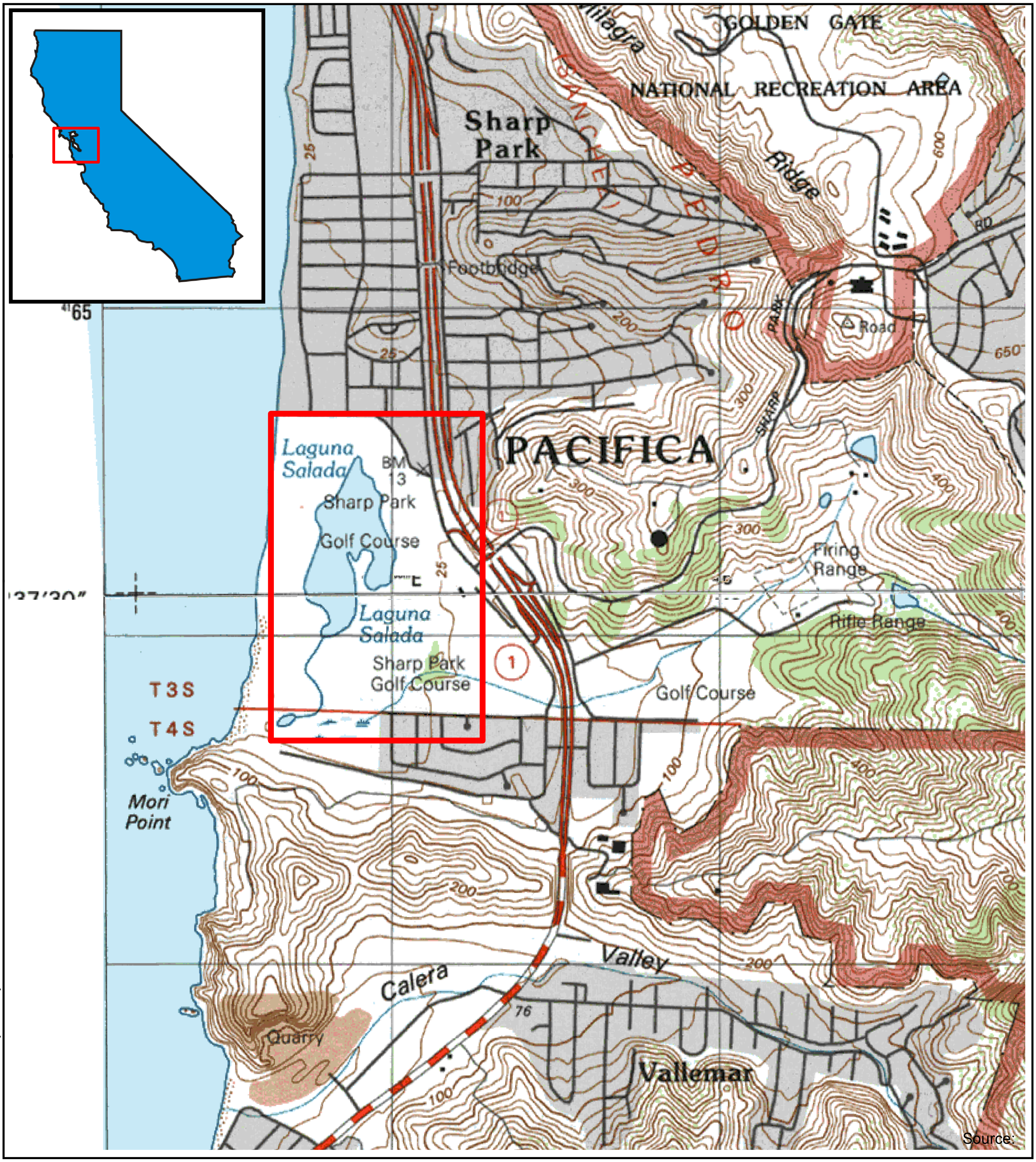
APPENDIX A

Wetland Location Figures



R:/New/19598/GIS/Layouts/Project Location.mxd - 01/30/08 - YE

N

0 400

Feet

Legend

Project Area

Project Location
Laguna Salada

Pacifica, California

Tetra Tech, Inc

Figure 1

R:\19598\GIS\Layouts\Wetland Inventory Classification.mxd 07/30/08 - YE

National Wetland Inventory Classification

Legend

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

N

0 400

Feet

Laguna Salada
Pacifica, California

Tetra Tech, Inc

Figure 2

Legend

- Sample Locations
- Wet Meadow
- Willow Scrub
- Unvegetated Pond/Open Water
- Freshwater Marsh

Tetra Tech, Inc

N

0 300
Feet

Wetland Delineation

Laguna Salada
Pacifica, California

Figure 3

APPENDIX B

Wetland Delineation Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada – Horse Stable Pond City/County: Pacifica, San Mateo County Sampling Date: 6/24/08

Applicant/Owner: ______ State: CA Sampling Point: HSP-1U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 4 S, R 6 W

Landform (hillslope, terrace, etc.): creek bank -edge golf course fairway Local relief (concave, convex, none): none Slope (%): 0-5

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Candlestick variant loam, 2-15% slopes NWI classification: PEMF

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Scirpus microcarpus	40	Y	OBL
2. Potentilla anserina	25	Y	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	65		
Woody Vine Stratum (Plot size: ______)			
1. Rubus vitifolius			FACW
2.			
= Total Cover			

% Bare Ground in Herb Stratum 30

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: HSP-1U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	5 Y 2.5/1	100					fine sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No X

Remarks: Soil survey unit is non hydric. No redox features observed. Area is slightly higher in elevation than adjacent wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- N Saturation (A3)
- N Water Marks (B1)
- N Sediment Deposits (B2)
- N Drift Deposits (B3)
- N Algal Mat or Crust (B4)
- N Iron Deposits (B5)
- N Surface Soil Cracks (B6)
- N Inundation Visible on Aerial Imagery (B7)
- N Sparsely Vegetated Concave Surface (B8)
- N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- N Salt Crust (B11)
- N Aquatic Invertebrates (B13)
- N Hydrogen Sulfide Odor (C1)
- N Oxidized Rhizospheres along Living Roots (C3)
- N Presence of Reduced Iron (C4)
- N Recent Iron Reduction in Tilled Soils (C6)
- N Stunted or Stressed Plants (D1) (**LRR A**)
- N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- N Drainage Patterns (B10)
- N Dry-Season Water Table (C2)
- N Saturation Visible on Aerial Imagery (C9)
- N Geomorphic Position (D2)
- N Shallow Aquitard (D3)
- N FAC-Neutral Test (D5)
- N Raised Ant Mounds (D6) (**LRR A**)
- N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ____________

Water Table Present? Yes ______ No X Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ____________

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada – Horse Stable Pond City/County: Pacifica, San Mateo County Sampling Date: 6/24/08

Applicant/Owner: ______ State: CA Sampling Point: HSP-1W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 4 S, R 6 W

Landform (hillslope, terrace, etc.): creek bank -edge golf course fairway Local relief (concave, convex, none): none Slope (%): 0-5

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Candlestick variant loam, 2-15% slopes NWI classification: PEMF

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soil Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is the Sampled Area within a Wetland? Yes X No ___

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1. Salix lasiolepis	60	Y	FACW
2.			
3.			
4.			
5.			
= Total Cover	60		
Herb Stratum (Plot size: ______)			
1. Scirpus microcarpus	50	Y	OBL
2. Potentilla anserina	15	N	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	65		
Woody Vine Stratum (Plot size: ______)			
1. Rubus vitifolius	5	N	FACW
2.			
= Total Cover	5		

% Bare Ground in Herb Stratum 30

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: HSP-1W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 2/1	100					fine sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ______

Remarks: Soil survey unit is non hydric. No redox features observed. Area is on toe of slope towards frequently inundated area. Inundation of the area is irregular, varying by extent and frequency. Water level is altered by pumping activities to keep golf course from flooding. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- Y Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): 9

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada – Horse Stable Pond   City/County: Pacifica, San Mateo County   Sampling Date: 6/24/08

Applicant/Owner: ____   State: CA   Sampling Point: HSP-2W

Investigator(s): K. Bayer, M. Zaccherio   Section, Township, Range: T 4 S, R 6 W

Landform (hillslope, terrace, etc.): ____   Local relief (concave, convex, none): none   Slope (%): 0-10

Subregion (LRR): A   Lat: ____   Long: ____   Datum: ____

Soil Map Unit Name: Candlestick variant loam, 2-15% slopes   NWI classification: PEMF

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed?   Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ____)			
1. Scirpus microcarpus	10	N	OBL
2. Potentilla anserina	5	N	OBL
3. Typha angustifolia	75	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	85		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: HSP-2W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks: Inundated - unable to dig hole, assume hydric

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- Y Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- Y Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- Y Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 1

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada – Horse Stable Pond City/County: Pacifica, San Mateo County Sampling Date: 6/24/08

Applicant/Owner: ______ State: CA Sampling Point: HSP-3W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 4 S, R 6 W

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0-10

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Candlestick variant loam, 2-15% slopes NWI classification: PEMF

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Juncus balticus	10	N	OBL
2. Potentilla anserina	20	Y	OBL
3. Typha angustifolia	40	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	70		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ______	x 1 = ______
FACW species ______	x 2 = ______
FAC species ______	x 3 = ______
FACU species ______	x 4 = ______
UPL species ______	x 5 = ______
Column Totals: ______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: HSP-3W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/1	96					clay loam	
0-10	5YR 5/8	4						redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- n/a Sandy Mucky Mineral (S1)
- n/a Sandy Gleyed Matrix (S4)
- n/a Sandy Redox (S5)
- n/a Stripped Matrix (S6)
- N Loamy Mucky Mineral (F1) (**except MLRA 1**)
- N Loamy Gleyed Matrix (F2)
- N Depleted Matrix (F3)
- Y Redox Dark Surface (F6)
- N Depleted Dark Surface (F7)
- N Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- Y Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- Y Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- Y FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ______

Water Table Present? Yes ____ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada – Horse Stable Pond City/County: Pacifica, San Mateo County Sampling Date: 6/24/08

Applicant/Owner: ______ State: CA Sampling Point: HSP-4W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 4 S, R 6 W

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0-10

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Candlestick variant loam, 2-15% slopes NWI classification: PSSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1. Salix sitchensis	100	Y	FACW
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ____)			
1. Juncus balticus	5	N	OBL
2. Scirpus microcarpus	90	Y	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	70		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 5			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	____	x 1 =	____
FACW species	____	x 2 =	____
FAC species	____	x 3 =	____
FACU species	____	x 4 =	____
UPL species	____	x 5 =	____
Column Totals:	____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks:

SOIL

Sampling Point: HSP-4W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10	5 Y 3/1	100					silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
n/a Sandy Mucky Mineral (S1)
n/a Sandy Gleyed Matrix (S4)
n/a Sandy Redox (S5)
n/a Stripped Matrix (S6)
N Loamy Mucky Mineral (F1) (**except MLRA 1**)
N Loamy Gleyed Matrix (F2)
N Depleted Matrix (F3)
N Redox Dark Surface (F6)
N Depleted Dark Surface (F7)
N Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ______

Remarks: Soil survey unit is non hydric. No redox features observed. Inundation of the area is irregular, varying by extent and frequency. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
Y High Water Table (A2)
Y Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ______
Water Table Present? Yes X No ____ Depth (inches): 8
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada – Horse Stable Pond City/County: Pacifica, San Mateo County Sampling Date: 6/24/08

Applicant/Owner: ____ State: CA Sampling Point: HSP-5U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 4 S, R 6 W

Landform (hillslope, terrace, etc.): ____ Local relief (concave, convex, none): none Slope (%): 2-10

Subregion (LRR): A Lat: ____ Long: ____ Datum: ____

Soil Map Unit Name: Candlestick variant loam, 2-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	Is the Sampled Area within a Wetland?	Yes ____ No X
Hydric Soil Present?	Yes ____	No X		
Wetland Hydrology Present?	Yes ____	No X		

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1. Cupresssus macrocarpa	20	Y	NL
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Picrus echoides	20	Y	FAC
2. Avena fatua	20	Y	NL
3. Lolium multiflorum	40	Y	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 15

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- N Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: No indicator status available for two dominant species; remaining to dominant species are FAC

SOIL

Sampling Point: HSP-5U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	2.5 Y 2.5/1	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks: Soil survey unit is non hydric. Area is slightly higher in elevation than adjacent wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

N Surface Water (A1)
N High Water Table (A2)
N Saturation (A3)
N Water Marks (B1)
N Sediment Deposits (B2)
N Drift Deposits (B3)
N Algal Mat or Crust (B4)
N Iron Deposits (B5)
N Surface Soil Cracks (B6)
N Inundation Visible on Aerial Imagery (B7)
N Sparsely Vegetated Concave Surface (B8)
N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
N Salt Crust (B11)
N Aquatic Invertebrates (B13)
N Hydrogen Sulfide Odor (C1)
N Oxidized Rhizospheres along Living Roots (C3)
N Presence of Reduced Iron (C4)
N Recent Iron Reduction in Tilled Soils (C6)
N Stunted or Stressed Plants (D1) (**LRR A**)
N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
N Drainage Patterns (B10)
N Dry-Season Water Table (C2)
N Saturation Visible on Aerial Imagery (C9)
N Geomorphic Position (D2)
N Shallow Aquitard (D3)
N FAC-Neutral Test (D5)
N Raised Ant Mounds (D6) (**LRR A**)
N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada – Horse Stable Pond City/County: Pacifica, San Mateo County Sampling Date: 6/24/08

Applicant/Owner: ______ State: CA Sampling Point: HSP-5W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 4 S, R 6 W

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0-10

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Candlestick variant loam, 2-15% slopes NWI classification: PSSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1. Salix lasiolepis	95	N	FACW
2.			
3.			
4.			
5.			
= Total Cover	95		
Herb Stratum (Plot size: ____)			
1. Oenanthe sarmentosa	5	N	OBL
2. Scirpus microcarpus	50	Y	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	55		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 30			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: HSP-5W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	2.5 Y 2.5/1	100					silty clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
n/a Sandy Mucky Mineral (S1)
n/a Sandy Gleyed Matrix (S4)
n/a Sandy Redox (S5)
n/a Stripped Matrix (S6)
N Loamy Mucky Mineral (F1) (**except MLRA 1**)
N Loamy Gleyed Matrix (F2)
N Depleted Matrix (F3)
N Redox Dark Surface (F6)
N Depleted Dark Surface (F7)
N Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ____
Depth (inches): ____

Hydric Soil Present? Yes X No ____

Remarks: Soil survey unit is non hydric. No redox features observed. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
Y Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)
__ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 9

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada – Horse Stable Pond City/County: Pacifica, San Mateo County Sampling Date: 6/24/08

Applicant/Owner: ______ State: CA Sampling Point: HSP-6W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 4 S, R 6 W

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0-10

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Candlestick variant loam, 2-15% slopes NWI classification: PSSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1. Salix lasiolepis	10	N	FACW
2.			
3.			
4.			
5.			
	10 = Total Cover		
Herb Stratum (Plot size: ____)			
1. Tropaeolum majus	30	Y	NL
2. Scirpus microcarpus	50	Y	OBL
3. Equisetum telmateia	5	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		
% Bare Ground in Herb Stratum 10			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: One dominant plant (garden nasturtium) not listed on plant list, no available indicator status

SOIL

Sampling Point: HSP-6W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	10 YR 3/1	97					clay loam	
	7.5 YR 5/8	3						redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
n/a Sandy Mucky Mineral (S1)
n/a Sandy Gleyed Matrix (S4)
n/a Sandy Redox (S5)
n/a Stripped Matrix (S6)
N Loamy Mucky Mineral (F1) (**except MLRA 1**)
N Loamy Gleyed Matrix (F2)
N Depleted Matrix (F3)
Y Redox Dark Surface (F6)
N Depleted Dark Surface (F7)
N Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ______

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
Y Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)
__ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes ______ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): 8

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-1U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): golf course fairway Local relief (concave, convex, none): concave Slope (%): 0-5

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X , Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities (area mowed).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ______)			
1. Poa pratensis	90	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	= Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: sample location is located in fairway and contains mowed grass

SOIL

Sampling Point: LS-1U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10	2.5 YR 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is at slightly higher elevation compared to adjacent wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

N Surface Water (A1)
N High Water Table (A2)
N Saturation (A3)
N Water Marks (B1)
N Sediment Deposits (B2)
N Drift Deposits (B3)
N Algal Mat or Crust (B4)
N Iron Deposits (B5)
N Surface Soil Cracks (B6)
N Inundation Visible on Aerial Imagery (B7)
N Sparsely Vegetated Concave Surface (B8)
N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
N Salt Crust (B11)
N Aquatic Invertebrates (B13)
N Hydrogen Sulfide Odor (C1)
N Oxidized Rhizospheres along Living Roots (C3)
N Presence of Reduced Iron (C4)
N Recent Iron Reduction in Tilled Soils (C6)
N Stunted or Stressed Plants (D1) (**LRR A**)
N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
N Drainage Patterns (B10)
N Dry-Season Water Table (C2)
N Saturation Visible on Aerial Imagery (C9)
N Geomorphic Position (D2)
N Shallow Aquitard (D3)
N FAC-Neutral Test (D5)
N Raised Ant Mounds (D6) (**LRR A**)
N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes ______ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-1W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): golf course fairway Local relief (concave, convex, none): concave Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Scirpus californicus	30	Y	OBL
2. Scirpus americanus	35	Y	OBL
3. Potentilla anserina	30	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	95		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: LS-1W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-10	2.5 YR 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ______

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is on toe of slope towards frequently inundated area. Inundation of the area is irregular, varying by extent and frequency. Water level is altered by pumping activities to keep golf course from flooding. Both wetland hydrology and hydrophytic vegetation present. All dominant species have an indicator status of OBL.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- Y High Water Table (A2)
- Y Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes X No ______ Depth (inches): 10

Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): 1

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-2U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): golf course fairway Local relief (concave, convex, none): convex Slope (%): 0-5

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation X , Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No X	Is the Sampled Area within a Wetland?	Yes ___ No X
Hydric Soil Present?	Yes ___ No X		
Wetland Hydrology Present?	Yes ___ No X		

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ___)			
1. Juncus balticus	10	N	OBL
2. Poa pratensis	60	Y	FACU
3. Potentilla anserina	10	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	20	x 1 = 20
FACW species		x 2 =
FAC species		x 3 =
FACU species	60	x 4 = 240
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = 12

