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**DOYLE DRIVE REPLACEMENT PROJECT
GENERAL WETLAND MITIGATION AND
MONITORING PLAN**

September 2009

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San Francisco County
Transportation Authority

**Doyle Drive
Replacement Project**

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Mitigation and Monitoring
Plan

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Introduction

Doyle Drive, also known as Route 101, provides southern access to the Golden Gate Bridge, serving residents in Marin and San Francisco Counties and the region as a whole. It also provides limited access to the Presidio of San Francisco (Presidio). Due to its importance within the regional transportation system, the Federal Highway Administration, the California Department of Transportation (Department), and the San Francisco County Transit Authority will be implementing the Doyle Drive Replacement Project (Project) to improve the seismic and structural integrity of the facility and to improve traffic safety along Doyle Drive.

Implementation of the Project will result in permanent and directs impacts to approximately 0.81 acres of Cowardin and/or federal wetlands. In addition, there is the potential that 1.77 acres of Cowardin wetlands will be indirectly impacted through the construction of one of the tunnel segments of the Project, as the flow of groundwater may be disrupted, which in turn would affect the Cowardin wetlands downgradient of the proposed tunnel.

To compensate for wetlands directly or indirectly impacted by the implementation of the Project, three basic strategies for mitigation have been developed: wetland creation, intensive wetland enhancement, and wetland enhancement. The respective compensatory ratios of 2:1, 3:1, and 5:1 (created/enhanced: impacted) will be employed to account for impacted State and/or federal wetlands. The mitigation strategy goals are to ensure no net loss of waters of the state. The principle parties have agreed to mitigate for losses as soon as was feasible, at sites restricted to within the Presidio, and in as close proximity to the wetlands impacts as possible.

Plan Objective

Planning and implementation of compensatory wetland mitigation sites for the Project will not be completed concurrently. Two of the sites, Battery East/Marine Drive and West Crissy Bluffs were implemented prior to the onset of Project construction. As of the drafting of this Plan, the remainder of the mitigation sites are in varying phases of design. Therefore, this Plan will serve as the general monitoring plan for all mitigation sites. The monitoring methodology (quantitative and qualitative), data analysis, success criteria, contingency measures, and reporting protocol discussed in this plan will be utilized for each of the Project mitigation sites. This plan will serve as an Appendix to subsequent site-specific detailed mitigation plans that will include: design drawings, planting lists, and other applicable site-specific information.

Monitoring

The purpose of this monitoring is to determine if mitigation actions have been successful in establishing wetland habitat that mitigates for areas degraded by implementation of the Project. Monitoring will be used to assess the efficacy of the methods used to re-establish vegetation and habitat, and will provide early indication of problematic areas where these methods may not be achieving the desired results.

In addition to quantitative sampling, which focuses primarily on the condition of vegetation that has been planted or that has established naturally, a qualitative form of monitoring is proposed to make sure that the focus on data gathering does not prevent the monitor from describing general aspects about the condition of a site to facilitate remedial action when it required. Both these approaches are described in the following sections.

I. Qualitative Monitoring Methodology

Qualitative monitoring will be conducted through the duration of the ten year monitoring period. In contrast to quantitative monitoring, which relies on gathering and analysis of data, qualitative monitoring will describe the pattern and process of re-establishing habitat on mitigation sites. Its purpose is to identify where problems exist with plant mortality, weed invasion, erosion, and other issues affecting success in meeting the mitigation criteria. Additionally, successful elements of the mitigation effort also are documented in this way, with attention to the broader context of the site and its overall ecological condition. Information obtained through qualitative monitoring provides a check on the applicability of the sample-based quantitative data, and helps to interpret that data.

