APPENDIX G: STATEMENT OF FINDINGS FOR EXECUTIVE ORDER 11990 PROTECTION OF WETLANDS

Statement of Findings for
Executive Order 11990

Protection of Wetlands

Improvements to Sir Francis Drake Boulevard
Point Reyes National Seashore, California

Recommended:_____ _____
Superintendent, Point Reyes National Seashore **Date**

Concurred:_____ _____
Chief, Water Resources Division **Date**

Approved:_____ _____
Director, Pacific West Region **Date**

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INTRODUCTION

This Wetlands Statement of Findings (WSOF) characterizes the wetland resources that occur within the study area for the Sir Francis Drake Boulevard (SFDB) improvement project at Point Reyes National Seashore (PRNS), a unit of the National Park Service (NPS) in Marin County, California. The SFDB project is being evaluated under a joint environmental assessment (EA)/Initial Study (IS) in compliance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). This WSOF describes the impacts the project would likely have on these aquatic resources, and documents the steps that will be taken to avoid, minimize, and offset these impacts.

Part 2.5 of the NPS Director's Order #77-1 for Wetland Protection (NPS 2012) states:

> Actions proposed by the NPS that have the potential to have adverse impacts on wetlands will be evaluated through the NEPA planning and compliance process. Regardless of the associated NEPA compliance pathway (EA, environmental impact statement, or categorical exclusion), a Wetland Statement of Findings documenting compliance with this Director's Order and Procedural Manual #77-1 will be completed for proposed actions that would result in adverse impacts on wetlands. Actions that may be excepted from this Statement of Findings requirement are identified in the Procedural Manual.

Director's Order #77-1, Section 5.3.4 (2) (NPS 2012), states:

> An EA that identifies a preferred alternative that will have adverse impacts on wetlands must be accompanied by a separately identifiable draft "Wetland Statement of Findings" (WSOF) that explains why an alternative with such impacts was chosen and that meets the other requirements identified in Section 5.3.5 of these procedures. EA/draft WSOF distribution must include all affected parties, other interested parties or organizations, and the agencies listed in Section 5.3.4.1 of these procedures.
>
> Following this review, the NPS must reevaluate the preferred alternative and its impacts, revise the WSOF as necessary, and issue either a Finding of No Significant Impact Statement (FONSI) or a Notice of Intent to prepare an Environmental Impact Statement (EIS) consistent with NPS NEPA procedures. If the final preferred alternative still results in adverse impacts on wetlands and a FONSI is to be issued, a final WSOF meeting the requirements identified in Section 5.3.5 must be attached to the FONSI as a separately identifiable document.

This Wetland Statement of Findings includes:

- A series of maps that show the locations and boundaries of Cowardin wetlands, and jurisdictional waters of the U.S. (WOUS) under the Clean Water Act within in the study area (Appendix A).
- Documentation of the qualifications of the staff and consultants who identified wetlands within the study area.
- Detailed descriptions of the affected wetlands.
- Functional descriptions of the affected wetlands.
- Full disclosure of the adverse impacts on the wetland habitats, processes, functions and values, and acreages at the sites where wetlands would be impacted.

- A discussion of the various factors and trade-offs considered in arriving at the decision to impact wetlands.
- A description of how the preferred alternative was designed to minimize wetland impacts to the greatest extent practicable.
- A description of the proposed wetlands compensation. Additionally, the WSOF will demonstrate how the NPS will:
    - Address the directives of Executive Order 11990 (Protection of Wetlands)
    - Ensure "no net loss" of wetland functions or values

OVERVIEW

The Federal Highway Administration (FHWA) Central Federal Lands Highway Division (CFLHD), in cooperation with Marin County and the NPS, is proposing improvements to SFDB in Point Reyes National Seashore, which is a unit of the NPS within Marin County, California. The proposed project includes reconstruction of approximately 12 miles of SFDB within PRNS. The project begins at the intersection with Pierce Point Road and continues south and west to the intersection with Chimney Rock Road (see Figure 1). In general, roadway improvements are expected to occur within the existing 60-foot wide right-of-way (ROW).

Site Description

SFDB extends from Route 101 in Greenbrae, north of San Francisco, westward approximately 43 miles to the Y-intersection with Chimney Rock Road and Lighthouse Road. The junction with Pierce Point Road is the approximate boundary of PRNS and is approximately 2 miles west of Inverness. The portion of SFDB to be reconstructed is 12 miles between Pierce Point Road and the Y-intersection, and is maintained by Marin County.

Purpose and Need

Within the project area, SFDB is narrow and deteriorating at an accelerated pace. The declining condition may necessitate vehicle restrictions or closures if not rehabilitated in the near future. Some sections of the road have substandard curves, and one segment between PM 9 and PM 10 floods more than once per year on average. SFDB was originally an unimproved dirt road that was chip sealed and has never undergone major rehabilitation. The existing pavement was not designed to handle the current traffic loads. The park has carried out partial and temporary repair projects over the years to keep it operational and to meet the needs of the traveling public. However, SFDB is now at an age where a comprehensive repair project is needed to ensure continued service.

Figure 1: Study Area

Specifically, the project is needed because:

- **Roadway Width is Substandard:** Existing pavement widths generally vary from 18 feet to 24 feet, with isolated areas as wide as 27 feet along switchbacks. The road should be rehabilitated to a consistent 24-foot width where possible per American Association of State Highway and Transportation Officials (AASHTO) roadway design guidelines. On narrow roadways such as this, recreational vehicles, school buses, park shuttles, and milk trucks put stress on the pavement edges, requiring additional maintenance. The existing roadway has no shoulders in many areas and does not provide sufficient clearance for vehicles and bicycles to safely pass each other without traveling into opposing lanes. Switchbacks on hills show evidence of tires dropping off pavement edges. Existing bridges at cattle under-crossings do not meet current AASHTO standards.
- **Roadway is Prone to Flooding:** A 0.5-mile section of the roadway floods frequently, which restricts access to the park and affects staff, visitors, and ranchers. Vehicles have also run off the road and into ditches during flooding. A channel has formed along this stretch of roadway as a result of flooding. This channel has aggraded to where it is the same level of the roadway, resulting in standing water that has damaged pavement (described below). Dredging the channel is problematic due to the presence of wetlands and potential for California red-legged frog (*Rana draytonii)* habitat, which is a federally protected species.
- **Bicycle Safety is Lacking:** Marin County currently classifies SFDB as a Class III bike-shared route, meaning motor vehicles and bicycles share the road with no separation. The road's narrow width and lack of paved shoulders are not designed to safely accommodate bicycles.
- **Roadside Hazards Pose Safety Problems:** Several sharp curves, dense roadside vegetation, roadside hazards at under-crossings, and steep grades with minimal sight distance occur along the route. Centerline striping has worn off in many areas, and edge lines are missing.
- **Pavement is Deteriorating:** The existing pavement was not designed for the current traffic loads. Pavement along SFDB is badly oxidized, heavily patched, lacks shoulder support, and demonstrates significant cracking and edge damage in some sections. Potholes, edge raveling, and rutting in the wheel paths also exist. Standing water in shallow ditches has contributed to pavement failures in the vicinity of the Schooner Creek crossing. The current deteriorating state of the roadway requires ongoing maintenance.

ALTERNATIVES CONSIDERED

The following alternatives were considered for this project, including the preferred alternative.

No Action

Under the No Action Alternative, the proposed activity would not take place.

- Ongoing maintenance activities would continue to repair pavement edges due to substandard roadway widths and to repair general pavement damage, such as potholes, cracking, and rutting.
- No actions to address pavement conditions, other than minor patching and overlays, would be implemented.
- No actions would be taken to reduce flood damage to the roadway. Standing water in the channel that has formed along the roadside would continue to damage pavement, requiring ongoing maintenance. The road would continue to be closed to traffic during flood events and associated repair activities.

- No actions to address safety, other than pavement repair as needed, would be implemented. Delineated shoulders would not be provided to separate motor vehicles and bicycles. No changes would be made to diminish sharp curves, remove hazards from the clear zone, address limited sight distance, add striping, or implement other measures to enhance safety.

Action Alternative

The Action Alternative primarily consists of resurfacing, restoring, and rehabilitating SFDB in a manner that will closely follow the existing roadway in order to minimize impacts to the natural terrain. In general, the Action Alternative would widen the roadway 1 to 6 feet to maintain a consistent 24-foot width with two 11-foot travel lanes and two 1-foot shoulders. The total pavement width would be 4 to 8 feet less than published guidelines (AASHTO, 2011; NPS, 1984). The proposed width is intended to allow much of the construction to occur within the existing roadway bench and the existing Marin County easement while providing a rehabilitated pavement section.

Roadway widening would include pulverizing the existing asphalt pavement, overlaying with 4 inches of asphalt pavement, striping, and ditch reconditioning, with dense vegetation removal as needed. Paved ditches between 2 and 4 feet wide with asphalt curbs are proposed in specific areas to expedite tying to existing cut slopes, which would minimize overall ground disturbance. Existing 15- and 18-inch culverts within the project area would generally be replaced with 24-inch culverts where feasible. At existing pullouts along the project corridor, a 5-foot asphalt apron would be added over the existing aggregate surface, and some pullouts would be resurfaced with aggregate. The clear zone, which is the area available for safe use by errant vehicles, would be improved through removal of obstructions, as feasible. The clear zone would vary between 3 feet wide and the AASHTO minimum design standard width of 12 feet in order to minimize ground disturbance. Widths below 12 feet would require a design exception.

Based on the 15 percent design, a total of 4.3 acres of impervious surface would be added as a result of increased road surface and paved ditches adjacent to the road. However, paving additional ditch sections to expedite tying to existing cut slopes and reduce construction limits would increase the amount of impervious service by up to 6.0 acres.

The Action Alternative includes localized reconstruction and safety improvements in certain areas as follows:

- Between PM 0.8 and PM 1.2, the vertical alignment of the roadway would be flattened and side slopes would be cut back, as needed, to improve sight distance.
- Between PM 1.8 and PM 2.1, near Historic B Ranch, the existing slope on the west side of the roadway would be cut back and a cut wall less than 6 feet high would be constructed to accommodate the wider roadway.
- Between PM 4.0 and PM 4.1, the surface of the roadway would be tilted or banked through the curve to improve driver safety, and side slopes may be cut back to improve sight distance.
- The two existing wooden deck cattle under-crossings at PM 7.1 and PM 7.3 would each be replaced with concrete box culverts approximately 8 feet high and 13 feet wide. The box culverts would be installed 2 feet below the existing ground surface to maintain a natural dirt floor.
- The two existing corrugated metal culverts at Schooner Creek (PM 9.2) would be replaced. The structure type would be determined during final design and would be designed to provide improved fish passage by reducing tidal and stormwater flow velocities.

- The existing gravel pullout at PM 9.2 by Schooner Bay would be paved with 4 inches of asphalt pavement to reduce erosion and maintenance.
- Between approximately PM 9.3 and PM 9.8, the roadway would be raised 1 to 4 feet and shifted approximately 12 feet to the south to reduce flooding of the roadway. Asphalt curb and gutter would be installed along the length of this section. Rockery walls, approximately six feet high, would be constructed along portions of this section to accommodate the wider roadway template and minimize impacts.
- The existing arch culvert at PM 9.9 would be replaced with a concrete box culvert up to 6 feet high and 12 feet wide. The culvert would be installed at least one foot below the existing channel bed to accommodate fish and other wildlife passage within East Schooner Creek.

The project area is wider in certain locations to accommodate minor roadway realignment, bridge replacement, and potential resurfacing of or disturbance to adjacent parking areas.

Justification for Use of Wetlands

Sir Francis Drake Boulevard is an existing roadway with safety and flooding issues. Safety improvement measures include widening the roadway to a uniform 24-foot width where possible and improving the horizontal and vertical alignment in select areas. A wider roadway would allow for the safer passage of truck traffic and provide room for vehicles to maneuver around disabled vehicles, pedestrians, and bicyclists. Drainage improvements, including the installation of new culverts and replacement of existing culverts, would allow drainage to flow more efficiently through the corridor and minimize flooding. Realigning the roadway between PM 9 and PM 10 would also serve to minimize flooding.

DESCRIPTION OF AFFECTED WETLANDS

Wetland Mapping Methodology

Wetland resource areas were delineated and mapped in the field on April 7 through April 11, 2014, by Jacobs Engineering Inc.'s environmental scientists. Members of the delineation and mapping team included:

Lori A. Macdonald, M.S., P.W.S., Senior Environmental Scientist. Lori Macdonald (P.W.S. #2086) has 20 years of experience in the environmental field and has been responsible for numerous wetland delineations in Massachusetts, including the Muddy Creek Wetland Restoration Project in Harwich/Chatham, funded by the U.S. Department of Agriculture (USDA) (Project No. 20110202.A10). As a part of this 1.5-mile project, Lori was also responsible for completing the vegetation composition analyses within wetland communities located along 20 transects. Lori is a member of the Society of Wetland Scientist, the Wildlife Society, and the California Native Plants Society.

Misha Seguin, Environmental Scientist – Biologist. Misha Seguin completed her Wetland Delineation certification from the Romberg Tiburon Center for Environmental Studies (San Francisco State University) in 2006. She assisted in the Delineation of Wetlands and Other Waters of the U.S. (OWUS) for the 2,000-plus acre Calaveras Dam Replacement Project for the San Francisco Public Utilities Commission, resulting in a delineation of over 1,000 acres of Waters of the U.S., including the reservoir. Subsequently, she has been lead scientist for many smaller-scale jurisdictional determinations throughout the diverse vegetation communities of California and Nevada. She was also certified in 2012 and 2013 in conducting the California Rapid Assessment Method (CRAM) for riverine and depressional wetlands systems, respectively.

Ben Eddy, Biologist, Wetland Professional in Training (WPIT). Ben Eddy is a former National Wetland Inventory (NWI) biologist and graduate of Indiana and Purdue Universities. Ben is

certified in wetland delineation and permitting by the U.S. Army Corps of Engineers (Corps). Ben has delineated wetlands for over 346 miles of transportation and utility right's-of-way. He is a member of the California and Colorado Native Plant Societies.

Dan Soucy, Biologist. Dan Soucy has 10 years of experience conducting wetland delineations and has worked on numerous wetland and riparian restoration projects in the mid-Atlantic area. He has conducted wetland work and delineated wetlands within the Atlantic and Gulf Coastal Plain; Great Plains; Western Mountains, Valleys, and Coast; and Arid West regions. Dan has completed the U.S. Army Corps of Engineers Wetland Delineation and Management Training Program (Certificate No: 4953) taught by Richard Chinn of Environmental Training Inc.

Wetlands were classified according to the U.S. Fish and Wildlife Service (USFWS) Cowardin Wetland Classification System (Cowardin, et al., 1979) and the Hydrogeomorphic Method (HGM). The specialists used Cowardin classifications to classify wetland units along the corridor, which defines wetlands as "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes (Cowardin, et al., 1979):

1. at least periodically, the land supports predominantly **hydrophytes**;
2. the substrate is predominantly **undrained hydric soil**, and
3. the substrate is non-soil and is **saturated with water** or covered by shallow water at some time during the growing season of each year."

Field data characterizing the degree of dominance of hydrophytic vegetation, site hydrology and the presence of hydric soils were collected for the wetland determinations. Generally, the specialists only used the hydric soil criterion when there was uncertainty about hydrophytic vegetation or hydrology status.

Hydrophytic vegetation cover was estimated at each potential wetland site. The first criterion was met if at least 50 percent of the wetland was covered with hydrophytic vegetation. The wetland indicator status was listed for all plant species using the 2013 National Wetland Plant List (Lichvar, 2013). The indicator status was then used to assess the likelihood of an area being classified as a wetland as defined by the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987).

During the field delineation, wetland specialists assigned a number to each wetland mapping unit meeting a unique Cowardin classification and HGM definition. For example, wetlands meeting Cowardin's criteria for palustrine-emergent (PEM) and the HGM definition of depressional are labeled Wetland Type 5. Wetlands designated as Wetland Sub-type 5.4 are cattail-dominated wetlands. The tenth's place accounts for different vegetative profiles under the Cowardin system and geological subtypes according to HGM.

The extent of wetlands and OWUS were determined using the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987) methodology incorporating updates in the *Arid West Regional Supplement*. Potentially jurisdictional wetlands and OWUS, as well as potential non-jurisdictional isolated features, were mapped at a scale of 1 inch = 200 feet on color digital orthoquad aerial imagery using a geographic information system (GIS) (ArcMap 10.1; Esri). Maps were generated in California State Plane. Map sets are found in Appendix A of the "Wetland, Other Waters of the U.S. and Riparian Area Delineation Report" prepared for this project and attached to this report as Appendix B. Completed data forms and a list of all plant species observed are also provided in Appendix B and C, respectively, of the attached delineation report (Jacobs, 2014).

Data was collected using Trimble GeoXH 6000 series global positioning system (GPS) collectors with Esri ArcPad and Trimble Positions software. Data points were also collected at a minimum of four FHWA survey monuments for reference purposes and for facilitating any transformation of the data to the FHWA coordinate system. Data dictionaries were used in ArcPad so that attribute choices could be predefined to allow for a more rapid and streamlined database population effort during field work. The data dictionaries also ensured data standardization across multiple GPS units and field staff. All data was post-processed using the Trimble Positions software to increase horizontal accuracy in WGS84 datum prior to it being moved to the project-specific coordinate system (California State Plane NAD 83). The processed field data was verified by the field staff to ensure no errors in feature attributes or spatial accuracy. All spatial analysis was conducted in an Esri ArcGIS Desktop environment using industry standard processes.

Wetland scientists captured GPS coordinates for each wetland determination data sheet completed in the field. Locations corresponding to the completion of wetland determination data sheets are marked in the delineation maps found in the "Wetland, Other Waters of the U.S. and Riparian Area Delineation Report" (Jacobs 2014) prepared for this project and attached as Appendix B. Informal wetland determination points are also indicated in delineation maps. Augers, instead of shovels, were used to analyze soil cores at these points. This method allowed wetland scientists to determine the extent of hydric soils and to map large wetland occurrences.

Vegetation

Plant species identified on the project site were assigned a wetland status according to the USFWS list of plant species that occur in wetlands (Lichvar, 2013). This wetland classification system is based on the expected frequency of occurrence in wetlands as follows:

OBL	Always found in wetlands	>99% frequency
FACW	Usually found in wetlands	67-99%
FAC	Equal in wetland or non-wetlands	34-66%
FACU	Usually found in non-wetlands	1-33%
NI	Not an indicator (not listed — upland)	<1%

Plants with obligate (OBL), facultative wetland (FACW), and facultative (FAC) classifications are considered hydrophytic vegetation in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987). The hydrophytic vegetation criterion is met when greater than 50 percent of the dominant plant species have an indicator status of OBL, FACW, and/or FAC. Dominant plant species were determined by listing each species in descending order of percent cover within the sample area until 50 percent cumulative cover was exceeded.

Hydrology

The Corps jurisdictional wetland hydrology criterion is satisfied if an area is inundated or saturated for a period sufficient to create anoxic soil conditions during the growing season (minimum of 18 consecutive days in the San Francisco Bay Area). Evidence of wetland hydrology can include direct evidence (primary indicators), such as visible inundation or saturation, drift lines, and surface sediment deposits (including algal mats), or indirect indicators (secondary indicators), such as oxidized root channels and the FAC-neutral test. If indirect or secondary indicators are used, at least two secondary indicators must be present to conclude that an area has wetland hydrology. Primary and secondary hydrology indicators were used to determine if areas surrounding each sample point in the study area satisfied the Corps hydrology criterion.

Soils

Soils formed over long periods of time under wetland conditions are often subject to a fluctuating water table that causes iron to shift from a reduced to an oxidized form. This commonly causes

the distinctive characteristics used as indicators of hydric soils. Hydric soils generally have a low matrix chroma, designated 0, 1, or 2, used to identify them as hydric. Chroma designations are determined by comparing a soil sample with a standard Munsell soil color chart. Soils with a chroma of 0 or 1 are considered hydric; soils with a chroma of 2 must also have mottles to be considered hydric. Soil profiles at each sample point in the study area were described to include horizon depths, color, redoximorphic features, and texture to determine if the soils satisfy the Corps criteria for hydric soils. The Natural Resources Conservation Service (NRCS) manual *Field Indicators of Hydric Soils in the United States* (USDA, 2010) was also used as a guide for determining hydric soils in the study area.

Wetland Classification within the Study Area

Wetland Type1 Cowardin-Palustrine-Forested (PFO); HGM-Slope

This wetland type occurs exclusively east of Schooner Bay. At the project's northern terminus, a seep originating immediately outside the project ROW forms a PFO-Slope wetland (Wetland Sub-type 1.1). This wetland emerges beneath a canopy of Bishop pine (*Pinus muricata*; NI), red alder (*Alnus rubra*; FACW), and toyon (*Heteromoles arbutus*; NI). Mature red alder dominates the Wetland Type 1 canopy, arroyo willow (*Salix lasiolepis*; FACW), blackberry (*Rubus* spp.), and currant (*Ribes* spp.), compose the shrub stratum, and giant horsetail (*Equisetum arvense*; FACW), poison hemlock (*Conium maculatum*; FACW), and coastal manroot (*Marah oreganus*; FACU) grow in the herb stratum.

One of the many hillside slopes east of Schooner Bay forms Wetland Sub-type 1.2. A mature red alder canopy covers the wetland; red-osier dogwood (*Cornus sericea*; NI), arroyo willow and shrubby blackberry compose the intermediate canopy. Ferns such as giant chain fern (*Woodwardia fimbriata*; FACW) form the majority of herbaceous cover.

Remaining occurrences of Wetland Type 1 (1.3) are intermixed with palustrine-scrub-shrub (PSS)-Slope wetlands on hillsides forming the study area's western boundary.

Occurrences of Wetland Type 1 correlate with seeps discharging water from hillsides. Points of discharge lie outside the study area, but form channels and/or wetlands mapped within it.

Soils collected in mapped areas of Wetland Type 1 show distinct indications of anaerobic conditions, as opposed to other mapped wetland types often displaying ambiguous indicators.

Wetland Type 2: Cowardin-Palustrine-Scrub-Shrub (PSS); HGM-Slope

This wetland type occurs east of Schooner Bay. Hillside seeps on the western edge of SFDB support willow thickets composed of arroyo willow intermixed with scrubby red alder. The understory is generally dense with blackberry and currants. Herbaceous species, including giant horsetail (*Equisetum telmateia*; FACW), water hemlock (*Cicuta douglasii*), and grasses, such as velvet grass (*Holcus lanatus*) and tall fescue (*Festuca arundinacea*), line the toe-of-slope at the edge of this wetland type.

Like Wetland Type 1, water discharged from hillside seeps provides wetland hydrology for Wetland Type 2. These seeps lie outside the study area, but influence areas mapped within it.

Wetland Type 3: Cowardin-Palustrine-Forested (PFO); HGM-Riverine

HGM classification interprets the extent of riverine wetlands more broadly than Cowardin. According to Cowardin, riverine wetlands occur in bottomlands and riparian areas regardless of their hydrological connectivity to the channel (USDA, 2008). For this reason, this report distinguishes between Cowardin's riparian systems and HGM riverine systems.

Wetland Type 3 occurs on the eastern edge of the study area. East Schooner Creek originates near the study area's northern terminus and flows adjacent to SFDB to its confluence with Schooner

Creek and ultimately, Schooner Bay. The bottomlands associated with this creek support this habitat type. Wetland Type 3 occurs largely outside the study area.

Mature red alder dominates the vegetative composition of Wetland Type 3. Red alder, often over 50 feet in height, provides a fairly dense canopy, but allows sufficient sunlight to support robust scrub-shrub and emergent strata. Shrub-height arroyo willow, red alder, and red elderberry (*Sambucus racemosa*; FACU) account for the majority of the intermediate canopy. Fertile riverine bottomlands support an herbaceous layer typically exceeding 100 percent (see Appendix B). Rough hedge nettle (*Stachys tenufolia*), stinging nettle (*Urtica dioca*; FAC), and species in the celery family (*Asclepiaceae*) compose the majority of the herbaceous stratum. A thick woody vined stratum of California blackberry (*Rubus ursinus*; FACU), with lesser numbers of Armenian blackberry (*Rubus armeniacus*; FACU), grow between shrub and herbaceous strata.

Occurrences of Wetland Type 3 continue upslope, beyond the study area, with small fragments mapped within the study area. Soil cores illustrated relatively thick O horizons, presumably a product of several dense vegetative strata contributing organic matter to the forest floor. Soil cores revealed particles finer (smaller diameter) than those mapped according to Cowardin's definition of riparian.

Wetland Type 4: Cowardin-Palustrine-Emergent (PEM); HGM-Slope

This wetland type occurs throughout the study area. East of Schooner Bay, Wetland Type 4 (4.1-4.2) is found on hillside seeps at the western edge of SFDB. Soft rush (*Juncus effuses*; FACW), small-bract sedge (*Carex subbracteata*; FACW), cow parsnip (*Heracleum maximum*; FACW), velvet grass (FACW), and tall fescue (FAC) dominate this wetland type. Arroyo willow and red alder saplings also occur.

As SFDB follows the crest of sand dunes west of Schooner Bay, Wetland Sub-type 4.6 occurs at the edge of the study area in dense sedge tussocks formed by slough sedge (*Carex obnupta*). Pacific silverweed (*Potentilla anserina*; FACW), rough hedge nettle (FACW), water hemlock, and rushes (*Juncus* spp.) are intermixed with slough sedge (OBL). Wetland subtype 4.6 correlates with the presence of Dune Land soil units (USDA, 1985). Strong coastal winds form Dune Land soils into tussocks and mounds. These soils do not develop profiles, constraining the ability to determine the presence of anaerobic conditions. Hydrologically, these wetlands appear influenced by coastal fog and precipitation. Plants close to the coast within PRNS depend on fog more than rain. Moreover, fog can represent the equivalent of 20 inches of rain annually in the seashore (Jacobs, 2014).