Hydrophytic Vegetation Indicators:

N Dominance Test is >50%

N Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks:

SOIL

Sampling Point: LS-2U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	5 Y 3/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is slightly higher in elevation than adjacent wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

N Surface Water (A1)
N High Water Table (A2)
N Saturation (A3)
N Water Marks (B1)
N Sediment Deposits (B2)
N Drift Deposits (B3)
N Algal Mat or Crust (B4)
N Iron Deposits (B5)
N Surface Soil Cracks (B6)
N Inundation Visible on Aerial Imagery (B7)
N Sparsely Vegetated Concave Surface (B8)
N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
N Salt Crust (B11)
N Aquatic Invertebrates (B13)
N Hydrogen Sulfide Odor (C1)
N Oxidized Rhizospheres along Living Roots (C3)
N Presence of Reduced Iron (C4)
N Recent Iron Reduction in Tilled Soils (C6)
N Stunted or Stressed Plants (D1) (**LRR A**)
N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
N Drainage Patterns (B10)
N Dry-Season Water Table (C2)
N Saturation Visible on Aerial Imagery (C9)
N Geomorphic Position (D2)
N Shallow Aquitard (D3)
N FAC-Neutral Test (D5)
N Raised Ant Mounds (D6) (**LRR A**)
N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-2W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): golf course fairway Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: PUBH

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Juncus balticus	25	Y	OBL
2. Scirpus americanus	25	Y	OBL
3. Potentilla anserina	30	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: LS-2W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	5 Y 3/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is on toe of slope towards frequently inundated area. Inundation of the area is irregular, varying by extent and frequency. Water level is altered by pumping activities to keep golf course from flooding. Both wetland hydrology and hydrophytic vegetation present. All dominant species have an indicator status of OBL.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
Y High Water Table (A2)
Y Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes X No ___ Depth (inches): 10
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 1

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-3U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex Slope (%): 0-5

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Rumex crispus	10	N	FACW-
2. Carex utriculata	5	N	OBL
3. Atriplex triangularis	20	N	FACW
4. Lotus wrangelianus	50	Y	NL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum 5			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

N Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: One dominant species not listed on the plant list – no indicator status available

SOIL

Sampling Point: LS-3U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is slightly higher in elevation than adjacent wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

N Surface Water (A1)
N High Water Table (A2)
N Saturation (A3)
N Water Marks (B1)
N Sediment Deposits (B2)
N Drift Deposits (B3)
N Algal Mat or Crust (B4)
N Iron Deposits (B5)
N Surface Soil Cracks (B6)
N Inundation Visible on Aerial Imagery (B7)
N Sparsely Vegetated Concave Surface (B8)
N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
N Salt Crust (B11)
N Aquatic Invertebrates (B13)
N Hydrogen Sulfide Odor (C1)
N Oxidized Rhizospheres along Living Roots (C3)
N Presence of Reduced Iron (C4)
N Recent Iron Reduction in Tilled Soils (C6)
N Stunted or Stressed Plants (D1) (**LRR A**)
N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
N Drainage Patterns (B10)
N Dry-Season Water Table (C2)
N Saturation Visible on Aerial Imagery (C9)
N Geomorphic Position (D2)
N Shallow Aquitard (D3)
N FAC-Neutral Test (D5)
N Raised Ant Mounds (D6) (**LRR A**)
N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes ______ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-3W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): toe of hillslope Local relief (concave, convex, none): none Slope (%): 0-5

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: PUBH

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ______)			
1. Distichlis spicata	70	Y	FACW
2. Scirpus americanus	10	N	OBL
3. Jaumea carnosa	5	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85 = Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ______	x 1 = ______
FACW species ______	x 2 = ______
FAC species ______	x 3 = ______
FACU species ______	x 4 = ______
UPL species ______	x 5 = ______
Column Totals: ______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: wet meadow

SOIL

Sampling Point: LS-3W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X **No** ______

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is on toe of slope towards frequently inundated area. Inundation of the area is irregular, varying by extent and frequency. Water level is altered by pumping activities to keep golf course from flooding. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- Y High Water Table (A2)
- Y Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 1

Wetland Hydrology Present? Yes X **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-4U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex Slope (%): 0-10

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland? Yes ____ No X**
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ______)			
1. Distichlis spicata	70	Y	FACW
2. Lotus wrangelianus	5	N	NL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	75 = Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 10

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = 12

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: LS-4U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes ____ No X

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is slightly higher in elevation than adjacent wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

N Surface Water (A1)
N High Water Table (A2)
N Saturation (A3)
N Water Marks (B1)
N Sediment Deposits (B2)
N Drift Deposits (B3)
N Algal Mat or Crust (B4)
N Iron Deposits (B5)
N Surface Soil Cracks (B6)
N Inundation Visible on Aerial Imagery (B7)
N Sparsely Vegetated Concave Surface (B8)
N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
N Salt Crust (B11)
N Aquatic Invertebrates (B13)
N Hydrogen Sulfide Odor (C1)
N Oxidized Rhizospheres along Living Roots (C3)
N Presence of Reduced Iron (C4)
N Recent Iron Reduction in Tilled Soils (C6)
N Stunted or Stressed Plants (D1) (**LRR A**)
N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
N Drainage Patterns (B10)
N Dry-Season Water Table (C2)
N Saturation Visible on Aerial Imagery (C9)
N Geomorphic Position (D2)
N Shallow Aquitard (D3)
N FAC-Neutral Test (D5)
N Raised Ant Mounds (D6) (**LRR A**)
N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-4W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): toe of hillslope Local relief (concave, convex, none): none Slope (%): 0-5

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: PUBH

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ______
Hydric Soil Present?	Yes X	No ______
Wetland Hydrology Present?	Yes X	No ______

Is the Sampled Area within a Wetland? **Yes X** **No ______**

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Distichlis spicata	55	Y	FACW
2. Jaumea carnosa	40	Y	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	95		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No ______**

Remarks: wet meadow

SOIL

Sampling Point: LS-4W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes X No ____

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is on toe of slope towards frequently inundated area. Inundation of the area is irregular, varying by extent and frequency. Water level is altered by pumping activities to keep golf course from flooding. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- Y High Water Table (A2)
- Y Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes X No ____ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 1

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-5U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): golf course fairway Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities (area mowed).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ___)			
1. Poa pratensis	95	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover			
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks: sample location is located in fairway and contains mowed grass

SOIL

Sampling Point: LS-5U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 YR 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes ____ No X

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

N Surface Water (A1)
N High Water Table (A2)
N Saturation (A3)
N Water Marks (B1)
N Sediment Deposits (B2)
N Drift Deposits (B3)
N Algal Mat or Crust (B4)
N Iron Deposits (B5)
N Surface Soil Cracks (B6)
N Inundation Visible on Aerial Imagery (B7)
N Sparsely Vegetated Concave Surface (B8)
N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
N Salt Crust (B11)
N Aquatic Invertebrates (B13)
N Hydrogen Sulfide Odor (C1)
N Oxidized Rhizospheres along Living Roots (C3)
N Presence of Reduced Iron (C4)
N Recent Iron Reduction in Tilled Soils (C6)
N Stunted or Stressed Plants (D1) (**LRR A**)
N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
N Drainage Patterns (B10)
N Dry-Season Water Table (C2)
N Saturation Visible on Aerial Imagery (C9)
N Geomorphic Position (D2)
N Shallow Aquitard (D3)
N FAC-Neutral Test (D5)
N Raised Ant Mounds (D6) (**LRR A**)
N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-5W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): edge of golf course fairway Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ______	**Is the Sampled Area within a Wetland?** **Yes X No ______**
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes X No ______	

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Typha angustifolia	40	Y	OBL
2. Scirpus californicus	5	N	OBL
3. Potentilla anserina	50	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	95		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ______**

Remarks: wet meadow

SOIL

Sampling Point: LS-5W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ______

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is adjacent frequently inundated area and reportedly sample area is periodically inundated. Inundation of the area is irregular, varying by extent and frequency. Water level is altered by pumping activities to keep golf course from flooding. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
Y Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes ______ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): 6

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-6U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): golf course fairway Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities (area mowed).

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	___ = Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	___ = Total Cover		
Herb Stratum (Plot size: ______)			
1. Poa pratensis	95	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	___ = Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	___ = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: sample location is located in fairway and contains mowed grass

SOIL

Sampling Point: LS-6U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10 YR 2/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- N Saturation (A3)
- N Water Marks (B1)
- N Sediment Deposits (B2)
- N Drift Deposits (B3)
- N Algal Mat or Crust (B4)
- N Iron Deposits (B5)
- N Surface Soil Cracks (B6)
- N Inundation Visible on Aerial Imagery (B7)
- N Sparsely Vegetated Concave Surface (B8)
- N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- N Salt Crust (B11)
- N Aquatic Invertebrates (B13)
- N Hydrogen Sulfide Odor (C1)
- N Oxidized Rhizospheres along Living Roots (C3)
- N Presence of Reduced Iron (C4)
- N Recent Iron Reduction in Tilled Soils (C6)
- N Stunted or Stressed Plants (D1) (**LRR A**)
- N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- N Drainage Patterns (B10)
- N Dry-Season Water Table (C2)
- N Saturation Visible on Aerial Imagery (C9)
- N Geomorphic Position (D2)
- N Shallow Aquitard (D3)
- N FAC-Neutral Test (D5)
- N Raised Ant Mounds (D6) (**LRR A**)
- N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-6W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): edge of golf course fairway Local relief (concave, convex, none): none Slope (%): 0-5

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ______
Hydric Soil Present?	Yes X	No ______
Wetland Hydrology Present?	Yes X	No ______

Is the Sampled Area within a Wetland? **Yes X** **No ______**

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1. Salix lasiolepis	60	Y	FACW
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1. Salix lasiolepis	30	Y	FACW
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Potentilla anserina	10	N	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	10		
Woody Vine Stratum (Plot size: ______)			
1. Rubus vitifolius	60	Y	FACW
2.			
= Total Cover	60		

% Bare Ground in Herb Stratum 15

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No ______**

Remarks: wet meadow

SOIL

Sampling Point: LS-6W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10 YR 2/1	97					coarse sandy loam	
0-12	5YR 4/6	3						mottles

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
Y Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes X No ___

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. Redox features observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
Y Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 9

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-7U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): golf course fairway Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities (area mowed).

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ______)			
1. Poa pratensis	95	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	____ = Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	____ = Total Cover		
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: sample location is located in fairway and contains mowed grass

SOIL

Sampling Point: LS-7U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- N Saturation (A3)
- N Water Marks (B1)
- N Sediment Deposits (B2)
- N Drift Deposits (B3)
- N Algal Mat or Crust (B4)
- N Iron Deposits (B5)
- N Surface Soil Cracks (B6)
- N Inundation Visible on Aerial Imagery (B7)
- N Sparsely Vegetated Concave Surface (B8)
- N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- N Salt Crust (B11)
- N Aquatic Invertebrates (B13)
- N Hydrogen Sulfide Odor (C1)
- N Oxidized Rhizospheres along Living Roots (C3)
- N Presence of Reduced Iron (C4)
- N Recent Iron Reduction in Tilled Soils (C6)
- N Stunted or Stressed Plants (D1) (**LRR A**)
- N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- N Drainage Patterns (B10)
- N Dry-Season Water Table (C2)
- N Saturation Visible on Aerial Imagery (C9)
- N Geomorphic Position (D2)
- N Shallow Aquitard (D3)
- N FAC-Neutral Test (D5)
- N Raised Ant Mounds (D6) (**LRR A**)
- N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-7W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): edge of golf course fairway Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Potentilla anserina	85	Y	OBL
2. Scirpus americanus	5	N	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	____	x 1 =	____
FACW species	____	x 2 =	____
FAC species	____	x 3 =	____
FACU species	____	x 4 =	____
UPL species	____	x 5 =	____
Column Totals:	____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: wet meadow

SOIL

Sampling Point: LS-7W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ____

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is adjacent frequently inundated area and reportedly sample area is periodically inundated. Inundation of the area is irregular, varying by extent and frequency. Water level is altered by pumping activities to keep golf course from flooding. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
Y Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 8

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-8U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): edge of golf course fairway Local relief (concave, convex, none): varied Slope (%): 0-15

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ______	**Is the Sampled Area within a Wetland?** **Yes** ______ **No** X
Hydric Soil Present?	Yes ______ No X	
Wetland Hydrology Present?	Yes ______ No X	

Remarks: Precipitation has been lower than normal. Disturbed vegetation area. Topography varied/uneven across area.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1. Eucalyptus globulus	10	N	NL
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Cortaderia selloana	10	Y	NL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	10		
Woody Vine Stratum (Plot size: ______)			
1. Rubus vitifolius	40	Y	FACW
2.			
= Total Cover	40		
% Bare Ground in Herb Stratum ______			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ______

Remarks:

SOIL

Sampling Point: LS-8U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-18	5 Y 3/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No N

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Soil disturbed and topography uneven. Area is slightly elevated compared to adjacent wetland area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- N Saturation (A3)
- N Water Marks (B1)
- N Sediment Deposits (B2)
- N Drift Deposits (B3)
- N Algal Mat or Crust (B4)
- N Iron Deposits (B5)
- N Surface Soil Cracks (B6)
- N Inundation Visible on Aerial Imagery (B7)
- N Sparsely Vegetated Concave Surface (B8)
- N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- N Salt Crust (B11)
- N Aquatic Invertebrates (B13)
- N Hydrogen Sulfide Odor (C1)
- N Oxidized Rhizospheres along Living Roots (C3)
- N Presence of Reduced Iron (C4)
- N Recent Iron Reduction in Tilled Soils (C6)
- N Stunted or Stressed Plants (D1) (**LRR A**)
- N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- N Drainage Patterns (B10)
- N Dry-Season Water Table (C2)
- N Saturation Visible on Aerial Imagery (C9)
- N Geomorphic Position (D2)
- N Shallow Aquitard (D3)
- N FAC-Neutral Test (D5)
- N Raised Ant Mounds (D6) (**LRR A**)
- N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-9U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): edge of golf course fairway Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1. Salix lasiolepis	80	Y	FACW
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Potentilla anserina	10	N	OBL
2. Scirpus americanus	10	N	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	10		
Woody Vine Stratum (Plot size: ______)			
1. Rubus vitifolius	10	N	FACW
2.			
= Total Cover	10		
% Bare Ground in Herb Stratum 60			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: LS-9U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-18	10 YR 3/2	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is slightly elevated compared to adjacent wetland area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

N Surface Water (A1)
N High Water Table (A2)
N Saturation (A3)
N Water Marks (B1)
N Sediment Deposits (B2)
N Drift Deposits (B3)
N Algal Mat or Crust (B4)
N Iron Deposits (B5)
N Surface Soil Cracks (B6)
N Inundation Visible on Aerial Imagery (B7)
N Sparsely Vegetated Concave Surface (B8)
N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
N Salt Crust (B11)
N Aquatic Invertebrates (B13)
N Hydrogen Sulfide Odor (C1)
N Oxidized Rhizospheres along Living Roots (C3)
N Presence of Reduced Iron (C4)
N Recent Iron Reduction in Tilled Soils (C6)
N Stunted or Stressed Plants (D1) (**LRR A**)
N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
N Drainage Patterns (B10)
N Dry-Season Water Table (C2)
N Saturation Visible on Aerial Imagery (C9)
N Geomorphic Position (D2)
N Shallow Aquitard (D3)
N FAC-Neutral Test (D5)
N Raised Ant Mounds (D6) (**LRR A**)
N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: soil drier at depth

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/23/08

Applicant/Owner: ______ State: CA Sampling Point: LS-10W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ______
Hydric Soil Present?	Yes X	No ______
Wetland Hydrology Present?	Yes X	No ______

Is the Sampled Area within a Wetland? **Yes X** **No ______**

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Potentilla anserina	90	Y	OBL
2. Scirpus americanus	5	N	OBL
3. Carex utriculata	5	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No ______**

Remarks: wet meadow

SOIL

Sampling Point: LS-10W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 3/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ______

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is adjacent to frequently inundated area and reportedly sample area is periodically inundated. Inundation of the area is irregular, varying by extent and frequency. Water level is altered by pumping activities to keep golf course from flooding. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
Y Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes ______ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): 12

Wetland Hydrology Present? **Yes** X **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/23/08

Applicant/Owner: ______ State: CA Sampling Point: LS-11W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ______	**Is the Sampled Area within a Wetland?** **Yes X No ______**
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes X No ______	

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	______ = Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	______ = Total Cover		
Herb Stratum (Plot size: ______)			
1. Potentilla anserina	40	Y	OBL
2. Scirpus americanus	5	N	OBL
3. Distichlis spicata	10	N	FACW
4. Salicornia virginica	40	Y	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	______ = Total Cover		
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ______	x 1 = ______
FACW species ______	x 2 = ______
FAC species ______	x 3 = ______
FACU species ______	x 4 = ______
UPL species ______	x 5 = ______
Column Totals: ______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ______**

Remarks: overall area contains two small upland areas

SOIL

Sampling Point: LS-11W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 3/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
N Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ______

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is adjacent to frequently inundated area and reportedly sample area is periodically inundated. Inundation of the area is irregular, varying by extent and frequency. Water level is altered by pumping activities to keep golf course from flooding. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
Y Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
Y Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes ______ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): 10

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-12U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): golf course fairway Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)

Are Vegetation X, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No X

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ______	No X	**Is the Sampled Area within a Wetland?** **Yes** ______ **No** X
Hydric Soil Present?	Yes ______	No X	
Wetland Hydrology Present?	Yes ______	No X	

Remarks: Precipitation has been lower than normal. Vegetation is altered due to regular golf course maintenance activities.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ______)			
1. Poa pratensis	95	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95 = Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ______ **No** X

Remarks: wet meadow

SOIL

Sampling Point: LS-12U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No N

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- N Saturation (A3)
- N Water Marks (B1)
- N Sediment Deposits (B2)
- N Drift Deposits (B3)
- N Algal Mat or Crust (B4)
- N Iron Deposits (B5)
- N Surface Soil Cracks (B6)
- N Inundation Visible on Aerial Imagery (B7)
- N Sparsely Vegetated Concave Surface (B8)
- N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- N Salt Crust (B11)
- N Aquatic Invertebrates (B13)
- N Hydrogen Sulfide Odor (C1)
- N Oxidized Rhizospheres along Living Roots (C3)
- N Presence of Reduced Iron (C4)
- N Recent Iron Reduction in Tilled Soils (C6)
- N Stunted or Stressed Plants (D1) (**LRR A**)
- N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- N Drainage Patterns (B10)
- N Dry-Season Water Table (C2)
- N Saturation Visible on Aerial Imagery (C9)
- N Geomorphic Position (D2)
- N Shallow Aquitard (D3)
- N FAC-Neutral Test (D5)
- N Raised Ant Mounds (D6) (**LRR A**)
- N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-12W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex Slope (%): 0-10

