EXHIBIT G

Peter R. Baye, Ph.D.
Coastal Ecologist, Botanist
33660 Annapolis Road
Annapolis, California 95412

baye@earthlink.net
(415) 310-5109

San Francisco Planning Department
1650 Mission St.
Suite 400
San Francisco,
CA 94103-2479
attention: Kei Zushi - (415) 575-9036 kei.zushi@sfgov.org

via email

October 18, 2013

SUBJECT: Notification of Availability and Intent to Adopt Mitigated Negative Declaration, September 18, 2013, Case No 2012.1427E, Sharp Park Safety, Infrastructure Improvement, and Habitat Enhancement Project; concerns regarding potential environmental effects

To the San Francisco Planning Department:

I would like to submit the following comments on the proposed Mitigated Negative Declaration for the Sharp Park Enhancement Project. These comments follow my scoping comments submitted on January 29, 2013, which are incorporated by reference.

1. **Project purpose of improved lagoon and wetland drainage lacks assessment of significant impacts.**

The project site description on page 3 of the MND explicitly states that the purpose of constructing the 1000 ft long connector channel between Horse Stable Pond (HSP) and Laguna Salada is to drain the lagoon and wetlands within the hydrologically linked wetland complex:

> The Sharp Park Golf Course is located within an 845-acre watershed.1 HSP is located south of LS and consists of an open water pond and a freshwater wetland. It is connected to LS via an approximately **1,000-foot-long channel that was constructed to drain water from the lagoon to HSP, and together these three features form a wetland complex.**
>
> MND p. 3 (emphasis added)

Page 4 of the MND explains that the growth of tules and cattails in the connector channels impairs the drainage of the lagoon by pumps at HSP, consistent with conclusions of Kamman

(2009). The description of the proposed project activities on page 5 of the MND states that the channel would be cleared of vegetation and sediment to remedy obstruction of flows between HSP and the main pond or lagoon, improving ability to drain water from the lagoon by pumping: "3) removal of sediment and emergent vegetation within HSP and the connecting channel that links HSP with LS". The MND, however, completely fails to assess the hydrological and ecological impacts of increasing drainage of the lagoon by increasing hydraulic connectivity between the main lagoon pond and HSP, even though it is clearly the basic purpose of the action. Any significant change in the duration and depth of flooding or soil saturation in lagoon wetlands has important ecological effects. Increased drainage of wetlands, above baseline (pre-project) conditions is a potentially significant impact I cited in my scoping comments on this project (Baye 2013). My scoping comments appear to be entirely ignored about this most basic modification of lagoon wetland hydrology, and their impacts on further spread of cattails and tules. To reiterate my scoping comments from 29 January 2013 regarding wetland hydrology impacts on wetland vegetation and habitat structure:

Lagoon drainage (pumping) effects

- What are the impacts of lowered lagoon water levels (lagoon drawdown) on the spread of cattails and tules over the lagoon bed? (potential indirect significant impact)

- What are the baseline (pre-project) effects of lagoon drainage (pumping, lowering lagoon levels) on water depths and the spread of cattails and tules on the lagoon bed? (baseline for assessment of potential indirect significant impact)

- What does SFRPD assume to be the critical limiting water depth range, and duration of limiting flood depth, for tules and cattails? (threshold for potential indirect significant impact)

- How long, and in what time of year, would areas of the lagoon be lowered to submergence depths that are shallower than the presumed critical depth for restricting spread of cattails beyond their pre-project extent? (threshold and mechanism for potential indirect significant impact)

- What is the *minimum area* of the lagoon bed that would be maintained at depths beyond the limits of submergence tolerance of cattails and tules? (threshold for potential indirect significant impact)

- What is the *maximum duration* of drawdown (lagoon lowering) to depths shallower than the limit of submergence tolerance of cattails and tules? (threshold for potential indirect significant impact)

- How will maintenance of low lagoon levels prior to storms (lagoon drawdown for stormwater detention capacity) affect the *vulnerability of the lagoon to seawater flooding during oceanic storm overwash events*? How much will drawing down the lagoon prior to storms impair the lagoon's capacity trap heavier seawater overwash flooding at the lagoon bottom by stratification of heavier saltwater under lighter freshwater? How much would lagoon drawdown

Peter R. Baye Ph.D.
Botanist, Coastal Ecologist
baye@earthlink.net
(415) 310-5109

during winter storm season expose the marsh shoreline to potential direct ocean water flooding, or flooding by less diluted seawater, compared with full freshwater-flooded lagoon conditions? (threshold and mechanism for potential indirect long-term significant impact)

- How will maintenance of proposed target lagoon levels affect the *elevation range* of freshwater and fresh-brackish marsh habitat of listed threatened and endangered wildlife species in relation to the elevation range of rising sea level or potential storm oceanic overwash flooding?

The MND completely fails to address potentially significant direct and indirect hydrological impacts of the proposed project's drainage component on Laguna Salada wetlands, despite my detailed scoping comments on this subject. There is no proposed mitigation for increasing the drainage of the lagoon, and making its bed shallower more often than pre-project conditions. Increasing the drainage of the lagoon will increase the spread of cattails and tules over the remaining open water. Cattails and tules are primarily limited by water depth and duration, which is directly affected by drainage and pumping. SFRPD continues to provide no direct evidence of significant recent sedimentation within the main lagoon pond commensurate with the timing, rate or magnitude of cattail and tule spread. The proposed project will likely accelerate the spread of tules and cattails. This will foreseeably result in even more misguided proposals to dredge the lagoon to remedy fictional "sedimentation" problems and "vegetation overgrowth" that is in fact directly related to the drainage of the lagoon.

2. Salinity and seawater sources of sulfur

Oligohaline (fresh-brackish) lagoon salinity is incorrectly reported as "freshwater", inconsistent with Tetra Tech 2009 and Kamman 2009. The project description in the MND on page 3, and subsequently, describes the lagoon as a "freshwater" pond and wetlands. This is incorrect, and is inconsistent with the hydrological assessment of Laguna Salada prepared for SFRPD by Tetra Tech (2009), based on the hydrologic report on Laguna Salada by Kamman (2009; Appendix A in Tetra Tech 2009). The SFRPD's own hydrological studies report salinity range between 0.7 and 2.5 parts per thousand (ppt). This salinity range is also correctly stated on p. 94 of the MND. This salinity range is oligohaline, not "freshwater", and is physiologically and ecological significant. It indicates a persistent dilution of salts from seawater either seeping through the Salada Beach, residual salinity in the bed sediments. Seawater sources of salinity include sulfates, a source of sulfur affecting bed sediments and coastal wetland soils. The MND is inconsistent in its statement of lagoon salinity, and incorrect in characterizing it as "freshwater".

Kamman (2009) described "freshwater" as salinity < 1.0 ppt. He reported that the earthen "seawall" eliminates characteristic (natural) episodic tidal exchange between the ocean and lagoon, but it did not state that all hydrologic connectivity is lacking between the lagoon and ocean. On the contrary, Kamman reported evidence of probable groundwater connectivity between lagoon and ocean through beach seepage, and recorded relatively saline groundwater with a salinity of 15 ppt (nearly half seawater salinity concentration) was observed in the sandy flat between Laguna Salada and the earthen seawall. This is also not consistent with the MND's claim of "freshwater" pond and wetlands. Note that cattail and tule marsh vegetation dominance occurs in both freshwater and oligohaline wetlands, and is not diagnostic of freshwater salinity range.

Peter R. Baye Ph.D.
Botanist, Coastal Ecologist
baye@earthlink.net
(415) 310-5109

The incorrect statement of lagoon salinity is important because the MND invalidly relies on the assumption that exclusion seawater salts from the lagoon precludes the occurrence of sulfur from seawater to fuel significant sulfide reduction in organic, anoxic sediments. Obviously, the consistent low salinity in the lagoon indicates seawater salts are always present – including sulfate, the next most abundant anion in seawater after chloride.

3. **Sulfide and acid sulfate biogeochemical impacts and mitigation**.

The explanation of sulfur oxidation-reduction sediment biogeochemistry on page 96 of the MND (water quality) is essentially accurate, but it is inconsistent with the utterly confused explanation on pp. 76-77 of the MND, which garbles hypoxia, pH, and inconsistent oxidation-reduction states associated with aerobic and anaerobic sediments. Acid sulfates are the oxidized forms of sulfur compounds, not the reduced forms (sulfides) associated with hypoxia and anoxia. The temporary suspension of anoxic iron sulfide-rich sediment, and free hydrogen sulfide (rotten egg scent) in the water column is the cause of acute hypoxia. Oxidative formation of acid sulfates and iron oxides is a slow process occurring over many days or weeks in aerobic conditions.
The MND argues on p. 77 that since no acid sulfate conditions were detected in the last episode of dredging 10 years ago, the impact is unlikely. This is utterly fallacious, since no measurements of soil sulfate levels or pH were sampled. An even more ludicrous fallacy on p. 77 is the exclusion of tidal flows precludes the existence of sulfur sources in sediments. Obviously, if salinity range is up to 2.5 ppt, and the only original salinity source is seawater, sulfates (the second most abundant anion in seawater) is present in the oligohaline sediments. Moreover, I provided direct observation of both iron sulfide and hydrogen sulfide in near-surface anoxic sediments of the exposed bed of Laguna Salada in the ESA-PWA report (ESA-PWA 2010). Strongly sulfidic sediments are ubiquitous and conspicuous throughout the lagoon complex, and readily detectible by any qualified wetland ecologist who looks for them. It is disingenuous of the MND, as well as flatly incorrect, to assert that they are "unlikely"
.
Proposed mitigation M-Bio-2b fails as a CEQA mitigation measure because it provides no objective chemical standard or biological criteria or threshold for sulfide concentrations, pH, Biological Oxygen Demand (a measure of hypoxia in the suspended sediment plum around dredging sites), or redox thresholds for significant biological impacts. It instead relies on purely subjective voluntary submittal of data (not evidence of actual consultation and reply!) with resource agencies, with no evidence that resource agencies have staff resources or commitments to comply with the mitigation measure. The mitigation measure is vague, programmatic, and unenforceable. Dredge sediments are routinely sampled for aquatic impacts throughout the San Francisco Bay area. It is seldom that dredging occurs in nontidal wetlands with endangered species (for good reason), but the analytic methods for assessing aquatic impacts of hypoxic sediment plumes during dredging are established. They are not cited by the MND. Nor does the MND show any evidence of consultation with the RWQCB – SFB for appropriate dredge sediment and water quality protocols adapted to the distinctive setting of Laguna Salada, including specific criteria for water column hypoxia and sulfide toxicity during dredging. Hypoxia and sulfide toxicity are not the same chemical phenomenon, even though they are physically related by suspension of reduced iron sulfide-rich sediment.
The MND is deficient in basic understanding of acid sulfate soils, sulfur oxidation-reduction sediment processes, and ecotoxicity. Below is a limited sample of relevant scientific literature to support improved understanding.

Peter R. Baye Ph.D.
Botanist, Coastal Ecologist
baye@earthlink.net
(415) 310-5109

Bagarinao, T. 1992. Sulfide as an environmental factor and toxicant–Tolerance and adaptations in aquatic organisms. *Aquat.Toxicol*. 24:21–62. doi: 10.1016/0166-445X(92)90015-F

Beauchamp, R.O., Bus, J.S., Popp, J.A., Boreiko, C.J., Andjelkovich, D.A., and Leber, P. 1984. A critical review of the literature on hydrogen sulfide toxicity. *Crit. Rev. Toxicol.* 13, 25–97.doi: 10.3109/10408448409029321

Connell, W.E., and Patrick, W.H. Jr. 1968. Sulfate reduction in soil: effects of redox potential and pH. *Science* 159, 86–87.doi:10.1126/science.159.3810.86

Dent, D. 1986. Acid Sulphate Soils: a Baseline for Research and Development. Wageningen: ILRI Publ. http://www2.alterra.wur.nl/Internet/webdocs/ilri-publicaties/publicaties/Pub39/pub39-h1.0.pdf

Dent, D. and Dawson, B. undated. The Acid Test: an expert system for acid sulfate soils. http://www.isric.org/sites/default/files/AcidSKit/identman.pdf

Lamers, L.P.M., Tomassen, H.B.M., and Roelofs, J.G.M. 1998. Sulfate- induced eutrophication and phytotoxicity in freshwater wetlands. *Environ. Sci. Technol.* 32, 199–205.

Lamers, Leon P.M., Josepha M.H. van Diggelen, Huub J.M. Opden Camp, Eric J.W. Visser, Esther C.H.E.T. Lucassen, Melanie A. Vile, Mike S.M. Jetten, Alfons J.P. Smolders and Jan G.M. Roelofs. 2012 Microbial transformations of nitrogen, sulfur, and iron dictate vegetation composition in wetlands: a review. Frontiers in Microbiology 26:1-12. *doi: 10.3389/fmicb.2012.00156*

Iron oxide surface films and iron sulfide accumulation of muds exposed by artificial lagoon drawdown at Laguna Salada, 2010. Iron oxide (orange-brown mineral films indicative of oxidation of iron sulfide and acid sulfates in brackish coastal sediments subject to alternating strong hypoxia and oxidation) are apparent in drawdown-emergent muds at the northeast end of Laguna Salada (left). Organic-rich sediment immediately below the iron oxide-stained surface sediment film is deep black (right), indicative of toxic iron sulfide, formed under strong anoxic bottom conditions, exposed at the marsh surface by artificial drawdown of the lagoon.

Peter R. Baye Ph.D.
Botanist, Coastal Ecologist
baye@earthlink.net
(415) 310-5109

4. **Archaeological resources and significant impacts**.

The MND on page 30 states that the project could have significant impacts on buried archaeological resources, given the location of known midden sites, and the depth of proposed excavation. The proposed mitigation to reduce this significant impact to less than significant levels relies entirely on excavation equipment operators with no expertise in detection of archeological artifacts (such as shells, bones, heat-altered rocks, bone or stone tools, or flaked stone) to detect “accidental discovery” in excavated jet-black iron sulfide-stained organic much during excavation, and in time to cease excavation and disturbance upon detection. This is not a credible or feasible mitigation measure. I have ample experience over two decades observing excavation and dredging of coastal wetland and aquatic sediments, including strongly organic and sulfidic muds like those that occur in Horse Stable Pond. Organic and iron-sulfide staining of bulk sediment removal would render any small midden artifacts utterly undetectable in the absence of sorting (sieving) and washing. The mitigation measure proposed is infeasible. Advance assessment of archeological resources (a sampling plan prepared by a qualified archeologist) at proposed dredging sites would be required to detect buried archeological resources in organic, iron sulfide-stained fine sediments.

Sincerely,

Peter Baye
baye@earthlink.net

Literature Cited

Baye, P. 2013. Scoping comment letter in response to Notification of Project Environmental Review dated January 15, 2013, Case No 2012.1427E, Sharp Park Safety, Infrastructure Improvement, and Habitat Enhancement Project; concerns regarding potential environmental effects . submitted January 29, 2013.

ESA-PWA, Peter Baye, and Dawn Reis. 2010. Preliminary Ecosystem Restoration Feasibility Assessment, Laguna Salada, Pacifica, CA. Report prepared for Wild Equity.

Kamman, G. 2009. Sharp Park Conceptual Restoration Alternatives Report. APPENDIX A: HYDROLOGICAL REPORT. In: Tetra Tech (2009).

Tetra Tech, K. Swaim, and Nickels Golf Group. 2009. Sharp Park Conceptual Alternatives Report. Prepared for San Francisco Recreation and Parks Department.

CRITICAL REVIEW OF THE BIOLOGICAL ASSESSMENT for the "SHARP PARK SAFETY, INFRASTRUCTURE IMPROVEMENT AND HABITAT ENHANCEMENT PROJECT" (MAY 2012), Pacifica, San Mateo County, California

Peter R. Baye, Ph.D.
Coastal Ecologist, Botanist
33660 Annapolis Road
Annapolis, California 95412
baye@earthlink.net




Prepared for Wild Equity Institute, Oakland, California
June 2012

1.0. Introduction

The purpose of this critical review is to provide an independent assessment of the following aspects of the Biological Assessment (BA) for the Sharp Park (…Infrastructure...) Project, prepared by the San Francisco Recreation and Parks Department , March 2012, revised May 2012:

- ecological validity and accuracy of the BA's assumptions and findings
- critical omissions of ecological information presented in the BA
- feasibility of the proposed take minimization measures
- consistency of BA proposals with recovery plans for the two listed species featured, San Francisco garter snake (SFGS) and California red-legged frog (CRLF)
- internal consistency of the BA, and consistency with other SFRPD background documents on Sharp Park/Laguna Salada wetlands and endangered species
- consistency with ESA regulations regarding biological assessments and preparation of BAs by designated non-federal representatives of the lead Federal agency

My qualifications to provide critical scientific and regulatory review of the BA are based on my professional experience (over 30 years) in coastal wetland and terrestrial ecology, my academic background in coastal ecology (Ph.D. University of Western Ontario), and my experience preparing and reviewing biological assessments and conducting formal and informal Section 7 ESA consultations for the U.S. Army Corps of Engineers (USACE) and U.S. Fish and Wildlife Service (USFWS), as well as preparing endangered species recovery plans (coastal wetland and terrestrial ecosystems) for USFWS. One of my areas of specialization is restoration and management of fresh-brackish coastal California lagoons. I was lead ecologist co-author of two California State Parks lagoon management/restoration plans supporting California red-legged frogs in the central coast region (Laguna Creek and Pilarcitos Creek lagoons), and I have provided consulting services and peer review for on coastal lagoon enhancement and restoration projects in

State Parks and National Parks jurisdiction in this region (Rodeo Lagoon, Crissy Field (Presidio) Lagoon, Big Lagoon, Scott Creek Lagoon, Waddell Creek Lagoon). I was lead ecologist and co-author of a 2011 technical report on Laguna Salada wetland restoration alternatives (ESA-PWA 2011), and I was an invited speaker to the Sharp Park advisory working group convened by San Francisco Recreation and Parks Department in November 2010, where I presented an introduction to California coastal lagoon wetlands, with an emphasis on Laguna Salada and similar lagoons.

I have reviewed in detail both the BA and its principal supporting documents, including the San Francisco Recreation and Parks Department (SFRPD) alternatives report on Sharp Park (Tetra Tech et al. 2009), including appendix reports on hydrology (KHE 2009) and special-status wildlife (Swaim 2008). As indicated in the comprehensive Laguna Salada ecosystem restoration report I co-authored (ESA-PWA et al. 2011, not cited in the BA), I have detailed, first-hand knowledge of the Laguna Salada barrier beach and backbarrier wetland complex.

My critical review of the BA is presented below, organized by sections emphasizing scientific, feasibility, and regulatory issues of specific BA proposals (Section 2.0), followed by more general review of key scientific and technical issues in or omitted by the BA (Section 3.0), section-specific corrections of erroneous information in the BA (Section 4.0), and conclusions and recommendations (Section 5.0).

2.0. Critical review of specific key Biological Assessment proposals

2.1. The BA proposes dredging of anoxic, high-sulfide lagoon bed and marsh sediments without standard prior sediment testing or mitigation for hypoxia and sulfide toxicity due to suspended anoxic sediments.

The BA proposes to dredge sulfidic anoxic sediments in the primary breeding habitat (HSP) of LS. The BA does not include any proposals to conduct routine dredge sediment testing toxic sulfide and ammonia sediment concentrations, or redox potential, even though the environment is a coastal lagoon immediately behind a barrier beach with a long history of fresh-brackish (marine sulfur enriched) hydrology and organic sediment to fuel microbial reduction to sulfide. Hydrogen sulfide is readily detectible by scent in disturbed bed sediments at Horse Stable Pond, and the color of sediment 1 mm below the surface is jet-black with iron sulfide. There is no question that these sediments are highly reduced, anoxic and sulfidic. There is also no question that sulfidic sediments oxidize to form acid sulfates and iron oxide (rust-colored sediment) when exposed to aerobic environments. Yet the BA fails to disclose or mitigate *forseeable* significant potential local impact of hypoxia events due to dredge-induced resuspension of anoxic, highly reduced (sulfidic) bottom sediment. Hypoxia, and associated pulses of toxic ammonia and sulfides in anoxic sediment dispersed in suspended sediment plumes are potentially lethal to CRLF tadpoles during and following dredging (ESA-PWA et al. 2011). The small size and lack of refuge from suspended sediment plumes in the small, enclosed HSP lagoon may intensify this foreseeable impact. The proposal to dredge anoxic, sulfidic coastal lagoon sediments without dredge sediment testing, particularly at HSP, the sub-region of Laguna Salada where Swaim (2009) found relatively higher frequency of egg masses, is an undisclosed significant source of potential incidental take that is not minimized by any proposed measures.

2.2. The BA proposes dredging of marsh as "enhancement" without evidence or other rational ecological basis.

The BA falsely proposes dredging to "enhance" CRLF habitat at Horse Stable Pond which it reports is nearly 50% open water and marsh. The BA provides no evidence that the relatively high proportion of open water, and high linear extent of freshwater marsh and open water, are currently limiting factors for CRLF breeding success at HSP, and are contradicted by SFRP's own data on the frequency of egg masses (Swaim 2009), which indicated relatively higher egg mass deposition at HSP at least in 2008. The BA fails to provide any evidence-based analysis of limiting factors for reproductive success of CRLF at Laguna Salada, and relies on selective and subjective judgment that arbitrarily excludes evidence from a contemporary comprehensive analysis of wetland degradation (PWA 2011). The BA fails to cite any precedent (previous USFWS-authorized CLRF habitat enhancement project for recovery of the species, or recovery plan guidance) or other rational basis for dredging anoxic fresh-brackish sulfidic marsh substrate as an alleged "enhancement" for CRLF. The BA arbitrarily leaps to the conclusion that dredging, which the applicant desires for the independent purpose of pumping and draining the lagoon and its wetlands, has sufficient independent utility as an "enhancement" for CRLF habitat, without an analysis of risks (see discussion of anoxic and sulfidic lagoon bed sediments and lack of sediment testing, above).

The implicit rationale for dredging Laguna Salada to "enhance" habitat appears to be based on a false (partial) analogy with an entirely different marsh habitat supporting CRLF and SFGS: San Francisco International Airport's West of Bayshore marsh, where marsh excavation has been authorized to increase interspersed open water and marsh habitat for SFGS. The Bayshore freshwater marsh, unlike Laguna Salada, *exhibited clear evidence of terrestrial sediment deposition and infilling of the marsh*, and loss of interspersed open water/emergent (cattail) marsh edge due to significant terrestrial sediment accretion from urban flood control and storm drainage channels that discharge directly into the marsh. The Bayshore marsh is *not artificially drained by pumps with 10,000 gpm capacity that cause water level drawdown* causing cattails and tules to grow in what would otherwise be excessively deep water. Shallow water depths at Bayshore favoring cattails are caused by urban stormwater sedimentation. Bayshore marsh is passively drained by gravity through flapgates. In contrast, Laguna Salada, is drained by a 10,000 gpm pump that causes rapid drawdown and is the primary control of sustained low water levels (KHE 2009) – year-round drawdown – that promote cattails and tules invasion over the artificially shallow lagoon bed. There is no evidence presented in the BA or supporting documents for any significant current or recent terrestrial sediment discharge from Sanchez Creek into Laguna Salada/ Horse Stable Pond. Sanchez Creek discharges into a large willow thicket and broad marsh before it discharges into HSP, and its banks are densely vegetated, lacking sediment deposits. *Permanent drawdown of lagoon water levels*, not substrate elevation change, are what drive tule-cattail marsh vegetation encroachment of Laguna Salada (ESA-PWA et al. 2011).

There is no dispute that pumping out freshwater from Laguna Salada controls the low lagoon levels all year round, regardless of drought or high rainfall, and the low level of variability in lagoon water levels. The SFRPD's own hydrology report (KHE 2009, Appendix A in Tetra Tech et al. 2009) states:

> 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. (KHE 2009 p. 5)

The BA does not explain that the lagoon would fill (submerging marsh) naturally even in dry years, but for the pumps that maintain drawdown of the lagoon:

> Results from a water budget investigation reveal that the *system is supplied with adequate water to fill the ponds even in dry years*. (KHE 2009, p. 5)

The BA (and Tetra Tech 2009 report) *neither provides nor cites evidence of significant terrestrial sedimentation or bed substrate elevation change at Laguna Salada*. There is no such evidence: the bed surface is fine aquatic muck produced by decomposing algae and vascular plant detritus. That is a fundamental hydrogeomorphic difference between Bayshore and Laguna Salada wetland habitats of CRLF and SFGS. The remedy for habitat degradation at Bayshore's overgrown, overfilled cattail marsh does not apply to Laguna Salada, which has a former deepwater lagoon bed overgrown with cattail and tule because it is excessively drained of freshwater inflows and made shallow by high capacity pumps. In essence, the BA proposes to increase open water/marsh edge by lowering lagoon bed elevations artificially, rather than allow the fresh water levels to rise naturally in winter, so the lagoon remains in a state of permanent drawdown all year round. This is a radical contrast with Bayshore marsh.

2.3. The BA-proposed permanent program of CRLF egg mass translocation is not take minimization, and is apparently not consistent with the approved recovery plan for CRLF.

The BA proposes permanent egg mass translocation program that appears to be inconsistent with the approved recovery plan for CRLF, and requests authorization of "incidental" take that is not incidental, but primary purpose of translocation. The proposed annual "relocation"of egg masses *in perpetuity*, with USFWS consultation appears to *conflict with the Service's approved final recovery plan for CRLF, which states that relocation is ineffective even for single event relocation of adults* (cited under "inadequate regulatory mechanisms" in the Recovery Plan). Egg mass relocation is not "incidental take" caused by some other permitted activity regulated by the Corps of Engineers permit. It appears to be a request for authorization of direct take of CRLF that is for a stand-alone purpose of allowing the City to drain the lagoon's fringing wetlands so golf can be played in wetland portions of the golf course in winter, and not a valid recovery purpose. This is an extraordinary precedent for "incidental" take authorization (and precedent for mitigation of CRLF impacts) that appears to be inconsistent with the recovery plan of the species. It is a particularly problematic "incidental take minimization" request because it is made in the absence of any assessment of feasible alternate actions to avoid mass stranding of egg masses due to rapid wetland drainage and drawdown.

The proposal to "minimize" incidental take by instituting a program of annual egg mass translocation in perpetuity with USFWS authorization is essentially unenforceable in the absence of any criteria for receptor habitat selection, or proposed quantitative monitoring and reporting of

- egg survivorship following translocation,
- tadpole recruitment and survivorship following translocation
- "control" (reference) group egg survivorship and tadpole recruitment
- estimated carrying capacity of receptor habitat,
- within-year and long-term populations trends
- water surface elevation thresholds and drawdown rates

The BA is essentially proposing a permanent policy of CRLF egg mass translocation without even minimum monitoring to provide the Service with a reasonable basis for evaluating its efficacy at minimizing take, or causing long-term decline of the CRLF population. This is inconsistent with the monitoring recommendations of the CRLF recovery plan, and is an unreasonable and scientifically invalid approach for take minimization.

2.4 Proposed gopher management impacts and "take" of SFGS and CRLF.

The BA proposes to set gopher traps and reduce gopher abundance in uplands bordering Laguna Salada. The BA fails to identify the risk of incidental "take" of SFGS or CRLF due to gopher traps, or *provide any measures for monitoring or minimizing potential take due to traps*. The recovery plans for both listed species, as well as the SFRPD's own supporting documents cited in the BA identify small mammal burrows as potential important foraging habitat for SFGS, and potential moisture refuges for their amphibian prey species (tree frogs and CRLF). The BA appears to provide insufficient information to support the BO's effects analysis of the risk of incidental "take" of SFGS or CRLF due to gopher burrow destruction or suppression. The BA provides no support to the BO regarding meaningful monitoring or assessment of either take or impacts of gopher suppression on listed species.

2.5 "Survey" methods based on disturbance of endangered species and habitat: "take" equivalent of hazing and habitat degradation activities proposed as survey method.

The BA's so-called "take minimization" measure at 2.3.8 proposes to "survey" for SFGS and CRLF in uplands bordering Horse Stable Pond by *mowing vegetation to a height of 4 inches*, reducing cover and exposing listed species to active disturbances and hazards of injury from mowing. Vegetation mowing in presumed occupied habitat of SFGS and CRLF is n*ot a survey method consistent with either the recovery plans of the two listed species, or take minimization*, and it is not rational: the "survey" method would itself reduce the likelihood of subsequent occurrence of the target species, which itself suggests the primary and undisclosed purpose of this extraordinary and unwarranted "survey" method. This measure has the appearance of hazing and affirmative habitat degradation rationalized as monitoring.

2.6 The BA fails to assess any reasonable alternatives with less adverse cumulative impact and "take" of endangered species.

The Service's ESA regulations at Section 402.12(f) (recommended contents of biological assessment) advise that the BA contain "results of on-site inspection, 2 views of recognized experts on species at issue, 3. Review of the literature and other information…4. analysis of effects of the action, including cumulative effects" and "5. An *analysis of alternate actions* considered by the Federal agency for the proposed action. . . The BA contains no discussion of any alternatives whatsoever. It arbitrarily excludes the most recent and comprehensive scientific assessment of Laguna Salada's wetland ecology, historical ecology, hydrology, coastal processes, and endangered species biology (ESA-PWA 2011) that identifies both short-term and long-term alternative actions that substantially reduce take and adverse impacts to listed species, and promotes their recovery. A copy of this report is included as an attachment.

The ESA-PWA report (2011) includes views of a recognized expert on CRLF ecology in coastal brackish lagoons of the San Mateo-Santa Cruz coast, Dawn Reis. The failure to provide the ESA-PWA report (2011) findings on alternatives and cumulative impacts to endangered species habitats is apparently inconsistent with the ESA statutory standard of utilizing the "best available commercial and scientific data" to support the endangered species consultation process. The ESA-PWA 2011 report was supplied directly to the SFRPD and most of its principal findings were presented in an invited oral presentation to City representatives, including one co-author of the BA in November 2010.

The interim (phased) restoration measures proposed by ESA-PWA et al. (2011) that were ignored by the BA are simple and feasible, and directly address the primary hydrological impairment of ecological function specific to CRLF and SFGS habitat. They do not depend on dredging of anoxic sediments or perpetual manual translocation of CRLF egg masses each breeding season. The interim (near-term, prior to long-term ecosystem restoration adapting habitats of listed species for climate change resilience) feasible restoration measures recommended are simply:

- *cessation of mowing emergent perennial fresh-brackish marsh on the landward shore of the lagoon (ending conversion of marsh to turf, marsh encroachment by mowing);*
- *leaving an adequate upland buffer of transition zone (seasonal wetland) vegetation above the former mown marsh;*
- *allowing seasonal shallow flooding of the upper (currently mown) marsh and relatively flat topography of the transition zone, so that rapid pumping does not draw down suitable seasonal wetland pools and strand egg masses there*.

The SFRPD's own hydrology report (KHE 2009) confirms that there are sufficient freshwater inflows to Laguna Salada to fill its ponds even in dry years. Accommodating seasonal wetland pools and CRLF breeding in this zone would not require actual flooding of actual uplands. It would require flooding only within wetlands that are mown to function as turfgrass (seasonal wetlands located within the annual floodplain of the lagoon), to flood; see items 3.2, 3.2 of this report, below. In effect, this alterative measure simply requires that the applicant cease mowing and draining existing wetlands that are seasonally occupied by CRLF and used as breeding habitat. The BA's suggestion that "flooding of uplands" is occurring routinely is flatly incorrect, and contradicts own statement (BA section 2.2.1) that "Portions of the golf cart paths along the eastern side of LS regularly flood, even during drought years." This is because the seasonally flooded areas are not uplands, but in fact *wetlands with perennial marsh habitat that is mown down to function as golf turf* – misleadingly called "uplands" (see item 3.2 below).

3.0. General critical review of the BA

3.1 Failure to disclose long-term consequences of the basic hydrologic management (pumping) regime on listed species. The BA proposals constitute a short-term infeasible "fix" based on its inaccurate and apparently biased diagnostic assessment of wetland degradation that ignores the *primary causes* of long-term and short-term endangered species/wetland habitat degradation. The *primary* causes of endangered species habitat decline at Laguna Salada are the direct, indirect, and cumulative effects of artificial hydrologic management (pumping regime) that the BA proposals support and continue in perpetuity, without which the BA proposals would have no independent justification.

The artificial water management regime at Laguna Salada *maintains the depressed wetland elevation range at precariously low elevations* (perennial marsh below +8 NAVD), making them artificially vulnerable to cumulative effects of sea level rise, and submergence with seawater during extreme storm overwash events like 1982-83 El Niño event. Contrary to the claims of SFRPD (Tetra Tech et al. 2009, Swaim 2008), the pump-induced drawdown of the lagoon and "seawall" do not protect the lagoon wetlands from catastrophic seawater flooding impacts; on the contrary, they *prevent* the wetlands from rising to naturally higher elevation ranges and locations that would adjust them to rising sea levels, and buffer them and make them *safer* from the effects of storm surges and overwash flooding (ESA-PWA et al. 2011). The artificially low lagoon maintains the habitat of CRLF and SFGS at depressed topographic positions that are *most vulnerable* to complete submergence by marine overwash impounded by the earthen berm, which lacks any potential natural (gravity-drained) sand outlet. In natural backbarrier fresh-brackish lagoons, barrier beaches impound lagoon water surface elevations *above* tides, and raise marsh elevations *above* reach of normal wave runup. The artificial water management regime at Laguna Salada prevents the lagoon from naturally impounding its freshwater discharges and raising marsh elevations above tide and overwash elevation range.

The ongoing pumping regime also prevents *normal*, *naturally higher seasonal (winter) lagoon water surface elevations* from forming *and maintaining* seasonal pools at the margins of the lagoon's wetlands, suitable for CRLF breeding. The water management regime at Laguna Salada also facilitates saltwater seepage (saline groundwater inflows) from the sandy (permeable) barrier beach as sea level rises. This hydrologic regime is not sustainable for long-term survival of CRLF and its predator, SFGS.