Wetland Type 5: Cowardin-Palustrine-Emergent (PEM); HGM-Depressional

SFDB acts as an artificial upland inclusion throughout much of the study area corridor. The road bank and pavement appear to trap water flow from seeps, sheetflow, and subsurface flow, causing water to pool either at the surface or to restrict subsurface migration, creating hydric soils at the toe-of-slope. The depression formed between the SFDB roadbank and adjacent naturally occurring slopes are the result of road construction. As a result, depressional wetlands can be found near the edge-of-pavement in much of the study area.

These depressional wetlands are known as swales. The San Francisco Environmental Protection Agency (SFEPA) office considers swales surface drainage features conveying concentrated surface flow, but lacking a defined bed and bank (Witham et al., 1998). For purposes of this study, this definition has significant jurisdictional context. Occurrences of Wetland Type 5 exist with and without a defined bed and bank. In many instances, these swales develop a defined channel in proximity to culverts at their lowest elevation, but lack these characteristics at higher elevations—elevation differential being no more than a few feet. Similarly, upland inclusions separate occurrences of Wetland Type 5 at relatively higher points.

Wetland scientists conjecture that flow velocity and water volume increase as swales approach their lowest topographical point. Wetland Type 5 swales appear to be fed, at least in part, by seeps upslope from SFDB.

Thin wetland swales, often no more than 1-2 feet in width, have formed east of Schooner Bay from the northern terminus to Drake's Estero between hillside seeps at the western edge of SFDB and the edge-of-pavement. Soft rush is the key wetland indicator for this wetland type, although velvet grass, water hemlock, giant horsetail, and willow (*Salix* spp.) saplings also grow in Wetland Type 5. NRCS soil maps place Rodeo Clay Loam beneath much of the wetlands east of Schooner Bay, helping explain water retention in Wetland A features. The permeability of Rodeo Clay Loam demonstrates slow permeability, creating saturation and pooled water from December through April. This soil unit also explains the inconsistency of channels within Wetland Type 5 swales. Rodeo Clay Loam has a low erosion potential (Jacobs, 2014).

Occurrences of Wetland Type 5 provide ambiguous wetland diagnostics south of SFDB's crossing of Drake's Estero, west of Schooner Bay. FACW species often occur in similar ratios as FACU plants; indications of iron reduction are not as visible, and wetland hydrology is unclear. A geological restrictive layer, presumably slowing water infiltration and creating anaerobic conditions is common to most occurrences of Wetland Type 5. NRCS-mapped soil units help explain the hydrological source of these wetland swales. Sandy soil types associated with upland dunes contain substantial inclusions of Humaquepts, Seeped. The high seepage potential and water retention of these inclusions may provide the necessary water discharges to form swales in depressional topography between the edge-of-pavement and low slopes typical in this part of PRNS.

South of Drake's Estero, Wetland Sub-type 5.5 vegetation generally includes higher graminoid percentages. Velvet grass, tall fescue, and perennial ryegrass (*Lolium perenne*; FAC) often contribute to more than half of vegetative cover. Rough hedge nettle, coast angelica (*Angelica hendersonii*; NI), Pacific silverweed, radish (*Raphanus* L.), and water hemlock typically grow in this wetland type. Invasive, hydrophytic weeds dominate the vegetative cover of Wetland Sub-type 5.6.

Wetland Type 6: Cowardin-Palustrine-Scrub-Shrub (PSS); HGM-Riverine

As with Wetland Type 3, wetland scientists identified Wetland Type 6 to distinguish between Cowardin's interpretation of riparian and the HGM definition of riverine. Unlike Cowardin, HGM classification considers a wetland's geological setting independent from hydrologic function.

Wetland Type 6 occurs only east of Schooner Bay. Bottomlands associated with East Schooner Creek support forested wetlands, though small breaks occur allowing for scrub-shrub (and emergent) habitats. Only small areas of this wetland type overlap with the study area. Occurrences of Wetland Type 6 begin where the toe-of-slop meets riverine bottomlands, leaving these wetlands largely outside the scope of this study.

Arroyo willow thickets, intermixed with red alder, red elderberry, and occasional occurrences of Pacific willow (FACW), dominate this wetland type. The dense canopy prevents significant herbaceous growth. Herbs, including giant horsetail, water hemlock, and invasive English ivy (*Hedera helix*; NI) occur where sunlight penetrates at the edges.

Vertical hydrology and sub-surface flow from hillside seeps appear to influence Wetland Type 6 more than East Schooner Creek. Whereas East Schooner Creek is deeply incised, a shallow water table in Wetland Type 6, no more than 3 inches deep, suggests a palustrine system rather than riparian.

Wetland Type 7: Cowardin-Riparian-Emergent (RP1EM); HGM-Riverine

This wetland type occurs only in the riverine bottomlands east of Schooner Bay. Small breaks in the otherwise dense canopy of the forested bottomlands allow for the growth of herbaceous species. Cattail (*Typha latifolia*; OBL), slough sedge, and California bulrush (*Schoenoplectus californicus*; OBL) contribute to more than 75 percent of vegetative cover in Wetland Type 7. Near the confluence of Schooner and East Schooner Creek, wetland scientists documented a large cattail monoculture in the riverine bottomland. The majority of the area comprising this wetland type consists of a large monoculture of cattails.

Hydrologically, Wetland Type 7 meets Cowardin's criteria for riparian classification. Stream water flows into these wetlands, pooling and allowing for a preponderance of FACW and OBL species.

Soil chemistry is also apparent in soil cores. Anaerobic soil diagnostics were clearly observed by wetland scientists. Additionally, mucky, organic O horizons are characteristic of Wetland Type 7.

Wetland Type 8: Cowardin-Riparian-Forested (RP1FO); HGM-Riverine

Like Wetland Type 7, Wetland Type 8 conforms to Cowardin's riparian criteria, as well as the HGM parameters for riverine. East Schooner Creek influences this wetland type both functionally and hydrogeomorphically.

This wetland type grows in a narrow band along the East Schooner Creek channel and occurs in forested wetlands, similar to Wetland Type 3. However, a larger percentage of tree-height arroyo willow grows in Wetland Type 8 than in Wetland Type 3, the latter dominated by mature red alder. Shrub and herbaceous strata are also sparser than in Wetland Type 3. Shrubby red alder, along with shrub-height arroyo willow, dominate the intermediate canopy. Likewise, herbaceous species are sparse in the rocky, sandy stream soils.

Wetland scientists identified a water table at roughly the same level as the stream channel in soil cores. Phreatophytic willow roots extend into the channel, indicating well-drained, sandy soils. Soil cores revealed sandy redox as the primary sign of anaerobic conditions.

Wetland Type 9: Cowardin-Riparian-Scrub-Shrub (RP1SS6); HGM-Riverine

As with Wetland Type 7 and 8, Wetland Type 9 complies with Cowardin's interpretation of riparian, as well as the HGM definition of riverine. This wetland type supports a nearby monoculture of arroyo willow. The dense willow canopy largely excludes sunlight from the thicket floor, preventing significant herbaceous growth.

Soils are sandy and thinner than in surrounding palustrine systems. Sandy redox indicated anaerobic soil conditions in areas of Wetland Type 9. Soil cores were taken near the ordinary high water mark (OHWM). Soil pits are filled with water at approximately the same elevation as the East Schooner Creek OHWM. As in Wetland Type 8, phreatophytic willows send roots into the stream channel, suggesting well-drained soils.

Wetland Type 10: Cowardin-Palustrine-Emergent (PEM); HGM-Riverine

This wetland type includes a single occurrence of the PEM and riverine wetland type. A small break in the bottomland forest adjacent to East Schooner Creek supports a flooded area dominated by California bulrush, with small percentages of cover comprised of rough hedge nettle and California blackberry.

During site visits in April, May, and June, six inches of water stood in the delineated area. The surface water elevation was several feet higher than the OHWM of the creek to the east, suggesting no hydrological connection to the stream. Geomorphically, Wetland Type 10 lies in a riverine bottomland.

Wetland Type 11: Cowardin-Estuarine-Emergent (E2EM); HGM-Estuarine

This wetland type occurs in the salt marsh flats at the northern edge of Drake's Estero. A causeway built for SFDB's crossing of the salt marsh acts as an artificial upland inclusion between estuarine wetlands on both sides of the road. For this reason, only small areas of Wetland Type 11 are within the scope of this study.

Beyond the ROW, the Drake's Estero salt marsh is a combination of halophytic pickleweed (*Salicornia* L.; OBL), saltgrass (*Distichlis spicata*; FAC), and alkali heath (*Frankenia salina*; FACW). Study areas mapped as estuarine were either vegetatively disturbed or influenced by freshwater flow from Schooner Creek. In addition to the halophytes mentioned above, wetland scientists identified Baltic sedge (*Carex balticus*; NI), marsh jaumea (*Jaumea carnosa*; OBL), gumplant (*Grindelia stricta*; FACW), and tall fescue.

The combination of halophytic and freshwater species indicates a freshwater influence at the estuary's periphery. Wetland scientists observed a drastic shift in vegetative cover at the convergence of Wetland Type 7, a freshwater emergent system, and Wetland Type 11. A monoculture of cattail borders a nearby monoculture of pickleweed, with no transitional area.

Soil cores revealed shallow redox; a reduced matrix could be seen within the first six inches.

Wetland Type12: Cowardin-Palustrine-Scrub-Shrub (PSS); HGM-Depressional

This wetland type contributes a small percentage of the total wetland area in the study area. An occurrence of Wetland Type 12 (12.1) falls within the SFDB ROW near Mount Vision Road. Vegetatively, this occurrence marginally classifies as a wetland as measured by the *Arid West Supplement* wetland vegetation index. Coyote brush (*Baccharis pilularis*; NI) represents the majority of scrubby cover. The herbaceous layer, composed of soft rush, giant horsetail, and velvet grass (all considered hydrophytic species in the Arid West) indicate the presence of a wetland.

The stressed appearance of wetland plants and succession of coyote brush suggest a hydrological disruption. Soil saturation was recorded deeper in soil cores than surrounding wetlands. Anaerobic soil diagnostics were also found deeper than surrounding wetlands.

Wetland Type13: Cowardin-Palustrine-Emergent (PEM); HGM-Mineral Soil Flats

A single occurrence of this wetland type exists east of Schooner Bay. It is a small, depressional wetland displaying characteristics of a vernal pool with an isolated, standing pool of water. The submerged soil lacks vegetation at its lowest point, which is contrasted by the surrounding bottomland's dense, herbaceous cover. Rough hedge nettle and California blackberry line the pool's fringe.

Soil cores revealed a thick O horizon and reduced matrix in the top four inches. A hardpan was present at twelve inches.

Wetland scientists found the water table two inches deeper than the pool's surface. The OHWM of the adjacent channel was also lower than the pool's surface water. For these reasons, wetland scientists believe that vertical hydrology influences Wetland Type 13, at least in part.

Total Wetlands Identified

A total of 17.95 acres of wetlands were identified during the survey efforts (Table 1), which was generally limited to the ROW surrounding SFDB, with a few exceptions where planned construction extended further.

Table 1: Total Amount of Wetland Systems throughout the Study Area

Wetland System	Square Feet	Acres
A	394,784	9.063
B	21,562	0.495
C	9,496	0.218
D	214,881	4.933
E	53,535	1.229
Total	694,259	15.94

Wetland Functions and Values

Wetland functions and values were assessed using the U.S. Army Corps of Engineers *The Highway Methodology Workbook Supplement: Wetland Functions and Values; A Descriptive Approach* (USACE 1999), which incorporates both wetland science and human judgment of values. The Corps notes that "intermixing science with value judgments in this way has proven to be both effective and acceptable" (USACE 1999). This assessment is based on the USACE methodology and provides a descriptive analysis of the following wetland functions and values within the study area (Table 2).

Table 2: Functions and Values Evaluated

Functions	Values
Groundwater recharge/discharge	Recreation
Floodflow alteration	Educational/scientific value
Fish and shellfish habitat	Uniqueness/heritage
Sediment/toxicant/pathogen retention	Visual quality
Nutrient removal/ retention/transformation	Endangered species habitat
Production export	
Sediment/shoreline stabilization	
Wildlife habitat	

As described above, 13 unique wetland types were identified in the wetland delineation report prepared for this project and attached as Appendix B. For the purposes of the *functional* assessment, wetlands were grouped on a larger scale based on a combination of dominant hydrologic influences, landscape setting, and location within the watershed, all which contribute to similar wetland functions. Five wetland systems were classified as a result and are discussed below. A detailed discussion of the functions and values of each wetland system can be found in Appendix C. Figures identifying the wetland systems and locations along the study area are attached as Appendix A.

Wetland System A: East Schooner Creek — Freshwater

Wetland System A is located at the easternmost end of the project area and runs south to the outlet at Schooner Bay (approximate PM 9.5 to PM 12). This freshwater system is anchored by East Schooner Creek and is predominantly influenced by groundwater seepage, precipitation, and ephemeral tributaries. Wetland System A is by far the most diverse and largest system in the study area. Wetland types found within System A, in order of prevalence, include palustrine scrub-shrub, palustrine forested, riparian emergent, riparian scrub-shrub, palustrine emergent, and riparian forested. HGM classifications included riverine, slope, depressional, and mineral soils. Wetland types mapped within this system include Type 1, 2, 3 6, 7, 8, 9, 10, 12, and 13.

The primary functions of this wetland system include floodflow alteration, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, sediment/shoreline stabilization, and

wildlife habitat. This wetland system also provides endangered species habitat value. See attached wetland function and value evaluation in Appendix C for details.

Wetland System B: Schooner Bay — Estuarine

Wetland System B is located within the salt marsh estuarine system at Schooner Bay, approximately 3 to 4 miles from the intersection of Pierce Point Road and SFDB (approximately near PM 9). Wetland B is primarily influenced by the tides from Drakes Bay, as well as freshwater outflow from East Schooner Creek to the east and Schooner Creek from the north. This wetland system is subject to the ebb and flow of the tide, but also contains brackish water northeast of the study area at the freshwater creek's outflow. The study area crosses the main outlet/tidal slough to Schooner Bay, which supports marine wildlife species and estuarine plant species. Wetland types within System B, in order of dominance, are estuarine emergent, palustrine emergent, and palustrine scrub-shrub. HGM classifications are estuarine and slope.

The primary functions of this wetland system include floodflow alteration, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, sediment/shoreline stabilization, wildlife habitat and recreation. The primary values of this wetland system include uniqueness/heritage, visual quality/aesthetics and endangered species habitat.

Wetland System C: Historic Ranch G — Freshwater

Wetland System C is a relatively small subwatershed located west and upslope of Schooner Bay near Historic Ranch G, where SFDB starts to climb in elevation above sea level. This system consists of palustrine emergent and palustrine scrub-shrub wetlands, with an HGM classification of "slope." A minor amount of estuarine emergent wetland is also located at the base of this system, as upslope freshwater drains down into Schooner Bay from the west, creating a brackish wetland system outside of the study area. The palustrine emergent slope wetlands along SFDB are a direct result of cuts into the hill slope from construction of the road, forming seep wetlands from groundwater and/or throughflow exfiltration. The palustrine scrub-shrub wetlands are dominated by willows, which continue south of SFDB into a well-vegetated and well-established manmade pond outside of the study area. The entire system drains into a freshwater wet meadow, and then into Schooner Bay.

This wetland system primarily provides wildlife habitat functions and visual quality/aesthetic value.

Wetland System D: Drainage Ditch Wetlands — Southern Section

Wetland System D is spread throughout the southern end of the study area and is predominantly comprised of roadside drainage ditches that would not be naturally present without construction of SFDB. These drainage features are either a result of cutting into the hillslope and allowing throughflow and/or groundwater to exfiltrate, or are drainage ditches predominantly constructed in uplands that have formed into wetlands based on hydrologic disruptions. Wetland types within Wetland System D are categorized as palustrine emergent wetlands-depressional or slope. Wetland System D comprises all drainage ditch wetlands found southwest of Historic G Ranch, approximately from PM 8.5 to PM 0.

The primary wetland functions associated with this wetland system include groundwater recharge/discharge, floodflow alteration and wildlife habitat. The wetland system's primary value is the presence of endangered species habitat.

Wetland System E: Drainage Ditch Wetlands — Eastern Section

Wetland system E is spread throughout the northeastern section of the study area and is comprised of roadside drainage ditches that would not be naturally present without construction of SFDB. These drainage features are either a result of cutting into the hillslope and allowing throughflow and/or groundwater exfiltratation, or are drainage ditches predominantly

constructed in uplands that have formed into wetlands based on disruptions of natural hydrologic processes. Wetland types within Wetland System E are categorized as palustrine emergent wetlands-depressional. Wetland System E comprises all drainage ditch wetlands east and northeast of Historic Ranch G, approximately from PM 8.5 to PM 12. This system is similar to Wetland System D. However, Wetland System E was classified separately based on a difference in subwatersheds, location in the landscape, and hydrological outputs. Although this system overlaps Wetland Systems A, B, and C, it was categorized separately due to the altered state of the drainage ditch features and functional differences. Specific functions and values for Wetland System E are described below.

The primary wetland functions associated with this wetland system include groundwater recharge/ discharge, floodflow alteration, and wildlife habitat. The wetland system's primary value is the presence of endangered species habitat.

ADVERSE IMPACTS EXPECTED TO WETLANDS

The proposed project is anticipated to have temporary and direct impacts on protected wetlands. Impacts were calculated using the project's 15 percent design and are identified in Table 3. Design is still in the preliminary stages and the impact estimates below represent a worst case scenario. A total of 5.1 acres of temporary impacts and 4.4 acres of permanent impacts are estimated at the 15 percent design level. Refinements through the final design process are anticipated to lessen the quantity of impacts to wetlands.

Table 3: Anticipated Temporary and Permanent Impacts to Wetland Systems and by Wetland Types

	Wetland Type to be Filled in Acres (Temp acre/ Perm acre)							Total
	PEM	PSS	PFO	RP1SS	RP1EM	RP1FO	E2EM	
System	Temp/Perm	Temp/Perm	Temp/Perm	Temp/Perm	Temp/Perm	Temp/Perm	Temp/Perm	Acres
A	0.081 / 0.026	0.863 / 1.090	1.207 / 0.705	0.239 / 0.179	0.156 / 0.106	0.058 / 0.026		4.736
B	0.063 / 0.011	0.068 / 0.014					0.243 / 0.085	0.48
C	0.053 / 0.077	0.033 / 0.028					0.001	0.19
D	1.441 / 1.511							2.95
E	0.467 /							1.17
Total	2.11 / 2.33	0.96 / 1.13	1.21 / 0.71	0.24 / 0.18	0.16 / 0.11	0.06 / 0.03	0.24 / 0.09	9.54

Note: Totals are rounded to the nearest hundredth.

WETLAND IMPACT AVOIDANCE, MINIMIZATION, AND COMPENSATION

Efforts to Avoid and Minimize Impact

Numerous wetlands and other waters are located directly adjacent to SFDB. The following design elements were implemented in order to avoid or minimize impacts to wetlands and OWUS:

- A 24-foot wide paved width, which is 4 to 8 feet less than published guidelines, is proposed (AASHTO, 2011; NPS, 1984).
- 1-foot-wide shoulders, which are below the minimum 3-foot (NPS, 1984) and 5-foot (AASHTO 2011) design standards, are proposed. This requires a design exception.

- A clear zone width between 3 feet and 12 feet, which will be at or below minimum design standards, will require a design exception for areas less than 12 feet wide.
- To minimize overall disturbance, rockery walls and paved ditch sections were incorporated into project design to expedite ting into existing cut slopes.
- A total of 32 curves provide less than minimum length of stopping sight distance. All of these curves will have design exceptions in order to minimize ground disturbance. The curves with design exceptions that would reduce impacts to adjacent wetlands and/or other waters of the U.S. are located at the following approximate stations (STA): 61+77, 68+51, 93+36, 98+37, 223+41, 275+46, 294+60, 300+06, 460+55, 490+26, 504+60, 524+48, 528+35, 623+44, and 626+80.
- A total of 44 curves have curve radii below the minimum values for a 40 mph design speed. In many of these areas, wetlands and other waters of the U.S. are located adjacent to the roadway. Design exceptions are proposed for these curves to minimize potential impacts.
- A design exception is proposed between STA 60+51 and STA 63+00 for the steep grade. In this area, wetlands are located adjacent to the roadway. The proposed design will match the existing terrain in order to minimize impacts.

In addition to the design elements noted above, an option was eliminated in the flood-prone area that would raise the elevation of the roadway 3 to 4 feet on top of the existing alignment. This option would have likely required a temporary, parallel alignment to maintain traffic during construction. This option would result in impacts to wetlands on both the north and south sides of the roadway, with major impacts to WOUS on the north where East Schooner Creek parallels the road. In order to maintain traffic flow, this option would also likely require a detour parallel to the existing roadway, which would further impact WOUS. This option was eliminated in favor of shifting the roadway south, away from the creek channel, which minimizes impacts to WOUS. Efforts to minimize impacts will continue through final design.

Wetland impacts will be further minimized during construction by applying Best Management Practices (BMPs) in the field. BMPs will include limiting work in water to the low flow period of April 15 through October 15, which is also the non-breeding period associated with California red-legged frogs. River-washed gravel bags will be used in waterways below the OHWM in order to avoid adversely impacting fishery habitat. Sand bags will not be used below the OHWM. Other BMPs include use of temporary erosion controls along the corridor to protect adjacent wetland areas from siltation. A combination of fiber rolls, straw bales, and silt fencing will be used to control runoff from the construction site. In addition, temporary swales, gravel check dams, and temporary drainage basins will be used to control runoff during rain events. Exposed slopes will be sprayed with bonded fiber matrix and/or a temporary erosion control seed mix to help prevent erosion. Concrete and asphalt piles will be stockpiled outside and away from wetland resource areas, surrounded with fiber rolls, and covered with plastic. Final BMPs will be agreed upon in coordination with interested agencies such as the U.S. Army Corps of Engineers, USFWS, National Marine Fisheries Service, Regional Water Quality Control Board (RWQCB), and NPS. Final approved BMPs will likely include those outlined in the *NPS Procedural Manual #77-1: Wetland Protection – Appendix B Best Management Practices and Conditions for Proposed Actions with the Potential to Have Adverse Impacts on Wetlands* (see Appendix D).

Compensatory Mitigation Measures

A Clean Water Act Section 404 Individual Permit application and a Section 401 Water Quality Certification application will be submitted to the Corps and the RWQCB, respectively, requesting permission to impact jurisdictional features.

Temporarily impacted wetlands will be restored on-site to pre-construction conditions through planting vegetation and hydroseeding with a native seed mix. FHWA will compensate for the

permanent loss of jurisdictional features through purchase of mitigation credits at an approved wetland mitigation bank and/or creation of wetland and riparian compensatory mitigation at a 1.5:1 ratio or higher, as agreed upon through the permit terms and conditions. Potential on-site or off-site mitigation opportunities will be coordinated with the Corps and NPS as appropriate. If any portion of the mitigation requirements are fulfilled through on-site or off-site mitigation, a mitigation and monitoring plan will be developed and submitted with the permit applications to the Corps and RWQCB documenting measures to ensure successful mitigation. FHWA will be responsible for ensuring all permit terms and conditions are met.

SUMMARY

FHWA finds that there is no practical alternative to impacting up to 9.5 acres of wetlands in order to make the proposed improvements to Sir Francis Drake Boulevard. The project has been designed to avoid wetlands to the maximum practical extent, and the wetland impacts that cannot be avoided will be minimized. Through restoration of temporary impacts and mitigation for permanent loss of jurisdictional features, FHWA will ensure this project is consistent with the NPS no-net-loss of wetlands policy. Therefore, the FHWA finds that the Action Alternative is in compliance with Executive Order 11990, Protection of Wetlands.

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APPENDIX A: WETLAND IMPACT MAPS

Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- PFO-Palustrine Forested
- Stationing Line
- Impact Limits (15%)
- Wetland System A

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane California III FIPS 0502 Feet
North American Datum 1983

Prepared on: 12/12/2014 Revised on: 1/15/2015

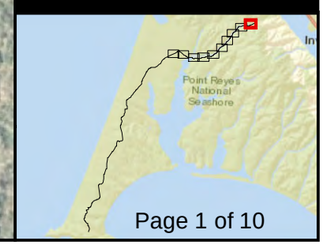
* Wetland Systems limits were produced to show general wetland system boundaries only, and do not represent watershed or geographical boundaries of any kind.

** NWI data are produced on a reconnaissance level and do not represent final wetland boundaries.

All wetlands within Impact Limits will be temporarily or permanently impacted.

Aquatic features contiguous with Study Area boundaries continue beyond the project limits.