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ______ No X (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ______	**Is the Sampled Area within a Wetland?** **Yes X No ______**
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes X No ______	

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	______ = Total Cover		
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
	______ = Total Cover		
Herb Stratum (Plot size: ______)			
1. Juncus balticus	40	Y	OBL
2. Atriplex triangularis	50	Y	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
	______ = Total Cover		
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ______**

Remarks:

SOIL

Sampling Point: LS-12W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 2.5/1	98					coarse sandy loam	
0-12	7.5YR 5/6	2						redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
Y Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ______

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. Redox features observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
Y Geomorphic Position (D2)
___ Shallow Aquitard (D3)
Y FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes X No ______ Depth (inches): 12
Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): 1

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: sample point is at toe of hillslope and adjacent to a frequently inundated area.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-13U

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): golf course fairway Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ______)			
1. Lotus wrangelianus	5	N	NL
2. Carex utriculata	10	N	OBL
3. Unknown	15		
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	30		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 50

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks: wet meadow

SOIL

Sampling Point: LS-13U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-16	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- N Histosol (A1)
- N Histic Epipedon (A2)
- N Black Histic (A3)
- N Hydrogen Sulfide (A4)
- N Depleted Below Dark Surface (A11)
- N Thick Dark Surface (A12)
- N Sandy Mucky Mineral (S1)
- N Sandy Gleyed Matrix (S4)
- N Sandy Redox (S5)
- N Stripped Matrix (S6)
- n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
- n/a Loamy Gleyed Matrix (F2)
- n/a Depleted Matrix (F3)
- n/a Redox Dark Surface (F6)
- n/a Depleted Dark Surface (F7)
- n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- N 2 cm Muck (A10)
- N Red Parent Material (TF2)
- N Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No N

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Area is slightly higher in elevation than adjacent wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- N Surface Water (A1)
- N High Water Table (A2)
- N Saturation (A3)
- N Water Marks (B1)
- N Sediment Deposits (B2)
- N Drift Deposits (B3)
- N Algal Mat or Crust (B4)
- N Iron Deposits (B5)
- N Surface Soil Cracks (B6)
- N Inundation Visible on Aerial Imagery (B7)
- N Sparsely Vegetated Concave Surface (B8)
- N Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- N Salt Crust (B11)
- N Aquatic Invertebrates (B13)
- N Hydrogen Sulfide Odor (C1)
- N Oxidized Rhizospheres along Living Roots (C3)
- N Presence of Reduced Iron (C4)
- N Recent Iron Reduction in Tilled Soils (C6)
- N Stunted or Stressed Plants (D1) (**LRR A**)
- N Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- N Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- N Drainage Patterns (B10)
- N Dry-Season Water Table (C2)
- N Saturation Visible on Aerial Imagery (C9)
- N Geomorphic Position (D2)
- N Shallow Aquitard (D3)
- N FAC-Neutral Test (D5)
- N Raised Ant Mounds (D6) (**LRR A**)
- N Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Small upland island

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada City/County: Pacifica, San Mateo County Sampling Date: 6/19/08

Applicant/Owner: ______ State: CA Sampling Point: LS-13W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 3 S, R 6 W

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0-2

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Orthents, cut and fill, 0-15% slopes NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: ___)			
1. Potentilla anserina	60	Y	OBL
2. Scirpus americanus	5	Y	OBL
3. Jaumea carnosa	30	Y	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- Y Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: LSS-11W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 2.5/1	100					coarse sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

N Histosol (A1)
N Histic Epipedon (A2)
N Black Histic (A3)
N Hydrogen Sulfide (A4)
N Depleted Below Dark Surface (A11)
N Thick Dark Surface (A12)
N Sandy Mucky Mineral (S1)
N Sandy Gleyed Matrix (S4)
Y Sandy Redox (S5)
N Stripped Matrix (S6)
n/a Loamy Mucky Mineral (F1) (**except MLRA 1**)
n/a Loamy Gleyed Matrix (F2)
n/a Depleted Matrix (F3)
n/a Redox Dark Surface (F6)
n/a Depleted Dark Surface (F7)
n/a Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

N 2 cm Muck (A10)
N Red Parent Material (TF2)
Y Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes X No ____

Remarks: Soil survey unit is non hydric. Soil appears disturbed, likely fill material. No redox features observed. Inundation of the area is irregular, varying by extent and frequency. Both wetland hydrology and hydrophytic vegetation present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
Y Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): 8

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: Laguna Salada – Sanchez Creek East City/County: Pacifica, San Mateo County Sampling Date: 6/24/08

Applicant/Owner: ______ State: CA Sampling Point: SCE-1W

Investigator(s): K. Bayer, M. Zaccherio Section, Township, Range: T 4 S, R 6 W

Landform (hillslope, terrace, etc.): creek with steep slope banks Local relief (concave, convex, none): varied Slope (%): 20-45

Subregion (LRR): A Lat: ______ Long: ______ Datum: ______

Soil Map Unit Name: Urban land Orthents, cut and fill complex, 0-5% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes X** **No ____**

Remarks: Precipitation has been lower than normal.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1. Salix lasiolepis	10	N	FACW
2.			
3.			
4.			
5.			
= Total Cover	10		
Herb Stratum (Plot size: ______)			
1. Oenanthe sarmentosa	10	N	OBL
2. Scirpus microcarpus	15	Y	OBL
3. Equisetum telmateia	10	N	OBL
4. Raphanus sativus	10	N	NL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	45		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 50

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ______	x 1 = ______
FACW species ______	x 2 = ______
FAC species ______	x 3 = ______
FACU species ______	x 4 = ______
UPL species ______	x 5 = ______
Column Totals: ______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No ____**

Remarks:

SOIL

Sampling Point: SCE-1W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
_ Histic Epipedon (A2)
_ Black Histic (A3)
_ Hydrogen Sulfide (A4)
_ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
_ Sandy Mucky Mineral (S1)
_ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
___Depleted Matrix (F3)
___Redox Dark Surface (F6)
___Depleted Dark Surface (F7)
___Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes X No ______

Remarks: Regularly inundated, assumed hydric

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ____ Depth (inches): 3

Water Table Present? Yes ______ No ______ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): ____________

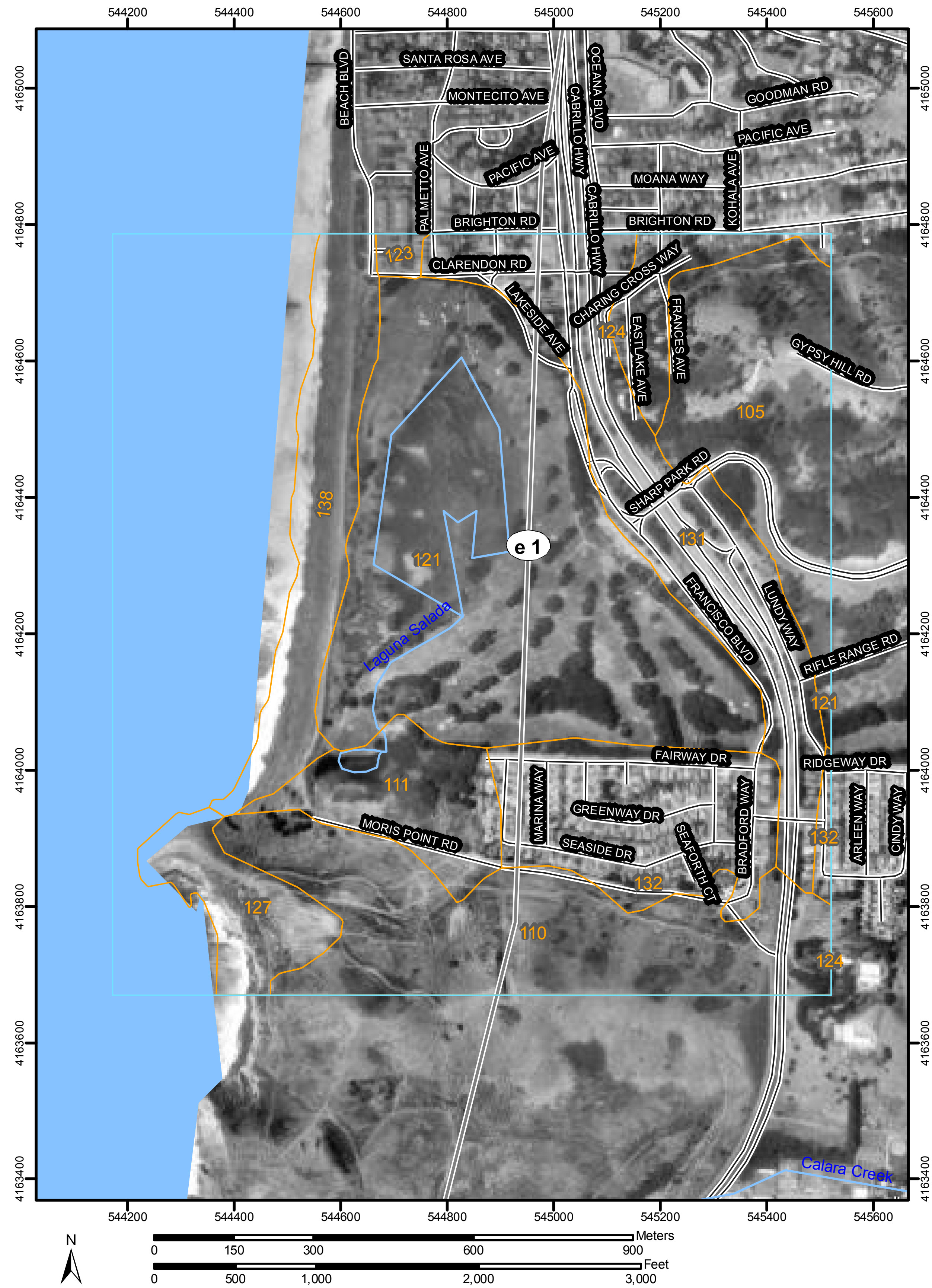
Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX C

County Soils Map


544200
544400
544600
544800
545000
545200
545400
545600
4165000
4164800
4164600
4164400
4164200
4164000
4163800
4163600
4163400
SANTA ROSA AVE
BEACH BLVD
MONTECITO AVE
CABRILLO HWY
OCEANA BLVD
GOODMAN RD
PACIFIC AVE
PALMETTO AVE
PACIFIC AVE
MOANA WAY
KOHALA AVE
BRIGHTON RD
BRIGHTON RD
CABRILLO HWY
CLARENDON RD
LAKESIDE AVE
CHARING CROSS WAY
EASTLAKE AVE
FRANCES AVE
GYPSY HILL RD
SHARP PARK RD
FRANCISCO BLVD
LUNDY WAY
RIFLE RANGE RD
FAIRWAY DR
RIDGEWAY DR
MARINA WAY
GREENWAY DR
SEAFORTH CT
BRADFORD WAY
ARLEEN WAY
CINDY WAY
MORIS POINT RD
SEASIDE DR
Laguna Salada
Calara Creek
e 1
123
124
105
138
131
121
121
111
132
132
127
110
124
N
Meters
0 150 300 600 900
Feet
0 500 1,000 2,000 3,000

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Mateo County, Eastern Part, and San Francisco County, California
Survey Area Data: Version 6, Mar 13, 2008

Date(s) aerial images were photographed: 7/10/1993

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

San Mateo County, Eastern Part, and San Francisco County, California (CA689)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
105	Barnabe-Candlestick complex, 30 to 75 percent slopes	41.4	8.7%
110	Candlestick-Kron-Buriburi complex, 30 to 75 percent slo pes	58.8	12.3%
111	Candlestick variant loam, 2 to 15 percent slopes	20.0	4.2%
121	Orthents, cut and fill, 0 to 15 percent slopes	114.9	24.0%
123	Orthents, cut and fill-Urban land complex, 0 to 5 percent slopes	1.7	0.4%
124	Orthents, cut and fill-Urban land complex, 5 to 75 percent slopes	10.5	2.2%
127	Rock outcrop-Orthents complex, 30 to 75 percent slopes	15.5	3.2%
131	Urban land	49.1	10.3%
132	Urban land-Orthents, cut and fill complex, 0 to 5 percent slopes	36.5	7.6%
138	Beaches	29.8	6.2%

Totals for Area of Interest (AOI)	477.8	100.0%

APPENDIX D

Photographs


General view of Laguna Salada from the southwest (February 2008)


Eastern end of Sanchez Creek (February 2008)


General view of Laguna Salada from the northwest (February 2008)


General view of Horse Stable Pond from the west (February 2008)

Salt tolerant vegetation near sample point LS-11W (June 2008)

Pond created by National Park Service as California red-legged frog habitat (June 2008)

Sharp Park Conceptual Restoration Alternatives Report

APPENDIX C: SENSITIVE SPECIES REPORT

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SHARP PARK WILDLIFE SURVEYS
AND SPECIAL STATUS REPTILE AND AMPHIBIAN RESTORATION RECOMMENDATIONS

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December 4, 2008

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Executive Summary

SBI conducted a literature and existing survey data review for Sharp Park and the vicinity to update the information in the previous enhancement plan (PWA 1992). We also conducted visual surveys for the western pond turtle (WPT) from January through June and a trapping survey at Laguna Salada and Arrowhead Lake during May 2008. Visual Surveys for the California red-legged frog (CRLF) and San Francisco garter snake (SFGS) were conducted at the following aquatic habitats and associated uplands: Horse Stable Pond (HSP), Laguna Salada (LS), the canal connecting HSP and LS, Sanchez Creek west of Highway 1, and Arrowhead Lake east of Highway 1 and the Archery Range. We conducted limited trapping surveys (under a separate contract) for SFGS and CRLF at Horse Stable Pond, the canal and the western side of LS. Surveys for the San Francisco forktail damselfly (FTDF), and salt marsh common yellowthroat (SMYT) were also conducted west of Highway 1 to determine the status of these species. During the course of the study we identified to the extent possible limiting factors for the special status reptiles and amphibians on the site and their prey species.

The survey results indicate that California red-legged frogs successfully breed primarily in HSP, but also breed in the Canal and Arrowhead Lake. California red-legged frogs breed at Laguna Salada (LS) in relatively high numbers, but breeding success and recruitment appears to be very limited because of combination of unsuitable vegetation structure and hydrology issues.

Although use of HSP, LS and the connecting canal has been documented in the past as recently as 2006 (HSP and LS only), the San Francisco garter snake was not observed at Sharp Park during the 2008 surveys. Concurrent surveys at Mori Point to the south documented the presence of five individual SFGS, and two individuals were observed near HSP during a separate project in 2008. One male western pond turtle was captured in Laguna Salada and others many have been sighted, but data are insufficient to determine if a breeding population exists. Numerous sightings of salt marsh common yellowthroats throughout Horse Stable Pond, Laguna Salada and the Canal suggest that several breeding pairs nested in Sharp Park during the survey period. A single San Francisco forktail damselfly was observed on the northern side of Horse Stable pond, indicating that the species continues to persist in the study area. PWA (1992) sufficiently covered the enhancement and constraints issues for SMYT and FTDF and no new recommendations or discussion is presented.

The primary limiting factor for the California red-legged frog is the deterioration of breeding habitat as Laguna Salada due to a combination of inappropriate vegetation structure for successful breeding. The California red-legged frog would benefit significantly from restoration actions that facilitate creation and enhancement of productive breeding habitat at any and all the aquatic features within Sharp Park. The constraint on creation would be to avoid completely isolating an aquatic feature within golf course features that do not maintain aquatic connectivity to other breeding habitat. For CRLF breeding, we recommend creating open water habitats adjacent to existing emergent vegetation in Laguna Salada, the Canal,

Sanchez Creek and Horse Stable pond to promote breeding of California red-legged frogs. Our recommendations are mostly in line with those made by PWA (1992).

Laguna Salada and the canal contain functionally little or no secure upland habitat for the San Francisco garter snake adjacent to the aquatic feature. This is one of the primary limiting factors for the snake. This lack of suitable upland with nearly constant disturbance by golf activity during the day minimizes the connectivity between Horse Stable Pond and LS. For SFGS that do make it to LS, the structure of the aquatic vegetation at LS currently provides extremely poor foraging habitat for SFGS. Use of LS by the snake exposes the snake to the potential for mortality as well from mowing, crushing by carts and people because in its current condition, the edges of LS are the most likely pathways for the SFGS to follow.

SFGS recovery in the form of increased distribution and carrying capacity in Sharp Park will not be accomplished by simply increasing CRLF breeding habitat or numbers in general. To increase SFGS use of the west and north perimeter of HSP, LS, and the connecting Canal will require development of additional undisturbed suitable upland habitat in these areas. Increased use of the northern bank of HSP, the connecting canal, and LS is desirable from an enhancement and recovery standpoint, but could present significant golf course management issues because of its fully-protected status. Consultation with the California Department of Fish and Game (CDFG) will be required to determine the extent to which limited take can be authorized for golf course management activities.

For SFGS, we recommend providing upland areas for basking, retreat and migration on the eastern and southern sides of Laguna Salada for garter snakes. Creating a wide zone of unmowed, undisturbed vegetation adjacent to, and along the length of the Canal would benefit the San Francisco garter snake by providing both upland habitat and an adequate seasonal movement corridor to Laguna Salada and potentially attract a resident segment of the local population to use the area consistently throughout the year. Depending on the configuration, restored upland habitats may need to be enclosed with fencing to prevent both golf and other park visitors (pedestrian and bicycle) from impacting these habitats and listed species using these areas. At Arrowhead Lake, we support significant reduction in non-native tree cover to increase suitable habitat connectivity with SFGS populations in the Crystal Springs watershed, and upland habitat enhancement for the SFGS. We also recommend determining whether large predatory fish occur in Laguna Salada and Arrowhead Lake and if so, removing them.