The BA proposal *maximizes* impacts of artificial wetland drainage (and mowing; see 3.2 below) to degrade eliminate seasonal wetland breeding habitat and *preclude* breeding in natural peripheral seasonal wetlands of the lagoon ecosystem, as a method of "avoiding" take of CRLF eggs and tadpoles. This is an apparent contradiction: The BA proposes extensive "take" (draining of whole seasonal wetland pools along the landward (eastern) upland edge that routinely attract egg mass deposition, and which would otherwise persist *but for* pumping and artificial drainage) in order to "minimize incidental take" of individual egg masses. More significantly, these seasonal breeding pools are located at the *landward*, most naturally freshwater-influenced (least saline) end of the wetland complex, and farthest from influence of rare storm overwash and seawater flooding. In other words, the current regime drains the most defensible long-term CRLF breeding habitat locations that could survive sea level rise and increased storm overwash of the 21st century. Breeding habitats along the back of the barrier beach (seaward end of the wetland complex) are inherently vulnerable to increased risk of overwash and salinity intrusion as sea level rises. Inevitable "coastal squeeze" due to sea level rise puts a long-term conservation premium on the breeding habitat locations on the landward end of the lagoon wetland system. HSP, in contrast, is in a precarious long-term position directly behind the beach, right where it naturally breached even in the 19th century (ESA-PWA et al. 2011).

The essential features of the proposal are to excavate a canal to more rapidly and efficiently drain Laguna Salada into the pumping basin/forebay called Horse Stable Pond, and operate pumps to drain seasonal wetland pools so rapidly that they minimize opportunities for egg deposition. This does not appear to be "incidental" take: the primary purpose of the drainage is to preclude formation of normal seasonal (winter) breeding pools in regularly flooded wetlands. This appears to constitute direct take rather than incidental take: it deliberately and actively degrades seasonal wetland pools (potential suitable breeding habitat) as though they were inherently "attractive nuisance" habitat, instead of suitable wetland habitat deliberately drained and mown to exclude frog breeding in areas desired for golf recreation activities.

The BA appears to rationalize ecological "enhancement" purposes for activities that are essentially engineering proposals in support of recreational golf and pump maintenance. The BA invokes non-existent causes of environmental degradation without any evidence, such as "soil deposition from the uplands…entering the waterway" (the site is surrounded by sand beach deposits and wetland soil and has a continuously vegetated border) to justify features such as a retaining wall in endangered species habitat. See also discussion of (lack of evidence of) terrestrial sediment deposition in item 2.2 above.

The BA also rationalizes erroneous and misleading ecological causes of endangered species habitat degradation to justify marsh dredging instead of beneficial water level and hydroperiod management to avoid take of CRLF egg masses. The BA (following Tetra Tech et al. 2009 and Swaim 2008) fails to provide any rational argument or evidence for the causes of excessive marsh vegetation growth that it invokes (again, without evidence) as the leading limiting factor for CRLF reproductive success at Laguna Salada. See item 2.2 above (Bayshore marsh comparison). The BA ignores all local data on hydroperiods, topography and water depths that clearly show that the pumping regime maintains Laguna Salada at permanently low levels with shallow (subcritical) water depths within the flooding tolerance of tules and cattails across most of the lagoon bed. The BA ignores water quality data showing relatively nutrient-enriched (total nitrogen; the typical limiting nutrient for marsh primary production) eutrophic condition, including nitrate levels that are within effects range for red-legged frog tadpole adverse impacts (ESA-PWA et al. 2011). The BA also fails to provide any quantitative data on cumulative nitrogen and phosphorus loads due to golf fertilizer, and instead emphasizes largely irrelevant non-quantitative information about "organic" types of fertilizer use as a "best management practice". The BA completely fails to asssess the relationship between shallow marginal water depths maintained by pumping to maximize golf turgrass area, and the aggressive encroachment of the former bed of Laguna Salada by solid stands tules and cattails.

3.2. Failure to disclose or assess mowing of fresh-brackish marsh to provide extension of functional turfgrass area.

The BA fails to disclose the extent and ecological (vegetation) zone in which routine mowing occurs. Mowing clearly extends into saturated soils dominated by obligate and facultative-wet dominated vegetation identical with the adjacent marsh (ESA-PWA et al. 2011). The golf course mows marsh vegetation to the height of turf and drains it, converting it seasonally to functional turf composed of marsh vegetation. This marsh vegetation (coast bulrush, silverweed, bentgrass) mowed is seasonally submerged and is otherwise suitable habitat for CRLF and SFGS. The BA does not assess the effects on loss of cover, the relationship of the mowed marsh zone and water surface elevation in winter (during CRLF breeding) or the effect mowing has on location of egg mass deposition. The BA-proposed "no mow" zone discussion does not address the marsh mowing issue. These are critical omissions.

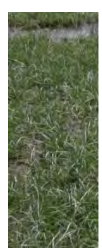
Marsh mowing: golf maintenance impacts. The golf turf mowing encroaches marsh at the northeast end of Laguna Salada, extending directly into perennial fresh-brackish marsh and riparian woodland zones. The apparent golf turf is composed of the same fresh-brackish marsh species shown at the left, *Schoenoplectus pungens, Potentilla anserina, Agrostis stolonifera,* and *Cotula coronopifolia*. The seasonally flooded outer marsh and its terrestrial ecotone are replaced by turf even with pumped drawdown of the lagoon. The natural floodplain (unimpaired maximum lagoon elevations) would include a much wider floodplain area. All wildlife cover is eliminated, exposing travel corridors of SF Garter snakes and eliminating suitable mammal burrow foraging habitats. All potential buffers for fertilizer impacts are eliminated by encroachment of golf turf into the marsh. Above: June 10, 2010. Below: August 3, 2010.

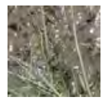
3.3. Misleading representation of seasonally flooded wetlands as 'flooded uplands" to be drained.

The BA's account of the "normal wetland hydrology", even in drought years, includes inconsistent and inaccurate reference to "floodwaters" in seasonal wetlands. Areas that are repeatedly flooded even in drought years (as well as in summer dry seasons!) enough to sustain CRLF egg deposition are clearly not "uplands" in any biologically meaningful way, in context of Section 7 consultation. The lowland zones bordering the emergent Laguna Salada marsh that at are artificially drained and mown to function as golf turfgrass are seasonal and perennial wetlands. The so-called "uplands" are mown encroachments of marsh (see 3.2 above).

3.4. Sediment chemistry and dredging/post-dredging impacts.

The BA does not identify the nature of the sediments it proposes to dredge in occupied endangered species habitat, including the larval life-history stages of CRLF that cannot escape the water column. The BA presents no monitoring data on sediment quality, water quality, or CRLF impacts from previous dredging episodes at HSP, and thus provides the BO with no information to support an analysis of direct, indirect, or cumulative effects. The BA does not identify or assess potential impacts of suspended anoxic, sulfidic sediment from the warm brackish (sulfide-rich) bed of Laguna Salada, even though these readily detected (rotten egg scent of sulfides; jet-black ferrous sulfide) sediments are widespread in organic-rich muck in marsh and open water lagoon bottom sediments. The BA proposes no measures to contain anoxic suspended sediment plumes or minimize hypoxia effects in a small, closed basin in which CRLF tadpoles must be presumed to be present. The BA fails to identify any potential refuges for CRLF tadpoles affected by a hypoxia event due to dredging suspended sediment plumes. Similarly, the BA does not evaluate any other predictable water and sediment chemistry changes associated with dredging anoxic organic sediments, such as ammonia pulses, post-aeration nitrate pulses, and formation of acid sulfates. The BA proposes to place sulfidic sediments in uplands presumed occupied by CRLF and SFGS, where they should be expected to form acid sulfates. The lack of sediment testing as a basic, standard component of wetland dredging is not explained in the BA.



Iron oxide surface films and iron sulfide accumulation of muds exposed by artificial lagoon drawdown. Iron oxide (orange-brown mineral films indicative of oxidation of iron sulfide and acid sulfates in brackish coastal sediments subject to alternating strong hypoxia and oxidation) are apparent in drawdown-emergent muds at the northeast end of Laguna Salada. Organic-rich sediment immediately below the iron oxide-stained surface sediment film is deep black (lower left), indicative of toxic iron sulfide, formed under strong hypoxic bottom conditions, exposed at the marsh surface by artificial drawdown of the lagoon.

3.5. Origin and types of pre-golf Laguna Salada wetlands: misleading and inaccurate account of golf course creation of freshwater marsh habitat for CRLF and SFGS.

The BA, relying in the 2009 SFRPD Sharp Park Alternatives Report (Tetra Tech 2009), uncritically adopts the unsupported and unsound assumption that the original condition of Laguna Salada was a homogenous saline lagoon unsuitable as habitat for the California red-legged frog and San Francisco Garter snake (BA section 3.1), rather than the typical fresh-brackish lagoon wetland gradients that prevail even today along the coast of San Mateo, Santa Cruz, and Marin Counties. This fallacy appears to originate with the (now obsolete) 1992 PWA report (ESA-PWA et al. 2011), which inferred a saline lagoon merely from the folk-name “Salada”, indicating some degree of at least brackish salinity; there was no evidence or historical ecology analysis in the 1992 PWA report or the 2009 Tetra Tech report that supported the conclusion that the pre-golf condition of the lagoon, or the pre-European “natural” condition of the lagoon was a saline nontidal or tidal (marine salinity) lagoon. There is strong direct local historical evidence (herbarium records, historical photographs and maps) that the pre-golf lagoon wetlands ranged from fresh-brackish (oligohaline) to brackish, like most seasonally or intermittently non-tidal coastal lagoons of the Central Coast region that support populations of California red-legged frogs and garter snakes (including SFGS) at the landward (fresher) ends of their wetland gradients today.

The strongest and most direct local evidence of the pre-golf salinity regime and vegetation at the landward end of Laguna Salada prior to golf construction is a ground-level historical photograph taken during the agricultural land use phase, dated approximately in 1928. This photograph appears in the 2011 PWA report appendix on historical ecology of Laguna Salada (ESA-PWA et al. 2011, Appendix A, Figure A-1), and is also publicly featured as part of a natural interpretive display sign erected on Mori Point by the National Parks Service. The photograph shows clearly identifiable prevalence of marsh plant species that are physiologically intolerant of marine salinity to brackish salinity (polyhaline conditions) – specifically, California tule, cattails, and bulrushes – <u>the same relatively salt-intolerant perennial marsh plant species that are dominant today along Laguna Salada.</u> The open water appears to be covered by floating mats of sago pondweed, a fresh-brackish submerged vascular plant typically associated with salinity regimes supporting tule-cattail-bulrush marsh. California red-legged frogs use sago pondweed stands as breeding habitat at Laguna Creek Lagoon in Santa Cruz. The tule-cattail-bulrush marsh assemblage in the pre-golf photo essentially the same as the typical vegetation bordering most California red-legged frog breeding habitat sites in other coastal lagoons in the region. Other freshwater marsh species intolerant of even moderately brackish salinity at Laguna Salada appear in early 20th century herbarium collections. Exhibit A, p. 85 (ESA-PWA 2011 et al. Appendix A, Table A-1).

There is no evidence of any salt marsh plant species in the circa 1928 photograph of pre-golf Laguna Salada at the landward lagoon shore location. The lack of salt marsh vegetation is particularly significant because other aerial and ground photographs of Laguna Salada from the 1920s and earlier show that artificial breach canals were cut through the beach, apparently to drain the lagoon at low tide, so that the lagoon would act as a sump for agricultural drainage of flood-prone lowland croplands of the adjacent valley. Artificial breaching of the barrier beach during the growing season would allow seawater to enter the lagoon before wave action sealed the artificial, unstable breach with sand. Even with artificial breaching to increase growing-season seawater influxes to the lagoon, the landward edge of the lagoon is dominated with cattail, tule, and bulrush marsh vegetation that indicates prevalent fresh-brackish (oligohaline) rather than saline (polyhaline to euhaline) conditions in the landward fringing marshes of the lagoon in the long-term.

The folk-name "Laguna Salada" indicates only that the aqueous salinity of the lagoon was sufficiently brackish (for potable or agricultural irrigation water, readily detectable by taste above 2 parts per thousand salt concentration) to be distinguished from predominantly freshwater lagoons with no appreciable salinity (less than 2 ppt). Botanists and geographers in the 19th century, like authors of place-names, did not make the distinction between "brackish" (a term that was brought into widespread scientific descriptive use in the 20th century) and "saline". Other early historical place-names suggest that salinity-descriptive nomenclature like "Freshwater Bay" used by early navigators of Suisun Bay (actually estuarine: brackish in summer, nearly fresh in winter, contrasting with saline San Francisco Bay) reflected seasonal (like "Arroyo Seco", dry creek) rather than permanent salinity or hydrological regimes, as well as contrasts with nearby waterbodies. Thus, a naïve literal interpretation of "Laguna Salada" as "Saline Lake" is inconsistent with early maps, early 20th century photos prior to golf construction. (ESA-PWA 2011 Appendix F).

Equally naïve and unsupported by historical and scientific evidence is the popular belief (repeated uncritically by some environmental professionals) that golf course construction "created" the fresh-brackish lagoon wetlands at Laguna Salada. There is no evidence from aerial photos that golf construction contributed additional marine overwash flood protection structures to Laguna Salada's natural barrier beach, and certainly not beyond any minor changes that may have been inherited from the agricultural land use era.

Fresh-brackish vegetation is typical of the landward edges of central California coastal lagoons where freshwater stream deltas slightly above high tide elevations intergrade with lagoon fringing wetlands. This is exactly the structure represented in the mid-19th century U.S. Coast Survey map of Laguna Salada: the marsh map symbol is restricted to the southwest corner of the lagoon where three small channels, oriented like marsh distributary channels of the freshwater Sanchez Creek, intersect the marsh. (ESA-PWA et al. 2011, Figure A-11). The three distributary channels are shown as artificially channelized seasonal arroyos (freshwater seasonal creek) in the 1897 U.S. Geological Survey map of Laguna Salada. The 19th and 20th century US Coast Survey and subsequent U.S. Geological Survey maps all represent Laguna Salada as a closed lagoon with no open tidal inlet to sustain high salinity. This is consistent with other coastal lagoons with full exposure to Pacific swell and exhibit mostly ephemeral outlets for freshwater overflowing from the lagoon side of the barrier beach – not tidal inlets. Analysis of wave power and lagoon discharge (potential tidal prism or water volume) relationships (ESA-PWA et al. 2011) confirms that tidal inlets would be inherently unstable and prone to closure Laguna Salada.

Salt marshes and saline coastal lagoons in northern and central California are associated with the seaward ends of lagoons with at least seasonally stable tidal inlets. All other coastal stream mouth lagoons south and north of Laguna Salada in Marin to Santa Cruz counties exhibit fresh-brackish marsh or freshwater-dependent riparian woodland at their landward ends, in both modern and historical conditions. Many of these lagoons also support persistent populations of California red-legged frogs in the fresh-brackish landward portions of lagoon wetland gradients

4.0. Section-by-section critical review of the BA.

Sections of the BA discussed are shown in italics. Bullets indicate relevant BA text.

1.1 DOCUMENT PURPOSE

- Sharp Park Safety, Infrastructure Improvement, and Habitat Enhancement Project.

Project name and description do not explain "safety improvement", and do not disclose the essential compensatory mitigation purpose of the "habitat enhancements" enabling wetland drainage to be sufficient to maintain the existing lowest elevations of the golf course to encroach into wetlands that are seasonally flooded. If the basic purpose is habitat enhancement, then a range of alternatives that optimize hydrology and water quality for listed wetland-dependent species should have been included, not just dredging and existing water levels.

- "This BA has been prepared in conformance with Final Rule regarding Interagency Cooperation (50 CFR pt. 402)"

The BA was not prepared by the lead federal action agency (USACE), but by the applicant, and without any reference to designation of a non-federal representative for informal consultation or a biological assessment (50 CFR Sect. 402.08). This omission suggests that the BA fails to comply with 50 CFR Part 402. The lead agency (USACE) would need to have reviewed and supervised the BA as well as designate the applicant and consultants as non-federal representatives to comply with the Interagency Cooperation regulations of ESA.

1.2 LISTED SPECIES CONSIDERED

- "No other listed or proposed species have the potential to occur on the Project site."

This statement appears to be incorrect. Since Caspian and Forsters terns forage on fish in LS, and since CA Least Terns rangewide occupy barrier beaches and lagoons, there is potential (though not likely) for occurrence of CA least terns at Laguna Salada. CLT have colonized even less typical artificial oligohaline (near-freshwater) sand/lagoon habitats remote from their primary maritime distribution at Montezuma Wetlands, at the lower Sacremento River. The BA cites no bird data from Sharp Park to determine whether CLT occur there as vagrants or seasonal users.

1.4 PREVIOUS CONSULTATIONS

- "Biological Opinion for the Pacifica Recycled Water Project (81420-2008-1-1643), ….This project, which will provide recycled water to Sharp Park, was determined to have potential direct and indirect effects on CRLF and SFGS. "

This consultation appears not to have considered the cumulative impact of wastewater nutrient loading cumulative impacts with annual total golf fertilizer nutrient loads on Laguna Salada (both water quality for CRLF tadpoles and indirect effects on habitat through vegetation growth and structure), and the BA fails to supplement it with any quantitative analysis. The current consultation's effects analysis would need basic data on the total nutrient (primarily total N, P) loads from (a) recycled water inflows, (b) total annual golf course fertilizer load, and (c) watershed nutrient load in order to estimate cumulative impacts of eutrophication on marsh vegetation (habitat of CRLF) and direct water quality (nitrate, ammonia) impacts on CRLF tadpoles. See ESA-PWA et al. 2011.

2.1 PROJECT LOCATION

The description of project location omits essential and relevant information on the coastal backbarrier setting of the lagoon, its adjacency to three constructed freshwater GGNRA ponds/fringing marsh at S edge of Laguna Salada (inhabited by CRLF breeding and foraging habitat; SFGS detected present). The description lacks essential contextual information relevant to endangered species, such as surrounding habitats, land uses, distance to nearest potential CRLF and SFGS populations (isolation, potential for recolonization after population crash or extirpation). The setting is not described until 2.2.2.2, where key relevant information about habitat sustainability is omitted, such as drainage of lagoon below wave runup elevations and high tidal elevations)

2.2 PROJECT DESCRIPTION

- "The wetlands complex is composed of Laguna Salada (LS), Horse Stable Pond (HSP), a channel that connects the two water bodies, and adjacent wetlands. A seawall on the western boundary of Sharp Park eliminated the historic hydrologic connection between the Pacific Ocean and the wetlands…"

This is an inaccurate geographic description. *All* wetlands at Sharp Park occur *within the bed of historic Laguna Salada*; they are the drained lagoon bed, not separate distinct wetlands (ESA-PWA et al. 2011). Horse Stable Pond is the historic outlet channel of Laguna Salada (recurrent natural breach location allowing outflows of impounded freshwater) (ESA-PWA et al. 2011). "Channel" is artificial ditch completely infilled with tule & cattail. The "seawall" is not a structural seawall, but an *earthen berm* with partial boulder armor perched on the original natural barrier (sand) beach. T*here is no seawall structure or foundation*. The "seawall" does not eliminate all hydrologic connection between Pacific Ocean and LS: it restricts only *surface* flows (overwash and ephemeral outflows, temporary storm breaches) but is no barrier to groundwater exchange from beach to lagoon, and saline subsurface seeps are evident in both the western golf course and the west shore of the lagoon (KHE 2009, ESA-PWA et al. 2009). This indicates the long-term potential for salinization of the lagoon as sea level rises even if the earthen berm remains intact, as long as lagoon levels are kept below beach groundwater elevations (set up by wave runup "pumping" seawater above tide elevations; (ESA-PWA et al. 2011)).

- "wetlands are believed to be maintained by *ground water* but are *also* fed by surface water inflow due to precipitation in the winter."

This BA statement is incorrect and inconsistent with the project's own hydrology report (KHE 2009, not cited in BA), which states that winter *surface flows* are the primary water source for Laguna Salada, and are drained away by the pumps:

> *Surface water inflows* associated with winter storm events provide the *primary* source of water to the wetland system….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…. *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… (KHE 2009 p. 4-5; emphasis added)

KHE states merely that groundwater *contributes* to the lagoon because inflows exceed outflows. Groundwater sources include saline groundwater from the beach (KHE 2009). The lagoon is maintained by *channelized surface inflows of fresh water*; supplemental groundwater is subordinate:

> 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.

- "Operation of the flood control pump system is necessary to manage floodwaters both on the Property and on adjacent properties. During *normal rainfall* years, floodwaters into Laguna Salada back up onto the golf course path." …"Portions of the golf cart paths along the eastern side of LS regularly flood, even during drought years."

"*Normal* rainfall" filling of lagoon *by definition* is not "floodwater". Normal means normal re-occupation of the drained lagoon to normal levels; it's the mowing of marsh to function as turfgrass (see items 3.2, 3.3 above) that give the false and paradoxical appearance of "normal" and even dry-year flooding. The description inverts the nature of the wetlands, uplands, and flooding. Drought-year flooding is an oxymoron, and clear evidence of wetland topography and hydrology. Drainage of lagoon not necessary to protect adjacent properties, which can be protected by a separate small berm (ESA-PWA et al. 2011).

2.2.1 Construction Action

- "Currently, two factors adversely affect the operation of the pumps. First, pump operation is adversely affected by sediment buildup and vegetation growth around the pump intake structure and along the connecting channel between LS and HSP. Second, pump operation is adversely affected by the buildup of vegetation on the pump intake screens."

There is no "vegetation growth" obstructing screens or around the pump intake. See cover photo of this report (2010). There is a narrow fringe of coast bulrush on the uppers shoreline west of the pump intake, and tules many meters away; the forebay in front of th pump is all open water. Neither the BA nor the Tetra Tech et al. 2009 report provide any objective or quantitative evidence of sediment "buildup" – no elevation information or sedimentation rate data. The SFRPD hydrology report (KHE 2009) does not report sediment accumulation as a factor adversely affecting pumps. There are no sources of sediment inputs and no sediment budget, nor is there any evidence of surface sediment accretion. The fringing marsh vegetation (tule, cattail, saltgrass) occurs more than 5 m away from the screens, and can be managed without dredging (cutting below mud level). Debris accumulation (plant litter) is not controlled by dredging.

- "…removal of sediments and emergent vegetation within the HSP wetland near the intake structure in order to reduce obstructions to water flow to the pump intake and to enhance breeding habitat for the CRLF." Approximately 2,350 square feet (0.05 acres) of this 5,900 square foot area is occupied by cattails and bulrush; the remaining area is open water…. Removal of sediment and emergent vegetation that impedes water flow and reduces habitat suitability for CRLF in select locations…"

The BA fails to provide any evidence or analysis for the project's claimed purpose of "enhancement" of existing open water and fringing tule-cattail marsh habitat of CRLF or SFGS. There is not even facial evidence for "reduced habitat suitability" of *nearly 50% open water area* at HSP (photo). HSP has the highest measured egg mass deposition frequency of LS reported by Swaim (2008). "Bulrush" in HSP is tule, (*Schoenoplectus californicus*), not bulrush (*Schoenoplectus pungens*).

- "..installation of steps leading down the slope from the access road to the pumphouse and the intake structure (approximately 47 square feet or 0.001 acres). A fence with a locking gate will restrict access to the steps and boardwalk."

The steps may improve terrestrial predator access (raccoons and feral cats not deterred by fence) to CRLF habitat, but impacts are not assessed.

- "Replacement of the failing wooden retaining wall next to the pumphouse (at the base of the levee slope between the uplands and the wetland) with a concrete retaining wall to prevent further soil deposition from the uplands from entering the waterway."

There is no evidence for any "soil deposition from the uplands" of the adjacent levee or slope fills, which are entirely vegetated. The marsh surface is composed of fine-grained sulfidic and organic muck (autochthonous, accreted in situ), not alluvium eroded from adjacent upland slopes. The BA provides no evidence of erosion or deposition at the pumphouse (no evidence from on-site inspection, recommended for BA in 50 CFR 402.12). The purpose of a concrete retaining wall cannot reasonably be justified by erosion or habitat enhancement.

- “Excavation of sediments and vegetation will be conducted from the golf course uplands wherever possible, thus minimizing impacts to the wetlands. The sediment and vegetation removal along the connecting channel between HSP and LS can be accomplished with little or no impact to the adjacent wetland. …sediment and vegetation removal from HSP would be to use a compact multi-purpose aquatic vessel (i.e., an Aquamog) or similar equipment with long boom and clam shell or bucket type attachment…will be placed in an elevated dewatering container located in an adjacent cleared upland or placed directly into a dump truck and hauled to either the organic dump or reclaimed rifle range east of the PCH”

See BA comments at 3.4 (dredging impacts). No locations are shown for “cleared upland” in what is presumed SFGS habitat; no impacts assessed. This is potential “take”.

2.2.2 Golf Course Maintenance and Operations

- “The SFRPD currently employs seven staff members who perform the year-round operation and maintenance) of the golf course. These activities include mowing; application of water for irrigation; application of fertilizers”

See BA comments on mowing in marsh and fertilizer impacts (and lack of quantification of cumulative lagoon nutrient loading (lb/area/yr, total area = nutrient load) and fertilizer composition (N, P). See ESA-PWA et al. 2011.

2.2.2.3 Integrated Pest Management

- Today, only organic fertilizers are used at Sharp Park…

Misleading and irrelevant to nutrient loading quantification. BA fails to provide quantification of annual nutrient load from fertilizer. "Organic" nutrient (N, P) pollution of LS is no different from non-organic; eutrophication depends on rate of nutrient loading, not "organic" label.

- Gophers are common on golf courses. Gopher mounds may damage mowers, and gophers can damage turf roots as well as other plants. SFRPD staff manage gopher populations by raking down gopher mounds. Mounds are raked away from the opening of the hole. If an active burrow is present on the fairway, greens, tees or roughs, traps may be set by removing a clump of dirt from the ground such that the middle of a main tunnel is exposed. A U-shaped wire sprung gopher trap (MacAbee trap) is placed in the burrow on either side of the hole. The access hole is then immediately filled in with the clump of turf that had been removed. Typically the traps are checked and removed before the end of the work day.

See BA comment at 2.4. Traps = snake take risk; no take minimization proposed. Raking mounds does not "manage" gopher population. gopher burrows = estivation and moisture refuge habitat for tree frog (prey of SFGS), CRLF. Suppression of mammal burrows in adjacent uplands is impact to habitat potential impact to SFGS and CRLF.

2.2.3 Natural Areas Restoration

- "…these areas are to be managed and restored for their biodiversity. Maintenance activities, such as hand removal of vegetation within and adjacent to HSP, LS and the connecting channel, contribute to the preservation and enhancement of habitat for the species."

This is a key area of dispute that should be resolved in the biological opinion's analysis of cumulative effects including interrelated and interdependent actions: *dredging does not address the larger issue of permanent drainage and mowing impacts of the lagoon*. The characterization of dredging openings in drained marsh so the lagoon can be drained low enough to allow golf mowing in wetlands is doubtful "enhancement" of endangered species wetland habitat. See BA comments at 3.1, 3.3, 3.4, etc.

- "The activities would include the removal of vegetation overhanging and shading the wetlands such as acacia, Monterey cypress, as well as vegetation within the wetlands such as cattails and bulrush that reduce the quality of CRLF breeding habitat and therefore reduce prey availability and foraging habitat quality for SFGS. In areas where appropriate, native plants and erosion control measures would be installed to replace and augment the wildlife habitat and reduce soil loss."

Cattail and bulrush overgrowth is due primarily to pumping and water depth reduction to less than 4 ft all year round over most of the lagoon bed (most of fringing marsh occupies water depth less than 3 ft deep), and stabilization of water level. This is a basic flaw in analysis of causes of habitat decline. There is no evidence of "soil loss" in uplands: the west shore is all sand, and the east and north shore are mown marsh and golf turf; the south end is solid marsh backed by riparian woodland (willow grove).

2.3 MINIMIZATION AND MITIGATION MEASURES

Alternate actions (alternatives) are missing from this section, as is any assessment of consistency with recovery objectives and tasks for the two listed species.

- 2.3.5 During dredging and vegetation removal activities, if required, up to three (3) biological monitors will be present to 1) monitor the area of vegetation or sediment removal, 2) observe the material as it transferred to the shoreline and 3) to inspect material as it is loaded into a container/dump bed that will allow the water in the excavated sediment to drain out before removal from the site.

See comments on failure to test sediment prior to dredging or assess dredging impacts, comments at 2.1.

- 2.3.8 Terrestrial vegetation in undisturbed areas around HSP and the connecting channel will be cleared by manual means to a height of 4 inches (or a height that allows visibility of the ground) under the supervision of an approved biological monitor and checked for the presence of CRLF and SFGS.

This “survey” method is in itself a potential source of incidental take, and is not justified or shown to be consistent with recovery plan survey methodology or USFWS approved protocols. Mowing/clearing vegetation is a source of habitat degradation (loss of cover).

- 2.3.13 Erosion control best management practices (silt fences, coir rolls, straw bales) would be employed as part of the dewatering of sediments after removal and while soils are exposed. The erosion control measures will not include netting, plastic or natural monofilament netting or other materials that may entrap frogs or snakes.

There is no evidence for any "soil deposition from the uplands" of the adjacent levee or slope fills, which are entirely vegetated. The marsh surface is composed of fine-grained sulfidic and organic muck (autochthonous, accreted in situ), not alluvium eroded from adjacent upland slopes. The BA provides no evidence of erosion or deposition at the pumphouse. There is no description of location of sediment dewatering of potential acid sulfate (oxidized sulfidic) sediment.

- 2.3.16 During and following completion of the Project, the water pumps will be operated pursuant to the following criteria: Appropriate water levels will be determined by conducting visual surveys of CRLF egg masses in potential habitat areas around HSP, LS and the connecting channel. During the visual surveys, data on the CRLF egg masses including attachment type, water depth, size of egg mass, and Gosner stage will be taken, and a determination of potential stranding will also be made.

It is not feasible to determine “appropriate water levels” without measuring surface and water elevations at locations at issue; subjective “data” of visual surveys are not verifiable or reportable and cannot support data interpretation.

- Pump levels will be set relative to the CRLF egg mass with the least amount of water around it; in other words, the pumps will be set to a level to protect the most vulnerable egg masses in HSP, LS and the connection channel.

This measure in infeasible because water surface elevations differ between HSP (pump location) and Laguna Salada because of friction and slope of water surface (KHE 2009).

There is an inherent spatial lag in water surface drawdown between HSP and LS, and an inherent temporal lag between pump activation/deactivation and water level adjustments. The constraints of "fine-tuning" water levels with the pumps and these lags in relation to the sensitivity of egg mass stranding are not analyzed; it is left to subjective judgment that is not accompanied by quantitative monitoring of water surface elevations, substrate elevations, egg mass attachment elevations, and real time. The BA proposal appears to be both infeasible and unenforceable for this reason.

- Once all the CRLF eggs have hatched and the tadpoles are no longer aggregating about the egg mass, the water level will be lowered incrementally and the dewatering of HSP, LS and the connecting channel is monitored to ensure that CRLF tadpoles are not stranded by receding waters.

This measure to "lower incrementally" water levels does not specify limit on maximum rate of drawdown or pumping; it is not enforceable without it. The constraints of "fine-tuning" water levels with the pumps and these lags in relation to the sensitivity of egg mass stranding are not analyzed; it is left to subjective judgment that is not accompanied by quantitative monitoring of water surface elevations, substrate elevations, egg mass attachment elevations, and real time.

- 2.3.17 During and following completion of the Project, if CRLF egg masses are determined to be at risk because they are deposited in ephemeral swales or in other conditions that are not sustainable, an SFRPD biological monitor with the Natural Areas Program will apprise USFWS of the situation and propose a relocation plan to the USFWS for review and approval. Such a relocation plan will describe….

See BA comments at 2.3. Egg mass translocation annually in perpetuity does not appear to be consistent with CRLF Recovery Plan. No monitoring data, thresholds or performance criteria are proposed; the plan is not even a potentially enforceable take minimization measure (even if consistent with recovery plan) without monitoring and performance criteria.

- 2.3.18 During and following completion of the Project, mowing will occur pursuant to the following criteria: The area to be mowed will be the minimum required to maintain the golf course. A no-mow zone area, which includes the roughs adjacent to the wetlands, will be identified with stakes or other markers on the ground (see Figure 2-5). Golf staff will be instructed not to mow in these areas.

See BA comments at 3.2. This measure fails to provide a minimum buffer around endangered species habitat and allows direct encroachment of mowing into wetlands.

- 2.3.19 During and following completion of the Project, only organic fertilizers, such as pro-biotics, blood meal, lime, and compost tea, will be used at Sharp Park

Misleading and irrelevant to nutrient loading quantification. BA fails to provide quantification of annual nutrient load from fertilizer. "Organic" nutrient (N, P) pollution of LS is no different from non-organic; eutrophication depends on rate of nutrient loading, not "organic" label.

5.3 & 5.4 – [Interrelated and interdependent and cumulative effects]

The effects analysis lacks any meaningful assessment of the long-term consequences of proposed water level management on marsh elevations, salinity intrusion, sea level rise, as they affect of CRLF and SFGS population viability and habitat sustainability (ESA-PWA et al. 2011; see BA comments at 2.0, 3.0).

5.0 Conclusions and recommendations.

The BA appears not to comply with the general ESA standard of providing the "best available scientific and commercial data" regarding the scientific account of ecosystem inhabited by listed species in the project action area. It apparently fails to provide a reasonably complete and accurate scientific assessment of direct, indirect, and cumulative impacts of proposed actions. The BA proposes some very high-risk, potential high impact actions offered as "take minimization" measures that commit serious omissions of basic data – particularly (a) dredge sediment testing data for sulfidic, anoxic (ecotoxic) brackish marsh sediments, and potential for hypoxia events and subsequent acid sulfate formation, and (b) the permanent CRLF egg translocation program that appears to conflict with the CRLF recovery plan. The BA is acutely deficient in failing to identify reasonable alternatives (alternate actions of reasonable and prudent measures with less impact and take of listed species), based on comprehensive assessment of the ecosystem. The BA appears to rationalize recreation-priority land and water management activities as benign or even beneficial to listed species, and systematically ignores the fundamental hydrologic threats they impose in the long-term. The BA, therefore, does not appear to provide a sound scientific or regulatory basis on which the formal Section 7 consultation may reasonably rely for scientific analysis of "effects of the action" or formulation of reasonable and prudent measures or alternatives.