Regional Locator



Pierce Point Road

640+00

630+00

12

Wetland System A

East Schooner Creek

Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- PFO-Palustrine Forested
- PSS-Palustrine Scrub-Shrub
- RP1FO-Riparian Forested
- Stationing Line
- Impact Limits (15%)
- Wetland System A

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane California III FIPS 0502 Feet North American Datum 1983

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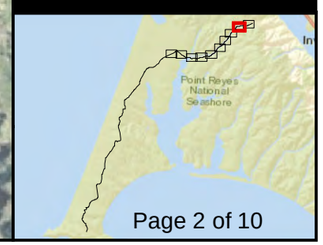
Regional Locator



Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- PFO-Palustrine Forested
- PSS-Palustrine Scrub-Shrub
- Stationing Line
- Impact Limits (15%)
- Wetland System A

National Wetland Inventory - Wetland

- Freshwater Forested/ Shrub Wetland**

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane California III FIPS 0502 Feet
North American Datum 1983

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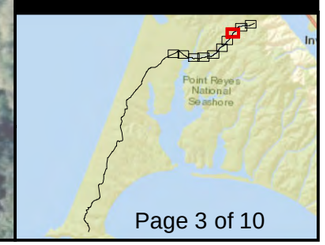

Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- PFO-Palustrine Forested
- PSS-Palustrine Scrub-Shrub
- RP1SS-Riparian Scrub-Shrub
- Stationing Line
- Impact Limits (15%)
- Wetland System A

National Wetland Inventory - Wetland

- Freshwater Forested/ Shrub Wetland**

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane California III FIPS 0502 Feet
North American Datum 1983

Prepared on: 12/12/2014 Revised on: 1/15/2015

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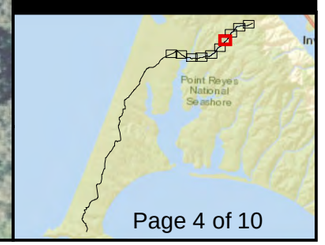
Regional Locator



Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- PFO-Palustrine Forested
- PSS-Palustrine Scrub-Shrub
- RP1EM-Riparian Emergent
- RP1SS-Riparian Scrub-Shrub
- Stationing Line
- Impact Limits (15%)
- Wetland System A

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane California III FIPS 0502 Feet North American Datum 1983

Prepared on: 12/12/2014 Revised on: 1/15/2015

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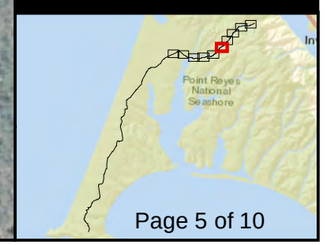
All wetlands within Impact Limits will be temporarily or permanently impacted.

Aquatic features contiguous with Study Area boundaries continue beyond the project limits.

Regional Locator



Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- PFO-Palustrine Forested
- PSS-Palustrine Scrub-Shrub
- RP1SS-Riparian Scrub-Shrub
- Stationing Line
- Impact Limits (15%)
- Wetland System A

National Wetland Inventory - Wetland

- Freshwater Emergent Wetland**
- Freshwater Pond**

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane California III FIPS 0502 Feet North American Datum 1983

Prepared on: 12/12/2014 Revised on: 1/15/2015

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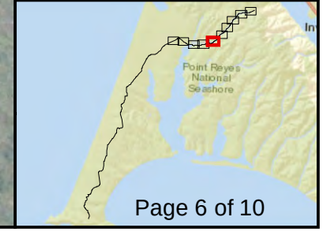
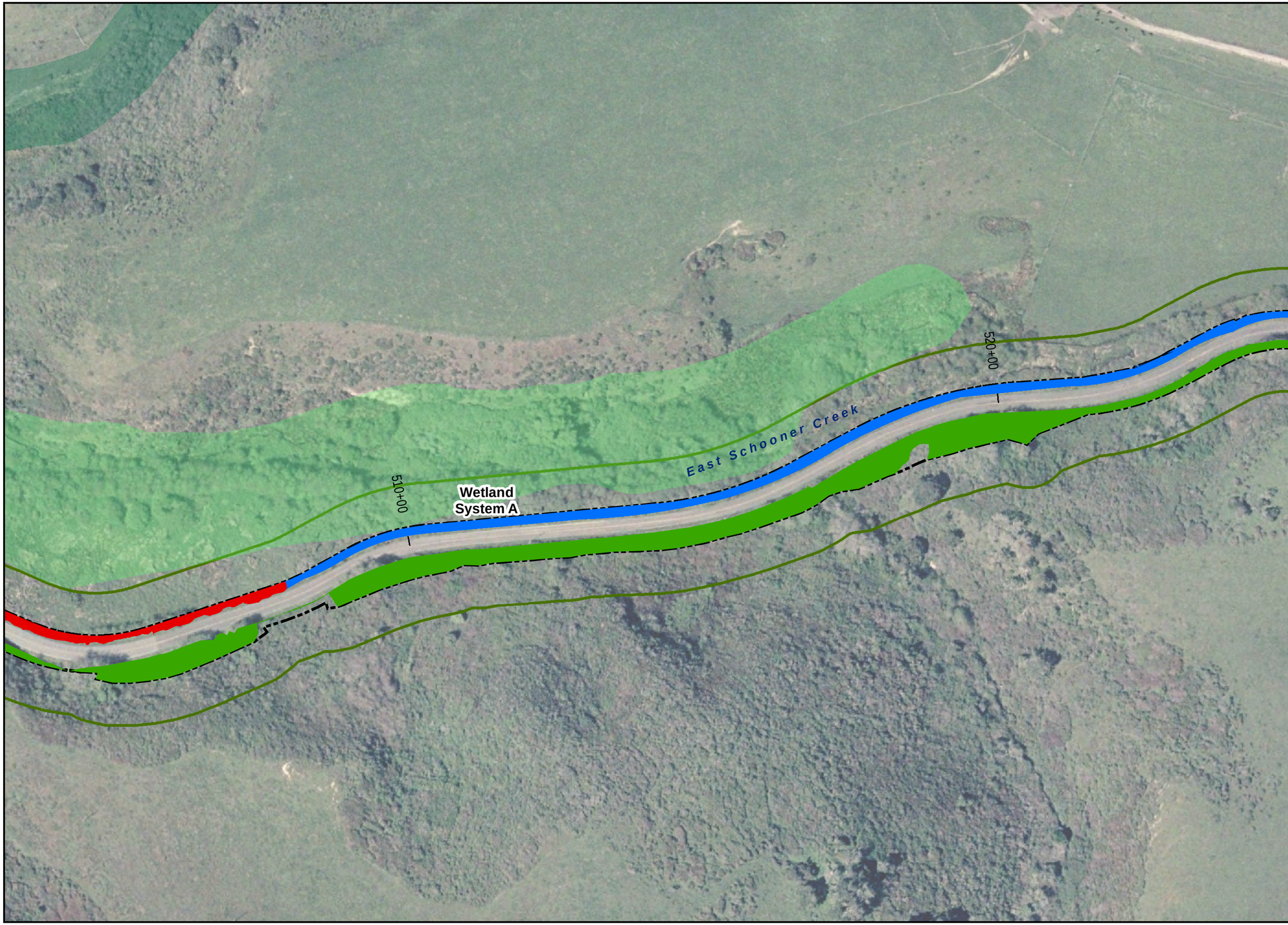
All wetlands within Impact Limits will be temporarily or permanently impacted.

Aquatic features contiguous with Study Area boundaries continue beyond the project limits.

Regional Locator





Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- PFO-Palustrine Forested
- PSS-Palustrine Scrub-Shrub
- RP1EM-Riparian Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System A

National Wetland Inventory - Wetland

- Freshwater Emergent Wetland**
- Freshwater Forested/ Shrub Wetland**

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane California III FIPS 0502 Feet
North American Datum 1983

Prepared on: 12/12/2014 Revised on: 1/15/2015

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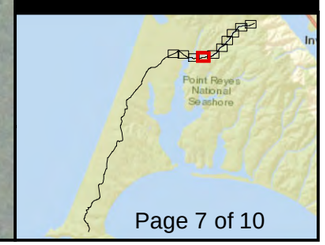

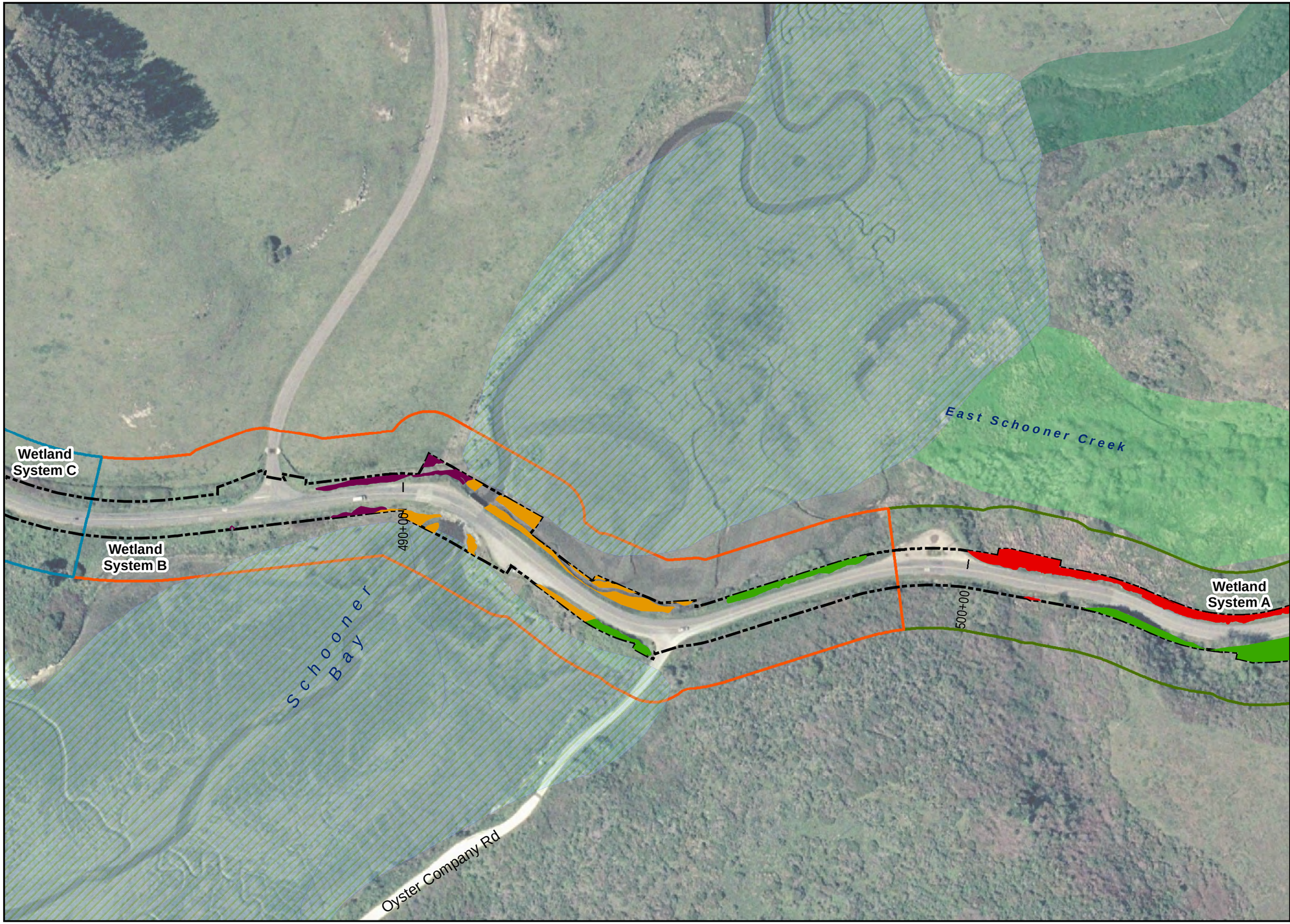

Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- E2EM-Estuarine Emergent
- PEM-Palustrine Emergent
- PSS-Palustrine Scrub-Shrub
- RP1EM-Riparian Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System A
- Wetland System B
- Wetland System C

National Wetland Inventory - Wetland

- Estuarine and Marine Wetland**
- Freshwater Emergent Wetland**
- Freshwater Forested/ Shrub Wetland**

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane California III FIPS 0502 Feet
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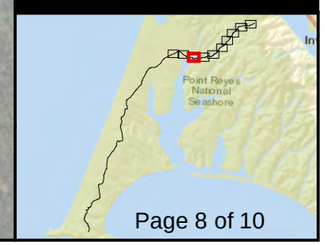

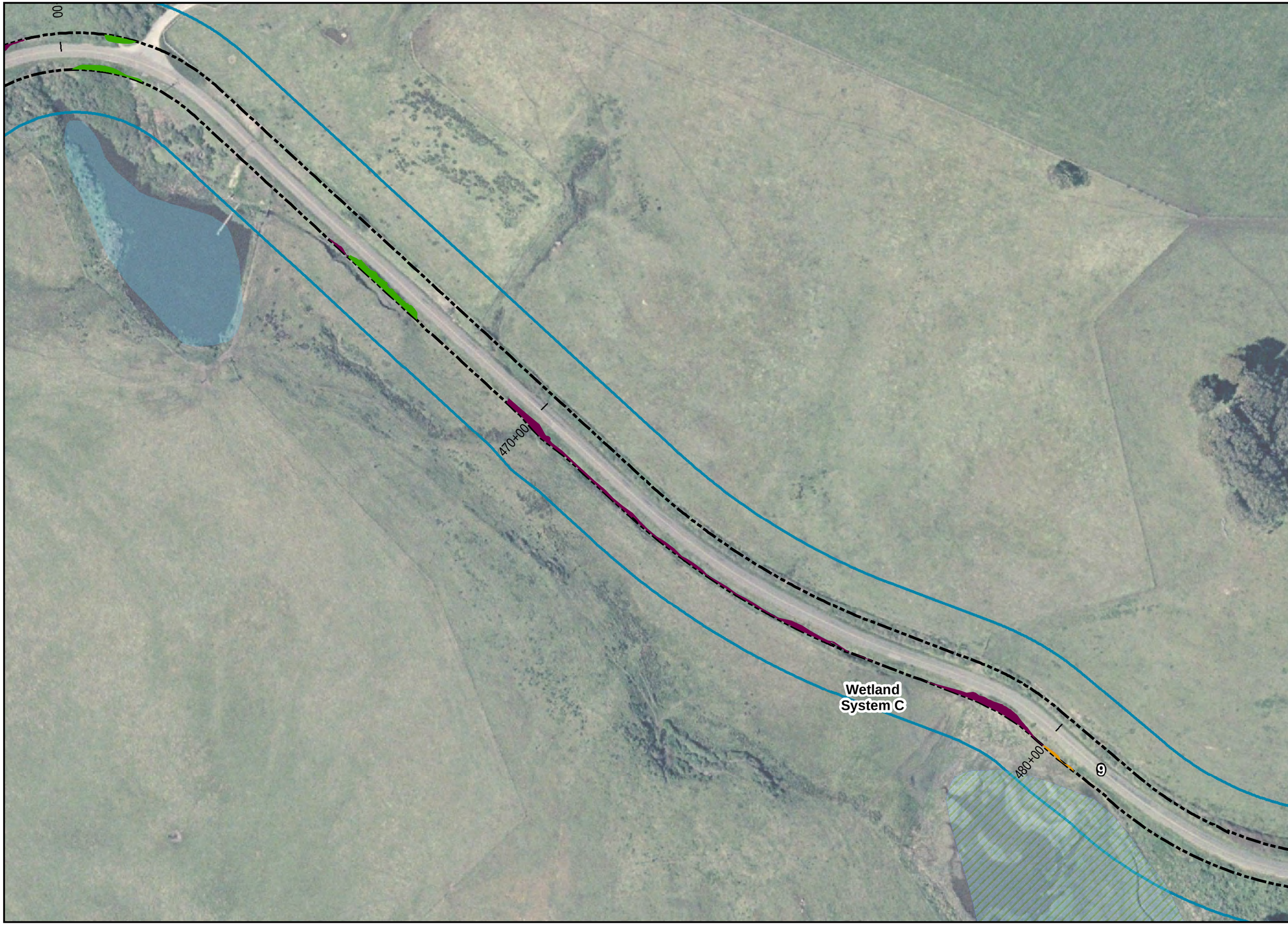

Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- E2EM-Estuarine Emergent
- PEM-Palustrine Emergent
- PSS-Palustrine Scrub-Shrub
- Stationing Line
- Impact Limits (15%)
- Wetland System C

National Wetland Inventory - Wetland

- Estuarine and Marine Wetland**
- Freshwater Pond**

N

0 110 220 Feet

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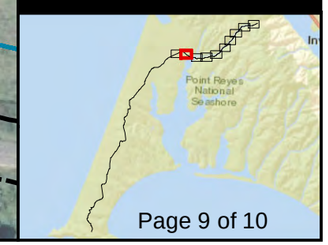

Sir Francis Drake Boulevard Improvement Project

Wetland System A,B,C*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- PSS-Palustrine Scrub-Shrub
- Stationing Line
- Impact Limits (15%)
- Wetland System C

National Wetland Inventory - Wetland

- Freshwater Pond**

N

0 110 220 Feet

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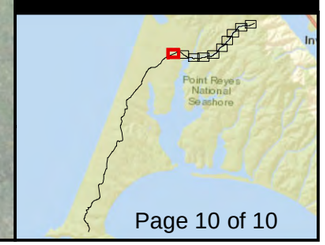

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System E

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

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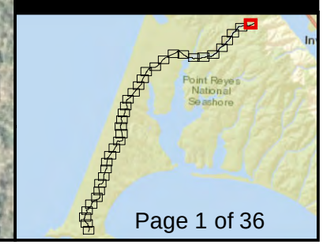

Pierce Point Road

640+00

12

630+00

East Schooner Creek

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System E

N

Feet
0 110 220

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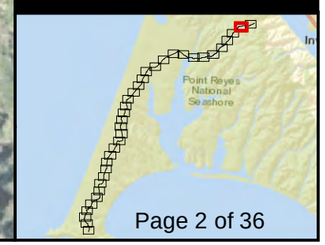

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System E

National Wetland Inventory - Wetland

- Freshwater Forested/ Shrub Wetland**

N

0 110 220 Feet

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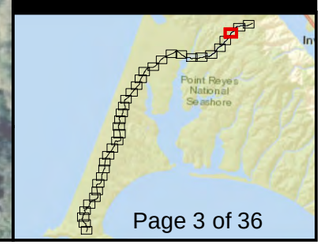

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System E

National Wetland Inventory - Wetland

- Freshwater Forested/ Shrub Wetland**

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Feet
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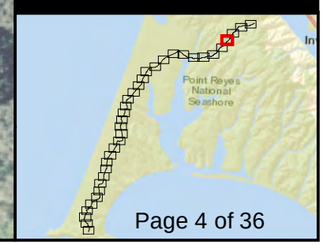

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

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- PEM-Palustrine Emergent
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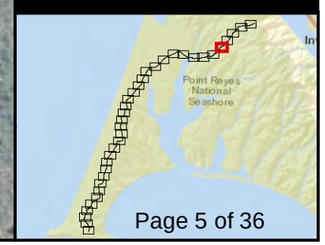

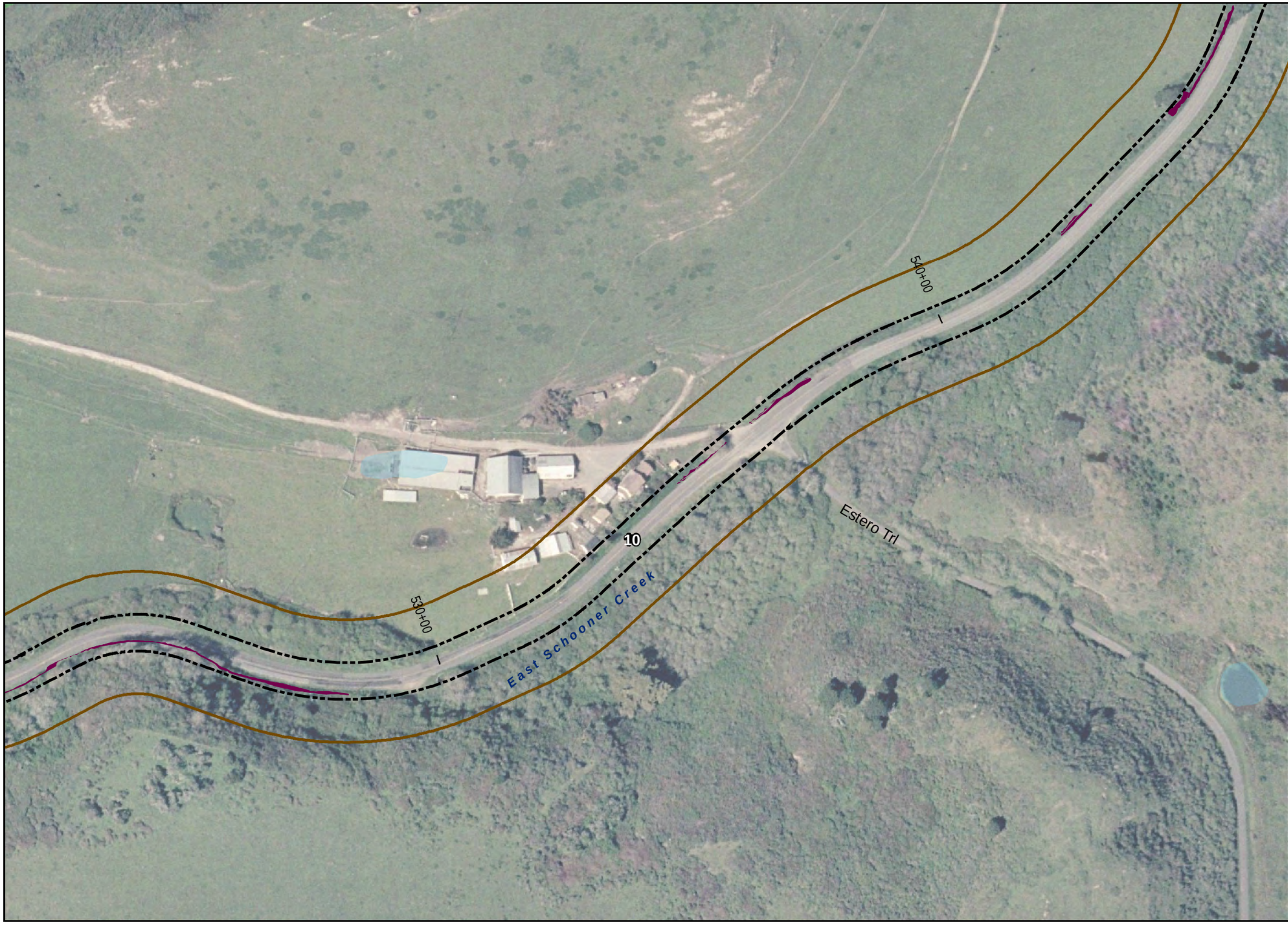

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System E

National Wetland Inventory - Wetland

- Freshwater Emergent Wetland**
- Freshwater Pond**

N

0 110 220 Feet

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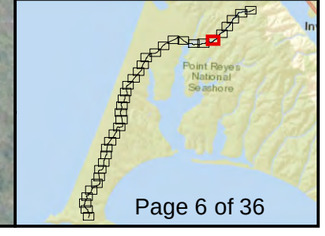

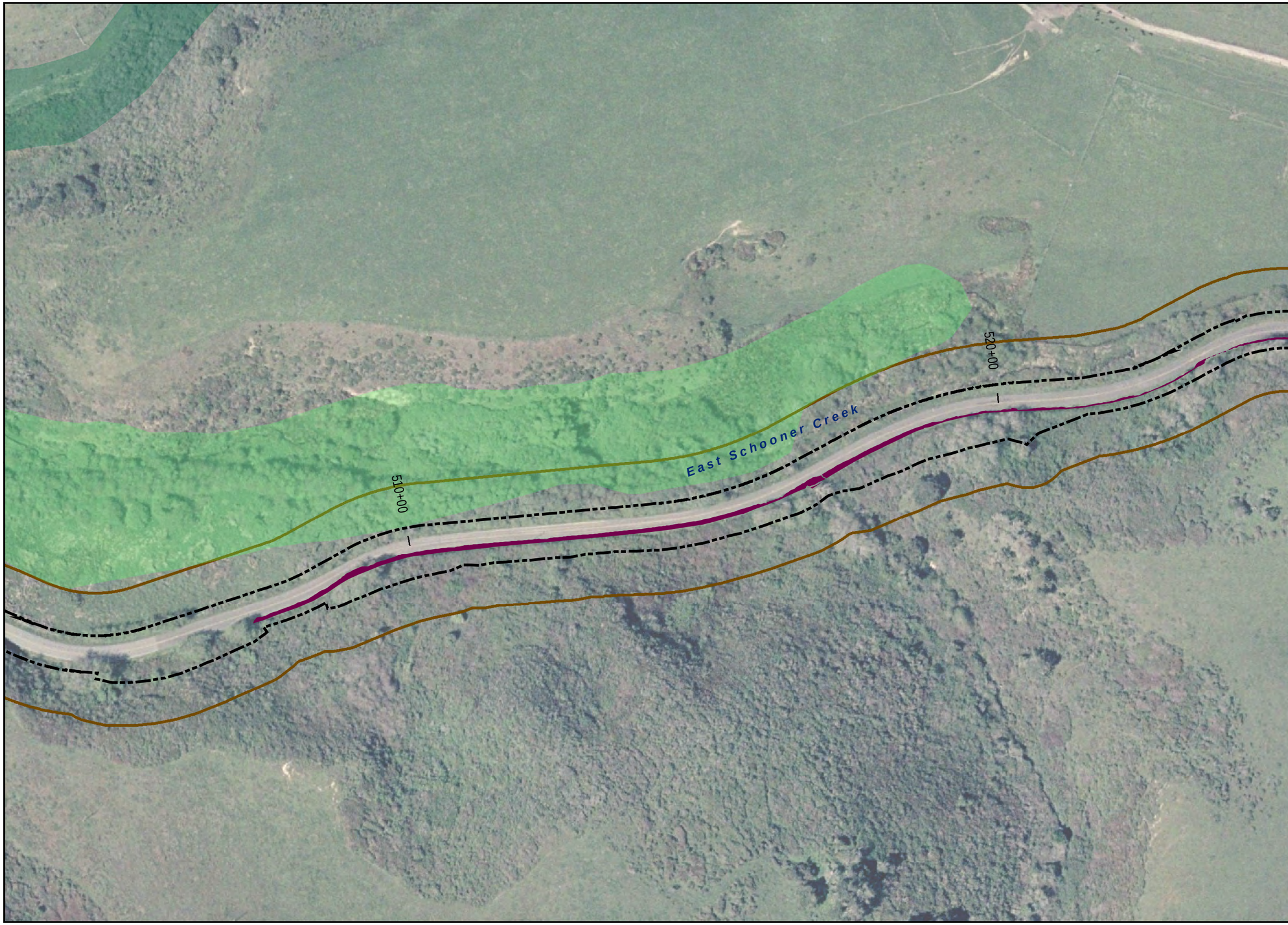

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
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- Wetland System E