This report describes measures for avoiding take of listed species while performing habitat enhancement activities. It also makes recommendations for further studies to monitor and assess the effectiveness of habitat enhancements.

1.0 INTRODUCTION

1.1 Project Background

As part of our agreement to provide biological support services for Tetra Tech, SBI compiled literature and database records and conducted field surveys for special-status wildlife species at Sharp Park. Results of this study will be included in the Laguna Salada Resource Enhancement Plan developed by the City of San Francisco Department of Recreation and Parks and the San Francisco Planning Department.

The information contained in this report follows several studies conducted at Sharp Park over the past decades. Surveys for the San Francisco garter snake first were conducted at Sharp Park in the mid 1940s and were repeated on subsequent occasions until the most recent published surveys in 2006 (SBI 2006). Habitat conditions and species abundance varied during this time and present conditions reflect the history of local environmental events as well as historic and current land use practices. This report summarizes the results of the historical surveys conducted at the site and provides a description of current habitat conditions and use by listed species.

1.2 Report Purpose

This report provides a summary of the existing information, including findings of surveys conducted specifically in support of the Biological Assessment for the Laguna Salada Restoration Project in 2008. We report on the presence and where possible the distribution of the California red-legged frog (*Rana draytonii*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), San Francisco forktail damselfly (*Ischnura gemina*), salt marsh common yellowthroat (*Geothlypis trichas sinuosa*), and western pond turtle (*Clemmys marmorata*) within Sharp Park. The results of our field surveys and opportunities to enhance habitat within the study area with regard to the target species are discussed. We also propose measures to reduce the risk of accidental 'take' of listed species during enhancement implementation and conceptual take avoidance measures for ongoing golf course operations and maintenance. The report focuses primarily on the federally threatened California red-legged frog and federally endangered and state endangered and fully protected San Francisco garter snake.

1.3 Project Location and Study Area

Sharp Park is located in the town of Pacifica in San Mateo County, approximately 15 miles south of San Francisco. It covers an area of approximately 400 acres, extending westward from the lower slopes of the Coast Range (Sweeny Ridge) to the Pacific Ocean just north of Mori Point (Figure 1).

Sharp Park's location near several open space areas makes it an important part of the overall distribution of San Francisco Garter Snake and California red-legged frog on the San Francisco Peninsula. The Golden Gate National Recreation Area (Mori Point) borders Sharp Park to the southwest and supports San Francisco garter snake and California red-legged frog. Habitat enhancement projects in 2004, 2005 and 2007 increased the amount breeding habitat for California red-legged frog and foraging habitat for the San Francisco garter snake at Mori Point. Sweeney Ridge GGNRA lies to the east and southeast and provides habitat for the California red-legged frog. San Francisco garter snakes were recently detected at the north end of San Andreas Reservoir, just east of Sweeney Ridge (SBI 2008 unpubl. data). To the north of Sharp Park, Milagra Ridge GGNRA supports California red-legged frogs and contains habitat suitable to support San Francisco garter snakes. To the south beyond Mori Point, the Caleras Creek watershed supports a large population of California red-legged frogs and also includes potential habitat for the San Francisco garter snake. Movement of individual San Francisco garter snake and California red-legged frog probably occurs between some or all of these sites, and Sharp Park provides suitable habitat for dispersal and foraging for both species as well as being a source population for California red-legged frog.

USFWS (1985) included Sharp Park among six locations supporting a significant population of San Francisco garter snakes and considered essential to their long-term survival. Since that time additional populations have been located, but geographically, Sharp Park still represents the northernmost known population of the San Francisco garter snake. Fox (1951) believed that the population of San Francisco Garter Snake occurring on the coast around Laguna Salada and along Skyline Boulevard represented the purest examples of the subspecies.

1.4 Regulatory Context and Species Accounts

1.4.1 San Francisco Garter Snake

The SFGS was one of the first species to be designated federally endangered in 1967: state listing followed in 1971. The SFGS is also a fully protected species, meaning that the CDFG cannot permit 'take' (i.e. to harass, pursue, wound, kill, capture, trap, collect, molest or disturb) except for recovery actions. SFGS populations have severely declined over the past century. This species has suffered from habitat loss due to urbanization, collection by the black-market pet trade, and decline of its main prey species, the California red-legged frog.

SFGS have a yellowish-green dorsal stripe, edged with black, bordered by a red stripe, then black again on both sides. The belly is blue-green and the top of the head is red (Stebbins, 2003). Juveniles have the same coloration as adults.

Historically, SFGS occurred in scattered wetlands and the associated matrix of uplands along the San Francisco Peninsula, from just south of the San Francisco County line south to Waddell Creek, Santa Cruz County, and along the base of the Santa Cruz Mountains to at least Upper Crystal Springs Reservoir (U.S. Fish and Wildlife Service, 1985). SFGS enter into a zone of intergradation with conspecific California red-sided garter snake (*T. sirtalis infernalis*) just south of the Pulgas water temple (Crystal Springs Reservoir, San Mateo Co.) into extreme northern Santa Clara County around Stanford University campus (Barry, 1994).

They are found at permanent and seasonal freshwater wetlands that provide dense vegetation for cover, open habitats for basking, and are nearby to upland areas where snakes may retreat into rodent burrows through winter (Barry 1994). Typical upland habitats are annual grassland and coastal prairie. The presence of preferred prey items, Pacific chorus frogs (*Pseudacris regilla*) and California red-legged frogs (*Rana draytonii*), is a key component of suitable San Francisco garter snake habitat.

In general, garter snakes are highly mobile and tend to move seasonally between breeding, foraging and upland sites. The San Francisco garter snake appears to be particularly active in the spring, possibly a result of mate seeking (Larsen 1994). In one study a snake moved a straight line distance of 2.1 km over a period of several months (Wharton 1989). We reviewed all available historical accounts of surveys conducted at Sharp Park and in the vicinity. Recent surveys include a trapping study for the San Francisco garter snake conducted by SBI in Sharp Park that sampled portions of the habitat adjacent to Laguna Salada, the canal leading to Horse Stable Pond, Horse Stable Pond, Arrowhead Lake and Mori Point (SBI 2005). Additional surveys were conducted at Mori Point in 2004, 2006 and 2008 in association with two pond creation projects (SBI 2006). These surveys included data on both California Red-Legged frog and San Francisco Garter snake distribution and abundance at the site. We also compiled locality data for the California red-legged frog and Western pond turtle from California Natural Diversity Database (CNDDB) records and museum database collections. Salt marsh common yellowthroat and San Francisco forktail damselfly occurrence at the site was described in the Laguna Salada Resource Enhancement Plan (PWA 1992) and is considered in our analysis.

The first records of the San Francisco garter snake at Sharp Park were made in the mid-1940s and published in the early 1950s (Fox 1951). The specimens were collected from Laguna Salada, specifically the eastern most pool. The snake apparently existed in abundance but came under collecting pressure first by zoologists and later by reptile enthusiasts. Collection by scientists waned during the 1960s as awareness of its decline increased, and in 1967 the snake was listed as a Federal endangered species, followed by a California state endangered listing in 1971. With increased awareness of the rarity of the snake however, collecting pressure for the pet trade increased at Sharp Park, a highly accessible collecting site (McGinnis 1988) and the population probably continued to remain relatively low during the first part of the 1970s. Surveys in the late 1970s detected the presence of numerous San Francisco garter snakes at Horse Stable Pond (Barry 1979) and at Mori Point (Barry 1978) and the species appeared to be recovering. In the early 1980s however, saltwater intrusion through the eroding seawall caused the numbers of California red-legged frogs and San Francisco garter snakes at Sharp Park to decline (McGinnis 1988). Numerous surveys during the 1980s resulted in the detection of one adult and one newborn garter snake in the upland area east of Horse Stable Pond (McGinnis 1986b). By the latter half of the 1980s the San Francisco garter snake population at Sharp Park and Mori Point appeared to be on the verge of extinction (McGinnis 1988). Surveys in the early 1990s suggested that numbers were still low; three juvenile snakes were found at Mori Point and none were observed at Sharp Park (PWA 1992).

The results of a series of trapping studies at Mori Point and Sharp Park since 2004 suggest that the San Francisco garter snake population again may be increasing, at least at Mori Point. Trapping surveys conducted in association with a habitat enhancement project at Mori Point in 2004 and 2006 resulted in the capture of six and thirteen San Francisco garter snakes, respectively (SBI 2006). In 2004 an additional four garter snakes were captured at Horse Stable Pond, and a juvenile was captured along the west side of the connecting canal between HSP and LS (SBI 2005). In 2008, five San Francisco garter snakes were captured at Mori Point in a study conducted for the U.S. Fish and Wildlife Service (SBI, unpubl. data), and two additional snakes were observed at Sharp Park near Horse Stable Pond.

1.4.2 California Red-legged Frog

The California red-legged frog (*Rana draytonii*) is a federally endangered species and considered a species of special concern by the state of California. It is California's largest native frog (Wright and Wright 1961) at 85.0-138.0 mm snout-vent length. It is brown to reddish-brown with diffuse moderate-sized dark brown to black spots that occasionally have light centers (Storer 1925). The California red-legged frog can be easily identified by its distinct dorsolateral folds, also usually visible on larvae. Dark bands stripe the dorsal side of the hind legs and red coloration is typical of the ventral side of the hind legs (Stebbins 2003).

In California, red-legged frog populations are distributed from Shasta County south to the Mexican border. Introduced populations also currently exist in south-central Nevada (Linsdale 1940, Green 1985). California red-legged frogs inhabit humid forests, woodlands, grasslands, and stream sides (Stebbins 2003) characterized by dense, shrubby riparian vegetation associated with deep (0.7 m), still, or slow-moving water (Hayes and Jennings 1988). Emergent vegetation is ideal for cover and egg attachment (Storer 1925).

California red-legged frogs are generally found in close proximity to water, but often disperse to upland habitat after rains (Stebbins 2003). Although the majority of frogs at some locations remain at the breeding site year round, long-distance movements of up to 3,600 meters to and from non-breeding sites have been observed (Bulger et al. 2003).

One-hundred percent mortality occurs in California red-legged frog egg masses at salinity levels of 4.5 parts per thousand (Jennings and Hayes 1990), and larvae cannot survive in concentrations higher than 7.0 parts per thousand (M. Jennings *in litt*. 1993 cited in USFWS 2002). The presence of egg masses in Laguna Salada, the Canal and Horse Stable Pond suggest salinity levels of less than 4.5 ppt during the breeding season. Historic pesticide use has been linked with declines in California red-legged frog and other amphibian populations located downwind (Davidson 2004).

1.4.3 Western Pond Turtle

The western pond turtle (*Clemmys marmorata*) is not listed by the federal government but is a California species of special concern. It is a medium-sized turtle reaching about 22 cm in length with a low carapace, olive, brown or blackish in color usually with a dark radiating pattern on its shields (Stebbins 2003). Historically, this turtle had a relatively continuous distribution in most Pacific slope drainages from Klickitat County, Washington, along the Columbia River to northern Baja California, Mexico. In California, it was historically present in most Pacific slope drainages between the Oregon and Mexican borders (Jennings and Hayes 1994). The Western pond turtle is a California species of special concern and is declining over the majority of its range.

Western pond turtles require some still- or slow-water aquatic habitat. Habitat quality seems to vary with the availability of aerial and aquatic basking sites; however, western pond turtles often reach higher densities where many aerial and aquatic basking sites are available. Hatchlings require shallow water habitat with relatively dense submergent or short emergent vegetation in which to forage. Pacific pond turtles also require an upland oviposition site in the vicinity of the aquatic site. Suitable oviposition sites must have the proper thermal and hydraulic environment for incubation of the eggs. The thin shelled eggs of these turtles are suited to development in a dry nest; in an excessively moist nest (irrigated areas), eggs have a high probability of failing. Nests also are typically located on a slope that is unshaded to ensure that substrate temperatures would be high enough to incubate the eggs.

This aquatic turtle usually leaves the aquatic site to reproduce, aestivate, and overwinter. Western pond turtles may overwinter on land or in water, or may remain active in water during the winter season (Jennings and Hayes 1994). Mating, which has been rarely observed, typically occurs in late April or early May, but may occur year-round. Females migrate from the aquatic site to an upland location and deposit from one to thirteen eggs in a shallow excavation. The nesting site can be more than 400 meters from the aquatic site (Storer 1930; Reese 1996), but average distance is probably less than 200 meters (Jennings and Hayes 1994). Females may lay more than one clutch per year, usually during May and June, although some individuals may deposit eggs as early as late April and as late as early August (Jennings and Hayes 1994).

1.4.4 San Francisco Forktail Damselfly

The San Francisco forktail damselfly is known to occur only in the San Francisco Bay Area and is listed as an IUCN Red List Endangered species. Its range extends from Point Reyes, in Marin County to approximately San Jose, Santa Clara County, with most known populations occurring around the San Francisco Bay including the wetland habitats at Sharp Park (Garrison and Hafernik 1981; Hafernik 1989). Males are dark in color with blue patterns on the thorax and tip of the abdomen. Females are more cryptically colored tending to greenish or brown. A relatively long flight season and its ability to remain active during cool, windy and foggy days are probably adaptations to life in the San Francisco Bay Area (Garrison and Hafernik 1981).

The San Francisco forktail damselfly is associated with wetlands and slow-moving waters in the San Francisco Bay Area. Naiads and adults are predaceous and feed on invertebrates including small crustaceans and insects. Adults tend to perch on horizontal substrates and use both aquatic vegetation and nearby grasses and shrubs.

1.4.5 Salt Marsh Common Yellowthroat

The salt marsh common yellowthroat is one of 12 subspecies of the common yellowthroat recognized north of Mexico (Menges 1998). As its name suggests, it is relatively abundant in appropriate habitats, yet this subspecies is in decline due to loss of wetland habitats (Menges 1998). Currently it is listed as both state and federal Species of Concern. The subspecies is generally identified by range and breeding habitat. Some suggest that salt marsh common yellowthroats are distinguishable by sight and song (Grinnell 1901, Marshall and Dedrick 1994, Raby 1992).

The male common yellowthroat is distinctive, with a black mask and bright yellow chin and breast. The females are much more cryptic, olive green above with yellow on the chin and crissum (Sibley 2003). They feed on invertebrates and seeds. Pairs are monogamous during the breeding season and often raise two broods of 3-5 young. They are known as one of the three most frequent cowbird hosts (Ehrlich et al. 1988).

2.0 SPECIES SURVEY AND HABITAT ASSESSMENT METHODS

2.1 Habitat Assessment

The habitat assessment was conducted to document the current vegetation conditions as they relate to habitat for each of the species, to determine if the limiting factors enumerated by PWA (1992) still occur, and to identify any new limiting factors. Our study area also included more detailed habitat assessment and species surveys of the portion of Sharp Park on the west side of Highway 1. The primary purpose of the field surveys was to assess the status of the target species in the project area and identify the habitat within the project area currently being used by the California red-legged frog. Extensive surveys for the San Francisco garter snake were not conducted.

2.2 Field Surveys

We conducted field surveys for the target species from January through July, 2008. These included visual surveys both on foot and by kayak, live funnel-trapping for a brief period using a separate contract (Mori Point and Horse Stable Pond only), nocturnal eye-shine surveys, point counts, dip-netting and seining. We timed the surveys to coincide with peak activity of the target species and refined our plans based on local weather conditions. Surveys for California red-legged frog and San Francisco garter snake were intended to help determine relative abundance and habitat use while surveys for other species were primarily intended to establish whether species were present in the study area.

2.2.1 California Red-Legged Frog

The presence of breeding populations of California red-legged frogs is most easily determined by searching for egg masses. In coastal populations, females may begin to lay eggs in late December to early January, typically attaching them to emergent vegetation or uneven substrate. At Arrowhead Lake, Sanchez Creek, Horse Stable Pond, the Canal, and Laguna Salada we conducted egg mass surveys by walking transects around the perimeter of the water bodies and inspecting the areas near the shoreline for egg masses. At Laguna Salada and Horse Stable Pond we supplemented walking surveys with kayaks to help view the open water-emergent vegetation interface that was inaccessible on foot. To survey the dense emergent vegetation on the east side of Laguna Salada we walked using hip waders or wet suits.

We conducted frog egg mass surveys on foot and by kayak on 1/8, 1/9, 1/14, 1/22, 1/31, 2/6, 2/13, 2/20, 2/26, 3/4, 3/13. We surveyed for postmetamorphs using visual encounter surveys on 2/20 (evening), and incidental observations were recorded daily from 3/27, to 5/5 at Horse Stable Pond, Laguna Salada and the Canal while performing trap checks for San Francisco garter snakes. We performed seining and dip-netting for frogs and tadpoles at Horse Stable Pond, Laguna Salada, the Canal, Arrowhead Lake and portions of Sanchez Creek on 5/20 and 5 /21. Other incidental sightings of California red-legged frog were recorded during visual surveys for garter snakes and site visits to document habitat conditions from March through July.

2.2.2 San Francisco Garter Snake

We conducted visual surveys specifically for San Francisco garter snakes on 3/4, 3/13, 3/21, 3/27, 4/1, 4/4, 4/16, 4/21, 5/7, 5/12, 5/21, and 5/30. We also conducted visual surveys daily from 3/27 to 5/5 at Horse Stable Pond, Laguna Salada and the Canal while performing trap checks at Mori Point and Sharp Park.

2.2.3 Western Pond Turtle

Western Pond turtle visual surveys were conducted concurrently with frog egg mass surveys, and a trapping survey was conducted from 5/7 to 5/23. One basking-style trap was placed in

Laguna Salada and one in Arrowhead Lake. Each was checked daily for approximately two weeks.

2.2.4 San Francisco Forktail Damselfly

Visual surveys conducted at Sharp Park in 1990 and 1991 by Arndt and Hafernik suggested a low to moderate population density of San Francisco forktail damselflies (PWA 1992). Their findings were concentrated along the Canal and around the edges of Horse Stable Pond, especially in areas where *Typha* and *Scirpus* grew in lower densities (PWA 1992). Dip net sampling yielded similar results with the highest relative densities of *Ishnura* naiads found in the southern portion of the Canal, although some of their samples also probably contained *I. cervula* (PWA 1992). The results of these surveys suggested that the southern portion of the Canal and margins of Horse Stable Pond were most important for the survival of overwintering naiads (PWA 1992). We conducted visual surveys for San Francisco forktail damselflies concurrently with surveys for frog egg masses and snakes

2.2.5 Salt Marsh Common Yellowthroat

We conducted timed point count surveys for salt marsh common yellowthroats on 4/4, 4/21, 5/6, and 5/20 and non-point surveys on 3/21 and 3/29. For timed point count surveys, we chose points distributed throughout the study area based on their proximity to suitable habitat around the aquatic features at Sharp Park. All birds that were observed visually or acoustically were recorded during ten-minute intervals at each point.