I recommend that the deficiencies of the BA be corrected, at least in the final BO if not a revised BA, by:

- requiring dredge sediment testing data by independent qualified experts, with a specific assessment of potential ecotoxicity of hypoxic sediment plumes during dredging, and post-dredging water quality for CRLF tadpoles, including mortality risks.
- requiring an analysis of ongoing and proposed long-term water management at Laguna Salada by independent, unbiased qualified experts, with focus on long-term groundwater salinity changes and marsh elevation range in relation to vulnerability to storm overwash flooding, including gradual sea level rise interactions.
- requiring an unbiased analysis of alternative interim and long-term alternate actions, including reasonable modifications of seasonal water levels favorable for CRLF breeding (including any appropriate small-scale hydrologic barriers bordering true upland areas), cessation of mowing marsh vegetation, and creation of adequate upland buffers with suitable vegetation cover and basking sites.
- requiring review and reference to relevant portions of the ESA-PWA report (2001) to satisfy the general ESA statutory standard of "the best scientific and commercially available scientific data".
- (most importantly) providing a rigorous analysis of the feasibility of long-term management of CRLF by a permanent program of egg mass translocation in response to artificial rapid drawdown due to pumping to maintain a fixed range of low lagoon levels, and the consistency of such a program with the approved final recovery plan for CRLF, including possible precedents for future Section 7 consultations based on single-event or perennial CRLF translocation to "minimize" take.

References

KHE (Kamman Hydrology & Engineering, Inc.). 2009. Report for the Hydrologic Assessment and Ecological Enhancement Feasibility Study: Laguna Salada Wetland System Pacifica, California *Prepared For:* Tetra Tech, Inc. San Francisco, California

ESA-PWA (Environmental Science Associates - Philip Williams and Associates) 2011. Conceptual ecosystem restoration plan and feasibility assessment: Laguna Salada, Pacifica, California. Prepared for: Wild Equity Institute. Prepared by:ESA PWA with Peter Baye and Dawn Reis Ecological Studies. 65 pp + appendices

Swaim, K. 2008. Sharp Park wildlife surveys and special reptile and amphibian restoration recommendations. Prepared for Tetra Tech Inc. Portland, OR by Swaim Biological Incorporated Livermore, CA. Appendix C in Tetra Tech 2009.

Tetra Tech, Inc., Swaim Biological, and Nickels Golf Group. 2009. Sharp Park Conceptual Restoration Alternatives. Prepared for San Francisco Recreation and Parks Department. November 2009.

EXHIBIT H

UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA
NORTHERN DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.* Plaintiffs, **v.** **CITY AND COUNTY OF SAN FRANCISCO,** *et al.*, Defendants.	Case No.: **3:11-CV-00958 SI** **DR. MARC HAYES EXPERT REPORT**

QUALIFICATIONS AND BACKGROUND

1. I am submitting this expert report in support of plaintiffs' position in this litigation that activities at the Sharp Park Golf Course ("Sharp Park") are resulting in the "take" of the California Red-legged Frog ("CRLF"; *Rana draytonii*) and the San Francisco Garter Snake ("SFGS"; *Thamnophis sirtalis tetrataenia*), and their position that in the absence of judicial relief such take will continue. I have the requisite credentials to offer expert opinions on these issues, as well as other matters on which I will opine in this expert report.

2. For nearly four decades, I have worked professionally as a research and field ecologist and herpetologist, studying reptiles and amphibians in California, Oregon, Washington, Mexico, Costa Rica, and Florida. During this time, I have supervised over 70 projects addressing the ecology and habitat needs of the herpetofauna in these areas, working with the California Department of Fish and Game, the United States Fish and Wildlife Service, the California Academy of Sciences, and diverse other public and private entities. I am a member of the following professional scientific organizations: American Society of Ichthyologists and Herpetologists (life member), The Herpetologist's League (life member), The Wildlife Society (associate member), Society for Northwestern Vertebrate Biology (life member), Society for Conservation Biology (life member), Society for Integrative Biology (life member), Societas Europea Herpetologica (life member), Society for the Study of Amphibians and Reptiles (life

member), Desert Tortoise Council (life member), and the Association of Zoos and Aquariums (associate member).

3. I received my Bachelors degree in biology in 1972 from U.C. Santa Barbara, my Masters in Biological Sciences in 1975 from California State University, Chico, and my PhD in Herpetological Ecology in 1991 from the University of Miami, Florida. Currently I serve as an Adjunct Professor at Central Washington University (Ellensburg, WA), Evergreen State College (Olympia, WA), Portland State University (Portland, OR), and the University of Washington (Seattle, WA). I am also an Affiliate Curator in Herpetology at the Burke Museum at the University of Washington, and I serve as a Senior Research Scientist with the Washington Department of Fish and Wildlife ("WDFW"). In 2010, I received the prestigious *Conservation Award* from WDFW—the highest award the department grants—specifically for my work on amphibian conservation. More detailed information about my research can be found in my current curriculum vitae, along with a list of my publications from the past 10 years, which is attached to this report as Exhibit A.

4. My research and my field experience have been particularly focused on California's rare and endangered amphibians and reptiles. In 1994, I co-authored a 255-page report for the California Department of Fish and Game ("CDFG") entitled *Amphibians and Reptiles of Special Concern in California.* That report, which was a compilation of the status and threats facing all rare amphibians and reptiles in the state, was designed to help CDFG decide which of these species were eligible for protection under state or federal law.

5. While researching and writing that report, we discovered that the CRLF was facing severe threats; that it had suffered a marked contraction in its geographic range over the preceding century; and that its remaining populations were at risk due to a suite of factors. Yet it was not protected under federal endangered species law. We therefore submitted a petition to list the species under the federal Endangered Species Act to the United States Fish and Wildlife Service ("FWS"). This petition ultimately led to the current listing of the frog as threatened under the Endangered Species Act.

6. I have also conducted numerous field studies on the CRLF, logging hundreds of hours searching for, identifying, and monitoring the species during all stages of its life cycle. For example, from 1974 to 1983, I studied populations of the CRLF in Corral Hollow (San Joaquin County), Pico Creek (San Luis Obispo County), and Cañada de la Gaviota (Santa Barbara County). From 1988 to 2002, I studied the last remaining CRLF population in southern California south of Los Angeles, located at Cole Creek on the Nature Conservancy's Santa Rosa Plateau Preserve (Riverside County).

7. Besides field research, I have studied historic species accounts, laboratory specimens, and popular writing about California's frogs and snakes, with a particular emphasis on the CRLF. I have reviewed specimens and historic accounts in the American Museum of Natural History in New York; the Burke Museum at the University of Washington; the California Academy of Sciences in San Francisco; the California State University Chico Vertebrate Museum; the Carnegie Museum in Pittsburgh; the Los Angeles County Museum of Natural History; the Museum of Comparative Zoology at Harvard University; the Museum of Vertebrate Zoology at the University of California at Berkeley; the Museum of Zoology at the University of Michigan; the Oregon State University Vertebrate Museum; the Portland State University Vertebrate Museum; the San Diego Museum of Natural History; the Slater Museum at the University of Puget Sound; the Southern Oregon State College Vertebrate Museum; the University of Kansas Vertebrate Museum; and the Smithsonian Institution and its Archives in Washington, D.C.

8. My studies have resulted in over 120 peer-reviewed publications and reports over my career. These include studies that have explained the historic overharvest of CRLF in California, revealing that humans—not American Bullfrogs, as previously supposed—were the primary reason for the decline of the species near the turn of the 19th century. I have also demonstrated that the decline of ranid frogs in the North American west is generally explained by introduced fishes more accurately than introduced American Bullfrogs; and that vocal sac differences were a strong indication that two species (now called California and northern red-

legged frogs) existed within what was formerly considered one species (simply called red-legged frogs).

9. More generally, I have been active in research and field study of many frog species in the family *Ranidae*, to which the CRLF belongs. These frogs are sometimes called "true frogs." True frogs share many similarities, and therefore, lessons learned from one species can help scientists understand the habitat needs of other ranid frogs, while gaining a better understanding of each species' unique evolutionary path. For example, I have studied the ecology and distribution of the stream-dwelling Foothill yellow-legged frog (*Rana boylii*) in western Oregon. I've shown that this species has also sustained a severe contraction in its geographic range over the last 100 years, and that introduced fishes, especially Smallmouth bass (*Micropterus dolomieu*), better explain this species' regional disappearance than do American Bullfrogs.

10. My research has also addressed reptiles in California, including rare and endangered snakes. For example, I observed and recorded information on the San Francisco gartersnake in the course of my studies of the CRLF at Pescadero Marsh. Those studies suggest that the SFGS is seasonally dependent on CRLF juvenile production as a summer food resource.

11. Through my research and study, I have become an expert in identifying frog and snake species, particularly closely related species, in any and all life stages. I can readily identify egg, larvae, juvenile, and adult phases of all California frog species, and eggs, juveniles, and adults of all California snake species through visual inspection, aural calls (typically only applicable to frogs and toads), habitat range, and habitat characteristics.

12. My research and study has also made me an international expert in the habitat and ecological needs of frogs and snakes, and the types of habitat modifications that threaten these species. I have studied the Oregon spotted frog (*Rana pretiosa*), a formal candidate for listing under the ESA, over much of the last 20 years in the Pacific Northwest. Via extensive surveys, I have shown that this species has probably been extirpated from the Willamette Valley floor in Oregon and across its geographic range in California. I have also shown that the Oregon spotted frog is resistant to the amphibian chytrid fungus, a pathogen known to have decimated

frogs worldwide, but that Oregon spotted frogs are highly vulnerable to predation by introduced American bullfrogs because of their aquatic habits. In the region of Monteverde, Costa Rica, I worked on the entire amphibian and reptile fauna for over three years, and characterized the ecology and distribution of the over 110 species present, demonstrating marked changes in species composition across a rain- to dry-forest gradient.

13. I am personally very familiar with Sharp Park, including its main aquatic habitat features: Laguna Salada, Horse Stable Pond, and Sanchez Creek. I have visited Sharp Park on several occasions throughout my career, most recently on June 25, 2011, and I have observed and studied the CRLF at Sharp Park and at surrounding lands. Based on my personal site visits and my interactions with employees with the National Park Service ("NPS"), I am also familiar with restoration efforts that have occurred at Mori Point, a national park unit adjacent to Sharp Park, and the habitat enhancements that have been implemented there for both the CRLF and SFGS by the NPS. Given my expertise and background, I am well-equipped to offer expert opinions concerning the impact of defendants' activities at Sharp Park on both individual CRLFs and SFGSs, and on the prospects for the survival and recovery of the resident populations of these species.

14. Although I am not an attorney and I have not been asked to provide an opinion on the legal implications of the defendants' activities that affect the CRLF and SFGS, I have had extensive experience in assisting the State of Washington in developing applications for Incidental Take Permits ("ITPs") and associated Habitat Conservation Plans ("HCPs") in accordance with section 10 of the ESA. Accordingly, I am personally very familiar with the kinds of activities for which ITPs/HCPs are prepared, and the process for developing scientifically supportable mitigation and other measures necessary to obtain the FWS's approval for ITPs/HCPs, especially with respect to measures bearing on the survival and recovery of amphibians. For example, I have been directly involved in coordinating the adaptive management science involving the HCP addressing the largest landscape of any HCP in North America—the Forests and Fish HCP in Washington State—which encompasses over 9,000,000 acres of private timberlands and addresses ITPs/HCPs for no fewer than seven species of

amphibians in that landscape. Accordingly, while it is not the principal focus of this expert report, as a Senior Research Scientist with the Washington Department of Fish and Wildlife who has worked closely with the FWS, I do have extensive personal familiarity with, and involvement in preparing applications for, ITPs/HCPs and in pursuing FWS approval of them, and I believe that this practical experience could be of assistance to the Court in evaluating whether defendants' activities at Sharp Park should continue to bypass the formal ITP/HCP process.

15. For my work in preparing this expert report and related materials and in providing deposition and expert testimony, I am charging Plaintiffs at the rate of $120/hour, although given the conservation import of this case I anticipate that I will not ultimately bill plaintiffs for all of the work that will be entailed in carrying out these tasks. I have not been deposed or testified as an expert witness in the past four years.

FACTS OR DATA CONSIDERED IN FORMING OPINIONS

16. I have been asked by plaintiffs to proffer opinions on (1) whether the CRLF and SFGS are present at Sharp Park; (2) whether Sharp Park Golf Course's operations and maintenance activities have taken, are taking, and will continue to take members of these species as the term is defined by the ESA and its implementing regulations (*i.e.*, to encompass direct killing or injuring individual members of the species, as well as harassing and harming them through significant habitat modifications that result in actual death or injury to members of the species); and (3) whether such ongoing impacts are likely having adverse effects on the long-term ability of the species' populations at Sharp Park to survive and recover.

17. In formulating and rendering my opinions on these matters I have relied on my overall background and familiarity with these species and with related species, as well as the official listing, recovery plans, and other published materials concerning these species issued by the FWS; the published, peer-reviewed literature on the species including my published and unpublished fieldwork on the species; and all publicly available reports, studies, and publications regarding the CRLF and SFGS at Sharp Park, and in particular the materials listed in Attachment C. My opinions are also based on my own site inspections at both Sharp Park

and Mori Point; site photographs I have both taken and reviewed (as specified in this report); declarations and other materials filed in connection with plaintiffs' motion for a preliminary injunction (particularly the declarations of Dr. Mark Jennings [hereafter Jennings Decl.], dated October 18, 2011; and Ms. Karen Swaim, [hereafter Swaim Decl.], dated October 21, 2011, both in Case No. 3:11-CV-00958 SI); personal communications I have had with Darren Fong, an Aquatic Ecologist with the Golden Gate National Recreation Area ("GGNRA"); a 2010 GGNRA report senior-authored by Mr. Fong, part of which summarizes data collected at Sharp Park and adjacent Mori Point on the CRLF; personal communications I have had with Mr. Kuhn, a former employee of Swaim Biological Consulting who was directly involved in biological surveys at Sharp Park; a 2010 study performed by Brett DiGregorio and his associates concerning snake mortality at a golf course on the Outer Banks in North Carolina, and personal communications I have had with Mr. DiGregorio concerning that research; and pertinent materials produced in discovery in this case (particularly the survey sheets for CRLF egg masses prepared by Jon Campo and other San Francisco Recreation and Parks Department ("RPD") employees; and the deposition testimony of Mr. Campo, Mr. Ascariz, and Ms. Wayne), as well as other materials identified in the discussion that follows. A list of the materials I relied upon in writing this report is attached as Exhibit B.

OPINIONS AND THE BASIS AND REASONS FOR THEM

I. Sharp Park Is Important, Occupied Habitat For the CRLF and SFGS.

18. It is my professional opinion that Sharp Park is not only occupied by the CRLF and SFGS, but it is also extremely critical recovery habitat for these imperiled species. For imperiled species in general, their long-term survival and recovery depends on maintaining an adequate number of independent populations, to protect against stochastic (or chance) events, disease, or other threats. Avoiding the loss of the populations of these two species at Sharp Park is essential to the long-term viability of existing populations of SFGS and to reestablish populations within the snake's historic range. Preservation and enhancement of Sharp Park is also essential for the CRLF to recover, and if areas like Sharp Park are not preserved and

enhanced for the benefit of the species, and take avoided or at least minimized, the CRLF may never recover.

19. The threatened CRLF faces a wide variety of threats to its continued existence, and if these threats are not arrested and reversed, a high probability exists that the species will one day go extinct. By the mid-1980s, the species had already been lost from 70% of its historic range, and extirpation of a number of populations extant at that time has occurred since then. Destruction and adverse modification of the species' terrestrial and aquatic habitat is the primary reason for these declines, though this has been exacerbated by periodic extreme drought conditions over the last 25 years. The latter conditions are a poorly recognized part of climate change. Within the climate change trajectory under which we currently exist, more extraordinary measures are necessary to protect the terrestrial and aquatic habitat for the CRLF. In particular, this trajectory is characterized by greater frequency of climatic extremes (either drought or precipitation events) that will make it increasingly difficult to prevent or mitigate adverse changes to CRLF and SFGS habitats.

20. The endangered SFGS is critically imperiled: it is the most endangered serpent in North America. The species' natural range, centered on San Mateo County, is intrinsically small. However, many of the species' most important known habitats were lost to urbanization and development, and today the species is found in significant numbers in only a few fragmented locations. The species is now so rare that accurate estimation of its total population size is difficult. This is because it is inherently difficult to find rare species when few individuals are present overall, and surveys that detect even one SFGS are therefore infrequent. This zero-inflated survey frequency (i.e., an excess of zero-observation surveys due to the species' rarity) makes population estimation, even using mark-recapture approaches, unreliable.

21. Given the ongoing, serious threats to the CRLF and SFGS throughout their ranges, conserving these species over the long term depends on affording adequate protections to the species in those remaining habitats where the species are present. It is my professional opinion that both the CRLF and SFGS are present at Sharp Park. The presence of the CRLF at Sharp Park is well documented. Several of the defendants' publications and reports have confirmed

the presence of the species on the property, including the Sharp Park Conceptual Restoration Alternatives Report and several biological reports prepared by the City's biological consultants.

22. On June 26, 2011, I personally observed CRLFs along the channel connecting Laguna Salada to Horse Stable Pond, and in Horse Stable Pond. True and correct copies of photographs of CRLF that were taken during my visit to Sharp Park on June 26, 2011 were attached to my October 6, 2011 Declaration (*see* Docket No. 60-3, Ex. C). It is my unqualified professional judgment that the CRLF is present at Sharp Park.

23. It is similarly my unqualified professional judgment that the SFGS is present at Sharp Park. The recorded literature shows that over 40 specimens were collected there in the mid-1940s, that similar numbers were observed near Horse Stable Pond in the 1970s, and that more recently four SFGS were recorded at Horse Stable Pond in 2005, and two more were found a few feet south of Horse Stable Pond during removal of old tires on September 29, 2008. It is my understanding that three SFGS were observed at Mori Point in 2011, directly adjacent to Sharp Park to the South.

24. In addition to these SFGS sightings, my judgment that SFGS continue to occupy Sharp Park is also based on the fact that the focal prey base upon which the SFGS depends, life stages of stillwater-breeding amphibians, remains available at Horse Stable Pond, though as I discuss later, this prey base is being harmed by RPD's activities. Moreover, other lines of evidence indicate that SFGS continue to occupy Sharp Park. SFGS, like all gartersnakes, feed exclusively in aquatic habitats. Aquatic habitat at Sharp Park includes Horse Stable Pond and Laguna Salada, both of which are stillwater habitats, on which SFGS are cued to search for stillwater-breeding amphibian prey regardless of whether that prey is present, because that type of habitat is the only aquatic habitat in which those amphibians reproduce. For snakes to ignore the aquatic habitats in which their focal prey breeds would put them at risk. Hence, searching behavior by SFGS in stillwater habitat for their stillwater-breeding amphibian prey would be expected. The only suitable alternative stillwater habitats available, several of the ponds that now exist at Mori Point, did not become available until after 2005, when they were created. Yet these ponds subsequently attracted SFGS, indicating that the recovery efforts at Mori Point are

succeeding. Further, Sharp Park's proximity to known SFGS habitats at Mori Point and San Francisco Public Utility Commission watershed lands that can be used for aestivation or overwintering, coupled with the fact that most SFGS sightings over the last 25 years in the area have occurred near the Sharp Park/Mori Point boundary south of Horse Stable Pond, indicate that SFGS move across that area seasonally. These collective data indicate that no valid scientific reason exists why individual San Francisco gartersnakes would *not* be present at Sharp Park.

25. Accordingly, I agree with the City and County of San Francisco's own biologist, Karen Swaim, who concluded in her 2008 report (on p. 3-2, section 3.2, end of first paragraph) that past "observations, the abundance of prey items in these areas, their proximity to observations of the snake at Mori Point and Horse Stable Pond, and historical occurrence suggest that SFGS likely forage in and move through the areas around Lower Sanchez Creek, Laguna Salada, the canal, and Horse Stable Pond."[1] Given the 2011 observations of SFGS at Mori Point mentioned previously, the validity of SFGS currently using adjacent areas of Sharp Park still stands.

II. <u>Activities At Sharp Park Are Taking the CRLF and SFGS</u>

26. In my professional opinion, a host of activities being undertaken by the RPD at Sharp Park are taking the CRLF and SFGS, both directly and indirectly. For purposes of this report, I will address activities that, if left unchanged, are virtually certain to cause ongoing take of the species. For purposes of this report, I am applying the definitions of "take" that I understand to be set forth in the ESA and implementing regulations, i.e., take is defined by the ESA to encompass actions that include "killing," "injuring," "harassing," and "harming" members of a listed species. I also understand that the ESA implementing regulations define "harass" in the definition of take to encompass an action that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns such as breeding, feeding or sheltering; and that the regulations define "harm" in the take definition to include actions that entail significant habitat modification or degradation where it actually kills

---

[1] However, I do not concur with Ms. Swaim's conclusion that an abundance of potential SFGS prey in Laguna Salada—which I will demonstrate, based on Swaim's own data, are in fact largely lacking in the lagoon—drives SFGS foraging. Rather it is the presence of stillwater *habitat* with the *potential* of containing suitable prey that drives SFGS foraging activity.

or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering.

27. Applying these definitions of take to the relevant scientific information, it is my opinion that a number of activities routinely undertaken by RPD employees take, and will unavoidably continue to take, the CRLF and SFGS. These activities include water pumping, which leaves frog egg masses exposed to the air; entrains frog tadpoles, metamorphs or juveniles in the pumps; injures juveniles and possibly adults by plastering them against the intake screens of the pumping gate; and which I understand can alter hydrological gradients in Laguna Salada such that salinity levels may become high enough to kill CRLF embryos, and possibly early life stages. The harmful activities also include mowing, which can kill or injure both species with blades or by crushing them with wheels; and golf cart use, both on and off golf cart paths, which can crush CRLF and SFGS.

A. Water Management Activities

28. When the winter rains come, the golf course at Sharp Park floods. Photographs of flooding events at Sharp Park were attached to my October 6, 2011 Declaration (*see* Docket No. 60-3, Ex. B). To eliminate the flooding, the golf course has installed two pumps that drain Sharp Park's aquatic features and send the water through an earthen berm and onto a relatively saline pool on a sandy beach at low tide and out to sea at high tide. It is my professional opinion that these pumping operations causes take of the CRLF in three distinct ways: (1) through desiccation of egg masses; (2) through entrainment in the pumps; and (3) through modification of habitat in Sharp Park water bodies. By modifying habitat and reducing prey availability by taking CRLF, pumping is also reasonably certain to be taking SFGS.

1. Egg Desiccation and Stranding

29. The CRLF is the largest frog native to the west. Like all true frogs, the species requires aquatic habitats in which to breed and lay eggs, and for tadpoles to develop, metamorphose into juveniles, and become adults. Under normal conditions, the frog will lay its eggs during late winter rains, and attach its egg masses to aquatic vegetation near the high water mark. If the water levels are sufficiently deep for a long enough interval, the eggs will hatch, tadpoles will

emerge and feed, and eventually become adults. However, by pumping water from Sharp Park Golf Course during the rainy season, the golf course exposes CRLF egg-masses to the air, causing these eggs to desiccate or become stranded, and the animals will die.

30. I base this conclusion on my decades of work on the species, my understanding of the RPD's egg mass monitoring data, as well as my review of reports published by the City and County of San Francisco. I concur with the view expressed in the City's Conceptual Alternatives Report, which explains (on page 39) that at Sharp Park, when "the water levels drop, these egg masses can be stranded on dry ground and desiccate," and that "[e]ven 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." If pumping were ceased once CRLF eggs are laid, it is my professional opinion that egg masses would not become stranded and desiccate, and there would be sufficient water for CRLF eggs to develop into fully formed-frogs.

31. CRLF attach their eggs to a vegetation brace near the water surface because it ensures higher survivorship at hatching. Because the eggs are attached at a specific point on aquatic vegetation, they have only limited ability to rise and fall with water levels corresponding to the pliability of egg mass jelly. It therefore does not require much lowering of water levels to strand CRLF eggs. Pumping during the breeding season puts CRLF eggs at high risk of being killed. When pumping occurs during the peak-breeding season, an entire annual cohort (generation) of CRLFs can be jeopardized at once. Peak breeding season corresponds with the times that the golf course floods, and therefore, in every year with sufficient rains, golf course pumping operations that take CRLF eggs are a certainty.

32. Indeed, the available data is overwhelming that CRLF egg masses are being desiccated and stranded due to defendants' pumping operations rather than any natural or other factors. Unlike species of western North American *ranid* frogs that typically lay unattached egg masses in water having a shallow total depth (7.5-15 centimeters [3-6 inches]) (for example, Cascade Frog [*Rana cascadae*] and Oregon Spotted Frog [*Rana pretiosa*]) and that are, as a consequence, vulnerable to water fluctuations, CRLFs are less susceptible to stranding because

they typically deposit egg masses attached to a vegetation brace where total water depth is somewhat greater (>15 centimeters [>6 inches]). Moreover, the jelly in which CRLF eggs are imbedded is somewhat pliant and elastic, and the vegetation braces on which the CRLF typically deposits its eggs also have some pliability. In combination, these factors allow CRLF egg masses to generally tolerate some water fluctuation without stranding. Stranding of CRLF egg masses uninfluenced by human activities does occur, but rarely; and typically involves few egg masses. I have personally viewed it but three times (each time involving 1 to 3 egg masses) in many observations of many hundreds of CRLF egg masses over my years of field work on this species.

33. The stranding and desiccation rate at Sharp Park, in contrast, reflects an alarming increase of strandings compared to what would be expected in the absence of human interference. According to data produced in discovery, in 2011 nearly 80% (128) of the 159 CRLF egg masses observed by the City of San Francisco at Sharp Park had to be moved to so the eggs or subsequent tadpoles would not become stranded (Docket No. 54-6, Ex. 10). This is an incredibly high rate of egg-mass stranding, much higher than any rate documented in the scientific literature. It cannot be explained by normal variability in rainfall, topography, or drainage—it can *only* be a product of human agency adversely affecting habitat conditions on the site. In my professional opinion, therefore, the data is overwhelming that defendants' pumping operations are causing and will inevitably continue to cause a large number of CRLF egg mass desiccations and strandings.

2. Entrainment in pumps

34. The second way that the pumping operations inevitably cause take of the CRLF is by entraining tadpoles or other mobile life stages of the species in the pumps as they suck water from Horse Stable Pond out to sea. I have reviewed documents indicating that the City has long known that the massive amounts of water sucked from Horse Stable Pond have a high probability of entraining CRLFs. On June 25, 2011, during a visit to Sharp Park, I personally observed an adult CRLF on flotsam that had accumulated immediately adjacent to the debris grate to the inflow compartment of the Sharp Park pump house in Horse Stable Pond. A copy

of a photograph of that frog in this location was attached to my October 6, 2011 Declaration (*see* Docket No. 60-3, Ex. C). Had the pump been turned on with any frog life stage adjacent to this debris grate, it would be at high risk of entrainment. Entrained animals small enough would go through the grate, and if they survived the sheer stress of moving through the outflow pipe, would be swept into inhospitable (saline) habitat in the pool below the outflow pipe on the upper beach. If they were too large to go through the grate, such as an adult CRLF might be, they would be plastered against the grate until the suction was reduced when the pump was shut off. An animal remaining plastered to the grate for too long an interval (that is, the pump remaining on continuously for more than 30 minutes) would likely either drown if it was beneath the water line or be irreversibly injured because it was unable to do the normal buccal pumping (a movement of its throat muscles) required for it to ventilate its lungs. The latter would deprive the Frog of sufficient oxygen. I have observed several individuals of a closely related species, the Northern Red-legged Frog (*Rana aurora*), die because they were plastered to a grate with similar-sized mesh through which there were only moderate flows, and based on the capacity of the pumps at Sharp Park (over 25 cubic feet per second ("cfs") potential capacity; at least 15.5 cfs actual capacity) the same fate would befall the CRLF.

35. It is also my professional opinion that it is virtually certain that CRLF tadpoles have been taken, and will continue to be taken, by the Sharp Park pumping operations as they are drawn into the pump and spewed out to sea. Crayfish are strong swimmers and have a hard exoskeleton. I have reviewed documents reflecting that crayfish have been sucked through the pumps at Horse Stable Pond. A photograph of a freshwater crayfish observed inside Sharp Park's outfall pipe was attached to my October 6, 2011 Declaration (*see* Docket No. 60-3, Ex. D). The crayfish could only have gotten here by being pumped through the pump house. I have also reviewed a Swaim Biological, Inc. Sharp Park Outfall Repair Biological Monitoring Form from November 23, 2008, which states that "several dead crayfish found at discharge end of pipe at beach," and concluding that "if crayfish can become entrained in pump then frogs might also." California red-legged frog eggs and tadpoles, unlike crayfish, have a highly flexible cartilaginous skeleton surrounded by a jelly-like body, and they are weak swimmers,

particularly during the very early stages of development. Since strong swimming species such as crayfish have been observed dead after being sucked through the pump house, tadpoles would also be sucked into the pump intake under the same or weaker forces.[2]

3. Habitat modification

36. The third way the pumping operations cause take of CRLF is by keeping the aquatic habitats artificially shallow, which degrades habitat quality for CRLF aquatic life stages. Pumping creates shallow aquatic conditions that promote the growth of cattails and tules, aquatic plant species that cannot tolerate deeper water conditions. Over the years, these two tall emergent plant species have encroached on the stillwater aquatic habitats in Sharp Park, namely Laguna Salada, Horse Stable Pond, and the connecting channel between them, greatly reducing the amount of open water, floating, or low emergent vegetation that is suitable habitat for the CRLF and SFGS to breed and feed. This reduces the overall habitat quality for these two species, and reduces the habitat footprint needed for individual frogs and snakes to perform the behaviors they require for survival, behaviors like breeding, feeding, and sheltering. It is my professional opinion that this encroachment, which is really a promotion of succession in a coastal lagoon system that would not otherwise exist at present, is a direct consequence of the Golf Course's ongoing pumping of Horse Stable Pond and Laguna Salada. Lagoons along the coast of California typically have a stream dynamic, largely through winter high flows, that renews their open water habitat footprint. Laguna Salada is a historic lagoon, but its system dynamics are already constrained to varying degrees, mostly by presence of an artificial shoreline berm or seawall. Although these constraints might be expected to alter the lagoon over a long timeline (many decades to a few hundred years), the pumping pattern from Horse Stable Pond has rapidly accelerated the timeline for this encroachment, impairing the species' habitat in a manner that is causing impacts to the species' breeding, feeding, sheltering, and other essential life functions.

---

[2] Because tadpoles, and in particular recent hatchlings, are extremely delicate, it is highly likely that once the tadpole enters the pump, it will be shredded or torn into unidentifiable pieces before these pieces are spewed to the beach. The bony structures of fish and crayfish, on the other hand are likely to remain at least partially intact through such trauma, making them much easier to observe and, in my professional opinion, good indicators of take of the CRLF in this manner.

37. Pumping also modifies CRLF habitat by changing hydrological gradients affecting Laguna Salada. As pointed out by Dr. Peter R. Baye in his technical review and comment of the Sharp Park Conceptual Restoration Alternatives Report (hereafter Alternatives Report Review), pumping of water from Horse Stable Pond will alter hydrological gradients in Laguna Salada in the long run, especially between the groundwater interface between the Ocean and Laguna Salada. More specifically, as the climate change trajectory promotes continuing sea level rise, Dr. Baye's report suggests that it will become more likely that pumping will modify hydrological gradients around Laguna Salada and increase salinity within CRLF breeding habitats. Coupled with the likelihood that ocean wave overtopping of the seawall will continue to increase sea level rises, habitat degradation due to increased salinity in Laguna Salada is ultimately a certainty unless management practices at Sharp Park are changed.

38. Third, pumping can force young CRLF tadpoles into unsuitable habitat if pumping reduces water levels after the young tadpoles hatch from egg masses. At high water levels, oviposition along Laguna Salada's east margin has been well documented. However, because pumping eliminated water depth in this location, the City was forced to move large numbers of these egg masses to prevent massive egg die-offs. If these egg masses had been allowed to hatch when the water levels were sufficiently high, they would have had a high probability of long-term survival.

39. These same consequences of the City's water management activities at Sharp Park are also reasonably certain to take the SFGS. First, by destroying egg masses, and in turn, reducing the number of CRLFs in the Park, the pumping reduces the available prey base for the Snake in such as a manner as to reduce the prospects for survival of individual Snakes that depend on the site. Second, SFGS may also become plastered against the grate – or juveniles sucked through the grate – just as with the CRLF. Third, as noted, these activities adversely modify SFGS habitat in such a manner as to limit the ability of the SFGS to feed, breed, and engage in other critical life functions.

B. <u>Inability of the Compliance Plan to Prevent Take From Pumping Operations</u>

40. It is my understanding that the City has prepared an "Endangered Species Compliance Plan" ("Compliance Plan") for Sharp Park, which I have reviewed. It is my professional opinion that, even if the Compliance Plan were fully implemented, take of CRLF is nonetheless reasonably certain to continue through pumping-induced desiccation, entrainment, habitat modification, and impingement. Moreover, based on records of pump management and operations I have reviewed, my own observations of Sharp Park, and my professional opinion, I believe that the City is not and cannot actually implement the Compliance Plan.

41. The Compliance Plan is predicated on the City's ability to manage water levels to avoid desiccating or stranding frog egg masses. The inadequacy of this premise was made clear this past winter, when more than one hundred CRLF egg masses were put at risk of desiccation, and eggs in at least one egg mass were killed by the pumping operations at Sharp Park, despite the implementation of the Compliance Plan protocols.

42. It is my understanding, based on City records, that beginning in January, 2011, Recreation and Park Department staff-member Jon Campo was required to move over 100 egg masses which he concluded would be stranded and desiccate if left in place. *See* Docket No. 54-3, Ex. 5). I have also reviewed photographs of an egg mass that was documented at Horse Stable Pond completely exposed to the air, and ultimately found desiccated and partially frozen after extended pumping occurred pursuant to the Compliance Plan protocols. (*see* Docket No. 60-1, Ex. 3 and Docket No. 60-2, Ex. 4).

43. All of these egg mass strandings occurred despite the Compliance Plan because pumping water from Sharp Park during CRLF is inherently in conflict with successful frog breeding efforts. Sharp Park's pumps cannot pump water as fast as the rain flows into the system during normal winter rains. This causes floodwaters to rise above the level at which the Compliance Plan specifies the water must be retained. Indeed, upon reviewing the deposition transcript of John Azcariz, the City's stationary engineer, it is apparent that this fluctuation in water levels is part of the design of the Compliance Plan, despite the plan's purported desire to prevent waters from fluctuating. Rapid cycling of the pumps' on/off mechanism places additional wear and

tear on the pumps, so to improve pump longevity the City purposefully allows water levels to rise for some period of time before the pumps are turned on. Azcariz Dep., p. 25. When the pumps turn on and draw the water back down to the original water level, any egg mass that is laid in the interim will become stranded and die. Because it can take days for the water to be drawn down from a large storm, many CRLF egg masses that were laid under high water conditions will be exposed to the air or stranded in isolated pools, even though the Compliance Plan would be functioning as designed.