National Wetland Inventory - Wetland

- Freshwater Emergent Wetland**
- Freshwater Forested/ Shrub Wetland**

N

0 110 220 Feet

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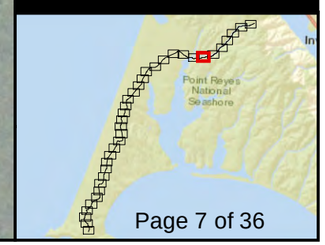

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Wetland System D,E*

- Project Miles

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- Stationing Line
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National Wetland Inventory - Wetland

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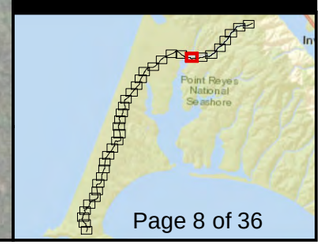


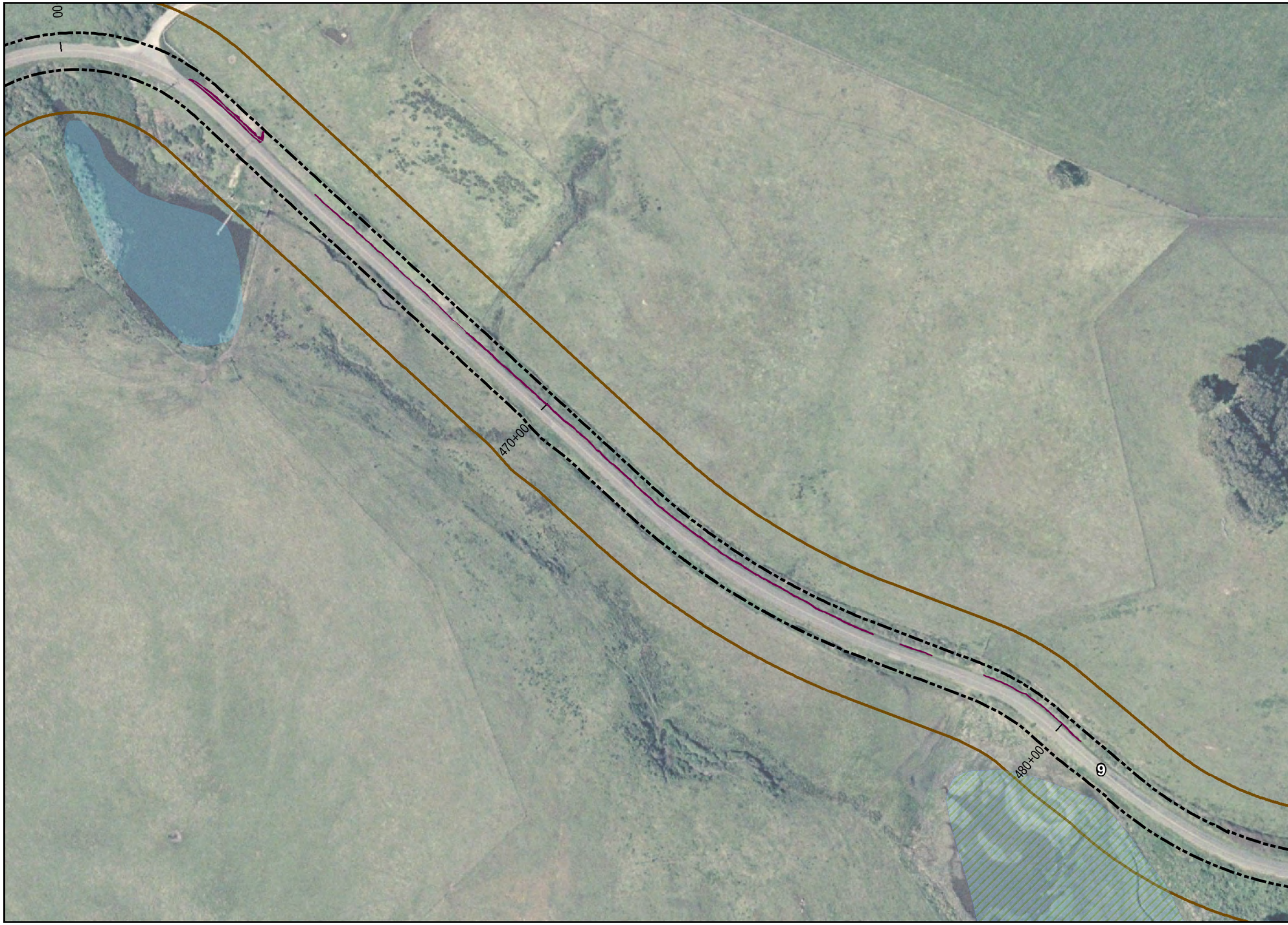
East Schooner Creek

Schooner Bay

490+00

500+00

Oyster Company Rd



Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System E

National Wetland Inventory - Wetland

- Estuarine and Marine Wetland**
- Freshwater Pond**

N

0 110 220 Feet

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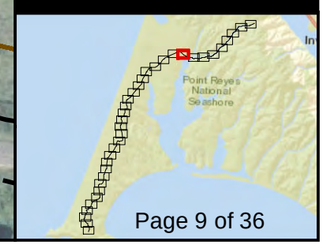

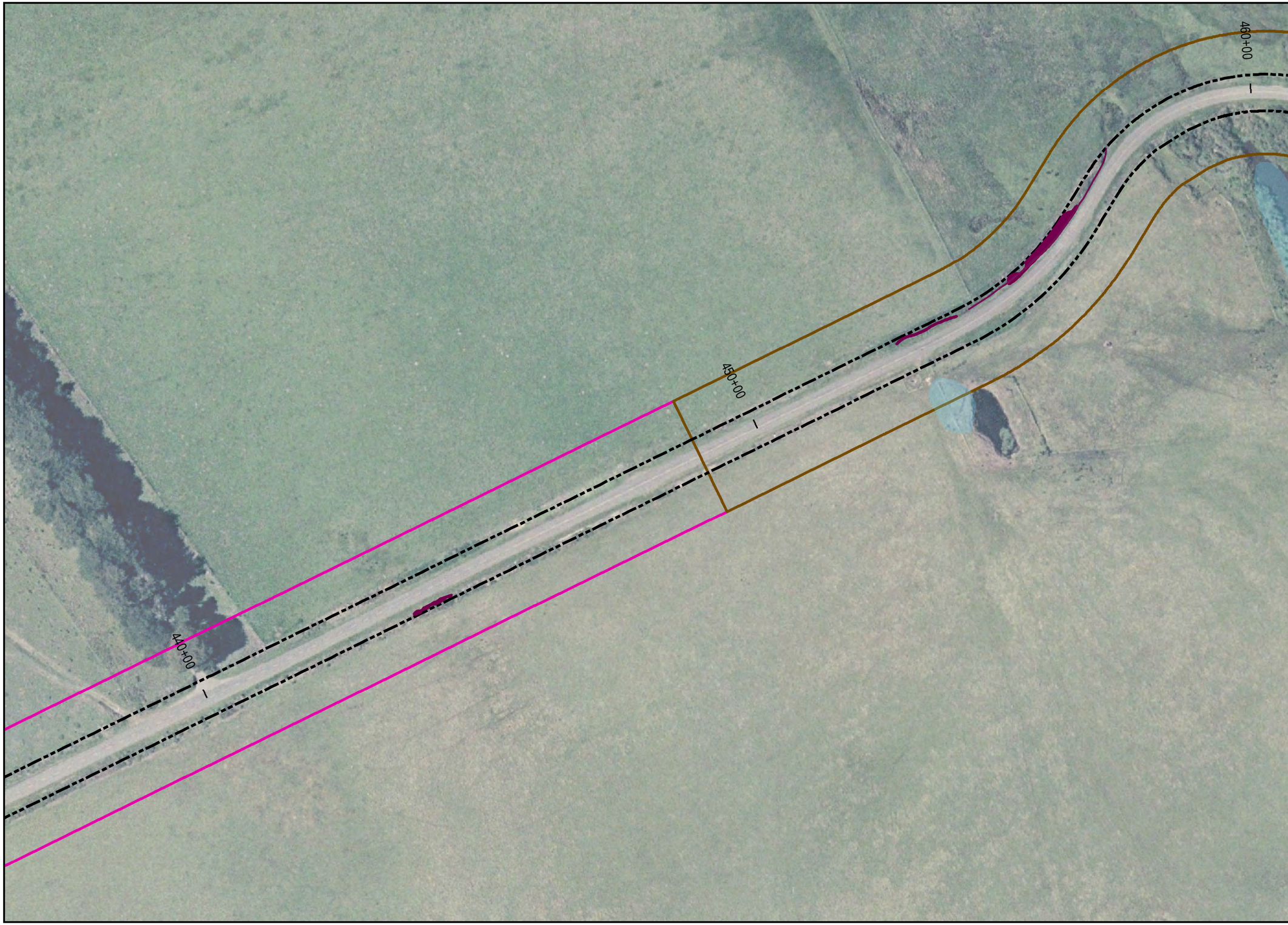

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System D
- Wetland System E

National Wetland Inventory - Wetland

- Freshwater Pond**

N

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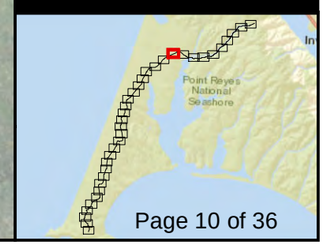

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles
- Stationing Line
- Impact Limits (15%)
- Wetland System D

Feet
0 110 220

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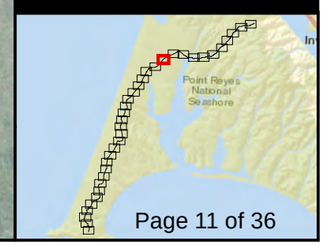

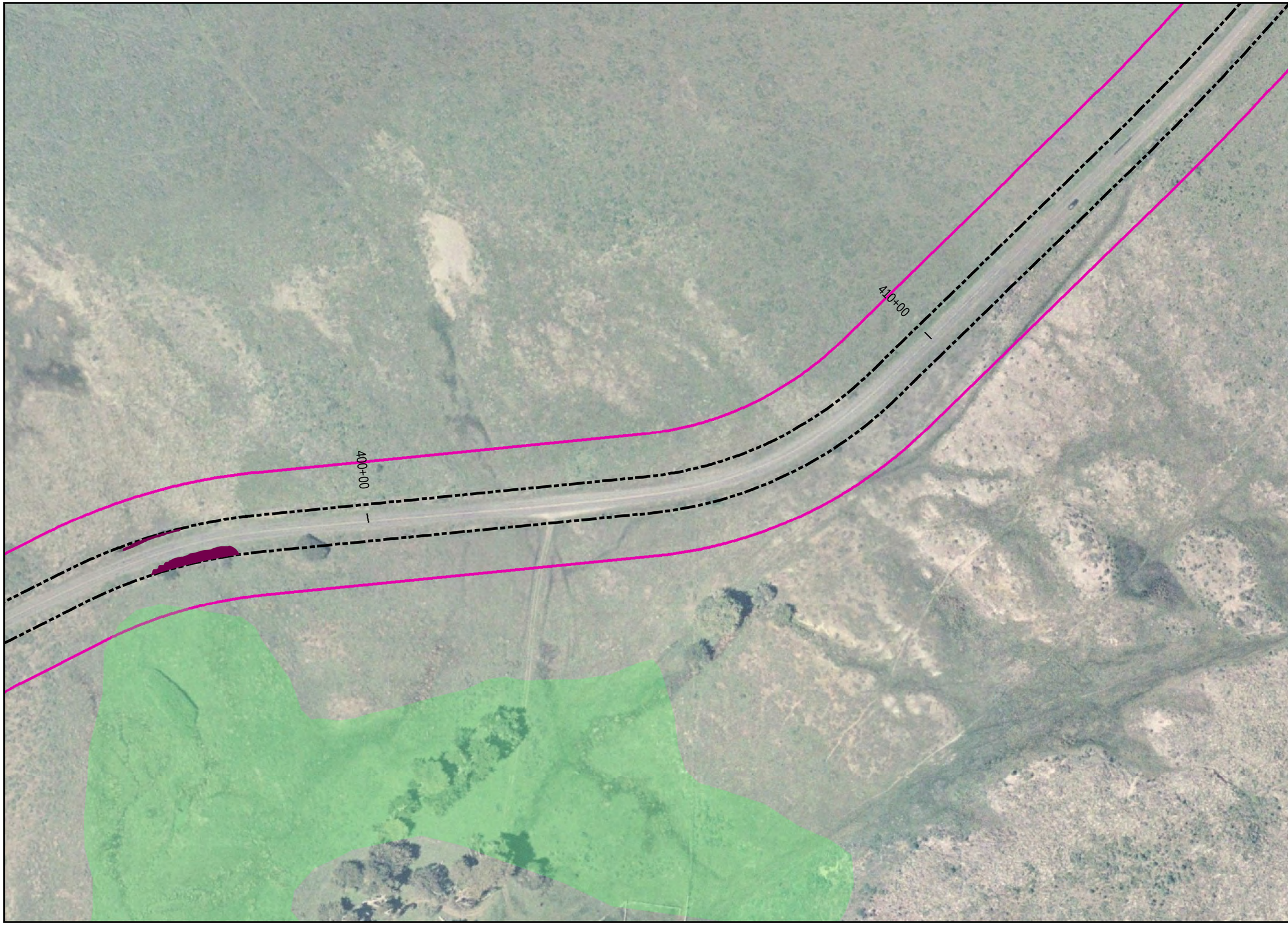

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

Project Miles

Wetland System

PEM-Palustrine Emergent

Stationing Line

Impact Limits (15%)

Wetland System D

National Wetland Inventory - Wetland

Freshwater Emergent Wetland**

Feet
0 110 220

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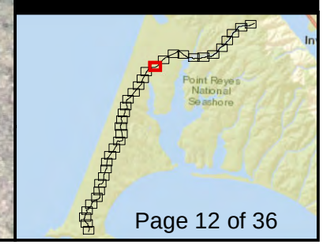

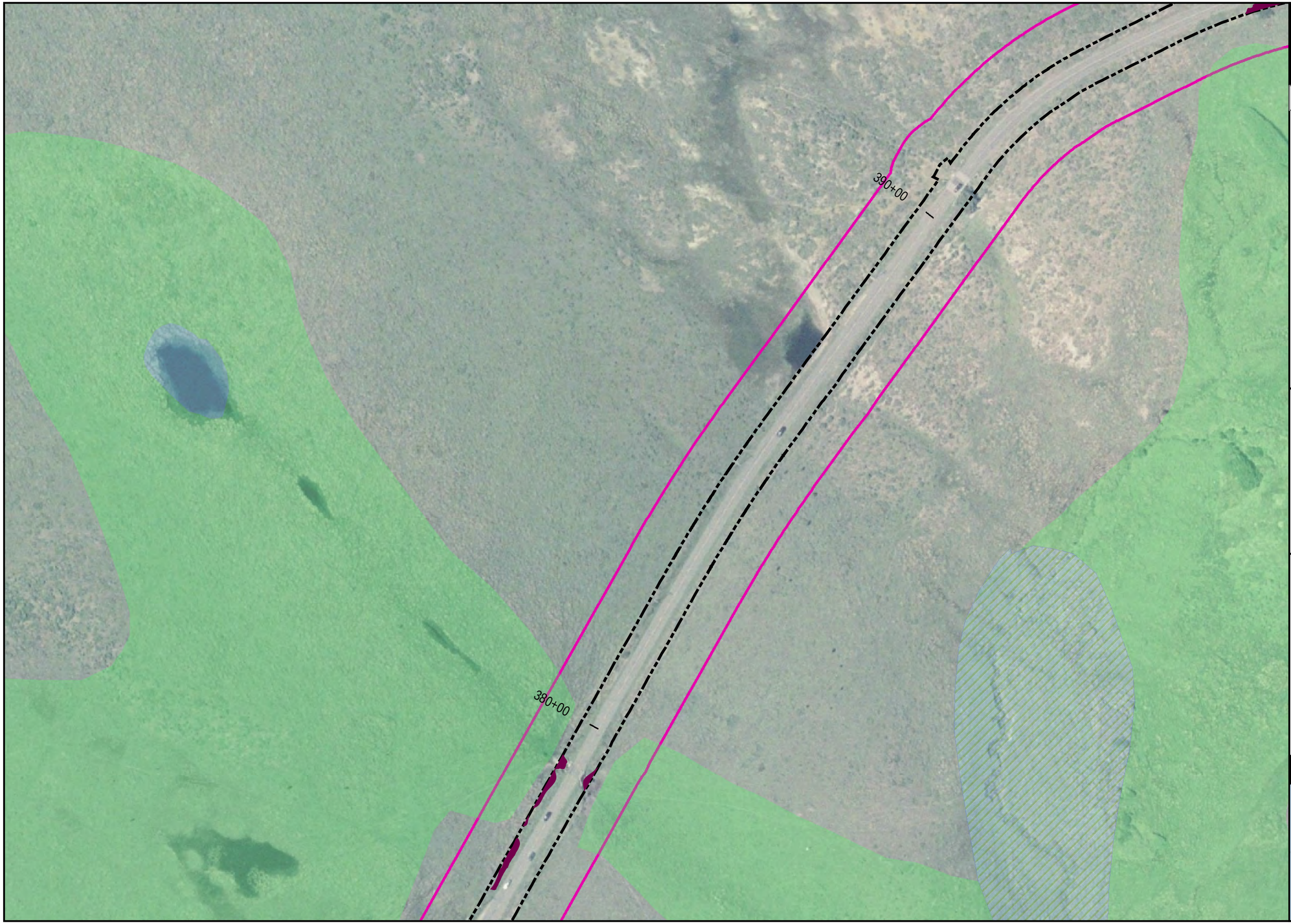

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System D

National Wetland Inventory - Wetland

- Estuarine and Marine Wetland**
- Freshwater Emergent Wetland**
- Freshwater Pond**

N

0 110 220 Feet

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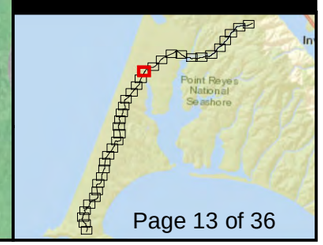

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

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- Stationing Line
- Impact Limits (15%)
- Wetland System D

National Wetland Inventory - Wetland

- Estuarine and Marine Wetland**
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N

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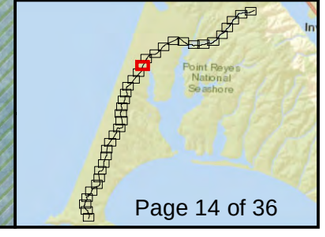

Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System D

National Wetland Inventory - Wetland

- Freshwater Emergent Wetland**

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane
California III FIPS 0502 Feet
North American Datum 1983

Prepared on: 12/12/2014 Revised on: 1/15/2015

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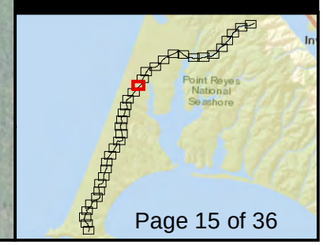

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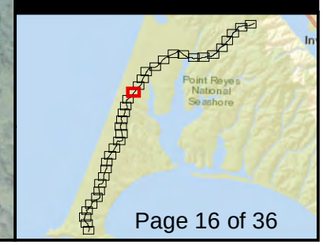

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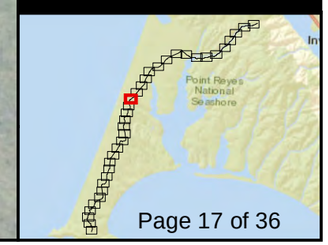

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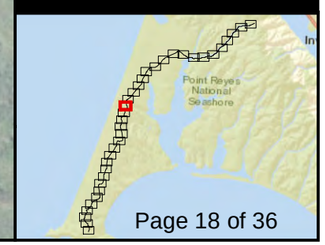

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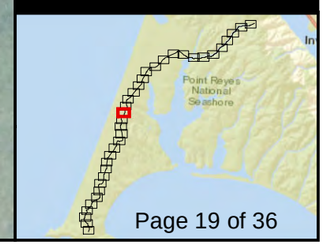

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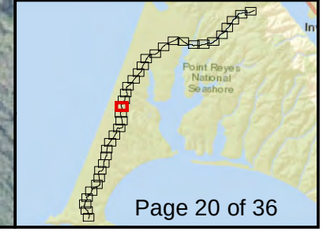

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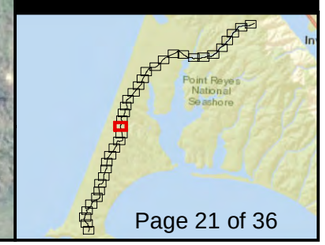

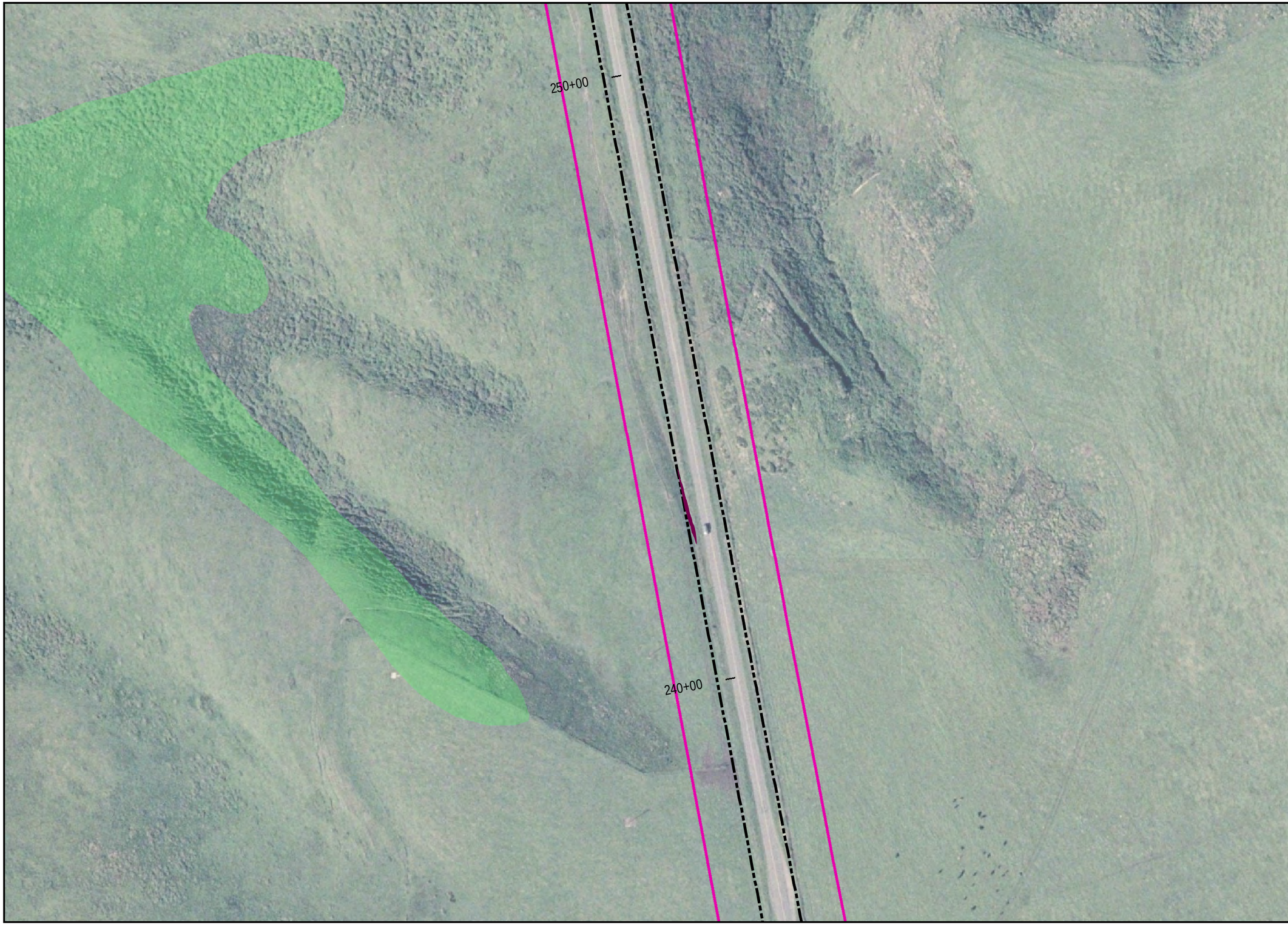

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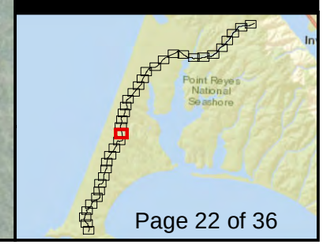

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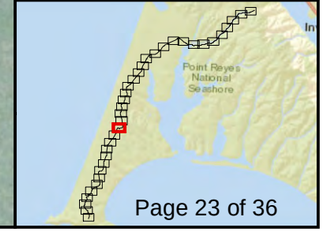