3.0 RESULTS

Four of the five target species were found to be present in the area of Sharp Park west of Highway 1 and one was observed east of Highway 1 (Table 1). Detailed results for each species are present in the sections below.

Species	Arrowhead Lake	Sanchez Creek	Horse Stable Pond	Canal	Laguna Salada	Notes
California red-legged frog (*Rana aurora draytonii*)	Observed (B)	Observed (NB)	Observed (B)	Observed (B)	Observed (B)	
San Francisco garter snake (*Thamnophis sirtalis tetrataenia*)						Observed at Willow Pond and south of Sanchez Creek, Mori Point
Western pond turtle (*Clemmys marmorata*)	Unknown[1]				Observed	[1]A turtle observed swimming near the pond center could not be confirmed as a WPT
San Francisco forktail damselfly (*Ischnura gemina)*				Observed		
Salt marsh common yellowthroat (*Geothlypis trichas sinuosa*)			Observed (B)	Observed (B)	Observed (B)	

B = Breeding, NB = non-breeding

Table 1. Summary of Results of 2008 Field Surveys

3.1 California Red-Legged Frog

During our surveys we found a total of 85 California red-legged frog egg masses. The highest concentration was in Horse Stable Pond where we located 57 masses (Figure 2). We also found four egg masses in the Canal and twenty in portions of Laguna Salada. East of CA Hwy 1, we found four egg masses in Arrowhead Lake (Figure 2). No egg masses were found in Sanchez Creek. No egg masses were found in areas of extremely dense emergent vegetation that lacked open water, including several portions of LS and the east side of HSP. Tadpoles were captured in Arrowhead Lake, and Horse Stable Pond.

The results indicate that California red-legged frog breeding took place primarily in Horse Stable Pond and to a much lesser extent the Canal, Laguna Salada and Arrowhead Lake (Table 2). Areas that are suitable for foraging and basking but where no sign of breeding was observed include Sanchez Creek and portions of Laguna Salada, notably the north end. Juvenile and adult California red-legged frogs were concentrated in and around Horse Stable Pond, the Canal, and Lower Sanchez Creek. In these areas we observed frogs basking in sunlight or sitting under vegetation directly adjacent to the water. We did not observe frogs in extremely dense cattails or bulrushes, however these habitats are difficult to survey and provide abundant cover for frogs attempting to hide from disturbance.

3.2 San Francisco Garter Snake

Although no San Francisco garter snakes were observed during our visual surveys, two San Francisco garter snakes were observed at Sharp Park on September 29th 2008 during a project involving the removal of old tires from the property. These snakes were seen a few meters south of Horse Stable Pond and were using tires for cover. In addition to the two garter snakes seen at Horse Stable Pond, five San Francisco garter snakes were trapped at a nearby wetlands at Mori Point in 2008 (SBI unpubl. data) and in wetland habitats south of the golf course and east of Horse Stable Pond. On July 9th, Golden Gate National Recreation Area biologists reported seeing a San Francisco garter snake in the ‘north pond’, a few hundred feet east of Horse Stable Pond (S. Bennett *in litt* 2008). These observations, the abundance of prey items in these areas, their proximity to observations of the snake at Mori Point and HSP (SBI 2006), and historical occurrence suggest that the areas around Lower Sanchez Creek, Laguna Salada, the Canal, and Horse Stable Pond are likely to be used by San Francisco garter snakes for foraging and movement.

Arrowhead Lake supports a breeding population of California red-legged frogs and Pacific chorus frogs, and is bounded by dense riparian vegetation, providing suitable foraging habitat for the San Francisco garter snake. Although no San Francisco garter snakes were observed there during these surveys, Arrowhead Lake and the surrounding uplands may be used as habitat. There is a historical record of and SFGS on the parcel north of and adjacent to Sharp Park with no barriers between. San Francisco garter snakes are also known to occupy the SFPUC watershed land to the east around San Andreas Reservoir below Sweeney Ridge.

3.3 Western Pond Turtle

We were unable to determine whether a breeding population of western pond turtles exists at Sharp Park. One male western pond turtle was captured by hand in Laguna Salada on 2/26. Other turtles were observed swimming in Laguna Salada and Arrowhead Lake but could not be identified. The individuals observed were in deep (approximately 2 meters) water near the northern end of Laguna Salada and swimming near the center of Arrowhead Lake. Suitable aquatic habitat for pond turtles exists in both Laguna Salada and Arrowhead Lake, including deep, still water, emergent vegetation, and coarse woody debris for basking. Little upland habitat for nesting exists around Laguna Salada, eggs could be deposited east of Horse Stable Pond or in the upland areas at Mori Point if one or more adult females are present.

3.4 San Francisco Forktail Damselfly

On 5/21, one male San Francisco forktail damselfly was observed at the north end of Horse Stable Pond (Figure 2).

3.5 Salt Marsh Common Yellowthroat

Salt marsh common yellowthroats were observed in cattails east of Horst Stable Pond, near the Canal, and around Laguna Salada, particularly the western edge (Figure 3). We observed no salt marsh common yellowthroats east of CA Hwy 1. Nests were not located during our surveys but breeding and nesting were assumed based on the presence of individuals of both sexes including singing males during the breeding season. We recorded a total of 23 observations of yellowthroats around Horse Stable Pond the Canal and Laguna Salada, although multiple observations of the same individuals were likely. Previously territory sizes in the Bay Area have been estimated at between 0.2 and 2.0 territories per hectare (Foster 1977). We used a simplified estimate of one territory per hectare of suitable habitat, resulting in an estimate of six nesting pairs of salt marsh common yellowthroats at Sharp Park during the 2008 breeding season.

Complete bird lists are provided for the areas east and west of CA Hwy-1 (Appendix 1).

4.0 DISCUSSION

Below we describe the known and potential limiting factors for SFGS, CRLF and WPT at Sharp Park. The limiting factors for each aquatic feature Laguna Salada, Horse Stable Pond, Connecting Channel, Sanchez Creek, and Arrowhead Lake Following the summary statement of the limiting factor, we provide supporting details, as needed, on how these factors impact the species or their habitat directly and/or indirectly. We did not detail the limiting factors on the SMYT or FTDF beyond that of PWA (1992) here and make no further comment on these species.

4.1 Limiting Factors for California Red-Legged Frog and San Francisco Garter Snake

4.1.1 Laguna Salada

Despite its large size and extensive wetland area, less than one-quarter of the total frog egg masses (20 of 87) were found in Laguna Salada. Seventeen of those 20 were found along the eastern margin of LS where it interfaces the golf course adjacent to the rough and fairways of holes 13 and 14.

Although it is the largest aquatic feature in Sharp Park, use of LS by San Francisco garter snakes appears to be very minimal. No SFGS were observed there in 2008 visual surveys or trapping surveys along the western edge of LS in 2006 or 2008. No traplines were placed on the eastern side during the trapping because all the wetland vegetation and portions of the golf course on the east side were still submerged when the surveys for SFGS (funded by FWS) began in April 2008.

1. Dense vegetation on the eastern margin of Laguna Salada where it interfaces with the golf course provides poor California red-legged frog breeding habitat.

A large portion of the area east side of the main open water area of Laguna Salada is covered by very dense stands of cattails and other wetland plants. When water levels were high in winter 2008 storms, water was trapped on the eastern margin by the dense vegetation of LS (Figure 5). This created an area on the eastern edge of LS that was structurally the most appropriate and possible only accessible area for CRLF breeding. CRLF deposited all but 3 of the 20 egg masses in this area. This water drains slowly enough toward the open water area of LS to potentially remain long enough to allow some successful hatching of tadpoles from the egg masses, but it is unlikely that tadpoles can reach areas where water remains for full development. As a result this area provides for very limited, if any successful breeding habitat for California red-legged frog and to some degree acts as a sink.

2. The remainder of Laguna Salada wetland lacks areas that are both accessible to frogs with the appropriate water depths and emergent vegetation for breeding and egg mass attachment.

The only interface of persistent open water is on the main body of LS where it appears frogs can't readily reach because of the densities of the vegetation and possibly because of predatory fish in the main body of water. If predatory fish are present, the deep water allows large predatory fish to access egg masses and tadpoles, and colder temperatures slow tadpole development. Areas of shallow water that developed on the eastern shore adjacent to the golf course during the winter months provided protection from fish but these areas disappeared by mid-April as the water level receded, leaving insufficient time for tadpole development and metamorphosis.

3. Virtual lack of suitable secure upland habitat (unmowed, undisturbed) for basking and daily retreats adjacent to LS for SFGS

A large portion of the perimeter of Laguna Salada is adjacent to mowed areas of the golf course. Unmowed and vegetated areas west of Laguna Salada consist mainly of acacia and cypress trees that provide snakes with little protection from predators, and non-native iceplant that deters the establishment of small mammal burrows that could be used as retreats. The lack of open, grassy areas that provide concealment, basking opportunities and that also contain rodent burrows for retreats around Laguna Salada limits the numbers of snakes that would forage at the water's edge

4. **Lack of adequate connectivity between HSP and LS along the Canal due to lack of upland and very frequent disturbance by golf activity along the connecting canal during the day**

5. **Wetland vegetative structure adjacent to the open water of LS is too dense and not functioning adequately for foraging habitat for SFGS**

6. **Native and Non-native aquatic predators.**

Aquatic predators including several species of small fish and Signal crayfish (*Pacifastacus leniusculus*) were observed in Laguna Salada. While the presence of small fish probably does not have a significant negative effect on California red-legged frogs, crayfish and larger fish species prey on one or more life stages of the California red-legged frog and have been a factor in their decline (USFWS 2002). We did not observe any large fish during our surveys but they may exist in Laguna Salada.

7. **Subsidized Native and Non-native Terrestrial / avian predator Populations Potentially Inflated.**

Avian predators including hawks, ravens, crows, herons and gulls benefit from food acquired from human visitors, particularly on the western side of Laguna Salada. Terrestrial predators such as raccoons, opossums, skunks and non-native rats may also be subsidized by food-related trash from Sharp Park and the surrounding developments. Numerous domestic cats were observed in the area, a potentially serious threat to resident snakes and frogs. In January 2006 several cat food containers were found near Horse Stable Pond, presumably left by visitors to the park. This may lead to unnaturally high predation on SFGS and CRLF, especially where adequate cover is lacking on the west side.

8. **Park visitors and their pets negatively impact frogs and deter snake movement on the west side of Laguna Salada**

Non-golf pedestrian/pet use of upland areas surrounding Laguna Salada is concentrated on the west edge where social trails have become established. While pedestrian traffic in this area has the potential to impact snakes and frogs, much of the area consists of sand dunes with ice plant (*Mesembryanthemum crystallinum*), and Monterey cypress (*Cupressus macrocarpa*), vegetation not associated with high-quality frog and snake habitat. Emergent bulrushes along the west edge of Laguna Salada remain relatively unaffected by human activity in this area, but heavy foot traffic immediate uphill may prevent the growth of dense vegetation that could provide cover for snakes and frogs.

On several occasions dogs were observed running or swimming through water along the west edge of Laguna Salada. Dog activity in breeding areas could reduce the chances of successful development by crushing frog eggs or dislodging egg masses from emergent vegetation making them more susceptible to predators. Dogs are most likely to enter the water from open, sandy areas and impact egg masses attached to nearby emergent vegetation.

9. Isolated patches of dense vegetation surrounded by bare areas and invasive ice plant deter movement of snakes on the western side of Laguna Salada

On the west side of Laguna Salada emergent vegetation is interspersed with open beach areas creating isolated patches of bulrush. Because the San Francisco garter snake tends to avoid bare areas, these isolated patches of cover provide snakes with habitat of marginal quality. The former golf course fairway and green southwest of Laguna Salada have become dominated by invasive ice plant (*Mesembryanthemum crystallinum*), and Monterey cypress (*Cupressus macrocarpa*), vegetation not typically associated with high-quality snake habitat and probably act to deter movement of snakes and frogs through the area. Ice plant forms dense nearly impenetrable mats that impede the movement of snakes through them.

10. Park visitors and their pets may further deter movement of snakes on the west side of Laguna Salada

Non-golf pedestrian/pet use of upland areas surrounding Laguna Salada is concentrated on the west edge where social trails have become established and the activity there is relatively constant.

11. **Exposure to potential injury, mortality from golf course operations and maintenance- mowing, crushing by carts and people.**

4.1.2. Horse Stable Pond

Horse Stable Pond was the primary center for California red-legged frog breeding activity in Sharp Park during our surveys. Over two-thirds of the egg masses we found were here and it has the highest quality SFGS habitat as detected by past trapping studies.

1. Stranding and mortality of CRLF due to Pumping water/Reduction of SFGS prey

At Horse Stable Pond, receding water levels caused by pumping has stranded egg masses and caused them to desiccate. Egg masses stranded by receding water levels in Horse Stable Pond were recorded in 2003, 2004, and 2005 (SFRPD unpubl. data). In 2008 we observed several egg masses that had been deposited on broken cattail stalks stranded above the water line following pumping. We were able to bend the cattail further to return the bulk of the mass in to the water to prevent desiccation. While frog egg masses appeared to be resistant to minor reductions in water level, drawdown of more than a few centimeters poses a significant desiccation risk to developing eggs attached to emergent vegetation and to those deposited in shallow water. Once all of the eggs have hatched into tadpoles, the threat posed by changing water levels is reduced or eliminated so long as sufficient water remains for development and metamorphosis. Pumping however, may still pose a threat if tadpoles are caught in the pump mechanism or forced from Horse Stable Pond into the ocean.

Discontinuing pumping at Horse Stable Pond would be expected to result in reduced fluctuations in water level and a lower risk of egg mass desiccation. In 2008 egg masses were deposited at Horse Stable Pond from late January through late February. By early March, all eggs had transformed into tadpoles. Under natural conditions rainfall and inflow from the rest of the watershed during this period would prevent egg masses from becoming stranded above the waterline. It should be noted that the breeding season can go as late as early April in some years. Monitoring pumping

2. Park visitors and their pets negatively impact frogs at Horse Stable Pond

Similar to LS, visitors to Sharp Park currently allow dogs to run off-leash along the west edge of Laguna Salada and at Horse Stable Pond. Free-roaming dogs potentially may harass or harm snakes and frogs, disturb aquatic habitats including frog oviposition sites, and may disturb turtle nesting sites. During one survey an off-leash dog was observed running through the water at Horse Stable Pond at a time when numerous California red-legged frog egg masses were attached to nearby vegetation.

3. Extremely Minimal upland habitat on north side for SFGS

4. Dense vegetation on the eastern side of Horse Stable Pond provides poor California red-legged frog breeding habitat.

While the shallow water on the north, south and west sides of Horse Stable Pond contains a large amount of suitable breeding habitat, shallow portions of its east side contain very dense stands of cattails where breeding did not occur during the survey period. This currently does not appear to be a limiting factor for overall breeding success since high-quality habitat exists nearby within the pond. However, the encroachment of cattails and total elimination of shallow, open water in other portions of Horse Stable Pond would be detrimental to frog breeding success.

4.1.3. Sanchez Creek

Portions of Sanchez Creek and its adjacent banks remain moist and cool throughout the year and provide non-breeding habitat for CRLF. The portion of the creek immediately west of the terminus of Fairway drive does not appear to provide-breeding habitat for CRLF.

Limiting factors:

1. Open water areas in Sanchez Creek tend to flow too swiftly to provide oviposition sites for frogs and contains sparse cover in some areas that may deter movement of snakes.

Particularly from the terminus of Fairway Drive east, Sanchez Creek lacks emergent and overhanging vegetation. This area currently provides only non-breeding habitat for frogs and minimal value as a movement corridor for snakes. Creating a riparian corridor along this portion of the creek with shallower sloped banks in some areas would provide more suitable non-breeding habitat for frogs and would create a dispersal corridor increasing connectivity between areas bisected by CA-Hwy 1. Water flow through Sanchez Creek is too swift during the red-legged frog breeding season to facilitate breeding east of the terminus of Fairway Drive.

2. Shading by Cypress Trees reduces quality for SFGS (lack of basking sites)

3. Sedimentation of Creek west of terminus of Fairway Drive.

Further downstream the creek is sedimented. This area lacks open water and contains extremely dense vegetation, reducing its suitability for frog breeding and egg deposition.

4.1.4. Canal

The canal connecting Laguna Salada with Horse Stable Pond provides breeding and non-breeding habitat for California red-legged frogs, and may serve as a foraging and migration area for San Francisco garter snakes.

Limiting factors:

1. Dense vegetation resulting in lack of open water reduces the suitability of most of the canal for frog breeding and egg mass deposition

Like portions of Sanchez Creek west of Fairway Drive, the canal is sedimented and in most areas has become invaded by cattails. These areas would be more suitable for breeding if they contained a combination of open water and emergent vegetation.

2. Pumping water can strand frog egg masses in the Canal and cause them to fail

As in Horse Stable Pond, drawdown of water in the Canal more than a few centimeters poses a significant desiccation risk to developing eggs attached to emergent vegetation and to those deposited in shallow water. Once all of the eggs have hatched into tadpoles, the threat posed by changing water levels is reduced or eliminated provided that sufficient water remains for development and metamorphosis.

The canal connecting Laguna Salada with Horse Stable Pond provides does not appear to provide suitable connectivity to LS for SFGS in its current condition.

3. The band of unmowed vegetation along the edges of the canal is narrow and provides little upland habitat with burrows and cover for movement. Increasing the buffer of natural habitat along the edges of the canal would provide cover for garter snakes moving between Laguna Salada and the Horse Stable / Mori Point uplands and would provide much-needed upland habitat for garter snakes foraging in the canal and Laguna Salada

4. The area near the canal is frequently disturbed by golf activity and SFGS would likely need to cross golf course paths and other features to get to LS.

4.1.5. Arrowhead Lake

CRLF currently breed here, but SFGS have not been observed in recent times.