44. In addition, because the Compliance Plan allows, indeed commands, that a large amount of water to be pumped out to sea, the water that remains to secure egg and tadpole development is reduced. If a large rain event is followed by an extended drought, the buffer of rainwater provided by the initial storm event is eliminated, and the frog eggs and tadpoles are at risk of stranding or mortality.

45. As discussed above, the City addressed the failure of its Compliance Plan by moving stranded egg masses by hand into deeper waters. But it is my understanding the City will no longer be permitted by the FWS to relocate egg masses in Sharp Park until the City obtains incidental take authorization for its ongoing activities. Dec. 8, 2011 FWS letter. It is also my understanding based on Lisa Wayne's January 9, 2012 deposition (at pp. 222-227) that the City's pumping protocols are going to remain unchanged despite this development, and that Ms. Wayne stated "I don't have any specific plans" when she was asked how she would change protocols in response to this development. Her only suggestion was that she would "let the Fish and Wildlife Service know" if egg masses become stranded again this year. In light of these facts, it is my professional opinion that egg mass strandings will be unavoidable in any winter with precipitation levels are sufficient to raise water levels to the emergent edge of Laguna Salada. Given the FWS's prohibition on moving egg masses, any egg mass so laid will likely desiccate and die.

46. Even if FWS were to reverse course and permit the City to move stranded egg masses this year, the City's approach to locating, monitoring, and moving egg masses is so flawed that so long as the City continues to pump during the breeding season, the City can not possibly

ensure that take of CRLF is reduced to the point that permits from FWS are no longer necessary. The City's approach relies on perfect detection levels by biological monitors as they search for CRLF egg masses in the tules, cattails, and bulrushes around Sharp Park's many acres of waterways, ponds, and canals. However, even with attached, essentially immobile life stages like eggs, it is not possible to detect all of the egg masses, or even estimate their individual detectability rate (a condition necessary to estimate egg mass abundance), using single-pass surveys. It is my understanding, based on Mr. Campo's deposition testimony (at pp. 50, 116), that Mr. Campo believes that he cannot observe all egg masses due to several observation constraints, and that he has explained this to his supervisors previously. I concur with this sentiment. In my extremely broad field experience with amphibians and reptiles, I know that detecting every frog and snake during a single-pass survey is nearly impossible to do, even where habitat complexity is extraordinarily low and the surveyor has the highest possible visibility of the habitat. Yet this nearly impossible task is critical to the success of the Compliance Plan, and that is why the plan is simply not capable of stopping take of CRLF at Sharp Park.

47. Locating and then moving stranded or nearly stranded egg masses due to pumping operations is itself a highly questionable mitigation measure. As a preliminary matter, CRLF typically deposit eggs in habitats where at least some of the offspring have a high probability of survival, otherwise the species would rapidly go extinct. It is therefore likely that moving egg masses from the locations CRLF chose to breed will have some deleterious impact. Moreover, most of the egg masses moved last winter were moved into Horse Stable Pond. Movement of egg masses from Laguna Salada to Horse Stable Pond, where a number of CRLF egg masses had already been laid, risks decreasing the survivorship of tadpoles in Horse Stable Pond because tadpole density is artificially and greatly increased. As density increases, CRLF carrying capacity can be reached or exceeded, and tadpole survival rates can decrease.

48. Additionally, CRLF egg masses are delicate, and individual eggs, and even entire egg masses, can be harmed and may become unviable when they are moved. It is my understanding from the testimony produced in this case that when Mr. Campo moves egg masses he does not

ensure that the egg mass is attached to a brace at the new location. Campo Dep., Docket No. 54-5, p. 57. He has also observed egg masses break apart as a consequence of a move, and he has further observed that the egg masses sometimes disappear from places he has moved them to. *Id.,* 58-62. Since a CRLF egg mass, when laid, is attached to a vegetation brace, to move the egg mass it must be removed from that brace and either re-attached to a new brace if placed in deep water, or laid in shallow water to ensure survival. This is because egg masses through the first two-thirds of the developmental interval will sink (they are denser than water) in deep water if unattached, which will increase the likelihood of mortality. Egg masses placed in shallow water to avoid the sinking problem will risk stranding if pumping occurs, or risk floating into deeper water if unattached and any disturbance occurs.

49. In addition, because the City's practice has been to move all egg masses into Horse Stable Pond—where the suction from the pumps is highest—egg mass movement puts tadpoles at a higher risk of entrainment and impingement. The Compliance Plan lacks adequate protocols to prevent impingement or entrainment of tadpoles or other mobile life stages of the CRLF. In particular, the Compliance Plan does not provide for regular observation or monitoring once pumps are turned on after egg masses hatch; it does not provide for a screening mechanism around known oviposition sites that would prevent tadpoles, particularly hatchlings, from swimming too close to the pump intake port during a pumping event; and it does not provide for some kind of velocity reduction mechanism, such as screening baffles, associated directly with the intake port to reduce the likelihood of CRLF life stages being plastered against the screen.

50. It is my professional opinion that the unauthorized take of CRLF and SFGS through pumping operations will continue so long as RPD operates the pumps at Sharp Park, and that prohibiting pumping when egg masses are found will stop pump-related strandings of frog egg masses and will ensure that tadpoles are not entrained or impinged. Ceasing pumping when egg masses are observed would ensure that egg masses have the greatest possible chance to develop, and tadpoles to metamorphose to adult frogs before water levels decrease when the rains stop. This has been recognized by a wide variety of research, and is the appropriate conclusion based on my many years of research. I concur with the statement contained in Appendix C of the

City's "Sharp Park Conceptual Restoration Alternatives Report," in which the City's consulting biologist, Karen Swaim, concluded that "[d]iscontinuing pumping at Horse Stable Pond would be expected to result in reduced fluctuations in water level and a lower risk of egg mass desiccation. . . . Under ambient conditions, rainfall and inflow from the rest of the watershed during this period would prevent egg masses from becoming stranded above the waterline." I also concur with Ms. Swaim's recommendation in the same report that the City should "[e]liminate unnatural water level reductions during the frog breeding season."[3]

51. Discontinued pumping would also ensure that tadpoles or other mobile life stages of the CRLF are not entrained or damaged by the pump, since no pumping would be occurring.

52. Discontinuing pumping would have the added benefit of improving overall habitat conditions for the CRLF by limiting the growth of tules and cattails, which are currently encroaching on a large number of acres of habitat for the frog. Tules and cattails cannot grow in deep water, and other vegetation types or open water eventually replaces them as water levels rise. This would provide additional habitat availability for frog breeding, egg laying, and tadpole development, significantly improving habitat quality and eliminating the impediments to the CRLFs' essential breeding patterns currently imposed by the golf course water management. Discontinuing pumping would also have the benefit of reducing the likelihood of saltwater intrusion into Laguna Salada, and as a consequence, increase the likelihood that CRLF would make greater use of the Laguna Salada for breeding. Water quality data collected within the last 10-year window in Laguna Salada coupled with my own direct observations of the vegetation on selected areas on the west side of Laguna Salada strongly suggest that a salinity influence on Laguna Salada currently exists that appears to vary seasonally. Pumping is likely to exacerbate salinity to levels that would be lethal to CRLF embryos.[4]

---

[3] I have observed atypical water level fluctuations, the consequence of pumping, inhibit breeding in a pond used by Northern red-legged frogs and observed individuals breed in an immediately adjacent pond. Excessive water level fluctuation inhibits breeding in the stream-breeding Foothill yellow-legged frog, so it would not surprise me that atypical fluctuations might not only inhibit breeding at the appropriate time in the CRLF, but it risks egg mortality from stranding after breeding has begun. Any action that minimizes water level fluctuation prior to or during breeding for the CRLF would enhance its successful breeding.

[4] Dredging Laguna Salada to reduce its dense vegetation footprint could result in much more harm and risk to both the CRLF and the SFGS. In particular, the excavation of anoxic organic

C. Take From Mowing and Other Activities

53. Mowing and/or golf cart operations have also been documented to cause take of endangered species at Sharp Park in the past, and it is my professional opinion that these operations also are reasonably certain to result in take of CRLFs and/or SFGS in the future. According to the FWS's 2006 Five-year Status Review of the SFGS, which I have reviewed, a dead SFGS found at Sharp Park in 2005 had been killed by a golf course lawn mower. I have reviewed the declaration of Steve Salisbury, which explains that Mr. Salisbury discovered this dead snake on Sharp Park's Hole 12 near the edge of the green, and I have reviewed the photographs of this snake and have read the correspondence that accompanied the file, all of which is attached to my October 6, 2011 Declaration, *see* Docket No. 60-3, Ex. E. I concur that the snake was killed either by a lawn mower or another mechanized vehicle, such as a golf cart. The dorso-ventral compression indicated in the picture of this animal is characteristic of road-killed snakes that have been run over by a vehicle, of which I have observed many thousands during thousands of hours of road-riding for snakes in my career. However, animals road-killed by car-sized vehicles or larger, especially those the size of a SFGS, typically show extreme dorso-ventral compression: that is they are often paper thin because they have been run over by a number of large vehicles (cars, trunks, or semis) in a relatively short period of time. The animal killed at Sharp Park's Hole 12 shows only a moderate amount of dorso-ventral compression, indicating that the mass of the vehicle or vehicles that ran it over was not as extreme, such as something in the mass range of a mower or a golf cart.

54. Though golf carts have traditionally been viewed as innocuous, recent work clearly demonstrates that they are responsible for substantial mortality among snakes. A 2010 study by Brett DiGregorio and his colleagues on an Outer Banks golf course in South Carolina, *see* Docket No. 79-1, Ex. B, in an area where car-sized vehicle traffic is virtually non-existent, concluded that nearly all of the more than 200 snakes found road-killed in the study were killed by golf carts or lawn mowers, since no other vehicles are used on golf course grounds. Further,

wetland soils can result in the excessive release of toxic sulfides and their acid sulfur oxidation products can subsequently become manifest.

all direct observations by these investigations of a golf cart striking a snake resulted in the death of that snake (B. DiGregorio, *personal communication*).

55. It is reasonably certain that many more SFGS have been killed by mowing and golf cart operations in Sharp Park than have been documented. However, detecting dead SFGS is difficult to do, because snake carcasses are rapidly scavenged. Corvid (various species of crows, ravens and jays) and larid birds (various species of gulls), a number of carnivores (especially foxes, coyotes) and various other species are highly opportunistic scavengers on carrion and will rapidly remove carcasses when these become available.

56. During my two recent (2011) short (partial day) visits to Sharp Park, I observed many crows, gulls, jays, and I heard ravens, and I also directly observed one or two foxes on each visit. The foxes were scavenging from human garbage, suggesting that they were food-limited. In such an environment, I would expect carcasses of either SFGS or CRLF to be available for an observer to detect for only a short time. In fact, Brett DiGregorio and his colleagues clearly demonstrated in a study currently in press (B. DiGregorio, *personal communication*), Docket No. 60-3, Ex. F, that a suite of effective scavengers can result in substantial underestimate of road-kill mortality. My observations of the scavenger set at Sharp Park indicates that numerous effective scavengers are clearly present, so underestimating SFGS mortality at Sharp Park is the anticipated result.

D. <u>Inability of the Compliance Plan to Prevent Take Through Mowing</u>

57. Even if fully implemented, the City's Compliance Plan does not eliminate the reasonable certainty that take from mowing and golf operations will occur, given that the scale of mowing and golf cart use, particularly around the edge of water features, is so massive. As I understand the Compliance Plan, it relies on biological monitors to observe numerous acres of habitat with 100% reliability to ensure that all frogs and snakes will be detected, moved, or mowing delayed until the species are clear from danger. However, the protocol, even if implemented faithfully, cannot attain this level of reliability; rather it is certain to be *unable* to detect all frogs and snakes present. No species of amphibian or reptile has perfect individual detectabilities, and where detectability has been measured it is typically far less than one, with snakes often having

detectabilities less than 0.2 (a detectability of 0.2 simply means that for every individual you see, there are 4 other you did not observe). In imperfect detectability situations, which are the norm for amphibians and reptiles, it is essential to know the levels of detectability of the animals you are trying to observe, or you cannot obtain accurate survey results. But the Compliance Plan protocol, which relies on single-pass, visual surveys before mowing occurs, cannot estimate detectability rates—at least two passes under controlled circumstances would be needed to estimate detectability, and such controlled conditions are unlikely to occur at Sharp Park. Therefore, the City is likely to take SFGS or CRLF simply because it failed to detect the animal under the Compliance Plan protocol.

58. Moreover, it is my understanding that monitoring at Sharp Park is being conducted by the golf course mowing staff, and that this monitoring is infrequent, sometimes conducted in the dark, and not conducted by individuals with the requisite training (Kappelman Deposition, pp. 51-56). Therefore, even these basic, albeit inadequate monitoring safeguards contained in the Compliance Plan are not being implemented. Hence, this inadequate protocol is highly likely to result in take.

59. For these reasons, it is my professional opinion that unauthorized take of SFGS and CRLF through mowing operations is highly likely to occur unless defendants cease mowing and golf cart use within roughly 200 meters of the delineated wetland boundary area at Sharp Park, which will ensure that the species are not taken while they traverse within their normal daily range. Moreover, the size of the buffer area will ensure that edge and upland habitats will extend out beyond the high water mark of flooded areas, and provide secure refuge, estivation and underground habitat for snakes and frogs.

III. The Ongoing Take Threatens The CRLF and SFGS Populations At Sharp Park/Mori Point, and Undermines NPS's Recovery Efforts

60. It is my professional opinion that unless golf course operations that cause ongoing take of the CRLF and SFGS are halted or at least significantly curtailed, populations of both species in the Sharp Park/Mori Point complex will likely be lost in the foreseeable future. With respect to the SFGS, in view of the extremely imperiled status of the species and the critical importance

of conserving all remaining populations, it is my professional opinion that the ongoing take that is occurring at Sharp Park is jeopardizing the entire species.

61. Moreover, because of Sharp Park's proximity to recovery efforts at Mori Point, the golf course is also negatively affecting a functioning recovery process. The Mori Point recovery effort is the driver that maintains and enhances the CRLF and SFGS at the Sharp Park/Mori Point complex. If the harmful activities at Sharp Park are not arrested, the recovery efforts complete disruption and ultimately fail.

62. As a preliminary manner, the available data does not support the proposition that there has been an "overall increase in the number of CRLF in Horse Stable Pond and to a lesser extent, in Laguna Salada." Decl. of Lisa Wayne, Docket No. 72, p. 2. In fact, Fong et al. 2010 showed CRLF egg mass numbers in Horse Stable Pond were, at best, stable from 2003 to 2009, *not* that the egg mass numbers have been increasing. My own analysis of the data set supplemented with 2010 and 2011 egg mass data, supports Fong et al.'s conclusion. I ran a simple linear regression on the GGNRA's available data set for egg masses surveyed at Horse Stable Pond. This data set includes all known observations of egg masses at Horse Stable Pond, but excludes egg masses from Laguna Salada because there has been inconsistent survey effort by the City at Laguna Salada across time, making year-to-year trend analysis of Laguna Salada's egg mass data ambiguous. The results of this analysis show that there has been no discernable change in egg mass numbers at Horse Stable Pond over the past nine years.

63. I agree with Lisa Wayne's subsequent deposition testimony that there are no discernable changes in CRLF egg mass numbers at Sharp Park. For example, when asked, "[d]o you have an understanding of what the trend is of the population of red-legged frogs at Sharp Park?," she responded "no." When she was asked, "What I want to make sure I understand is you can't draw any conclusions on the population trends of Sharp Park based on the egg mass observations of last year; is that right?," she responded "No. In one year, no." Wayne Dep., p. 249-50.

64. It is my professional opinion that pumping-induced habitat degradation at Sharp Park, combined with the high probability of CRLF take events into the future, will cause the CRLF

population to become unstable, decline, and threaten the recovery of the entire Sharp Park/Mori Point population. The defendants' and intervenors' declarants agree that Laguna Salada currently provides poor breeding habitat for CRLF. For example, Dr. Jennings has stated that "Laguna Salada and Horse Stable Pond are now completely choked with a thick and overgrown mat of tules and cattails, displacing optimal frog breeding ground and resulting in less favorable habitat for the Frog," Jennings Decl., p. 19, and Lisa Wayne has suggested that "[d]ense tule and cattail growth, in particular, reduce the value of the habitat for CRLF breeding."[5]

65. What is missing from their statements is an explanation about why tule and cattail growth is increasing. As explained by Dr. Peter Baye, this encroachment is directly attributable to golf course pumping and water management. As water is drawn down by pumping to a shallow depth, and kept within a narrow elevation band, tules and cattails, which cannot survive in deeper waters, are able to grow and spread in the artificially shallow lagoon. This is directly attributable to the artificial water levels imposed by golf course management, and the decline in habitat quality described by the intervenors and the defendants is directly attributable to this pumping-induced vegetation growth. I agree with Ms. Wayne's deposition testimony where she stated that allowing water levels to increase at Sharp Park would prevent tules and cattails from growing rapidly in Laguna Salada and Horse Stable Pond. Wayne Dep., p. 214-215.

66. Breeding habitat in Sharp Park has been declining due to succession caused by artificially shallow and invariant water levels. Furthermore, juvenile recruitment at Sharp Park is also low. How is it then possible that so many egg masses were laid at Sharp Park in 2011? The answer lies neither in the City's failed Compliance Plan, nor in the pumping and mowing threats that the golf course imposes on these species. Rather, the answer is found in the increase in habitat via the creation of new ponds at Mori Point since 2005, and in recognizing the fact

---

[5] Laguna Salada's decreasing ability to sustain CRLF habitat over time is also indicated by the failure to find CRLF tadpoles in the lagoon, 2008 Swaim report, p. 5.1, and the generally fewer observations of juvenile CRLF in Laguna Salada relative to Horse Stable Pond. These observations clearly indicate inadequate habitat conditions and recruitment problems for CRLF in Laguna Salada.

that the CRLFs that occupy Sharp Park do not represent a population independent from the CRLFs at Mori Point.

67. Directly adjacent to Sharp Park, Mori Point's recently restored habitats are a demonstrable population source that contributes to CRLF and SFGS production at Sharp Park and Mori Point. In November 2004, the Fish and Wildlife Service, the Golden Gate Park Conservancy and the Golden Gate Natural Research Area completed construction of two ponds (Willow and Middle Ponds) at Mori Point to enhance amphibian habitat and provide foraging opportunities for the SFGS (see Fong et al. 2010). In addition, in the fall of 2007 two larger ponds (Wetland Pond [36 m ! 12 m] and Southern Pond [18 m ! 32 m]) were built at Mori Point.

68. During this time period, CRLF egg masses and SFGS were surveyed at both Sharp Park and Mori Point to determine the efficacy of the recovery efforts. The analysis of these surveys showed, as discussed above, that egg mass counts in Horse Stable Pond over this time interval showed no significant change—they were essentially stable. On the other hand, a statistically significant increase in egg mass numbers exists over the 7-year interval 2003-2009 at Mori Point (Fong et al. 2010, p. 6). Using the additional data for the most recent two years (2010 and 2011) obtained from the National Park Service, I ran a linear regression model on the Mori Point egg mass data for the entire suite of years between 2003 and 2011. I was able to show that a general increasing trend in egg mass counts at Mori Point—an indication that the CRLF recovery there is working.

69. In sum, it is my professional opinion that any increase in egg masses observed in the Sharp Park/Mori Point complex reflects continued increases in recruitment from the Mori Point ponds. Yet because defendants' activities at Sharp Park are taking the CRLF in several ways, including by adversely altering habitat conditions at Sharp Park, defendants activities are in fact having negative population-level impacts on the entire Mori Point/Sharp Park CRLF population. Indeed, to the extent that Sharp Park is now operating as a "population sink" due to defendants' activities, the extensive efforts by NPS to recover the CRLF population are being directly undermined and made far less effective than otherwise would be the case. Over the long term, it

is my view that these activities threaten the survival of the resident population and, if the population is lost, the recovery of the entire species will be impeded.

70. Similarly, SFGS in the Mori Point/Sharp Park complex are being negatively impacted by Sharp Park Golf Course's activities, while Mori Point's restoration work is helping the species recover. As explained above, the GGNRA has invested in extensive recovery efforts at Mori Point by constructing feeding habitats for the SFGS. A baseline survey was conducted before these ponds were constructed, and follow-up surveys for SFGS in 2006 and 2008 were implemented to determine the impact of the recovery effort.

71. The surveys were conducted by Swaim Biological, and published in a report entitled San Francisco Garter Snake Habitat Improvement Project at Mori Point, Pacifica, California 2004-2008. I have reviewed this report, and it appears that the SFGS population is in fact growing because of the habitat restoration efforts at Mori Point. The Swaim report generally shows greater numbers of SFGS over the interval 2004-2008, suggesting a recovery since the last systematic surveys were conducted in the mid-1980s and early 1990s. The report itself concludes that the "the long-term response of the SFGS population to the pond creation and enhancement project will be positive." Yet as explained above, Sharp Park's actions act as a "sink" on the overall population, and because the SFGS population is very small, the impact of this sink has extreme import on the population as a whole. If the golf course activities are not abated, it is my professional opinion that the SFGS population at Mori Point/Sharp Park will likely go extinct, and the entire species will be jeopardized with extinction.

1/20/12	s/Marc Hayes
Date	Marc Hayes, Ph.D.

I, Brent Plater, hereby attest that Marc Hayes concurrence in the submission of this document has been obtained.

Executed on: January 20, 2012

Brent Plater

EXHIBIT A

CURRICULUM VITA

Marc Philip Hayes

Birthdate: 12 October 1950
Birthplace: Marysville, California
Nationality: American, first generation (French mother)

Specializations: I am a research herpetological ecologist. The large majority of my career has focused on the ecology of amphibians and reptiles. My work has emphasized aquatic herpetofauna; in particular, the ecology of western North American ranid frogs and Pacific Northwest stream-associated amphibians, fish-amphibian and gartersnake-amphibian interactions, and the ecology of the two Pacific coast turtle species. Most of my work also focuses on native species conservation.

Current Foci: Movement ecology of the northern red-legged frog (*Rana aurora*); the influence of predation on the movement patterns of ranid frogs; Oregon spotted frog (*Rana pretiosa*) ecology, demography and overwintering patterns; ecology of the stream-breeding Coastal tailed frog (*Ascaphus truei*); and influences of altered hydrologies on amphibian habitat use.

Education:

1991 PhD *with distinction*, University of Miami, Miami, Florida
Dissertation: Attendance in the tropical, leaf-breeding frog *Centrolenella fleischmanni* (Anura: Centrolenidae): A study in parental care.
Major Advisor: Jay M. Savage

1975 MA *with highest honors*, California State University, Chico, California
Thesis: Systematics and ecology of the California mountain kingsnake (*Lampropeltis zonata*).
Major Advisor: Frank S. Cliff

1972 BA University of California, Santa Barbara, California

1970 AA *salutatorian*, Yuba College, Marysville, California

1968 Diploma Yuba City High School, Yuba City, California

Teaching Experience:

2010 (April) Society of Wetland Scientists (SWS); Amphibian Management Workshop.

2009 (March) SWS; Amphibian ID & Habitat Assessment Workshop;.

1999 (spring) Portland State University; Vertebrate Zoology (BI 387); lecture and lab.

1999 (June) Bureau of Land Management, Klamath Falls; Workshop on Amphibian and Reptile ID and Habitat Evaluation.

1998 (June) Portland State University; Field Herpetology (BI 505); lecture and lab; techniques course.

1992-8 Portland Community College; Biology [for non-majors] (BI 101,102,103); Principles of Biology [for majors] (BI 211,212,213), and Habitat courses (BI 141[Forest], BI 142[Aquatic], BI 143[Marine]); lecture and lab in all except BI 101 and 103, where lab only.

1996	US Fish and Wildlife Service and Willamette National Forest; Workshop on ecology of the Oregon spotted frog (*Rana pretiosa*).
1996 (spring)	Workshop on the western pond turtle (*Clemmys marmorata*); US Fish and Wildlife Service.
1995 (spring)	Portland State University; Herpetology (BI 413/513); lecture and lab; team taught with Drs. Richard Forbes and Stanley Hillman.
1993 (spring)	Pacific University; Behavioral Statistics (PSY 350); lecture and lab.
1993 (spring)	Oregon Zoo; Taught a ZooUniversity course on Amphibian Ecology.
1992 (fall)	Oregon Zoo; Taught a ZooUniversity course on Arctic Ecology.
1983-1986	University of Miami; Taught the laboratory sections of courses in Elementary Ecology (BSC 103) and General Biology (BSC 111/112). [both lower division college courses.]
1978-1982	University of Southern California; As a teaching assistant, taught laboratory sections in Ecology and Evolutionary Biology (BIO 215), Fundamentals of Vertebrate Biology (BIO 302), General Biology (BIO 106L), and Genetics (BIO 210) and Humans and their Environment (BIO 102) [all lower division college courses]; and taught lecture and lab in Ornithology (BIO 477L) and Herpetology (BIO 543L). [both upper division and graduate college courses]
1976-1978	Butte College; Taught Environmental Quality Protection (ESC 200) [lecture course]; Field Biology (BIO 205), Field Botany (BIO 204), Human Anatomy (BIO 220), and Human Physiology (BIO 221) [lab and lecture for all courses], and Natural History of Butterfly Botanical Area (INP 100) [field course]. [all were lower division college-level courses].
1975 (spring)	Bureau of Land Management, northern California; Taught Amphibian and Reptile Identification/Ecology Workshop.
1974-1975	California State University, Chico; As teaching assistant, taught laboratory sections in General Zoology (BIO 107) and Human Anatomy (BIO 122) [both lower division college-level courses].

Work Experience:

2006-present	Senior Research Scientist, Science Team, Habitat Program, Washington Department of Fish and Wildlife; Expanded responsibilities addressing adaptive management research on amphibians in headwater streams; coordinate multi-state co-operation for Recovery of the Oregon spotted frog.
2001-2003	Conducted overwintering study of the Oregon spotted frog at Conboy Lake National Wildlife Refuge; Washington State Department of Transportation (sponsor).
2000-2005	Research Scientist, Science Team, Habitat Program, Washington Department of Fish and Wildlife; Primary responsibility addresses leading adaptive management research on amphibians in headwater streams to ultimately test whether the patch buffers prescribed in the statewide Forest

and Fish Agreement are effective in protecting the resources in headwater streams through timber harvest rotations.

2000- Bullfrog selectivity study; on-going work at Conboy Lake National Wildlife Refuge designed to determine whether bullfrogs exhibit any dietary selectivity (positive or negative), especially with respect to the Oregon spotted frog as prey; w/ Christopher A. Pearl and R. Bruce Bury, US Fish and Wildlife Service (sponsor).

2000-2001 Oregon spotted frog demographic study; on-going work at Conboy Lake National Wildlife Refuge designed to determine whether significant larger Oregon spotted frogs found at Conboy exhibit differences in growth or age population from those elsewhere, US Fish and Wildlife Service and The Wildlife Society (sponsors).

1999-2002 Coordinator and Scientific Lead; Rivergate Project; Leading 10-person team in an on-going ecosystem study of South Rivergate Corridor (Lower Columbia River) with focus on western painted turtle (*Chrysemys picta*); Port of Portland (sponsor).

1999-2002 Northern red-legged frog (*Rana aurora aurora*) movement study; work on the Tiller Ranger District of the Umpqua National Forest (southwestern Oregon) designed to determine seasonal spatial patterns of habitat utilization; w/ Christopher A. Pearl and Christopher J. Rombough, Oregon Zoo and the Umpqua National Forest (sponsors).

1999-2001 Northern red-legged frog (*Rana aurora aurora*) overwintering study; work at Burlington Bottoms (Lower Columbia River) designed to determine overwintering patterns; w/ Dr. Peter I. Ritson, US Fish and Wildlife Service (sponsor).

1996-2001 Herpetological Scientific Advisor, North Umpqua Hydroelectric Project; Scientific advisor during FERC relicensing on dynamics of hydrological modifications as influencing the amphibian and reptile fauna of the North Umpqua Hydroelectric Project; Advisor for Stillwater Sciences, Berkeley, California.

1999-2000 Oregon spotted frog/bullfrog habitat partitioning study; on-going work at Conboy Lake National Wildlife Refuge designed to determine how habitat utilization of the Oregon spotted frog and bullfrog differ; w/ Joseph D. Engler, US Fish and Wildlife Service (sponsor).

1998-2000 Co-operator on movement and overwintering study of the Columbia spotted frog (*Rana luteiventris*); w/ Dr. Evelyn Bull, Pacific Northwest Forest Range and Experiment Station, La Grande.

1998-2001 Co-operator on study of headwater stream amphibians that builds an empirically based model of amphibian response in undisturbed versus disturbed (timber harvested) situations; w/ Stillwater Sciences (consultants); NCASI (sponsor), timber industry-funded entity addressing major environmental issues.

1998-9 Oregon spotted frog overwintering study; pilot study design to identify basic overwintering patterns; US Fish and Wildlife Service (sponsor).

1996 Expert panelist; Amphibians and reptiles; Habitat-Species project; Numerous sponsors collectively led by David Johnson and Tom O'Neill, respectively, with the Washington and Oregon Departments of Fish and Wildlife.

1987-1988 Laboratory Coordinator; Organized and coordinated teaching assistants and laboratory technicians in teaching, lab prep, and testing for General Biology (BSC 111/112) at University of Miami.

1972-1997 Researcher, co-operator, participant in over 60 ecological projects for various federal, state, local and private entities.

Other Experience:

2011- Member, Washington State Aquatic Nuisance Species Guidance Committee; committee formulates policy and addresses approaches for dealing with exotic and nuisance aquatic species.

2010- Adjunct Professor, Central Washington University, Ellensburg, Washington. Serving on Committee for Brandon Fessler Masters Degree Candidate working on the movement ecology of the Coastal giant salamander (*Dicamptodon tenebrosus*).

2007- Adjunct Professor, University of Washington, Department of Fisheries, Served on Committee for Amy Yahnke, who complete a Masters Degree on stillwater amphibian ecology in stormwater ponds; and serving on Committee for Amy Yahnke, PhD candidate working on contaminants affecting amphibians in stormwater ponds.

2002- Affiliate Curator, Herpetology, University of Washington Burke Museum. Herpetological collection research and curation.

2001-2006 Adjunct Professor, The Evergreen State College, Olympia, Washington. Served on Committee's for Jennifer Serra Shean and Joanne Schuett-Hames, both graduate students that completed Masters theses on the movement ecology of Northern red-legged frogs (*Rana aurora*).

2001-2009 Herpetological Review, Section Editor, Natural History Notes, Herpetological Review; editor for natural history notes on amphisbaenids, crocodilians, lizards, and tuataras (*Sphenodon*).

2000- Committee Member for two Master’s level student projects at The Evergreen State College addressing northern red-legged frog movement and habitat utilization ecology.

2000-2001 Panel Member, Washington State Aquatic Nuisance Species Committee; committee addresses all issues regarding all categories of exotic animal and plant nuisance species ranging from immediate problems to education to research.

1998-2000 Panel Member, Wildlife Integrity Committee of the Oregon Department of Fish and Wildlife; committee developed scientifically based designations for imported and exotic wildlife.

1992- Adjunct Assistant, then Adjunct Associate Professor (1995-), Portland State University; served on Committees for Aaron Borisenko, a graduate student who obtained a Master's degree on the status of the Foothill yellow-legged frog (*Rana boylii*) in Oregon; and Catherine Callison, a graduate study who obtained a Master's degree on the Northern red-legged frog oviposition behavior and ecology.

Posters and Presentations:

2009 "Amphibian production in stormwater detention ponds, King County, Washington." presented at the 2009 Joint Annual Meeting of the Society for Northwestern Vertebrate Biology and Washington Chapter of the Wildlife Society held at Skamania Lodge, Stevenson, Washington, February 18-21, 2009. w/ Amy Yahnke and Christain Grue. (contributed poster)

2009 "Sex-specific identification of *Ascaphus truei* at maturity." presented at the 2009 Joint Annual Meeting of the Society for Northwestern Vertebrate Biology and Washington Chapter of the Wildlife Society held at Skamania Lodge, Stevenson, Washington, February 18-21, 2009. w/ April Barreca and Teal Waterstrat. (contributed poster)

2009 "Torrent Salamander movement ecology: perspective on a 'sedentary' species." Abstracts from the 2009 Joint Annual Meeting of the Society for Northwestern Vertebrate Biology and Washington Chapter of the Wildlife Society held at Skamania Lodge, Stevenson, Washington, February 18-21, 2009. w/ Julie Tyson. (contributed poster)

2007 "Species identification and body size estimation of amphibians in Washington State based on foot morphology. Abstracts from the 2007 Annual Meetings of the Society for Northwestern Vertebrate Biology, Northwest Scientific Association and Northwest Lichenologists held jointly at Harbour Towers & Suites, Victoria, BC, February 21-24, 2007. Northwestern Naturalist 88:101-127. (contributed poster)

2007 "Comparative diet of three species of terrestrial forest-dwelling amphibians (*Rana aurora*, *Dicamptodon tenebrosus*, and *Rhyacotriton kezeri*) in western Washington." Abstracts from the 2007 Annual Meetings of the Society for Northwestern Vertebrate Biology, Northwest Scientific Association and Northwest Lichenologists held jointly at Harbour Towers & Suites, Victoria, BC, February 21-24, 2007. w/ Casey Richart and Ryan O'Donnell. (contributed talk)

2007 "Differentiating *Ascaphus truei* at sexual maturity." presented at the 2007 Annual Meetings of the Society for Northwestern Vertebrate Biology, Northwest Scientific Association and Northwest Lichenologists held jointly at Harbour Towers & Suites, Victoria, BC, February 21-24, 2007. w/ April Barreca and Teal Waterstrat. (contributed talk)

2006 "Trends in the breeding population of Oregon Spotted Frog (*Rana pretiosa*) at Conboy Lake National Wildlife Refuge. Abstracts from the 2006 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society held jointly at Evergreen State College, Washington, March 27-April 1, 2006. w/ Joseph Engler and Christopher Rombough. (contributed talk)

2006 "Washington terrestrial slugs and snails." presented at the 2006 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society held jointly at Evergreen State College, Washington, March 27-April 1, 2006. w/ Casey Richart and William Leonard. (contributed poster)

2006 "Dispersion of Coastal Tailed Frog (*Ascaphus truei*): A hypothesis relating occurrence of frogs in non-fishbearing headwater basins to their seasonal movements." presented at the 2006 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society held jointly at Evergreen State College, Washington, March 27-April 1, 2006. w/ Timothy Quinn, Daniel Dugger, and Tiffany Hicks. (invited talk)

2006 "Torrent Salamander distribution within headwater streams." presented at the 2006 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society held jointly at Evergreen State College, Washington, March 27-April 1, 2006. w/ Amberlynn Pauley, Stephen West and Marty Raphael. (contributed poster)

2005 "Foothill Yellow-legged Frog abundance in Cow Creek." Abstracts from the 2005 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Oregon Chapter of the Wildlife Society held jointly at Corvallis, Oregon, February 22-25, 2005. w/ Christopher Rombough and Nancy Duncan. (contributed talk)

2005 "Columbia Torrent Salamander (*Rhyacotriton kezeri*) occurrence in headwater streams: the importance of water," presented at the 2005 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Oregon Chapter of the Wildlife Society held jointly at Corvallis, Oregon, February 22-25, 2005. w/ Daniel Dugger and Timothy Quinn. (contributed talk)

2005 "*Plethodon* Salamander occupancy in managed landscapes in southwest Washington." presented at the 2005 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Oregon Chapter of the Wildlife Society held jointly at Corvallis, Oregon, February 22-25, 2005. w/ Aimee McIntyre, Timothy Quinn, Daniel Dugger, and Tiffany Hicks. (contributed talk)

2003 "Population changes in the Oregon spotted frog at Conboy National Wildlife Refuge: The pivotal role of hydrology", presented at the 2003 Annual Meeting of the Washington Chapter of The Wildlife Society in Port Townsend, Washington, April 15-17 w/ Joseph D. Engler. (invited talk).

2003 "Comparing Amphibian Sampling Methods : Which is Best for Headwater Streams?", presented at Amphibian Sampling Symposium at the 2003 Annual Meeting of the Society for Northwestern Vertebrate Biology in

Arcata, California, March 19-22. w/ Daniel J. Dugger, Tiffany L. Hicks, and Timothy Quinn. (invited talk).

2003 “Headwater Habitat Variation: Its Relationship to Stream Amphibian Distribution”, presented at the 2003 Annual Meeting of the Society for Northwestern Vertebrate Biology in Arcata, California, March 19-22. w/ Daniel J. Dugger, Tiffany L. Hicks, and Timothy Quinn (invited poster).

2003 “Headwater Habitat Variation: Its Relationship to Stream Amphibian Distribution”, presented at the 2003 Annual Meeting of the Society for Northwestern Vertebrate Biology in Arcata, California, March 19-22. w/ Daniel J. Dugger, Tiffany L. Hicks, and Timothy Quinn (invited poster).

2000 “Egg attendance in the frog genus *Hyalinobatrachium*: Function and Phylogenetic Implications”, part of the Symposium on Ecology and Evolution in the Tropics: Essays in Tribute to Jay M. Savage, presented at the 80^{th} Annual Meeting of the American Society of Ichthyologists and Herpetologists in La Paz, Mexico, June 14-20. w/ Roy W. McDiarmid (invited talk).

2000 “Oregon spotted frog *Rana pretiosa* oviposition: Conservation Implications”, presented at the 80^{th} Annual Meeting of the American Society of Ichthyologists and Herpetologists in La Paz, Mexico, June 14-20. w/ Joseph D. Engler (contributed talk).

2000 “Oviposition patterns in the northern red-legged frog: Factors in site choice”, presented at the 80^{th} Annual Meeting of the American Society of Ichthyologists and Herpetologists in La Paz, Mexico, June 14-20. w/ Christopher J. Rombough, presenter (contributed talk).

2000 “Foothill yellow-legged frog *Rana boylii* decline in Oregon: Conservation implications”, presented at the 80^{th} Annual Meeting of the American Society of Ichthyologists and Herpetologists in La Paz, Mexico, June 14-20. w/ Aaron N. Borisenko, presenter (contributed talk).

2000 **“**Oregon spotted frog *Rana pretiosa* oviposition: Conservation Implications**”**, part of the Symposium on Terrestrial and Riparian Amphibians, presented at the year 2000 Joint Annual Meeting of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society in Ocean Shores, Washington, March 15-17. w/ Joseph D. Engler (invited talk).

1999 “Oregon spotted frog in the Klamath Basin: History and Ecology”; Third Klamath Basin Ecological Conference, sponsored by the Klamath Basin Ecological Restoration Office (invited talk)

1999 “Oregon spotted frog oviposition: Conservation implications”; First Annual Northwest Conservation Research Consortium, sponsored by the Oregon Zoo (invited talk)

1998 “Oregon spotted frog: History and current ecology”; Symposium on the spotted frogs of Oregon, sponsored by US Fish and Wildlife Service (invited talk)

1998	"Vulnerability to predation of the Oregon spotted frog to the bullfrog"; Annual meeting of the Society for Northwestern Vertebrate Biology (contributed talk)
1998	"The status of Oregon spotted frog across its geographic range"; Joint annual meeting of the ASIH, Herpetologists League, and SSAR (invited poster)
1997	"The egg-laying reptile fauna of the Squaw Flat Research Natural Area: Implications for forest management"; The Wildlife Society annual regional meeting, Bend, Oregon (invited talk)
1997	"Vulnerability of the postmetamorphic stages of the Oregon spotted frog"; The Wildlife Society annual regional meeting, Bend, Oregon (contributed talk)
1975-1996	Over 30 invited talks and two invited posters, mostly on various aspects of amphibian ecology and conservation.

<u>Publications</u>

Tidwell, K.S., D.J. Shepherdson, and M.P. Hayes. Inter-populational variability in evasive behavior in the Oregon Spotted Frog (*Rana pretiosa*). *Journal of Herpetology* (in review)

Padgett-Flohr, G., and M.P. Hayes. 2011. Assessment of the vulnerability of the Oregon spotted frog (*Rana pretiosa*) to the Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*). *Herpetological Conservation and Biology* 6(2):99-106.

Conlon, J.M., M. Mechkarska, E. Ahmeda, L. Coquet, T. Jouenne, J. Leprince, H. Vaudry, M.P. Hayes, and G. Padgett-Flohr. 2011. Host defense peptides in skin secretions of the Oregon spotted frog *Rana pretiosa*: Implications for species resistance to chytridiomycosis. *Developmental and Comparative Immunology* 35:644-649.

Palmeri-Miles, A.F., K.A. Douville, J.A. Tyson, K.D. Ramsdell and M.P. Hayes. 2010. Field observations of oviposition and early development of the Coastal Tailed Frog (*Ascaphus truei*). *Northwestern Naturalist* 91(2):206-213.

Hayes, M.P., C.J. Rombough, G.E. Padgett-Flohr, L.A. Hallock, J.E Johnson, R.S. Wagner, and J.D. Engler. 2009. Amphibian chytridiomycosis in the Oregon spotted frog (*Rana pretiosa*) in Washington State, USA. *Northwestern Naturalist* 90(2):148-150.

McIntyre, A.P., M.P. Hayes and T. Quinn. 2009. *Type N Feasibility Study*. A report submitted to the Landscape and Wildlife Advisory Group, Amphibian Research Consortium, and the Cooperative Monitoring, Evaluation, and Research Committee. Washington Department of Fish and Wildlife, Olympia, Washington. 48 pp. + appendices

Ricketts, N.L., and M.P. Hayes. 2009. *2009 Pilot Citizen Science Stillwater Amphibian Protocol Summary Report*. Washington Department of Fish and Wildlife, Olympia, Washington. 33 pp. + appendices

Curry, T.R. and M.P. Hayes. 2009. *Rana aurora* (Northern Red-legged Frog). Egg mass disturbance. *Herpetological Review* 40(2):208-209.

Kroll, A.J., M.P. Hayes, and J.G. MacCracken. 2009. Concerns regarding the use of amphibians as metrics of critical biological thresholds: a comment on Welsh and Hodgson (2008). *Freshwater Biology* 54(11):2364-2373.

Tyson, J.A., K.A. Douville and M.P. Hayes. 2009. *Rhyacotriton olympicus* (Olympic Torrent Salamander). Maximum larval size. *Herpetological Review* 40(1):67.

Lund, E.M., M.P. Hayes, T.R. Curry, J.S. Marsten, and K.R. Young. 2008. Predation on the Coastal Tailed Frog (*Ascaphus truei*) by a shrew (*Sorex* spp.) in Washington State. Northwestern Naturalist 98():200-202.

Hayes, M.P; T. Quinn; K.O. Richter; J.P. Schuett-Hames; and J.T. Serra Shean. 2008. Maintaining Lentic-Breeding Amphibians in Urbanizing Landscapes: The Case Study of the Northern Red-Legged Frog (*Rana aurora*). Pp. 445-461. *In*: Mitchell, J.C., R.E. Jung Brown, and B. Bartholomew (editors), *Urban Herpetology*, Society for the Study of Amphibians and Reptiles, Herpetological Conservation 3. [Book chapter]

Hayes, M.P., T. Quinn, and T.L. Hicks. 2008. *Implications of Capitol Lake Management for Fish and Wildlife*. Report to the Washington State Department of General Administration, Olympia, Washington. 88 pp. + appendices

Hayes, C.B., and M.P. Hayes. 2008. *Elgaria coerulea* (Northern Alligator Lizard). Juvenile growth. *Herpetological Review* 39(2):222-223.

Hicks, T.L., D.E. Mangan, A.P. McIntyre and M.P. Hayes. 2008. *Rhyacotriton kezeri* larval diet. *Herpetological Review* 39(4): 456-457.

Rombough, C.J. and M.P. Hayes. 2008. *Rana pretiosa* (Oregon Spotted Frog). Reproduction. *Herpetological Review* 39(3):340-341.

Waterstrat, F.T., A.P. McIntyre, M.P. Hayes, K.M. Phillips, and T.R. Curry. 2008. *Ascaphus truei* (Coastal Tailed Frog). Atypical Amplexus. *Herpetological Review* 39(4):458.

Richart, C.H., M.P. Hayes and R.P. O'Donnell. 2007. Comparative diet of three species of terrestrial forest-dwelling amphibians (*Rana aurora*, *Dicamptodon tenebrosus*, and *Rhyacotriton kezeri*) in western Washington. *Northwestern Naturalist* 88(2):121-122. [abstract]

Quinn, T.; Hayes, M.P.; D.J. Dugger; T.L. Hicks; and A. Hoffmann. 2007. Comparison of two techniques for surveying headwater stream amphibians. *Journal of Wildlife Management* 71(1):282-288.

Barreca, A.B., F.T. Waterstrat, and M.P. Hayes. 2007. Differentiating *Ascaphus truei* at sexual maturity. *Northwestern Naturalist* 88(2):102-103. [abstract]

O'Donnell, R.P., T. Quinn, M.P. Hayes and K.E. Ryding. 2007. Comparison of three methods for surveying amphibians in forested seep habitats in Washington State. *Northwest Science* 81(4):274-283.

Hayes, M.P. 2007. Size record? *Herpetological Review* 38(4):393.

Rombough, C.J. and M.P. Hayes. 2007. *Rana boylii* (Foothill Yellow-legged Frog). Reproduction. *Herpetological Review* 38(1):70-71.

Waterstrat, F.T., R.L. Crawford, and M.P. Hayes. 2007. *Ascaphus truei* (Tailed Frog). Spider Prey. *Herpetological Review* 38(3):318.

Hayes, M.P., C.J. Rombough and C.B. Hayes. 2007. *Rana aurora* (Northern Red-legged Frog). Movement. *Herpetological Review* 38(2):192-193.

Hayes, M.P; T. Quinn; D.J. Dugger; T.L. Hicks; M.A. Melchiors; and D.E. Runde. 2006. Dispersion of coastal tailed frog (*Ascaphus truei*): An hypothesis relating occurrence of frogs in non-fish-bearing headwater basins to their seasonal movements. *Journal of Herpetology* 40(4):531-543.

Hayes, M.P., T. Quinn, D.J. Dugger, and T.L. Hicks. 2006. Dispersion of Coastal Tailed Frog (*Ascaphus truei*): A hypothesis relating occurrence of frogs in non-fishbearing headwater basins to their seasonal movements. *Northwestern Naturalist* 87(2):171-172. [abstract]

Karraker, N.E., D.S. Pilliod, E.L. Bull, P.S. Corn. L.V. Diller, L.A., Dupuis, M.P. Hayes, B.R. Hossack, G.R. Hodgson, E.J. Hyde, K. Lohman, B.R. Norman, L.M. Ollivier, C.A. Pearl, C.R. Peterson. 2006. Taxonomic variation in the oviposition by Tailed Frogs (*Ascaphus* spp.). *Northwestern Naturalist* 87(2):87-97.

Hayes, M.P., J.D. Engler, and C.J. Rombough. 2006. Trends in the breeding population of the Oregon spotted frog (*Rana pretiosa*) at Conboy Lake National Wildlife Refuge. *Northwestern Naturalist* 87(2):171. [Abstract]

Hayes, M.P., J.D. Engler and C.J. Rombough. 2006. *Rana pretiosa* (Oregon Spotted Frog). Predation. *Herpetological Review* 37(2):209-210.

Hayes, M.P., M.R. Jennings, and G.B. Rathbun. 2006. *Rana draytonii* (California red-legged frog). Prey. *Herpetological Review* 37(4):449.

Price, R.F., D.J. Dugger, T.L. Hicks and M.P. Hayes. 2006. *Dicamptodon copei* (Cope's Giant Salamander). Predation. *Herpetological Review* 37(4):436-437.

Rombough, C.J., M.P. Hayes and J.D. Engler. 2006. *Rana pretiosa* (Oregon Spotted Frog). Maximum size. *Herpetological Review* 37(2):210.

Richart, C.H., M.P. Hayes and W.P. Leonard. 2006. Washington terrestrial slugs and snails. Northwestern Naturalist 87(2):184. [abstract]

Hayes, M.P., and L.L.C. Jones. 2005. *Rhyacotriton olympicus*. Pp. 880-882. *In*: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Hayes, M.P. and T. Quinn. 2005. *Rhyacotriton kezeri*. Pp. 876-880. *In*: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Hayes, M.P. 2005. *Rhyacotriton cascadae*. Pp. 874-876. *In*: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Pearl, C.A., and M.P. Hayes. 2005. *Rana pretiosa*. Pp. 577-580. In: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Jennings, M.R. and M.P. Hayes. 2005. *Rana boylii* (Foothill Yellow-legged Frog). Coloration. *Herpetological Review* 36(4):438.

Rombough, C.J., M.P. Hayes, N.L. Duncan. 2005. Foothill Yellow-legged Frog abundance in Cow Creek. *Northwestern Naturalist* 86(2):114-115.

Dugger, D.J., M.P. Hayes, T. Quinn. 2005. Columbia Torrent Salamander (*Rhyacotriton kezeri*) occurrence in headwater streams: the importance of water. *Northwestern Naturalist* 86(2):92. [abstract]

Hayes, M.P., A.P. McIntyre, T. Quinn, D.J. Dugger, and T.L. Hicks. 2005. *Plethodon* salamander occupancy in managed landscapes in southwest Washington. *Northwestern Naturalist* 86(2):98. [abstract]

Rombough, C.J., and M.P. Hayes. 2005. Novel aspects of oviposition site preparation by female foothill yellow-legged frogs (*Rana boylii*). *Northwestern Naturalist* 86:157-160.

Rombough, C.J., J. Chastain, A.M. Schwab and M.P. Hayes. 2005. *Rana boylii* (Foothill Yellow-legged Frog). Predation. *Herpetological Review* 36(4):438-439.

Eaton-Mordas, A., E.P. Urling, M.P. Hayes, D.J. Dugger, and T. Quinn. 2003. *Plethodon dunni, Plethodon vehiculum* (Dunn's Salamander, Western Red-backed Salamander). Behavior. *Herpetological Review* 34(1):54-55.

Hayes, M.P., and C.B. Hayes. 2004. *Rana aurora aurora* (Northern red-legged frog): Vocalizations. *Herpetological Review* 35(1):52-53.

Hayes, M.P., and C.B. Hayes. 2004. *Bufo boreas boreas* (Boreal toad): Behavior. *Herpetological Review* 35(4):369-370.

Hayes, M.P., and C.B. Hayes. 2003. *Rana aurora aurora* (Northern red-legged frog): Juvenile Growth and Male Size at Maturity. *Herpetological Review* 34(3):112-133.

Hayes, M. P. and C.B. Hayes. 2003. *Ensatina eschscholtzii oregonensis* (Oregon Ensatina). Colonization. *Herpetological Review* 34(1):45-46.

Pearl, C.A. and M.P. Hayes. 2002. Predation by Oregon Spotted Frog (*Rana pretiosa*) on Western Toads (*Bufo boreas*) in Oregon. *American Midland Naturalist* 147(1):145-152.

Bull, Evelyn; and M.P. Hayes. 2002. Overwintering of Columbia spotted frogs (*Rana luteiventris*) in northeastern Oregon. *Northwest Science* 76(2):141-147.

Hayes, M.P., C.A. Pearl, and C.J. Rombough. 2001. *Rana aurora aurora*: Movement. *Herpetological Review* 32(1):35-36.

Bull, Evelyn; and M.P. Hayes. 2001. Post-breeding movements of Columbia spotted frogs (*Rana luteiventris*) in northeastern Oregon. *Western North American Naturalist* 61(1):119-123.

Altman, R.; M.P. Hayes, R.D. Forbes, and S.D. Janes. 2001. Chapter 10: Wildlife communities of westside grassland and chaparral. In: D.H. Johnson and T. O'Neill (editors), *Habitat-Species Relationships of Oregon and Washington*, Oregon State University Press. [Book chapter]

Hayes, M.P., J.D. Engler, S. Van Leuven, D.C. Friesz, T. Quinn, and D.J. Pierce. 2001. Overwintering of the Oregon Spotted Frog (*Rana pretiosa*) at Conboy Lake National Wildlife Refuge, Klickitat County, Washington, 2000-2001. Final

Report to the Washington Department of Transportation, Washington Department of Fish and Wildlife, Olympia, Washington. 38 pp.

Bull, E.L., and M.P. Hayes. 2000. Livestock effects on reproduction of the Columbia spotted frog. *Journal of Range Management* 53(3):291-294.

Hayes, M.P.; M.R. Jennings; and J.D. Mellen. 1998. Beyond mammals: Environmental enrichment for amphibians and reptiles. Pp. 205-235. In: Hutchinson, M.; J. Mellen; and D. Shepherdson (editors), *Second Nature: Environmental enrichmental for captive animals*, Smithsonian Institution Press, Washington, D.C. [Book chapter]

Mellen, J.D.; M.P., Hayes, M.P.; and D.J. Shepherdson. 1998. Captive environments for small felids. Pp. 184-201. In: Hutchinson, M.; J. Mellen; and D. Shepherdson (editors), Second Nature: Environmental enrichmental for captive animals, Smithsonian Institution Press, Washington, D.C. [Book chapter]

Hayes, M.P. 1997. Counting annuli. Pp. 37-38. In: R.B. Bury and J.R. Sisk (editors), Western pond turtle: Biomonitoring and Survey Plan. Publication of the Western Pond Turtle Working Group.

Jennings, M.R., and M.P. Hayes. 1994. Decline of ranid frogs in the desert southwest. Pp. 183-212. In: Brown, P.R., and J.W. Wright (editors), Proceedings of a Symposium on the Herpetology of North American Deserts, Southwestern Herpetological Society, Special Publication (5).

Jennings, M.R., and M.P. Hayes. 1994. Amphibians and reptiles of special concern in California. Final report submitted to The California Department of Fish and Game, Inland Fisheries Division, 1701 Nimbus Road, Rancho Cordova, CA 95701 under Contract Number 8023. 255 pp.

Hayes, M.P. 1994. The status of the spotted frog (*Rana pretiosa*) in western Oregon. Oregon Department of Fish and Wildlife Technical Report 94-2:1-11. + appendices.

Hayes, M.P. 1994. The spotted frog (*Rana pretiosa*) in western Oregon. Oregon Department of Fish and Wildlife Technical Report 94-1:1-30. + appendices

Holland, D.C., M.P. Hayes, and E. McMillan. 1990. Late summer movement and mass mortality in the California tiger salamander (*Ambystoma californiense*). The Southwestern Naturalist 35(2):217-220.

Hayes, M.P., J.A. Pounds, and W.W. Timmerman. 1989. An annotated list and guide to the amphibians and reptiles of Monteverde, Costa Rica. SSAR Herpetological Circular (17):1-67.

Hayes, M.P., and M.R. Jennnings. 1989. Patterns in the commercial exploitation of frogs. Proceedings of the First World Congress of Herpetology, University of Kent, Canterbury, England. [Abstract]

Hayes, M.P., J. Le Corff, and R. Gaby. 1989. SSAR Life History Notes: *Gopherus polyphemus*. SSAR Herpetological Review 20(2):55-56.

Hayes, M.P., and M.R. Jennings. 1989. Habitat correlates of distribution of the California red-legged frog (Rana aurora draytonii) and the foothill yellow-legged frog (Rana boylii): Implications for management. Pp. 144-158. In: Szaro, R.E., K.E. Severson, and D.R. Patton (technical coordinators): Proceedings of the Symposium on the Management of amphibians, reptiles, and small mammals in North America [July 19-21, 1988 – Flagstaff, Arizona], USDA General Technical Report RM-166:1-458.

Hayes, M.P., and P.N. Lahanas. 1987. Nesting of the aquatic salamander *Amphiuma means*. Florida Scientist 50(Supplement 1):16. [Abstract]

Hayes, M.P., J.A. Pounds, and D.A. Robinson. 1986. The fringe-limbed treefrog, *Hyla fimbrimembra*: New records from Costa Rica. Florida Scientist 49(3):193-198.

Hayes, M.P., and D.C.F. Rentz. 1986. Observations on the biology of the Neotropical katydid *Haemodiasma tesselata* Brunner (Orthoptera: Tettigonidae). *Entomological News* 97(5):222-224.

Hayes, M.P., and M.R. Jennings. 1986. Declines of ranid frogs in western North America: Are bullfrogs responsible? *Journal of Herpetology* 20(4):490-509.

Hayes, M.P., and D. M. Krempels. 1986. Vocal sac variation among frogs of the genus *Rana* in western North America. *Copeia* 1986(4):927-936.

Hayes, M.P. 1986. Selection against frequent brooding in a leaf-breeding frog. *American Zoologist* 26(4):7A. [Abstract]

Hayes, M.P., and F.C. Shaffner. 1986. Life history notes: *Rana catesbeiana*. SSAR *Herpetological Review* 17(2):44-45.

Miyamoto, M.M., M.P. Hayes, and M.R. Tennant. 1986. Biochemical and morphological variation in Floridean populations of the bark anole (*Anolis distichus*). *Copeia* 1986(1):76-86.

Hayes, M.P., and J. Warner. 1985. Life history notes: *Rana catesbeiana*. SSAR *Herpetological Review* 16(4):109.

Hayes, M.P. 1985. Life history notes: *Coluber constrictor priapus*. SSAR *Herpetological Review* 16(3):78.

Hayes, M.P., and M.R. Tennant. 1985. The diet and feeding behavior of the California red-legged frog (*Rana aurora draytonii*). Southwestern Naturalist 30(4):601-605.

Hayes, M.P. 1985. Geographic distribution: *Centrolenella euknemos*. SSAR *Herpetological Review* 16(2):59.

Hayes, M.P., and D. M. Krempels. 1985. Geographic distribution: *Centrolenella vireovittata*. SSAR *Herpetological Review* 16(1):31.

Jennings, M.R., and M.P. Hayes. 1985. Pre-1900 overharvest of California red-legged frogs (*Rana aurora draytonii*): The inducement for (*Rana catesbeiana*) introduction. *Herpetologica* 41(1):94-103.

Hayes, M.P. 1985. Nest structure and attendance in the stream-dwelling frog, *Eleutherodactylus angelicus*. *Journal of Herpetology* 19(1):168-169.

Hayes, M.P., and M.M. Miyamoto. 1984. Biochemical, behavioral, and body size differences between the red-legged frogs, *Rana aurora aurora* and *Rana aurora draytonii*. *Copeia* 1984(4):1018-1022.

Hayes, M.P. 1983. A technique for partitioning hatching and mortality estimates in leaf-breeding frogs. *Herpetological Review* 14(4):115-116.

Hayes, M.P., R. LaVal, M. Fogden, and P. Fogden. 1983. The mammals of Monteverde: An annotated checklist to the mammals of Monteverde – Monteverde, Costa Rica. Published by the Pensión Quetzal, Monteverde, Costa Rica.

Hayes, M.P. 1983. Predation on the adults and prehatching stages of glass frogs. *Biotropica* 15(1):74-76.

Hayes, M.P., and F.S. Cliff. 1982. A checklist of the herpetofauna of Butte County, the Butte Sink, and Sutter Buttes, California. *Herpetological Review* 13(3):85-87.

Hayes, M.P., and C. Guyer. 1981. The herpetofauna of Ballona. Pp. H1-H80. In: Schreiber, R.W. (editor), *The biota of the Ballona region*. Publication of the Los Angeles County Planning Commission with assistance from the United State Office of Coastal Zone Management and the National Oceanic and Atomspheric Administration.

Timmerman, W.W., and M.P. Hayes. 1981. The reptiles and amphibians of Monteverde. Published by the Pensión Quetzal, Monteverde, Costa Rica in cooperation with the Tropical Sciences Center, San Jose, Costa Rica.

Hayes, M.P., and H. Starrett. 1980. Notes on a collection of centrolenid frogs from the Colombian Chocó. Bulletin of the Southern California Academy of Sciences.

Hayes, M.P., R.A. Schlising, and H. Wurlitzer. 1979. *Calycadenia fremontii* – rediscovered? Fremontia 7(1):14-15..

Additionally, over 40 over non-referreed reports and publications have been produced.

Reviewed manuscripts or books for:

Biological Conservation
Biotropica
Copeia
Forest Science
Herpetologica
Herpetological Review
Journal of Herpetology
The Northwestern Naturalist
The Southwestern Naturalist
McGraw Hill: Interactive text in aquatic ecology
Society of NW Vertebrate Biology: Book on sampling amphibians in lentic habitats
Smithsonian Press: Book on environmental enrichment

Professional Societies:

1996- Life Member of the American Society of Ichthyologists and Herpetologists
1996- Member of The Wildlife Society
1995- Member of the National Association of Environmental Professionals
1995- Member of the Society of Northwestern Vertebrate Biology
1995- Member of the International Association for Bear Research and Management

1989- Member of the Society for Conservation Biology
1988- Life Member of the American Society of Zoologists
1987- Member of the American Association for the Advancement of Science
1987- Member of the Societas Europea Herpetologica
1986- Life Member of the Society for the Study of Amphibians and Reptiles

Professional Societies: (continued)

1980- Life Member of the Desert Tortoise Council

Also a member of 10 minor, regional, or local professional societies.

Grants, awards, and contracts:

$568,000	2000-2	Department of Natural Resources; funding for Forest and Fish Adaptive Management in headwater streams
$12,800	2000	US Fish and Wildlife Service; funding for deformity study of the Oregon spotted frog at Conboy Lake
$2,025	2000	Oregon Zoo Foundation; funding for PIT tags and skeletochronology on Umpqua northern red-legged frog study
$950	2000	The Wildlife Society; funding for skeletochronology on Conboy Lake Oregon spotted frog study
$124,000	1999-2000	Port of Portland; Rivergate western painted turtle study
$8,500	1999-2000	US Fish and Wildlife Service; Oregon spotted frog habitat partitioning study
$12,000	2000	US Fish and Wildlife Service, SAR funding; bullfrog selectivity study (R. Bruce Bury, principal investigator)
$9,600	1999	US Fish and Wildlife Service; Northern red-legged frog overwintering
$1,200	1999	Umpqua National Forest; funding for temperature data loggers for northern red-legged frog habitat utilization study
$8,700	1999	US Fish and Wildlife Service; Oregon spotted frog oviposition
$4,200	1998-2000	PNW Range and Experiment Station; Columbia spotted frog movements
$35,860	1996-1997	US Fish and Wildlife Service, Oregon Department of Fish and Wildlife; Study of the status of the foothill yellow-legged frog in Oregon
$32,300	1994-1997	Winema National Forest; Aquatic amphibian and reptile studies in the Sky Lake Wilderness
$24,600	1996	Umpqua National Forest; Studies of the amphibian and reptile fauna of the Squaw Flat Research Natural Area

Additionally, I have obtained over 10 additional grants, awards, or contracts totalling over $150,000 during the period 1988-1996.

Languages spoken:

French	fluent
Spanish	near fluent

Marc Hayes Publications since 2000

McIntyre, A.P., Jay E. Jones, F.T. Waterstrat, J.N. Giovanini, S.D. Duke, M.P. Hayes, T. Quinn, A.J. Kroll. Evaluating N-mixture abundance estimators for unmarked individuals of cryptic taxa. *Methods in Ecology and Evolution* (in review)

Hayes, M.P., and T. Quinn (editors). Review and synthesis of literature on Tailed Frogs (genus *Ascaphus*) with special reference to managed landscapes. Prepared for the Cooperative Management, Evaluation, and Research Committee, The Landscape and Wildlife Advisory Group and The Amphibian Research Consortium. 157 pp. + appendix (in review)

Yahnke, A.E., C.E. Grue, M.P. Hayes, A.T. Troiano. Effects of the herbicide imazapyr on juvenile Oregon spotted frogs. *Environmental Toxicology and Chemistry* (in review)

Tidwell, K.S., D.J. Shepherdson, and M.P. Hayes. Inter-populational variability in evasive behavior in the Oregon Spotted Frog (*Rana pretiosa*). *Journal of Herpetology* (in press)

Padgett-Flohr, G., and M.P. Hayes. 2011. Assessment of the vulnerability of the Oregon spotted frog (*Rana pretiosa*) to the Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*). *Herpetological Conservation and Biology* 6(2):99-106.

Thompson, C.E., J.M. Walker, F.T. Waterstrat, A.P. McIntyre, and M.P. Hayes. 2011. *Rhyacotriton kezeri* (Columbia Torrent Salamander) Predation. *Herpetological Review* 42(3):406-408.

Conlon, J.M., M. Mechkarska, E. Ahmeda, L. Coquet, T. Jouenne, J. Leprince, H. Vaudry, M.P. Hayes, and G. Padgett-Flohr. 2011. Host defense peptides in skin secretions of the Oregon spotted frog *Rana pretiosa*: Implications for species resistance to chytridiomycosis. *Developmental and Comparative Immunology* 35:644-649.

Palmeri-Miles, A.F., K.A. Douville, J.A. Tyson, K.D. Ramsdell and M.P. Hayes. 2010. Field observations of oviposition and early development of the Coastal Tailed Frog (*Ascaphus truei*). *Northwestern Naturalist* 91(2):206-213.

Hayes, M.P., C.J. Rombough, G.E. Padgett-Flohr, L.A. Hallock, J.E Johnson, R.S. Wagner, and J.D. Engler. 2009. Amphibian chytridiomycosis in the Oregon spotted frog (*Rana pretiosa*) in Washington State, USA. *Northwestern Naturalist* 90(2):148-150.

McIntyre, A.P., M.P. Hayes and T. Quinn. 2009. *Type N Feasibility Study*. A report submitted to the Landscape and Wildlife Advisory Group, Amphibian Research Consortium, and the Cooperative Monitoring, Evaluation, and Research Committee. Washington Department of Fish and Wildlife, Olympia, Washington. 48 pp. + appendices

Ricketts, N.L., and M.P. Hayes. 2009. *2009 Pilot Citizen Science Stillwater Amphibian Protocol Summary Report*. Washington Department of Fish and Wildlife, Olympia, Washington. 33 pp. + appendices

Curry, T.R. and M.P. Hayes. 2009. *Rana aurora* (Northern Red-legged Frog). Egg mass disturbance. *Herpetological Review* 40(2):208-209.

Kroll, A.J., M.P. Hayes, and J.G. MacCracken. 2009. Concerns regarding the use of amphibians as metrics of critical biological thresholds: a comment on Welsh and Hodgson (2008). *Freshwater Biology* 54(11):2364-2373.

Tyson, J.A., K.A. Douville and M.P. Hayes. 2009. *Rhyacotriton olympicus* (Olympic Torrent Salamander). Maximum larval size. *Herpetological Review* 40(1):67.

Lund, E.M., M.P. Hayes, T.R. Curry, J.S. Marsten, and K.R. Young. 2008. Predation on the Coastal Tailed Frog (*Ascaphus truei*) by a shrew (*Sorex* spp.) in Washington State. Northwestern Naturalist 98():200-202.

Hayes, M.P; T. Quinn; K.O. Richter; J.P. Schuett-Hames; and J.T. Serra Shean. 2008. Maintaining Lentic-Breeding Amphibians in Urbanizing Landscapes: The Case Study of the Northern Red-Legged Frog (*Rana aurora*). Pp. 445-461. *In*: Mitchell, J.C., R.E. Jung Brown, and B. Bartholomew (editors), *Urban Herpetology*, Society for the Study of Amphibians and Reptiles, Herpetological Conservation 3. [Book chapter]

Hayes, M.P., T. Quinn, and T.L. Hicks. 2008. *Implications of Capitol Lake Management for Fish and Wildlife*. Report to the Washington State Department of General Administration, Olympia, Washington. 88 pp. + appendices

Hayes, C.B., and M.P. Hayes. 2008. *Elgaria coerulea* (Northern Alligator Lizard). Juvenile growth. *Herpetological Review* 39(2):222-223.

Hicks, T.L., D.E. Mangan, A.P. McIntyre and M.P. Hayes. 2008. *Rhyacotriton kezeri* larval diet. *Herpetological Review* 39(4): 456-457.

Rombough, C.J. and M.P. Hayes. 2008. *Rana pretiosa* (Oregon Spotted Frog). Reproduction. *Herpetological Review* 39(3):340-341.

Waterstrat, F.T., A.P. McIntyre, M.P. Hayes, K.M. Phillips, and T.R. Curry. 2008. *Ascaphus truei* (Coastal Tailed Frog). Atypical Amplexus. *Herpetological Review* 39(4):458.

Quinn, T.; Hayes, M.P.; D.J. Dugger; T.L. Hicks; and A. Hoffmann. 2007. Comparison of two techniques for surveying headwater stream amphibians. *Journal of Wildlife Management* 71(1):282-288.

Richart, C.H., M.P. Hayes and R.P. O'Donnell. 2007. Comparative diet of three species of terrestrial forest-dwelling amphibians (*Rana aurora*, *Dicamptodon tenebrosus*, and *Rhyacotriton kezeri*) in western Washington. *Northwestern Naturalist* 88(2):121-122. [abstract]

Barreca, A.B., F.T. Waterstrat, and M.P. Hayes. 2007. Differentiating *Ascaphus truei* at sexual maturity. *Northwestern Naturalist* 88(2):102-103. [abstract]

O'Donnell, R.P., T. Quinn, M.P. Hayes and K.E. Ryding. 2007. Comparison of three methods for surveying amphibians in forested seep habitats in Washington State. *Northwest Science* 81(4):274-283.

Hayes, M.P. 2007. Size record? *Herpetological Review* 38(4):393.

Rombough, C.J. and M.P. Hayes. 2007. *Rana boylii* (Foothill Yellow-legged Frog). Reproduction. *Herpetological Review* 38(1):70-71.

Waterstrat, F.T., R.L. Crawford, and M.P. Hayes. 2007. *Ascaphus truei* (Tailed Frog). Spider Prey. *Herpetological Review* 38(3):318.

Hayes, M.P., C.J. Rombough and C.B. Hayes. 2007. *Rana aurora* (Northern Red-legged Frog). Movement. *Herpetological Review* 38(2):192-193.

Hayes, M.P; T. Quinn; D.J. Dugger; T.L. Hicks; M.A. Melchiors; and D.E. Runde. 2006. Dispersion of coastal tailed frog (*Ascaphus truei*): An hypothesis relating cccurrence of frogs in non-fish-bearing headwater basins to their seasonal movements. *Journal of Herpetology* 40(4):531-543.

Hayes, M.P., T. Quinn, D.J. Dugger, and T.L. Hicks. 2006. Dispersion of Coastal Tailed Frog (*Ascaphus truei*): A hypothesis relating occurrence of frogs in non-fishbearing headwater basins to their seasonal movements. *Northwestern Naturalist* 87(2):171-172. [abstract]

Hayes, M. P., M. R. Jennings, and G. B. Rathbun. 2006. *Rana draytonii* (California Red-legged Frog). Prey. *Herpetological Review* 37(4):449.

Karraker, N.E., D.S. Pilliod, E.L. Bull, P.S. Corn. L.V. Diller, L.A., Dupuis, M.P. Hayes, B.R. Hossack, G.R. Hodgson, E.J. Hyde, K. Lohman, B.R. Norman, L.M. Ollivier, C.A. Pearl, C.R. Peterson. 2006. Taxonomic variation in the oviposition by Tailed Frogs (*Ascaphus* spp.). *Northwestern Naturalist* 87(2):87-97.

Hayes, M.P., J.D. Engler, and C.J. Rombough. 2006. Trends in the breeding population of the Oregon spotted frog (*Rana pretiosa*) at Conboy Lake National Wildlife Refuge. *Northwestern Naturalist* 87(2):171. [Abstract]

Hayes, M.P., J.D. Engler and C.J. Rombough. 2006. *Rana pretiosa* (Oregon Spotted Frog). Predation. *Herpetological Review* 37(2):209-210.

Price, R.F., D.J. Dugger, T.L. Hicks and M.P. Hayes. 2006. *Dicamptodon copei* (Cope's Giant Salamander). Predation. *Herpetological Review* 37(4):436-437.

Rombough, C.J., M.P. Hayes and J.D. Engler. 2006. *Rana pretiosa* (Oregon Spotted Frog). Maximum size. *Herpetological Review* 37(2):210.

Richart, C.H., M.P. Hayes and W.P. Leonard. 2006. Washington terrestrial slugs and snails. Northwestern Naturalist 87(2):184. [abstract]

Hayes, M.P., and L.L.C. Jones. 2005. *Rhyacotriton olympicus*. Pp. 880-882. *In*: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Hayes, M.P. and T. Quinn. 2005. *Rhyacotriton kezeri*. Pp. 876-880. *In*: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Hayes, M.P. 2005. *Rhyacotriton cascadae*. Pp. 874-876. *In*: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Pearl, C.A., and M.P. Hayes. 2005. *Rana pretiosa*. Pp. 577-580. In: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Jennings, M.R. and M.P. Hayes. 2005. *Rana boylii* (Foothill Yellow-legged Frog). Coloration. *Herpetological Review* 36(4):438.

Rombough, C.J., M.P. Hayes, N.L. Duncan. 2005. Foothill Yellow-legged Frog abundance in Cow Creek. *Northwestern Naturalist* 86(2):114-115. [abstract]

Dugger, D.J., M.P. Hayes, T. Quinn. 2005. Columbia Torrent Salamander (*Rhyacotriton kezeri*) occurrence in headwater streams: the importance of water. *Northwestern Naturalist* 86(2):92. [abstract]

Hayes, M.P., A.P. McIntyre, T. Quinn, D.J. Dugger, and T.L. Hicks. 2005. *Plethodon* salamander occupancy in managed landscapes in southwest Washington. *Northwestern Naturalist* 86(2):98. [abstract]

Addendum X - Hayes Publications since 2000

Rombough, C. J., and M. P. Hayes. 2005. Novel aspects of oviposition site preparation by female foothill yellow-legged frogs (*Rana boylii*). *Northwestern Naturalist* 86:157-160.

Rombough, C.J., J. Chastain, A.M. Schwab and M.P. Hayes. 2005. *Rana boylii* (Foothill Yellow-legged Frog). Predation. *Herpetological Review* 36(4):438-439.

Hayes, M.P., and C.B. Hayes. 2004. *Rana aurora aurora* (Northern red-legged frog): Vocalizations. *Herpetological Review* 35(1):52-53.

Hayes, M.P., and C.B. Hayes. 2004. *Bufo boreas boreas* (Boreal toad): Behavior. *Herpetological Review* 35(4):369-370.

Hayes, M.P., and C.B. Hayes. 2003. *Rana aurora aurora* (Northern red-legged frog): Juvenile Growth and Male Size at Maturity. *Herpetological Review* 34(3):112-133.

Hayes, M. P. and C.B. Hayes. 2003. *Ensatina eschscholtzii oregonensis* (Oregon Ensatina). Colonization. *Herpetological Review* 34(1):45-46.

Eaton, Mordas, A., E.P. Urling, M.P. Hayes, D.J. Dugger, and T. Quinn. 2003. *Plethodon dunni, Plethodon vehiculum* (Dunn's Salamander, Western Red-backed Salamander). Behavior. *Herpetological Review* 34(1):54-55.

Pearl, C.A. and M.P. Hayes. 2002. Predation by Oregon Spotted Frog (*Rana pretiosa*) on Western Toads (*Bufo boreas*) in Oregon. *American Midland Naturalist* 147(1):145-152.

Bull, Evelyn; and M.P. Hayes. 2002. Overwintering of Columbia spotted frogs (*Rana luteiventris*) in northeastern Oregon. *Northwest Science* 76(2):141-147.

Hayes, M.P., C.A. Pearl, and C.J. Rombough. 2001. *Rana aurora aurora*: Movement. *Herpetological Review* 32(1):35-36.

Bull, Evelyn; and M.P. Hayes. 2001. Post-breeding movements of Columbia spotted frogs (*Rana luteiventris*) in northeastern Oregon. *Western North American Naturalist* 61(1):119-123.

Altman, R.; M.P. Hayes; R.D. Forbes; and S.D. Janes. 2001. Chapter 10: Wildlife communities of westside grassland and chaparral. *In*: D.H. Johnson and T. O'Neill (editors), *Habitat-Species Relationships of Oregon and Washington*, Oregon State University Press. [Book chapter]

Hayes, M.P., J.D. Engler, S. Van Leuven, D.C. Friesz, T. Quinn, and D.J. Pierce. 2001. Overwintering of the Oregon Spotted Frog (*Rana pretiosa*) at Conboy Lake National Wildlife Refuge, Klickitat County, Washington, 2000-2001. Final Report to the Washington Department of Transportation, Washington Department of Fish and Wildlife, Olympia, Washington. 38 pp.

Hayes, M.P.; M.R. Jennings; and J.D. Mellen. 2000. Beyond mammals: Environmental enrichment for amphibians and reptiles. Pp. 205-235. *In*: Hutchinson, M.; J. Mellen; and D. Shepherdson (editors), *Second Nature: Environmental enrichment for captive animals*. Smithsonian Institution Press, Washington, D.C. [Book chapter]

Bull, E.L., and M.P. Hayes. 2000. Livestock effects on reproduction of the Columbia spotted frog. *Journal of Range Management* 53(3):291-294.

EXHIBIT B

MARC HAYES EXPERT REPORT
ATTACHMENT C
MATERIALS RELIED ON IN FORMING EXPERT REPORT OPINIONS[1]

- Exhibits to Sept. 23, 2011 declaration of Dr. Marc Hayes (Plaintiffs' Preliminary Injunction ("Pl. PI Ex.") 6) (DE 60-3)
- Exhibits to Nov. 4, 2011 declaration of Dr. Marc Hayes (Pl. PI Ex. 45 (DE 79-1)
- U.S. Fish and Wildlife Service. 2002. Recovery plan for the California red-legged frog (CRLF). Region 1, Portland, Oregon, USA.
- San Francisco Garter Snake (SFGS) Recovery Plan
- 2008 Swaim report for SFGS/CRLF at Sharp Park and Mori Point (Pl. PI Ex. 22) (DE 56)
- 2005 Swaim report for SFGS/CRLF at Sharp Park and Mori Point
- Swaim, K. SFGS Improvement Project At Mori Point, Pacifica, Cal. (CCSF89390-443)
- Sharp Park Conceptual Alternatives Report and Appendices ("Alt. Report") (Feb. 2006)
- Peter Baye Technical Review and Comments on Alt. Report
- Final Draft Endangered Species Compliance Plan for SFGS (CCSF 4590-4608)
- Declaration of Dr. Mark Jennings dated October 18, 2011 (DE 68)
- Declaration of Ms. Karen Swaim dated October 21, 2011 (DE 66-1)
- Declaration of Lisa Wayne dated October 21, 2011 (DE 72)
- Darren Fong personal communication
- Fong, D. et al. Year 2003-2005 California Red-legged Frog Surveys, Golden Gate National Recreation Area
- Fong, D. et al., Year 2006-09 CRLF Surveys, Golden Gate Nat'l Recreation Area \ and data sets through 2011
- Kuhn personal communications
- DeGregorio, B. A., T. E. Hancock, D. J. Kurz, and S. Yue. 2011. How Quickly are Road-Killed Snakes Scavenged? Implications for Underestimates of Road Mortality. Journal of the North Carolina Academy of Science 172: 184-188 (DE 60-3)
- DeGregario, B.A., et al, 2010. Patterns of Snake Road Mortality On An Isolated Barrier Island. Herpetological Conservation and Biology 5(3):441-448 (DE 79-1)
- Brett DiGregorio personal communications
- CRLF Egg Mass Survey Sheets
- Deposition testimony of Jon Campo (Sept. 13, 2011)
- Deposition testimony of John Ascariz (Dec. 14, 2011)
- Deposition testimony of Wayne Kappelman (Dec. 15, 2011)
- Deposition testimony of Lisa Wayne (Jan. 9, 2012)
- U.S. Fish and Wildlife Service. 2006. San Francisco Garter Snake (Thamnophis sirtalis tetrataenia). 5-Year Review: Summary and Evaluation, Sacramento Field Office, Sacramento, CA.
- Sept. 27, 2011 email from Christina Crooker to Brent Plater and Darren Fong re SFGS sightings at Mori Point

---

[1] This list encompasses materials the expert relied on in forming expert opinions, and is intended to include all materials listed in the expert report, but to the extent additional references are listed in the report the expert relied on those as well.

- Kats, L.B., and R.P. Ferrer. 2003. Alien predators and amphibian declines: review of two decades of science and the transition to conservation. Diversity and Distributions 9(2):99-110
- Gamradt, S.C, and L.B. Kats. 2002. Effect of introduced crayfish and Mosquitofish on California Newts. Conservation Biology 10(4):1155-1162; and references therein.
- Emails between City and FWS (Pl. PI Ex. 5) (DE 54)
- photographs of an egg mass documented in Horse Stable Pond (Pl. PI Ex. 3
    - and 4 (DE 54 and 60)
- photographs of the CRLF taken June 26, 2011 (Pl. PI Ex. 5) (see DE 60)
- photographs of flooding events at Sharp Park (Pl. PI Ex. 5)(see DE 60)
- photograph of freshwater crayfish observed inside Sharp Park's outfall pipe
    - (Pl. PI Ex. 5)(see DE 60)
- Dec. 8, 2011 letter from FWS to CCSF (CCSF 96925-26)
- Phillip Williams & Ass. 1992 Laguna Salada Resource Enhancement Plan
- Jan. 2012 Linear Regression Analysis by Marc Hayes
- Jennings and Hayes, 1994. Amphibian and Reptile Species of Special Concern in California.
- Unpublished Data on entrainment.

EXHIBIT I

PGA design INC
LANDSCAPE ARCHITECTS

October 27, 2011

Bill Wycko
Environmental Review Officer
Planning Department
City of San Francisco
1650 Mission Street, Ste 400
San Francisco, CA 94103-2479

RE: Sharp Park Golf Course – Historic Resource Evaluation

Dear Mr. Wycko,

I have reviewed Appendix C of the DEIR for the *Significant Natural Resource Areas Management Plan: Sharp Park Golf Course* and question the determination of eligibility for listing on the National Register of Historic Properties (NRHP). On page 5-4 the author suggests that Sharp Park Golf Course has historic significance under Criterion A and C under the NRHP and Criterion 1 and 3 for the California Register of Historic Resources (CRHR). Criterion C/3 requires that "a property embody the distinctive characteristics of a type, period, or method of construction that represents the work of a master, or that possesses high artistic values". Based on the number and extent of alternations that have taken place since the period of significance (1929 – 1932) I question the validity of finding Sharp Park eligible as a historic resource.

Bulletin 18 "How to Evaluate and Nominate Designed Historic Landscapes,"[1] states "As defined by the National Historic Preservation Act of 1966 and the National Register criteria, to be eligible for the National Register a designed historic landscape must possess significance ..... and integrity of location, design, setting, materials, workmanship feeling and association." Sharp Park Golf Course lacks integrity.

The *Historical Resources Evaluation Report* (HRER) prepared by Tetra Tech, Inc. describes many alterations made to the course since 1932. Comparing the course layouts depicted in the two exhibits included in the Evaluation Report[2] one finds very few similarities between how the course was designed and how it exists today.

[1] National Park Service, "How to Evaluate and Nominate Designed Historic Landscapes," *National Register Bulletin No. 18*, p. 6.
[2] The original Sharp Park Golf Links plan prepared by Mackenzie, Hunter & Egen (Figure 3) and the aerial of the Existing Golf Course (Figure 2).

Chris Pattillo **Cathy Garrett** **Christopher Kent**

444 - 17th Street Oakland CA 94612
Tel 510.465.1284 Fax 510.465.1256

1. The original hole 1 (now hole 11) was a long, straight shot. The reconfigured hole doglegs to the right.
2. The original hole 2 (now hole 12) was a dogleg that wrapped around the south end of the course. Hole 12 is now a lot shorter with no dogleg.
3. The original holes 3, 4, and 8 were destroyed in a big storm and not replaced.
4. The original hole 5 offered multiple fairway options – a unique design feature of Mackenzie. Hole 17 which replaced 5 is a single straight shot.
5. The original hole 6 that ran east-west at the north boundary no longer exists.
6. The original hole 7 appears to be similar to current hole 16 identified on Figure 2 as having been built after 1941, after the period of significance.
7. The original holes 9 and 10 each offered double fairways. The replacement holes 13 and 14 eliminated these special features.
8. The original hole 11 – a short run - appears to be similar to current hole 15.
9. The original hole 12 was a long straight shot. It has been replaced by hole 18 that is longer with a dogleg.
10. The original holes 13, 14 and 15 were on the east side of the county road and generally paralleled the road running north-south. Today this area has four holes that all run east-west.
11. The original hole 16 was a dogleg left replaced by hole 3 a straight shot.
12. The original hole 17 ran east-west and was a long shot with a dogleg. Hole 8, a short, straight fairway replaced it.
13. The original hole 18 was a dogleg. This hole has been replaced by hole 2, a straight shot.

In summary only hole 11 (now hole 15) is similar to the original design. The layout of the remainder of the course has been substantially altered. The change to the order of how the holes are played is significant as it materially alters the sequence and nature of views the player experiences making it unlike what was intended by the designer. Other major changes implemented since the period of significance include:

A. Elimination or reconfiguration of several sand traps.
B. Construction of a seawall in 1941 to prevent flooding of the golf course. This eliminated views to the beach and Pacific Ocean and the essence of the links design concept.
C. Filling a portion of the lagoon as part of the reconfiguration of hole 10.
D. Installation of concrete golf cart paths along the back nine holes in 1996 where none existed previously.
E. Culverting of water features on five holes and the elimination of water hazards – an important component of the original design.
F. Installation of a 4000-gallon pump to help with annual flooding of Laguna Salada.
G. Alternations made between 1985 and 1994 to accommodate female players such as shortening of the fairways.

Adding together all of these alterations it is apparent that Sharp Park Golf Course lacks sufficient integrity to qualify as a historic resource under criterion C/3. The course no longer reflects the work of Alister Mackenzie. The land use remains a golf course but otherwise there are few similarities between the course that existed during the period of significance and what remains today.

The Evaluation Report notes that Alister Mackenzie attained status as a master golf course architect. Appendix C on page 4-7 notes, "George Shackelford, in his book *Grounds for Golf*, describes Mackenzie as a master designer and offers that Mackenzie's secret to creating unique courses was <u>his talent for routing</u>." Regrettably, today nothing remains of Mackenzie's unique routing. He continues to explain that his work "was known for its original and distinctive bunkers, with irregular shapes and each with its own design." And "Distinctive bunkering, the use of small hillocks around greens, and exciting hole locations were Mackenzie's trademark".

Another of Mackenzie's trademarks was his talent for working with natural landform and subtlety integrating his courses with a site's topography to take full advantage of the unique qualities of each site. Quoting from the HRER, "Mackenzie felt that the success of golf course construction depended entirely on making the best use of natural features and devising artificial ones indistinguishable from nature." The HRER continues with, "……. while many architects try to create a special course, Mackenzie could figure out how best to fit holes into a property and situate a golf course to evoke a comfortable, settled, connection to the ground. His course routings are always functional and original but rarely do they fight the contours of the property."

In summary, defining characteristics of Mackenzie's design style included unique course routing, a talent for adapting a course to fit the land, an ability to offer challenge to players of varying skill levels, distinctively designed bunkers, and inclusion of multiple fairway options – offering advantage to those to took greater risks in their play. The vast majority of these features have been eliminated from the course. According to Wexler, in a recently published article "no appreciable trace of his strategy remains in play."[3]

Unfortunately, Sharp Park Golf Course began to fail even before the course opened in 1932 because Mackenzie failed to fully understand the forces of nature at this site. Page 4-3 of the Evaluation Report notes that the opening was delayed twice due to "drainage problems on the course due to winter rains." Shortly after the course opened a major storm washed out a large portion of the course and necessitated construction of the seawall in 1938 intended to prevent similar damage in the future. This type of damage has continued – as recently as 1982 a major storm wiped out several holes. In 1990 another breach killed many of the cypress trees on the course. Few of the golf courses designed by Alister Mackenzie remain intact today. It would be ironic and misplaced if this course – one that represents a failure in design – became a lasting representative of his life's work by being officially designated as a historic property.

---

[3] Dr. Alister Mackenzie, "Sharp Park Golf Course", Pacifica, CA page 113

The determination of historic significance is tied to a site's level of integrity. According to *A Guide to Cultural Landscape Reports: Contents, Process, and Techniques*[4] "The historic integrity of a cultural landscape relates to the ability of the landscape to convey its significance." And "Historic integrity is assessed to determine if the landscape characteristics and associated features, and the spatial qualities that shaped the landscape during the historic period of significance, are present <u>in much the same way as they were historically.</u>" Emphasis added.

The guide continues, "Historic integrity is determined by the extent to which the general character of the historic period is evident, and <u>the degree to which incompatible elements obscuring the character can be reversed</u>". In the case of Sharp Park Golf Course the changes to the course were not the result of the normal evolution of a living landscape – maturing trees and other plantings, but rather major changes that were forced to solve functional problems that resulted from flaws in the original design – a failure to fully understand the power of nature and it's ability to wreak havoc. The changes made to Sharp Park Golf Course cannot be reversed because doing so would recreate the conditions that necessitated that the alterations be made in the first place.

Page 5-2 of the HRER notes, "Because landscape features change over time, a landscape need not retain all of the original features it had during its period of significance, <u>but it must retain the essential features and characteristics that make its historic character clearly recognizable."</u>

In essence for a site to meet the criteria of historic significance most of the designed features must look as they did during the period of significance. This may be true for the Clubhouse and maintenance building which are not addressed here, but it is not the case at Sharp Park Golf Course and no doubt explains why "None of the state or national registers identified Sharp Park Golf Course as a historical resource" as noted on page 4-1 of the HRER.

By making the finding that the existing golf course represents a historic resource under criterion C/3 it seems that Tetra Tech failed to appreciate not only the subtleties of golf course architecture but its essential features. Just because there was a golf course present in 1932 the fact that there is still a golf course present today, does not qualify the current course as a historic resource.

[4] A Guide To Cultural Landscape Reports: Contents, Process and Techniques by Robert R. Page, Cathy A. Gilbert, and Susan A. Dolan, US Department of the Interior, National Park Service, Cultural Resource Stewardship and Partnerships, 1998.

Sharp Park Golf Course lacks integrity. While a golf course at this site is consistent with the historic land use, that fact is insufficient evidence for a finding of historic significance. Failure to demonstrate significance voids eligibility for historic resource status. I urge you to consider this as you plan for the future use of Sharp Park.

Sincerely,

Chris Pattillo, ASLA
Historic Landscape Architect
President, PGAdesign[inc]

CHRIS PATTILLO

HISTORIC LANDSCAPE ARCHITECT

PROFESSIONAL EXPERIENCE

PGAdesign[inc], 1979 to present

EDUCATION - REGISTRATION

Master of Landscape Architecture, 1975, UC Berkeley
Bachelor of Arts, 1972, UC Berkeley
California Landscape Architect, #1925

ASSOCIATIONS

Historic American Landscapes Survey (HALS), No. California Chapter, Co-Founder 2004, Chair 2004-2009 & Vice Chair 2010
American Society of Landscape Architects (ASLA), Member
ASLA Historic Preservation Professional Practice Committee, National Chair & Vice Chair 2006-2009
California Genealogy Society, Vice President & Board member 2010
Garden Conservancy, Member
California Preservation Foundation, Member
National Trust, Member
Oakland Heritage Alliance, Member
Oakland Chamber of Commerce, Member
Oakland Chamber of Commerce Economic Develop Committee
Open Space, Conservation & Recreation Elements (OSCAR), Advisory Committee

AWARDS

Oakland Chamber of Commerce: "Small Business of the Year" 1995
Oakland Chamber of Commerce: "Woman Owned Business of the Year" 2000

RELEVANT PROJECT EXPERIENCE

Badger Pass Ski Area CLR, Yosemite Natl. Park, CA
Doyle Drive in San Francisco Presidio HALS, San Francisco, CA
Atchison Village HSR, Richmond, CA
Meyers Estate Garden Master Plan & Maintenance Guidelines, Union City, CA
Roeding Park HALS, Fresno, CA
Sakai-Oishi Nurseries HALS, Richmond CA
William Land Park Cultural Landscape Survey & Evaluation, Sacramento
Berkeley City Club Gardens HALS, Berkeley, CA

PUBLICATIONS

"Preparing a Historic American Landscapes Survey (HALS) History: Brief Guide to Identifying and Documenting HALS Sites," co-author, *National Park Service, US Dept of the Interior,* Washington DC, August 2010

“Doyle Drive: Using Innovation HALS Methodology,” SF Heritage News, Vol. XXXVII, No. 2, Summer 2010

“Innovation HALS Methodology Developed for SF Presidio Project,” CPF News, Summer 2009

PRESENTATIONS

Documenting our Heritage, Annual ASLA conference, San Diego, California, October 2011

Historic American Landscapes Survey – An Introduction, for ASLA Chapter Presidents, October 2011

Exploring Cultural Landscapes through Case Studies, California Preservation Foundation (CPF), August 2010

Historic American Landscapes Survey – An Overview, American Society of Landscape Architects (ASLA), July 2010

Doyle Drive HALS at the Presidio of San Francisco, CPF, May 2010

Landscape Within The Historic Context, American Institute of Architects (AIA) Historic Resources Committee, San Francisco, CA, June 2009

Historic American Landscapes Survey – Tools of Preservation, UC Berkeley Extension, Landscape Architecture Program, May 2009

Alviso Adobe Park: History & Design Process – Opening Remarks, Pleasanton, CA, October 2008

Historic American Landscape Survey – A Panel Discussion, ASLA Annual Conference, San Francisco, CA, October 2007

Olmsted in the East Bay – tour leader & speaker, ASLA Annual Conference, San Francisco, CA, October 2007

Oakland Waterfront Parks – tour speaker, ASLA Annual Conference, San Francisco, CA, October 2007

Historic American Landscapes Survey – An Overview, Oakland Heritage Alliance (OHA), Oakland, CA, Summer 2007

Historic American Landscapes Survey – An Overview, Town & Gown Club, Berkeley, CA Spring 2007

Cleveland Cascade – Rehabilitation of a Howard Gilkey Landscape, OHA, Oakland, CA, March 2007

Making a Splash: Preservation of Pools and Fountains, CPF Conference, Sacramento, CA, April 2006

Peralta Hacienda Historical Park – Planning and Design, Friends of Peralta Hacienda, Oakland, CA, December 2005

Kaiser Roof Garden and the Gardens of the Museum of California: Comparing Two Mid-Century Modern Roof Gardens, OHA, Oakland, CA, July 2005

Planning and Public Policy: The Urban Planning Process, Department of City & Regional Planning, UC Berkeley, April 1983

HISTORIC AMERICAN LANDSCAPES SURVEY (HALS) NOMINATION FORMS

Anderson Marsh State Historic Park, Lake County, 2011

Berkeley Women's City Club, Berkeley, 2011

Bidwell Mansion, Chico, 2011

Bidwell Park, Chico, 2011

Boyd Memorial Park, San Rafael, 2010

California Nursery Company Historic Park, Niles, 2008

Call Ranch at Fort Ross State Park, Jenner, 2009

Captain Fletcher's Inn & Manager's House, Navarro, 2009

Centerville Pioneer Cemetery, Fremont, 2008

Children's Fairyland, Oakland, 2009

China Camp State Park, San Rafael, 2009

Fern Dale (Shaw House), Ferndale, 2009

Forest Theater, Carmel, 2010

Henry H. Meyers Garden, Union City, 2010

La Mirada Adobe, Monterey, 2010

Marin Art and Garden Center, Ross, 2009

McConaghy Estate, Hayward, 2009

Meek Mansion & Carriage House, Hayward, 2009

Mendocino Woodlands Demonstration Recreation Area, Mendocino, 2009

Micke Grove Park, Lodi, 2009

Mountain View Cemetery, Oakland, 2010

Point Arena Cove, Point Arena, 2010

Point Arena Lighthouse, Point Arena, 2010

Point Cabrillo Lighthouse, Casper, 2009

Rancho Higuera Adobe Historical Park, 2008

Ravenswood Estate, Livermore, 2009

Robson-Harrington Park, San Anselmo, 2009

Shibata Japanese Garden (Mount Eden Nursery), Hayward, 2010

Shinn Historical House & Arboretum, Fremont, 2008

Sun House, Ukiah, 2009

Tor House, Carmel, 2010

Wassama Village, 2010

WILD Equity INSTITUTE

Building a healthy and sustainable global community for people and the plants and animals that accompany us on Earth

The Wild Equity Institute is working to build a new public park at Sharp Park in Pacifica, CA. With our partners at the NPCA, the Neighborhood Parks Council, the National Japanese American Historical Society, and many other organizations, we have proposed to close the course and partner with the National Park Service to restore the land and interpret its hidden history, including the former WWII internment camp and prehistoric artifacts that have been found on the site.

Perhaps in response to this idea and litigation, **for the first time San Francisco is proposing to landmark Sharp Park Golf Course. This proposal is not well informed**. Below you will find background information about this proposal.

Although Alister MacKenzie, the original architect of Sharp Park Golf Course, has made some important golf courses, there is significant disagreement about (a) the quality of the original architectural design at Sharp Park and whether it is a reflection of Mackenzie's signature design, and (b) its current integrity**. Every history written about this course before the restoration proposal we are advancing was announced concluded that the original MacKenzie design no longer exists at Sharp Park today.**

Some contemporary golf advocates have suggested that these previous assessments were based on misinformation or bad data. They have gone as far as suggesting that several of the links at Sharp Park remain consistent with Sharp Park's original design. As a preliminary matter, **golf courses are not simply a collection of links: they are a course, and to suggest that because a few golf links remain in the places Alister MacKenzie placed them does not answer the question about the historic integrity of the course as a whole.**

But more importantly, these assessments are directly contradicted by assessments made away from the heat of this dispute, and not conducted by individuals with a stake in the outcome. **Indeed, the only individuals who have asserted that Sharp Park is historic are associated with the San Francisco Public Golf Alliance—a golf activist organization that is not qualified to provide these assessments, and has an inherent conflict in doing so regardless.** Therefore, the previous assessments are more likely to be unbiased and accurate: even if the historians who wrote them would prefer the original course be restored, instead of than the natural areas upon which the course was built.

Some of MacKenzie's courses should be considered for recognition. But Sharp Park is simply not the place to start. There is not a single Alister MacKenzie golf course presently listed on the California or federal registers of historic places, and most everyone would agree that Sharp Park is not one of the greatest examples of his work. Indeed, **the litany of problems the golf course faces—from chronic annual flooding, to the killing of endangered species, to the low grades given the course by its own golfers, to the chronic financial instability of the course, to the inevitable loss of the site to sea level rise as our climate changes—all indicate that this particular course does not exemplify the work of a master implementing his art.**

P.O. Box 191695 ❧ San Francisco, CA ❧ 94119 ❧ P: 415-349-5787 ❧ info@wildequity.org ❧ http://wildequity.org

Moreover, the San Francisco Public Golf Alliance has distributed false information to the Planning Department and to the Historic Preservation Commission arguing that Sharp Park Golf Course itself has been designated an historic landmark by the City of Pacifica**. This is not true: indeed, to the extent any historic preservation has been provided to Sharp Park, it has been equally provided to the trees, lagoon, and marsh on the property,** as will be shown below. Indeed, a proposal to try and landmark the golf course was tabled indefinitely by Pacifica's Planning Commission in 2009.

The Pacifica General Plan (as updated August 2005) Historic Preservation Element. This section includes a "list and map of all of the sites and structures felt to be of historic significance in Pacifica."

With regards to Sharp Park, the Pacifica Historic Sites list includes:

Number 18. Laguna Salada & Marsh
Number 19. Sharp Park Golf Course & Clubhouse
Number 20. Trees in Sharp Park

However, this section also states that "the element would be implemented by an Historic Ordinance which would establish a Pacifica Historic Sites Advisory Committee to review proposed changes to sites and structures designated on the Historic Sites Map and advise the Planning Commission and City Council of the appropriateness of the proposal." **No such Historic Ordinance or Advisory Committee was ever created: instead Pacifica implemented this through its zoning code.**

Title 9 of Pacifica's Zoning Code, Chapter 7 covers Historic Preservation. Section 9-7.208 of the Code lists Pacifica's designated Historic Sites:

Sec. 9-7.208. - Final designations.
The following structures, having been approved by the Planning Commission and Council for designation as historic landmarks pursuant to the procedures of this article, are hereby given final landmark designation:

(a)Sanchez Adobe;
(b)Sharp Park Golf Course Clubhouse;
(c)Little Brown Church;
(d)San Pedro Schoolhouse;
(e)185 Carmel Avenue;
(f)Vallemar Station, 2125 Cabrillo Highway;
(g)Anderson's Store, 220 Paloma Avenue;
(h)165 Winona Avenue; and
(i)Dollaradio Station.

(§ 1, Ord. 482-C.S., eff. May 27, 1987, as amended by § 1, Ord. 533-C.S., eff. September 27, 1989, § 1, Ord. 534-C.S., eff. September 27, 1989, and § 2, Ord. 569-C.S., eff. July 10, 1991, § II, Ord. No. 770-C.S., eff. May 26, 2010)

As you can see, only the golf course clubhouse has been designated historic by Pacifica**. Laguna Salada itself, along with the golf course, are 'potential' historic resources according to the general plan, but because these potential resources were never finalized into actual landmarks, they are not so protected.**

Only Sharp Park Golf Course's clubhouse is listed as an historic landmark in Pacifica, an uncontroversial finding that is not impacted in any way by the restoration proposals we have all pursued. However, **to rely on Pacifica's general plan as reason to landmark the golf course takes one only so far, because the marsh, lagoon and trees—all directly threatened by the course, are provided the same level of so-called protection as the course itself.**

San Francisco's own Historic Preservation Commission, the City's agency responsible for identifying and designating landmarks, disagreed with this assessment. **On September 21, 2011, the Commission ordered staff to prepare comments stating that they do not concur in the Recreation and Parks Department's position that Sharp Park retains historic integrity.**

There is good reason for this determination:

- The Recreation and Parks Department's Historic Resources Evaluation provides **insufficient information and evidence to support its conclusion that Sharp Park retains historic integrity**.
- The evaluation also **lacks a proper analysis of the historic landscape**, and thus there isn't an appropriate baseline to judge integrity.
- The Evaluation also **fails to consider a range of mitigation measures**, and thus precludes restoration of endangered species habitat. Historic preservation and natural resources protection are not exclusive – Crissy Field and Muir Woods restoration are examples of natural resource restoration projects where historic resources existed.
- The National Park Service has asked to play a role in any historic resource evaluation of the golf course – per their 2009 statement – because the course is within their historic boundary and they are undertaking a multi-million dollar wildlife habitat restoration project adjacent to Sharp Park, yet the City has not engaged the Park Service. The **Park Service is considered the most respected expert in historic resource preservation**.

Attached to this memo are previous statements by the National Park Service and the City of San Francisco opposing landmarking the golf course in Pacifica; written histories about how the course no longer retains integrity; and a link-by-link assessment of what has been lost at the golf course.

Sharp Park today bears no resemblance to Alister MacKenzie's original design**. Every link has been changed at Sharp Park—in many cases radically, and many holes have been lost completely.** It is misleading to claim that any historical integrity exists at the course.

- The water features on five MacKenzie holes east of Laguna Salada, original holes 1, 9, 15, 16, & 17, have been culverted, eliminating crucial water hazards essential to his design.

- Five holes west of Laguna Salada, including original holes 3, 4, 6, 7, & 8 were destroyed completely by massive coastal storm surges and the subsequent construction of the berm.

- Two others, original holes 2 & 5, were severely damaged and modified to eliminate additional water features and other elements of their design. Now the site of hole 12, the original hole 2 was shortened by 60 yards and a stroke while the strategic features—including its proximity to a much larger Horse Stable Pond than exists currently—are almost completely irrelevant to the hole's play today. Hole number 5, which was considered by Jack Fleming to be "one of the most interesting holes on the course, similar to Dr. MacKenzie's 'ideal golf hole,'" is now the current site of hole 17, but other than occupying the same space the hole bears absolutely no resemblance to the original hole 5: a tee shot over Laguna Salada has been removed, and dual fairways have been combined into one, eliminating strategy alternatives integral to MacKenzie's design.

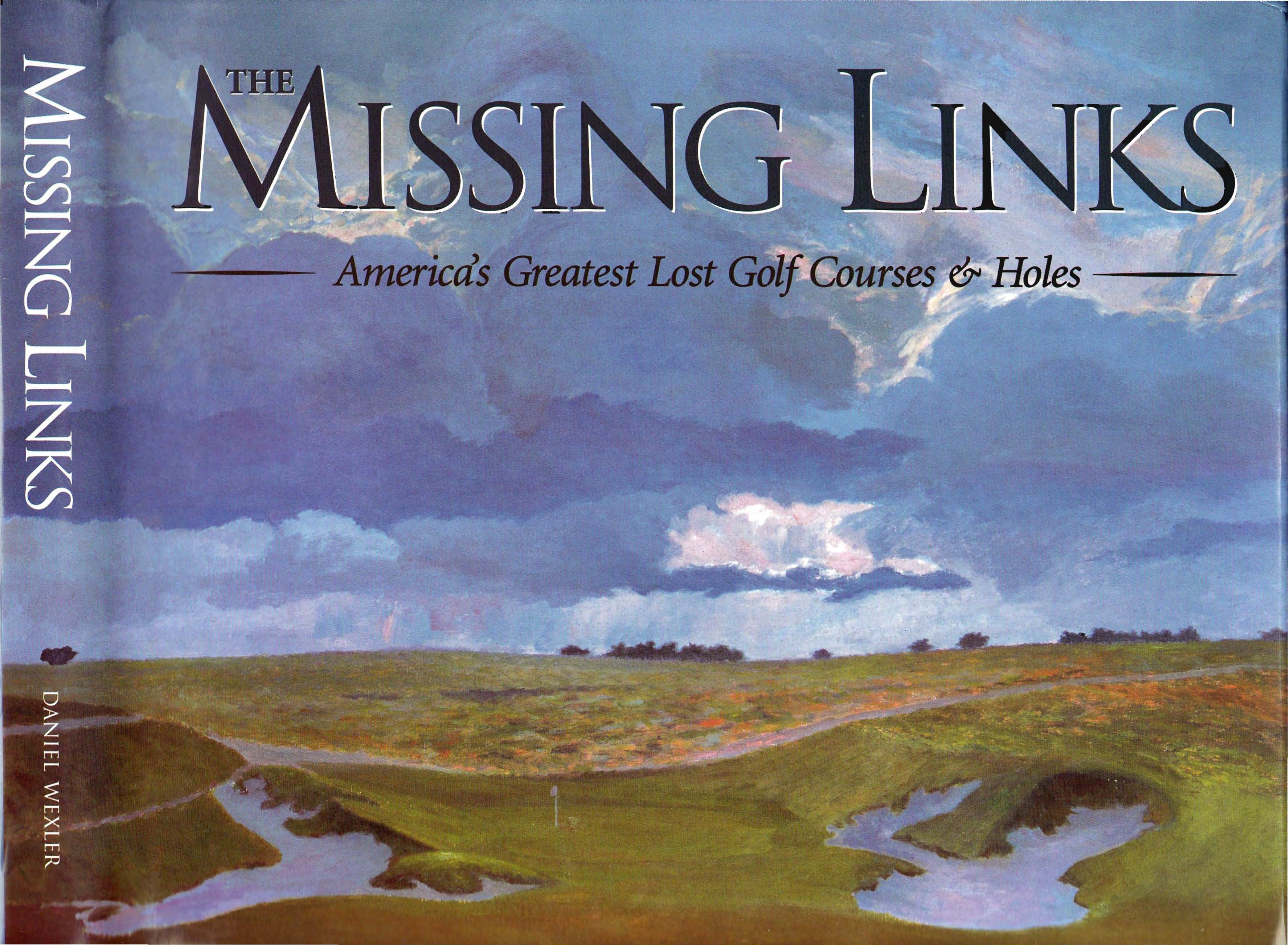
- Original holes 10 and 11, now the location of holes 14 and 15, have likewise been modified with changed greens and fairways that bear no resemblance to MacKenzie's layout. Indeed, Daniel Wexler argued that the original hole 10 was perhaps the course's best link, but its essential feature—a double fairway—no longer exists.

- Original hole 12, now the location of hole 18, has had sand traps removed from the design. In addition, original hole 13 (now 3), and original holes 14 and 15 (now the location of holes 8 and 2) described by Wexler as "not among the layout's finest" to begin with, have likewise had hazards reconfigured, as has the final original hole, 18 (now the location of hole 10).

- In addition, the theory of the course—the creation of a links-type, seaside course—was entirely upended when the berm was built separating the course from the ocean.

THE MISSING LINKS

America's Greatest Lost Golf Courses & Holes



MISSING LINKS

DANIEL WEXLER

SHARP PARK																				
400	274	423	120	338	168	383	398	538	3042	392	142	483	345	143	330	363	471	443	3112	6154
4	4	4	3	4	3	4	4	5	35	4	3	5	4	3	4	4	5	4	36	71

1943 aerial survey reveals a number of MacKenzie's original holes still intact, plus four newer ones built to the east. (National Archives)

SHARP PARK GOLF COURSE

PACIFICA, CA

Opened in 1931 / 6,154 yards Par-71

As today, some 65 years after his death, Dr. Alister MacKenzie remains perhaps the most celebrated golf architect in history, it is truly remarkable that two public courses he laid out in major American metropolises could have been so short-lived and poorly documented. Yet Bayside, as we have seen, labored in (and vanished into) almost complete obscurity—and it cannot even begin to compare with the briefly-lived legacy of San Francisco's Sharp Park.

MacKenzie's Sharp Park layout is surely one of golf architecture's most enduring mysteries. Owing to the fact that it was built in 1931, then washed into oblivion by a coastal storm shortly thereafter, its original design was seen firsthand by very few. Nor was this initial version in any way adequately recorded, with few photographs of any kind known to remain in existence. Further, a visit to today's 6,299-yard facility offers little; this vastly-altered layout serving mostly to make one wonder if a vintage MacKenzie design ever *could* have existed upon this site.

But the Doctor's original, located very much upon this same land, was all that its tantalizing prospects have suggested, a marvelous golf course featuring seaside holes, two double fairways, a large lake, and a cypress-dotted setting fairly reminiscent of Monterey. It was, in short, a municipal masterpiece.

Located just 10 miles south of downtown San Francisco, the site given to MacKenzie was uncommonly fine for a public facility, including a nearly 1,000-yard oceanfront stretch along Salada Beach. For a county whose public course facilities at Harding and Lincoln Parks were among the busiest in the nation, the development of Sharp Park was a godsend, but this wonderful property was not without its drawbacks.

For one thing, a fair amount of the land required shoring up with massive quantities of dredged sand in an expensive, Lido-like operation. Second, the site was partially divided by a small county road, a circumstance dictating that three of MacKenzie's back-nine holes be separated from their 15 brethen. Years later this road would be rerouted, though by that time the storm-driven reconfiguration of the golf course would still leave four newer holes separated, about the only commonality between MacKenzie's work and the course in play today.

The 1931 layout began with a dogleg-right par-4 of 400 yards, a strong but not especially memorable opener. But things changed quickly at the second, a 274-yard par-4 with alternate tees situated on either side of the first green. In what today might be referred to as "risk/reward" style, this nearly-driveable hole featured a large bunker front-right of the putting surface and a lake to the left of the fairway, creating the wonderful question of just how near the water one dared to venture in pursuit of an easier angle for his second.

The third was a long two-shotter of 423 yards, playing directly north along the beachfront. Again the risk/reward question was laid before us: play safely down the middle and deal with a front-right greenside bunker or aggressively skirt the beach in pursuit of an open second? Seaside winds generally affected play at Sharp Park greatly, bringing those most unlinkish of obstacles—trees—into play along the right side as well.

Following the short fourth, a precise pitch played along the lake's westward shoreline, one reached the first of the dual-fairway holes, the 338-yard fifth. Here the player's options were numerous with a "safe" left-side route leaving the most difficult second-shot, a dangerous lakefront fairway opening up a more direct line, or the all-out blast over everything leaving a mere pitch from a wide-open angle. As at the second hole, a second tee positioned left of the previous green served to create additional angles and variety.

The 385-yard seventh was the course's second and last seaside hole, playing directly south to a long, narrow green flanked on either side by sand. The slight angling of the putting surface again tempted one to drive close to the beach (particularly if the pin was cut back-left), but the lesser presence of trees at least made this tee shot a bit more forgiving.

The 398-yard eighth, though built with only one fairway, offered two very distinct lines of play. A drive aimed safely left was simple enough but set up a nearly all-carry approach across two front-left greenside bunkers. For the man capable of controlling a long fade, however, there was the option of skirting the treeline, a shot which, if brought off successfully, again yielded a more favorable approach.

Though one hesitates to name a best hole among so many good ones, the 392-yard 10th did a fine job of nominating itself. Here was the double fairway concept played out to the fullest, the right side providing ample safety but a bunker-obscured second, the left requiring a gutsy tee shot to a water-guarded fairway but yielding a straight-on approach. Yet again, dual tee boxes varied the challenge from day to day, making the 10th a truly great hole—but an intimidating prospect for anyone hoping to slip past the starter and begin play on the back nine.

Following the 142-yard 11th came the long 12th, a 493-yarder distinctly reachable in two, provided one avoided several prominent trees and the out-of-bounds which ran down the entire left side.

Perhaps not surprisingly, the three holes exiled across the county road were not among the layout's finest, the 345-yard 13th being the best of the bunch with out-of-bounds also threatening its more-favored left side.

With the routing having returned to the clubhouse for a third time, one set out again at the 363-yard 16th, a par-4 following much the same path as today's first hole. Here a large mound punctuated the fairway some 175 yards off the tee, offering several different angles of play. The more difficult drive was the one aimed down the right side, close to a clump of trees. Naturally this choice also provided the better approach angle to a deep, narrow putting surface.

MacKenzie closed out Sharp Park with a pair of long finishers beginning with the 471-yard 17th. Though not a particularly difficult hole, this short par-5 often faced a strong sea breeze and featured out-of-bounds left, two bunkers, a meandering brook and a green laid precariously close to a rough, marshy depression. The 18th, by contrast, was a bit of a monster, its 443 yards requiring more brute strength than finesse, though the ability to draw one's tee shot would obviously have come in handy.

It was indeed unfortunate for Sharp Park that so many of its best holes fell along the property's ocean side, for it was this flank which took the brunt of any incoming storms. Following the early 1930s deluge that washed several of these gems out to sea, a massive berm was constructed (largely upon land once occupied by holes three and seven) to prevent history from repeating itself. The subsequent rerouting of the county road and reconfiguring of the lakeside holes has further muddled things so that today only a handful of holes run consistent with MacKenzie's originals, and no appreciable trace of his strategy remains in play.

How Sharp Park Would Measure Up Today

Oceanfront holes, double fairways, MacKenzie bunkering, marvelous scenery...

Any way you look at it, even at only 6,154 yards, Sharp Park would have to stand well out in front as America's finest municipal golf course.

Restoration anyone?

SHARP PARK

Being that the City had come by the lots at Sharp Park so cheaply(free in fact)they decided to bring in one of the world's foremost golf architects, Dr. Alister Mackenzie. The fact that Mackenzie and his assistant at that time, Jack Fleming, were able to design a golf course along the San Mateo County coast line was quite an accomplishment in itself. They managed to accomplish this difficult feat by dredging for fourteen months in order to build up the fairways.

On May 15, 1930 Robert Hunter, Jr. was appointed the superintendent of construction for Sharp Golf Course at a fee of $750 for ten month's work. Four and a half months later on October 2, 1930 Willis Polk and Company was authorized to prepare plans and specfications for the starter's house at the golf course. The original cost of playing golf was $2.00 per month and a card good for all three courses became available in May 1932 for $5.00.

The courses's opening in 1932 was twice delayed due to wet conditions. The golf course officially opened April 1, 1932. Perhaps the fact that even the opening of the course had to be delayed twice due to winter rains should have warned of the drainage problems this site would always face. Normally a golf course will welcome the rest and revitalization the winter rains bring. In Sharp Park's case the winter rains brought about the annual flooding of Laguna Salada out on to playable portions of the golf course. This problem still persists 47 years later even though a 4,000 gallon water pump has been installed. Two factors contribute to the poor drainage problem at the Sharp Park site. First and foremost is the fact that the course is built at sea level and thus was susceptable to changing tides. The second factor was the annual flooding of Laguna Salada itself.

The golf course that opened on April 1, 1932 was becoming increasingly popular until it was severely damaged by high tides in a storm during the winter of 1938. The holes constructed on or near the beach were unindated by the unchecked tides of the storm. This resulted in severe damage to the beach holes - Numbers 2 through 8. The course, generally considered one of the best tests of golf in Northern California would never be the same. The beach holes had to be abandoned and reconstruction was forced across the Coast Highway up into what is now referred to as "The Canyon Holes". The effect was much the same as taking a house with a beach view and turning it 180 degrees to face a mountain slope. This was the most drastic architectural change the Sharp Park layout would ever face. Even the State Highway construction in the early 1960's that wiped out one par three hole would not have as damaging effect as nature.

Sharp Park remains very busy to this day drawing players both from the City and from down the peninsula. During the winter, however, as the water table rises, the course becomes less playable and suffers a significant drop in play - more so than other municipal courses during the winter. One winter in the early 1970's flooding was so thorough that the unchecked water nearly reached the clubhouse.

City and County of San Francisco
Recreation and Park Department

McLaren Lodge in Golden Gate Park
501 Stanyan Street, San Francisco, CA 94117
TEL: 415.831.2700 FAX: 415.831.2096 WEB: www.parks.sfgov.org

September 1, 2009

Honorable Julie Lancelle
Mayor, City of Pacifica
City of Pacifica City Hall
170 Santa Maria Avenue
Pacifica, CA 94044

Michael Crabtree, Planning Director
City of Pacifica
Planning Department
1800 Francisco Blvd.
Pacifica, CA 94044

Re: Proposed Designation of Sharp Park Golf Course as a Pacifica City Landmark

Dear Mayor Lancelle and Director Crabtree,

I am writing in regard to the City of Pacifica's application to designate the Sharp Park Golf Course a Historic Landmark under Pacifica Municipal Code, Chapter 7. We think this action is both inappropriate and unnecessary. Under California law, the City of Pacifica cannot regulate land use at Sharp Park which is owned by the City and County of San Francisco. (*See*, Cal. Govt. Code §§ 53090, et seq., *Akins v. County of Sonoma*, 67 Cal. 2d 185 (1967).) Therefore, any designation of the Sharp Park Golf Course as a historic landmark by the City of Pacifica will have no legal effect and, frankly is not helpful in furthering a legitimate public policy debate here in San Francisco.

We certainly recognize that Sharp Park Golf Course is used and enjoyed not just by many San Franciscans, but also by the residents of Pacifica, and that your City is concerned about any potential changes to it, and particularly to the golf course. As you may know Sharp Park is approximately 400 acres -- 237 of those acres are included in the San Francisco Recreation and Park Department's Significant Natural Resource Areas Management Plan (SNRAMP). This Plan is currently undergoing environmental review under the California Environmental Quality Act. We appreciate the historic and cultural value of the golf course, and an evaluation of the effects of the SNRAMP on the golf course as a potential historical resource will be included in the SNRAMP EIR.

As you also likely know, the area around the Sharp Park Golf Course contains habitat that support two special status species: San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), listed as endangered under the federal Endangered Species Act, and classified as a fully protected species under California Fish and Game Code § 5050; and the California red-legged frog (*Rana draytonii*), listed as threatened under the federal Endangered Species Act and a state species of special concern. Under federal and state law, the City and County of San Francisco must ensure that the golf course operation does not endanger or harm either of these species. Recently, the San Francisco Board of Supervisors enacted legislation directing the Recreation and Park Department to develop a plan for restoring the habitat for the garter snake and red-legged frog in conformance with federal and state law. Currently, we are preparing option plans, including schedules and costs for presentation to the public and to the Board which we hope to have preliminarily completed in October 2009.

We take our stewardship responsibilities at Sharp Park very seriously. In a very difficult financial climate, we must manage the recreational, cultural and biological uses of the park in a manner that best balances legitimate recreational needs with our fiduciary and legal responsibility to protect the habitat. We will continue to include the City of Pacifica in our discussions as we evaluate plans Sharp Park's future.

Very truly yours,

Philip A. Ginsburg
General Manager

cc: Mayor Gavin Newsom
Members of the Board of Supervisors
City Attorney Dennis Herrera
Members of the Recreation and Park Commission

United States Department of the Interior
NATIONAL PARK SERVICE
Golden Gate National Recreation Area
Fort Mason, San Francisco, California 94123

IN REPLY REFER TO:

L1415 (GOGA-PLAN)

July 20, 2009

Mr. Michael Crabtree
Planning Director
170 Santa Maria Avenue
Pacifica, CA 94044

Re: Proposed Historic Landmark Designation for Sharp Park Golf Course. HLD-6-09

Dear Mr. Crabtree:

Enclosed is our statement regarding the proposed action above. Please make this part of the July 20, 2009 City of Pacifica Planning Commission hearing. If you have any questions, contact Nancy Hornor at (415) 561-4937.

Sincerely,

Frank Dean
Acting General Superintendent

Enclosure:

United States Department of the Interior

NATIONAL PARK SERVICE
Golden Gate National Recreation Area
Fort Mason, San Francisco, California 94123

IN REPLY REFER TO:

NPS Statement on Pacifica Landmark Designation for Sharp Park

July 20, 2009

We learned of the City of Pacifica's proposal to designate Sharp Park Golf Course as a Pacifica Historic Landmark when we received the public hearing notice. We were not notified of this proposal through the Pacifica GGNRA Advisory Committee, which was set up by the Pacifica City Council to discuss items pertinent to both bodies.

As you know, Sharp Park is within the boundary of the Golden Gate National Recreation Area and adjacent to lands that we manage at Sweeney Ridge and Mori Point. We are currently completing a multi-year restoration project at Mori Point, to protect the Endangered San Francisco Garter snake and the threatened Red-legged frog and provide for compatible recreation and community stewardship and educational activities. Therefore, we have an interest in the future of Sharp Park.

Although we concur that the golf course and club house, as well as the remains of the WWII internment camp, should be evaluated, we request that you not make a landmark designation without a professional assessment of the significance and integrity of the property. We can assist with such an evaluation and would like to work with City of Pacifica and the City of San Francisco to define an appropriate process that includes all stakeholders.

SAN FRANCISCO
PLANNING DEPARTMENT

September 26, 2011

1650 Mission St.
Suite 400
San Francisco,
CA 94103-2479

Reception:
415.558.6378

Fax:
415.558.6409

Planning
Information:
415.558.6377

Mr. Bill Wycko
Environmental Review Officer
San Francisco Planning Department
1650 Mission Street, 4th Floor
San Francisco, CA 94103

Dear Mr. Wycko,

On September 21, 2011, the Historic Preservation Commission (HPC) held a public hearing and took public comment on the Draft Environmental Impact Report (DEIR) for the proposed Significant Natural Resources Area Management Plan. After discussion, the HPC arrived at the comments below:

- The HPC did not have consensus on the historical integrity of the Sharp Park Golf Course. Some commissioners thought that the property does not retain sufficient integrity to convey the property's historical significance per the National Register of Historic Places and/or California Register of Historical Resources, while others thought that the property does retain sufficient integrity.
- The HPC suggest that the mitigation measure described in M-CP-1 (Page 11) should be modified to specify that the future historic resource evaluations should be completed by a qualified professional landscape architectural historian.
- The HPC suggests that the mitigation measure described in M-CP-7 (Page 13) should be modified to specify that a qualified professional landscape architectural historian should be retained to document the cultural landscape.
- The HPC suggests that implementation of the Sharp Park restoration activity to construct a post and rail fence along the seawall of the golf course described in I-CP- 8 (Page 14) *would* cause a substantial adverse change in the significance of the Sharp Park Golf Course.
- The HPC also commented that it is likely that future projects involving federal permitting or funding will be reviewed and commented on by the Commission as part of the National Environmental Policy Act (NEPA) process.

The HPC appreciates the opportunity to participate in review of this environmental document.

Sincerely,

Charles Chase, President
Historic Preservation Commission

MEMORANDUM FOR RECORD

FILE NUMBER: 2010-00327
PROJECT: Sharp Park Pump Maintenance
DATE: 9/29/10
SUBJECT: NPR

Proposed Site: The project site is located in a portion of a wetland located within the Laguna Salada Restoration Project located within Sharp Park, in the city of Pacifica, San Mateo County, California.

Proposed Project: The San Francisco Recreation and Parks Department proposes to dredge a small area (68 sq. feet) within Laguna Salada wetland to maintain the pumps that convey storm flows from the lagoon to the ocean.

A trash Debris pump would be used to suck the sediment in a 4 foot by 8 foot by 2 foot area in front of the intake structures. Sediment would also be removed from the intake box. On September 23, the project was discussed further with the applicant's agent. He confirmed that no fill in the wetland would occur. The site would be access from upland roads or the seawall associated with the wetland. The sediment would be deposited on uplands occupied ice plant as indicated on the delineation map verified by the Corps. Additionally, no coffer dam would be required to complete the work.

Project Background: A wetland delineation was verified by Project Manager, Ian Liffmann (file 209-00044). On August 17, 2010 a letter requesting approval to complete the dredging was submitted. On September 8, 2010 the DMMO office confirmed that the project is not navigational dredging and therefore should be handled by the Regulatory Office.

Site Visit: None completed.

Jurisdictional Determination: None Completed.

Endangered Species: There are known occurrences of California red-legged frog and San Francisco Garter Snake within Sharp Park Golf Course. The letter should clearly indicate that although no permit is required, that compliance with federal ESA is still required. This topic was further reviewed by the Project Manager, Paula Gill and the applicant's agent David Munro on September 23, 2010.

Historic Properties: None are expected to occur.

Corps Recommendations: The proposed project does not trigger the need for a USACE permit.

Paula Gill, Project Manager

9/29/10
Date

CESPN-OR-R

Memo For The Record

Project Manager: Ian Liffmann

Attendees: Kelly Bayer, Daniel LaForte, David Munro, Katerina Galacatos, Ian Liffmann

File No.: 2009-00044S

Date: March 2, 2009

Subject: Site visit (February 18, 2009) and decision to issue JD verification letter.

Site Location: The Laguna Salada Wetland Restoration and Habitat Recovery Project is located in the Sharp Park Golf Course, in the City of Pacifica, San Mateo County, California.

Proposed Project: The project will involve re-working the wetlands and open waters within the golf course in order to create potentially better habitat for the San Francisco garter snake and the California red-legged frog, and to stabilize the fluctuations in the water level of the wetlands by creating better flow to the pump station that regulates the water level. A formal application for the project has not been received yet- at this point it is only a JD verification.

Notes/Site Inspection: The site was heavily flooded when we visited it- the main pump to the ocean was broken, and thus water was backing up and flooding the wetlands and the golf course. The wetlands and golf course are situated behind a levee that separates them from the Pacific Ocean. Before the levee was constructed this area was a tidal lagoon.

JD: The Corps has jurisdiction of the pond and the wetlands up to the ordinary high water mark.

Federally Listed Species Issues: The site is home to the San Francisco garter snake and the California red-legged frog.

Impacts to Corps Jurisdiction: A formal project application has not been received yet, but initial conversation indicate that the project may propose the filling of up to 5 acres of wetlands. I had a conversation with the consultants about the fact that all of these impacts would have to be mitigated for (even if they were beneficial for wildlife), and that it was possible that a combination of on and off site mitigation could compensate appropriately, but that minimizing as much of this fill as possible should be the number one priority.

Mitigation Proposal: A formal mitigation proposal has not been received.

Historic Properties: There are no historic properties at this site.

Corps Staff Recommendations: Since the site's water is regulated artificially, coming to a decision on an exact boundary of the wetlands and waters would be difficult. The map that the consultants provided is a good representation of what the site would normally look like if the pump was working, which would be different than it was when the site was visited. Because the water could be kept at any number of levels artificially, I believe that the map that was provided would be a good representation of the normal level that the wetlands and waters extend to, and therefore a JD letter verifying this map as accurate should be sent.

EXHIBIT J

San Francisco Department of Public Works

Sharp Park

Sharp Park Sea Wall Evaluation

December 2009

Arup North America Ltd
560 Mission Street, Suite 700, San Francisco, CA 94105
Tel +1 415 957 9445 Fax +1 415 957 9096
www.arup.com

Job number   211219

2.3 Task 3 – Saltwater Intrusion Evaluation

Arup reviewed existing salinity data of Laguna Salada collected by the SFRPD. The purpose of the review was to identify if water is penetrating the Sea Wall and entering the wetlands. We also visually inspected the Sea Wall to determine if noticeable areas of salt water intrusion are present.

3 Site History

3.1 Acquisition and Building of the Golf Course

The City and County of San Francisco acquired the property of Sharp Park in 1916-1917 through an indirect bequest by Mrs. Honora Sharp. The property came with the stipulation that the property be used only for a public park or playground. The decision to build a Golf Course took place in 1929 and it was completed in 1932. It was designed by Dr. Allister McKenzie along with Robert Hunter (Geomatrix 1987).

3.2 Building of the Sea Wall

The first unarmored earthen Sea Wall embankment at the site was built between 1941 and 1952 to protect the golf course from waves and flooding (Philip Williams & Associates [PWA] 1992). From that time until a major storm in 1983, maintenance was periodically performed on the Sea Wall embankment.

3.3 Major Storms and Erosion of Coastline

Since 1931, between 200 to 300 ft of beach has been lost due to shoreline erosion, including 16 acres of the golf course. A majority of this erosion has occurred during major storms. The most noteworthy have been in 1958 ,when most of the golf course was submerged due to wave overflow and storm inflows, and January 1983, when a large portion of the Sea Wall was breached and large amounts of sand were carried onto the golf course (PWA 1992).

3.4 Reconstruction of Sea Wall in 1989

After the 1983 breach, the City and County of San Francisco took measures to prevent erosion of the Sea Wall on a large scale. In 1984, a geotechnical study titled Restoration of Coastal Embankment; Sharp Park Golf Course was performed by Woodward-Clyde Consultants, which looked at the soils underlying the Sea Wall and the area in the immediate vicinity. In 1987, a feasibility study was conducted by Geomatrix Consultants titled Restoration of the Coastal Embankment; Sharp Park Golf Course, which looked at various design alternatives for the Sea Wall. In 1989, a reconstructed Sea Wall was completed which spanned the entire 3,200 ft of coastline at Sharp Park. Several years later, the northern 1,140 ft of the Sea Wall was lightly armored to protect against wave action. Then, between 1997 and 2000, the southern 285 ft of the Sea Wall was also armored.

4 Review of Available Data

4.1 Available Geotechnical Data

The majority of the available geotechnical data for the site is in the 1984 geotechnical study by Woodward-Clyde Consultants. For this report, eight borings were drilled along the Sea Wall and engineering laboratory tests were conducted on the collected soil samples. The report presents several potential designs for the Sea Wall.

In this report, six of the eight borings show loose to dense Beach sand over their entire depth, which is 14.5 to 20.5 ft below the bottom of the Sea Wall. Two boreholes in the area west of the southern portion of the Sea Wall show silty clay below the Beach sand. In one borehole the silty sand goes from 20 ft to the bottom of the borehole at 24.5 ft. In the other borehole, the silty sand is present from 22 to 26 ft and is underlain by sandy gravel that extends to the bottom of the borehole at 29.5 ft. The surface elevations of the boreholes are not given in the report (Woodward-Clyde 1984b).

Another 1984 study by Woodward-Clyde Consultants titled Design Memorandum, Beach Boulevard Seawall provides subsurface information at the northern-most edge of the Sea Wall alignment. In this report, 5 boreholes are within 400 ft of the Sea Wall alignment and were considered relevant to this project. They show loose to medium dense, fine-grained sand at the ground surface to elevation 3.6 to -4.5 ft (NGVD29). Below the sand is medium stiff to very stiff, silty or sandy clay, which extends to the bottom of the boreholes at elevation 0.6 to -10.3 ft (NGVD29) (Woodward-Clyde 1984a).

4.2 Aerial Photographs

Fourteen aerial photographs were obtained from Pacific Aerial of Oakland, CA for the area of the Sharp Park Sea Wall. The earliest photograph obtained is from 1946 while the latest is from 2000. In the 1946 to 1969 photographs, the crest of the Sea Wall appears to be low and non-uniform, as shown in the 1946 photograph (Figure 3). In 1972, a well-defined Sea Wall appears over the northern half of the alignment (Figure 4) but appears to deteriorate through 1981. In 1983, the Sea Wall is no longer visible as it was breached and eroded in the January 1983 storm (Figure 5). In 1985, it seems that minor repairs have been done along the alignment, and in 1989 the Sea Wall appears in its current form (Figure 6). In 1991, the rip rap on the northern section is present. The rip rap on the southern section is visible in the 2000 photo (Figure 7).

4.3 Current Tidal Data and 100-year Flood Estimate

The three nearest tidal stations to the Sharp Park Golf Course are Ocean Beach, San Francisco Bar, and Half Moon Bay. Daily tidal predictions are available for these stations from the National Oceanic and Atmospheric Administration (NOAA). However, these stations do not present data in terms of absolute datums and therefore were not used. The nearest station that has datums available is San Francisco (Golden Gate). At this location, the Mean Highest High Water (MHHW) level is 5.84 ft above the Mean Lowest Low Water (MLLW) level. This corresponds to a MHHW level of elevation 5.92 ft in the NAVD88 datum. The highest water level recorded at this station during the period of 1983 to 2001 was 8.74 ft (NAVD88) on January 27, 1983 (NOAA 2009).

The Base Flood Elevation (BFE) at the Pacific Ocean, at Sharp Park State Beach, located approximately 2,000 ft north of the site, is 29.7 ft (NAVD88). The BFE is the elevation to which floodwaters are expected to rise to during a 100-year flood (Federal Emergency Management Agency [FEMA] 2009). A 100-year flood is the flood that has a 1% chance of occurring every year. The definition is the same for a 100-year storm.

4.4 Previous Coastal Design Criteria

In the previous design and feasibility studies performed by Woodward-Clyde Consultants (1984) and Geomatrix Consultants (1987), coastal design criteria were presented for the design of the Sea Wall. In the Woodward-Clyde report, a design still water level of 9 ft (MLLW) was assumed. A design wave height of 12.7 ft (MLLW) was assumed.

Photograph: AV9-13-1
Date: 7-29-1946

HISTORICAL AERIAL PHOTOGRAPH: 1946

Sharp Park
Sharp Park Sea Wall Evaluation - Draft
Department of Public Works
San Francisco, California

December 2009

ARUP

FIGURE 3

Q:\211219\4 Internal Project Data\4-05 Reports & Narratives\01 Sharp Park Draft Report\Individual Figures\Historical Photo 1946.grf

Photograph: AV-1045-02-23
Date: 5-11-1972

HISTORICAL AERIAL PHOTOGRAPH: 1972

Sharp Park
Sharp Park Sea Wall Evaluation - Draft
Department of Public Works
San Francisco, California

December 2009

ARUP

FIGURE 4

Photograph: AV-2265-01-18
Date: 6-6-1983

HISTORICAL AERIAL PHOTOGRAPH: 1983

Sharp Park
Sharp Park Sea Wall Evaluation - Draft
Department of Public Works
San Francisco, California

December 2009

ARUP

FIGURE 5

Photograph: AV3556 1 16
Date: 6-19-1989

HISTORICAL AERIAL PHOTOGRAPH: 1989

Sharp Park
Sharp Park Sea Wall Evaluation - Draft
Department of Public Works
San Francisco, California

December 2009

ARUP

FIGURE 6

Photograph: SMT AV 6600 2 15
Date: 8-15-2000

HISTORICAL AERIAL PHOTOGRAPH: 2000

Sharp Park
Sharp Park Sea Wall Evaluation - Draft
Department of Public Works
San Francisco, California

December 2009

ARUP

FIGURE 7

EXHIBIT K

UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA
NORTHERN DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.* Plaintiffs, **v.** **CITY AND COUNTY OF SAN FRANCISCO,** *et al.*, Defendants.	Case No.: **3:11-CV-00958 SI** **WENDY DEXTER EXPERT REPORT**

1. I am submitting this expert report on behalf of plaintiffs in this case.

BACKGROUND AND QUALIFICATIONS

2. I am the President and Principal Biologist at Condor Country Consulting, Inc., a biological consulting firm I founded ten years ago. For the past twenty years I have worked professionally as a wildlife biologist, with an emphasis on herpetology, i.e., the study of amphibians and reptiles. Through my work I have conducted special-status species surveys and prepared biological reports for projects requiring permits from federal and state agencies, including Endangered Species Act permits from the United States Fish and Wildlife Service. In this capacity, I have provided my expertise to many public entities, including the San Francisco Public Utilities Commission, Caltrans, San Mateo County Public Works, and many other public agencies. I am a member of several professional organizations, including the Wildlife Society, the Society for Conservation Biology, and the Society for the Study of Amphibians and Reptiles.

3. I received a B.S. in Environmental Planning and Management from U.C. Davis in 1990, and completed my graduate coursework in Biology at California State University at Hayward in 1998. Sam McGinnis, PhD. was my major professor and under his tutelage I worked on several research projects collecting data on the San Francisco gartersnake (*Thamnophis sirtalis tetrataenia*, SFGS) and the California red-legged frog (*Rana draytonii*, CRLF).

4. I am one of a small number of professional biologists permitted by both the United States Fish and Wildlife Service and the California Department of Fish and Game to carry out recovery actions on the SFGS. I am therefore one of a few individuals authorized to study and implement recovery actions for this subspecies. I am also permitted to work with the CRLF and other federal and state-listed threatened and endangered herpetofauna (reptiles and amphibians) by these agencies.

5. I have studied almost a significant number of the peer-reviewed journal articles and books that address life history aspects of SFGS and CRLF, in addition to various master's theses, Environmental Impact Reports, habitat assessments, Biological Opinions, and Biological Assessments that contained information or opinions on these species. I have also reviewed historic accounts of SFGS in Wade Fox's papers, and of CRLF in Storer's 1925 A Synopsis of the Amphibia of California.[1]

6. I have conducted several studies on lands where the SFGS and the CRLF occur, logging hundreds of hours searching for, identifying, and monitoring these species during all life stages. For example, I have performed population studies of SFGS at the Pescadero Marsh State Park, Crystal Springs Reservoir, and West of Bayshore properties. I have participated in habitat enhancement efforts including pond construction, dredging of aquatic habitat, and vegetation management and enhancement at several other sites throughout San Mateo County. In addition, I have trapped or performed visual surveys for SFGS at seven other locations. All but two of these projects also included either studying, protecting, or enhancing habitat for the CRLF. I have spent hundreds of hours observing, trapping, netting, capturing, relocating, and surveying for this frog in counties throughout its range.

7. In the process of performing these studies I have discovered new populations of CRLF. I have also assisted in the discovery that CRLF tadpoles can overwinter, and that female CRLF

---

[1] At one time the California red-legged frog and the Northern red-legged frog were considered two subspecies of *Rana aurora*. Today the California red-legged frog is considered its own species, *Rana draytonii.* Nonetheless, observations that pre-date this taxonomic change can still provide useful information about *Rana draytonii* if the observations are from areas where only one of the two species was known to occur. The two subspecies did not overlap in range at Sharp Park, so these older observations are relevant to our current knowledge of the frogs at Sharp Park.

can vocalize when frightened or when desiring release during amplexus (an egg-laying position where the male frog holds the female from behind in order to fertilize eggs as they are laid). Both of these life history characteristics were undocumented prior to work on a project in Contra Costa County where I and my colleague Jeff Alvarez first observed these phenomena.

8. Part of my profession is to determine project impacts on threatened and endangered species. In the course of my career this work has prompted literature review and synthesis on a variety of threats that could affect the CRLF and the SFGS. This research has focused on topics such as wildlife mortality associated with vehicle collisions on roads (specifically focusing on frogs, salamanders and snakes), noise and nighttime lighting impacts on sensitive bird and bat species, vegetation management impacts to herpetofauna and avian species, ground disturbance impacts to a host of species that live underground for some portion of the year (including CRLF and SFGS), impacts associated with the introduction of invasive non-native fauna, as well as large scale impacts associated with converting habitat to development. I have studied and observed threats to individual animals, such as activities that directly "take" or injure and kill these animals, and activities that impair important aspects of their life history through habitat conversion and modification associated with flood control, water management, land clearing, construction, and vegetation management.

9. For example, approximately ten years ago I was studying SFGS at the West of Bayshore property. On a cold but sunny day in mid-October, I observed an SFGS basking early in the morning on the levy road along cupid's row canal, an activity that put the animal at great risk of being run over. I have also reported and examined an SFGS that was killed by a vehicle traveling on a construction site at slow speeds in the same area and time period. The driver had received species awareness training and direction on procedures necessary to keep from hitting snakes. These experiences inform my recommendations about operating vehicles in SFGS habitats, and the ability of operators to avoid harming these animals.

10. I have also spent dozens of hours monitoring vegetation removal in and around SFGS aquatic habitat in several locations, including West of Bayshore and Woodside, and I have a keen awareness of how difficult the snake is to detect, how quickly they can move in or out of

an area, and how difficult it is to remain alert and vigilant to the task at hand when an animal has not been seen for hours or days. These experiences have informed my opinions about protocols that purport to prevent take of these species by relying on visual detection of these elusive animals.

11. Another part of my profession is to ensure that endangered species permits under state and federal law are properly applied for, obtained, and complied with. I have worked on many projects that have required incidental take approval from the U.S. Fish and Wildlife Service under the Endangered Species Act, and I am very familiar with these permitting processes. I have worked on projects that have had a federal nexus and therefore may be permitted through the Section 7 Consultation process under the ESA, and on projects that do not have an obvious federal nexus and require a Section 10 habitat conservation plan in order to obtain incidental take authorization. For example, I worked on a small project that had both frog and snake impacts, but had no federal nexus because the applicant was claiming no impact to Army Corps of Engineers jurisdictional waters. A majority of my work consists of assisting clients with permitting projects under existing HCPs, through Section 7 Consultation, or in the odd case where both Section 10 and Section 7 Consultation are required. This experience includes permitting dozens of projects that had the potential to impact CRLF or SFGS.

12. For example, in the past five years a client in Woodside was considering installing a golf course on their property, which was habitat for SFGS. I spend a considerable amount of time researching and considering how this might be accomplished for a subspecies listed as "fully protected" under the California Fish and Game Code, but could not conceive of a golf course where no take would occur.

13. I have also worked on many projects where CRLF were present, often in more than one life stage (e.g. adults and tadpoles), where pumping was required. My experience with these projects included assisting with the pump cage design and monitoring the cage to be sure that no animals were trapped on the mesh. Through these experiences I have found that unless there is a vigilant monitor clearing the fine mesh screen and very low water velocities, tadpoles become entrained and either are sucked through the pump and killed or they are sucked against the mesh

and die because they cannot free themselves. All of these projects had take permits, but none of them attempted to draw down the water in the pond during the timeframe when eggs or very small tadpoles would be in the water.

14. Based on my professional experience and expertise with CRLF and SFGS, in 2009, I was invited by the City and County of San Francisco to participate in a "peer-review panel" to discuss the City's Conceptual Restoration Alternative Plan for Sharp Park. I am very familiar with Sharp Park. I visited Sharp Park for several hours in August 2011, and based on that visit and my review of all available reports (as outlined in Attachment B), it is my professional opinion that Mori Point and Sharp Park constitute *one* population of the SFGS and *one* population of the CRLF that function within a complex habitat mosaic. A SBI (2006) document supports my opinion that the two properties constitute one population when it states "[b]ased on size class data, a few individuals captured in 2004 and 2006 may represent young of year from Fall 2003 and Fall 2005. This implies that SFGS at Mori Point are part of a breeding population that occupies the Mori Point and Laguna Salada area. This population may also extend to the south into the Calera Creek watershed where no physical boundaries exist between the parcels and occurrence has been documented in the past (McGinnis 1990)."

15. My experiences there have also helped me understand the proximity of the mowed areas to the aquatic habitat, and to understand how predators and scavengers, as well as prey availability, may impact SFGS and CRLF populations, as well as our ability to detect these species, at the site.

16. I have also reviewed documents regarding CRLF and SFGS at Sharp Park and the surrounding lands (*see* Attachment B). I have reviewed these documents with a particular interest in the differences between management approaches at Sharp Park—which conducts several activities that create a population "sink"—an area where death rates exceed birth rates due to poor quality habitat or impacts associated with disturbance—and management approaches at the adjacent Mori Point National Park—where a robust recovery action is ongoing, creating a population "source" for both species, continually introducing new snakes and frogs into Sharp Park, despite the operations that make Sharp Park a sink.

17. More information about my work with CRLF and SFGS can be found in my resume, which is attached as Exhibit A. My expert testimony in this report is based on the resources described above, along with the documents listed on the attached Exhibit B as well as any other materials discussed below. I am charging plaintiffs $75 per hour for the time I spend reviewing materials and providing deposition and trial testimony in this matter. I have not authored any publications in the previous 10 years, and I have not testified as an expert at trial or by deposition during the previous four years.

REQUESTED TESTIMONY AND FACTS CONSIDERED

18. Plaintiffs have requested that I provide my expert opinion and testimony regarding the presence of San Francisco garter snakes at Sharp Park Golf Course; the effects of mowing operations at Sharp Park Golf Course on the San Francisco garter snake population found there; and the overall impacts the Golf Course's activities have on the population and the species.

SAN FRANCISCO GARTER SNAKES ARE PRESENT AT SHARP PARK

19. It is my professional judgment that the San Francisco gartersnake is present at Sharp Park based on the continued observations of SFGS on the property and at the adjacent Mori Point; on the fact that biologically speaking the Mori Point and Sharp Park populations are one biological unit; and because suitable habitat exists at Sharp Park wherever the golf course operations and management have not removed or degraded required elements of suitable habitat.

20. Many studies from diverse sources indicate that SFGS has persisted at Sharp Park for many decades, and continues to do so. Wade Fox, the first biologist to systematically survey and record amphibian and reptile species at Sharp Park, found relatively large numbers of San Francisco gartersnakes at Sharp Park in the 1940s, collecting 34 specimens there during ten visits to the site in 1946. In 1978, Sean Barry observed 37 San Francisco gartersnakes near Horse Stable Pond, and an additional 46 at Mori Point in ten visits: indicating a persistent population at least on the southern edge of the golf course at that time. Extensive trapping in the mid- to late-80s by Dr. Sam McGinnis captured only two San Francisco gartersnakes at Sharp Park (SBI 2009), and while subsequent surveys conducted from 1990 to 1992 found 3

SFGS at Mori Point, but none at Sharp Park (PWA 1992 *in* SFRPD 2006). In 1997 McGinnis trapped one SFGS in the "marsh pond and stable area" (SBI 2009). Swaim Biological Consulting (2005) reported capturing four SFGS at Horse Stable Pond and one at Laguna Salada in 2004. SFGS were observed at Horse Stable Pond in 2005 (Campo 2005 *in* SFRPD 2006). SBI (2006) also reported four snakes trapped in 2004 at Sharp Park in the vicinity of Horse Stable Pond and 6 or 7 trapped in the same vicinity in 2006. The discrepancy in the 2006 numbers is derived from a difference between the data in Figure 9 and Table 1 of the document. In 2008, two San Francisco gartersnakes were observed at Sharp Park (SBI 2009); and between 2006 and 2011, 17 SFGS have been incidentally observed at Mori Point (Crooker email 2011). Throughout this time period, several other San Francisco gartersnakes were also observed in adjacent San Francisco Public Utility Commission watershed lands.

21. The absence of the snake from certain survey efforts demonstrate that negative findings do not equate to extirpation of the species from a site. McGinnis performed two extensive survey efforts in 1986 and 1988, capturing no SFGS at Sharp Park or Mori Point (SBI 2009). Yet SFGS were detected in years after 1988. Those snakes did not likely come from afar to recolonize this location. There was likely a small population that was just not detected during the surveys. The idea that negative survey results are not the same as the species being absent from the site is an idea supported by both CDFG and USFWS. Karen Swaim describes it this way in an email to a client:

> "The primary reasons a negative finding could not be accomplished in this study include the documented presence of the SFGS population at Mori with no barriers or even deterrents to movement between the sites and habitats, the historical presence in Calera Creek –[sic] former quarry) and the continued presence of suitable habitat and abundant prey species (including a federally listed species) there. It is also relevant to point out population fluctuations in biological systems prevent establishment of an "absence finding" for SFGS in this situation. I can site two very specific examples of locations where SFGS surveys have been conducted with none found in one survey and subsequently conducted in the same location in following (consecutive or with many years in between), one of those being Mori Point and the other a site on SF PUC property where Dr. McGinnis did a 90 day study below Crystal Springs Dam and got no SFGS (I'm not sure what year) and we trapped in 2007 and got an SFGS within one month."

22. The variable survey effort and reported captures within Sharp Park provide an unreliable picture of the SFGS population through time because different techniques (trapping, hand

capture, and incidental observations) with varying success rates were used and because levels of effort and survey timing (time of year) varied widely. The best population comparisons available are those of Fox and Barry because they both constitute ten days of survey effort and they both used a hand capture technique. Given that the population appeared to remain fairly stable between those two survey efforts, it is interesting to note that major flood events occurred in 1938 (Faulkner 1979), eight years prior to Wade Fox's survey, and in 1958 (Geomatrix 1987) and January of 1978 (FEMA 1987), 20 years and immediately prior to Barry's survey. Other major flooding occurred in the winters of 1978 and 1983. It is obvious that both the snake and its prey, CRLF and Sierran treefrog, have survived many large storm events that may have temporarily increased the salinity of a portion of the aquatic habitat available to them in Sharp Park. The mosaic of habitat provided by the creek, ponds and marshes allow these species to move away from saline habitats into fresh water habitats until they recover.

23. Although the most recent sightings of SFGS have occurred at Mori Point, this does not mean SFGS are no longer present at Sharp Park. Sharp Park and Mori Point share a contiguous boundary of suitable habitat, from Horse Stable Pond east to Fairway Drive. These areas are connected with suitable habitat through the slough/connector channel to Laguna Salada. SFGS found at Mori Point therefore have suitable habitat to reach Sharp Park, and vice versa.

24. Moreover, telemetry studies of the snake determined that the species conducts its daily routines within one to two hundred meters of aquatic foraging habitat (Larsen 1994; SFGS 5-Year Review). In some instances, forays of up to 671 meters were recorded (Larsen 1994). Several areas where SFGS have been recently observed at Mori Point are within one to two hundred meters of Sharp Park, including Mori Point ponds that were restored as part of an SFGS and CRLF recovery action implemented by the National Park Service.

25. There is even evidence from snakes at Sharp Park that indicate individuals found there use both Mori Point and Sharp Park habitats. In 1978 Sean Barry recaptured a snake at Mori Point that he had originally captured and marked at Sharp Park two years prior, about a half mile away. This information supports the assertion that SFGS will continuously move through the Mori Point/Sharp Park population, from Laguna Salada and Horse Stable Pond at Sharp

Park to Mori Point ponds, because the areas contain contiguous suitable foraging and upland habitat.

26. While SFGS have not been observed at Laguna Salada in recent years, they have been observed within Sharp Park at Horse Stable Pond during every trapline survey conducted in recent times. Since the last trapline survey was conducted in 2008, only visual, opportunistic surveys for SFGS have occurred at Sharp Park. However, while a visual survey can confirm presence of SFGS when one is found, as explained above, a failure to detect the species does not mean the species is not present. San Francisco gartersnakes are difficult to find, even under favorable conditions. The subspecies is relatively small, secretive, and cryptic. In addition, its preferred habitats make visual observation difficult. Because of this, one cannot conclude that the subspecies is no longer present simply because you have not visually observed it.

27. My opinion that SFGS continue to be present at Sharp Park is consistent with every written document prepared by the City's Natural Resource Program Manager Lisa Wayne, who has repeatedly written that SFGS are found at Sharp Park. My opinion is also consistent with the conclusions of Karen Swaim, a consultant working for the City, who has repeatedly determined that SFGS are present at Sharp Park. To my knowledge, not a single biologist, herpetologist, or regulatory agency has ever determined that SFGS no longer inhabit Sharp Park.

GOLF COURSE OPERATIONS ARE TAKING THE SAN FRANCISCO GARTER SNAKE

28. Many different golf course activities are harming the San Francisco gartersnake, both directly and indirectly. These activities include golf cart use both on and off golf cart paths, which is reasonably certain to crush San Francisco gartersnakes, and mowing, which is reasonably certain to kill both snakes and frogs with mower blades or crush them with the mower's wheels.

29. It is my professional opinion that the San Francisco gartersnake's habitat at Sharp Park is not secure, and that the subspecies has been taken, and will continue to be taken in the foreseeable future, by the continued operations and management of Sharp Park Golf Course.

30. As will be explained below, it is my professional opinion that these take events have occurred more frequently than observed in the past, and will continue to occur in the future unless the relief requested in this case is provided.

31. SFGS, like most gartersnakes, feed in aquatic features like ponds and lagoons. The snake is also an obligate basker, meaning that it needs to bask in the sun in order to function well, so it seeks open uplands adjacent to suitable foraging habitat to warm itself.

32. Nearly all of the areas surrounding Laguna Salada and Horse Stable Pond are mowed regularly by the golf course, very near or immediately adjacent to the wetland edge. This leaves a very narrow band of emergent wetland habitat between the open water areas of the lagoon and the golf course links, and no protected upland in which SFGS can bask, breed, or seek refuge in a burrow. Beyond the narrow band of emergent vegetation, SFGS would face a very high likelihood of being taken directly by mowing operations.

33. Upon inspecting the golf course on August 28, 2011, it is clear to me that the City is mowing aquatic vegetation, *i.e.*, it is directly mowing wetland habitats that are important for the San Francisco gartersnake. This alone creates a high degree of certainty that a San Francisco gartersnake will be taken by golf course mowing operations. These areas are important habitats for San Francisco gartersnakes, and there is a high probability that lawn mowing activities there will result in take of the snake. This is in part due to the fact that, from a snake's perspective, cover equals safety, so any snake basking near or foraging in or near this habitat edge will seek cover in the edge habitat if disturbed. If that disturbance is an approaching lawn mower, the snake will feel protected by the cover even though that cover is exactly what the mower is removing.

34. Moreover, mowing activities eliminate cover and shelter for the gartersnake, making them more susceptible to predation events. This habitat modification is therefore leading directly to injury and death of individual animals, taking the gartersnake.

35. It is reasonable to expect that snakes are almost constantly moving between and among all aquatic habitat at Sharp Park and Mori Point and that some portion of the population will forage and disperse into the Laguna Salada area, a straight line distance of less than 350 meters

from one Mori Point pond. As SFGS move from Mori Point to Laguna Salada, they will be exposed to activities like lawn mowing that can harm or kill individual snakes. It is likely that these SFGS will be killed by mowing so long as mowing occurs within the normal activity range of the SFGS.

36. The United States Fish and Wildlife Service stated in its 2006 Five-year Status Review of the San Francisco Gartersnake that a dead SFGS found at Sharp Park in 2005 had been killed by a golf course lawn mower. I have reviewed the photographs of this snake, read the correspondence that accompanied the file, and reviewed photos of other snakes injured or killed by lawnmowers that I found and I concur that the snake was likely killed either by the wheels and blades of a lawn mower or by another mechanized vehicle, such as a golf cart. I identified two compression wounds on the snake that could have been made by either mower or golf cart wheels, one above the tail end of the snake and one anterior to the middle of the snake that would have crushed vital organs. In addition, there are a number of lacerations along the entire length of the snake's body that are characteristic of blade cuts. These include cuts where the flaps of skin remain and locations where large chunks of flesh were removed (mid-body) and removal of a portion of the tail.

37. It is my professional opinion that many more San Francisco gartersnakes likely have been killed by mowing and golf cart operations in the past, and that more will likely be killed in the foreseeable future. Detecting dead San Francisco gartersnakes is very difficult to do, because snake carcasses are rapidly scavenged. Several studies documenting wildlife mortality on roads have also quantified the percentage of mortalities not detected due to scavenging. In a study by Antworth et al. (2005), researchers planted dead snakes in the median and on the side of a busy road and then monitored the carcasses at two-hour intervals do determine the percentage of carcasses that are missed in roadkill surveys. They used dead snakes and chicks as carcasses and found that there was about an 85% chance of encountering a dead snake on the road within 2 hours of the carcass being placed there. At 4 hours the chance of encounter decreased to less than 50%, and after 24 hours the chance of encounter was less than 10%.

38. . While visiting Sharp Park in August, 2011, I observed many potential scavengers of snake carcasses. I observed a red fox hunting on the golf course for more than an hour. I also observed a group of at least five ravens perched on the dead cypress trees adjacent to Laguna Salada. Both species are likely to scavenge injured, dying, or dead snakes from the golf course during the day, and the fox would also take them at night. So on the golf course, where scavenging is safer than on the busy road, there is likely at least a 50% chance that a snake killed there will be scavenged within 4 hours. Given that potential for decreased detection and the fact that nobody is assigned to look for dead snakes at Sharp Park, I am certain that undocumented deaths of snakes occur annually, if not more frequently.

39. Similarly, golf cart operations, both on and off golf cart pathways, are likely to take San Francisco gartersnakes. Gartersnakes need to bask in the sun to regulate bodily functions such as body temperature and digestion, and the paved golf cart paths absorb and store heat, providing snakes exceptional opportunities for quick warming on cold sunny mornings, throughout the day, and even after the sun has set. Golf carts are particularly well known to cause harm to snakes, even at slow speeds. One researcher, needing dead snakes to study the effects of scavenging on roadkill detection rates, found that golf carts killed many snakes and collected dead snakes from areas with known golf cart activities. Snakes killed in this manner were used as a prey source in his study (DeGregorio 2011).

40. Because CRLF and treefrogs, both pond/pool breeders, are an important component of the snake's diet, the population size of these species directly impacts the population size of SFGS. Management of aquatic habitat that affects water depth during the egg laying and maturation season can significantly affect the size of the prey population. Golf course management activities that lower water levels once eggs have been laid will leave egg masses above the water level to desiccate and die. Reduced numbers of frogs means reduced foraging opportunities for the snake and an increased risk of death from starvation or predation due to spending more time actively foraging.

41. It is my professional opinion that mowing, golf cart use, and other habitat modifying activities like pumping are taking SFGS at Sharp Park, and will continue to do so unless these activities are stopped.

DEFENDANTS' COMPLIANCE PLAN IS NOT SUFFICIENT TO PREVENT TAKE OF SAN FRANCISCO GARTER SNAKES AT SHARP PARK

42. After 2008, the City released a Final Draft Endangered Species Compliance Plan for Sharp Park. Upon review of this plan it is my professional judgment that the plan is unworkable and cannot reduce take to levels that would obviate the need for Endangered Species Act permits.

43. Even if it were complied with, the City's compliance plan cannot eliminate take of SFGS by the golf course because under the plan mowing and golf cart use will still occur within the snake's known daily activity range around Laguna Salada and other foraging habitats at Sharp Park. Under the compliance plan, some of these areas will not even be monitored for SFGS before mowing and golf cart use occurs, virtually assuring that SFGS will be taken by these activities.

44. In other areas, the compliance plan relies on biological monitors to visually observe portions of the golf course before mowing occurs. Having spent hundreds of hours searching for SFGS along the edge of their aquatic habitat and in uplands I have personal experience that informs my opinion that these animals are too fast and difficult to detect effectively, especially where there is any change in vegetation or change in topography. It is simply unrealistic to expect even a trained eye to detect every SFGS that will be in harm's way. These snakes are fast and wary. The compliance plan relies on biological monitors being able to scan acres of habitat with 100% reliability and certainty that all frogs and snakes will be observed, moved, or lawn mowing delayed until the subspecies are clear from danger. However, the protocol implemented cannot reach this level of certainty, and will inevitably result in an under-observance of frogs and snakes. I know from experience that maintaining that kind of focus, especially when you have not seen your target species in a long time, requires uncommon levels of discipline, motivation, and focus.

45. Moreover, it is my understanding that in fact the only monitoring conducted before mowing activities is by the golf course mowing staff, and that monitoring may not occur at all or in some cases more than three hours before the mowing (Kappelman Deposition, pp. 51-56). Under these circumstances it is even more certain that SFGS and CRLF are being taken as a result of mowing activities at Sharp Park. As discussed above, an experience biologist may find it difficult to detect these animals when they have not seen one after hours or days of unsuccessful searching. These are professionals that likely have a search image in thought, gained from previous observations. In addition, I have often witnessed the difference in the level of vigilance between a professional biologist searching for an animal and a layperson trained to search for the same species. Though I cannot say that every biologist is more conscientious than every layperson, I can say with certainty that from my experience, the biologists do a far better job overall of detecting the target animal than the layperson. I believe this to be attributable to the biologist's training and the interest level being greater than that of the layperson with regard to the target animal. In addition, it is obvious that if the golf course staff are not searching for the snake or frog before they mow, there is a high likelihood that take of the SFGS and CRLF are occurring as a result.

46. For these reasons it is my professional opinion that to avoid take of these species all mowing and cart use within the known daily activity range of SFGS, roughly one to two hundred meters from the delineated wetland boundary area should be prohibited, which will provide upland habitat for basking and other essential SFGS upland activity and a buffer protecting SFGS and CRLF from the significant threats posed by mowing activities.

IF GOLF COURSE OPERATIONS ARE NOT SUBSTANTIALLY CHANGED, THE SAN FRANCISCO GARTER SNAKE POPULATION AT SHARP PARK MAY BE LOST, SPECIES RECOVERY WILL BE IMPEDED, AND THE ENTIRE SPECIES WILL BE PUT CLOSER TO EXTINCTION

47. It is my professional opinion that unless the golf course operations that cause take of the San Francisco gartersnake are halted in areas where the snake is likely to be found, the Sharp Park/Mori Point population will continue to decline, increasing the potential for the population to become extirpated. Because there are less than ten wild populations of SFGS known to exist,

each contributes significantly to the genetic diversity, distribution, and viability of the subspecies. The loss of even one population would result in the subspecies becoming more critically endangered, reduce genetic diversity, decrease its distribution, and ultimately make it more vulnerable to extinction through stochastic events.

48. It is my professional opinion that Sharp Park is an extremely important recovery area for the SFGS. Preservation and enhancement of this area is essential for the subspecies to recover, and if areas like Sharp Park are not preserved and enhanced for the benefit of the subspecies, the subspecies may go extinct. In my opinion, the potential for Sharp Park to provide a habitat connection from Coast Side to Bay Side populations of these species is critical to the conservation and recovery of both species. Genetic interchange across these small, isolated populations, even when infrequent, may preclude dangerous levels of inbreeding, disease, and other deleterious harms that face small populations.

1/20/12 ______ s/Wendy Dexter ________________
Date Wendy Dexter

I, Brent Plater, hereby attest that Wendy Dexter's concurrence in the submission of this document has been obtained.

Executed on: January 20, 2012 ________________
Brent Plater

EXHIBIT A

Ms. Dexter has twenty years of professional experience as a wildlife biologist, emphasizing herpetology, raptor biology, and large freshwater branchiopod biology. Over the years she has gained valuable experience with local, state and federal government projects. She has provided biological documentation, Section 7 consultation, and directed special-status species surveys for various private, county, state and federal clients including the San Francisco Public Utilities Commission, San Mateo County Public Works, the Federal Emergency Management Agency, Lawrence Livermore National Laboratory/University of California, California Energy Commission, Caltrans, Contra Costa County Public Works, and the City of Hercules.

Examples of projects she has participated in include endangered species recovery actions, habitat enhancement efforts, habitat management plans, numerous road construction and realignment projects, flood control projects, construction monitoring, long-term mitigation and monitoring for a dam project, hydroelectric facility recertification, timber harvest projects, natural community conservation planning, and numerous small development projects. Her involvement with these projects included performing habitat assessments, preparing Biological Assessments and Natural Environment Studies, GIS/GPS habitat mapping, mitigation site analysis, surveys and/or trapping for San Francisco garter snake, Alameda whipsnake, California red-legged frog, foothill yellow-legged frog, California tiger salamander, fairy shrimp, tadpole shrimp, western pond turtle, numerous raptors, bats, small mammals, and fish. She has also prepared habitat assessments, biology sections for CEQA and NEPA documents, and managed formal Section 7 consultation with NMFS and USFWS regarding salmonids, spotted owls, and other federally listed species.

EDUCATION

University of California, Davis
B.S., Environmental Planning and Management, 1990
California State University, Hayward
Biology, graduate coursework complete, 1996-1998

EXPERIENCE

- **Principal**, Condor Country Consulting, Martinez, CA (07/01-Present)
  Responsible for all aspects of a biological consulting business. Projects include managing large-scale biology surveys, monitoring, and mitigation projects. She has worked on projects with foothill yellow-legged frog, fairy shrimp, California red-legged frogs, San Joaquin kit fox, burrowing owls, California tiger salamander, small and large mammals, fish, Swainson's hawk, California and Northern spotted owl, Alameda Whipsnake and San Francisco garter snake. She is USFWS permitted for work with California red-legged frog, California tiger salamander, listed branchiopods, Alameda Whipsnake, and San Francisco garter snake.
- **Project Biologist**, Impact Sciences, Oakland, CA (06/00-06/01)
  Responsible for preparation of numerous CEQA documents for a wide variety of projects across northern and southern California. Directed habitat assessments and special status species surveys. Biological work within California included work pertaining to the following species: California red-legged frog, western spadefoot, California tiger salamander, Tehachapi slender salamander, yellow-blotched salamander, San Joaquin pocket mouse, vernal pool tadpole shrimp, and several species of fairy shrimp.
- **Wildlife Biologist**, MSE Group, Oakland, CA. (01/00 – 05/00)

Responsible for supervision and coordination of biological monitoring activities for the BART extension to the San Francisco International Airport on the West of Bayshore property. Supervised six biologists in providing monitoring for various construction activities. Coordinated with several levels of environmental compliance monitors, the US Fish and Wildlife Service representative, and the California Department of Fish and Game representative. Monitored construction activities for compliance with the biological opinion and other inter-agency agreements. Trapped work areas for San Francisco garter snakes. Captured and relocated California red-legged frogs and other animals in harm's way.

- **Wildlife Biologist**, URS Greiner Woodward Clyde, Oakland, CA. (10/97-01/00)
  Responsible for preparing documents and permits for varied projects requiring NEPA and CEQA compliance. These include biological assessments, natural environment studies, and mitigation plans. Practiced in compliance with the Federal and California Endangered Species Acts, the Migratory Bird Treaty Act, and other regulations relevant to the protection of biotic resources. Consulted with federal and state wildlife agencies on two FEMA projects in Mendocino County.
- **Research Assistant**, California State University, Hayward, Foundation. (2/96-6/98)
- **Teaching Assistant**, California State University, Hayward. (9/96-6/98)
- **Wildlife Biologist**, Jones and Stokes Associates, Sacramento, CA. (11/94-10/98)
- **Field Biologist**, North State Resources, Redding, CA. (6/94-11/94
- **Field Biologist**, Beak Consultants, Kirkland, WA. (6/93-8/93)
- **Wildlife Biology Technician**, U.S.D.A. Forest Service, El Dorado National Forest, Amador Ranger District, Pioneer, CA. (4/90-11/93)

SPECIAL STATUS SPECIES PERMITS

U.S. Fish and Wildlife 10(a)(1)(A) Permit for San Francisco garter snake, California tiger salamander, all listed Branchiopods in California, California red-legged frog, and Alameda Whipsnake.

California Department of Fish and Game Scientific Collecting Permit and MOU for San Francisco garter snake, Alameda Whipsnake, California tiger salamander, and California red-legged frog work under federal permit.

PROFESSIONAL MEMBERSHIPS

- The Wildlife Society, Western Section
- Society for Conservation Biology
- Society for the Study of Amphibians and Reptiles

CERTIFICATIONS/TRAINING

- Proficient use of Trimble Global Positioning System, ArcView GIS, and Microsoft Word/Excel. Comfortable with Macintosh and PC environments.
- Aerial Photograph Interpretation, 1992, USDA Forest Service, Placerville, CA.
- Wild Animal Handling and Restraint, 1991, California Dept. of Fish and Game, Sacramento, CA.
- Basic Firefighting, 1990, Sierra Community College, Placerville, CA.

EXHIBIT B

WENDY DEXTER EXPERT REPORT
ATTACHMENT B
MATERIALS RELIED ON IN FORMING EXPERT REPORT OPINIONS

- Wade Fox Field Notes and journals, San Mateo County.
- U.S. Fish and Wildlife Service. 2006. San Francisco Garter Snake (Thamnophis sirtalis tetrataenia). 5-Year Review: Summary and Evaluation, Sacramento Field Office, Sacramento, CA. (Plaintiffs' Preliminary Injunction Ex. ("Pl. PI Ex.") 20) (DE 55)
- 2008 Swaim report for SFGS/CRLF at Sharp Park and Mori Point (attached)
- 2008 Swaim report for SFGS/CRLF at Sharp Park and Mori Point (Pl. PI Ex. 22) (DE 56)
- Compiled take evidence of CRLF and SFGS at Sharp Park]
- U.S. Fish and Wildlife Service. 2002. Recovery plan for the California red-legged frog (Rana aurora draytonii). Region 1, Portland, Oregon, USA.
- SFGS Recovery Plan
- McGinnis Geomatrix study 1986
- McGinnis Mori Point study 1988
- Barry Mori Point Report , 1978
- Rossman, D. A., N. B. Ford, and R. A. Seigel. 1996. The garter snakes, evolution and ecology. University of Oklahoma Press, Norman, Oklahoma, USA.
- background information on www.Californiaherps.com
- Youtube.com videos of snakes run over by lawnmowers
- Storer, T. L. 1925. A synopsis of the amphibia of California. University of California Press, Berkeley, California, USA.
- Final Draft Endangered Species Compliance Plan for SFGS (CCSF 4590-4608)
- Comments on Alternatives Reports from Wild Equity Institute and Peter Baye
- Conceptual Ecosystem Restoration Plan and Feasibility Assessment (attached)
- Antworth, L. R., D. A. Pike, and E. E. Stevens. 2005. Hit and Run: Effects of scavenging on estimates of roadkilled vertebrates. Southeastern Naturalist 4(4): 647-656.
- DeGregorio, B. A., T. E. Hancock, D. J. Kurz, and S. Yue. 2011. How Quickly are Road-Killed Snakes Scavenged? Implications for Underestimates of Road Mortality. Journal of the North Carolina Academy of Science 172: 184-188.
- Larsen, S. S. 1994. Life history aspects of the San Francisco garter snake at the Millbrae habitat site. Master's Thesis. California State University, Hayward, California (attached)
- Swaim, K. SFGS Improvement Project At Mori Point, Pacifica, Cal. (CCSF89390-443)
- Sept. 27, 2011 email from Christina Crooker to Brent Plater and Darren Fong re SFGS sightings at Mori Point (attached)
- excerpts of Dec. 15, 2011 deposition of Wayne Kappelman (pp. 51-56)
- excerpts of Jan. 9, 2011 deposition of Lisa Wayne
- Email From Karen Swaim to Peebles Corp.
- Email from Christina Cooker to Darren Fong
- Federal Emergency Management Agency (FEMA), 1987, Flood Insurance Study, Pacifica, California, San Mateo County, community number 060323, February 19, 30p.
- Geomatrix, 1987, Feasibility Study, Restoration of Coastal Embankment, Sharp Park

Golf Course, Pacifica, CA. Prepared for: City and County of San Francisco, Department of Public Works, Bureau of Engineering, November, 91p.

- Swaim, K. San Francisco garter snake habitat improvement project at more point, Pacifica, California 2004 - 2008
- Faulkner History of San Francisco Golf Courses, 1979
- Natural Areas Program Draft and Final EIR and Management Plan for Sharp Park

EXHIBIT L