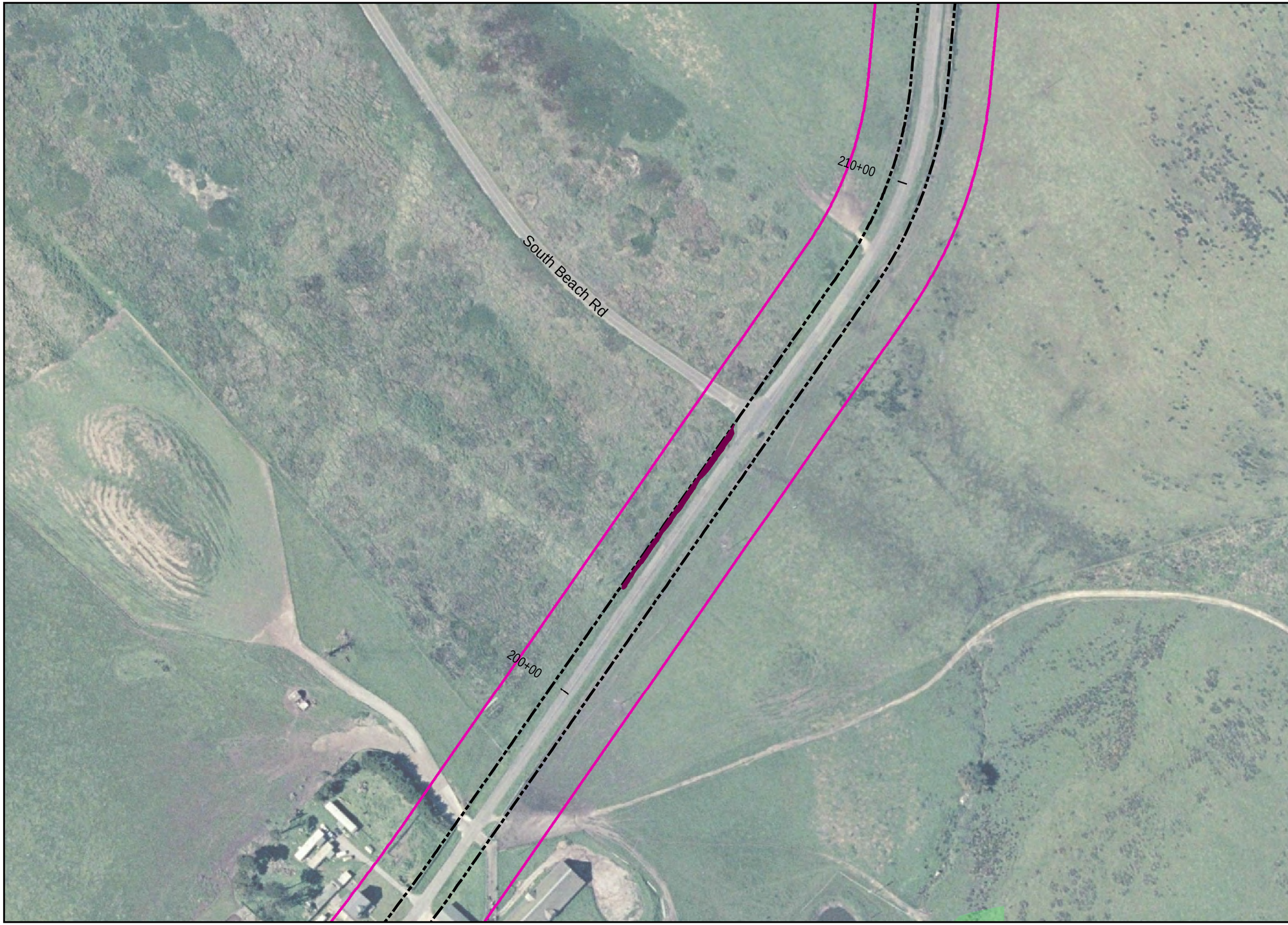

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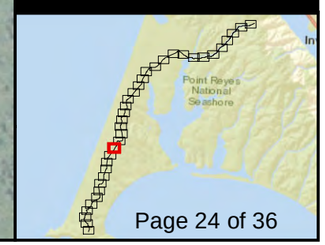

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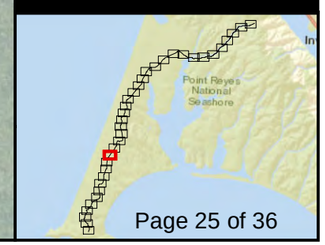

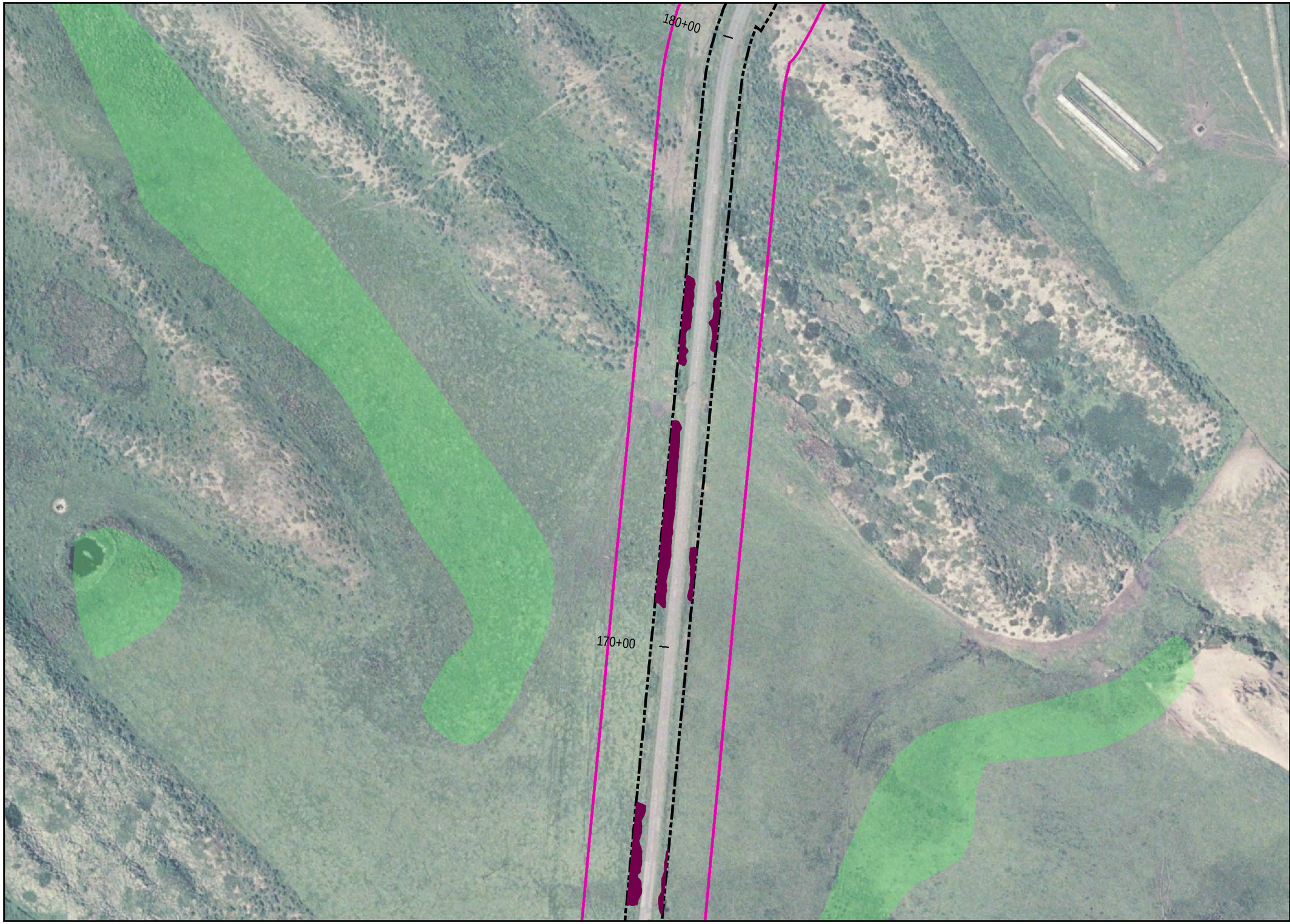

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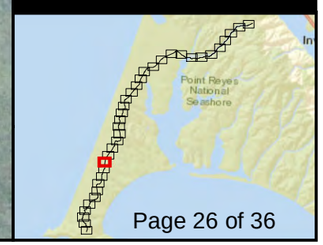

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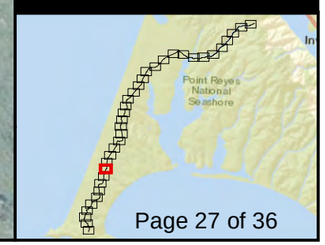

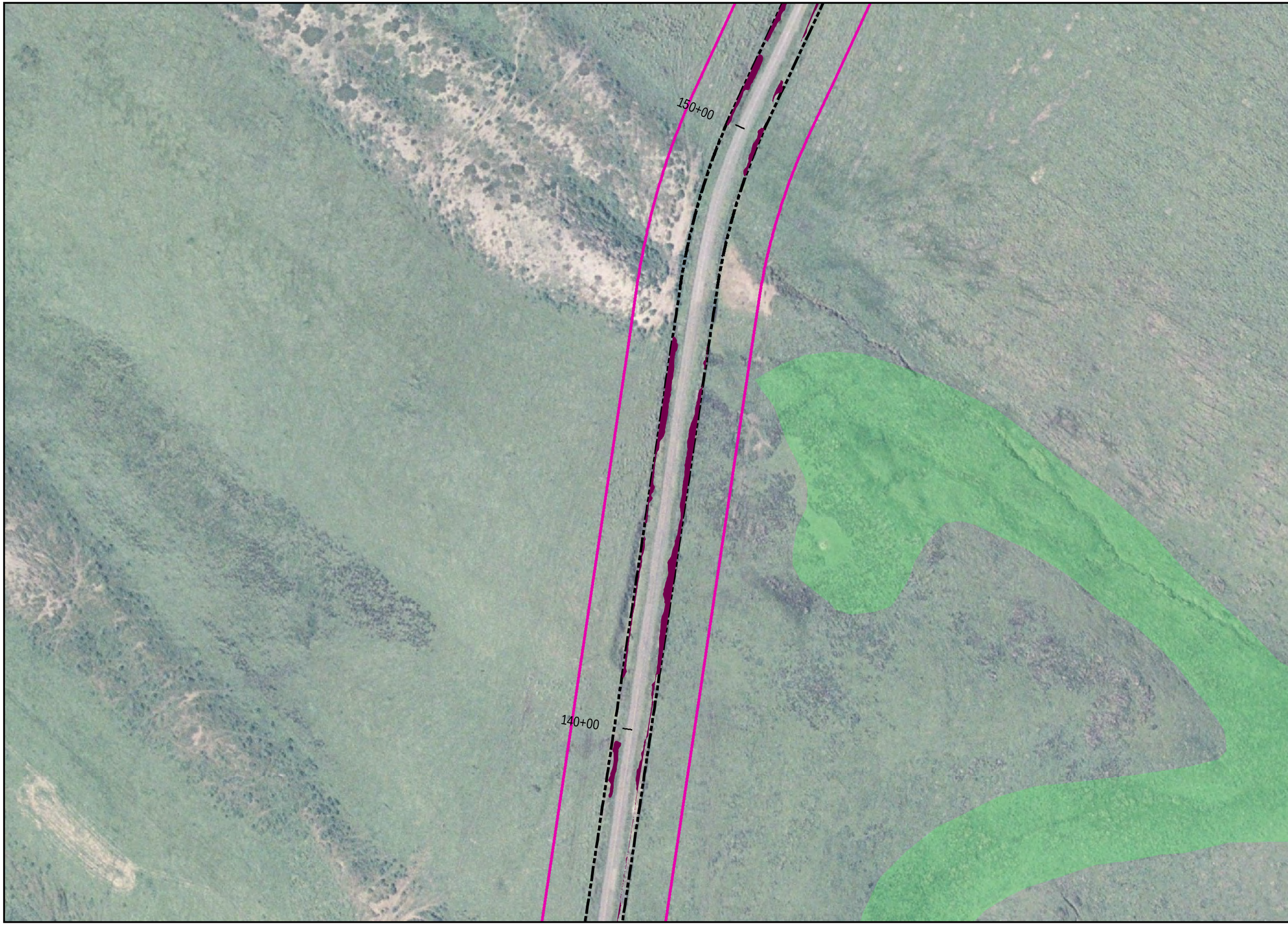

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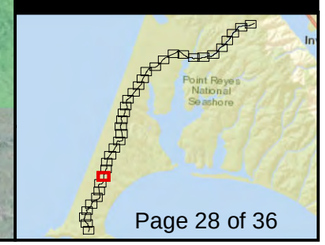

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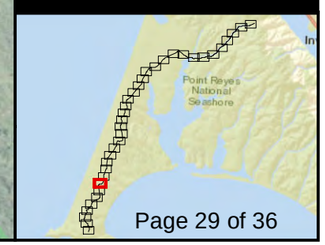

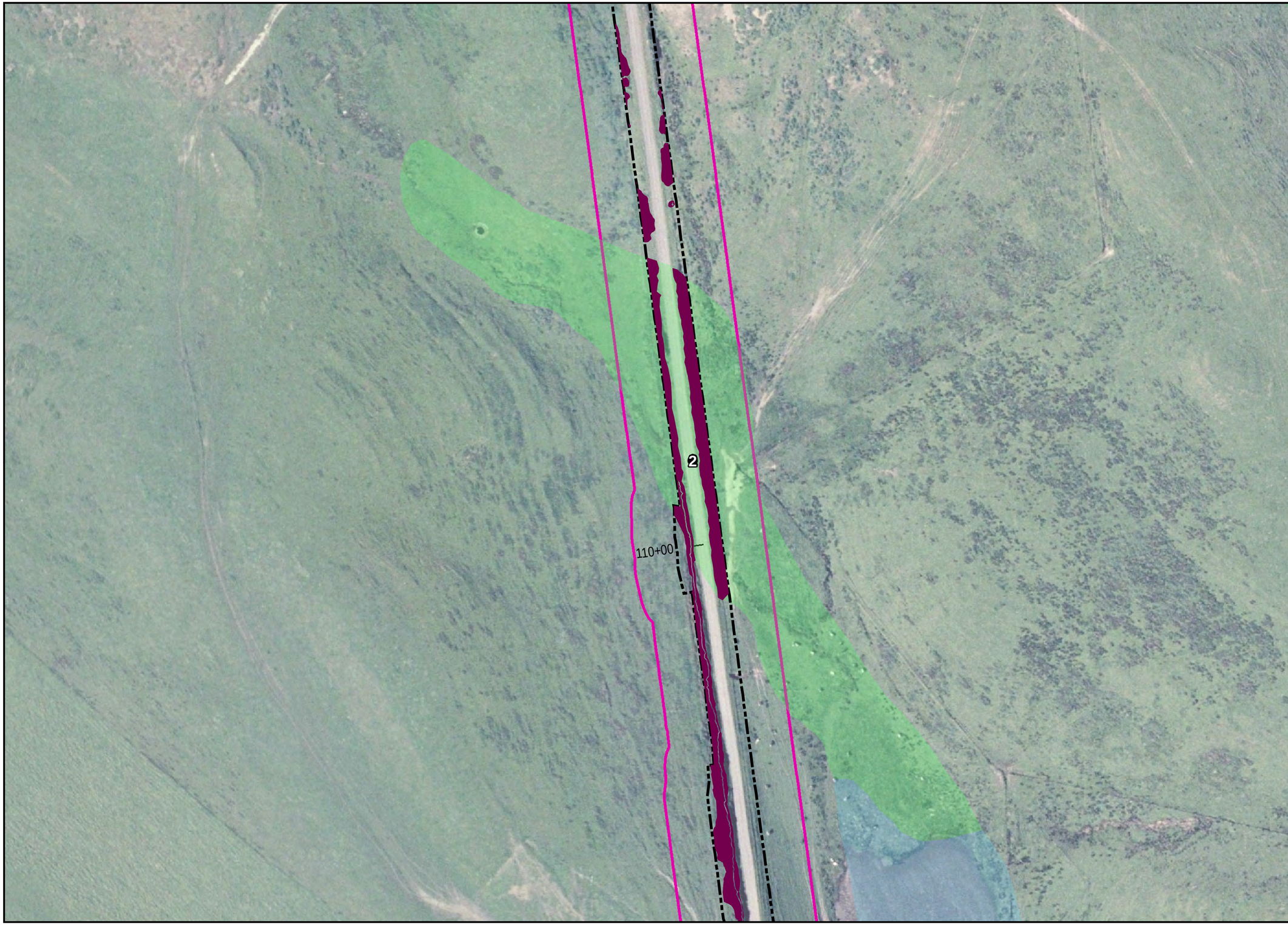

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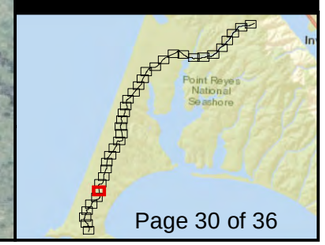

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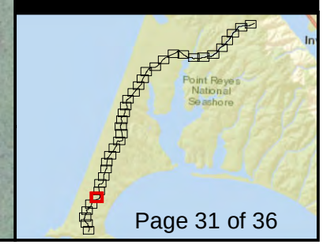

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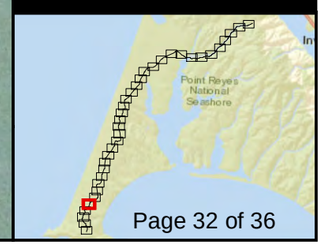

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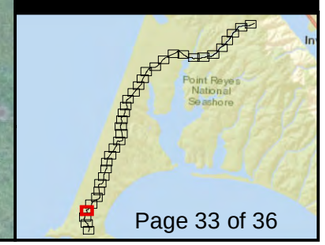

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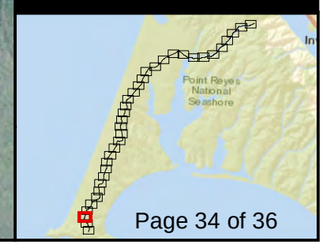
Regional Locator



Sir Francis Drake Boulevard Improvement Project

Wetland System D,E*

- Project Miles

Wetland System

- PEM-Palustrine Emergent
- Stationing Line
- Impact Limits (15%)
- Wetland System D

National Wetland Inventory - Wetland

- Freshwater Forested/ Shrub Wetland**
- Freshwater Pond**

N

0 110 220 Feet

Source Layer Credits: 2014 Imagery ESRI

Projection: Lambert Conformal Conic State Plane California III FIPS 0502 Feet
North American Datum 1983

Prepared on: 12/12/2014 Revised on: 1/15/2015

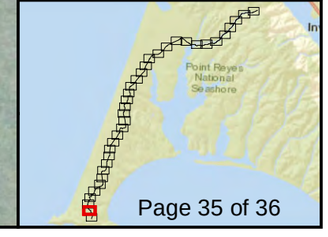
* Wetland Systems limits were produced to show general wetland system boundaries only, and do not represent watershed or geographical boundaries of any kind.

** NWI data are produced on a reconnaissance level and do not represent final wetland boundaries.

All wetlands within Impact Limits will be temporarily or permanently impacted.

Aquatic features contiguous with Study Area boundaries continue beyond the project limits.

Regional Locator



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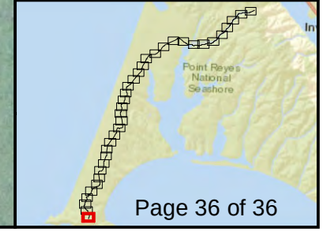

APPENDIX B: WETLAND DELINEATION REPORT

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Please refer to the Project File for the Wetland, Other Waters of the U.S., and Riparian Area Delineation Report and to Appendix D of the EA/IS for wetland and other waters of the U.S. delineation maps.

APPENDIX C: FUNCTIONAL ASSESSMENT OF WETLANDS

WETLAND FUNCTIONS AND VALUES ASSESSMENT

Wetlands are valuable assets to the natural environment. In order to capture the value wetlands provide to the ecosystem, their contributions are categorized by the many processes by which wetlands are associated. Wetlands provide essential functions, including water quality improvements, wildlife habitat, and flood attenuation. Additionally, wetlands are intrinsically valued by humans for qualities including visual aesthetics, recreation, and scientific opportunities. It is important to understand the general wetland functions and values that wetlands within a watershed provide, specifically to ensure the continued existence of their functions and values. This wetland functional assessment is designed to explain the role the wetlands play within the ecosystem and human environment of the Sir Francis Drake Boulevard (SFDB) project study area.

Methods

The "descriptive approach" to wetland functions and values outlined in the U.S. Army Corps of Engineers' (USACE) *The Highway Methodology Workbook Supplement: Wetland Functions and Values; A Descriptive Approach* (USACE 1999) incorporates both wetland science and human judgment of values. The USACE notes that "intermixing science with value judgments in this way has proven to be both effective and acceptable" (USACE 1999). This assessment is based on the USACE methodology and provides a descriptive analysis of the wetland functions and values within the study area, but does not quantify or rank their importance.

The functions and values evaluated in this analysis are listed in Table 1.

Table 1: Functions and Values Evaluated

Functions	Values
Groundwater recharge/discharge	Recreation
Floodflow alteration	Educational/scientific value
Fish and shellfish habitat	Uniqueness/heritage
Sediment/toxicant/pathogen retention	Visual quality
Nutrient removal/ retention/transformation	Endangered species habitat
Production export	
Sediment/shoreline stabilization	
Wildlife habitat	

Wetland Function-Value Evaluation Forms (Attachment A) were completed for each wetland system identified in the study area. Analysis incorporated field experience, references from the "Draft Wetland, Other Waters of the U.S., and Riparian Area Delineation Report" (Jacobs 2014a), and online resources.

Results

According to the "Wetland, Other Waters of the U.S. and Riparian Area Delineation Report" prepared for this project, 13 unique wetland types were identified in the study area. These wetland types were categorized using a combination of Cowardin and Hydrogeomorphic Approach (HGM) methods of classifying wetlands. For the purposes of a functional assessment, wetlands were grouped on a larger scale based on a combination of dominant hydrologic influences, landscape setting, and location within the watershed, all which contribute to similar wetland functions. Five wetland systems (Wetland System A through E) were classified and are discussed in this report. Table 2 below shows how the wetland types identified in the delineation report were grouped into wetland systems for this functional assessment.

Table 2: Wetland Types in the Study Area

Wetland System	Cowardin	HGM	Wetland Types[1]
A	Palustrine Forested (PFO)	Slope	Wetland 1
	Palustrine Scrub-Shrub (PSS)	Slope	Wetland 2
	Palustrine Forested (PFO)	Riverine	Wetland 3
	Palustrine Emergent (PEM)	Slope	Wetland 4
	Palustrine Scrub-Shrub (PSS)	Riverine	Wetland 6
	Riparian Emergent (RP1EM)	Riverine	Wetland 7
	Riparian Forested (RP1FO)	Riverine	Wetland 8
	Riparian Scrub-Shrub (RP1SS6)	Riverine	Wetland 9
	Palustrine Emergent (PEM)	Riverine	Wetland 10
	Palustrine Scrub-Shrub (PSS)	Depressional	Wetland 12
	Palustrine Emergent (PEM)	Mineral Soil Flats	Wetland 13
B	Palustrine Scrub-Shrub (PSS)	Slope	Wetland 2
	Palustrine Emergent (PEM)	Slope	Wetland 4
	Estuarine Emergent (E2EM)	Estuarine	Wetland 11
C	Palustrine Scrub-Shrub (PSS)	Slope	Wetland 2
	Palustrine Emergent (PEM)	Slope	Wetland 4
	Estuarine Emergent (E2EM)	Estuarine	Wetland 11
D	Palustrine Emergent (PEM)	Slope	Wetland 4
	Palustrine Emergent (PEM)	Depressional	Wetland 5
E	Palustrine Emergent (PEM)	Depressional	Wetland 5

[1] Jacobs 2014a

The wetlands within the study area are located across three Cowardin systems: estuarine, palustrine, and riparian. However, palustrine is the dominant Cowardin system, containing more than 90 percent of the total wetland acres within the study area. The dominant classes within the palustrine system are emergent, scrub-shrub, and forested wetlands.

As defined by Cowardin, palustrine wetlands "include all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens and all such wetland that occur in tidal areas where salinity due to ocean derived slats is below 0.5 percent. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) areas less than 20 acres; (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of the basin less than 2 m at low water; and (4) salinity due to ocean derived salts less than 0.5 percent" (Cowardin 1979).

Palustrine wetlands are predominantly represented within the study area as seep and slope wetlands with dense shrubs (i.e., willows [*Salix* sp.] and alders [*Alnus* sp.]) and emergent vegetation (i.e., rushes [*Juncus* sp.]), as well as depressional wetlands with emergent vegetation.

Functional and value analysis revealed that most of the wetland systems within the study area provide some level of almost all of the wetland functions and values outlined in Table 1 (see forms in attachment A) for the following reasons:

- The location of the wetlands within Point Reyes National Seashore (PRNS) enhances their ability to sustain multiple functions and values. The National Park Service (NPS) limits or prevents development within its lands, which limits disturbances to the wetlands.
- As a unit of the NPS, PRNS is a destination recreation area, and therefore fundamentally holds value for human interests.

- A high density of emergent and shrubby vegetation, as well as a diverse amount of wetland types contributing to the overall functions of the surrounding wetlands are a predominant indicator that the wetlands provide many functions.
- The study area supports special status plants species and special status wildlife species, including California red-legged frog (CFLF [*Rana draytonii*]) and migratory habitat for Central California Coast coho salmon (CCC coho [*Oncorhynchus kisutch*]). Providing wildlife habitat and endangered species habitat is an important function of wetlands, and contributes to the value of the wetlands for society.

A table outlining the special status wildlife species that have potential to occur in each wetland system is provided in Attachment B.