1. Large predatory fish, if present, could severely limit red-legged frog breeding success and prey on both SFGS and CRLF.

2. Extensive stands of mature Eucalyptus (non-native vegetation) limit potential SFGS colonization.

4.2 Other limiting factors

4.2.1 Take Due Golf Operations and Maintenance

1. Impacts to frog and garter snake habitat from golf are likely to occur in areas where the golf course is directly adjacent to wetland and riparian vegetation. Golf may have direct and indirect impacts on frogs and garter snakes

Portions of Sharp Park Golf Course lie directly to the north of Horse Stable Pond, both sides of the Canal and Sanchez Creek, and much of the perimeter of Laguna Salada, creating a potential for impacts to wildlife and habitat in these areas. Nearby foot and cart traffic, players searching for golf balls and grounds keepers performing maintenance activities may impact wildlife or habitat directly through harassment, trampling of vegetation, and inadvertent harm to individuals by mowing. Indirectly, the golf course may limit the movement of garter snakes to and from foraging habitats by creating large expanses of grass that provides little cover or underground refuges. These areas also probably support few prey items for frogs such as insects and other invertebrates than do more densely vegetated upland areas. In general, the proximity of the golf course to aquatic habitats reduces the amount of surrounding upland vegetation associated with high quality habitat for both species.

3. Tertiary Treated Waste Water (TTWW) - we did not determine if this would be a limitation
4. Pesticides/Fertilizer Runnoff- We did not assess whether impacts from pesticide and fertilizer runoff from the golf course or other areas of the watershed are limiting factors.

   Pesticides, with the exception of glyphosate (Round-Up®) are not used at Sharp Park. One herbicide, dicamba, is used on the golf course greens. Although its effects on CRLF and SFGS are unknown, toxicity studies of dicamba on one- to two-week old tadpoles of the Australian tusked frog (*Adelotus brevis*) and Brown striped marsh frog (*Limnodynastes peroni*) were not acutely toxic (Johnson 1976). Based on their screening level assessment, the EPA determined that dicamba does not have a direct acute affect on threatened and endangered freshwater and estuarine fish, or aquatic invertebrates. The Agency's level of concern, however, was exceeded for endangered birds, mammals, and non-target plants (USEPA 2006). Chronic exposure risk to dicamba has not been well researched, and the effects on survival, growth, and reproduction of aquatic organisms chronically exposed to remain uncertain (EPA 2006). Although existing information suggests that adverse effects should not result from exposure from normal application, without additional information about chronic exposure and the concentrations of dicamba in the aquatic habitats at Sharp Park we cannot determine what effects, if any, its use has on listed species.

4.2.2 Collection by Reptile Enthusiasts

5. Reptile collectors present an unknown level of risk to San Francisco garter snakes at Sharp Park

4.2.3 Salinity

6. Salinity: We did not assess water quality, but salinity was sufficiently low to allow frog breeding in 2008. Keeping salinity levels low is critical to the long term survival of the frog and snake populations at not only Laguna Salada and Horse Stable Pond, but at the GGNRA Mori Point Park.

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4.3 Enhancement Recommendations and Constraints

4.3.1. Laguna Salada

❖ Increase the amount of shallow water containing some emergent vegetation in areas where large fish could not prey on frog eggs. Periodically the vegetation in these areas would require management in order to maintain sufficient open water (free of dense emergent vegetation) to allow frogs to breed. Increasing this habitat type could be accomplished by:

    1) Dredging the area on the eastern side to create an area of open water with raised banks and separating it from the main portion of Laguna Salada

    2) creating shallow "fingers" radiating out from the edges with open water in the centers and emergent vegetation along the edges

❖ Increase available upland habitat for the San Francisco garter snake with an attempt to keep the enhancements from resulting in mortality due to golf course maintenance (primarily mowing). Specific Areas include:

1) Relocation or shortening and narrowing of hole # 13

2) Narrowing hole # 14

3) Determine Feasibility of adding a single hole to the west side in its former location. This is the area that is currently in the poorest habitat condition for SFGS and CRLF. Other restoration species may not benefit from this action.

4) Investigate potential of moving 1 or 2 holes to the east side of Highway 1.

❖ Reduce human and pet impacts to wildlife and habitats by posting educational signs and strategically fencing sensitive areas from the public. Use of the west side of Laguna Salada as a pet swimming and picnicking are is one of the most significant and widest scale impacts to both species.

- Currently the area surrounding Laguna Salada and the canal consists of golf course greens or sandy areas with sparse vegetation and few underground retreats. Increasing cover and retreats in the areas adjacent to the canal would allow some snakes to remain year-round in the vicinity of Laguna Salada, and facilitate the movement of others to upland habitats elsewhere including the area east of Horse Stable Pond and Mori Point.
- Create basking platforms for western pond turtles
- Monitor for the presence of bullfrogs and implement control measures

4.3.2. Horse Stable Pond

- Deepen the eastern edge of the pond to increase breeding areas. Create an edge of 2-foot deep water with cattails adjacent to a deeper open water area.
- Restrict access by pedestrians and dogs potentially with fencing and signage.
- Replace non-native ice plant near the pump house with native vegetation that provides cover for snakes and frogs
- Eliminate unnatural water level reductions during the frog breeding season
- Plant native vegetation on the uphill area north of the pond currently covered by the golf course (Hole 12). This area would become upland habitat for snakes and would provide underground retreats and a migration corridor between the Pond and Laguna Salada.
- Remove the old tires and other debris in the vicinity
- Investigate the feasibility of breaching the seawall to allow Sanchez Creek to flow to the ocean via gravity. This enhancement would not be recommended if it resulted in any intrusion of salt water in to the Laguna. No restoration effort that allows increased salinity or the potential for increased salinity is recommended. Such an action would jeopardize the entire population of CRLF and SFGS.
- Monitor for the presence of bullfrogs and implement control measures

4.3.3. Sanchez Creek

- Create a natural riparian buffer around the portion of the creek east of the terminus of Fairway Drive. This would provide non-breeding habitat for California red-legged frogs and a movement corridor for both frogs and San Francisco garter snakes.
- Provide frog breeding habitat by removing a portion of the cattails in the area west of Fairway Drive creating deeper open water pools away from the culvert out flow. This

area is located on GGNRA property, therefore any management actions in this area would require coordination with that agency.

- West of Fairway Drive the creek is heavily sedimented and little open water is available for breeding habitat. Although west of Fairway Drive the creek channel supports emergent vegetation, the density of these plants, primarily cattails, has severely reduced available open water, reducing its suitability as breeding habitat for frogs. A reduction in the density of cattails west of Fairway Drive would increase the suitability of this area as a frog breeding site and increase foraging habitat for San Francisco garter snakes.
- Monitor for the presence of bullfrogs and implement control measures

4.3.4. Canal

- Increase the functionality of the area as a movement corridor and upland habitat by creating a buffer of unmowed vegetation around the edges of the Canal. This area would provide underground retreats and basking sites for both snakes and frogs. This would require a reconfiguration of a portion of the golf course. Several specific recommendations were enumerated in the Laguna Salada Section to increase connectivity. Additional recommendations for holes not adjacent to LS include
    1) Shorten Hole # 9
    2) Relocate Hole # 12
- Re-contour the canal and deepen a large center area to >3 feet in order to prevent cattails from reestablishing. The edges should remain shallow enough to allow cattails to persist (approximately 2 feet) and provide habitat for egg deposition, tadpole development and snake foraging
- Install a fence and signage to restrict visitor access to the canal area
- Remove non-native Monterey cypress and allow sunlight to promote the growth of understory vegetation.
- Monitor for the presence of bullfrogs and implement control measures

4.3.5. Arrowhead Lake

- At Arrowhead Lake, we support significant reduction in non-native tree cover to increase suitable habitat connectivity with SFGS populations in the Crystal Springs watershed, and upland habitat enhancement for the SFGS.
- Monitor for the presence of bullfrogs and implement control measures

- ❖ Determine whether large predatory fish are present and implement a removal plan to increase California red-legged frog breeding success and eliminate the potential for predation on SFGS.
- ❖ Determine whether western pond turtles are present and if so, create platforms for basking

Recommendations for other limiting factors:

- ❖ Create sufficient buffer zones with upland habitat around aquatic features so that garter snakes are less likely to use golf course rough or fairways. Use of the fairways and other golf features is primarily at night and may not conflict with operations as much.
- ❖ Create barren, sandy areas, or areas covered by iceplant between high-quality breeding and foraging habitat and the golf course to deter the movement of frogs and garter snakes.
- ❖ Modify the design the golf course so that garter snakes can move safely between the Horse Stable Pond / Mori Point area and Laguna Salada

4.4 Summary of Golf Course Design Changes Recommended (DRAFT)

- Relocate/Shorten hole #13
- Narrow/Relocate #14
- Shorten hole #9
- Relocate #12
- Recontour canals
- Create Upland habitat at hole #12
- Create wide undisturbed zone along canal
- Create more open water in Laguna Salada
- Investigate west side of Laguna Salada as potential fairway
- Remove some cypress and replace with willow
- Investigate moving two holes to west of highway on the west side of LS

4.5 Take Avoidance Measures During Enhancement Implementation

Specific measures to avoid potential adverse effects on the California red-legged frog and the San Francisco garter snake during enhancement activities should be developed in consultation with the US Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG). We recommend the following general measures as guidelines for the Enhancement Plan:

- Prior to any ground-disturbing activity, a qualified biologist should provide environmental awareness training for all workers who will be on site. The training should include a brief overview of the Endangered Species Act, a description of the California red-legged frog and San Francisco garter snake, what steps should be taken to avoid impacts to their habitats, and what to do if an individual frog or snake is found.

- A temporary exclusion fence (e.g. silt fence) should be installed to prevent listed species from entering the work area. The placement of the fence would be directed by a qualified biologist in consultation with the USFWS and CDFG.

- Following installation of the exclusion fence and at least 6 weeks prior to construction, a trapping program will be conducted to remove all listed species from the area to be impacted.

- A qualified biologist should monitor all work activities on site. The monitor would verify that exclusion fence, erosion control measures and any other environmental protection measures are properly installed.

- Work should be confined to the smallest area possible to safely complete the project. Workers should be instructed to stay within the work corridor and limits should be clearly marked.

- Vehicle refueling and maintenance should be conducted a minimum of 150 feet from aquatic habitats and other sensitive areas identified by a qualified biologist.

- Construction activities should be done during the dry season (June 1 through October 15).

- If a California red-legged frog or San Francisco garter snake is found inside a work area a USFWS and CDFG-authorized biologist should relocate it out of harm's way.

4.6 Take Avoidance Measures to Minimize Impacts of Golf Course Operations and Maintenance after Enhancement Implementation

In order to minimize impacts and potentially eliminate injury or death to SFGS or CRLF, the following measures are recommended for implementation at the Sharp Park Golf Course. This section was provided as a general guideline for SFRPD because the potential for take of SFGS will likely increase after implementation of the restoration. Further details will need to be developed for this plan as it was not part of this restoration project.

- Educational program for maintenance and operations staff. This type of education would need to be on-going as staff turn over occurs.

- Develop a monitoring plan with the agencies for avoiding take during mowing, and other Operations and Maintenance activities that could result in take.
- Signage alerting golfers and reminding staff of the presence of the sensitive species.
- Flyers/brochures for golfers (photos, protective measures)
- Convert course to walking only
- Golfers restricted from retrieving balls outside of the fairways and greens
- Possible restrictions on fertilizer but more information needed.
- Closely monitor pumping at Horse Stable Pond, if gravity system can't be implemented.

Qualifications required for biological monitors working with California red-legged frogs and San Francisco garter snakes are determined by USFWS and CDFG. The agencies should be contacted to determine the qualifications and level of training needed to provide biological monitoring services.

4.7 Measuring Restoration Project Success

Future surveys should be aimed at monitoring long-term trends in San Francisco garter snake population demographics (*i.e.*, age class ratios, sex ratios, total number of individuals) at Sharp Park and measuring the success of enhancement activities. Mark-recapture surveys would allow calculation of garter snake population estimates and can be compared statistically with future surveys to measure the recovery of the population.

Visual surveys for California red-legged frog egg masses would allow the assessment of frog habitat enhancement activities at Sharp Park. Several years of egg mass observation data currently exist for Horse Stable Pond. Egg mass surveys conducted in 2008 at the other aquatic habitats in would provide baseline data for future surveys in those areas using similar methods.

5.0 Conclusions

5.1 California red-legged frog habitat enhancement

Increasing California red-legged frog breeding habitat should be a priority for habitat enhancement in Sharp Park. Our surveys suggest that oviposition sites are limited to Horse Stable Pond, the southern and western portion of Laguna Salada, and to a lesser extent the Canal, and Arrowhead Lake. Tadpoles were not observed in Laguna Salada during visual surveys or seining, and while this is not conclusive proof of their absence, we believe few tadpoles were able to survive to metamorphosis in Laguna Salada. If this is the case, California red-legged frog breeding success in Sharp Park relies primarily on the persistence of high-quality habitat in Horse Stable Pond. The creation of additional suitable habitat would increase the total population of frogs and provide a hedge against a sudden decline in its habitat quality resulting from seawater intrusion or other disturbance at Horse Stable Pond.

5.2 San Francisco garter snake habitat enhancement

Increasing California red-legged frog breeding areas will also provide foraging areas for garter snakes. While the predator/prey relationship between the California red-legged frog and San Francisco garter snake results in some degree of overlap in their aquatic habitat requirements, upland habitat requirements differ. San Francisco garter snakes do not remain at water bodies year-round; instead they retreat daily to refuges such as rodent burrows in the upland throughout the year. The distance they move into the uplands can vary both seasonally and daily. During the winter months when it is cold, San Francisco garter snakes are likely to seek retreats further into the uplands where burrows would not be flooded by rain. Radio-tracking suggests they may remain in their upland retreats for weeks at a time (Larsen 1994). Other important upland features include open grassy hillsides for basking and mating (USFWS 1985).

High-quality upland habitat at Sharp Park with rodent burrows and grass in sufficient quantity to provide cover is limited to the area south and east of Horse Stable Pond, and increasing habitat of this type should be a priority for enhancement. The northern and eastern sides of Laguna Salada transition abruptly from wetland vegetation to the golf course, providing few, if any, areas where snakes can bask without threat of disturbance or predation. Large San Francisco garter snakes are also less likely to move across open areas such as the golf course greens where little cover is available to protect them from avian and terrestrial predators. Therefore we recommend combining actions to increase available aquatic foraging habitat with the creation of protected, open, grassy upland areas with underground retreats to maximize the benefits of habitat enhancements for the San Francisco garter snake.

6.0
FIGURES

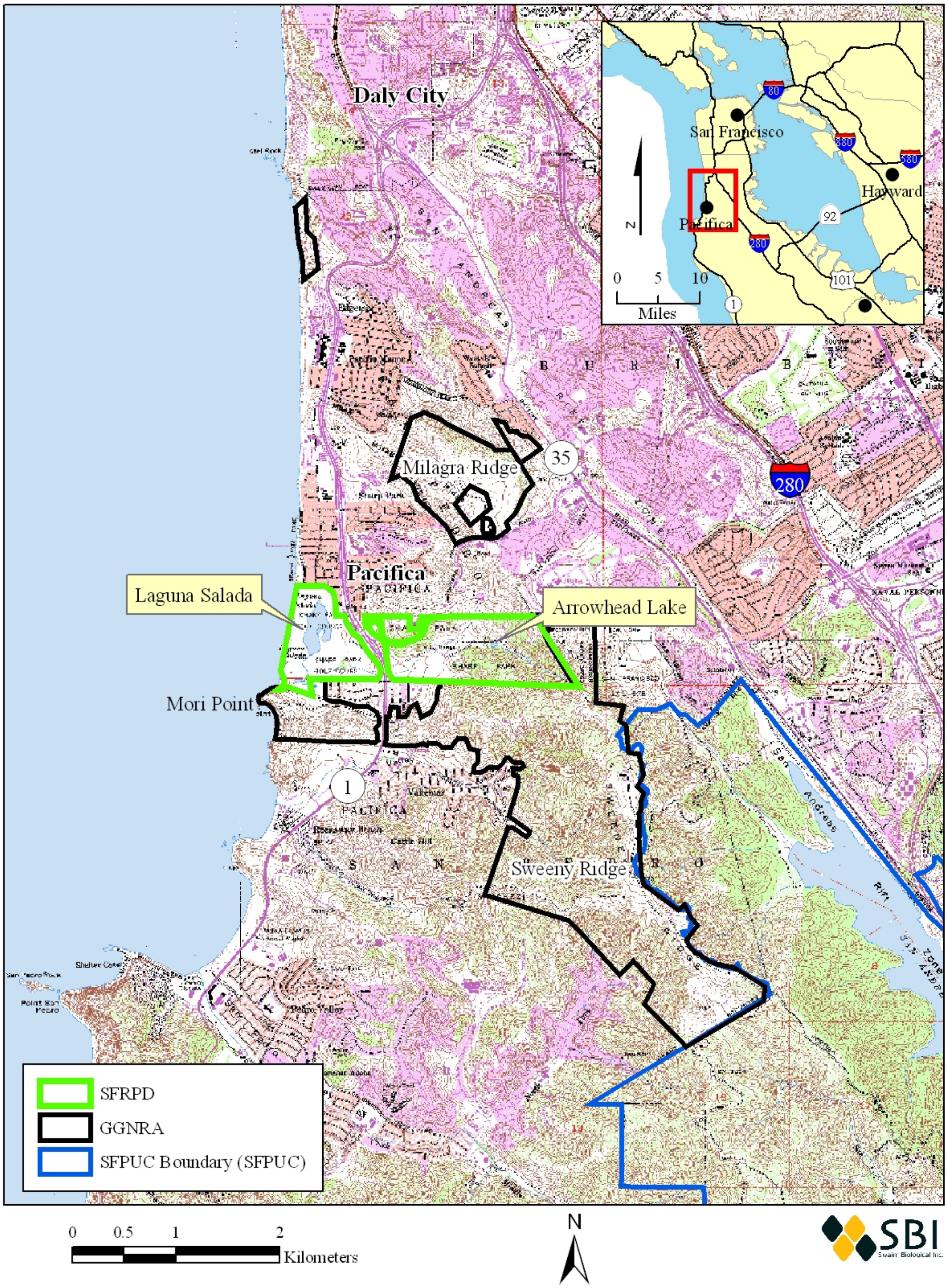

Figure 1. Regional Location.