Qualitative surveys will be conducted twice annually (spring and fall) for a minimum of ten years following planting/non-native removals. These surveys will assess the status of the site, and observations will include:

1. Status of planted vegetation by species
2. Presence/absence of native plant recruitment by species
3. Replanting efforts required
4. Presence and extent of non-native plant species, particularly invasive species
5. Erosional features
6. Diseases affecting native vegetation
7. Status and effectiveness of the irrigation system if applicable
8. Trash/refuse/construction materials requiring removal
9. Indications of problematic areas (bare ground), and analysis of potential causes and remediation.
10. Indicators of wetland hydrology (See below)
11. Presence and identification of terrestrial or aquatic animal or invertebrate species.

The qualitative sampling will generate reports that will be used to accomplish maintenance tasks. Replanting requirements, irrigation upkeep or changes, problems with disease or erosion, and/or cleanup will be addressed frequently to ensure the success of established or enhanced wetlands.

II. Quantitative Monitoring Methodology

Quantitative monitoring will be conducted annually in the spring for the ten year monitoring period. These surveys will be conducted no later than May 30 of each monitoring year. The monitoring period will commence upon planting native species for each individual mitigation site.

A stratified random sampling method will be used for quantitative monitoring of mitigated sites. Stratified sampling ensures that each major habitat type (i.e. wetland, upland, riparian) is sampled proportional to its total area. The number and proposed location of sampling units per area will be determined in advance using aerial maps of each mitigation area and a GIS script to randomly assign plot locations.

The data sampled will vary according to the restoration mitigation category (creation or enhancement) as well as for site characteristics (emergent wetland, riparian, etc).

The sampling methodology will also allow for some flexibility to account for differences in site characteristics. Quadrat sampling will be employed, with sampling frequency and plot size dependent on size of the mitigated area, the type of vegetation, or other factors. A minimum of 3% of the site will be sampled for mitigation sites smaller than 0.5 acres and a minimum of 1% of the site will be sampled for mitigation sites greater than 0.5 acres.

Pre-established photographic monitoring points will be marked on a map, color photographs taken during every monitoring event, and the photographs included in every monitoring report. Points shall be GPSed.

Quadrat Sampling:

Sites will first be stratified according to distinct vegetative communities, whether the distinction relates to hydrogeologic conditions or not. The number of samples chosen for each community will be proportional to the relative size of that community (e.g. for a site that has 2 acres of emergent wetland and 1 acre of riparian scrub, there would be twice as many sample units in the emergent wetland).

Within each stratum, permanent quadrat locations will be randomly selected and mapped.

For each quadrat, the following data will be collected: total percent plant cover, percent bare ground, every plant species encountered, percent cover for each species encountered, percent cover herbaceous, percent cover shrub, and native-non native status of each species.

Cover will be determined using cover classes (0-10%, 11-20%, 21-30%, 31-40%, 41-50%, 51-60%, 61-70%, 71-80%, 81-90%, 91-100%). Cover class midpoints will be used in analysis.

III. Success Criteria

1. At the end of the anticipated monitoring period (ten years after planting) each revegetation area will:
 - a. Have at least 80% absolute cover of native species
 - b. Less than 20% of the area occupied by non-native invasive species, defined by Cal-IPC Table 1 list at the time of monitoring, (<http://www.calipc.org/ip/inventory/weedlist.php>).
 - c. Have less than ten percent of the following species: Cape ivy (*Delairea odorata*); Mattress wire weed (*Muehlenbeckia complexa*); Himalayan blackberry (*Rubus discolor*); English ivy (*Hedera helix*); African rice grass (*Ehrharta erecta*); iceplant (*Carpobrotus edulis*); radish (*Raphanus sativus*); and poison hemlock (*Conium maculatum*).
 - d. Have 75% of planted species present as 5 or more individuals.
2. Following the ten year monitoring period a determination will be made, in consultation with the Trust/NPS as to whether the project achieved the final mitigation goals, or whether additional maintenance/planting efforts are required. If additional maintenance/planting efforts are required, monitoring will continue until the project has achieved final mitigation goals.
- 3.

Maintenance will continue for a minimum of ten years **and** until all success criteria above are met.

IV. Data Analysis:

A post-hoc power analysis with medium effect size ($d=0.5$) will be used to determine whether the number of samples is statistically sufficient for valid analysis. If the power analysis determines more samples are required after the first quantitative analysis, sufficient and random quadrates will be added before the next monitoring event.

Percent cover of all native plant species will be calculated by dividing the percent cover of the target species across all sample points by the number of quadrats sampled.

Plant cover will be compared to the success criterion (example: 80% cover of native plant species) using single sample one-tailed t-tests. For example, the null hypothesis will test for native plant cover of less than 80% ($H_0: \mu < 80\%$) and the alternative hypothesis will test for native plant of greater than or equal to 80% ($H_A: \mu \geq 80\%$). These tests will be performed using an alpha level of 0.05 and a confidence interval of 95%.

V. Contingency Measures:

Hydrology

Should surveys determine that hydrologic characteristics of the site are not conducive to wetland creation/retention, one or more of the following measures may need implementation: modification of water inlet or outlet control, supplemental surface water input from diversion, decrease soil permeability (add fine substrates or compact soils), or grading revision if possible.

Vegetation:

Should qualitative and quantitative surveys find dead plantings, poor recruitment, and/or invasive species one or more of the following measures will be implemented, some of which after consultation with a botanist and Trust/GGNRA approval (ie, herbicide):

- 1) additional planting to account for dead plants and/or lacking diversity. Plant propagation requires an 18 month process. Plants must be from Presidio stock, grown by or under the direction of the Presidio Plant Nursery.
- 2) consideration of different species for planting that better match hydrologic conditions
- 3) substrate amendments
- 4) pulling invasive species
- 5) herbicide applications; the use and application must be consistent with the Trust IPM protocols.)
- 6) herbivore control (fencing)
- 7) changes in irrigation, frequency or intensity

Other Contingency Measures

- 1) Erosion Control: The addition of one or more of the following measures could be implemented: erosion control matting, physical controls (rock/hay bales), additional planting.
- 2) Access Control: ESA fencing will be applied around all mitigated sites. The monitoring of ESAs is covered in the general Biological Monitoring Plan for the Doyle Drive Project. Should construction personnel or others fail to stay out of ESAs, corrective action will be administered by the Resident Engineer and/or the Contractor.
- 3) Trash/Refuse: Should the monitor discover trash/refuse on the site, this information will be relayed to the Resident Engineer/Contractor if it is construction related, or to the Trust/GGNRA if not, so remedial action can be undertaken.

VI. Reporting

- 1) For qualitative surveys, the monitor(s) will prepare memoranda within 30 days of the monitoring event, submitted to the Presidio Trust Division of Conservation, Stewardship and Research. The memo will detail site specific maintenance

- requirements for replanted areas, including (at a minimum): replanting efforts required, the status and maintenance needs of the irrigation system, the effectiveness of erosion control measures, and the status of non-native invasive species. The monitor will recommend strategies for replanting, control of invasives, and irrigation maintenance as needed. Memoranda will also include survey specific information, including: surveyor name(s), date(s), time of day, and weather conditions at the time of the survey.
- 2) Reports for quantitative surveys will be completed within 90 days of the survey, submitted to the Presidio Trust Division of Conservation, Stewardship and Research. The reports will include color photographs and statistical analyses in addition to all of the information that will be provided for qualitative surveys.
 - 3) As per 401 permit obligations, the Project will use the standard Wetland Tracker form to provide Project information describing impacts and mitigation/restoration measures no later than November 1, 2010. The completed Wetland Tracker form shall be submitted electronically to wetlandtracker@waterboards.ca.gov.

VII. Final Clearance:

The monitor will prepare and submit a final Compliance Monitoring Report within three months of the conclusion of mitigation requirements. After internal review, the report will be submitted to the Trust and GGNRA before its ultimate submittal to the applicable agencies.