Wetlands not only support special status species, but many other wildlife species as well. Several hundred non-status wildlife species may occur within the study area, in addition to special status wildlife species known to occur, or with potential to occur. Currently 80 species of mammals, 85 species of fish, 29 species of reptiles and amphibians, 490 bird species, and thousands of aquatic and terrestrial invertebrate species are documented throughout PRNS (NPS 2014a), some of which are assumed present within the study area. Additionally, over 900 plant species have been reported throughout PRNS (NPS 2014b), a few hundred of which were observed within the study area. (A table of the plant species that were observed during the wetland delineation surveys is provided in Attachment C). Due to the large numbers of plant and wildlife species that have been documented within PRNS, general species lists are not included in this report.[1]

A general discussion of each function and value of the wetland systems is provided below. Individual analysis of each wetland system can be found in the attached Wetland Function-Value Evaluation Forms (Attachment A). A description of the reference numbers used in the Rationale section of the forms can be found in the attachment D.

Wetland System A: East Schooner Creek — Freshwater

Wetland System A is located at the easternmost end of the project area and runs south to the outlet at Schooner Bay (approximate Project Mile (PM) 9.5 to PM 12). This freshwater system is anchored by East Schooner Creek and is predominantly influenced by groundwater seepage, precipitation, and ephemeral tributaries. Wetland System A is by far the most diverse and largest system in the study area. Wetland types found within System A, in order of prevalence, include palustrine scrub-shrub, palustrine forested, riparian emergent, riparian scrub-shrub, palustrine emergent, and riparian forested. HGM classifications included riverine, slope, depressional, and mineral soils. Specific functions and values for Wetland System A are described below.

Functions

Groundwater recharge/discharge. This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area, and refers to the fundamental interaction between wetlands and aquifers. Wetland System A is located in the lower regions of the watershed where groundwater naturally flows and discharges into East Schooner Creek. This function was represented predominantly by exfiltration from the slope wetlands, visibly demonstrating groundwater and/or throughflow discharge. Wetlands associated with East Schooner Creek, a perennial waterway, are also supported by groundwater discharge, as the water table was observed close to the surface during the delineation activities. Groundwater recharge was presumed by the presence of sandy and gravelly soils and wetlands with variable water levels.

[1] In addition to Attachments B and C, see the NPS PRNS website for potential species that could occur within the study area: http://www.nps.gov/pore/naturescience/index.htm.

Floodflow alteration. This function considers the effectiveness of the wetland in reducing flood damage by providing prolonged periods of water retention following precipitation events, and by gradually releasing the floodwaters. The dense vegetative cover in Wetland System A provides flood protection by slowing precipitation, and hydric soils absorb water. Several of the wetlands in this system are located in the bottomlands surrounding East Schooner Creek and provide additional water storage in high flow events, directly altering floodflows. Flood protection is considered a principal function of Wetland System A.

Fish and shellfish habitat. This function considers the effectiveness of seasonal or permanent watercourses associated with the wetland in supporting fish and shellfish habitat. East Schooner Creek is a perennial freshwater creek that provides a migratory corridor for CCC coho and also supports steelhead trout (*Oncorhynchus mykiss*), stickleback (*Gasterosteus* sp.), and other fish species. The dense vegetation that comprises the wetlands abutting the creek provide cover and food.[2] Providing fish and shellfish habitat is considered a principal function of Wetland System A.

Sediment/toxicant/pathogen retention. This function reduces or prevents degradation of water quality based on the effectiveness of the wetland to trap sediments, toxicants, or pathogens in runoff water from surrounding uplands or upstream eroding wetland areas. Surrounding uplands in the study area are used for poultry farming, which may introduce toxicants into the watershed. Slow moving water, organic soils, and dense vegetation observed in many wetland types in Wetland System A allow for retention of sediments and toxicants throughout the study area. Sediment/toxicant/pathogen retention is considered a principal function of Wetland System A.

Nutrient removal/retention/transformation. This function considers the effectiveness of the wetland to trap nutrients in runoff water from surrounding uplands or contiguous wetlands, and the ability of the wetland to transform them into other forms that can be used by higher trophic levels (i.e., birds, amphibians, or mammals). Indicators of this function in Wetland System A include the presence of excess nutrients (livestock waste), long-term saturated wetlands, dense vegetation, emergent vegetation, and a high diversity of vegetation. Additionally, several wetland types showed signs of slow moving diffuse water, which allows for nutrient removal and transformation. Nutrient removal/retention/transformation is one of the principal functions of Wetland System A.

Production export. This function evaluates the effectiveness of the wetland to produce food or useable products for humans or other living organisms. Wetland System A has a high density of vegetation, typically consisting of flowering plants that provide food for nectar-gathering insects. Many wetland types in this system support blackberry bushes [*Alnus* sp.] and emergent vegetation, providing food for higher trophic level species (i.e., birds, fish, and small mammals) as well.

Sediment/shoreline stabilization. This function considers the effectiveness of a wetland to stabilize streambanks and shorelines against erosion. Sediment/shoreline stabilization is a principal function of most of the individual wetland types bordering East Schooner Creek. The dense forested and shrubby vegetation (willows, alders, and blackberry) within Wetland System A, as well as the thick emergent vegetation (cattails [*Typha* sp.] and rushes), provides shoreline stabilization and helps attenuate erosion during high flow events.

Wildlife habitat. This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland

[2] For a full list of fish species known to occur within PRNS, refer to www.nps.gov/pore/naturescience/animalspecieslist.htm.

edge. Wetland System A provides habitat for all types of wildlife, which is a principal function of this system. The entire study area falls within critical habitat for the CRLF; therefore, almost all wetland types in the study area provide either aquatic or refugia habitat for CRLF. CRLF are known to occur throughout the study area and were observed onsite in 2014 in one palustrine emergent wetland (pers. com. Kull). Wetland System A also provides habitat for special status CCC coho and other fish species, including steelhead trout, sculpin (*Cottus* sp.), and stickleback. This wetland system also has potential to support several special status bird and mammal species (refer to Attachment B). Non-status wildlife species known to occur near East Schooner creek include California giant salamander (*Dicamptodon ensatus*), pacific tree frog (*Pseudacris regilla*), garter snake (*Thamnophis sirtalis*), and rough-skinned newt (*Taricha granulosa*) (NPS 2009).[3]

Values

Recreation. This value considers the suitability of the wetland and associated watercourses to provide passive recreational opportunities such as hiking, canoeing, etc. All wetland systems, including Wetland System A, are considered recreationally valuable due to their setting within a national park. Recreation is a primary reason for park visitation, and the wetland types within the study area contribute to the recreation experience by supporting wildlife habitat, visual aesthetics, diverse vegetation, wildflower displays, and improved water quality. However, opportunities for visitors to enjoy the wetlands in Wetland System A are limited because no hiking trails or separated bike paths are located within this system, and parking is restricted to a few pullouts along the road.

Educational/scientific value. This value considers the suitability of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research. Wetland System A provides some level of educational and scientific value to the human population, particularly because the wetlands support habitat for the special status CRLF. Additionally, the wetland types within Wetland System A are minimally disturbed relative to those in the surrounding San Francisco Bay area, and provide examples of numerous types of unique wetlands within a small geographical region. In addition, the wetlands are adjacent to SFDB and are readily accessible, which may provide educational experiences as well.

Uniqueness/heritage. As with all systems in the study area, Wetland System A provides a level of "uniqueness and heritage"[4] value to the human population, particularly due to the undeveloped nature of PRNS, as well as the unique geology, geography, and hydrology of the area.

- Hydrology of PRNS is significantly influenced by fog deposition, which provides a considerable source of water in the study area. Fog deposition helps sustain the productivity of the extremely diverse vegetation communities within the park during the typically dry California summers, and is a unique hydrologic influence compared to other wetlands in California.
- The geology of the peninsula supporting the study area is distinct from the entire California mainland due to the San Andreas Fault line, which divides the peninsula on the Pacific Plate and the rest of Marin County and California on the North American Plate (Stoffer 2005). The vegetation within Point Reyes demonstrates the different characteristic of the bedrock and

[3] For a list of vertebrate wildlife species within PRNS, many of which may occur within Wetland System A, refer to www.nps.gov/pore/naturescience/animalspecieslist.htm.

[4] Heritage values may include archaeological sites and critical habitat for endangered species, and the wetland's overall health and appearance, its role in the ecological system of the area, and its relative importance as a typical wetland class for this geographic location. These functions are valuable wetland attributes relative to aspects of public health, recreation, and habitat diversity.

soils on opposite sides of the fault line. The contrast also reflects the difference between the slope, aspect, precipitation, and other climatic factors influencing vegetation on opposite sides of the fault (USGS n.d.).

- The wetland types are unique in that they support critical habitat for the federally threatened CRLF.

Visual quality. This value considers the visual and aesthetic quality or usefulness of the wetland. Wetland System A provides valuable visual quality, particularly due to its setting within PRNS, which is relatively undeveloped and offers scenic vistas throughout the study area. Dense and diverse vegetation, wildlife sightings, aesthetically pleasing views of open water, and unobstructed sightlines all contribute to the visual quality of the wetland systems.

Endangered species habitat. This value considers the suitability of the wetland to support threatened or endangered species. Endangered species habitat is supported by Wetland System A and is considered a principal function of this system. This system hosts critical habitat for the federally threatened CRLF and, more specifically, provides aquatic breeding habitat. East Schooner Creek provides migratory habitat to the federally endangered CCC coho salmon, and old growth tree species provide habitat for federally threatened Northern spotted owl (*Strix occidentalis caurina*) along the eastern most section of the system.

Wetland System B: Schooner Bay — Estuarine

Wetland System B is located within the salt marsh estuarine system at Schooner Bay, approximately 3 to 4 miles from the intersection of Pierce Point Road and SFDB (approximately near PM 9). Wetland B is primarily influenced by the tides from Drakes Bay, as well as freshwater outflow from East Schooner Creek to the east and Schooner Creek from the north. This wetland system is subject to the ebb and flow of the tide, but also contains brackish water northeast of the study area at the freshwater creek's outflow. The study area crosses the main outlet/tidal slough to Schooner Bay, which supports marine wildlife species and estuarine plant species. Wetland types within System B, in order of dominance, are estuarine emergent, palustrine emergent, and palustrine scrub-shrub. HGM classifications are estuarine and slope. Specific functions and values for Wetland System B are described below.

Functions

Groundwater recharge/discharge. Wetland System B is located in the lowest regions of the watershed where groundwater naturally flows and discharges into Schooner Bay, and then into the Pacific Ocean. Due to this location, it is likely that this wetland system provides discharge functions that benefit these waters. In addition, the relatively high water quality within Drakes Estero (CWRQCB 2013) may be attributed in part to the presence of Wetland System B.

Floodflow alteration. Wetland System B covers a large, flat landscape and can collect excess water during high flow events. This system is accustomed to extreme variations in water levels due to tidal influences, and includes dense vegetation and hydric soils that also absorb excess water as needed. Floodflow alteration is considered a principal function of Wetland System B.

Fish and shellfish habitat. Schooner Bay is an estuarine system that provides marine fish habitat for migratory special status CCC coho salmon. Additionally, most of the 85 species of fish identified with PRNS occur in marine habitats, many of which are presumably found within Drake's Bay and/or Schooner Bay.[5] Providing fish habitat is considered a principal function of Wetland System B.

[5] For a full list of fish species observed in PRNS, refer to http://www.nps.gov/pore/naturescience/upload/animalspecieslist_fish.pdf.

Sediment/toxicant/pathogen retention. Wetland System B is a large catchment basin for waters flowing downslope westward, southward, and eastward into the ocean. Surrounding uplands are used for livestock grazing and poultry farming, which may introduce toxicants into the watershed. Slow moving water, organic soils, and dense vegetation allow for sediment and toxicant retention throughout the estuarine system. Sediment and toxicant retention is considered a principal function of Wetland System B.

Nutrient removal/retention/transformation. Wetland System B traps excess nutrients and transforms them into other forms to be used by higher trophic levels (i.e., birds, amphibians, or mammals). Indicators supporting this function include the presence of excess upstream nutrients (livestock waste), long-term saturated wetlands, dense vegetation, and emergent vegetation. Nutrient removal and transformation is considered a principal function of Wetland System B.

Production export. Wetland System B provides food for wildlife by supporting plant habitat and fish species for use by higher trophic level species, including rodents, marine mammals, and birds. Tidal sloughs within Wetland System B provide for easy movement for fish and marine species.

Sediment/shoreline stabilization. The dense emergent vegetation (pickleweed [*Salicornia virginica*] and willows) found throughout Wetland System B provides shoreline stabilization and helps attenuate erosion during high tide and high runoff events. Established tidal sloughs direct water towards the bay and help protect the shoreline upstream. Sediment/shoreline stabilization is considered a principal wetland function for Wetland System B.

Wildlife habitat. As previously stated, Wetland System B provides marine habitat for fish, mammals such as harbor seals, birds, and marine invertebrates. Wildlife habitat is considered a principal function for this system. According to the *San Francisco Bay Basin Plan*, the body of water within Drake's Estero is "nearly pristine" and of great value for wildlife habitat (CRWQCB 2013). Wetland System B also has potential to provide foraging habitat for several special status bird and mammal species (refer to Attachment B).[6]

Values

Recreation. All wetland systems, particularly the estuarine system, are considered recreationally valuable due to their setting within a national park. An upland area with picnic tables overlooking Schooner Bay and public parking for visitors is available within Wetland System B, allowing visitors direct recreation opportunities within this system. Recreation within PRNS is a primary reason for park visitation, and the wetland types within the study area help support the recreation experience by supporting wildlife habitat, visual aesthetics, diverse vegetation, wildflower displays, and improved water quality. However, there are few opportunities for visitors to enjoy the wetlands in Wetland System B because no hiking trails or separated bike paths are located within this System.

Educational/scientific value. This wetland system provides educational and scientific value through easy access to a tidal salt marsh, a diminishing resource within the San Francisco Bay. It also provides habitat for special status plant and wildlife species. Additionally, the wetland types within Wetland System B are minimally disturbed relative to those in the surrounding San Francisco Bay area, and provide examples of numerous types of unique wetlands within a small geographical region.

[6] For a list of vertebrate species within PRNS, many of which are marine species and may occur with Wetland System B, refer to www.nps.gov/pore/naturescience/animalspecieslist.htm.

Uniqueness/heritage. As with all systems in the study area, Wetland System B provides a level of "uniqueness and heritage" value to the human population, particularly due to the undeveloped nature of PRNS, as well as the unique geology, geography, and hydrology of the area.

- The tidal hydrology of this system is becoming rarer in the San Francisco Bay area.
- The geology of the peninsula supporting the study area is distinct from the entire California mainland due to the San Andreas Fault line, which divides the peninsula on the Pacific Plate and the rest of Marin County and California on the North American Plate (Stoffer 2005). The vegetation within Point Reyes demonstrates the different characteristic of the bedrock and soils on opposite sides of the fault line. The contrast also reflects the difference between the slope, aspect, precipitation, and other climatic factors influencing vegetation on opposite sides of the fault (USGS n.d.).

Visual quality. Wetland System B provides valuable visual quality, particularly due to its setting within PRNS, which is relatively undeveloped and provides scenic vistas across Schooner Bay and into Drake's Estero. Dense and diverse vegetation, wildlife sightings, aesthetically pleasing views of open water, and unobstructed sightlines all contribute to the visual quality value of this wetland system.

Endangered Species Habitat. Wetland System B provides migratory habitat to the federally endangered CCC coho salmon, as well as habitat for the special status Point Reyes bird's beak (*Cordylanthus maritimus* ssp. *palustris*), a locally rare plant. Additionally, Schooner Bay may provide foraging habitat for protected marine mammals. Endangered species habitat is a principal function of Wetland System B.

Wetland System C: Historic Ranch G — Freshwater

Wetland System C is a relatively small subwatershed located west and upslope of Schooner Bay near Historic Ranch G, where SFDB starts to climb in elevation above sea level. This system consists of palustrine emergent and palustrine scrub-shrub wetlands, with an HGM classification of "slope." A minor amount of estuarine emergent wetland is also located at the base of this system, as upslope freshwater drains down into Schooner Bay from the west, creating a brackish wetland system outside of the study area. The palustrine emergent slope wetlands along SFDB are a direct result of cuts into the hill slope from construction of the road, forming seep wetlands from groundwater and/or throughflow exfiltration. The palustrine scrub-shrub wetlands are dominated by willows, which continue south of SFDB into a well-vegetated and well-established manmade pond outside of the study area. The entire system drains into a freshwater wet meadow, and then into Schooner Bay. Specific functions and values for Wetland System C are described below.

Functions

Groundwater recharge/discharge. This function was represented by saturation in the Wetland System C slope wetlands, visibly demonstrating throughflow and/or groundwater discharge from the hillslope. The ponded area outside of the study area may be contributing to groundwater recharge as well.

Floodflow alteration. Wetland System C provides a minimum amount of flood protection, typically through dense vegetative cover that slows precipitation, and hydric soils that absorb water. The wetlands are predominantly located in the upper parts of the drainage basin and receive runoff from the road and surrounding uplands, therefore attenuating high volumes of precipitation.

Sediment/toxicant/pathogen retention. Wetland System C provides a minimal amount of sediment/toxicant/pathogen retention. Surrounding uplands are used for livestock grazing and

dairy farming, which may introduce toxicants into the watershed. Organic soils and dense vegetation allow for sediment and toxicant retention throughout this system.

Nutrient removal/retention/transformation. Wetland System C provides a minimal amount of nutrient removal/retention/transformation. Indicators supporting this function include the presence of excess nutrients higher up in the watershed (livestock waste), long-term saturated wetlands, and the presence of slowly drained organic soils.

Production export. Wetland System C provides a minimal amount of production export by supporting flowering plants that provide food for nectar-gathering insects, and by the presence of dense vegetation. The scrub-shrub vegetation provides nesting and foraging habitat for bird species.

Sediment/shoreline stabilization. Wetland System C provides sediment/shoreline stabilization, particularly through the palustrine scrub-shrub wetland just south of and across SFDB from Historic G Ranch. Severe erosion and headcutting is occurring outside of the study area adjacent to an ephemeral drainage. The dense willow thickets within the scrub-shrub wetland are holding the hillside in place and preventing further erosion.

Wildlife habitat. Wetland System C provides wildlife habitat, which is considered a principal function for this wetland. The study area falls within critical habitat for the CRLF; therefore, almost all wetland types in the study area provide either aquatic or refugia habitat for CRLF. CRLF are known to occur throughout the study area, and it is presumed they inhabit the man-made pond just west of Wetland System C. Therefore, Wetland System C likely provides refugia habitat for CRLF. This system also has the potential to provide habitat for other special status wildlife species (refer to Attachment B). As mentioned previously, almost 700 vertebrate species have been documented with PRNS.

Values

Recreation. All wetland systems, including Wetland System C, are considered recreationally valuable due to their setting within a national park. Recreation is a primary reason for park visitation, and the wetland types within the study area help support the recreation experience by supporting wildlife habitat, visual aesthetics, diverse vegetation, wildflower displays, and increased water quality. However, there are few opportunities for visitors to enjoy the wetlands within Wetland System C because no hiking trails or separated bike paths are located within this System.

Educational/scientific value. Wetland System C provides some level of educational and scientific value, particularly because the wetlands support habitat for special status species such as CRLF. The wetlands are easily accessible, which may provide educational experiences as well.

Uniqueness/heritage. As with all systems in the study area, Wetland System C provides a level of "uniqueness and heritage" value to the human population, particularly due to the undeveloped nature of PRNS, as well as the unique geology, geography, and hydrology of the area.

- Hydrology of PRNS is significantly influenced by fog deposition, which provides a considerable source of water in the study area. Fog deposition helps sustain the productivity of the extremely diverse vegetation communities within the park during the typically dry California summers, and is a unique hydrologic influence compared to other wetlands in California.
- The geology of the peninsula supporting the study area is distinct from the entire California mainland due to the San Andreas Fault line, which divides the peninsula on the Pacific Plate and the rest of Marin County and California on the North American Plate (Stoffer 2005). The vegetation within Point Reyes demonstrates the different characteristic of the bedrock and

soils on opposite sides of the fault line. The contrast also reflects the difference between the slope, aspect, precipitation, and other climatic factors influencing vegetation on opposite sides of the fault (USGS n.d.).

- The wetland types are unique in that they support critical habitat for the federally threatened CRLF.

Visual quality. Wetland System C provides valuable visual quality, particularly due to is setting within PRNS, which is relatively undeveloped and provides scenic vistas throughout the study area. Dense and diverse vegetation, wildlife sightings, aesthetically pleasing views of open water, and unobstructed sightlines all contribute to the visual quality value of the wetland systems. Visual quality is considered a principal wetland function of Wetland System C, particularly based on the view *from* the system, not necessarily *of* the wetland system. The view from Wetland System C provides an overlook of Schooner Bay and the surrounding freshwater wetlands that feed it from the west.

Endangered Species Habitat. Wetland System C supports endangered species habitat, which is considered a principal function of this system. This system hosts critical habitat for the federally threatened CRLF and, more specifically, the pond just outside the study area likely provides aquatic breeding habitat.

Wetland Systems D: Drainage Ditch Wetlands — Southern Section

Wetland System D is spread throughout the southern end of the study area and is predominantly comprised of roadside drainage ditches that would not be naturally present without construction of SFDB. These drainage features are either a result of cutting into the hillslope and allowing throughflow and/or groundwater to exfiltrate, or are drainage ditches predominantly constructed in uplands that have formed into wetlands based on hydrologic disruptions. Wetland types within Wetland System D are categorized as palustrine emergent wetlands-depressional or slope. Wetland System D comprises all drainage ditch wetlands found southwest of Historic G Ranch, approximately from PM 8.5 to PM 0. Specific functions and values for Wetland System D are described below.

Functions

Groundwater recharge/discharge. This function was represented in Wetland System D by saturation in the slope and the presence of depressional wetlands, visibly demonstrating throughflow and/or groundwater discharge from the hillslope. Minimal groundwater recharge is also presumed by the presence of sandy and gravelly soils.

Floodflow alteration. Wetland System D provides a minimum amount of flood protection, typically through dense vegetative cover that slows precipitation, and hydric soils that absorb water. The wetlands are predominantly located in the upper area of the drainage basin and receive runoff from the road and surrounding uplands, therefore attenuating high volumes of precipitation.

Sediment/toxicant/pathogen retention. Wetland System D provides sediment/ toxicant/ pathogen retention through collection of roadway run-off and potential toxicants from surrounding uplands that are used for livestock grazing and dairy farming. Dense vegetation and depressional geography allow for sediment and toxicant retention throughout this system.

Nutrient removal/retention/transformation. Wetland System D provides a minimal amount of nutrient removal/retention/transformation. Indicators supporting this function include the potential presence of excess nutrients higher in the watershed (livestock waste), long-term saturated wetlands, and the depressional geography of the wetlands.

Production export. Wetland System D provides a minimal amount of production export by supporting flowering plants that provide food for nectar-gathering insects, and by the presence

of dense vegetation. Several of the palustrine emergent wetlands support blackberry bushes and emergent vegetation, providing food for higher trophic level species (i.e., birds and small mammals).

Sediment/shoreline stabilization. Wetland System D provides a minimal amount of sediment/shoreline stabilization, as wetlands within this system do not directly abut a waterway. However, wetlands in this system do allow for sediment absorption and collection due to dense vegetation and topographical depressions.

Wildlife habitat. Wetland System D provides wildlife habitat, which is considered one of the two principal functions for this wetland. The study area falls within critical habitat for the CRLF; therefore, almost all wetland types in the study area are presumed to provide either aquatic or refugia habitat for CRLF. Wetland System D predominantly provides only refugia habitat due to a lack of ponded water (i.e., aquatic habitat) within the study area. Additionally, specific areas within Wetland system D provide habitat for the special status Myrtle's silverspot butterfly (*Speyeria zerene myrtleae*). This system also has potential to provide habitat for other special status wildlife species (refer to Attachment B).

Values

Recreation. All wetland systems, including Wetland System D, are considered recreationally valuable due to their setting within a national park. Recreation is a primary reason for park visitation, and the wetland types within the study area help support the recreation experience by supporting wildlife habitat, visual aesthetics, diverse vegetation, wildflower displays, and increased water quality. Wetland System D crosses the trailhead for the Bull Point hiking trail, which includes a public parking area and allows visitors direct recreation in this system. However, there are no separated bike paths located within the study area to provide access to Wetland System D.

Educational/scientific value. Wetland System D provides some level of educational and scientific value to the human population, particularly because the wetlands support habitat for the special status CRLF. The wetlands are easily accessible, which may provide educational experiences as well.

Uniqueness/heritage. As with all systems in the study area, Wetland System D provides a level of "uniqueness and heritage" value to the human population, particularly due to the undeveloped nature of PRNS, as well as the unique geology, geography, and hydrology of the area.

- Hydrology of PRNS is significantly influenced by fog deposition, which provides a considerable source of water in the study area. Fog deposition helps sustain the productivity of the extremely diverse vegetation communities within the park during the typically dry California summers, and is a unique hydrologic influence compared to other wetlands in California.
- The geology of the peninsula supporting the study area is distinct from the entire California mainland due to the San Andreas Fault line, which divides the peninsula on the Pacific Plate and the rest of Marin County and California on the North American Plate (Stoffer 2005). The vegetation within Point Reyes demonstrates the different characteristic of the bedrock and soils on opposite sides of the fault line. The contrast also reflects the difference between the slope, aspect, precipitation, and other climatic factors influencing vegetation on opposite sides of the fault (USGS n.d.).
- The wetland types are unique in that they support critical habitat for the federally threatened CRLF.

Visual quality. Wetland System D provides valuable visual quality, particularly due to its setting within PRNS, which is relatively undeveloped and provides scenic vistas throughout the study area. Wildlife sightings, aesthetically pleasing views of open water and the Pacific Ocean, and unobstructed sightlines all contribute to the visual quality value of this wetland system.