2008 California Red-legged Frog Egg Mass Observations

Figure 2. Distribution of California red-legged frog egg masses west of CA Hwy 1.

2008 California Red-legged Frog Egg Mass Observations

Figure 3. Distribution of California red-legged frog egg masses at Arrowhead Lake.

2008 Common Yellowthroat Observations

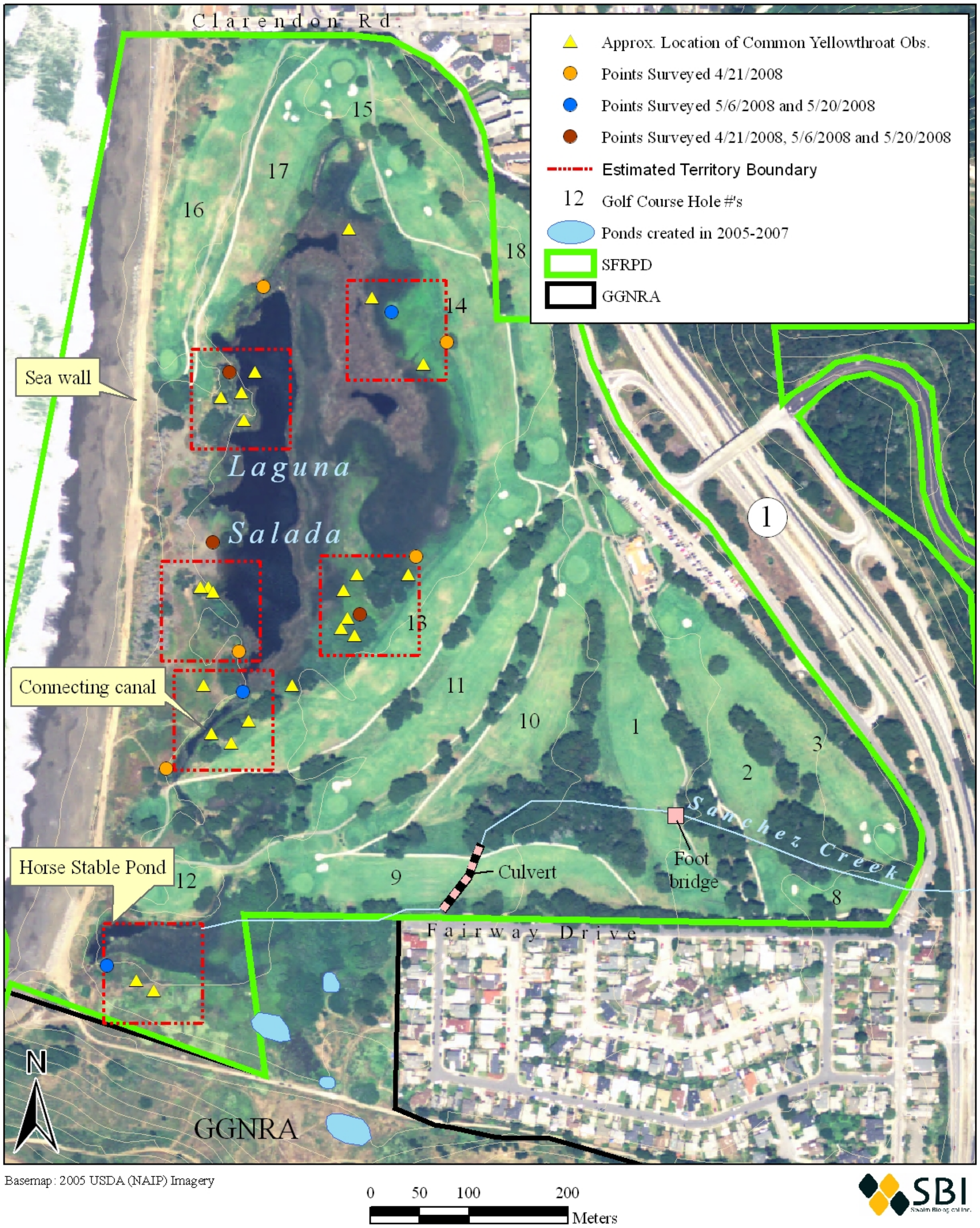

Figure 4. Salt marsh common yellowthroat observations and estimated territories

Figure 5 Open water adjacent to dense cattails on the east side of Laguna Salada. Although California red-legged frogs bred in this habitat type in 2008, water in these areas did not persist long enough to allow tadpoles to develop.

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Appendix I. Birds Encountered During Point Count Surveys

West of CA Hwy 1

AOU_code	Common_name	Sci_name
MALL	Mallard	*Anas platyrhynchos*
RUDU	Ruddy Duck	*Oxyura jamaicensis*
PBGR	Pied-billed Grebe	*Podilymbus podiceps*
DCCO	Double-crested Cormorant	*Phalacrocorax auritus*
GBHE	Great Blue Heron	*Ardea herodias*
GRHE	Green Heron	*Butorides virescens*
BCNH	Black-crowned Night-Heron	*Nycticorax nycticorax*
RTHA	Red-tailed Hawk	*Buteo jamaicensis*
AMCO	American Coot	*Fulica americana*
KILL	Killdeer	*Charadrius vociferus*
SPSA	Spotted Sandpiper	*Actitis macularius*
MEGU	Mew Gull	*Larus canus*
CATE	Caspian Tern	*Hydroprogne caspia*
ROPI	Rock Pigeon	*Columba livia*
MODO	Mourning Dove	*Zenaida macroura*
ANHU	Anna's Hummingbird	*Calypte anna*
ALHU	Allen's Hummingbird	*Selasphorus sasin*
BLPH	Black Phoebe	*Sayornis nigricans*
AMCR	American Crow	*Corvus brachyrhynchos*
CORA	Common Raven	*Corvus corax*
TRES	Tree Swallow	*Tachycineta bicolor*
BARS	Barn Swallow	*Hirundo rustica*
CBCH	Chestnut-backed Chickadee	*Poecile rufescens*
BUSH	Bushtit	*Psaltriparus minimus*
MAWR	Marsh Wren	*Cistothorus palustris*
SWTH	Swainson's Thrush	*Catharus ustulatus*
AMRO	American Robin	*Turdus migratorius*
EUST	European Starling	*Sturnus vulgaris*
COYE	Common Yellowthroat	*Geothlypis trichas*

CALT	California Towhee	*Pipilo crissalis*
SOSP	Song Sparrow	*Melospiza melodia*
WCSP	White-crowned Sparrow	*Zonotrichia leucophrys*
GCSP	Golden-crowned Sparrow	*Zonotrichia atricapilla*
RWBL	Red-winged Blackbird	*Agelaius phoeniceus*
BRBL	Brewer's Blackbird	*Euphagus cyanocephalus*
BHCO	Brown-headed Cowbird	*Molothrus ater*
HOFI	House Finch	*Carpodacus mexicanus*
AMGO	American Goldfinch	*Carduelis tristis*

East of CA Hwy 1

AOU_code	Common_name	Sci_name
MALL	Mallard	*Anas platyrhynchos*
CAQU	California Quail	*Callipepla californica*
RNPH	Red-necked Phalarope	*Phalaropus lobatus*
MODO	Mourning Dove	*Zenaida macroura*
ANHU	Anna's Hummingbird	*Calypte anna*
ALHU	Allen's Hummingbird	*Selasphorus sasin*
HUVI	Hutton's Vireo	*Vireo huttoni*
STJA	Steller's Jay	*Cyanocitta stelleri*
CORA	Common Raven	*Corvus corax*
PYNU	Pygmy Nuthatch	*Sitta pygmaea*
HOWR	House Wren	*Troglodytes aedon*
SWTH	Swainson's Thrush	*Catharus ustulatus*
AMRO	American Robin	*Turdus migratorius*
WIWA	Wilson's Warbler	*Wilsonia pusilla*
CALT	California Towhee	*Pipilo crissalis*
SOSP	Song Sparrow	*Melospiza melodia*
DEJU	Dark-eyed Junco	*Junco hyemalis*
HOFI	House Finch	*Carpodacus mexicanus*

Sharp Park Conceptual Restoration Alternatives Report

APPENDIX D: ITEMIZED COST ESTIMATES BY ALTERNATIVE

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Preliminary Detailed Cost Estimate - Laguna Salada
Excess Excavation Disposed Offsite

No.	Line Item	Unit Cost	Units	Alt A-0 Qty	Alt A-0 Unit Cost	Alt A-0 Total	Alt A-18 Qty	Alt A-18 Unit Cost	Alt A-18 Total	Alt A-9 w/Range Qty	Alt A-9 w/Range Unit Cost	Alt A-9 w/Range Total	Notes/Assumptions
1.0	**Site Preparation**				*17%*	***$ 2,789,875***		*17%*	***$ 1,056,040***		*17%*	***$ 1,549,454***	Standard markups (see cost appendix)
1.1	Mob/Demob	10%	LS	1	10%	$ 1,268,125	1	10%	$ 480,018	1	10%	$ 704,297	
1.2	Dewatering/Diversion	5%	LS	1	5%	$ 634,062	1	5%	$ 240,009	1	5%	$ 352,149	
1.3	Erosion/Control and BMP's	3%	LS	1	3%	$ 380,437	1	3%	$ 144,006	1	3%	$ 211,289	
1.4	Traffic Control	2%	LS	1	2%	$ 253,625	1	2%	$ 96,004	1	2%	$ 140,859	
1.5	Utilities	1%	LS	1	1%	$ 126,812	1	1%	$ 48,002	1	1%	$ 70,430	
1.6	Demolition	1%	LS	1	1%	$ 126,812	1	1%	$ 48,002	1	1%	$ 70,430	
2.0	**Construction Items**												
2.1	Install Culvert	$ 300	LF	120	$ 300	$ 36,000	120	$ 300	$ 36,000	120	$ 300	$ 36,000	Furnish, deliver, install culvert (sed. basin to lagoon), restore access
2.2	Remove Invasive Plants	$ 5,000	AC	0.1	$ 5,000	$ 500	0.1	$ 5,000	$ 500	0.1	$ 5,000	$ 500	Remove ice plant with mowers and hand operated equipment
2.3	Plant Riparian Vegetation - Channel	$ 15,000	AC	0.3	$ 15,000	$ 3,750	0.3	$ 15,000	$ 3,750	0.3	$ 15,000	$ 3,750	Revegetate Hole 12
2.4	Plant Shrub Vegetation	$ 10,000	AC	4.4	$ 10,000	$ 43,800	4.4	$ 10,000	$ 43,800	4.4	$ 10,000	$ 43,800	Plant coastal shrub grassland
2.5	Plant Fringe Wetland	$ 13,500	AC	11.0	$ 13,500	$ 148,500	11.0	$ 13,500	$ 148,500	11.0	$ 13,500	$ 148,500	Supplement existing vegetation with riparian species
2.6	Excavate - No Haul	$ 8	CY	12,800	$ 8	$ 102,400	12,750	$ 8	$ 102,000	18,000	$ 8	$ 144,000	Excavation and regrading within 100 feet with no net haul
2.7	Excavate - Short Haul	$ 15	CY	12,800	$ 15	$ 192,000	12,750	$ 15	$ 191,250	18,000	$ 15	$ 270,000	Excavation and regrading within 1 mile (short haul)
2.8	Excavate - Haul Offsite	$ 35	CY	277,928	$ 35	$ 9,727,490	100,999	$ 35	$ 3,534,953	145,499	$ 35	$ 5,092,453	Includes fairways & wetland organics, haul offsite to Ox Mtn, HMB Landfill
2.9	Construct Sedimentation Basins	$ 500	CY	120	$ 500	$ 60,000	120	$ 500	$ 60,000	120	$ 500	$ 60,000	Clear, excavate, regrade two basins, primarily natural with some basic structures (weir, risers, etc.)
2.10	Install Recreational Features	$ 50,000	LS	1	$ 50,000	$ 50,000	1	$ 50,000	$ 50,000	1	$ 50,000	$ 50,000	Signage and benches
2.11	Remove Non-Native Trees - Creek	$ 5,000	AC	26	$ 5,000	$ 128,389	7	$ 5,000	$ 34,000	6	$ 5,000	$ 32,000	Tree removal, all areas including Sanchez Cr, per acre
2.12	Revegetate - Riparian, Creek	$ 15,000	AC	2	$ 15,000	$ 28,168	-	$ 15,000	$ -	-	$ 15,000	$ -	
2.13	Revegetate - Coastal Scrub/Shrub	$ 15,000	AC	92	$ 15,000	$ 1,377,150	22	$ 15,000	$ 336,300	45	$ 15,000	$ 677,100	
2.14	Import Topsoil Fill - Coastal Scrub/Shrub	$ 6	CY	32,000	$ 6	$ 192,000	4,000	$ 6	$ 24,000	13,000	$ 6	$ 78,000	
2.15	Demo Cart Path	$ 4	SF	36,000	$ 4	$ 144,000	-	$ 4	$ -	24,200	$ 4	$ 96,800	Demo 4" A-C paved cart path
2.16	Reconstruct Path - Decomp. Granite	$ 3	SF	36,000	$ 3	$ 108,000	-	$ 3	$ -	24,200	$ 3	$ 72,600	4' wide decomposed granite path
2.17	Construct Fence - Wire Mesh	$ 10	LF	6,435	$ 10	$ 64,350	5,943	$ 10	$ 59,430	6,177	$ 10	$ 61,770	3' hjgh, 2" sq steel wire mesh, recycle plastic posts, wood top rail
2.18	Construct Wodden Boardwalk	$ 350	LF	785	$ 350	$ 274,750	502	$ 350	$ 175,700	502	$ 350	$ 175,700	Timber boardwalk, auger supported, includes handrails, ADA accessible
2.19	Construct Golf Holes & Greens	Varies	LS	1	$ -	$ -	1	$ 1,612,755	$ 1,612,755	1	$ 1,711,750	$ 1,711,750	Per D. Nichols, includes reshaping/contouring greens/fairways and misc. related construction. Does not include excavation
2.20	Construction Monitoring (wtlnd complex only)	$1,200	DY	60	$ 1,200	$ 72,000	60	$ 1,200	$ 72,000	60	$ 1,200	$ 72,000	
	Construction Subtotal					***$ 12,753,248***			***$ 6,484,938***			***$ 8,826,723***	Subtotal of construction costs and standard site prep markups
3.0	**General Markups**	**50%**			**50%**	**$ 7,771,561**		**50%**	**$ 3,770,489**		**50%**	**$ 5,188,089**	Standard markups (see cost appendix)
3.1	Contingency	25%	LS	1	25%	$ 3,885,781	1	25%	$ 1,885,245	1	25%	$ 2,594,044	
3.2	Design Phase	10%	LS	1	10%	$ 1,554,312	1	10%	$ 754,098	1	10%	$ 1,037,618	
3.3	Construction Management	15%	LS	1	15%	$ 2,331,468	1	15%	$ 1,131,147	1	15%	$ 1,556,427	
4.0	**O&M**	varies	LS	1	varies	$667,954	1	varies	$196,771	1	varies	$353,216	Operation, monitoring, maintenance, rehab, replacement, & repair (contingency included)
	TOTAL COST					**$ 23,983,000**			**$ 11,509,000**			**$ 15,918,000**	Total cost of design, construction and maintenance
	Total Cost of Wetland Work Items					**$ 9,091,000**			**$ 7,602,000**			**$ 8,032,000**	Estimate of wetland construction costs
	Total Cost of Upland Work Items					**$ 14,820,000**			**$ 3,835,000**			**$ 7,815,000**	Estimate of upland construction costs