Endangered Species Habitat. Wetland System D supports endangered species habitat, which is considered a principal function of this system. Wetland System D provides critical habitat for the federally threatened CRLF and supports Western dog violet (*Viola adunca*), the host plant for the federally endangered Myrtle's silverspot butterfly. This system also provides habitat for the state endangered Point Reyes meadowfoam (*Limnanthes douglasii sulphurea*), several populations of which have been documented on site.

Wetland E: Drainage Ditch Wetlands — Northeastern Section

Wetland system E is spread throughout the northeastern section of the study area and is comprised of roadside drainage ditches that would not be naturally present without construction of SFDB. These drainage features are either a result of cutting into the hillslope and allowing throughflow and/or groundwater exfiltratation, or are drainage ditches predominantly constructed in uplands that have formed into wetlands based on disruptions of natural hydrologic processes. Wetland types within Wetland System E are categorized as palustrine emergent wetlands-depressional. Wetland System E comprises all drainage ditch wetlands east and northeast of Historic Ranch G, approximately from PM 8.5 to PM 12. This system is similar to Wetland System D. However, Wetland System E was classified separately based on a difference in subwatersheds, location in the landscape, and hydrological outputs. Although this system overlaps Wetland Systems A, B, and C, it was categorized separately due to the altered state of the drainage ditch features and functional differences. Specific functions and values for Wetland System E are described below.

Functions

Groundwater recharge/discharge. This function was represented in Wetland System E by saturation in the depressional wetlands, visibly demonstrating throughflow and/or groundwater exfiltration from the hillslope. The wetlands are located in the lower regions of the watershed where groundwater naturally flows and discharges into waterways. Groundwater discharge is considered a principal function of Wetland System E.

Floodflow alteration. Wetland System E provides flood protection by receiving runoff from the road and surrounding uplands, therefore attenuating high volumes of precipitation. These wetlands typically have dense vegetative cover that slows precipitation, and hydric soils that absorb water. Although the wetlands are located in the bottomlands surrounding East Schooner Creek, they are located across SFDB from the creek and can provide additional water storage when floodwaters cross the road during high flow events. Floodflow alteration is considered a principal function of Wetland System E.

Sediment/toxicant/pathogen retention. Wetland System E provides sediment/ toxicant/ pathogen retention through collection of roadway runoff and potential toxicants from surrounding uplands that are used for livestock grazing and poultry farming. Dense vegetation and depressional geography allow for sediment and toxicant retention throughout this system.

Nutrient removal/retention/transformation. Wetland System E provides a minimal amount of nutrient removal/retention/transformation. Indicators supporting this function include the presence of excess upstream nutrients (livestock waste), long-term saturated wetlands, and the depressional geography of the wetlands.

Production export. Wetland System E provides a minimal amount of production export by supporting flowering plants that provide food for nectar-gathering insects and by the presence of dense vegetation. Several of the palustrine emergent wetlands support blackberry bushes and

emergent vegetation, providing food for higher trophic level species (i.e., birds and small mammals).

Sediment/shoreline stabilization. Wetland System E provides sediment stabilization through sediment absorption and collection due to dense vegetation, topographical depressions, and the presence of organic soils.

Wildlife habitat. Wetland System E provides wildlife habitat, which is considered one of the principal functions for this wetland system. The study area falls within critical habitat for the CRLF; therefore, almost all wetland types in the study area provide either aquatic or refugia habitat for CRLF. Wetland System E is adjacent to, and may contain, aquatic breeding habitat for CRLF. Additionally, this system has the potential to provide habitat for other special status wildlife species (refer to Attachment B). Non-status wildlife species known to occur near East Schooner creek include California giant salamander, pacific tree frog, garter snake, and rough-skinned newt (NPS 2009).

Values

Recreation. All wetland systems, including Wetland System E, are considered recreationally valuable due to their setting within a national park. Recreation is a primary reason for park visitation, and the wetland types within the study area help support the recreation experience by supporting wildlife habitat, visual aesthetics, diverse vegetation, wildflower displays, and increased water quality. However, there are few opportunities for visitors to enjoy wetlands within Wetland System E because no hiking trails or separated bike paths are located within this system, and parking is limited to a few pullouts along the road and the area at Schooner Bay.

Educational/scientific value. Wetland System E provides some level of educational and scientific value to the human population, particularly because the wetlands support habitat for the special status CRLF. The wetlands are easily accessible, which may provide educational experiences as well.

Uniqueness/heritage. As with all systems in the study area, Wetland System E provides a level of "uniqueness and heritage" value to the human population, particularly due to the undeveloped nature of PRNS, as well as the unique geology, geography, and hydrology of the area.

- Hydrology of PRNS is significantly influenced by fog deposition, which provides a considerable source of water in the study area. Fog deposition helps sustain the productivity of the extremely diverse vegetation communities within the park during the typically dry California summers, and is a unique hydrologic influence compared to other wetlands in California.
- The geology of the peninsula supporting the study area is distinct from the entire California mainland due to the San Andreas Fault line, which divides the peninsula on the Pacific Plate and the rest of Marin County and California on the North American Plate (Stoffer 2005). The vegetation within Point Reyes demonstrates the different characteristic of the bedrock and soils on opposite sides of the fault line. The contrast also reflects the difference between the slope, aspect, precipitation, and other climatic factors influencing vegetation on opposite sides of the fault (USGS n.d.).
- The wetland types are unique in that they support critical habitat for the federally threatened CRLF.

Visual quality. Wetland System E provides valuable visual quality to the human population, particularly due to its setting within PRNS, which is relatively undeveloped and provides scenic vistas throughout the study area. Wildlife sightings and aesthetically pleasing views of a variety of vegetation communities contribute to the visual quality value of the wetland system.

Endangered Species Habitat. Wetland System E supports endangered species habitat, which is considered a principal function of this system. Wetland System E provides critical habitat for the federally threatened CRLF and is likely to provide aquatic breeding habitat for this species as well.

Conclusion

Each of the five wetland systems within the study area provides some level of almost every function and value identified in *The Highway Methodology Workbook Supplement: Wetland Functions and Values; A Descriptive Approach* (USACE 1999). Wetland Systems A and B provide the most functions and highest values of all the systems, based on the number of principal functions each one provides. Wetland System A includes the highest diversity and density of wetland types, and subsequently includes the highest quantity of wetland acres within the study area. Although Wetland System B is much smaller, it provides unique functions and values to the ecosystem and the public because it is estuarine with tidal salt marsh. Wetland Systems C, D, and E provide substantially fewer principal functions to the surrounding ecosystem. However, these systems still provide a minimal amount of most wetland functions and values throughout the study area. In general, the most prevalent wetland functions and values in the study area across all wetland systems include providing wildlife habitat, endangered species habitat, sediment shoreline stabilization, and groundwater recharge/discharge.

Although the study area is located within a national park and is relatively undeveloped, the lands and ecosystems are not unaltered. Cattle grazing, dairy farming, road construction, and high visitor use contribute to lessening of the study area's wetland functions and values. SFDB, a paved road, has bisected the natural watershed and interrupted the wildlife corridor. Hydrology has been altered and existing culverts have become clogged as a result of dense vegetation and maintenance limitations, resulting in sections of the road being periodically flooded. During flooding, water covers the paved surface, which is unable to receive groundwater infiltration and absorb floodwaters. Additionally, several of the individual wetland types have been bisected by the road and are therefore small, which reduces the continuity of the wildlife corridors and provides for lesser flood attenuation than a larger wetland system. Wildlife habitat directly abuts the road, resulting in a slight reduction in habitat value and safety for special status and non-status wildlife species. The dominant land use in the southern half of the study area is livestock grazing, which contributes excess nutrients and toxicants into the wetland systems, potentially reducing overall water quality and wildlife habitat. Non-native plant species (i.e., velvet grass) dominate some of the wetland areas, which reduces vegetation diversity and quality of wildlife habitat as well. Despite these limitations, the wetland types within the study area support many important wetland functions and provide value to humans and surrounding wildlife.

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Personal Communications

Kull, Kallie 2014. Marin County Senior Environmental Planner. April 9, 2014.

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Attachment A: Wetland Function-Value Evaluation Forms

Wetland Function-Value Evaluation Form

Total area of wetland 9.06 acre Human made? No Is wetland part of a wildlife corridor? yes or a "habitat island"?

Adjacent land use National Park, Dairy Farming, Road Distance to nearest roadway or other development abuts SFDB

Dominant wetland systems present PFO, PSS, PEM Contiguous undeveloped buffer zone present yes

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? bottom

How many tributaries contribute to the wetland? 1 Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. Wetland System A

Latitude 38°5'28.851"N Longitude 122°55'29.57"W

Prepared by: M.Seguin Date 12/11/14

Wetland Impact:
Type Temp & Perm - Direct Area Tem-2.6;Per-2.13 ac

Evaluation based on:
Office ✓ Field

Corps manual wetland delineation completed? Y ✓ N

Function/Value	Suitability Y	Suitability N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	✓		4, 6,9,7,12,13,15		Seeps and large cattail wetland show signs of groundwaterexpression
Floodflow Alteration	✓		3,5,6,7,8,9,10,12,13,14,16,	✓	18. Wetlands attenuate some flow and retain water from rainstorm events. Vegetation is dense, however area has a history of flooding.
Fish and Shellfish Habitat	✓		1, 2,4,5,7,8,10,11,12,14,15	✓	16, 17. East Schooner Creek supports coho, steelhead trout, sculpin and stickleback.
Sediment/Toxicant Retention	✓		1,2,3,4,5,8,10,11,13,14,16	✓	Wetlands slow the flow and able to trap sediments. Dense vegetation allows for sediment retention. System is downslope of poultry and dairy farming, possible sources of toxicants.
Nutrient Removal	✓		3,4,5,6,7,8,9,10,11,12,13,	✓	14, water flows slowly allows for nutrient accumulation. potential sourceds of excess nutrients (livestock) exist upstream/upslope
Production Export	✓		1,2,4,5,6,7,8,9,12,14		High vegetation density. Wetland plants, including blackberries, feed wildlife.
Sediment/Shoreline Stabilization	✓		1,2,6,9, 12,13,15	✓	dense vegetation provides stabilization of creek shoreline.
Wildlife Habitat	✓		1,4,5,6,7,8,9,11,13,19,20,	✓	System provides habitat for many wildlife species, including amphibians, birds, and mammals. *
Recreation	✓		1,5, 6, 7		Located with national park boundaries and provides wildlife habitat.
Educational/Scientific Value	✓		1,2,3,4,5,11,		provides habitat for T&E species
Uniqueness/Heritage	✓		4,5,7,11,12,13,15,16,17,18		19,22,24. Provides views of unpolluted and undisturbed wetlands. Provides critical habitat for CRLF
Visual Quality/Aesthetics	✓		1,2,3,4,5,,7,8,9,10,11,12		attractive emergent marsh vegetation. Provides views of unpolluted and undisturbed wetlands.
ES Endangered Species Habitat	✓		1,2	✓	provides coho, steelhead, and CRLF habitat
Other					

Notes: *Within the entire PRNS there have been reported occurrences of 80 mammal, 85 fish, 29 reptile and/or amphibian, & 490 bird species, http://www.nps.gov/pore/naturescience/animals.htm. This system encompasses the last 3+ miles of the study area from post miles 9.5 to 12. The system represents wetlands associated with East Schooner Creek. This wetland system drains into Schooner Bay.

* Refer to backup list of numbered considerations.

Wetland Function-Value Evaluation Form

Total area of wetland 0.495 ac Human made? No Is wetland part of a wildlife corridor? yes or a "habitat island"?

Adjacent land use National Park, Dairy Farming, Road Distance to nearest roadway or other development abuts SFDB

Dominant wetland systems present E2EM, PEM, PSS Contiguous undeveloped buffer zone present No

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? bottom

How many tributaries contribute to the wetland? 1 Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. Wetland System B

Latitude 38.09100000 Longitude -122.92800000

Prepared by: M.Seguin Date 12/11/14

Wetland Impact:
Type temp & perm - direct Area Temp-0.37;Perm-0.11 ac

Evaluation based on:
Office ✓ Field ✓

Corps manual wetland delineation completed? Y ✓ N

Function/Value	Suitability Y	Suitability N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	✓		7, 12, 13, 15		Wetland is tidally influenced
Floodflow Alteration	✓		1,5,6,8,9,10,13,14,16,18	✓	salt marsh provides water storage and slows flow during high flow events.
Fish and Shellfish Habitat	✓		1,3, 4,5,	✓	Marine environment, Supports migratory habitat for anadromous fish
Sediment/Toxicant Retention	✓		1,2,3,4,5,8,9,10,11,12,15,	✓	16. Traps potential sediments in dense vegetation and slow moving water.
Nutrient Removal	✓		1,2,3,4,5,7,8,9,10,14	✓	slow moving, ponded water is filtered through dense vegetation.
Production Export	✓		1,2,4,5,6,7,10,		
Sediment/Shoreline Stabilization	✓		1,2,3,4,6,7,9,12,15	✓	extensive wetland size and vegetation promote shoreline stabilization
Wildlife Habitat	✓		1,5,6,7,8,9,10,11,13,16,18,	✓	21, Salt marsh wetland provides migratory fish passage, bird and mammal habitat.
Recreation	✓		1,4,5,6,7,8,10,11,	✓	pull-out and picnic tables available at wetland. easily accessible
Educational/Scientific Value	✓		1,2,3,4,5,8,10		easily accessible well developed salt marsh habitat could be good educational site.
Uniqueness/Heritage	✓		4,5,6,9,12,13,14,16,1718,	✓	19,27,28. Salt marsh habitat is rare and diminishing in the bay area.
Visual Quality/Aesthetics	✓		1,2,3,5,6,7,8,9,10,11,12	✓	Very scenic view looking out over wetland to bay/ocean
ES Endangered Species Habitat	✓		1,2,	✓	Supports T & E plant and fish species.
Other					

Notes: Salt marsh habitat is rare and has diminished rapidly around the SF Bay. This area is a large contiguous salt marsh with defined channels that supports special-status plants and fish migration. Wetland System B is predominantly encompasses the salt marsh habitat where SFDB crosses Schooner Bay and is localized to mile post 9.

* Refer to backup list of numbered considerations.

Wetland Function-Value Evaluation Form

Total area of wetland 0.21 acre Human made? No Is wetland part of a wildlife corridor? yes or a "habitat island"?

Adjacent land use National Park, Dairy Farming, Road Distance to nearest roadway or other development abuts SFDB

Dominant wetland systems present PSS, PEM, E2EM Contiguous undeveloped buffer zone present No

Is the wetland a separate hydraulic system? Yes If not, where does the wetland lie in the drainage basin? Middle

How many tributaries contribute to the wetland? 1 Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. Wetland System C

Latitude 38°3'52.933"N Longitude 122°58'16.1"W

Prepared by: M.Seguin Date 12/11/14

Wetland Impact:
Type temp & perm - direct Area Temp.-0.09/Perm-0.1ac

Evaluation based on:
Office ✓ Field

Corps manual wetland delineation completed? Y ✓ N

Function/Value	Suitability Y	Suitability N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	✓		4, 6, 10, 13		Seeping from hillslope is an expression of groundwater discharge. PORE is dominated by impervious surfaces (bedrock).
Floodflow Alteration	✓		2,4,5,9		
Fish and Shellfish Habitat		✓			
Sediment/Toxicant Retention	✓		1, 2,4, 8		
Nutrient Removal	✓		4, 7		
Production Export	✓		1, 7		
Sediment/Shoreline Stabilization	✓		2, 13, 15		
Wildlife Habitat	✓		5, 7, 8	✓	CRLF upland refugia habitat
Recreation	✓		1, 4, 5,		Located with national park boundaries
Educational/Scientific Value	✓		1 , 5		Provides CRLF upland refugia habitat
Uniqueness/Heritage	✓		13,19, 24		
Visual Quality/Aesthetics	✓		1, 2, 4, 5, 7, 8, 10, 11, 12	✓	unobstructed views of multiple wetland types
ES Endangered Species Habitat	✓		1, 2		CRLF upland refugia habitat
Other					

Notes: System C is a small system west of Schooner Bay made up of wetland ditches and slope wetlands that are present due to road cutting of SFDB in the hillside. It drains downslope and east into a freshwater wetland (outside the study area) then into the tidal marsh at Schooner Bay.

* Refer to backup list of numbered considerations.

Wetland Function-Value Evaluation Form

Total area of wetland 4.93 acre Human made? Not directly Is wetland part of a wildlife corridor? yes or a "habitat island"?

Adjacent land use National Park, Dairy Farming, Road Distance to nearest roadway or other development abuts SFDB

Dominant wetland systems present PEM - Depressional, & Slope Contiguous undeveloped buffer zone present No.

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? bottom

How many tributaries contribute to the wetland? 1 Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. Wetland System D

Latitude 38°4'10.098"N Longitude 122°58'16.232"W

Prepared by: M.Seguin Date 12/11/14

Wetland Impact:
Type temp & perm - direct Area Temp 1.44/Perm 1.51 ac

Evaluation based on:
Office ✓ Field

Corps manual wetland delineation completed? Y ✓ N

Function/Value	Suitability Y	Suitability N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	✓		2, 4, 6, 10, 13	✓	Wetlands that occur at toe of slope indicate groundwater discharge areas.
Floodflow Alteration	✓		2,3,4,5,6,8,9,18	✓	The wetlands are depressional features along the road that can hold or slow water runoff during rain/flooding events.
Fish and Shellfish Habitat		✓			
Sediment/Toxicant Retention	✓		2, 3, 6,		Receives direct run-off from the road. Also livestock waste is adjacent to wetlands
Nutrient Removal	✓		3, 4, 8, 10, 11		livestock waste is adjacent to wetlands
Production Export	✓		1,2,4,7		Dense vegetation provides food for wildlife (blackberries)
Sediment/Shoreline Stabilization	✓		2, 15		
Wildlife Habitat	✓		4, 5, 7, 8	✓	Upland refugia habitat for CRLF, cover for small mammals.
Recreation	✓		1,5, 7		provides habitat for CRLF. Wetland system located with PRNS
Educational/Scientific Value	✓		1, 3, 5		considered as valuable wildlife habitat, potential education site for wetland hummock education
Uniqueness/Heritage	✓		13, 17, 22, 24		provides critical habitat for CRLF
Visual Quality/Aesthetics	✓		1,7, 8, 9, 10, 11		
ES Endangered Species Habitat	✓		1, 2	✓	Entire project area is within CRLF critical habitat and CRLF are known to occur.
Other					

Notes: This wetland system comprises of roadside ditches and slope wetlands that were formed as a result of the building of SFDB. SFDB cut into hillsides creating areas for groundwater to surface and support wetland vegetation, thus creating wetlands. This system includes all drainage ditches/slope wetlands west/south of Drake's Estero, within the study area.

* Refer to backup list of numbered considerations.

Wetland Function-Value Evaluation Form

Total area of wetland 1.22 ac Human made? Not directly Is wetland part of a wildlife corridor? yes or a "habitat island"?

Adjacent land use National Park, Dairy Farming, Road Distance to nearest roadway or other development abuts SFDB

Dominant wetland systems present PEM - Depressional, & Slope Contiguous undeveloped buffer zone present No.

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? bottom

How many tributaries contribute to the wetland? 1 Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. Wetland System E

Latitude 38°4'10.098"N Longitude 122°58'16.232"W

Prepared by: M.Seguin Date 12/11/14

Wetland Impact:
Type temp & perm - Direct. Area Temp 0.47/Perm 0.7 ac

Evaluation based on:
Office ✓ Field

Corps manual wetland delineation completed? Y ✓ N

Function/Value	Suitability Y	Suitability N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	✓		4, 6, 10, 13	✓	Wetlands that occur at toe of slope indicate groundwater discharge areas.
Floodflow Alteration	✓		3,4,5,6, 7, 8, 9, 10,12, 18	✓	The wetlands are depressional features along SFDB that can hold or slow water runoff during rain/flooding events.
Fish and Shellfish Habitat		✓			
Sediment/Toxicant Retention	✓		1,2, 3, 4,6, 10		roadway runoff & livestock waste upslope of wetlands
Nutrient Removal	✓		3, 4, 8, 10, 11		roadway runoff & livestock waste upslope of wetlands
Production Export	✓		4, 5, 7		
Sediment/Shoreline Stabilization	✓		2, 3, 9, 15		
Wildlife Habitat	✓		4, 5, 6, 7, 13	✓	CRLF upland refugia
Recreation	✓		1,5, 7		provides habitat for CRLF, particularly wetlands east of Drakes Estero. System located with PRNS.
Educational/Scientific Value	✓		1, 3, 5		considered as valuable wildlife habitat, potential education site for wetland hummock education
Uniqueness/Heritage	✓		13, 17, 22, 24		provides critical habitat for CRLF
Visual Quality/Aesthetics	✓		1,7, 8, 9, 10, 11		
ES Endangered Species Habitat	✓		1, 2	✓	Entire project area is within CRLF critical habitat and CRLF are known to occur.
Other					

Notes: This wetland system comprises of roadside ditches and slope wetlands that were formed as a result of the building of SFDB. SFDB cut into hillsides creating areas for groundwater to surface and support wetland vegetation, thus creating wetlands. This system includes all drainage ditches east of Drakes Estero.

* Refer to backup list of numbered considerations.

Attachment B: Special Status Wildlife Species that have Potential to Nest, Forage, or Migrate through Wetland Systems in the Study Area

Special Status Species		Wetland Systems				
Common Name	Scientific Name	A	B	C	D	E
American badger	*Taxidea taxus*			x	x	
Bald eagle	*Haliaeetus leucocephalus*	x	x			
Burrowing owl	*Athene cunicularia*			x	x	x
California black rail	*Laterallus jamaicensis coturniculus*		x			
California red-legged frog	*Rana draytonii*	x		x	x	x
Central California coast coho salmon	*Oncorhynchus kisutch*	x	x			
Cooper's hawk	*Accipiter cooperii*	x				
Golden eagle	*Aquila chrysaetos*	x	x	x	x	x
Myrtle's silverspot butterfly	*Speyeria zerene myrtleae*				x	
Northern harrier	*Circus cyaneus*		x	x	x	
Northern spotted owl	*Strix occidentalis caurina*	x				
Osprey	*Pandion haliaetus*	x	x			
Pallid bat	*Antrozous pallidus*	x		x	x	x
Point Reyes jumping mouse	*Zapus trinotatus orarius*	x		x	x	x
Point Reyes mountain beaver	*Aplodontia rufa phaea*	x				
Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*		x			
Sharp-shined hawk	*Accipiter striatus*	x	x			
Swainson's hawk	*Buteo swainsoni*	x	x	x	x	x
Townsend's big-eared bat	*Corynorhinus townsendii*	x				
Tricolored blackbird	*Agelaius tricolor*	x		x		
Western pond turtle	*Actinemys marmorata*	x				
Western red bat	*Lasirurs blossevillii*	x				
White-tailed kite	*Elanus leucurus*		x	x	x	x
Yellow warbler	*Setophaga petechia*	x				

Source: Jacobs 2014b

Attachment C: Plant Species Identified During Wetland Delineation Surveys

Plants are not differentiated into Wetland Systems.

Scientific Name	Common Name
Acer negundo var californicum	California box elder
Achillea millefolium	yarrow
Agrostis stolonifera	red top
Alisma plantago-aquatica	water plantain
Alnus rhombifolia	white alder
Alnus rubra	red alder
Alopecurus pratensis	meadow foxtail
Amaranthus biltoides	amaranth
Amaranthus deflexus	amaranth
Ammophila arenaria	European beachgrass
Amsinckia menziesii var intermedia	fiddleneck
Amsinckia spectabilis var spectabilis	coast fiddleneck
Anaphalis margaritacae	pearly everlasting
Anemone oregana	western wood anemone
Angelica hendersonii	coastal angelica
Angelica tomentosa	woodland angelica
Arabis blepharophylla	coast rock cress
Arctostaphylos uva-ursi	manzanita
Arctostaphylos virgata	Marin manzanita
Artemesia californica	California sagebrush
Artemesia pycnocephala	coastal sagewort
Athyrium filix-femina var cyclosorum	coastal lady fern
Azolloa filiculoides	mosquito fern
Baccharis pilularis	coyote bush
Berberis pinnata ssp. *pinnata*	Oregon grape
Brassica nigra	black mustard
Bromus diandrus	ripgut brome
Bromus madritensis ssp. *rubens*	foxtail chess
Calamogrostis crassiglumis	Thurber's reedgrass
Calamogrostis nutkaensis	Pacific reedgrass
Capsella bursa-pastoris	Shepherd's purse
Cardamine californica	milk maids
Carex leptalea	sedge
Carex obnupta	slough sedge
Carex subbracteata	many-headed sedge
Carpobrotus chilensis	sea fig (iceplant)
Carpobrotus edulis	hottentot fig (iceplant)
Ceanothus gloriousus var exaltus	Mount Vision Ceanothus
Ceanothus gloriousus var gloriousus	Point Reyes ceanothus
Ceanothus thyrsiflorus	prostrate ceanothus
Cerastium arvense	field chickweed
Chenopodium album	lamb's quarters
Chlorogalum pomeridianum	soap plant

Scientific Name	Common Name
Chrysolepis chrysophylla var minor	chinquapin
Cirsium vulgare	spear thistle
Claytonia perfoliata	miner's lettuce
Claytonia sibirica	candy flower
Conium maculatum	poison hemlock
Cortaderia jubata	Pampas grass
Cupressus macrocarpa	Monterey cypress
Daucus carota	carrot
Distichilis spicata	saltgrass
Elymus californicus	California bottlebrush grass
Elymus triticoides	creeping wild rye
Equisetum arvense	common horsetail
Equisetum hyemale	common scouring rush
Equisetum telmateia ssp. *braunii*	giant horsetail
Erodium brachycarpum	giant storksbill
Erodium cicutarium	storksbill
Erysimum capitatum	western wallflower
Eschscholzia californica	California poppy
Euonymous occidentalis var occidentalis	euonymous
Festuca arundinaceae	tall fescue
Foeniculum vulgare	sweet fennel
Fragaria vesca	wild strawberry
Frageria chiloensis	beach strawberry
Frankenia salina	alkalai heath
Galium aparine	sticky willy
Galium californicum var californicum	California sticky willy
Geranium carolinum	Carolina geranium
Gnapthalium palustre	marsh cudweed
Hedera helix	English ivy
Heracleum lanatum	cow parsnip
Heracleum maximum	cow parsnip
Holcus lanata	velvet grass
Hyphochaeris radicata	catsear
Ilex aquifolium	English holly
Iris douglasiana	Douglas' iris
Juncus balticus	Baltic rush
Juncus effusus	soft juncus
Juncus xiphioides	iris-leaved juncus
Lemna minor	duckweed
Ligusticum lucidum	lovage
Limnathes doglasii sulphurea	Point Reyes meadowfoam
Linum bienne	narrow-lead flax
Linum usitatissimum	common flax

Scientific Name	Common Name
Lithocarpus densiflorus var densiflorus	tan oak
Lolium perenne	English ryegrass
Lomatium utriculatum	hog fennel
Lonicera hispidula var vacillans	California honeysuckle
Lonicera involucrata var ledbourii	coast honeysuckle
Lupinus albifrons var albifrons	silverleaf lupine
Lupinus arboreus	bush lupine
Madia sativa	coast tar weed
Marah fabaceus	California wild cucumber
Marah oreganus	coast man root
Medicago arabica	spotted burclover
Medicago sativa	alfalfa
Melilotus alba	white clover
Melilotus indica	yellow clover
Miimulus aurantiacus	bush monkey flower
Mimulus guttatus	common monkey flower
Perideria gairdneri ssp. *gairdneri*	Gairdnerçs yampah
Phacelia californica	California phacelia
Pinus muricata	Bishop pine
Pinus radiata	Monterey pine
Plantago lanceolata	narrowleaf plantain
Plantago major	common plaintain
Plantago maritima	Pacific plantain
Platystemon californicus	cream cups
Polygonum arenastrum	common knotweed
Polystichum munitum	sword fern
Potentilla anserina ssp. *pacifica*	Pacific cinquefoil
Potentilla glandulosa var glandulosa	sticky cinquefoil
Pseudotsugata menziesii var menziesii	Douglas fir
Pteridium aqulinum	bracken fern
Quercus agrifolia var agrifolia	coast live oak
Raphanus sativa	radish
Rhamnus californica ssp. *californica*	California coffeeberry
Rhynchospora californica	California rhynchospora
Ribes menziesii	canyon gooseberry
Ribes sanguineum	red-flowering currant
Ribes sanguineum var glutinosum	pink-flowering currant
Ribes sanguineum var sanguineum	red-flowering currant
Rorippa palustris	yellow water cress
Alnus discolor	Himalayan blackberry
Rubus parviflorus	thimbleberry
Rubus ursinus	California blackberry
Rumex acetosella	sheep sorrel
Rumex crispus	curly dock
Rumex occidentalis	western dock
Rumex pulcher	fiddle dock
Salicornia depressa	common glasswort
Salicornia virginica	pickleweed
Salix exigua	narrow-leaf willow
Salix laevigata	red willow
Salix lasiandra	Pacific willow
Salix lasiolepis	arroyo willow
Salsola soda	salty shrub
Sambucus racemosa	red elderberry
Schoenoplectus californicus	California bulrush
Scrophularia californica	California figwort
Sidalceae hickmanii var anomola	Checkerbloom
Sidalceae hickmanii var viridis	Marin checkerbloom
Sidalceae malviflora ssp. malviflora	checker mallow
Sidalceae malviflora ssp. *californica*	California checkerbloom
Sidalceae malviflora ssp. *malviflora*	Checkerbloom
Sisymbrium officinale	hedge mustard
Sonchus asper	Lettuce
Spergulia macrotheca	large-flowered sand spurrey
Stachys rigida	rough hedge nettle
Stellaria media	common chickweed
Symphoricarpos albus var leavigata	bush snowberry
Thalictrm fendleri	meadow rue
Torillis nodosa	hedge parsley
Toxicodendron diversilobum	poison oak
Trifolium dubium	shamrock
Trillium ovatum	white trillium
Typha domingensis	southern cattail
Typha latifolia	broad-leaved cattail
Ulex europaea	gorse
Umbellaria californica	bay laurel
Urtica dioica ssp. gracilis	California nettle
Urtica dioica ssp. holosericea	hoary nettle
Verbascum blattaria	mullein
Vicia americana var americana	American vetch
Vicia hirsuta	tare
Vicia sativa	vetch
Vinca major	periwinkle
Viola adunca	western dog violet
Vulpia bromoides	brome fescue
Woodwardia fimbriata	chain fern

Source: Jacobs 2014

Attachment D: Appendix A Wetland Evaluation Supporting Documentation (USACE 1999)

Appendix A

Wetland evaluation supporting documentation; Reproducible forms.

Below is an example list of considerations that was used for a New Hampshire highway project. Considerations are flexible, based on best professional judgment and interdisciplinary team consensus. This example provides a comprehensive base, however, and may only need slight modifications for use in other projects.

GROUNDWATER RECHARGE/DISCHARGE— This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. It refers to the fundamental interaction between wetlands and aquifers, regardless of the size or importance of either.

CONSIDERATIONS/QUALIFIERS

1. Public or private wells occur downstream of the wetland.
2. Potential exists for public or private wells downstream of the wetland.
3. Wetland is underlain by stratified drift.
4. Gravel or sandy soils present in or adjacent to the wetland.
5. Fragipan does not occur in the wetland.
6. Fragipan, impervious soils, or bedrock does occur in the wetland.
7. Wetland is associated with a perennial or intermittent watercourse.
8. Signs of groundwater recharge are present or piezometer data demonstrates recharge.
9. Wetland is associated with a watercourse but lacks a defined outlet or contains a constricted outlet.
10. Wetland contains only an outlet, no inlet.
11. Groundwater quality of stratified drift aquifer within or downstream of wetland meets drinking water standards.
12. Quality of water associated with the wetland is high.
13. Signs of groundwater discharge are present (e.g., springs).
14. Water temperature suggests it is a discharge site.
15. Wetland shows signs of variable water levels.
16. Piezometer data demonstrates discharge.
17. Other

FLOODFLOW ALTERATION (Storage & Desynchronization) — This function considers the effectiveness of the wetland in reducing flood damage by water retention for prolonged periods following precipitation events and the gradual release of floodwaters. It adds to the stability of the wetland ecological system or its buffering characteristics and provides social or economic value relative to erosion and/or flood prone areas.

CONSIDERATIONS/QUALIFIERS

1. Area of this wetland is large relative to its watershed.
2. Wetland occurs in the upper portions of its watershed.
3. Effective flood storage is small or non-existent upslope of or above the wetland.
4. Wetland watershed contains a high percent of impervious surfaces.
5. Wetland contains hydric soils which are able to absorb and detain water.
6. Wetland exists in a relatively flat area that has flood storage potential.
7. Wetland has an intermittent outlet, ponded water, or signs are present of variable water level.
8. During flood events, this wetland can retain higher volumes of water than under normal or average rainfall conditions.
9. Wetland receives and retains overland or sheet flow runoff from surrounding uplands.
10. In the event of a large storm, this wetland may receive and detain excessive flood water from a nearby watercourse.
11. Valuable properties, structures, or resources are located in or near the floodplain downstream from the wetland.
12. The watershed has a history of economic loss due to flooding.
13. This wetland is associated with one or more watercourses.
14. This wetland watercourse is sinuous or diffuse.
15. This wetland outlet is constricted.
16. Channel flow velocity is affected by this wetland.
17. Land uses downstream are protected by this wetland.
18. This wetland contains a high density of vegetation.
19. Other

FISH AND SHELLFISH HABITAT (FRESHWATER) — This function considers the effectiveness of seasonal or permanent watercourses associated with the wetland in question for fish and shellfish habitat.

CONSIDERATIONS/QUALIFIERS

1. Forest land dominant in the watershed above this wetland.
2. Abundance of cover objects present.

STOP HERE IF THIS WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE

3. Size of this wetland is able to support large fish/shellfish populations.
4. Wetland is part of a larger, contiguous watercourse.
5. Wetland has sufficient size and depth in open water areas so as not to freeze solid and retain some open water during winter.
6. Stream width (bank to bank) is more than 50 feet.
7. Quality of the watercourse associated with this wetland is able to support healthy fish/shellfish populations.
8. Streamside vegetation provides shade for the watercourse.
9. Spawning areas are present (submerged vegetation or gravel beds).
10. Food is available to fish/shellfish populations within this wetland.
11. Barrier(s) to anadromous fish (such as dams, including beaver dams, waterfalls, road crossing) are absent from the stream reach associated with this wetland.
12. Evidence of fish is present.
13. Wetland is stocked with fish.
14. The watercourse is persistent.
15. Man-made streams are absent.
16. Water velocities are not too excessive for fish usage.
17. Defined stream channel is present.
18. Other

Although the above example refers to freshwater wetlands, it can also be adapted for marine ecosystems. The following is an example provided by the National Marine Fisheries Service (NMFS) of an adaptation for the fish and shellfish function.

FISH AND SHELLFISH HABITAT (MARINE) — This function considers the effectiveness of wetlands, embayments, tidal flats, vegetated shallows, and other environments in supporting marine resources such as fish, shellfish, marine mammals, and sea turtles.

CONSIDERATIONS/QUALIFIERS

1. Special aquatic sites (tidal marsh, mud flats, eelgrass beds) are present.
2. Suitable spawning habitat is present at the site or in the area.
3. Commercially or recreationally important species are present or suitable habitat exists.
4. The wetland/waterway supports prey for higher trophic level marine organisms.
5. The waterway provides migratory habitat for anadromous fish.
6. Essential fish habitat, as defined by the 1996 amendments to the Magnuson-Stevens Fishery & Conservation Act, is present (consultation with NMFS may be necessary).
7. Other

SEDIMENT/TOXICANT/PATHOGEN RETENTION — This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants, or pathogens in runoff water from surrounding uplands or upstream eroding wetland areas.

CONSIDERATIONS/QUALIFIERS

1. Potential sources of excess sediment are in the watershed above the wetland.
2. Potential or known sources of toxicants are in the watershed above the wetland.
3. Opportunity for sediment trapping by slow moving water or deepwater habitat are present in this wetland.
4. Fine grained mineral or organic soils are present.
5. Long duration water retention time is present in this wetland.
6. Public or private water sources occur downstream.
7. The wetland edge is broad and intermittently aerobic.
8. The wetland is known to have existed for more than 50 years.
9. Drainage ditches have not been constructed in the wetland.

STOP HERE IF WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE.

10. Wetland is associated with an intermittent or perennial stream or a lake.
11. Channelized flows have visible velocity decreases in the wetland.
12. Effective floodwater storage in wetland is occurring. Areas of impounded open water are present.
13. No indicators of erosive forces are present. No high water velocities are present.
14. Diffuse water flows are present in the wetland.
15. Wetland has a high degree of water and vegetation interspersion.
16. Dense vegetation provides opportunity for sediment trapping and/or signs of sediment accumulation by dense vegetation is present.
17. Other

NUTRIENT REMOVAL/RETENTION/TRANSFORMATION — This function considers the effectiveness of the wetland as a trap for nutrients in runoff water from surrounding uplands or contiguous wetlands and the ability of the wetland to process these nutrients into other forms or trophic levels. One aspect of this function is to prevent ill effects of nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries.

CONSIDERATIONS/QUALIFIERS

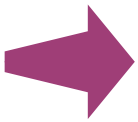
1. Wetland is large relative to the size of its watershed.
2. Deep water or open water habitat exists.
3. Overall potential for sediment trapping exists in the wetland.

4. Potential sources of excess nutrients are present in the watershed above the wetland.
5. Wetland saturated for most of the season. Ponded water is present in the wetland.
6. Deep organic/sediment deposits are present.
7. Slowly drained fine grained mineral or organic soils are present.
8. Dense vegetation is present.
9. Emergent vegetation and/or dense woody stems are dominant.
10. Opportunity for nutrient attenuation exists.
11. Vegetation diversity/abundance sufficient to utilize nutrients.

STOP HERE IF WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE.

12. Waterflow through this wetland is diffuse.
13. Water retention/detention time in this wetland is increased by constricted outlet or thick vegetation.
14. Water moves slowly through this wetland.
15. Other

PRODUCTION EXPORT (Nutrient) — This function evaluates the effectiveness of the wetland to produce food or usable products for humans or other living organisms.



CONSIDERATIONS/QUALIFIERS

1. Wildlife food sources grow within this wetland.
2. Detritus development is present within this wetland
3. Economically or commercially used products found in this wetland.
4. Evidence of wildlife use found within this wetland.
5. Higher trophic level consumers are utilizing this wetland.
6. Fish or shellfish develop or occur in this wetland.
7. High vegetation density is present.
8. Wetland exhibits high degree of plant community structure/species diversity.
9. High aquatic vegetative diversity/abundance is present.
10. Nutrients exported in wetland watercourses (permanent outlet present).
11. “Flushing” of relatively large amounts of organic plant material occurs from this wetland.
12. Wetland contains flowering plants that are used by nectar-gathering insects.
13. Indications of export are present.
14. High production levels occurring, however, no visible signs of export (assumes export is attenuated).
15. Other

SEDIMENT/SHORELINE STABILIZATION — This function considers the effectiveness of a wetland to stabilize streambanks and shorelines against erosion.

CONSIDERATIONS/QUALIFIERS

1. Indications of erosion or siltation are present.
2. Topographical gradient is present in wetland.
3. Potential sediment sources are present up-slope.
4. Potential sediment sources are present upstream.
5. No distinct shoreline or bank is evident between the waterbody and the wetland or upland.
6. A distinct step between the open waterbody or stream and the adjacent land exists (i.e., sharp bank) with dense roots throughout.
7. Wide wetland (>10’) borders watercourse, lake, or pond.
8. High flow velocities in the wetland.
9. The watershed is of sufficient size to produce channelized flow.
10. Open water fetch is present.
11. Boating activity is present.
12. Dense vegetation is bordering watercourse, lake, or pond.
13. High percentage of energy-absorbing emergents and/or shrubs border a watercourse, lake, or pond.
14. Vegetation is comprised of large trees and shrubs that withstand major flood events or erosive incidents and stabilize the shoreline on a large scale (feet).
15. Vegetation is comprised of a dense resilient herbaceous layer that stabilizes sediments and the shoreline on a small scale (inches) during minor flood events or potentially erosive events.
16. Other

WILDLIFE HABITAT — This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species must be considered. Species lists of observed and potential animals should be included in the wetland assessment report.[1]

CONSIDERATIONS/QUALIFIERS

1. Wetland is not degraded by human activity.
2. Water quality of the watercourse, pond, or lake associated with this wetland meets or exceeds Class A or B standards.
3. Wetland is not fragmented by development.
4. Upland surrounding this wetland is undeveloped.
5. More than 40% of this wetland edge is bordered by upland wildlife habitat (e.g., brushland, woodland, active farmland, or idle land) at least 500 feet in width.
6. Wetland is contiguous with other wetland systems connected by a watercourse or lake.
7. Wildlife overland access to other wetlands is present.
8. Wildlife food sources are within this wetland or are nearby.
9. Wetland exhibits a high degree of interspersion of vegetation classes and/or open water.
10. Two or more islands or inclusions of upland within the wetland are present.
11. Dominant wetland class includes deep or shallow marsh or wooded swamp.
12. More than three acres of shallow permanent open water (less than 6.6 feet deep), including streams in or adjacent to wetland, are present.
13. Density of the wetland vegetation is high.
14. Wetland exhibits a high degree of plant species diversity.
15. Wetland exhibits a high degree of diversity in plant community structure (e.g., tree/shrub/vine/grasses/mosses)
16. Plant/animal indicator species are present. (List species for project)
17. Animal signs observed (tracks, scats, nesting areas, etc.)
18. Seasonal uses vary for wildlife and wetland appears to support varied population diversity/abundance during different seasons.
19. Wetland contains or has potential to contain a high population of insects.
20. Wetland contains or has potential to contain large amphibian populations.
21. Wetland has a high avian utilization or its potential.
22. Indications of less disturbance-tolerant species are present.
23. Signs of wildlife habitat enhancement are present (birdhouses, nesting boxes, food sources, etc.).
24. Other

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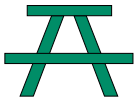
[1]In March 1995, a rapid wildlife habitat assessment method was completed by a University of Massachusetts research team with funding and oversight provided by the New England Transportation Consortium. The method is called WEThings (wetland habitat indicators for non-game species). It produces a list of potential wetland-dependent mammal, reptile, and amphibian species that may be present in the wetland. The output is based on observable habitat characteristics documented on the field data form. This method may be used to generate the wildlife species list recommended as backup information to the wetland evaluation form and to augment the considerations. Use of this method should first be coordinated with the Corps project manager. A computer program is also available to expedite this process.

RECREATION (Consumptive and Non-Consumptive) — This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting, and other active or passive recreational activities. Consumptive opportunities consume or diminish the plants, animals, or other resources that are intrinsic to the wetland. Non-consumptive opportunities do not consume or diminish these resources of the wetland.



CONSIDERATIONS/QUALIFIERS

1. Wetland is part of a recreation area, park, forest, or refuge.
2. Fishing is available within or from the wetland.
3. Hunting is permitted in the wetland.
4. Hiking occurs or has potential to occur within the wetland.
5. Wetland is a valuable wildlife habitat.
6. The watercourse, pond, or lake associated with the wetland is unpolluted.
7. High visual/aesthetic quality of this potential recreation site.
8. Access to water is available at this potential recreation site for boating, canoeing, or fishing.
9. The watercourse associated with this wetland is wide and deep enough to accommodate canoeing and/or non-powered boating.
10. Off-road public parking available at the potential recreation site.
11. Accessibility and travel ease is present at this site.
12. The wetland is within a short drive or safe walk from highly populated public and private areas.
13. Other

EDUCATIONAL/SCIENTIFIC VALUE — This value considers the suitability of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.

CONSIDERATIONS/QUALIFIERS

1. Wetland contains or is known to contain threatened, rare, or endangered species.
2. Little or no disturbance is occurring in this wetland.
3. Potential educational site contains a diversity of wetland classes which are accessible or potentially accessible.
4. Potential educational site is undisturbed and natural.
5. Wetland is considered to be a valuable wildlife habitat.
6. Wetland is located within a nature preserve or wildlife management area.
7. Signs of wildlife habitat enhancement present (bird houses, nesting boxes, food sources, etc.).
8. Off-road parking at potential educational site suitable for school bus access in or near wetland.
9. Potential educational site is within safe walking distance or a short drive to schools.
10. Potential educational site is within safe walking distance to other plant communities.
11. Direct access to perennial stream at potential educational site is available.
12. Direct access to pond or lake at potential educational site is available.
13. No known safety hazards exist within the potential educational site.
14. Public access to the potential educational site is controlled.
15. Handicap accessibility is available.
16. Site is currently used for educational or scientific purposes.
17. Other

UNIQUENESS/HERITAGE — This value considers the effectiveness of the wetland or its associated waterbodies to provide certain special values. These may include archaeological sites, critical habitat for endangered species, its overall health and appearance, its role in the ecological system of the area, its relative importance as a typical wetland class for this geographic location. These functions are clearly valuable wetland attributes relative to aspects of public health, recreation, and habitat diversity.

CONSIDERATIONS/QUALIFIERS

1. Upland surrounding wetland is primarily urban.
2. Upland surrounding wetland is developing rapidly.
3. More than 3 acres of shallow permanent open water (less than 6.6 feet deep), including streams, occur in wetlands.
4. Three or more wetland classes are present.
5. Deep and/or shallow marsh or wooded swamp dominate.
6. High degree of interspersion of vegetation and/or open water occur in this wetland.
7. Well-vegetated stream corridor (15 feet on each side of the stream) occurs in this wetland.
8. Potential educational site is within a short drive or a safe walk from schools.
9. Off-road parking at potential educational site is suitable for school buses.
10. No known safety hazards exist within this potential educational site.
11. Direct access to perennial stream or lake exists at potential educational site.
12. Two or more wetland classes are visible from primary viewing locations.
13. Low-growing wetlands (marshes, scrub-shrub, bogs, open water) are visible from primary viewing locations.
14. Half an acre of open water or 200 feet of stream is visible from the primary viewing locations.
15. Large area of wetland is dominated by flowering plants or plants that turn vibrant colors in different seasons.
16. General appearance of the wetland visible from primary viewing locations is unpolluted and/or undisturbed.
17. Overall view of the wetland is available from the surrounding upland.
18. Quality of the water associated with the wetland is high.
19. Opportunities for wildlife observations are available.
20. Historical buildings are found within the wetland.
21. Presence of pond or pond site and remains of a dam occur within the wetland.
22. Wetland is within 50 yards of the nearest perennial watercourse.
23. Visible stone or earthen foundations, berms, dams, standing structures, or associated features occur within the wetland.
24. Wetland contains critical habitat for a state- or federally-listed threatened or endangered species.
25. Wetland is known to be a study site for scientific research.
26. Wetland is a natural landmark or recognized by the state natural heritage inventory authority as an exemplary natural community.
27. Wetland has local significance because it serves several functional values.
28. Wetland has local significance because it has biological, geological, or other features that are locally rare or unique.
29. Wetland is known to contain an important archaeological site.
30. Wetland is hydrologically connected to a state or federally designated scenic river.
31. Wetland is located in an area experiencing a high wetland loss rate.
32. Other

APPENDIX D: NPS PROCEDURAL MANUAL #77-1: WETLAND PROTECTION - APPENDIX 2: BEST MANAGEMENT PRACTICES AND CONDITIONS FOR PROPOSED ACTIONS WITH THE POTENTIAL TO HAVE ADVERSE IMPACTS ON WETLANDS

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The following serve as Best Management Practices (BMPs) for NPS actions that may have adverse impacts on wetlands. Additional BMPs may be appropriate depending on local conditions or special circumstances. These also serve as "conditions" that must be met for the actions listed in Section 4.2.1 of these procedures to qualify as "excepted."

1. **Effects on hydrology and fluvial processes:** Action must have only negligible to minor, new adverse effects on site hydrology and fluvial processes, including flow, circulation, velocities, hydroperiods, water level fluctuations, sediment transport, channel morphology, and so on. Care must be taken to avoid any rutting caused by vehicles or equipment.

2. **Effects on fauna:** Action must have only negligible to minor, new adverse effects on normal movement, migration, reproduction, or health of aquatic or terrestrial fauna, including at low flow conditions.

3. **Water quality protection and certification:** Action is conducted so as to avoid degrading water quality to the maximum extent practicable. Measures must be employed to prevent or control spills of fuels, lubricants, or other contaminants from entering the waterway or wetland. Action is consistent with state water quality standards and Clean Water Act Section 401 certification requirements (check with appropriate state agency).

4. **Erosion and siltation controls:** Appropriate erosion and siltation controls must be maintained during construction, and all exposed soil or fill material must be permanently stabilized at the earliest practicable date.

5. **Proper maintenance:** Structure or fill must be properly maintained so as to avoid adverse impacts on aquatic environments or public safety.

6. **Heavy equipment use:** Heavy equipment use in wetlands must be avoided if at all possible. Heavy equipment used in wetlands must be placed on mats, or other measures must be taken to minimize soil and plant root disturbance and to preserve preconstruction elevations.

7. **Stockpiling material:** Whenever possible, excavated material must be placed on an upland site. However, when this is not feasible, temporary stockpiling of excavated material in wetlands must be placed on filter cloth, mats, or some other semipermeable surface, or comparable measures must be taken to ensure that underlying wetland habitat is protected. The material must be stabilized with straw bales, filter cloth, or other appropriate means to prevent reentry into the waterway or wetland.

8. **Removal of stockpiles and other temporary disturbances during construction:** Temporary stockpiles in wetlands must be removed in their entirety as soon as practicable. Wetland areas temporarily disturbed by stockpiling or other activities during construction must be returned to their pre-existing elevations, and soil, hydrology, and native vegetation communities must be restored as soon as practicable.

9. **Topsoil storage and reuse:** Revegetation of disturbed soil areas should be facilitated by salvaging and storing existing topsoil and reusing it in restoration efforts in accordance with NPS policies and guidance. Topsoil storage must be for as short a time as possible to prevent loss of seed and root viability, loss of organic matter, and degradation of the soil microbial community.

10. **Native plants:** Where plantings or seeding are required, native plant material must be obtained and used in accordance with NPS policies and guidance. Management techniques must be implemented to foster rapid development of target native plant communities and to eliminate invasion by exotic or other undesirable species.

11. **Boardwalk elevations:** Minimizing shade impacts, to the extent practicable, should be a consideration in designing boardwalks and similar structures. (Placing a boardwalk at an

elevation above the vegetation surface at least equal to the width of the boardwalk is one way to minimize shading.)

12. **Wild and Scenic Rivers:** If the action qualifies as a water resources project pursuant to Section 7(a) of the Wild and Scenic Rivers Act, then appropriate project review and documentation requirements under Section 7(a) are required.

13. **Coastal zone management:** Action must be consistent, to the maximum extent practicable, with state coastal zone management programs.

14. **Endangered species:** Action must not jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, including degradation of critical habitat (see *NPS Management Policies 2006* and guidance on threatened and endangered species).

15. **Historic properties:** Action must not have adverse effects on historic properties listed or eligible for listing in the National Register of Historic Places.