Preliminary Detailed Cost Estimate - Laguna Salada
All Excavation Reused Onsite

Line Item	Unit Cost	Units	Alt A-0			Alt A-18			Alt A-9 with range			Notes/Assumptions
			Qty	Unit Cost	Total	Qty	Unit Cost	Total	Qty	Unit Cost	Total	
Site Preparation				*17%*	*$ 858,361*		*17%*	*$ 330,772*		*17%*	*$ 498,867*	Standard markups (see cost appendix)
Mob/Demob	5%	LS	1	5%	$ 252,459	1	5%	$ 97,286	1	5%	$ 146,725	
Dewatering/Diversion	5%	LS	1	5%	$ 252,459	1	5%	$ 97,286	1	5%	$ 146,725	
Erosion/Control and BMP's	3%	LS	1	3%	$ 151,476	1	3%	$ 58,372	1	3%	$ 88,035	
Traffic Control	2%	LS	1	2%	$ 100,984	1	2%	$ 38,914	1	2%	$ 58,690	
Utilities	1%	LS	1	1%	$ 50,492	1	1%	$ 19,457	1	1%	$ 29,345	
Demolition	1%	LS	1	1%	$ 50,492	1	1%	$ 19,457	1	1%	$ 29,345	
Construction Items												
Install Culvert	$ 300	LF	120	$ 300	$ 36,000	120	$ 300	$ 36,000	120	$ 300	$ 36,000	Furnish, deliver, install culvert (sed. basin to lagoon), restore access
Hand Remove Invasive Plants	$ 5,000	AC	0.1	$ 5,000	$ 500	0.1	$ 5,000	$ 500	0.1	$ 5,000	$ 500	Remove ice plant with mowers and hand operated equipment
Plant Riparian Vegetation - Channel	$ 15,000	AC	0.3	$ 15,000	$ 3,750	0.3	$ 15,000	$ 3,750	0.3	$ 15,000	$ 3,750	Revegetate Hole 12
Plant Shrub Vegetation	$ 10,000	AC	4.4	$ 10,000	$ 43,800	4.4	$ 10,000	$ 43,800	4.4	$ 10,000	$ 43,800	Plant coastal shrub grassland
Plant Fringe Wetland	$ 13,500	AC	11.0	$ 13,500	$ 148,500	11.0	$ 13,500	$ 148,500	11.0	$ 13,500	$ 148,500	Supplement existing vegetation with riparian species
Excavate - No Haul	$ 5	CY	12,800	$ 5	$ 64,000	12,750	$ 5	$ 63,750	18,000	$ 5	$ 90,000	Excavation and regrading within 100 feet with no net haul
Excavate - Short Haul	$ 8	CY	290,728	$ 8	$ 2,325,826	113,749	$ 8	$ 909,989	163,499	$ 8	$ 1,307,989	Excavation and regrading within 1 mile (short haul)
Excavate - Haul Offsite	$ 35	CY	-	$ 35	$ -	-	$ 35	$ -	-	$ 35	$ -	Includes fairways & wetland organics, haul offsite to Ox Mtn, HMB Landfill
Construct Sediment Basins	$ 500	CY	120	$ 500	$ 60,000	120	$ 500	$ 60,000	120	$ 500	$ 60,000	Clear, excavate, regrade two basins, primarily natural with some basic structures (weir, risers, etc.)
Install Recreational Features	$ 50,000	LS	1	$ 50,000	$ 50,000	1	$ 50,000	$ 50,000	1	$ 50,000	$ 50,000	Signage and benches
Remove Non-Native Trees - Creek	$ 5,000	AC	26	$ 5,000	$ 128,389	7	$ 5,000	$ 34,000	6	$ 5,000	$ 32,000	Tree removal, all areas including Sanchez Cr, per acre
Revegetate - Riparian, Creek	$ 15,000	AC	2	$ 15,000	$ 28,168	-	$ 15,000	$ -	-	$ 15,000	$ -	
Revegetate - Coastal Scrub/Grassland	$ 15,000	AC	92	$ 15,000	$ 1,377,150	22	$ 15,000	$ 336,300	45	$ 15,000	$ 677,100	
Import Topsoil Fill - Coastal Scrub/Grassland	$ 6	CY	32,000	$ 6	$ 192,000	4,000	$ 6	$ 24,000	13,000	$ 6	$ 78,000	
Demo Cart Path	$ 4	SF	36,000	$ 4	$ 144,000	-	$ 4	$ -	24,200	$ 4	$ 96,800	Demo 4" A-C paved cart path
Reconstruct Path - Decomp. Granite	$ 3	SF	36,000	$ 3	$ 108,000	-	$ 3	$ -	24,200	$ 3	$ 72,600	4' wide decomposed granite path
Construct Fence - Wire Mesh	$ 10	LF	6,435	$ 10	$ 64,350	5,943	$ 10	$ 59,430	6,177	$ 10	$ 61,770	3' hjgh, 2" sq steel wire mesh, recycle plastic posts, wood top rail
Construct Wooden Boardwalk	$ 350	LF	785	$ 350	$ 274,750	502	$ 350	$ 175,700	502	$ 350	$ 175,700	Timber boardwalk, auger supported, includes handrails, ADA accessible
Construct Golf Holes & Greens	Varies	LS	1	$ -	$ -	1	$ 1,612,755	$ 1,612,755	1	$ 1,711,750	$ 1,711,750	Per D. Nichols, includes reshaping/contouring greens/fairways and misc. related construction. Does not include excavation
Construction Monitoring (wtlnd complex only)	$1,200	DY	60	$1,200	$ 72,000	60	$ 1,200	$ 72,000	60	$ 1,200	$ 72,000	
Construction Subtotal					***$ 5,121,184***			***$ 3,630,474***			***$ 4,718,259***	Subtotal of construction costs and standard site prep markups
General Markups	**50%**			**50%**	**$ 2,989,773**		**50%**	**$ 1,980,623**		**50%**	**$ 2,608,563**	Standard markups (see cost appendix)
Contingency	25%	LS	1	25%	$ 1,494,886	1	25%	$ 990,312	1	25%	$ 1,304,281	
Design Phase	10%	LS	1	10%	$ 597,955	1	10%	$ 396,125	1	10%	$ 521,713	
Construction Management	15%	LS	1	15%	$ 896,932	1	15%	$ 594,187	1	15%	$ 782,569	
O&M	varies	LS	1	varies	$667,954	1	varies	$196,771	1	varies	$353,216	Operation, construction monitoring, maintenance, rehab, replacement, & repair (contingency included)
TOTAL COST					**$ 9,638,000**			**$ 6,139,000**			**$ 8,179,000**	Total cost of design, construction and maintenance
Total Cost of Wetland Work Items					**$ 3,353,000**			**$ 3,253,000**			**$ 3,388,000**	Estimate of wetland construction costs
Total Cost of Upland Work Items					**$ 6,213,000**			**$ 2,761,000**			**$ 4,719,000**	Estimate of upland construction costs

Sharp Park Golf Course A18

Pacifica, CA 2009

Nickels Golf 3-Nov-09

	Item	14&18 fariway
	remove existing hole #12 and #13 tee	others
1	Mobilization	$ 50,000.00
2	raise portion #10 green area	$ 11,500.00
3	reroute road to Archer Club, with culvert	$ 96,125.00
4	Clearing and grubbing for new hole #7 (remove eucalyptus)	$ 80,000.00
5	build new golf hole #7 with irrigation, green, tee, bunkers, grass	$ 380,500.00
6	raise 14, 18 fairway and #15 tee with dredged materials	$ 944,900.00
7	build new tee complex on hole #13	$ 49,750.00
	Total Golf Construction	**$ 1,612,775.00**

2 Raise area near #10 green prone to flooding

raise area prone to flooding	1000	cy	$	6.50	$	6,500.00
irrigation,	0.2	acre	$	15,000.00	$	3,000.00
sod	4000	sf	$	0.50	$	2,000.00
			total		$	11,500.00

3 Move existing road to location behind new golf hole #7 including culvert over stream.
Road is used for archery club and utility maintenance crew

culvert - double 60 inch cmp pipe.	60	ft	$	300.00	$	18,000.00
new gravel road 25 feet width	625	lf	$	125.00	$	78,125.00
			total		$	96,125.00

4 cut and clear existing eucalyptus trees for new road construction and new hole

remove trees	2	acres	$	40,000.00	$	80,000.00

5 construct new par three golf hole #7 at 165 yards.

grubing of site	3	acres	$	3,500.00	$	10,500.00
golf feature contouring		ls	$	-	$	40,000.00
green	6500	sf	$	9.00	$	58,500.00
bunkers (3)	4000	sf	$	7.00	$	28,000.00
sand tees	6000	sf	$	5.00	$	30,000.00
irrigation	3	acres	$	20,000.00	$	60,000.00
drainage	3	acres	$	16,000.00	$	48,000.00
soil admendment	2	acres	$	20,000.00	$	40,000.00
finish grade, seed with some sod	3	acres	$	8,500.00	$	25,500.00
cart path concrete	8000	sf	$	5.00	$	40,000.00
			total		$	380,500.00

6 raise 14 &18th fairways and #15 tee with dredged material. Add catch basins and pipe for drainage. Redo irrigation on the new area.

prep fairway for fill material	9	acres	$	3,500.00	$	31,500.00
demo cart path	1700	lf	$	20.00	$	34,000.00
spread and shape fill material	50000	cy	$	2.00	$	100,000.00
drainage pipe 8 inch with	1500	lf	$	16.00	$	24,000.00
catch basins	5	basins	$	500.00	$	2,500.00
fairway drainage	9	acres	$	12,000.00	$	108,000.00
new tee	5000	sf	$	5.00	$	25,000.00
soil admendment	7	acres	$	20,000.00	$	140,000.00
new irrigation	9	acres	$	15,000.00	$	135,000.00
new cart path 8' wide	1700	lf	$	32.00	$	54,400.00
finish grade and seed,	9	acres	$	6,500.00	$	58,500.00
new greens at #14 and #18	12000	sf	$	9.00	$	108,000.00
new bunkers	7000	sf	$	7.00	$	49,000.00
plant trees		ls			$	75,000.00
			total		$	944,900.00

7 build new tee complex with irrigation and cart path addition - hole #13

contour soil	1000	cy	$	6.50	$	6,500.00
build new sand tees with drainage	5000	sf	$	5.00	$	25,000.00
adjust fairway irrigation for new tees	0.5	acre	$	11,000.00	$	5,500.00
finish grade and sod	15000	sf	$	0.75	$	11,250.00
add 250 8 foot wide cart path	250	lf	$	32.00	$	8,000.00
					$	49,750.00

Sharp Park Golf Course 9 hole with range

Pacifica, CA 2009

Nickels Golf   3-Nov-09

	Item	Cost Estimate	
	mobilization		$ 50,000.00
1	construct range tee		$ 111,000.00
2	clear trees in new range		$ 40,750.00
3	construct netting around range		$ 405,000.00
4	clear trees for new holes		$ 202,000.00
5	build new holes #5 and #6		$ 903,000.00
	Total Golf Construction		**$ 1,711,750.00**

1 construct newdriving range tee out of concrete where existing green and tee complex is located.

finish grade, seed disturbed area	2	acres	$ 6,500.00	$ 13,000.00
new tee - concrete for mats	3000	sf	$ 6.00	$ 18,000.00
reconfigure irrigation	2	acres	$ 15,000.00	$ 30,000.00
landscape budget				$ 50,000.00
			total	$ 111,000.00

2 clear trees in new range area that consist of up to 10 mature cypress trees. Stump grind and seed area.

remove trees	10	trees	$ 3,000.00	$ 30,000.00
grade and seed	0.5	acres	$ 6,500.00	$ 3,250.00
add irrigation	0.5	acres	$ 15,000.00	$ 7,500.00
			total	$ 40,750.00

3 construct netting around range to contain golf balls.

netting with poles	135000	sf	$ 3.00	$ 405,000.00

4 clear and grub area of 12 acres with mostly scrub brush but about 4 acres of mature trees to be cleared and removed.

4 acres of mature trees, eucs and misc.	4	acres	$ 40,000.00	$ 160,000.00
12 total acres of grubbing.	12	acres	$ 3,500.00	$ 42,000.00
			total	$ 202,000.00

B9 Page 2

5 build two new holes on newly cleared area utilizing spoils that are being spread and dried.
Holes will be a 400 yard par 4 and a 175 yard par 3.
B9 page 2

golf course feature contouring		ls			$	80,000.00
new greens at 6000 sf each	12000	sf	$	9.00	$	108,000.00
new tees for each hole	10000	sf	$	5.00	$	50,000.00
new bunkers	6000	sf	$	7.00	$	42,000.00
new irrigation	8	acres	$	20,000.00	$	160,000.00
cart path - 8 foot wide	2500	lf	$	40.00	$	100,000.00
drainage	8	acres	$	16,000.00	$	128,000.00
soil admendment	6	acres	$	20,000.00	$	120,000.00
finish grade,seed entire disturbed area.	10	acres	$	6,500.00	$	65,000.00
landscape budget		ls			$	50,000.00
			total		$	903,000.00

Laguna Salada Wetland Restoration - Preliminary Costs
Unit Costs and Markups

Cat.	Line Item	Cost/%	Variable	Unit	Source	Notes
Site Preparation Markups	Mob/Demob	5%	MD	Site prep markups are shown as percentage of construction subtotal, NOT INCLUDING THESE SITE PREP MARKUPS	General mob/demob estimate	Includes mob/demob of construction equipment and preparation of site access and staging areas.
	Dewatering/Diversion	5%	DW		Engineer's estimate - average for restoration sites	Includes dewatering, water control, and stream diversion as necessary.
	Erosion/Control and BMP's	3%	EC		Engineer's estimate (1.5% Erosion+1% Pollution)	Includes silt fences, straw bales, inlet protection, biofilter bags, and other BMP's.
	Traffic Control	2%	TC		Recent project exper. (2% temp prot/div of traffic)	Site access/routing constr. vehicle traffic, not incl. long-term detours, rerouting traffic, or improvements to detour routes (sep. line items).
	Utilities	1%	UT		Engineer's estimate - average for restoration sites	Utility coord/notif, accomodations for minor utility impacts only, not incl. major service interruptions/relocations (covered in sep. line items).
	Demolition	1%	DM		Engineer's estimate - average for restoration sites	Demo and disposal of debris/obstructions, not including demolition of major infrastructure. Major work included in separate line items.
	Site Preparation Markup	***17%***	***SP***		Subtotal	Site prep markups are to construction subtotal, non-inclusive of markups.
Construction Line Items	Demo AC Paved Path	$ 4	DP	per square foot	Recent project costs	Demo 4" AC paving cart path
	Construct DG Path	$ 2	DG	per square foot	Recent CALTRANS/ SLO County unit costs	Construct 4' wide decomposed granite path
	Construct Wire Mesh Fence	$ 5	WMF	per lineal foot	Recent USDA NRCS fence costs	Construct 3' hjgh, 2" sq steel wire mesh, recycle plastic posts, wood top rail
	Construct Wooden Boardwalk	$ 350	WB	per lineal foot	National unit cost survey	8' wide wooden boardwalk, auger supported, ADA accessible w/ railing
	Install Pipe Culvert	$ 300	PP	per lineal foot	Engineer's estimate	Assume HDPE or PVC pipe, ~18" dia
	Excavate and Haul Offsite	$ 35	EH	per cubic yard	Per Republic Services July 2009 disposal quote	Assume haul/disposal 20 mi. to Ox Mtn Landfill, Half Moon Bay, incl $130/hr haul rate, 26 CY/Load semi-end dump, $19/CY tip fee
	Excavate - No Haul	$ 5	ER	per cubic yard	Engineer's estimate	Excavation and regrading onsite within 100 feet with no net haul
	Excavate - Short Haul	$ 8	ER_F	per cubic yard	Engineer's estimate	Excavation and regrading onsite within 1 mile (short haul, include load, unload)
	Construct Sediment Basins	$ 500	CSB	per cubic yard	Engineer's estimate	Clear, excavate, regrade two basins, primarily natural with some basic structures (weir, risers, etc.)
	Import & Place Topsoil	$ 6	TS	per cubic yard	Recent cost reference, CA Coastal Conserv Estim.	Import, place 3" topsoil over golf course restoration areas
	Remove Invasive Vegetation	$ 5,000	RI	per acre	Engineer's estimate	Remove ice plant
	Plant Wetland Vegetation	$ 13,500	WT	per acre	Engineer's estimate - recent experience	Plant emergent wetland planting plugs at 2' O.C. $0.50 each material, $1.25 each installed
	Plant Riparian Vegetation	$ 15,000	RV	per acre	Engineer's estimate - recent experience	Plant riparian species ($3.00 each gal mat'l, $6.00 each installed at 8' O.C. + seeding ($2,500/acre)
	Plant Coastal Scrub/Shrub	$ 10,000	CSS	per acre	Engineer's estimate - recent experience	Plant & seed coastal scrub, shrub species
	Construct Golf Course	TBD	GC	per acre	To be determined	To be determined
General Markups	Contingency	25%	CT	General markups are shown as % of construction subtotal, including site prep	General allowance	Account for unknown topography, subsurface conditions, site conditions, prelim design phase
	Design Phase	10%	DS		Previous Corps 206 projects (PDOT Standard 25%)	Includes staking & as-builts; geotech, permitting, precon survey are assumed not needed or completed
	Construction Management	15%	CM		Engineer's estimate (PDOT Standard 15%)	Includes construction oversight, inspections, administration, and engineering during construction
	General Markups	***50%***	***GM***		Subtotal	Markup to construction subtotal, including site preparation markups, but not including individual general markups
Other	Real Estate (private)	$ 20,000	RE	per acre	Engineer's estimate	Investigations, notification & coordination with project area and adjacent landowners. Acquisition costs for adjacent private parcels. No cont.
	Real Estate (public)	$ 5,000	RP	per acre	Engineer's estimate	Investigations, notification & coordination with site landowners and adjacent landowners. Easement costs for public lands. No contingency.
	OMMRRR	varies	OM	net present value	Engineer's estimate	Varies based on size of revegetation and invasive species removal areas (contingency included)

Additional Assumptions:
1. Unit costs include equipment, labor, materials, contractor overhead and profit
2. Real estate acquisition costs are assumed to be zero.
3. As posible, unit prices are based on prior, similar, nearby projects.
4. Costs do not account for phased construction (multiple mobilizations)
5. Costs are in 2009 dollars. Escalation costs for anticipated period of construction not included.
6. Revegetation costs include topsoil as needed

Sharp Park Conceptual Restoration Alternatives Report

Appendix E: Alternative A18 Golf Hole Lengths and Pars

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SHARP PARK GOLF COURSE A18

Oct. 31, 2009

SCORECARD

HOLE	BACK	CLUB	FORWARD	PAR
1	370	353	321	4
2	336	322	291	4
3	366	353	321	4
4	462	454	435	5
5	196	182	148	3
6	416	403	340	4
7	165	155	140	3
8	412	382	365	4
9	91	91	91	3
OUT	**2814**	**2695**	**2452**	**34**
10	481	463	452	5
11	422	415	395	4
12	411	405	398	4
13	330	320	300	4
14	386	365	359	4
15	137	131	116	3
16	373	368	364	4
17	352	331	271	4
18	498	489	468	5
IN	**3390**	**3287**	**3123**	**37**
OUT	**2814**	**2695**	**2452**	**34**
TOTAL	**6204**	**5982**	**4904**	**71**

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2009 NOV 10 AM 11:45

BY
Time Stamp or
Meeting Date

INTRODUCTION FORM

By a member of the Board of Supervisors or the Mayor

I hereby submit the following item for introduction:

_____ 1. For reference to Committee:
An ordinance, resolution, motion, or charter amendment.
_____ 2. Request for next printed agenda without reference to Committee
__X_ 3. Request for Committee hearing on a subject matter.
_____ 4. Request for letter beginning "Supervisor _____ inquires…".
_____ 5. City Attorney request.
_____ 6. Call file from Committee.
_____ 7. Budget Analyst request (attach written motion).
_____ 8. Substitute Legislation File Nos.
_____ 9. Request for Closed Session
_____ 10. Board to Sit as A Committee of the Whole

Please check the appropriate boxes. The proposed legislation should be forwarded to the following:

☐ Small Business Commission
☐ Ethics Commission
☐ Building Inspection Commission
☐ Youth Commission
☐ Planning Commission

Note: For the Imperative Agenda (a resolution not on the printed agenda), use a different form.]

Sponsor(s): Supervisor Ross Mirkarimi

SUBJECT: Hearing Request – Sharp Park Restoration Alternatives

The text is listed below or attached:

Hearing to review the "Sharp Park Conceptual Restoration Alternatives" and "Sharp Park Mitigation Bank Financial Viability and Analysis" reports, which were prepared by the Recreation and Parks Department in response to ordinance 0085-09.

Signature of Sponsoring Supervisor: ____________________

For Clerk's Use Only: