In order to mitigate or avoid significant effects resulting from the proposed project, Public Resources Code Section 21081.6 requires that monitoring and reporting procedures take place through a Mitigation Monitoring and Reporting Program (MMRP). Table A-1 provides the MMRP for the proposed Project in accordance with those guidelines.
## TABLE A-1
### MITIGATION MONITORING AND REPORTING PROGRAM

<table>
<thead>
<tr>
<th>Monitoring Measure</th>
<th>Individual Responsible for Monitoring and/or Reporting</th>
<th>Individual or Organization Responsible for Verifying Compliance</th>
<th>Timing of Initial Action</th>
<th>Frequency and/or Duration of Monitoring</th>
<th>Performance Criteria</th>
<th>Proposed Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.2 Agricultural Resources</strong> AR-1</td>
<td>Applicant</td>
<td>Humboldt County Planning and Building Department</td>
<td>Project operation</td>
<td>Project operation</td>
<td>County/ State standards</td>
<td>Applicant/ Coastal Conservancy</td>
</tr>
<tr>
<td><strong>Pasture Monitoring Plan (not a Mitigation Measure).</strong></td>
<td>The Coastal Conservancy shall put in place a Pasture Monitoring Plan to monitor the increase in productivity resulting from the proposed Project for no fewer than five years. The Pasture Monitoring Plan will assess the Project’s ability to provide a more predictable management of flow and sediment in the avulsion areas, and will quantify pasture production for the five-year period. Additionally, the Coastal Conservancy shall place $84,000 into an escrow account, or otherwise cause such funds to be set aside, to be used only in the event that the Pasture Monitoring Plan shows that the projected productivity increases do not occur by the conclusion of the five-year monitoring period. The funds will be used to acquire or otherwise protect or improve agricultural land in or near the Project area for the benefit of the agricultural economy of Humboldt County. The fund amount is based on agricultural land in the Project area being worth an estimated $6,000/acre, and the potential conversion of prime agricultural land being 14 acres. If this outcome is triggered, the funds will be granted to a suitable non-profit or special district capable of and willing to administer the funds. Possible recipients include the Humboldt Resource Conservation District, the Salt River Watershed Council or the Northcoast Regional Land Trust.</td>
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<td><strong>3.3 Air Quality</strong> AQ-1</td>
<td>Applicant’s Contractor</td>
<td>Humboldt County Planning and Building Department</td>
<td>Project construction</td>
<td>During construction</td>
<td>County/ standards</td>
<td>Applicant</td>
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<td><strong>Dust Control Measures during Construction.</strong></td>
<td>The contractor shall implement the following Best Management Practices:</td>
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<td>1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, active graded areas, and unpaved access roads) shall be watered two times per day.</td>
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<td>Monitoring Measure</td>
<td>Individual Responsible for Monitoring and/or Reporting</td>
<td>Individual or Organization Responsible for Verifying Compliance</td>
<td>Timing of Initial Action</td>
<td>Frequency and/or Duration of Monitoring</td>
<td>Performance Criteria</td>
<td>Proposed Funding</td>
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<td>3.</td>
<td>All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.</td>
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<td>4.</td>
<td>All vehicle speeds on unpaved roads shall be limited to 15 mph, unless the unpaved road surface has been treated for dust suppression with water, rock, wood chip mulch, or other dust prevention measures.</td>
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### 3.4 BIO-1a Biological Resources

**Avoidance, Minimization, and Mitigation for Tidewater Goby.**

Because implementing the Project could directly or indirectly harm or kill Tidewater Gobies, the following avoidance and minimization measures will be incorporated into the Project:

- Construction activities will be phased and conducted in a sequence that minimizes impacts to Tidewater Gobies. Construction also will be limited to dry-season work windows (June 15 through October 15) to reduce the amount of goby habitat affected and minimize the impact on water quality. Although dry-season work windows may coincide with spawning and larval development, the footprint of available goby habitat may be smaller because summer conditions typically are drier, reducing the area in which Tidewater Gobies may be present. In addition, conducting work during the dry season will minimize the impact on water quality from sediment generated by construction activities, and from spills that could occur during construction and maintenance of the Project (e.g., oil, fuel, hydraulic fluid).
- Phase Project construction so Tidewater Gobies can be relocated to sites in the Project area but away from areas targeted for restoration. During excavation, Tidewater Gobies may be crushed by equipment or debris or may be removed from

<table>
<thead>
<tr>
<th>BIO-1a</th>
<th>Applicant</th>
<th>USFWS</th>
<th>First year of construction during the dry season and pre-operation</th>
<th>During construction and operation</th>
<th>State and Federal standards</th>
<th>Applicant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring Measure</td>
<td>Individual Responsible for Monitoring and/or Reporting</td>
<td>Individual or Organization Responsible for Verifying Compliance</td>
<td>Timing of Initial Action</td>
<td>Frequency and/or Duration of Monitoring</td>
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<td>channels or marshes unintentionally by equipment. Mortality can be minimized by capturing and relocating Tidewater Gobies out of construction areas. Relocating Tidewater Gobies from areas targeted for restoration to habitat outside of the immediate restoration area before construction begins is intended to protect individual fish; however, improper capture and handling may result in injury or mortality. In addition, Tidewater Gobies that need to be relocated should be taken to areas that have suitable habitat (e.g., where Tidewater Gobies are known to thrive). Therefore, the capture and handling of Tidewater Gobies will be conducted by qualified biologists, and suitable habitats for relocation will be identified before construction begins. Tidewater gobies were successfully translocated as part of restoration activities at the nearby Riverside Ranch (Kramer 2016).</td>
<td>Applicant</td>
<td>USFWS; CDFW</td>
<td>Pre-construction</td>
<td>Pre-construction</td>
<td>Federal and State standards</td>
<td>Applicant</td>
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<tr>
<td>Bio-1b Conduct pre-construction Avian Surveys for Nesting Passerine Birds and Avian Species of Special Concern.</td>
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<td>Monitoring Measure</td>
<td>Individual Responsible for Monitoring and/or Reporting</td>
<td>Individual or Organization Responsible for Verifying Compliance</td>
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<td>Trees are not present; therefore, none would be removed. Clearing of shrubs or other vegetation, if necessary for construction or maintenance, shall be conducted during the fall and/or winter months from August 16 to February 29, outside of the active nesting season for migratory bird species (i.e., March 1 to August 15). If vegetation removal or ground disturbance cannot be confined to work during the non-breeding season, the applicant shall have a qualified biologist conduct preconstruction surveys within the impact area for ground disturbance, vegetation removal and/or maintenance activities, to check for nesting activity of migratory, raptors, and special-status bird species. The biologist shall conduct the preconstruction surveys within the 14-day period prior to vegetation removal and ground-disturbing activities (on a minimum of three separate days within that 14-day period). If ground disturbance and vegetation removal work lapses for 15 days or longer during the breeding season, a qualified biologist shall conduct a supplemental avian preconstruction survey before Project work may be reinitiated. If active nests are detected within the construction or maintenance (operation) footprint or within 500 feet of construction activities, the applicant shall have locations flagged that are supporting breeding, and will not begin ground disturbing work or vegetation removal inside the buffers until the nests have fledged. Construction activities shall avoid nest sites until the biologist determines that the young have fledged or nesting activity has ceased. If nests are documented outside of the construction (disturbance) footprint, but within 500 feet of the construction area, buffers will be implemented if deemed appropriate in coordination with CDFW. In general, the buffer for common species would be determined on a case-by-case basis with consultation with CDFW, the buffer for sensitive species would be 300 feet, and the buffer for raptors would be 500 feet.</td>
<td>Applicant</td>
<td>USFWS</td>
<td>During</td>
<td>During</td>
<td>Federal</td>
<td>Applicant</td>
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</tbody>
</table>
### Monitoring Measure

#### Western Snowy Plover.

Construction and maintenance activities associated with dune re-establishment would be conducted between September 1 and March 1, outside of the plover nesting season. The area of impact, defined as permanent or semi-permanent change in elevation or conversion to > 30 percent vegetation cover, would be mitigated through enhancement of dunes elsewhere on the EREP site, in the northern half of the dune complex within the site (generally between the northern limit of the Inner marsh and the outlet of the Eel River). Enhancement would occur at a minimum ratio of 1.1:1, and would include removal of European beach grass through mechanical or other appropriate methods; and quarterly maintenance, through removal of re-sprouts, for a period of two years post-construction. The initial removal effort would occur concurrently with the impacts. This would result in no net loss nor temporal loss of suitable Western Snowy Plover breeding habitat.

#### BIO-1d Habitat Enhancement for Northern Red-legged Frog.

Although direct impacts to Northern Red-legged Frog breeding habitat is not anticipated because the duckponds will remain in freshwater conditions, measures for this species are included because individual frogs may disperse for considerable distances and could enter construction areas. Pre-construction surveys would occur prior to ground disturbance in any areas of potential frog habitat (not in saline or tidal areas).

After consultation with CDFW, a qualified Project biologist will relocate Northern Red-legged Frog eggs if observed within the direct Project footprint in spring prior to construction or if observed during Project implementation.

#### BIO-1e Mitigate for potential impacts to salmonid species and Longfin Smelt.

The in-water construction and maintenance work window will be limited to June 15th through October 15th to avoid or minimize impacts to juvenile salmonids and Longfin.
<table>
<thead>
<tr>
<th>Monitoring Measure</th>
<th>Individual Responsible for Monitoring and/or Reporting</th>
<th>Individual or Organization Responsible for Verifying Compliance</th>
<th>Timing of Initial Action</th>
<th>Frequency and/or Duration of Monitoring</th>
<th>Performance Criteria</th>
<th>Proposed Funding</th>
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<tr>
<td>Smelt. Before potential de-watering activities begin in creeks or channels within the Project area, the qualified Biologist shall ensure that native aquatic vertebrates and larger invertebrates, if feasible, are relocated out of the construction footprint into a flowing channel segment by a qualified fisheries biologist. In deeper or larger areas, water levels shall first be lowered to manageable levels using methods to ensure no impacts to fisheries and other special status aquatic species. A qualified fisheries biologist or aquatic ecologist shall then perform appropriate seining or other trapping procedures to a point at which the biologist is assured that almost all individuals within the construction area have been caught. These individuals shall be kept in buckets with aerators to ensure survival. They shall then be relocated to an appropriate flowing channel segment or other appropriate habitat as identified by the qualified Biologist in consultation with NOAA Fisheries and CDFW. Federally threatened salmonid species that occur within the Project area either natal or non-natal Coho salmon, steelhead, and Chinook salmon.</td>
<td>Applicant</td>
<td>USFWS</td>
<td>Pre-construction and pre-operation</td>
<td>Annual monitoring post-construction for two years</td>
<td>No net loss in number of individual plants. If replanting is employed, a 2:1 planting ratio includes built in overplanting in order to meet success criteria and no net loss.</td>
<td>Applicant</td>
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</tbody>
</table>

**BIO-2a Mitigate Impacts to Beach Layia.**

The following measures shall be implemented to mitigate impacts to the federally listed beach layia during construction and operation/ongoing maintenance of the Project, primarily associated with dune building on EREP and European beachgrass removal associated with Western Snowy Plover habitat enhancement required by Mitigation Measure BIO-1c.

A pre-construction survey shall be conducted prior to the beginning of ground disturbing work and at the appropriate season to verify the extent of known beach layia occurrences and to identify new occurrences on or adjacent to dunes, if any. At the beginning of construction, flagging or exclusion fencing shall be installed around all known occurrences of beach layia within 10 feet of construction limits. Locations of fencing shall be identified and flagged by a qualified biologist and installed while the...
### Monitoring Measure
- If any new or existing occurrences of beach layia are in proximity to areas of Project-related ground disturbance and if Project activities could conceivably result in indirect impacts such as alteration of dune erosion or deposition patterns, then mitigation will be employed that includes one or more of the following mechanisms: protective wooden fencing to shelter the population from shifting sand, seed collection from the site and/or nearby known occurrences so that replacement plants can be grown out at a nursery and replaced at a stable portion of the site (2:1 planting ratio), seed collection for seed banking in the event indirect impacts occur as a result of the Project in a dynamic coastal environment, plant relocation, and/or preparation of a sensitive species management plan (SSMP) that provides further details about the above options in cooperation with USFWS as to which mechanism(s) are preferred option(s) at the time of impact. The triggering mechanism for seed banking would be if this plant species is identified within 100 feet in a downwind direction of dune establishment, and/or 50 feet in any other direction, or within the footprint of the proposed Western Snowy Plover mitigation area. If an SSMP is deemed appropriate by jurisdictional agencies, the report would lay out specific timing and details of seed collection, mitigation site identification (within EREP), substrate preparation, monitoring and maintenance. If plant replacement, or relocation is deemed necessary (whether through relocation and/or replanting) annual monitoring for two years shall be required, with no net loss of number of individual number of plants. If replanting is employed, a 2:1 planting ratio includes built in overplanting in order to meet success criteria and no net loss.

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<tr>
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<th>Frequency and/or Duration of Monitoring</th>
<th>Performance Criteria</th>
<th>Proposed Funding</th>
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<tbody>
<tr>
<td>BIO-2b Mitigate Impacts to Sensitive-Listed Plant Species.</td>
<td>Applicant</td>
<td>CDFW/ NMFS</td>
<td>Pre-</td>
<td>Pre-</td>
<td>Success</td>
<td>Applicant</td>
</tr>
</tbody>
</table>
Mitigation for special status plant species other than beach lalya is addressed collectively for all species, with modifications noted for individual species; this measure is patterned after and slightly modified from one used successfully on the adjacent Salt River (Grassetti et al. 2011). Significant impacts to special-status plant species present or likely to be present onsite shall be minimized, avoided, and (if necessary) compensated by complying with the following:

- Pre-construction and maintenance surveys: Potential habitat for special-status plant species shall be surveyed in appropriate seasons for optimal species-specific detection prior to Project excavation/dredging, fill, drainage, or flooding activities associated with Project construction and maintenance. Survey methods shall comply with CNPS/CDFG rare plant survey protocols, and shall be performed by qualified field botanists. Surveys shall be modified to include detection of juvenile (pre-flowering) colonies of perennial species when necessary. Any populations of special-status plant species that are detected shall be mapped. Populations shall be flagged if avoidance is feasible and population is located adjacent to construction areas. Previous special-status plant surveys documented populations of Lyngbye’s sedge and Humboldt Bay owl’s clover as described above.

- The locations of any special status plant populations to be avoided shall be clearly identified in the contract documents (plans and specifications).

- If special-status plant populations are detected where construction or maintenance would have unavoidable impacts, a compensatory mitigation plan shall be prepared and implemented in coordination with CDFW. Such plans may include salvage, propagation, on-site reintroduction in restored habitats, and monitoring. Plans have been developed for Lyngbye’s sedge, Humboldt Bay owl’s...
### Monitoring Measure

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<tr>
<th>Monitoring Measure</th>
<th>Individual Responsible for Monitoring and/or Reporting</th>
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<th>Proposed Funding</th>
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</table>

clover, and eelgrass, and will be further revised in consultation with regulatory agencies. Impacts to these species shall be avoided or minimized to the extent feasible. It should be noted that populations of owl’s clover can fluctuate dramatically between years (Pickart 2001), making the number of individuals impacted difficult to predict in advance.

- Humboldt Bay owl’s clover: A qualified botanist shall collect and conserve seed from local (preferable on-site, or from the immediate region if on-site sources are insufficient) populations of Humboldt Bay owl’s clover. These seeds shall be used to replant a population of this species to mitigate for the population lost to construction impacts. The Project area shall be monitored for five years and compared with a reference population to determine whether replanting and natural recruitment have resulted in population numbers equal to or greater than those present before Project implementation. If the population does not appear to have reestablished during the five-year period, seed shall be collected from elsewhere and additional attempts shall be made to reestablish the population.

- Lyngbye’s sedge: Seed shall be collected from Lyngbye’s sedge in the Project area to be used for replanting in the event that natural recruitment does not result in a post-Project population size equal to or greater than the pre-Project population size. Monitoring and adaptive management will be conducted for a ten-year period to determine whether the area and approximate number of Lyngbye’s sedge in the Project area is similar to the area of sedge before the Project. Additional planting efforts (from seed or from rootstock of mature plants) shall be undertaken if the population size is declining below pre-Project size during the monitoring period.

- Eelgrass: The extent and density of eelgrass cover within areas of Project impact shall be mapped prior to
### Monitoring Measure

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<th>Monitoring Measure</th>
<th>Individual Responsible for Monitoring and/or Reporting</th>
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<th>Timing of Initial Action</th>
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<th>Performance Criteria</th>
<th>Proposed Funding</th>
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<tr>
<td>construction. Natural recruitment shall be monitored for three years to determine whether eelgrass is naturally recruiting in newly created channels adequately to replace the area of eelgrass lost due to Project impacts. If eelgrass does not establish in an area equal to or greater than that lost due to Project impacts in the first three years, eelgrass shall be actively planted to offset any lack of natural recruitment, using the most current scientific methods and following NMFS guidance. If CDFW requires propagation or transplantation, scientifically sound genetic management guidelines and protocols for rare plants shall be applied.</td>
<td>Applicant CDFW/ CCC</td>
<td>Post-construction</td>
<td>Annually for 10 years and post-construction</td>
<td>No performance criteria for restored tidal wetlands or dune mat</td>
<td>Applicant</td>
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<tr>
<td>Monitoring Measure</td>
<td>Individual Responsible for Monitoring and/or Reporting</td>
<td>Individual or Organization Responsible for Verifying Compliance</td>
<td>Timing of Initial Action</td>
<td>Frequency and/or Duration of Monitoring</td>
<td>Performance Criteria</td>
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<tr>
<td><strong>BIO-3b</strong> Mitigate Impacts to Sensitive Listed Habitats Through Control of Invasive Species.</td>
<td>Applicant</td>
<td>CDFW/ CCC</td>
<td>Pre-construction and pre-operation</td>
<td>Pre-construction through construction; and 10 years operation post-construction</td>
<td>Success criteria achieved</td>
<td>Applicant</td>
</tr>
<tr>
<td>In order to reduce the likelihood of dense-flowered cordgrass (Spartina) colonizing restored tidal marsh, existing populations in and adjacent to (north of the tidegates) the Project footprint shall be controlled prior to construction using manual, mechanical, and/or approved chemical methods, and in compliance with appropriate methods analyzed and disclosed in the Regional Invasive Spartina Management Plan and the associated EIR. During the operation period of the Project (10 year maintenance under the adaptive management plan), removal of cordgrass would be conducted under the authority of the Regional Invasive Spartina Management Plan and the associated EIR. Colonization of the Inner Marsh and other portions of the Project footprint by cordgrass will be controlled in collaboration with the region-wide eradication program.</td>
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<td>Invasive weed removal shall be conducted as part of Project maintenance. Weed removal techniques may include manual, mechanical, and/or approved chemical means (including mowing, cutting, pulling, grinding, and/or excavation and burial) as discussed in the adaptive management plan and as approved by jurisdictional agencies.</td>
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<td>Heavy equipment would be required to be cleaned and weed-free before entering the site.</td>
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<td><strong>BIO-4</strong> Mitigate Temporary and Short-term Impacts to Sensitive Habitats Including Wetlands Through Construction Minimization and Avoidance Measures.</td>
<td>Applicant</td>
<td>USACE/ CCC</td>
<td>Pre-construction</td>
<td>Pre-construction through construction and post-construction for five years</td>
<td>Agency standards</td>
<td>Applicant</td>
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<td>• The locations of sensitive habitats including wetlands to be avoided shall be clearly identified in the contract documents (plans and specifications).</td>
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<td>Monitoring Measure</td>
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<td>• Before clearing and grubbing commences, disturbance areas shall be flagged to clearly define the limits of the work area. These areas shall be clearly identified on the contract documents (plans and specifications).</td>
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<td>• Selected contractors shall sign a document stating that they have read, understand, and agree to the required resource avoidance measures, and shall have construction/maintenance crews participate in a training session on sensitive resources.</td>
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<td>• A qualified biologist shall be on-site to observe activities as appropriate when construction or maintenance in or adjacent to sensitive habitat including wetlands occurs. Site disturbance shall be minimized to the greatest extent feasible by using existing disturbed areas for access roads and staging areas, and concentrating the area of disturbance associated with restoration actions within the minimum space(s) necessary to complete the Project. Where feasible, temporary measures for access or construction, such as the use of temporary tracks or pads, shall be used to minimize impacts. Revegetation activities shall take place at seasonally appropriate times based on habitat types, and as soon as feasible following habitat disturbance, to restore disturbed areas to pre-Project conditions or better.</td>
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<td>• There would be no net loss of jurisdictional wetlands. Any permanent fill in wetlands would be compensated through in-kind re-establishment or enhancement of wetlands at a ratio determined by use of the USACE SPD Mitigation Ratio Checklist and the California Coastal Commission.</td>
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### 3.5 Cultural Resources

**CR-1 Disturbance of Undiscovered Cultural Resources.**
During the course of ground-disturbing activities associated with Project implementation, if any cultural resources are discovered, work shall be halted immediately within 66 feet of the site disturbance area.
of the discovery, and the Humboldt County Planning Department shall be immediately notified. At that time, the county will coordinate any necessary investigation and evaluation of the discovery with a qualified archaeologist. If the archaeological resources are Native American, representatives of the appropriate culturally affiliated tribe shall also be enlisted to help evaluate the find and suggest appropriate treatment.

The county shall consult with the archaeologist and agree upon implementation of treatment of the resources that is deemed appropriate and feasible. Such treatment may include avoidance, curation, documentation, excavation, preservation in place, or other appropriate measures.

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<tr>
<th>Monitoring Measure</th>
<th>Individual Responsible for Monitoring and/or Reporting</th>
<th>Individual or Organization Responsible for Verifying Compliance</th>
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<th>Proposed Funding</th>
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<tbody>
<tr>
<td><strong>CR-2 Potential Disturbance of Undiscovered Paleontological Resources.</strong></td>
<td>Applicant</td>
<td>Humboldt County Planning and Building Department</td>
<td>During construction</td>
<td>Throughout construction</td>
<td>County standards</td>
<td>Applicant</td>
</tr>
<tr>
<td>During the course of ground-disturbing activities associated with Project implementation, if any paleontological resources are discovered, work shall be halted immediately within 66 feet of the discovery, and the Humboldt County Planning Department shall be immediately notified. At that time, the county will coordinate any necessary investigation of the discovery with a qualified paleontologist. The county shall consider the mitigation recommendations of the qualified paleontologist for any unanticipated discoveries of paleontological resources. The county shall consult with the paleontologist and agree upon implementation of a measure(s) that are deemed appropriate and feasible. Such mitigation measures may include avoidance, curation, documentation, excavation, preservation in place, or other appropriate measures.</td>
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<td><strong>CR-3 Potential to Uncover Human Remains.</strong></td>
<td>Applicant</td>
<td>Humboldt County Coroner</td>
<td>During construction</td>
<td>Continuously during construction</td>
<td>State standards</td>
<td>Applicant</td>
</tr>
<tr>
<td>If construction activities result in the discovery of human remains during ground disturbing activities, in accordance with California Health and Safety Code Section 7050.5, no further disturbance shall occur until the Coroner has made</td>
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<tr>
<td>Monitoring Measure</td>
<td>Individual Responsible for Monitoring and/or Reporting</td>
<td>Individual or Organization Responsible for Verifying Compliance</td>
<td>Timing of Initial Action</td>
<td>Frequency and/or Duration of Monitoring</td>
<td>Performance Criteria</td>
<td>Proposed Funding</td>
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<td>a determination of origin and disposition pursuant to PRC Section 5097.98. The Coroner shall be notified of the find immediately. If the human remains are determined to be prehistoric, the Coroner shall notify the NAHC, which shall determine and notify a Most Likely Descendant. The Most Likely Descendant shall complete the inspection of the site within 48 hours of notification and may recommend scientific removal and non-destructive analysis of human remains and items associated with Native American burials.</td>
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</tr>
<tr>
<td>3.6 GEO-1 Geology and Soils Implement Recommendations in the Geotechnical Report. The California State Coastal Conservancy shall ensure that the Project is designed to comply with the recommendations in the Project’s Geotechnical Report (LACO 2016) to ensure seismic stability and adherence to the CBC. The geotechnical recommendations are proposed to be incorporated in the final plans and specifications and implemented during construction. Professional inspection by a qualified engineer or geologist of foundation and excavation, earthwork and other geotechnical aspects of site development shall be performed during construction in accordance with the current version of the CBC.</td>
<td>Applicant</td>
<td>Humboldt County Planning and Building Department</td>
<td>Pre-construction</td>
<td>During construction</td>
<td>County/ State standards</td>
<td>Applicant</td>
</tr>
<tr>
<td>3.9 HWQ-1a Hydrology and Water Quality Manage Construction Storm Water. The Project and operations shall obtain coverage under State Water Resources Control Board Order No. 2009-0009-DWQ, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities, as amended by Order No. 2012-0006. In compliance with the NPDES requirements, a Notice of Intent (NOI) shall be prepared and submitted to the NCRWQCB, providing notification and intent to comply with the State of California General Permit.</td>
<td>Applicant</td>
<td>Humboldt County Planning and Building Department/ NCRWQCB</td>
<td>Pre-construction</td>
<td>Pre-construction through construction</td>
<td>County/ NCRWQCB standards</td>
<td>Applicant</td>
</tr>
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</table>
In addition, a Construction Storm Water Pollution Prevention Plan (SWPPP) would be prepared for pollution prevention and control prior to initiating site construction activities. The Construction SWPPP shall identify and specify the use of erosion sediment control BMPs for control of pollutants in stormwater runoff during construction related activities, and would be designed to address water erosion control, sediment control, off-site tracking control, wind erosion control, non-stormwater management control, and waste management and materials pollution control. A sampling and monitoring program shall be included in the Construction SWPPP that meets the requirements of the NCRWQCB to ensure the BMPs are effective. A Qualified Storm Water Pollution Prevention Plan Practitioner shall oversee implementation of the Plan, including visual inspections, sampling and analysis, and ensuring overall compliance.

The operations associated with the adaptive management plan include but not limited to activities associated with sediment management and channel maintenance are not anticipated to require preparation and implementation of a SWPPP as per section I (C) of Order No. 2009-0009 DWQ which lists activities that are not covered under the general permit: (24) Routine maintenance to maintain the original line and grade, hydraulic capacity, or original purpose of the facility and (25) Disturbance to land surfaces solely related to agricultural operations such as disking, harrowing, terracing and levelling and soil preparation.

**HWQ-1b Implement Contractor Training for Protection of Water Quality.**
All contractors that would be performing demolition, construction, grading, operations or other work that could cause increased water pollution conditions at the site (e.g., dispersal of soils) shall receive training regarding the environmental sensitivity of the site and need to minimize impacts. Contractors also shall be trained in

<table>
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<tr>
<th>Monitoring Measure</th>
<th>Individual Responsible for Monitoring and/or Reporting</th>
<th>Individual or Organization Responsible for Verifying Compliance</th>
<th>Timing of Initial Action</th>
<th>Frequency and/or Duration of Monitoring</th>
<th>Performance Criteria</th>
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<td>Humboldt County Planning and Building Department</td>
<td>Pre-construction</td>
<td>Pre-construction through construction</td>
<td>County standards</td>
<td>Applicant</td>
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### Monitoring Measure

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<th>Monitoring Measure Details</th>
<th>Individual Responsible for Monitoring and/or Reporting</th>
<th>Individual or Organization Responsible for Verifying Compliance</th>
<th>Timing of Initial Action</th>
<th>Frequency and/or Duration of Monitoring</th>
<th>Performance Criteria</th>
<th>Proposed Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWQ-1c</td>
<td>In-Stream Erosion and Water Quality Control Measures during Channel Excavation and Operations. In instances where excavation occurs in an effort to widen/deepen Project channels and ditches, in-stream erosion and turbidity control measures shall be implemented. These measures include installation and maintenance of in-stream turbidity curtains, cofferdams and silt-fence along channel banks as specified in Project designs, specifications and erosion control plans.</td>
<td>Applicant</td>
<td>Humboldt County Planning and Building Department</td>
<td>During construction</td>
<td>Throughout construction</td>
<td>County standards</td>
<td>Applicant</td>
</tr>
<tr>
<td>HWQ-3</td>
<td>Implement Erosion and Water Quality Monitoring, Maintenance and Adaptive Management Plan. The long-term erosion monitoring of on-site channels would routinely screen the Project for areas experiencing excessive erosion leading to degraded water quality. Maintenance and adaptive management strategies are contained in the plan to stabilize areas experiencing excessive erosion.</td>
<td>Applicant</td>
<td>Humboldt County Planning and Building Department</td>
<td>Post-construction</td>
<td>Pre-construction per AMP</td>
<td>County standards</td>
<td>Applicant</td>
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</tbody>
</table>
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Exhibit 5: Mitigation Monitoring and Reporting Program and Adaptive Management Plan
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1. Introduction

1.1 Purpose of this Report

Operations and maintenance, adaptive management, and mitigation monitoring are facets of work that will begin upon completion of the Eel River Estuary Project’s core construction work. Some aspects of these activities are interrelated, nested, or dependent upon each other, yet they belong to fundamentally distinct categories of action. For this reason, they are presented as a single document composed of discrete sections: Water Levels Management, Habitat Mitigation and Monitoring, and the Adaptive Management Plan.

The Water Level Management Plan (WLMP) outlines the observations and operational activities that primarily determine the operating water levels within the Eel River Estuary Preserve. The Habitat Mitigation and Monitoring Program (HMMP) describes required mitigation measures and monitoring protocols to ensure that any habitat impacts or impacts to special status species are adequately mitigated. The specifics of the Habitat Mitigation and Monitoring Program will cover requirements of the Army Corps of Engineers (Section 404 Permits) and the Regional Water Quality Control Board (Section 401 Permit) for wetland dredge and fill, the Coastal Commission for impacts related to the Coastal Act, the California Department of Fish and Wildlife, the United States Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration- Fisheries for impacts to species under their jurisdictions. The construction documents and implementation plans for the Eel River Estuary Project are developed with professional standards of care and are expected to perform to achieve the project’s main goals. Regardless, once construction is completed, field conditions may arise that threaten the performance of project features or would result in short comings of the project goals. The Adaptive Management Plan (AMP) has been developed to anticipate potential changes and prescribe pre-permitted interventions allowing The Wildlands Conservancy to take action as needed. Some issues may arise that go beyond the scope of the Adaptive Management Plan. These would need to be addressed through regular permitting procedures. This Adaptive Management Plan is not to be confused with the Adaptive Management section of the HMMP, while they are compatible, the Adaptive Management section in the HMMP only covers the mitigated habitats through the period the habitats achieve the defined success criteria. The Adaptive Management Plan covers areas beyond these mitigation habitats.

This suite of Plans, presented here as the EEL RIVER ESTUARY PRESERVE MANAGEMENT PLANS (EMP), will be submitted to the permitting resource agencies, for permitting of The Wildlands Conservancy portion of the project (and not the Russ Properties portion). The following flowchart depicts the EMP framework and is subject to renewal 10 years following permit issuance. The plan seeks to combine both complex regulatory requirements and relatively simple, directed tasks for field staff in one document. A successful plan must have legibility in the field, yet adequately demonstrate compliance with state and federal environmental regulations. It is desirable to achieve these together in order to prevent confusion in translation and ensure that regulatory agencies have the fullest understanding of how information is conveyed in the field. It is the expectation that this document achieves both.
1.2 Scope and Limitations

Each section, a plan in its own right, is developed to cover specific aspects of managing the Eel River Estuary Preserve. Each plan is limited in scope to the specific aspect of management represented. While every attempt is made to be comprehensive in scope, every possible condition or need cannot be foreseen. Additionally, costs related to management cannot be foreseen.

1.3 Responsible Parties

The Wildlands Conservancy is the owner and manager of the EREP and will oversee implementation of the EMP.
## EREP Project Participants

The California Coastal Conservancy is the lead agency under the California Environmental Quality Act (CEQA). The California Coastal Conservancy and the California Department of Fish and Wildlife are the funders for project planning. Neighbors such as the Russ and the O’Rourke Foundation (ORF) Properties have been consulted through the design process. While the Russ property has been included in the Eel River Estuary Preserve Management Plan (EMP) Water Level Management Plan (WLMP) Habitat Mitigation & Monitoring Plan (HMMP) Adaptive Management Plan (AMP)

### Water Level Management Plan (WLMP)

**PURPOSE:** Defines operations and maintenance of water control structures

**ACTION:** Specific routine actions that are necessary to meet hydrologic-related goals and the drainage easement intent

**DURATION:** Service life of project components and/or drainage easement

### Habitat Mitigation & Monitoring Plan (HMMP)

**PURPOSE:** Obtain post-implementation approval for impacted wetlands and sensitive species habitat

**ACTION:** Routine monitoring/reporting to regulatory agencies

**DURATION:** Conducted until success criteria achieved (typically <10 years)

### Adaptive Management Plan (AMP)

**PURPOSE:** Defines specific monitoring and management activities that support overall achievement of project goals not already covered in WLMP and HMMP

**ACTION:** Routine monitoring to inform management activities

**DURATION:** Through achievement of project goals and/or service life of project components

### Exhibit 5: Mitigation Monitoring and Reporting Program and Adaptive Management Plan
CEQA scoping and analysis process, the project components for which this EMP applies to are located on the EREP only and therefore TWC will oversee the implementation of this plan. Given some EREP project components may necessitate an amendment to the existing drainage easement, the WLMP provides a decision making framework for water level management inclusive of the Russ and ORF properties.

1.5 **Drainage Easement**

A formal drainage easement burdening the EREP with TWC and ORF as grantors and Russ properties as Grantees also influences land management options. A complex system of dikes, tidegates and drainage ditches enable multiple land managers to operate successful agricultural operations both on and upstream of the EREP, on what was historically tidal marsh. Since the area generally declines in elevation as one moves from south to north, drainage moves roughly northward across numerous properties, including through EREP. The mutual interdependence of landowners upon this infrastructure is formally expressed in a drainage easement. The drainage easement was recorded October 20, 2008, shortly after the purchase of the Connick Ranch by TWC. In general, this easement allows the grantees (various Russ property owners, collectively “Russ”) to enter and perform certain drainage maintenance functions on the EREP and ORF property, to the extent that these are legally permissible. Key actions include removal of sand and sediment from the Western Drainage Ditch when it becomes clogged, and maintenance of the Cut-Off Slough tidegate and perimeter dike in order to facilitate drainage when conditions in the Eel River estuary permit and as environmental regulations allow.

The easement is restrictive and dictates maintenance conditions for a hydraulic system that is overwhelmed by the dynamic nature of the area. Sand and silt may be removed from the Western Drainage Ditch from time to time due to wave overwash or avulsion events, respectively, but sand must be placed to the west of the easement, and silt to the east. Grantees are not allowed to increase the width of the 5-10 foot wide ditch (once historic Centerville Slough) through the course of these maintenance activities. In effect, the easement preserves the ability to exercise a minimal level of emergency maintenance.

The Project components proposed on EREP are in part intended to improve aquatic habitat access while not impacting drainage on adjoining properties. Once finalization of the design and prior to construction, it is understood the drainage easement may be amended.

1.6 **Regulatory Agency Review**

This plan has been developed with input from multiple resource and regulatory agencies. Table 1-1 summarizes the permit approvals for this project.
Table 1-1: Project Permits and Status

<table>
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<tr>
<th>Law/Regulation</th>
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<th>Authority</th>
<th>Status</th>
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<tr>
<td>CEQA</td>
<td>EIR</td>
<td>State Coastal Conservancy/Lead Agency</td>
<td>Draft EIR presented for public comment 9/11/16</td>
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<td>Biological Assessment</td>
<td>US Fish and Wildlife Service, NOAA Fisheries</td>
<td>Application Submitted</td>
<td>3/1/17</td>
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</tbody>
</table>

Exhibit 5: Mitigation Monitoring and Reporting Program and Adaptive Management Plan
2. **EREP Project Description**

2.1 **Setting and Location**

The EREP Project area is approximately 1,200-acres and is located approximately four miles west of the City of Ferndale, in Humboldt County, California (Figure 1). Figure 2 shows existing components within the Project area. The Project area includes the EREP owned by TWC. The Project area includes the following APN’s: 10012105, 10013104, 10014201, 10013103, 10012104, 10012101, and 10014301.

The west side of the Project encompasses the near shore dunes of Centerville Beach and extends to the Pacific Ocean. East of the dunes the Project supports a system of sloughs and pastures that comprise a portion of the Salt River watershed, itself a tributary to the Eel River estuary. The north property line borders the Eel River. The southern half of the Project area includes two perennial, tributary streams: Russ Creek and a seasonal drainage referred to as Creamery Ditch.

Much of the Project area east of and including former Centerville Slough was reclaimed and has been converted to pasture for cattle grazing. Some of this land represents diked former tidelands separated from the estuarine wetlands by a series of dikes and the Cut-Off Slough tidegates. The project area along with three neighboring landholdings comprise an historic reclamation district that operated with a largely unified vision of managing tidal inundation, as well as the Eel River and Wildcat Hill stream floodwaters.\(^1\)

EREP includes agricultural (grazing) land, tidal salt marsh, brackish marsh, riparian scrub, sloughs/open water channels, freshwater ponds and ditches, and nearshore dune ridges and swales. A partially developed upland area occupies the eastern portion of the Project, where vehicular access is gained from Russ Lane. Few structures occur on site, but there two barns within the upland area near Russ Lane (referred to as the Potato Barn and Quonset Hut); a third barn (North Barn) located between Cut-Off Slough and the near shore dunes, approximately midway between the north and south property lines of the EREP; and a fourth barn (South Barn) located in the southwest corner of the EREP. The North and South barns are connected by unimproved roads to the Potato Barn at the Project entrance. The Potato Barn includes a ranch office, and storage for agricultural equipment. Watering troughs and extensive fencing occur throughout the central and southern portion of the Project area.

The climate is Mediterranean with precipitation most abundant in the winter months. The average annual rainfall is approximately 48.5 inches. Approximately two thirds of the year, the area is influenced by coastal fog. Prominent water features within the Project area include Russ Creek, remnant Centerville Slough, Cut-Off Slough, and the Western Drainage Ditch (which in turn conveys the flow of Shaw Creek and Creamery Ditch), as well as smaller (seasonal) slough channels and drainage ditches. The northern end of the Project area borders the mouth of the Eel River. The Project area ranges in elevation from below sea level to an approximate elevation of 30 feet. Unless noted otherwise, all elevations presented in this Project description are referenced to North American Vertical Datum 1988 (NAVD-88).

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\(^1\) This delicate balancing of conflicting forces was achieved by storing floodwaters from the Wildcat Hills to the south behind a system of levees and tidegates, and then draining that stored water northward (primarily through the Cut-Off Slough tidegate) when low tide conditions in the Eel River estuary permitted. The proposed Project adheres to this approach. Therefore, ensuring that the proposed Project does not diminish the flood storage capacity within the system of dikes is a fundamental design criterion for the Project.
Humboldt County General Plan Land Use designation for the Project area is Agriculture Exclusive (AE). Primary uses in AE designated lands include the production of food, fiber, plants, timber, timber agriculturally related uses, and agriculture related recreational uses. Zoning for the Project area is AE-60/W, F, R, T, which means parcel sizes with a minimum of 60 acres and combining zones of coastal wetlands, flood hazard areas, streams and riparian corridor protection, and transitional agricultural lands.

A formal drainage easement burdening the EREP with TWC and the Bertha Russ Lytel Foundation (now O’Rourke Foundation, or “ORF”) as grantors also influences land management options in the Project area. Within the Project area, a complex system of dikes, tidegates and drainage ditches enable multiple land managers to operate successful agricultural operations on what was historically tidal marsh. Since the area generally declines in elevation as one moves from south to north, drainage moves roughly northward across numerous properties. The mutual inter-dependence of landowners in the Project area upon this infrastructure is formally expressed in a drainage easement. The drainage easement was recorded October 20, 2008, shortly after the purchase of the Connick Ranch by TWC. In general, this easement allows the grantees (various Russ property owners, collectively “Russ”) to enter and perform certain drainage maintenance functions on the EREP and ORF property, to the extent that these are legally permissible. Key actions include removal of sand and sediment from the Western Drainage Ditch when it becomes clogged, and maintenance of the Cut-Off Slough tidegate and perimeter dike in order to facilitate drainage when conditions in the Eel River estuary permit and as environmental regulations allow.

The easement is restrictive and dictates maintenance conditions for a hydraulic system that is overwhelmed by the dynamic nature of the Project area, located as it is at the mouth of California’s third largest river system. Sand and silt may be removed from the Western Drainage Ditch from time to time based on wave overwash or avulsion events, respectively, but sand must be placed to the west of the easement, and silt to the east. Grantees are not allowed to increase the width of the 5-10 foot wide ditch (once historic Centerville Slough) through the course of these maintenance activities. In effect, the easement preserves the ability to exercise a minimal level of emergency maintenance.

2.2 Existing Biological Conditions

The presence of listed species in this area requires production of a biological assessment (BA) and incidental take permit (ITP) application. The BA and ITP evaluate the effects of the proposed project on these species in consultation with the U.S. Fish & Wildlife Service (USFWS), National Marine Fisheries Service (NMFS) and California Department of Fish & Wildlife (CDFW), and to achieve compliance with State and Federal Endangered Species Act (CESA and ESA). The existing environmental baseline is described in detail in the BA and ITP Application.

2.3 Project Goals and Objectives

The overall goal of the Project is to improve geomorphic and ecosystem functions that would enhance habitat for native fisheries and aquatic species, support waterfowl and wildlife species, and benefit agricultural land management by more effectively managing onsite flooding and sedimentation.

Specific objectives of the Project include:

- Improve access to restored aquatic habitats for salmonids and other aquatic dependent species by increasing or creating migratory access between estuarine and inland waters and by restoring overwintering and rearing habitat for juvenile salmonids
• Improve drainage efficiency and manage sediment loads more effectively using both passive natural processes and active management approaches, while enhancing tidal influences by reestablishing connectivity of Russ Creek, Shaw Creek and Creamery Ditch to a rehabilitated Centerville Slough
• Increasing resiliency to sea level rise and reducing salt water influences to pastures, enhancing drainage and establishing avulsion management areas for Russ Creek and Shaw Creek
• Enhance tidal processes by restoring tidal prism and improve reliability of tidegate infrastructure to provide adaptability for sea level rise and varied land management
• Enhance dune formation to increase resiliency to sea level rise
• Enhance freshwater pond habitat for waterbirds and other native aquatic dependent species
• Facilitate access for continued passive and active agricultural land management, and nature study opportunities consistent with existing conditions
• Suppress invasive species
• Establish long-term Operations, Maintenance and Adaptive Management Program.

Each component has a pivotal role in the success and long-term benefit of the project. Restoration objectives, outlined below, have been established for each project component in an effort to achieve the overall project goals. The proposed project was developed in close coordination with the neighboring property owners, U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), U.S. Army Corps of Engineers (USACE), California Coastal Commission (CCC), and other Local/State/Federal regulatory agencies. In addition, the County of Humboldt, State Coastal Conservancy, landowners, and others have played an important role in assisting TWC develop the project. The longevity of this project depends upon the successful restoration of natural ecological processes and the frequency and nature of maintenance activities, but will be heavily influenced by uncontrollable natural events within this highly altered and geologically unstable watershed.

2.4 Project Overview

The proposed activities would enhance the Project area by transitioning it from a landscape of mostly diked pasture land to a system of pastures and natural habitats including estuarine and tidal slough channels, freshwater streams, freshwater fowl ponds, and agricultural pastures. Critical to achieving this are: an enhancement in tidal exchange to reactivate wetland functions within the Inner Marsh and Centerville Slough; establishment of active sediment management areas; dune enhancement; and the creation of setback berms.

New muted-tidegates would be designed and installed in existing levees to re-introduce tidal prism into the Inner Marsh and Centerville Slough, enabling tidewaters to re-occupy historic tidal slough channels that have persisted despite former reclamation efforts, floods and significant tectonic activity. This would enhance aquatic organism passage from the Eel River to Centerville Slough, Shaw Creek and Russ Creek, while improving drainage efficiency. Additionally, repairing the existing tidegate structure on Cut-Off Slough through modification of the existing gates would increase infrastructural reliability and drainage efficiency, and provide an opportunity to restore fish passage into Cut-Off Slough.
Realignment and geomorphic restoration of Centerville Slough, Russ Creek and Shaw Creek is expected to support the introduction of overwintering juvenile salmonids, waterbird habitat and drainage from the landscape, and maintain an existing drainage easement. Improved drainage and habitat conditions would be established along Russ Creek.

It is acknowledged that the formal establishment of sediment management areas presumes future passive and active management, maintenance and long-term commitment to land management goals. This is particularly true in the absence of full historic tidal and floodplain functions, which historically maintained the area in equilibrium. Just as it was necessary and actively pursued prior to the development of the proposed Project, so, too, would such work be necessary in the future. The key difference is that the work would be geographically prescribed, permitted, and, presumably, more predictable and cost effective and consistent with long-term goals of naturally elevating low lying floodplain areas in advance of sea level rise. This effort is necessary to maintain agricultural viability, agricultural land management, capacity and uses, and ecological function. Similarly, management of the flattened (breached) dune regions would include actions to protect an existing drainage ditch and agricultural resources, agricultural land management, capacity and uses, while furthering science and projects relating to passive and active dune enhancement and climate change vulnerability. As a retreat strategy to reduce agricultural land vulnerability from sea level rise, the proposed placement of set-back berms would provide increased resiliency.

The longevity of Project benefits depends upon the successful restoration of some natural ecological processes and the frequency and nature of maintenance activities. As a result, this Project would include an Adaptive Management Plan (AMP) to provide a feedback mechanism for management responses based on scientific monitoring.

### 2.5 Project Components

The project proposed in the CEQA document includes the EREP owned by TWC and various parcels owned by Russ Ranch and Timber, L,L.C, and Jack and Linda Russ. A phased implementation is proposed over multiple years, generally progressing from the north to the south. As such, the first phase will include implementation of project components on EREP and therefore the following project description and permit applications have been developed for the EREP only. Regulatory approvals for the Russ property components will be subsequently obtained. While the approvals and implementation timeframe for the Russ components is less defined, the proposed project in the CEQA document demonstrated the project components could be implemented and mitigated for independently between the properties. Figure 3 illustrates the proposed EREP Project components that are described in further detail below. The projected habitats for the Project are described in the HMMP.

#### 2.5.1 Retrofit Existing Cut-Off Slough Tidegates

The existing tidal control structure in Cut-Off Slough provides the only anthropogenic conduit of drainage from the Project area into the Eel River. The structure is equipped with six top-hinge tidegates that leak and limit aquatic organism passage to/from the Eel River. The dike system and original tidal control structures were built as part of the original filed 1884 Reclamation District. The dike is approximately two miles in length and includes the aforementioned tidegate. This system protects an estimated 2,000 acres of agricultural lands. The system was built and has been maintained collectively primarily by the following entities or individuals: 1) Fern Cottage, Inc., 2) Russ Ranch and Timber Co., LLC, 3) The L.D. O’Rourke Foundation, 4) L and K Russ; 5) Connick Ranch, and; 6) The Wildlands Conservancy. An existing
drainage easement, described above, provides surrounding landowners with a right of access over the EREP for the purposes of maintaining drainage for the EREP and surrounding properties, to the extent allowed by law. The WLMP section of this report includes the proposed operations of the tidegates and may result in the revision of the current drainage easement.

During summer months, the average water surface elevation on the landward side of the tidegates is approximately 2.5 feet (NAVD-88) and sustained by groundwater influences, occasional dune over-wash, and tidegate leakage. During winter months periods of prolonged inundation and flooding occur upstream of the tidegate as the backwater influence from the Eel River prevents the gates from opening during low tide cycles and for extended periods of time. The salt tolerant vegetative communities that have established along the banks of Cut-Off Slough upstream of the tidegate structure corroborate the brackish conditions from leakage and groundwater seepage. Overland drainage from adjoining properties is collected in Western Drainage Ditch and Cut-Off Slough and ultimately drains through the existing Cut-Off Slough tidegates.

Three iterations of the Cut-Off Slough tidegate have blocked tidal exchange into the Project area and facilitated overland drainage from the Project area since the late nineteenth century. The existing concrete Cut-Off Slough tidegate structure was constructed in 1977 on the landward side of the existing earthen dike immediately west of the former tidegate structure. The construction included excavating new connector sloughs, re-contouring the existing dike with the spoil material and demolishing/burying the former tidegate built circa 1916, which in turn replaced a structure built in the 1870s. Based on review of the current tidegate construction plans and current visual observations during low tides, the exterior wall upon which the gates are attached appears in good condition with no apparent distress or visual cracking, apart from the seaward side wingwalls, which are cracked, with a major crack on the western wall. The wingwall crack has no impact on the proposed gate modifications and continued failure of the wall does not impose a threat to the overall structure, though it could result in localized dike erosion. The wood gates appeared degraded and leakage between the weathered concrete and wood is apparent through each of the six gates.

The Cut-Off Slough tidegate structure would be repaired to serve its original purpose with modified gates that would improve fish passage without significantly altering water quality and water level relative to existing conditions. The project does not propose to increase hydraulic capacity at this structure, however proposed repairs there will likely improve gate efficiency. The Project proposes to improve aquatic passage, and not adversely impact existing hydraulic conditions upstream. Repaired tidegates and/or auxiliary fish passage doors inserted into the existing structure would allow for improved, but managed, tidal function and improved drainage efficiency in Cut-Off Slough and adjoining properties, while also providing fish passage and complying with state and federal law.

The repaired or replaced gates would be steel or aluminum, side- and/or top hinged designed to meet specific hydraulic performance and installed by a gate manufacturer to the existing concrete wall with a new thimble seal. To reduce costs and minimize abrupt hydraulic changes gates may be installed or replaced individually over several years. Continued water level and water quality monitoring outlined in the WLMP would help inform the timing of replacement. The wingwall cracking would be repaired and an approximate 3-foot tall concrete parapet wall would be added to the front wall of the structure to reduce flood overtopping to an elevation equal to the adjoining perimeter dike (approximately 15-feet, NAVD-88). Additionally, rock slope protection would be placed near the existing wingwalls and over areas exhibiting active erosion.
2.5.2 Install New Muted Tidegates to Expand Tidal Prism in Inner Marsh and Centerville Slough

Referred to as the Inner Marsh, this area is surrounded on its northern, eastern, and southern boundaries by a dike of varying elevations. Natural dunes form the western boundary. The area is hydraulically connected with culverts to Centerville Slough and Cut-Off Slough on the landward side of the Cut-Off Slough tidegate. The perimeter dike provides a setting for expanding tidal wetland habitat without threatening adjacent land uses. To achieve this, tidal access would be modified to reintroduce tidal exchange at a muted level.

To increase and improve tidal wetland and salmonid rearing habitat, tidal exchange would be reintroduced to the Inner Marsh and reestablished Centerville Slough and allow for future tidal connectivity on the Russ properties as part of the subsequent phase described in the CEQA document proposed project. A new tidegate structure connecting the Inner Marsh to Cut-Off Slough would be installed through the existing dike immediately west (outboard) and separate from the existing Cut-Off Slough tidegate structure. This new tidegate will likely have multiple gates (three or four) including a muted tidegate regulator (MTR). Strategic design and sizing of these new tidegates would restrict tidal exchange to the Inner Marsh such that tidally-controlled water levels would not raise above 2.5 feet in elevation during the winter months and 5 feet during the summer months. The new tidegate structure would be approximately 75 feet long by 100 feet wide and 20 feet tall. The WLMP includes specific tidegate settings and seasonal operation guidelines to meet the desired hydraulic conditions for the area. The existing interior Inner Marsh dike would be raised to a minimum 8.0 feet elevation, widened in discrete areas and resurfaced with gravel to improve access reliability for operation and maintenance needs. Existing failed culverts that connect the Inner Marsh to Cut-Off Slough would be removed and the dike repaired in these locations. Additionally, a reestablished Centerville Slough would be realigned into the Inner Marsh to prevent tidal flooding into Cut-Off Slough and adjoining properties.

A significant constraint associated with introduction of the muted tide above the existing average groundwater surface elevation of 2.5 feet to the Inner Marsh and reestablished Centerville Slough is the loss of flood storage capacity of the surrounding and interconnected Project area. Avoiding diminished storage capacity is a design constraint for the Project. Any reduction of flood storage above an elevation of 2.5 feet would be ameliorated through excavation of an equivalent or greater volume of sediment above 2.5 feet elevation in the reestablished Centerville Slough and implementing a seasonal operation regime for the MTR. The seasonal operation approach would involve managing tidal exchange differently based primarily on precipitation patterns that influence Eel River and Russ Creek flows. During the summer dry season, when management of floodwaters is irrelevant, the MTR would allow for a tidal amplitude up to 5.0 feet elevation. During the winter wet season, and in advance of anticipated storm events, the MTR would be adjusted to reduce tidal inflow to a maximum of 2.5 feet elevation. This reduction in tidal inflow would retain the Inner Marsh and reestablished Centerville Slough capacity to provide freshwater storage from Russ Creek runoff similar to how it now functions. The combined balance of the excavation volume and/or seasonal operation flexibility is intended to result in no net loss of available freshwater runoff storage volume during winter months relative to existing conditions, while also improving the overall hydraulic function and drainage within the Project area.

The MTR would be seasonally operated based on biologic, geomorphic, hydrologic and land use objectives with routine monitoring to inform operational scenarios. The WLMP explains floodwater management strategies, and details the proposed operations of the proposed infrastructure.
Existing culverts connecting the Inner Marsh with Cut-Off Slough and Centerville Slough would be retrofitted with flap gates to allow one-way flow into the Inner Marsh, equipped with seasonally operated gates, or be removed and any remaining holes within the berm would be repaired. This would maintain the existing level of variation in tide flow elevations between the Inner Marsh and Cut-Off Slough.

The existing network of sloughs and terminal ponds within the Inner Marsh would provide sub- and inter-tidal habitats. A number of new small terminal ponds, earthen weirs, side channels and wood structures would be integrated into the final design to improve upon and diversify the existing channel network complexity providing low energy perennial ponding areas that emulate desirable habitat structure for the tidewater goby and juvenile salmonids. The majority of the internal slough channels will be constructed to provide adequate water depths and conditions for expansion by native eelgrass, which currently occurs in low abundance in existing channels.

Because the existing marsh plain elevations within the Inner Marsh are relatively low (3 to 5-feet), a mosaic of mudflat, low-, mid- and high-marsh habitats are anticipated to develop once the muted tidal exchange is introduced. Subtidal habitats will be restricted to the slough channels. Elevations to accommodate upland ecotone habitat will be maintained around the perimeter of the restored marsh providing a gradual gradient from the marsh plain to the top of berm. Historically, tidal wetlands transitioned into upland zones over very broad areas. As development and agricultural practices reclaimed these areas, those transition zones were lost. Most of the tidal wetlands in the Eel River estuary abut levees and then abruptly transition to grazing lands. These unique marsh-associated transitional habitats are critical components of tidal wetlands.

Based on monitoring and modeling data, the Inner Marsh and Centerville Slough are anticipated to experience very low salinity through the rainy season, transitioning through brackish conditions and into high/marine salinities by early summer through late fall, mirroring the salinity signature and seasonal cycle of the Eel River estuary. A mix of salt and brackish marsh vegetation will naturally recruit and colonize the Inner Marsh based on seasonal inundation and salinity patterns, similar to the naturally recruited vegetation colonizing Cut-off Slough.

2.5.3 Re-establish Centerville Slough and Restore Connectivity to Russ and Shaw Creek

Historically, Centerville Slough extended from its confluence with the Salt River, through present day O’Rourke Foundation property, south from Cut-Off Slough, parallel to the dune network all the way to the community of Centerville at the base of the Wildcat Mountains. Tidetage installation and the associated reduction in the tidal prism, coupled with reclamation and actively directed Russ Creek avulsions, infilled much of this historically navigable slough. The Western Drainage Ditch and Cut-Off Slough are all that remains as remnant drainage features. The Western Drainage Ditch lies in the path of disturbed dunes and is vulnerable to continued dune over wash and sedimentation. Western Drainage Ditch collects dune over wash, Creamery Ditch flow, Shaw Creek flow, and unnamed creek flow originating from the Halley property. Russ Creek once flowed into the Centerville Slough system, and was then directed to Western Drainage Ditch, but now terminates with avulsion and overland sheet flows over existing pastures on the EREP.

Re-establish and Enhance Centerville Slough

In order to increase aquatic habitat and enhance the movement of water and fish/wildlife to the north and south, the Project proposes to restore Centerville Slough by excavating a channel along its historic
alignment. The south end of the proposed Centerville Slough alignment would reconnect to Shaw Creek in the existing Angels Camp area on the Russ property. The northern end would be re-aligned into the Inner Marsh immediately upstream of the existing bridge crossing and become disconnected from Cut-Off Slough. The connectivity with the Inner Marsh would allow for an increase in summer tidal amplitude within Centerville Slough without impacting the neighboring ORF property whose levees have deteriorated to fairly low elevations. A new water control structure and/or earthen berm at or near the existing bridge would prevent high tides during the dry season from entering Cut-Off Slough downstream of the existing bridge; however, during high winter flows from Russ Creek during the winter months, the water control structure or berm would allow overland freshwater flow to be conveyed downstream of the existing bridge occupying available storage in Cut-Off Slough and on adjoining properties similar to existing conditions. As part of the final hydraulic design process a determination for use of a berm or water control structure will be made and details presented on the final design plans. A water control structure would include a channel spanning gate/flashboard structure that would be opened and allow for hydraulic exchange during the wet season (max 2.5 foot tidal exchange) then closed during the dry season to prevent max 5.0 foot tidal exchange from entering the adjoining properties.

Approximately 3,000 feet of Western Drainage Ditch, from the southern dune breech northward, would remain as a remnant side channel to the reestablished Centerville Slough. It would then be reconnected to Centerville Slough on the northern end in an area that would be enhanced for ecological benefit and drainage efficiency. The reestablishment of Centerville Slough would reconnect Russ Creek and, provide conveyance for over wash on properties to the south. In general, Centerville Slough channel has been sized to enable the slough to serve as, conveyance, and brackish aquatic habitat sharing similar tidal amplitudes as the Inner Marsh.

Because Centerville Slough was located further east than the existing Western Drainage Ditch, it would be less susceptible to filling from dune over-wash sand. Material excavated from Centerville Slough would be reused on site to construct any new or refurbished berms or reused in within the Project area. The new slough channel would convey muted tides from the Inner Marsh as well as be the primary water course receiving and conveying runoff from Russ Creek, Shaw Creek and the Creamery Ditch. It would also improve the opportunity for fish passage to the tributary creeks.

**Reconnect Russ Creek to Centerville Slough**

A new channel would be graded that follows an historic Russ Creek alignment to re-establish connectivity with Centerville Slough. The re-established channel would improve site drainage, create in-channel flood storage, re-establish a long tidal to freshwater ecotone and provide a wetland prism that includes freshwater wetland and/or riparian habitat. In addition, the improved Russ Creek channel would provide habitat connectivity for anadromous fish.

**Develop Primary Sediment Management Area (SMA) on Russ Creek**

Over time, sediment inputs to Russ Creek will be reduced by implementing erosion control and sediment trapping practices in the upper watershed. However, to maintain unimpeded flows, sediment conveyance, and improved ecosystem function along the corridor, sediment management will be required.

To accommodate natural flood processes, a sediment management area (SMA) is proposed in an avulsion prone region near the confluence of Russ Creek and Centerville Slough. The SMA will be constructed to emulate a distributary channel network within an alluvial fan by separating existing or
created floodplain and low-lying areas with low-relief berms. Large portions of the SMA will be subject to regular inundation, sedimentation and periodic rerouting of Russ Creek through natural fluvial processes. Accumulated sediment in the SMA could be reworked (leveled or tilled), seeded and irrigated as needed to enhance agricultural productivity in those areas.

In the event the SMA performance is not capable of eliminating undesirable sediment accumulation in Russ Creek and/or Centerville Slough, or if sediment accumulation poses an undesirable threat to property or project performance, excavation may be performed on a small scale within Russ Creek and/or Centerville Slough corridor (excavating specific areas of the channel and SMA). Larger-scale excavation/removal may be necessary as well as breaches in the proposed guide berm to provide additional sedimentation capacity. Routine vegetation maintenance within the SMA will occur during late summer or early fall months when Russ Creek flows are lowest to minimize potential erosion and sediment transport and to minimize impacts to salmonid and wildlife species. Vegetation removal methods are described in the project’s AMP and options include controlled flash grazing, manual removal and mechanical removal.

2.5.4 Enhance Existing and Create New Aquatic Habitat

The lack of tidal connectivity across the Project area has led to infilling and reduced availability of brackish and freshwater ponds for waterfowl and overwintering fish habitat.

**Salmonid and Tidewater Goby Habitat**

The introduction of muted tidal exchange introduces the opportunity to recreate historic on- and off-channel ponds and the associated wetland habitats within the historic back-dune Centerville Slough channel system. Due to the relatively low amplitudes of restored tidal action, recreating brackish marsh will necessitate lowering (excavating) down into the proposed muted tidal range. Brackish marsh/ponds will likely be sighted in relatively low, off-channel lying areas and connected to created project slough channels by excavation of relatively small connector channels. New brackish water ponds for overwintering juvenile salmonids would also be created by deepening other existing depressions in the floodplain of Centerville Slough/Russ Creek. Alcoves, terminal ponds and large wood structures would be established to provide additional habitat benefit.

**Waterbird Ponds**

Existing depressions in the landscape currently serve as freshwater ponds that are managed for waterfowl. These existing freshwater ponds would be deepened and re-configured with controlled inlets/outlets to enhance their habitat value and minimize long term maintenance. Seasonal rainfall would be the primary means of filling the ponds, while existing wellheads would provide backup supply.

New gated culverts and/or earthen berms would be constructed to allow water in the ponds to drain into Centerville Slough and the unnamed remnant slough to the east of the property. Expansion of the ponds and rehabilitation of the source wells are not proposed.

2.5.5 Enhance Dunes

Threats to existing habitat and land uses include; disturbances of coastal dunes, saltwater intrusion, loss of estuary-inland water connectivity, sedimentation of watercourses, subsidence and natural conversion of agricultural pasture, and invasive species.
Sea level rise alters groundwater composition and vegetation communities. As soils become increasingly saline and brackish, salt marsh vegetation would dominate. Periodic dune breaches exacerbate this effect. This is already being observed on the EREP and Russ properties portion of the Project in the historic alignment of Centerville Slough. While some areas within the Project area are targeted for tidal wetland increases, other areas would be preserved for agricultural pasture.

Natural sand dunes are generally self-maintaining; however, their form and dynamics are influenced by vegetation, sediment recruitment, storm/wave strength, geologic changes and other factors. Non-native invasive vegetation such as Ammophila arenaria (European beachgrass) alters dune mobility and shape. Both natural and anthropogenic influences can disturb dune formation. Dunes traditionally migrate, and possess various zones of recruitment that tends to protect the leeward side of the dune system. More recently, significant disturbance has occurred at two distinct locations within the Project area, a northern area approximately 15 acres and a central area approximately 3 acres. The disturbance and movement of this sand unconfined in any remaining dune network threatens the Western Drainage Ditch with infilling, a trend that threatens the safety and land use of the Project area and properties to the south, all of whom are parties to a formal drainage easement over the Project area. This movement has also facilitated breach and wave overwash events that have inundated hundreds of acres of pasture with salt water, impacting their agricultural utility and causing conversion to salt marsh.

**Re-establish Dune Configuration**

This Project seeks to implement passive and active techniques in dune management aimed at increasing resiliency to sea level rise while minimizing impacts to known habitat of the Western Snowy Plover. The bulk of Project effort associated with dune enhancement would be directed towards two overwash sites, referred to as the northern and central sites and as depicted on Figure 3. Specific actions that would be taken at the overwash sites are described below, and potentially elsewhere in the dune network, and were drawn from the *Eel River Plains Coastal Dunes Assessment* developed by Kamman Hydrology and Engineering (KHE 2015). In addition to the actions proposed below at each site, restriction of ORV through signage and fencing of the immediate enhancement area and implementation of a long-term monitoring and management program will be necessary. Over time, natural wave processes and storm actions may re-shape any alterations made. Further storm events would cause scarping, potentially further inland from the mean high water mark due to the absence of stabilizing vegetation. Therefore, the Adaptive Management Plan would include performance measures and actions that track changes with time and take suggest corrective action to prevent reversal to the original situation.

The proposed work at the northern and central sites would combine discrete enhancement actions with distinct actions intended to limit land use impacts and would promote trapping and retaining sand in a manner that rebuilds the dune in overwash areas to former and surrounding heights. This combined effort would enable the dunes in their existing location to rebuild and fortify over time. In addition, the integrity of the dunefield west of the EREP would gradually reconfigure to near-historic breadth and height through these actions taken in the Project. Relinquishing the need for drainage conveyance in the Western Drainage Ditch allows for dune migration inland as part of its recovery process without conflicting with existing agricultural uses.

Proposed actions at the northern and central sites include, but are not limited to;

- Mechanical Dune Construction - The proposed Project design would include mechanically elevating and reconstructing the dunes that have been lost to overwash events. Sand skimmed from the
overwash areas and adjoining areas would be used to construct new dunes to similar heights and widths of adjoining dunes and over a total area of approximately 8 acres.

- Sand Fence Installation - Sand fence would be installed in combination with the constructed dunes, or areas prone to overwash, in order to promote the recruitment of sand for dune rebuilding purposes.
- Large Wood (Wrack) Placement - Recognizing that natural recruitment of large wood assists in the recruitment of sand on dunes, the final designs may include large wood placed at select locations in wave overwash areas to promote dune rebuilding.
- Planting Native Vegetation - Native plants capable of encouraging dune stability would be planted as part of a revegetation strategy.
- Accommodating Natural Dune Building Processes - The Project design and configuration of Project features would ensure the ability of dunes to migrate eastward, thereby facilitating the reestablishment of zones of recruitment in the dune network capable of protecting the dune system from episodic disturbance.

The proposed actions described above at the northern and central sites are intended to convert the overwash areas back to dunes thereby directly impacting known Western Snowy Plover habitat. To offset the loss of this habitat, the project proposes to create similar habitat by removal of non-native beach grass on the dune strand west of the Outer Salt Marsh. Up to approximately 10 acres of non-native beach grass will be removed from this area using a combination of mechanical, hand removal, burning and/or herbicide methods. These techniques and monitoring processes are described in the HMMP (Appendix E).

2.5.6 Enhance Agricultural Lands and Operational Access

TWC intends to preserve agricultural land productivity managed as short-grass habitat for grazed pasture, silage/hay and Aleutian cackling geese. The proposed improvements will facilitate continued agricultural land operations.

Existing set-back berms will be enhanced and new berms constructed to improve overland drainage efficiency and increase resiliency of agricultural land from wave over-wash and rising sea levels. The berms would be constructed of excavated soils with gradual side slopes to allow for grazing on the east slope, and a transitional wetland-upland ecotone on the west slope.

A new guide berm would be constructed to the east of Russ Creek at an approximate 8.0 feet elevation. The existing access roads and berms along the EREP property’s eastern and southern boundaries would be improved by raising and resurfacing with gravel. Additionally, the seasonal access road on the west side of the Inner Marsh will be abandoned and relocated up to an elevation of approximately 8- feet along the back dune paralleling the existing.

Three new one-way culverts would be installed in the northern berms to allow drainage of the freshwater off-channel habitat to the Inner Marsh from Cut-Off Slough. In order to retain land management and facilitate access, two new bridges are proposed. One is located over the reestablished Centerville Slough channel at the southern end of the Inner Marsh and the second is across Centerville Slough, northeast of the South Barn. Based on existing channel alignments and size, the bridges would have a maximum length of approximately 75-feet. Rock slope protection would be placed at the base of the bridge footings.
as protection from scour. Additionally, rock slope protection would be placed along the footings of the existing bridges as preventative erosion measure.

2.5.7 Public Education and Access Improvements

TWC property is managed for agricultural production and for outdoor recreation and education opportunities. The EREP hosts an historic private duck hunting club, welcomes invited guests and docent-led group site visits, and uses the site to educate elementary school children about wetland and estuary systems and agriculture as practiced in the Coastal Zone.

Main Barn and Parking Area

Minor improvements to the Parking Area and signage limiting visitors to existing trails would educate any visitors to the EREP about the prevailing agricultural land use in the area, limitations on recreational opportunities, and seasonally or topically oriented restrictions. Signs about the cultural, agricultural and natural heritage of the area would interpret the landscape for viewers. A vault toilet would be installed to reduce impacts to the landscape.

North Barn Parking Area

Minor improvements to the North Barn Parking Area and signage limiting visitors to existing trails would facilitate TWC’s outreach and education efforts while minimizing impacts to the Project area. Signs about the cultural, agricultural and natural heritage of the area would interpret the landscape for viewers. A vault toilet would be installed to reduce impacts and traffic back to the entrance. The parking area would be limited to the existing heavy-use agricultural area.

Dune Walk and Overlook

A short boardwalk and trail with an overlook would take visitors along an existing trail, near the North Barn, into an intact dunefield for birding and natural observation.

Kayak Put In and Take Out

Two kayak ‘put in and take outs’ would be installed around the Inner Marsh. One is proposed to be located near the proposed bridge over reestablished Centerville Slough and the second at the new muted tidegate west of the Cut-Off Slough tidegate and to the north of the Inner Marsh. The put in and take outs will consist of foot accessible ramps with all-weather gravel surfaces. Kayak access to the Inner Marsh would facilitate; post-project monitoring of the Inner Marsh, aquatic educational programs, and minor recreational use by visitors. Interpretative signage would be installed at each put in and take out informing visitors of appropriate kayaking locations and tidal conditions.

Access Improvements

Several appurtenant structures will be installed on Russ Lane such as new gates an entrance sign and suitable lighting that clearly denotes EREP hours of operation, as well as additional area and fencing to provide adequate turn-arounds and protection for livestock. Project implementation and future management would require durable yet limited access routes that minimize impacts to the Project area. Some existing access routes and culverts would be improved and maintained, while others may be decommissioned. Routes would be designed to accommodate a range of vehicle types and weight classes and culverts replaced as needed to increase access reliability for agricultural and Project operations. The public access corridor through the property is fenced, and designed to track foot, bicycle and vehicle traffic in current road alignments from the Main Barn and parking area to the proposed Dune
Walk and Overlook, that minimally impacts grazing operations and should not result in a significant conversion of pasture land use.

### 2.5.8 Invasive Species Control and Removal

Freshly disturbed and newly restored sites typically provide a suitable environment for invasive species to colonize unless an active maintenance program is in place to ensure that these species do not colonize during the plant establishment period. Such an active maintenance process is described in the HMMP. Invasive species that have the potential to invade the Project area are dense-flowered cordgrass (*Spartina*), purple loosestrife, Himalayan blackberry, dwarf eelgrass and European beach grass (*Amophila*). Species that will be removed prior to construction or as part of construction include *Spartina* and *Amophila*. The removal techniques and post-project monitoring are described in the HMMP.

### 3. Water Level Management Plan (WLMP)

#### 3.1 Purpose and Need

The Project proposes the construction, rehabilitation and operation of drainage related facilities that are intended to enhance fish and wildlife habitat and continued agricultural viability. Once implemented, the facilities will require routine operations to achieve the Project and land management goals within and adjoining the project area. This combined area is referred to as the Water Level Management Plan (WLMP) Area and defined as the area bound on the landward side of the existing perimeter dike and inclusive of TWC, ORF, Russ and other small property holdings (Figure 4). These are properties for which floodwater is frequently conveyed through or impounded on during winter months and rely on a shared drainage network and existing tidegates to provide regional drainage and prevent seawater incursion. Other smaller private landholdings such as Harville Ranch LLC Co. and Fern Cottage Inc. are also located within the area however these lands are situated at higher elevations and are not defined as Grantors/Grantees in the drainage easement.

The purpose of the WLMP is to provide a framework and process to monitor and operate the drainage facilities consistent with the intent of the drainage easement, proposed Project and land management goals. While the WLMP Area extends beyond EREP, this plan only covers the operation and maintenance of drainage facilities located on EREP and as described in the Basis of Hydraulic Design Report (KHE 2016). Given the shared drainage network, it is understood the functionality of existing and/or new drainage facilities on properties adjoining EREP within the WLMP Area could alter the drainage characteristics throughout the Area.

#### 3.2 Background

The entire Eel River Estuary including the WLMP Area was extensively altered over the last 150 years in order to expand agricultural production in the region. Nineteenth and early twentieth century reclamation efforts converted the Eel River Delta from salt marsh to productive pastures. Levees, tide gates, dikes, and berms were installed to reduce tidal water volume, to reclaim wetlands for agricultural conversion, and to better manage high water events.
Among the many bridges, tidegates and other control structures, residents constructed a major tidegate on Cutoff Slough in the late nineteenth century. A more durable structure was built in 1916. This tidegate, known as the Cutoff Slough Tidegate, or sometimes as the “Occidental Tidegate,” had deteriorated considerably by the mid-20th century, and was replaced with a new structure funded by a consortium of adjacent property owners in 1979.

Exacerbating drainage challenges, the tributaries to the Centerville Slough complex and Salt River contribute large quantities of sediment. Historically this sediment load was effectively managed to maximize the agricultural potential of the area. Russ Creek was diverted into sediment management “cells” where small levees (1-2 foot in height) would impound the water and allow the sediment to deposit. The management of the Russ Creek sediment load altered the natural alluvial process of the creek. This practice continued until transfer of the property to TWC in 2008.

The direct manipulation of the alluvial fan of Russ Creek had three major effects. First, Russ Creek was entirely altered from its historic configuration. Second, Centerville Slough, once the primary extension of the Salt River was, apart from a short stretch, entirely filled. The Centerville Slough channel, once navigable and equal in size to the Salt River ceased to exist. Drainage patterns were significantly altered through the removal of basic hydraulic processes such as tidal exchange.

In addition to the management of sediment within Russ Creek, many of the surrounding parcels were raised in elevation to increase agricultural production. Certain parcels south and east of the EREP that did not benefit from the historic pasture raising approach are now at a lower elevation than the EREP. This configuration poses a challenge for routing the flows of Russ Creek, Shaw Creek and Creamery Ditch north towards the Eel. Parcels to the south of the Project area facing this challenge now find this trouble compounded by more frequent wave overwash from the sand dunes, continued infilling of key drainage components such as the WDD, levee deterioration and sea level rise. In an increasingly challenging environment, those parcels appear to be dependent on flow from Russ Creek, Shaw Creek and Creamery Ditch being directed through the EREP. Traditionally, this has been accomplished via routine maintenance of WDD.

### 3.3 WLMP Objectives

The objective of the WLMP is to:

- Define operation and maintenance activities necessary to achieve the CEQA Project goals and objectives while not adversely impacting adjoining properties within the WLMP Area; and
- Provide a framework to communicate monitoring data and management decisions following the adaptive management plan (AMP) portion of this EMP

### 3.4 WLMP Area Objectives

The proposed drainage-related project components have been presented above in the Project Description. For the purpose of this plan and based on differing land management goals, the WLMP Area has been divided into two sub-areas referred hereinafter as the western and eastern sub-areas (Figure 4). The western sub-area includes portions of western EREP such as the Inner Marsh and Russ properties such as Angels Camp. The eastern sub-area includes the remaining lands within the WLMP Area. Based on the overall CEQA Project goals, the following objectives have been used in developing designs and operational strategies for the drainage-related facilities in each sub-area.
3.4.1 Design Objectives - Western Sub-Area

- Maintain pre-project (existing conditions) flood storage capacity during the wet season to minimize changes in frequency/duration of floodwater inundation. This will be achieved by limiting an allowable tidal amplitude inflow to 2.5ft (NAVD 88) through the proposed Inner Marsh muted tidegate.
- Improve aquatic organism passage, restore former tidal wetlands, and increase tidal circulation that better mimics dissolved oxygen (DO), salinity and temperature regimes in the Eel River Estuary. This will be achieved by allowing a maximum tidal amplitude inflow to 5.0ft (NAVD 88) through the proposed Inner Marsh muted tidegate during the dry season.
- Increase potential for sediment re-entrainment and transport to the Eel River Estuary
- Maintain viable agricultural operations in designated areas

3.4.2 Design Objectives - Eastern Sub-Area

- Maintain pre-project (existing conditions) flood storage capacity during the wet season to minimize changes in frequency/duration of floodwater inundation, therefore limiting an allowable tidal amplitude inflow to 2.5ft (NAVD 88) through the existing Cut-off Slough tidegate.
- Avoid an increase in pre-project (existing conditions) inboard tidal elevations during the dry season
- Improve aquatic organism passage at the existing Cut-off Slough Tidegate
- Maintain similar water quality regimes in Cut-off Slough relevant to existing conditions
- Maintain viable agricultural operations in existing areas

3.5 Seasonal Operations

The objectives presented above were utilized in the design development of the various project components described in the Project Description. The design objectives are also applied to the operations of the WLMP area. As previously described, a significant constraint associated with introduction of the muted tide above the existing groundwater surface elevation of 2.5 feet is the loss of flood storage capacity within the WLMP area. Any reduction of flood storage above an elevation of 2.5 feet would be ameliorated through excavation of an equivalent or greater volume of sediment above 2.5 foot elevation in the re-established Centerville Slough in addition to implementing a seasonal operational regime as described below.

3.5.1 Dry Season (April/May – October/November)

At the onset of the dry season when management of floodwaters is irrelevant, the proposed Inner Marsh Muted Tidegate Regulator (MTR) would be adjusted to allow for a maximum allowable tidal inflow amplitude of 5.0 foot elevation in the Western Sub-area. Concurrently, the new water control structure would be adjusted to prevent the 5.0 foot tidal amplitude from entering the Eastern Sub-area.

3.5.2 Wet Season (October/November – April/May)

At the onset of the wet season and in advance of anticipated storm events, the proposed Inner Marsh Muted Tidegate Regulator (MTR) would be adjusted to allow for a maximum allowable tidal inflow
amplitude of 2.5 foot elevation in the Western Sub-area. Concurrently, the new water control structure would be adjusted (lowered) to maximize floodwater storage exchange between the Western and Eastern Sub-areas.

Table 3-1 summarizes the proposed wet and dry seasonal operations.

### Table 3-1: Seasonal Operations

<table>
<thead>
<tr>
<th>Season</th>
<th>Max Allowable Tidal Inflow (Approximate Elev. in ft-NAVD 88)</th>
<th>New Water Control Structure Setting (Approximate Elev. in ft-NAVD 88)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Western Sub-area (New MTR)</td>
<td>Eastern Sub-area (Existing Tidegate)</td>
</tr>
<tr>
<td><strong>Wet</strong> (Oct/Nov – April/May)</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Dry</strong> (April/May - Oct/Nov)</td>
<td>5</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Transitions between the seasonal operations will occur over several weeks to reduce abrupt biological changes within the sub-areas. To avoid abrupt changes and/or reduced flood storage associated with unseasonably high Eel River flows, the National Weather Service website provides a real time and 5-day prediction of Eel River stage at Fern Bridge. The stage predictions can be used to monitor predicted Eel River stage during the transition between seasonal operations. Image 3-1 depicts measured water levels in the Eel River Estuary (Cut-off Slough outboard and inboard), Fern Bridge and Humboldt Bay North Spit. Image 3-1 suggests that water levels exceeding approximately 7-feet (NAVD-88) measured at Fern Bridge for an extended period begin to influence the Estuary tidal amplitudes by elevating the low tides; and therefore can be used as a general guide during the seasonal transitions to maximize the extent for which the gates are open while minimizing the risk of reduced storage capacity. As explained in the draft Hydraulic Report, other influences such as tides, Eel River mouth conditions and Russ Creek flow also influence the frequency/duration the gates are open.
3.6 Operations, Monitoring and Reporting

The operations will be conducted by TWC, in accordance to this WLMP and informed by ongoing water level/quality monitoring data collected as part of the AMP portion of this report. TWC will conduct ongoing monitoring as described in the AMP portion of this report and other parties to the drainage easement may also contribute. The monitoring data is intended to further inform management decisions that will facilitate achievement of Project goals and objectives. The monitoring elements relevant to the WLMP and drainage-related facilities are summarized below:

- Continuous water level monitoring within the Western/Eastern Sub-areas and out-board of the perimeter dike
- Water quality (DO, salinity, temperature) within the Western/Eastern Sub-areas and out-board of the perimeter dike
- Channel and slough cross-sectional surveys
- Visual observations/inspections of drainage-related facilities

The above information will be compiled by TWC in an annual report and shared with property owners within the WLMP Area. The monitoring data will inform continued operations of the system and any necessary changes. Given the results of the monitoring process, if needed the control structure operations may be adjusted to more effectively meet the design objectives for each sub-area as previously described.
3.7 Maintenance and Repairs

The drainage related improvements, once constructed, are intended to reduce the current maintenance burden associated with Western Drainage, increase service life of the existing Cut-off Slough tidegate and provide a redundant drainage outlet with the new MTR. While collectively these facilities will require routine monitoring and management, the improvements are anticipated to reduce the current maintenance burden and provide a more resilient ecological and agricultural system.

As introduced in Chapter 1, the drainage easement describes some of the existing infrastructure on TWC property (ditch, flood control dike, flood control gates) and prescribes the abilities of the grantees (Russ) to cross the grantors’ property (ORF, TWC) in order to maintain this infrastructure. In general, the easement expresses the mutual desire of all property owners concerned (Russ, ORF and TWC) to cooperate for the protection of existing land uses (agricultural pasture) within the Russ, ORF and TWC properties. In order to achieve this common goal, the Project proposes improvements, both new and to existing facilities within the legal description boundary of the drainage easement. These proposed improvements are not intended to conflict with the intent of the drainage easement, but rather provide an overall increase to the drainage system performance and reliability.

While TWC proposes to conduct the operations and monitoring of all project components on the EREP and in accordance to this plan, it is understood maintenance and/or repair costs of existing and new facilities located within the legal description of the drainage easement would remain consistent with Section 9 of the drainage easement or an amended easement.
4. Habitats Mitigation & Monitoring Program (HMMP)

4.1 Summary

The EREP Project area is a landscape of mostly pasture land historically managed primarily for cattle grazing, seasonal waterfowl hunting, and drainage of neighboring properties. Incidental to this system, degraded, muted tidal wetland channels and marsh areas persisted. Over the years, tidal exchange has been reduced, infrastructure has aged and sediment from in-flowing streams has dispersed in “fan” shaped areas within the project area while other areas have subsided. A historically narrow dune system that buffers this pasture from wave action has also become compromised by overwash from large storms and is believed to lack adequate sediment supply to rapidly rebuild.

The EREP project as a whole intends to maintain the core functions of the site while enhancing tidal and geomorphic function for the benefit of aquatic, wetland, and upland habitats. The project anticipates improvements in habitat specifically for fisheries, including tidewater goby and salmonids. The project recognizes that certain levels of management must be maintained in order to honor existing legal agreements between neighboring property owners and land uses, and strategically leverages hydrologic, hydraulic, geomorphic, and aeolian processes with grading, tidegates, dikes, sediment management areas, and dune-building techniques to achieve these aims. The Project Description details the project components and changes to existing landforms and structures.

In order to make these advances, the project converts approximately 128 acres of jurisdictional agricultural wetland types to other tidal and freshwater jurisdictional wetland types. While these are all types of jurisdictional wetlands, tidal wetlands are an increasingly rare wetland type with high ecological function, value and biodiversity. The project does not propose to mitigate for wetland conversion. The project also fills approximately 4.13 acres of wetland habitats to create uplands and structures necessary to manage the complex legally-constrained drainage system. This is mitigated for by re-establishing 4.13 acres of wetlands in areas that are currently uplands. These mitigated wetlands are covered under this HMMP.

Rare, threatened or endangered plant species have been identified on the project site. Avoidance is the priority for this project and currently impacts are anticipated to one species, Lyngbye’s sedge, (*Carex lyngbyei*). The HMMP covers mitigation actions to be taken for this species and for the other special status plant species known to occur on the site if the avoidance approach cannot be achieved.

Additionally, the endangered Western Snowy Plover, (*Charadrius alexandrinus nivosus*), has been documented using a dune washover area for roosting and nesting. The project proposes activities to rebuild these dunes, which will result in a reduction in this habitat for plover. Mitigation will include establishment of suitable habitat for this species.

Finally, invasive species removal will be targeted to achieve success of the proposed mitigations in this plan.

In the interest of clarity, the EREP proposed project will be referred to as either “EREP plan” or “project” and the mitigation plan will be referred to as either the “mitigation plan” or “mitigation project.”
4.2 Proposed Mitigation and Non-Mitigated Restoration Objectives

Only three types of mitigation are necessary for the proposed EREP project including 4.13 acres of wetland mitigation, mitigation for Western Snowy Plover habitat, and mitigation for Lyngbye’s sedge. The overall objective of the EREP project is restoration, and several habitats are being restored that are not part of the project’s mitigation. Restored habitats include: 125.7 acres of tidal wetlands that will be converted primarily from agricultural wetlands, 16.7 acres of aquatic habitat created with the re-establishment of Centerville Slough, 14.9 acres of dune mat habitat created in dune enhancement areas, and 3.5 acres of forested agricultural wetlands that will be established along Russ Creek. Non-mitigated restoration components are discussed below.

4.2.1 Non-Mitigated Restoration

Wetland Conversion

The proposed project results in a net zero loss of jurisdictional wetlands. Improvements to tidegates, drainage design, and channel grading do result in the conversion of some jurisdictional wetlands to other jurisdictional wetlands. The majority of the wetland conversion transitions agricultural wetlands to tidal wetlands which will have higher ecological value and function (Table 3-1).

The most significant area of wetland conversion is within the area referred to as the Inner Marsh, an area surrounded on its northern, eastern, and southern boundaries by a dike of varying elevations. Natural dunes form the western boundary. The area is hydraulically connected with culverts to Centerville Slough and Cut-Off Slough on the landward side of the Cut-Off Slough tidegate. The perimeter dike provides a setting for expanding tidal wetland habitat without threatening adjacent land uses. To achieve this, tidal access will be modified to reintroduce tidal exchange at a muted level.

Within the portion of the site referred to as the Inner Marsh, the native salt marsh species perennial pickleweed (*Salicornia pacifica*) and saltgrass (*Distichlis spicata*) occur along the margins of slough channels and in wet depressions. The slightly higher flats are dominated by a mixture of saltgrass (which is tolerant of muted tidal conditions) and creeping bentgrass (*Agrostis stolonifera*). Creeping bentgrass, a perennial nonnative grass, is an aggressive competitor with wide environmental tolerances, a long growing season, and the ability to spread vegetatively. Once established, creeping bentgrass forms a thick thatch layer that buffers it from high salinities in underlying soils; however, it does not appear to tolerate full tidal inundation. Once a tidal connection is re-established to the Inner Marsh, it is anticipated that creeping bentgrass will die back and that a mix of salt and brackish marsh species will naturally colonize channel banks and the higher flats. These species could include the natives: pickleweed, saltgrass, arrowgrass (*Triglochin maritima*), jaumea (*Jaumea carnosa*), gumplant (*Grindelia stricta*), sea lavender (*Limonium californicum*), tufted hairgrass (*Deschampsia cespitosa*), sand spurry (*Spergularia marina*), Lyngbye’s sedge (*Carex lyngbyei*), and the non-native species fat hen (*Atriplex prostrata*), brass buttons (*Cotula coronopifolia*), and cordgrass (*Spartina densiflora*). Cordgrass, an invasive grass that is the target of a region wide eradication effort, achieves near mono-specific dominance in many areas of the Outer Salt Marsh. The remnant channel and depressional areas will evolve to sub-, inter-tidal and mudflat habitat types.

Increased Aquatic Habitat

To increase aquatic habitat and enhance movement of water and fish/wildlife to the north and south, the Project will re-establish Centerville slough by excavating a channel along its historic alignment. At the northern end Centerville Slough will be realigned to the inner marsh, and at the south end of the proposed
alignment it will be reconnected to Russ and Shaw Creeks. This will also re-establish connectivity with Creamery Ditch. The channel re-establishment will increase and create migratory access between estuarine and inland waters and will restore overwintering and rearing habitat for juvenile salmonids, creating approximately 16.7 acres of new aquatic habitat.

**Increased Dune Mat**

The proposed project seeks to implement passive and active techniques in dune management aimed at increasing resiliency to sea level rise. Dune enhancement is planned at two overwash sites within the project area. Proposed work may include: mechanical dune construction, sand fence installation, large wood (wrack) placement, accommodating natural dune building processes, developing a strategy for beach nourishment, and planting native vegetation. The re-established dune configuration will result in the conversion of approximately 11.2 acres of beach habitat and approximately 3.7 acres of European beach grass habitat to approximately 14.9 acres of dune mat habitat. This newly created habitat will be planted with American dune grass (*Elymus mollis* ssp. *mollis*), as well as other native dune mat herbs and shrubs.

**Increased Forested Agricultural Wetland**

In order to provide riparian cover and habitat diversity to the re-established Russ Creek channel, approximately 3.5 acres of agricultural wetlands will be planted and seeded in a narrow strip between the channel and the berm. This area will be seasonally grazed and will be seeded with the freshwater wetland seed mix described in Table 4-7. A revegetation plan will be developed utilizing a combination of pole cuttings and container stock. Suggested tree species include: Sitka willow (*Salix sitchensis*), coastal willow (*Salix hookeriana*), and Sitka spruce (*Picea sitchensis*) with some shore pine (*Pinus contorta* ssp. *contorta*). Suggested shrub species include: California wild rose (*Rosa californica*), California wax myrtle (*Morella californica*), salmonberry (*Rubus spectabilis*) and Pacific ninebark (*Physocarpus capitatus*).
<table>
<thead>
<tr>
<th>Change in Habitat Area (Acres)</th>
<th>Existing</th>
<th>Proposed</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural</td>
<td>692.2</td>
<td>563.5</td>
<td>-128.7</td>
</tr>
<tr>
<td>Pasture and/or Agricultural Wetland</td>
<td>608.6</td>
<td>495.1</td>
<td>-113.5</td>
</tr>
<tr>
<td>Freshwater Emergent Herbaceous</td>
<td>82.9</td>
<td>64.3</td>
<td>-18.6</td>
</tr>
<tr>
<td>Forested Agricultural Wetland</td>
<td>0.7</td>
<td>4.2</td>
<td>3.5</td>
</tr>
<tr>
<td>Non-Agricultural</td>
<td>543.9</td>
<td>672.5</td>
<td></td>
</tr>
<tr>
<td>Ammophila</td>
<td>117.0</td>
<td>93.8</td>
<td>-23.2</td>
</tr>
<tr>
<td>Aquatic</td>
<td>44.3</td>
<td>61.0</td>
<td>16.7</td>
</tr>
<tr>
<td>Bare Ground</td>
<td>0.8</td>
<td>0.6</td>
<td>-0.2</td>
</tr>
<tr>
<td>Beach</td>
<td>56.4</td>
<td>64.8</td>
<td>8.4</td>
</tr>
<tr>
<td>Developments</td>
<td>1.4</td>
<td>1.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Dominant Invasive</td>
<td>14.5</td>
<td>0.1</td>
<td>-14.4</td>
</tr>
<tr>
<td>Dune Mat</td>
<td>44.3</td>
<td>59.2</td>
<td>15.0</td>
</tr>
<tr>
<td>Forested Riparian</td>
<td>10.6</td>
<td>10.4</td>
<td>-0.2</td>
</tr>
<tr>
<td>Levee/Berm</td>
<td>20.1</td>
<td>20.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Road</td>
<td>7.3</td>
<td>7.3</td>
<td>0.0</td>
</tr>
<tr>
<td>Tidal Wetland (Saltmarsh/Brackish Herbaceous/Mudflat)</td>
<td>207.3</td>
<td>333.0</td>
<td>125.8</td>
</tr>
<tr>
<td>Scrub Shrub</td>
<td>20.0</td>
<td>20.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Unmapped</td>
<td>1.6</td>
<td>1.6</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Approximate Total</strong></td>
<td>1237.6</td>
<td>1237.6</td>
<td>0.0</td>
</tr>
</tbody>
</table>
It should be noted from Table 4-1 that the following areas undergo acreage reductions: pasture/agricultural wetlands, freshwater emergent herbaceous wetland managed for agriculture, non-native European beachgrass (*Ammophila*), bare ground, other dominant invasive species, and forested riparian. Over 113 acres of agricultural wetland are converted to tidal wetlands, which increase by over 125 acres. Additionally, there is an increase in forested agricultural wetland that exceed the loss of forested riparian habitat, and increases in dune mat and beach habitats. Increases in levee and berms are necessary for the overall functionality of the project, and represent a relatively small part of the land use change approximately 0.7 acre. Existing habitats at the Project site are shown in Figure 5 and proposed habitats are shown in Figure 6.

### 4.2.2 Mitigation Wetlands

Establishment of new guide berms is critical to the success of the EREP project, and requires the filling of some wetland areas. While new wetland channels are being graded and tidal exchange improved, most of these new wetland channels are counted under the wetland conversion discussion (4.2.1).

To mitigate for filled wetlands, existing upland spoils piles and sections of existing berms will be removed to re-establish wetlands. These mitigation wetlands will be adjacent or contiguous to existing wetlands, some of which will undergo conversion as muted tidal inflows up to 5’ are implemented. Mitigation wetlands are planned to be of the same wetland type as the adjacent or contiguous wetlands under the new hydrologic regime. Locations of areas to be filled are shown in Figure 7.

As noted in Section 4.1, mitigation for impacts is proposed as follows:

- Wetlands will be mitigated at a ratio of 1:1

### 4.2.3 Special Status Species Mitigation

Special status plant surveys identified populations of rare, threatened, or endangered species that occur at the project site, or that are likely to occur on site. The special-status terrestrial plant species include: the federally and state endangered beach layia (*Layia carnosa*, FE; SE; CRPR 1B.1), Lyngbye’s sedge (*Carex lyngbyei*; CRPR 2B.2), Humboldt Bay owl’s-clover (*Castilleja ambigua* ssp. *humboldtiensis*; CRPR 1B.2), dark eyed gilia (*Gilia millefoliata*; CRPR 1B.2), and sand spurrey (*Spergularia canadensis* var. *occidentalis*; CRPR 2B.1). The aquatic species eel-grass (*Zostera marina*) was also observed during surveys. Location of special status plants are shown in Figure 8. In addition to the species that were observed, the Project site contains high quality habitat for the federally and state endangered Menzies’ wallflower (*Erysimum menziesii* spp. *menziesii*; FE; SE: CRPR 1B.1). This species was not found during surveys but has a high likelihood of occurring within the Project site. In accordance with the Project’s Environmental Impact Report, strategies to protect these species follows CEQA Mitigation Measures, including:

- Mitigation Measure BIO-2a: Mitigate Impacts to Beach Layia
- Mitigation Measure BIO-2b: Mitigate Impacts to Sensitive-Listed Plant Species
- Mitigation Measure BIO-3a: Mitigate Impacts to Sensitive Listed Habitats Through Avoidance and Re-establishment.
- Mitigation Measure BIO-3b: Mitigate Impacts to Sensitive Listed Habitats Through Control of Invasive Species.
Mitigation Measure BIO-4: Mitigate Temporary and Short-Term Impacts to Sensitive Habitats Including Wetlands Through Construction Minimization and Avoidance Measures

In keeping with Mitigation Measure BIO-3a, the project design attempts to avoid known populations of sensitive species Figure 8 juxtaposes proposed areas of cut and fill with mapped rare plant occurrences. As can be seen in this figure, grading activity is concentrated away from known populations of rare plants. A known exception is an area of Lyngbye’s sedge, which is discussed below.

Some of the species noted above are part of the dune mat community. Dune mat is an Environmentally Sensitive Habitat Area (ESHA) under the Coastal Act. While most of the habitat within the project site’s coastal strand is dominated by the non-native invasive European beachgrass, dune mat is present along the backdune against a narrow fringe of brackish and saltmarsh wetlands. The small patches of intact dune mat vegetation will be protected through avoidance.

A special status plant survey has not occurred yet in the Snowy Plover mitigation area. This survey will be completed prior to construction and any potential impacts to special status species will be avoided or minimized. While it is the intention of the project to avoid special status plant species, previously unrecorded populations may become apparent within the areas of the project’s ground disturbance, or ground disturbance may result in indirect impacts such as dune erosion or new deposition that disturbs the dune mat community. In such cases, one or more of the following mechanisms will be employed:

Pre-construction and maintenance surveys prior to ground disturbing work

- Protective wooden fencing to shelter the sensitive vegetation community from shifting sand,
- Replacement plantings at a 2:1 planting ratio, with plants propagated from local genetic material (within project site or elsewhere within Eel River dunefields).
- Seed banking of genetically local seed in the event indirect impacts occur
- If necessary, planting and/or seeding or other remedial measures may occur to augment natural recruitment and/or to increase the diversity of species using an adaptive management approach.

Special Status Plant Species

In addition to the general measures mentioned above, the following mitigation guidelines have been developed for the special status species that are known to occur at the project site. Lyngbye’s sedge is the only species to be impacted by the proposed project. Mitigations for the other special status species known to occur on the site are discussed below as a precautionary measure.

Lyngbye’s sedge

Lyngbye’s sedge is a rhizomatous herb that requires intact coastal brackish reaches of estuaries, where it can form dense mono-specific stands and is often the first colonizer of open mudflats. At EREP, the main threat to the existing population of Lyngbye’s sedge is the continued encroachment of invasive cordgrass. Within the Project site, Lyngbye’s sedge was mapped north of the dike separating the Outer Salt Marsh from the Inner Marsh in a population estimated to contain >5,000 individuals in an area of 10.1 acres. A small portion of the Lyngbye’s sedge population that was mapped will be impacted by the current Project design. This area is adjacent to the new tidegate that will be installed on Cut-off Slough and is anticipated to be 0.051 acres, or 2,222 square feet.
In order to mitigate for impacts to Lyngbye’s sedge, a preconstruction survey of the known impact area will occur. The absolute cover of Lyngbye’s sedge will be assessed and mapped for the area where impacts are anticipated. The proposed Project will likely create new habitat where this species will thrive in the tidal wetland. Both the area of impact and the tidal wetland will be monitored for five years after Project construction to determine if Lyngbye’s sedge is recruiting enough to replace the population impacted by construction. Both area occupied and absolute cover of Lyngbye’s sedge will be mapped in the tidal wetland and in the area of impact, and the total area and mean absolute cover will be compared to the area and cover of the population impacted by the project.

If by June of year five, Lyngbye’s sedge has not recruited to an area and cover that is equal to or greater than the pre-Project impact population size, seed shall be collected from Lyngbye’s sedge at the other robust populations that occur at the Project site. Adaptive management efforts, including planting (from rootstock of mature plants collected from local area, or from plugs propagated from local seed) shall be undertaken in year six. Planting efforts would be monitored annually for five additional years. Additional adaptive management will occur over this timeframe as needed to ensure success of re-establishment.

**Humboldt Bay owl’s-clover**

Humboldt Bay owl’s-clover was mapped at EREP in five populations along the north portion of the dike separating the Outer Salt Marsh from the Inner Marsh in a narrow band of slightly higher elevation marsh in association with salt grass, cordgrass, pickleweed, and jaumea (GHD 2014). More than 10,000 individuals of this hemi-parasitic herb were mapped. No impacts to Humboldt Bay owl’s clover are anticipated.

However, if the Project impacts Humboldt Bay owl’s clover, a qualified botanist shall collect and conserve seed from local (preferably on-site, or from the immediate region if on-site sources are insufficient) populations of Humboldt Bay owl’s clover. These seeds would be used to replant a population of this species to mitigate for the population lost to construction impacts at a 2:1 ratio. The Project area would be monitored for five years and compared with a reference population to determine whether replanting and natural recruitment resulted in population numbers equal to or greater than those present before Project implementation. If the population did not appear to have reestablished during the five-year period, seed would be collected from elsewhere and additional attempts would be made to reestablish the population. These attempts would be monitored for two years.

**Beach layia**

Beach layia was mapped at EREP in the near-shore dunes in approximately 10 distinct populations ranging from 10 to 100 individuals. The majority of the mapped populations occur in areas adjacent to where the dike separating the Outer Salt Marsh and Inner Marsh meets the nearshore dunes; smaller populations were also found further south in the vicinity (300 to 800 ft south by south west) of the North Barn. No impacts to beach layia are anticipated.

However, if unavoidable Project impacts were to occur to beach layia, primarily as a result of dune building or European beachgrass removal associated with Western Snowy Plover habitat mitigation, the following mitigation measures would be implemented:

- Beach layia seed would be collected from the site and/or at nearby known occurrences so that replacement plants could be grown out at a nursery and transplanted to a stable portion of the site at a 2:1 planting ratio. If plant replacement, or relocation is deemed necessary (whether through relocation and/or replanting) annual monitoring for two years would be required, with no net loss of
number of individual plants. If replanting is employed, a 2:1 planting ratio includes built in overplanting in order to meet success criteria and no net loss.

- Seed collection for seed banking might also occur if indirect impacts occurred as a result of the dynamic coastal environment. The triggering mechanism for seed banking would be if this plant species is identified within 100 feet in a downwind direction of dune establishment, and/or 50 feet in any other direction, or within the footprint of the proposed Western Snowy Plover mitigation area.

- Plant relocation and or preparation of a sensitive species management plan (SSMP) that provides further details about the above options in cooperation with USFWS as to which mechanism(s) are the preferred option(s) would also occur before the time of impact. If an SSMP is deemed appropriate by jurisdictional agencies, the report would lay out specific timing and details of seed collection, mitigation site identification (within EREP), substrate preparation, monitoring and maintenance.

**Western sand spurrey**

A single population of 10 western sand spurrey plants were mapped in a nearshore swale adjacent to the brackish marsh supporting a large population of Lyngbye’s Sedge. In California, western sand spurrey is largely limited to coastal marshes and saline swamps. This annual herb is known to occur in both natural and disturbed marsh habitats from California to Alaska. However, its distribution is limited in California with documented observations geographically limited to the Humboldt Bay Area on Calflora.

Project impacts to this species are not anticipated as the population will be avoided. However, if possible Project impacts occur to any western sand spurrey on site, a qualified botanist shall collect and conserve seed from local (preferably from the immediate region) populations of western sand spurrey. These seeds would be used to replant a population of this species to mitigate for the population lost to construction impacts at a 2:1 ratio. The Project area would be monitored for five years to ensure the mitigation was successful. If the population did not appear to have reestablished during the five-year period, seed would be collected from elsewhere and additional attempts would be made to reestablish the population. These attempts would be monitored for two years.

**Dark-eyed gilia**

A single population of dark-eyed gilia, consisting of approximately 50 individuals, was mapped near where the dike separating the Outer Salt Marsh from the Inner Marsh meets the dune mat habitat type (GHD 2014b). In California this species is largely limited to the coastal strand and stabilized dune habitats. Project impacts are not anticipated to this species, and the population will be avoided. However, if possible Project impacts occur to any dark-eyed gilia, mitigation measures similar to those stated above for western sand spurrey will be implemented.

**Pacific eel-grass**

Eel-grass habitat is protected by federal and state regulation under the Clean Water Act and the California Coastal Act. CDFW has a no-net loss policy for eel-grass habitat in state waters and eel-grass habitat is considered Essential Fish Habitat by NOAA-Fisheries. No direct or indirect impacts are anticipated to eel-grass. Within the Project eel-grass has been qualitatively mapped along the Cutoff Slough south of the Cutoff Slough tidegate and no changes are proposed in this area. The population density in this area is greatest toward the existing tidegate where it reaches approximately 15 percent cover, thinning out gradually to zero percent cover approximately 2,500 feet south of the tidegate.
Hydrodynamic modeling and adversion/dispersion modeling of salinity suggest no significant changes in existing Cut-off and Centerville Sloughs.

Restoration of estuarine conditions inside of the tidegates on TWC property are likely to promote expansion of eel-grass beds into the Project area. Additionally, the proposed re-established Centerville Slough and the re-connected tidal channels within the Inner Marsh are anticipated to provide suitable habitat for natural recruitment of eel-grass thus enhancing eel-grass habitat within the Project area. The extent of eel-grass populations within the Project site in the future will be qualitatively reported in annual monitoring reports. Since no direct or indirect impacts are anticipated this species will not be mapped or quantitatively monitored.

If at final design phase any direct or indirect impacts to eel-grass are anticipated then any existing populations that would be impacted would be mapped prior to construction and natural recruitment would be quantitatively monitored annually for five years to determine whether eel-grass is naturally recruiting in the areas where it was impacted as well as in newly created channels. If eel-grass did not establish in an area equal to or greater than that lost due to Project impacts by year five then eel-grass would be actively planted to offset any lack of natural recruitment, using the most current scientific methods and following NMFS guidance.

**Invasive Species Removal**

Invasive species pose a risk to the successful recruitment of plant communities and individual species in newly constructed areas, and in the maintenance of healthy existing communities. Targeted invasive species removal and management will focus on ensuring that mitigated species and mitigated plant communities establish successfully. Mitigation Measure BIO-3b provides guidance for this activity.

Invasive weed removal shall be conducted both as part of mitigation, and as a project goal, for dense-flowered cordgrass. Invasive species removal related to mitigation is discussed in more detail in Section 4.9.2. Weed removal techniques may include manual, mechanical, and/or approved chemical means (including mowing, cutting, pulling, grinding, and/or excavation and burial) as discussed in the and as approved by jurisdictional agencies. Heavy equipment will be required to be clean and weed-free before entering the site.

**Dense-Flowered Cordgrass**

Dense-flowered cordgrass was found in and adjacent to the Project footprint, north of the tidegates. In order to reduce the likelihood of cordgrass colonizing the restored tidal wetlands, the existing population will be controlled prior to construction using manual, mechanical, and/or approved chemical methods, in compliance with the appropriate methods analysed and disclosed in the Regional Invasive Spartina Management Plan and the associated EIR. The cordgrass population within the Project footprint will be controlled during the ten-year operation period of the Project under the Adaptive Management Plan. Colonization of the Inner Marsh or other portions of the Project footprint by cordgrass will be controlled in collaboration with the region-wide eradication program.

**Special Status Animal Species**

The proposed project implements actions to expedite dune recovery in an area of washover that has become habitat for nesting and roosting Snowy Plover. This mitigation plan includes actions to address this impact. Please see the Biological Assessment and Incidental Take Permit for other state and
federally listed species within the project boundary that do not require inclusion in the mitigation and monitoring plan.

**Snowy Plover Habitat Mitigation**

Western Snowy Plover is a federally listed threatened species. It is a small, 6 inch long shorebird, with black legs, dark bars on either side of its breast, a dark fore-crown, dark eye patch, and brown to gray back. Snowy Plover nests from early March through mid-September and prefer to nest above the high tide line on sand spits, dune-backed beaches, lagoon and estuary salt pans, and beaches near river estuary mouths, and river gravel bars. While habitat loss and coastal development are the main contributors to their decline, predation by species associated with human development (i.e. corvids) and pesticides/inorganic compounds have also impacted the species. In northern California, predation by ravens and off-highway vehicle use on Eel River gravel bars has crushed nests and disturbed nesting plovers.

In accordance with the Project’s Environmental Impact Report, strategies to protect this species follows CEQA Mitigation Measures, including:

**Mitigation Measure BIO-1c: Avoid, Minimize, and Mitigate for Potential Impacts to Western Snowy Plover**

This mitigation measure details activities to reduce potential impacts to this species of special concern, including:

- Limiting dune re-establishment construction between September 1 and March 1, outside the plover nesting season

- Habitat enhancement at a suitable location at a 1.5:1 ratio (the CEQA mitigation measure requires a minimum of 1.1:1), consisting of removal of European beach grass and bi-annual maintenance (in the winter before breeding season and in the fall after breeding season) for a period of two years post-construction.

- Timing of initial removal effort concurrent to timing of construction impact in order to ensure no temporal or net loss.

The selected mitigation site is located on Wildlands Conservancy property. The area is relatively remote, approximately 3.9 miles from the Centerville Beach parking lot, a staging ground for much off-road vehicle activity and associated disturbances, and is near the Eel River mouth and the shore.

### 4.3 Mitigation Goals and Objectives

The overall project’s goal is to improve geomorphic and ecosystem functions that would enhance habitat for native fisheries and aquatic species, support waterfowl and wildlife species, and benefit agricultural land management by more effectively managing onsite flooding and sedimentation. Project objectives also include designing and planning for future climate scenarios and sea level rise in relation to agricultural land management, capacity and uses, dune enhancement, and vegetative communities.

The project’s mitigation goals are supportive of the project’s larger goals, but are narrower in focus to impact areas and sensitive species.
4.3.1 Mitigation Goals

Approach

Restoration of habitat functions and structures drives the wetland and Snowy Plover habitat elements of the mitigation plan. The precautionary principle (a risk management strategy that puts burden of proof that an action is not harmful on those taking the action) dictates an avoidance and relocation approach to special status plant species. Figure 9 shows the proposed mitigation plan with a breakdown of types and amount of mitigation area created.

Wetlands impacted by the proposed project include a range of habitat types with mitigation requirements that may vary according to the regulations that govern each agency’s review process:

**Corps Jurisdictional Wetlands**
- Agricultural Wetland/Pasture (PEM1C)
- Palustrine Emergent Wetland (PEM1C)
- Estuarine Saltmarsh (E2EM1P)

**Environmentally Sensitive Habitat Areas (ESHA)**
- Snowy Plover habitat (dune mat, beach)
- Endangered plant species

**Wetland Mitigation Approach**

As described elsewhere, primarily agricultural wetlands (pasture) will be filled and converted to uplands, while uplands consisting of existing spoils piles and berms will be removed and graded to become re-established wetlands. The levees to be removed were built in the early 1900s, and were part of a system that altered an extensive saltmarsh for agricultural uses. Tidal activity was controlled in these areas, confined to narrow channels between diked and protected lands. Tidegates were designed to minimize tidal inflow, which in recent years has been mostly incidental leakage due to the age and deterioration of existing tidegates. Persisting saltmarsh vegetation behind these dikes is largely attributable to saline soils, while some areas support agricultural or freshwater emergent wetlands. Spoils piles have resulted from the creation and maintenance of the western drainage ditch which is visible in aerial photos from the early 1960s. Removal of sediment and sand from the western drainage ditch is a historical and ongoing maintenance practice that is described in the drainage easement.

The EREP plan will restore muted tidal flows into the former salt marsh areas, and these areas are expected to support restoration of brackish and saltmarsh habitats. The existing berms that will be removed as part of mitigation is also expected to re-establish tidal wetlands with new tidal exposure. The mitigation wetlands from spoils piles, that will be graded to the same elevation as adjacent wetlands are expected to recruit either freshwater or brackish or saltmarsh vegetation, depending on their proximity to tidal fluctuation, and where they are influenced by groundwater or freshwater inflows. These areas are expected to perform comparably to the existing adjacent EREP project wetlands.

**Snowy Plover Approach**

Snowy Plover habitats described in Section 4.2.3 are indicative of a geomorphically active area in which episodic disturbance events periodically remove vegetation, prevent the establishment of a dune system, and maintain relatively flat and unvegetated plains near high tide activity. The mitigation plan for Snowy
Pl. Plover locates an area subject to active disturbance near the Eel River mouth. Mitigation activities focus on establishment of ideal vegetation conditions to be subsequently maintained by natural processes.

**Special Status Species Approach**

As indicated elsewhere, the driving approach for special status plant and animal species is avoidance. Maintaining viable, reproducing populations of these species depends on minimal interference with existing habitats. Should this not be possible, relocation and plant replacement at suitable sites within the project site will be implemented.

**Mitigation Goal**

The mitigation project shall compensate for filled jurisdictional wetlands, maintain or enhance existing levels of habitat integrity, and be functionally and ecologically seamless with other aspects of EREP.

### 4.3.2 Mitigation Objectives

Project objectives provide quantifiable targets of the mitigation plan, and form the basis for evaluating success.

The Eel River Estuary Preserve Project Mitigation Project shall:

- Balance filled wetlands with re-established wetlands
- Eliminate upland barriers within existing wetlands
- Protect populations of special status plant and animal species.

<table>
<thead>
<tr>
<th>Current Use/ Existing Habitat</th>
<th>Proposed Habitat</th>
<th>Proposed Action</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill (Levees and spoils piles)</td>
<td>Agriculture Wetland/Pasture, Palustrine Emergent Wetland, Tidal Wetland</td>
<td>Remove fill; grade for estuarine, palustrine and muted tidal processes. Re-establish wetland vegetation through seeding.</td>
<td>Figure 7</td>
</tr>
<tr>
<td>Disturbed dune/coastal strand</td>
<td>Snowy Plover habitat</td>
<td>Remove European beachgrass</td>
<td>Figure 10</td>
</tr>
<tr>
<td>Special Status Plant Communities/Habitats</td>
<td>Special Status Plant Communities/Habitats</td>
<td>Avoidance; if needed, relocation and replanting</td>
<td>Figure 8</td>
</tr>
</tbody>
</table>

### 4.4 Determination of Credits

#### 4.4.1 General

Impacts and mitigation credits are measured in acres, and mitigation will be applied at the following ratios: 1:1 for wetland mitigations, 1:1 for impacts to Lyngbye’s sedge, and 1.5:1 for Snowy Plover mitigation. Ratios above 1:1 are intended to compensate for permanent impacts, temporal lag, or uncertainty of success.
4.4.2 Mitigation Credits

The EREP Project proposes substantial improvements to saltmarsh habitat, tidal function, and anadromous fisheries. It also converts over 125 acres of agricultural wetland and other lower functioning habitats to estuarine wetlands. The mitigation plan also re-establishes freshwater and tidal wetlands.

Given the broad ecological benefits of the project as a whole, and the immediate recruitment of mitigated wetland habitats anticipated, wetland mitigation for this project is focused on a “no net loss” approach with a 1:1 mitigation ratio. See details in Table 4-3 below.
Table 4-3: USACE and California Coastal Commission Jurisdictional Wetlands\textsuperscript{2} Permanently Impacted and/or Created (all units in acres)

<table>
<thead>
<tr>
<th>Overall PROJECT (acres)</th>
<th>Overall PROJECT (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Wetland</td>
<td>Wetland Fill</td>
</tr>
<tr>
<td>1255</td>
<td>4.3\textsuperscript{4,5}</td>
</tr>
<tr>
<td>Wetland Creation</td>
<td>Excess Wetland</td>
</tr>
<tr>
<td>4.3\textsuperscript{6}</td>
<td>1251.2</td>
</tr>
<tr>
<td>Creation Ratio\textsuperscript{7}</td>
<td>1:1</td>
</tr>
</tbody>
</table>

\textsuperscript{1} Totals are approximate due to rounding of individual acreage amounts.
\textsuperscript{2} Eel River Estuary Preserve Ecosystem Enhancement Project Delineation of Uplands, July 2014.
\textsuperscript{4} Native fill from the channel excavation will be placed on approximately 4.8 acres of wetlands of which 4.3 ac will be permanently converted from wetlands to uplands. The permanently impacted area is associated with the new north and south berms, two agricultural bridge crossings of Centerville Slough and the new tide gate. The area has been calculated as the area above 1 ft above the existing ground elevation on either side of the fill.
\textsuperscript{5} Accounts for two agricultural bridge crossings across Centerville Slough and a new tide gate.
\textsuperscript{6} Creation of 4.3 acres of wetlands through lowering of site levees and mapped uplands.
\textsuperscript{7} Creation Ratio defined as total acres \textbf{Created} to total acres \textbf{Filled}.

Mitigation for impacts to Snowy Plover habitat is timed to prevent temporal losses. The proposed mitigation ratio for Snowy Plover habitat is 1.5:1.

Table 4-4: Proposed Western Snowy Plover Mitigation

<table>
<thead>
<tr>
<th>Impact</th>
<th>Jurisdiction</th>
<th>Impact Area (AC)</th>
<th>Mitigation Ratio</th>
<th>Mitigation Area (Ac)</th>
<th>Mitigation Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snowy Plover Habitat</td>
<td></td>
<td>TBD</td>
<td>1.5:1</td>
<td>TBD</td>
<td>n/a</td>
</tr>
</tbody>
</table>

As discussed elsewhere, avoidance is the primary strategy for protecting special status species. Lyngbye’s sedge is expected to incur an impact to approximately 0.05 acres (2,221 square feet). As sedges are rhizomatous plants that spread rapidly, the mitigation plan proposes to monitor for recovery and to replant if this recovery is not successful. Similarly, a 1:1 mitigation ratio will be followed for Pacific eel-grass should unanticipated and unavoidable impacts occur. Where avoidance is not possible for Humboldt Bay owl’s-clover, beach layia, western sand spurrey, or dark eyed gilia a combination of relocation and replanting to achieve a ratio of 2:1 is proposed with the development of a Sensitive Species Mitigation Plan. These mitigation ratios are indicated in Table 4-5.
Table 4-5: Proposed Mitigation for Sensitive Plant Species

<table>
<thead>
<tr>
<th>Impact</th>
<th>Jurisdiction</th>
<th>Impact Area (AC)</th>
<th>Mitigation Ratio</th>
<th>Mitigation Area (Ac)</th>
<th>Mitigation Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lyngbye’s sedge(^1)</td>
<td>■</td>
<td>0.051</td>
<td>1:1</td>
<td>0.051</td>
<td>Natural recruitment in impacted area; replanting if necessary</td>
</tr>
<tr>
<td>Humboldt Bay owl’s-clover(^2)</td>
<td>■</td>
<td>0</td>
<td>2:1</td>
<td>0</td>
<td>Salt marsh</td>
</tr>
<tr>
<td>Beach layia(^2)</td>
<td>■</td>
<td>0</td>
<td>2:1</td>
<td>0</td>
<td>Dune mat</td>
</tr>
<tr>
<td>Pacific eel-grass(^2)</td>
<td>■</td>
<td>0</td>
<td>1:1</td>
<td>0</td>
<td>Estuarine</td>
</tr>
</tbody>
</table>

1 The project proposes to monitor for recovery and mitigate through replanting only if recovery is unsuccessful upon completion of five years of monitoring.

2 The project proposes avoidance and therefore has not calculated impact areas. Mitigation ratios are provided in the event that avoidance is not successful and relocation or replanting is necessary.

4.4.3 Wetland Area Calculations

Wetland mitigation has been calculated from the restoration design plans through area calculations in computer aided drafting (CAD) and imported into Geographical Information System (GIS) mapping software. Where levees and berms exist or are being built, an additional calculation is needed to account for the effect of water ponding or a high water table on the slopes of the levee. The USACE wetland definition provides the basis for this calculation, indicating that flooding, ponding, or a water table within 12 inches of the soil surface must be present over a fourteen day consecutive period for an area to be considered to have wetland hydrology. The project has assumed a typical levee cross-section, with 3:1 slopes on the tidal side of the levee, and 7:1 slope on the freshwater side of the levee. Areas of levee or berm that would result in wetland habitat formed by this definition were also included in the wetland area calculation Figure 4.1.

The fill of wetlands is also accounted for when berm elevations are raised and the overall footprint of the berm is expanded, as also denoted in Figure 4.1. This has been included in the wetland fill calculations. Detailed information on permanent and temporary impacts to wetlands is provided in Table 4-6.
The U.S. Army Corps of Engineers (USACE 2005)

Fourteen (14) or more consecutive days of flooding or ponding, or a water table 12 in. (1 feet) or less below the soil surface, during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability)

Figure 4-1: Wetland Fill Calculations at Existing and New Levees/ Berms
Table 4-6: Type of Permanent and Temporary Impacts to USACE, NCRWQCB, and California Coastal Commission Jurisdictional Wetlands or Waters of the U.S./State

<table>
<thead>
<tr>
<th>TYPE OF IMPACT (PERMANENT(^2) AND TEMPORARY(^3))</th>
<th>Eel River Estuary Preserve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat Type</td>
<td>Permanent Fill and/or Dredge</td>
</tr>
<tr>
<td></td>
<td>CY</td>
</tr>
<tr>
<td>Channel (Dredge Native)(^6)</td>
<td>135,00</td>
</tr>
<tr>
<td>Sediment Management Area (Dredge Native)(^6)</td>
<td>150,000</td>
</tr>
<tr>
<td>Internal Slough Enhancement (Dredge Native)(^6)</td>
<td>-</td>
</tr>
<tr>
<td>Berm (Fill Native)</td>
<td>14,000</td>
</tr>
<tr>
<td>Raise Inner Marsh (Fill Native)</td>
<td>-</td>
</tr>
<tr>
<td>Bridge and Water Control Structure (Fill)</td>
<td>70</td>
</tr>
<tr>
<td>Area Access Road (Fill)(^5)</td>
<td>-</td>
</tr>
<tr>
<td>Rock Slope Protection at Existing and New Structures (Fill)</td>
<td>600</td>
</tr>
</tbody>
</table>

1 Eel River Estuary Preserve Ecosystem Enhancement Project Delineation of Uplands, July 2014.
2 Permanent impact areas are defined as areas that will experience permanent dredge/fill.
3 Temporary impact areas are areas where temporary construction disturbance could occur and are within the project area. These areas will be utilized for haul roads, staging areas and stockpiling areas and will be restored back to pre-construction conditions. These areas exclude soil amendment areas on agriculture lands.
4 Not Definable due to variable haul routes and coffer dam placement determined by the contractor and construction manager within the project limits of disturbance.
5 Accounts for to new bridge crossings of Centerville Slough and improvements to the existing access roads within the EREP
6 Excavation area within the EREP that is currently mapped as Jurisdictional Wetlands/Waters.
7 Temporary fill for construction access and coffer dam placement in sloughs/channels.
8 Does not include area within project limits and outside of permanent disturbance area that will be temporarily disturbed for construction access and material hauling. This area will be de-compacted and restored back to pre-construction conditions.

4.5 Mitigation Site Selection

4.5.1 Candidate Mitigation Site Descriptions and Analysis

Mitigation Wetlands

This proposed mitigation locations are contiguous to, part of, and complementary to, the EREP Project. The mitigation wetlands will become part of the overall functioning ecosystem of the site. Offsite mitigation sites were not considered for this reason. Wetland mitigation project design deliberately focused on the identification of suitable uplands for conversion to wetlands that would fit with the project’s overall restoration goals.
Snowy Plover Habitat

Similar to the mitigation wetlands, mitigation of Snowy Plover habitat was desired to fit within the functioning ecosystem of the overall project site. Recognizing the limitations of European beachgrass removal within a dune ecosystem, and the likely recolonization of this invasive weed, locating the project in an area where the episodic disturbance regime maintains ideal Snowy Plover habitat was recognized as desirable. This attribute will better support the perpetuation of the site for the benefit of plover. This reduced potential candidate sites to existing wave overwash areas, and areas near the Eel River mouth. Some existing wave overwash areas posed issues due to a variety of factors:

- Proximity to Centerville Beach and the higher use areas by off-road vehicles
- Some overwash areas were not within Wildland Conservancy property
- Some overwash areas expose agricultural lands to storm vulnerabilities and may require intervention that disturbs Snowy Plover habitat
- Some overwash areas within TWC were already inhabited by Snowy Plovers

Given these considerations, a site near the Eel River mouth was selected.

Other Special Status Species Sites

At this time, mitigation sites for other special status species have not been identified. Avoidance and monitoring are the primary mitigations. Should relocation or replanting be deemed necessary, the guidelines described in Section 4.2.3 will be followed. Suitable sites will be determined at that time.

4.5.2 Selected Mitigation Site

Mitigation Wetlands

The selected mitigation sites are filled areas of uplands (remnant spoils piles and existing berms) that will not be needed to maintain drainage operations under the new EREP plan. Additionally, they are obstructions to the wetland matrix that will be re-established under the plan. Some of these uplands are currently surrounded by dune mat and estuarine saltmarsh, others by palustrine emergent wetlands (including agricultural wetlands). In addition to these features, the shoulders will be rocked on a small section (0.36 acres) of the main access road.

Snowy Plover Habitat

The existing Snowy Plover habitat site lies at the northern end of the Eel River’s south spit, where the dunefield’s heights are lower and broader than dunes to the south end of the spit. Native dune mat vegetation is sparse; vegetation is primarily non-native European beachgrass. The site is close to the Pacific Ocean and the Eel River mouth, (Figure 9), posing ideal conditions for Snowy Plover nesting and roosting. Restoration of this project site for mitigation also expands an area documented as currently in use by Snowy Plover for these purposes.

4.5.3 Reference Site

Mitigation Wetlands

Reference sites for wetlands are the existing mosaic of wetlands within the larger EREP project site and are described broadly below. For the purpose of assessing the success of wetland re-establishment, specific reference sites will be chosen that are within 20 feet of six of the re-established mitigation
wetlands. Three specific reference locations will be chosen for the tidal wetlands and three for the freshwater wetlands. Each reference site will be approximately 400 square feet.

The mitigation and overall project site is part of a working agricultural landscape with ecological influences from upstream and upwind sources of non-native weed species, sediment and water supplies, and migratory animals that may be vectors of weed transmission. Existing freshwater wetlands at the site were classified during a wetland delineation (GHD 2013) as predominately palustrine emergent seasonal wetlands (National Wetlands Inventory Code PEM1Cd; Federal Geographic Data Committee 2013). A large percent of the freshwater wetlands at the Project are considered agricultural or pasture wetlands and are actively managed for grazing.

Vegetation data from the wetland delineation provides reference descriptions of the dominant vegetation in the freshwater wetlands managed for agriculture. Dominant species included the non-native pasture species: creeping bent grass (*Agrostis stolonifera*), perennial rye grass (*Festuca perennis*), white clover (*Trifolium repens*), and bird’s foot trefoil (*Lotus corniculatus*). The native wetland species silverweed cinquefoil (*Potentilla anserina*) and salt grass (*Distichlis spicata*) were present, as were several invasive species: (*Plantago lanceolata*), hairy cat’s ear (*Hypochaeris radicata*), curly dock (*Rumex crispus*), and bull thistle (*Cirsium vulgare*).

The specific vegetation communities that will re-establish in the 1.8 acres of mitigated tidal wetlands will be determined by the changing hydrologic conditions. Mitigated tidal wetlands may re-establish to support a range of vegetation communities from mudflats to high salt marsh (tidal wetlands). These wetlands will likely resemble the tidal salt marsh and brackish marsh communities described in the DEIR which provide habitat for native species such as: pickleweed (*Sarcocornia pacifica*), saltgrass (*Distichlis spicata*), gumplant (*Grindelia camporum*), tufted hairgrass (*Deschampsia cespitosa*), Lyngbye’s sedge (*Carex lyngbyei*), jaumea (*Jaumea carnosa*), and arrow grass (*Triglochin maritima*).

**Special Status Plant Species:**

A large population of Lyngbye’s sedge occurs at the Project site and only a small percent to the population will be impacted by construction. In other areas of the Project site, Lyngbye’s sedge is well established. These undisturbed areas will serve as reference sites with consideration given to the fact that it will take time for new populations to achieve the same density as that which occurs at existing reference sites.

### 4.6 Site Protection Instrument

The Wildlands Conservancy owns the mitigation sites. It is the intent of the Wildlands Conservancy to maintain the mitigation areas in perpetuity as wetlands and conservation lands, subject to relief in the event of catastrophic events as may be negotiated.

### 4.7 Mitigation Site Environmental Baseline

#### 4.7.1 Wetland Mitigation Sites

The mitigation sites are berms that are being removed and rebuilt elsewhere. These sites are shown on Figure 10. The remnant spoils piles and existing berms where wetlands will be re-established are approximately six to eight feet high. These areas were described in an upland delineation as two parameter uplands because they lack wetland hydrology and hydric soils (GHD 2013). These areas are often dominated by vegetation classified as facultative using the USACE classification system. The
upland delineation identified these areas as problematic due to the current and historic agricultural land use history. The pasture grasses rye grass (*Festuca perennis*) and creeping bent grass (*Agrostis stolonifera*), both facultative, are often dominant in upland areas that are spoils piles. Both of these species are abundant in adjacent pastures. From a statistical perspective, facultative species are those that have an equal likelihood of occurring in uplands or wetlands, (a 34-66% chance). It was determined that on the spoils piles dominant species are not growing as hydrophytes and thus these areas were classified as two parameter uplands (GHD 2013). The facultative wetland species salt grass, (*Distichlis spicata*), was also present to varying degrees of abundance on the upland spoil piles. The presence of this species on spoils piles is likely attributable to the fact that the soil it is growing on was recently excavated from the surrounding drainage channels.

The mitigation project’s goal is to mitigate for the impacted wetlands at a ratio of 1:1. This mitigation plan estimates approximately 2.3 acres of freshwater wetland creation and 1.8 acres of estimated estuarine wetland creation based upon adjacent wetland conditions and new tidal inflows. However, hydrologic conditions may vary resulting in differences in the final acreages of each type of wetland. The Project commits to no net loss of wetlands, and seeks to predict the acreage of each type of wetland that will be mitigated, but recognizes that the final acreages of each re-established wetland may differ from predicted targets.

### 4.7.2 Snowy Plover Mitigation

The mitigation site is an area of low, gently undulating dunes and beach, characterized by European beach grass and to a lesser extent, sand verbena (*Abronia latifolia*). Woody debris adds complexity to the site. It is expected that with the removal of European beachgrass, the site’s topography will become lower and smoother.

### 4.8 Mitigation Work Plan

#### 4.8.1 Mitigation Area

Wetland mitigation will occur at remnant spoils piles sites and at an existing berm removal site. Snowy Plover habitat mitigation will occur on TWC property near the Eel River mouth. These sites are shown in Figure 10 and have been discussed in Sections 4.5 and 4.7. Special status species avoidance is also discussed here although, as previously indicated, avoidance is the principal approach and any mitigation will occur should an impact happen.

#### 4.8.2 Work Plan

The wetland mitigation concept is based on the removal of upland fill that currently interrupts the surrounding wetland matrix. The Snowy Plover habitat mitigation is based on the removal of European beachgrass to create a suitable nesting/roosting site.

**Construction Phases and Methods**

Grading for wetland mitigation will occur in tandem with excavating the existing channels and with berm construction. Snowy Plover habitat mitigation will occur prior to or in tandem with dune rebuilding so as to ensure no temporal loss of habitat.

**Wetland Mitigation**
For the re-established freshwater and tidal wetland areas, native seed mixes will be obtained from a regionally appropriate source prior to commencement of grading activities. Seed will be installed in late September post grading using hand-held equipment. Certified weed free rice straw will be applied by hand on top of seeded areas. Newly seeded areas will be taken into consideration with regard to tidegate operation during the first few months post seeding.

The stormwater pollution prevention plan will also be implemented to protect adjacent Waters of the State and of the United States from runoff impacts. Erosion control measures will be installed as fill is removed to prevent hydrological activity (tidal action, precipitation, or runoff) from damaging grading and seeding.

The wetland mitigation sites will be cleared and grubbed using a combination of equipment and machinery. Removal of spoils piles and the levee section will require the use of heavy equipment such as excavators and dump trucks. Equipment that distributes its weight over a larger surface area, with tracks instead of tires, reduces compaction impacts and will be a preferred specification of equipment used on site. A stockpiling area will be situated so as not to impact the mitigation sites. Dump truck movement will be limited to moving between the spoils piles and levee to be removed and the dump site. This project component will use the same access routes as the overall project for construction equipment.

Erosion control measures will be installed. Environmental monitors will observe the growth and expanding coverage of wetland plantings. These erosion control measures will be removed when coverage of the re-established wetland areas achieves ≥ 70 percent.

Upon completion of implementation, a five-year monitoring and adaptive management period will begin. Invasive species management for target invasive species will be conducted in conjunction with quarterly inspections and management activities during the five year post-construction monitoring period.

**Snowy Plover Habitat Mitigation**

European beachgrass will be removed using either hand or mechanical methods, or herbicide, with a preference for hand or mechanical methods, including the digging of trenches and burial of the beachgrass.

Upon completion of implementation of all mitigation projects, a five-year monitoring and adaptive management period will begin. Invasive species management for target invasive species will be conducted in conjunction with quarterly inspections and management activities during the five year post-construction monitoring period. Quarterly inspections to assess European beachgrass invasion will be sensitive to Snowy Plover breeding season using techniques such as assessment by binoculars as necessary to avoid any Plover populations during the breeding season (March through September). Maintenance work will occur outside of the breeding season.

**Special Status Species Avoidance**

Pre-construction surveys will be conducted prior to commencement of construction to ensure that any special status species are not within the project area.

**Construction Timing and Sequence**

Subject to the availability of funding, the project will begin in May of 2017, the following timeline is an estimate, contingent upon receipt of funding.

**Wetland mitigation**
- Preconstruction surveys, seed collection: January-August 2017
- Erosion control, equipment mobilization and site preparation: May 2017
- Construction: May-October 2017
- Clean up and demobilization: October 2017
- Implement mitigation: May-October 2017
- Monitoring of restoration: October 2017-October 2022
- Ongoing maintenance: October 2017-October 2022, or as mandated by permit conditions. The Wildlands Conservancy will be responsible for maintenance through the monitoring period.

**Snowy Plover mitigation**
- Special status plant survey: Spring 2017
- Preconstruction surveys: August 2017
- Erosion control, equipment mobilization and site preparation: September 2017
- Implement European beachgrass removal: September-October 2017
- Clean up and demobilization: October 2017
- Monitoring of restoration: October 2017-October 2022
- Ongoing maintenance: October 2017-October 2022, or as mandated by permit conditions. The Wildlands Conservancy will be responsible for maintenance through the monitoring period.

**Special Status Species Avoidance**
- Preconstruction surveys, January-April 2017
- Mitigation Planting and/or Relocation (if needed), January 2017-January 2018
- Monitoring (if needed): January 2018-January 2023
- Ongoing maintenance: January 2018-January 2023, or as mandated by permit conditions. The Wildlands Conservancy will be responsible for maintenance through the monitoring period.

**Planting Plan**
The following seed mixes will be used to seed the mitigation sites:

**Table 4-7: Freshwater Wetland Seed Mix (40 lbs/ac)**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Quantity Lbs/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tufted hairgrass</td>
<td>Deschampsia cespitosa</td>
<td>5.0</td>
</tr>
<tr>
<td>Slender hairgrass</td>
<td>Deschampsia elongata</td>
<td>5.0</td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Quantity Lbs/Acre</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Common spikerush</td>
<td>Eleocharis macrostachya</td>
<td>2.0</td>
</tr>
<tr>
<td>Meadow barley</td>
<td>Hordeum brachyantherum</td>
<td>8.5</td>
</tr>
<tr>
<td>Creeping wild rye</td>
<td>Leymus triticoides</td>
<td>8.5</td>
</tr>
<tr>
<td>Vancouver wildrye</td>
<td>Leymus vancouverensis</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
</tr>
</tbody>
</table>

### Table 4-8: Tidal Wetland Seed Mix (40 lbs/ac)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Quantity Lbs/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tufted hairgrass</td>
<td>Deschampsia cespitosa</td>
<td>6.5</td>
</tr>
<tr>
<td>Saltgrass</td>
<td>Distichlis spicata</td>
<td>6.5</td>
</tr>
<tr>
<td>Regreen hybrid wheatgrass</td>
<td>Elymus x triticum</td>
<td>11.0</td>
</tr>
<tr>
<td>Gumplant</td>
<td>Grindelia stricta</td>
<td>2.0</td>
</tr>
<tr>
<td>Meadow barley</td>
<td>Hordeum brachanytherum</td>
<td>4.0</td>
</tr>
<tr>
<td>Jaumea</td>
<td>Jaumea carnosa</td>
<td>1.0</td>
</tr>
<tr>
<td>Marsh rosemary</td>
<td>Limonium californicum</td>
<td>0.5</td>
</tr>
<tr>
<td>arrowgrass</td>
<td>Triglochin maritima</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
</tr>
</tbody>
</table>

### 4.9 Maintenance Plan

#### 4.9.1 Maintenance

The mitigated habitats have been designed to be as self-sustaining as possible. However, natural ecosystems are dynamic and subject to change over time. Natural processes that create dynamic environments include flood, drought, fire, fog, wind, burrowing animal activity, climate change and grazing. Well-planned mitigation areas will respond to these natural processes with similar levels of resilience as adjacent naturally-evolved ecosystems. Anthropogenic (human-caused) disturbances can interrupt the functioning of both naturally-evolved and manmade ecosystems. Maintenance activities shall focus on promoting plant establishment and intervention to limit anthropogenic impacts such as invasive species, trespass, and illegal dumping.
The Wildlands Conservancy will be responsible for ongoing establishment, maintenance and monitoring upon completion of the construction project. Monitoring typically occurs for five years, unless activities such as replanting are required, which may re-set the establishment timeframe.

### 4.9.2 Inspection Activities and Frequencies

Inspection will occur quarterly throughout the mitigation monitoring timeframe, or less as needed after year one if plant success exceeds targets. Field notes will document if conditions are normal or abnormal, and the annual monitoring report will recommend remedial adaptive management actions to address any significant issues, as deemed necessary. In addition to the annual monitoring criteria listed above, annual monitoring will also note whether the following conditions are observed:

- Is there any presence of new or re-established populations of target invasive species?
- Is there a distinct pattern of plant die-off?

Inspections shall be documented in a maintenance logbook as to the date, time, site conditions, general observations, type of work to be done, and equipment used or required for follow-up maintenance. Inspection frequency may be altered depending on ambient conditions or the amount of work required at the site and overall success. The logbook will be submitted on an annual basis with the annual monitoring report.

#### Table 4-9: Schedule for Wetland Inspection and Maintenance During the Monitoring Period

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>I, M</td>
<td>I</td>
<td>M*</td>
<td>M*</td>
<td>I,M*</td>
<td>M*</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\* Maintenance will prioritize removal of invasive cordgrass flowers and seeds as they are first forming (May-August).

### 4.9.3 Maintenance Activities and Schedules

Maintenance shall be conducted throughout the five year monitoring period. Maintenance activities may include supplemental planting, invasive plant control, and herbivory control.

Maintenance shall occur at the most seasonally appropriate time depending on the activity. For example if dense-flowered cordgrass is becoming established on site, the maintenance shall occur prior to the flowering and setting of seed. Table 4-9: Schedule for Wetland Inspection and Maintenance During the Monitoring Period provides a guide for determining when to visit the mitigation sites for inspections and maintenance during the monitoring period.

Maintenance will be conducted to ensure revegetation out-planting is becoming established.

- Supplemental planting will occur in areas that have deficiencies in the seeding, when plants become damaged by maintenance activities, or to fill the niche for areas where target invasive plants are removed (may be in-kind, or if a particular species is not doing well at the sites, a suitable replacement species can be supplemented for original plant species)
**Invasive Species Management**

Non-native and invasive plant competition is a major factor to consider throughout the mitigation timeframe and extending into the long-term management timeframe. Control of targeted non-native invasive plant species is critical for the success of Project mitigation areas, including the mitigated wetlands, mitigated Snowy Plover habitat, and the area where Lyngbye’s sedge will re-establish, as well as any areas of mitigation that may be necessary due to unanticipated impacts to special status plant species. As mentioned previously, control of dense-flowered cordgrass will be a priority throughout the Project. Since control of this species is not tied to a specific mitigation site, its control will be addressed in the Adaptive Management Plan. Additionally, control of European beach grass will be critical to the success of the Snowy Plover mitigation area and would also be critical for any potential mitigation areas for special status plant species that might occur in dune habitats (for currently unanticipated impacts).

Control of invasive species becomes more complex for the wetland mitigation areas. While a portion (1.8 acres) of the wetland mitigation will re-establish as tidal wetlands, the majority of the 2.3 acres that will re-establish as freshwater wetlands will eventually be managed as pasture. Vegetation data from the Project area shows that existing agricultural/pasture wetlands are currently composed of many non-native species. These wetlands will also continue to be managed for agriculture and non-native pasture species may eventually be seeded or brought in by cattle. Many of the non-native pasture species that currently surround several of the freshwater wetland mitigation areas will likely establish once the wetlands are re-established. Therefore, invasive species control in mitigated areas for wetlands will focus on the most ecologically harmful, target non-native invasive species and will tolerate non-native species that are already established in the working agricultural landscape. Other species in Table 4-10 below will be exempt from mitigation success criteria as they have naturalized in California and/or locally in Humboldt County and are not considered to impact the ecological function of the proposed restored habitats.

The following are sources of information about weed species within the region, and are referenced for the development of this section.

- California Invasive Species Council (Cal-IPC)
- Humboldt County Weed Management Area (HWMA) Strategic Management Weed List
- Final Programmatic Environmental Impact Report (PEIR) for the Humboldt Bay Regional Spartina Eradication Plan

Table 4-10 below lists invasive plant species observed within Project sites based on special-status plant surveys (GHD 2014b), habitat mapping (GHD 2013), and upland delineations (GHD 2014a). Himalayan blackberry (*Rubus armeniacus*) and purple loosestrife (*Lythrum salicaria*) are included on the list of target invasive non-native species as they are problematic invasives that have been observed in the adjacent Salt River watershed (H.T. Harvey & Associates 2012).

Although not known from the project site, dwarf eelgrass (*Zostera japonica*), is also included on this list as it has been found in McNulty Slough in the Eel River estuary (Cal-IPC 2016). This species can rapidly colonize intertidal marine and estuarine habitats, particularly unvegetated mudflats. Colonization by dwarf eelgrass can alter physical habitat structure and alter the densities and richness of resident fauna (H.T. Harvey & Associates 2012). Early detection of dwarf eelgrass is difficult as it is typically found at tides of 2.0 ft MLLW (mean lower low water) or lower, the narrow blades of the eelgrass make it difficult to detect, and surveys are difficult to conduct in intertidal mudflat areas (H.T. Harvey & Associates 2012). If this species is found at EREP the populations will be reported to the Eureka offices of California Sea
Grant and the California Department of Fish and Wildlife and documented in monitoring reports. Both purple loosestrife and dwarf eelgrass are on the red alert list (the early detection, rapid response action category) for the Humboldt County Weed Management Area.

Reed canarygrass (*Phalaris arundinacea*) has not been included on the list of invasive non-native species below. This species has been found in the Salt River Watershed but is not known from inside the project boundary at EREP. The most current version of The Jepson Manual (Baldwin et al. 2012) lists reed canarygrass as a native species. There is currently confusion regarding the status of this species in North America as native or non-native, and native populations may have been exposed to gene flow from non-native strains (Waggy 2010). Humboldt State University is currently conducting research on the genotype of the population of reed canary grass at Salt River. Reed canarygrass has the ability to trap sediment and can lead to constriction of waterways. If it is found at EREP, the population will be observed and documented in monitoring reports. While not currently a known problem at EREP it is possible that this species could impact restoration goals. Targeted plants for control are indicated in the column at the far right of the table.
### Table 4-10: Invasive Non-native Species at Project Site Targeted for Control

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Cal-IPC Rating</th>
<th>Humboldt WMA Ranking</th>
<th>Target Species: Yes or No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SHRUBS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubus armeniacus</td>
<td>Himalayan blackberry</td>
<td>High</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>HERBS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agrostis stolonifera</td>
<td>creeping bent</td>
<td>Limited</td>
<td>High</td>
<td>No</td>
</tr>
<tr>
<td>Ammophila arenaria</td>
<td>European beach grass</td>
<td>High</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td>Arctotheca calendula</td>
<td>cape weed</td>
<td>Moderate</td>
<td>Monitor/Research</td>
<td>No</td>
</tr>
<tr>
<td>Cakile maritima</td>
<td>sea rocket</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Cirsium vulgare</td>
<td>bull thistle</td>
<td>Moderate</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td>Cirsium arvense</td>
<td>Canada thistle</td>
<td>Moderate</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td>Conium maculatum</td>
<td>poison hemlock</td>
<td>Moderate</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>Cotula coronopifolia</td>
<td>brass-buttons</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Cynosurus echinatus</td>
<td>bristly dogtail grass</td>
<td>Moderate</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Dactylis glomerata</td>
<td>orchard grass</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Erodium cicutarium</td>
<td>redstem filaree</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Festuca arundinacea</td>
<td>tall fescue</td>
<td>Moderate</td>
<td>Monitor/Research</td>
<td>No</td>
</tr>
<tr>
<td>Festuca myuros</td>
<td>rattle sixweeks grass</td>
<td>Moderate</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Festuca perennis</td>
<td>rye grass</td>
<td>Moderate</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Foeniculum vulgare</td>
<td>fennel</td>
<td>High</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td>Geranium dissectum</td>
<td>cranesbill</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Helminthotheca echioides</td>
<td>bristly ox-tongue</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Hirschfeldia incana</td>
<td>short pod mustard</td>
<td>Moderate</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>Holcus lanatus</td>
<td>common velvet grass</td>
<td>Moderate</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>Hypochaeris radicata</td>
<td>rough cat's-ear</td>
<td>Moderate</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Lythrum salicaria</td>
<td>purple loosestrife</td>
<td>High</td>
<td>Red Alert</td>
<td>Yes</td>
</tr>
<tr>
<td>Mentha pulegium</td>
<td>pennyroyal</td>
<td>Moderate</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Phalaris aquatica</td>
<td>Harding grass</td>
<td>Moderate</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td>Plantago lanceolata</td>
<td>English plantain</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Ranunculus repens</td>
<td>buttercup</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Raphanus sativus</td>
<td>wild radish</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Rumex acetosella</td>
<td>sheep sorrel</td>
<td>Moderate</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>Senecio glomeratus</td>
<td>fireweed</td>
<td>Moderate</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Silybum marianum</td>
<td>milk thistle</td>
<td>Limited</td>
<td>Not Listed</td>
<td>No</td>
</tr>
<tr>
<td>Spartina densiflora</td>
<td>cordgrass</td>
<td>High</td>
<td>High</td>
<td>Yes</td>
</tr>
<tr>
<td>Zostera japonica</td>
<td>dwarf eelgrass</td>
<td>Moderate</td>
<td>Red Alert</td>
<td>No</td>
</tr>
</tbody>
</table>
All mitigation areas, including wetland mitigations will be monitored and controlled for target non-native invasive plants (as shown in Table 4-9) during the mitigation timeframe. Various weed management techniques, including but not limited to, mowing, weed whacking, removal by weed wrench or extractigator, hand pulling, or use of equipment such as a Marshmaster may be employed. Invasive species targeted for control are discussed in more depth below.

Invasive plant inspections and maintenance will be conducted quarterly. Managers will need to take into consideration access, the potential for mobilizing wetland soil and the need for repeat/follow-up removal when selecting appropriate techniques.

The following general principles apply to maintenance activities for invasive species management:

- Where invasive and weedy plants have been removed, maintenance activities shall ensure they do not readily re-propagate within the mitigated habitats by filling the open niche with supplemental planting.
- Target invasive plant removal includes manual and mechanical methods to the extent practicable.

**Snowy Plover Habitat Target Invasive Species**

European beachgrass is a highly invasive perennial grass that reproduces through seed and spreads through rhizomes which enables it to quickly colonize bare sand. It has been used historically to stabilize beach and dune environments near settlements or infrastructure, and has become a pest species that reduces biodiversity, natural dune processes and resilience, and habitat.

Control methods range from hand removal, herbicidal control, and mechanical methods such as digging of deep trenches and burial. Beachgrass control would occur outside of the nesting season for Snowy Plovers. Removal would occur between September and March. Follow up management is often needed. Control of this species will be limited to the area designated for Snowy Plover habitat mitigation or any potential, presently unanticipated mitigations for sensitive plant species that might occur in dune habitats.

**Wetland Mitigation Target Invasive Species**

Target invasive species for the wetland mitigation areas include purple loosestrife (*Lythrum salicaria*), a species classified as a wetland obligate by USACE classification, Canada thistle (*Cirsium arvense*) and Himalayan blackberry (*Rubus armeniacus*) which are both classified as facultative species (equally likely to occur in wetlands and non-wetlands). Bull thistle (*Cirsium vulgare*), harding grass (*Phalaris aquatica*), and fennel (*Foeniculum vulgare*) are other invasive species known from the project area that are probably less likely to be problematic in the re-established wetlands given their classification as facultative upland species, however if any of the targeted invasive species occur in the re-establishing wetland areas they will be controlled. Although it is not a targeted invasive species in the mitigation plan, it is anticipated that once a tidal connection is re-established to the Inner Marsh, creeping bentgrass will die back and a mix of salt and brackish marsh species will naturally colonize channel banks and the higher flats. Methods for control of these species are briefly outlined below.

*Purple Loosestrife:* Purple loosestrife in a non-native perennial that competes with wetland plants and its vigorous growth forms dense colonies which can choke freshwater wetland areas. Established populations of purple loosestrife can dominate the seedbank of invaded areas. Purple loosestrife has been found in the Eel River area in Humboldt County; as with most invasive species, it is difficult to remove once established. Management recommendations include monitoring areas not yet infested and hand-pulling newly discovered seedlings to prevent its spread. Mechanical removal (mowing) before the
seeds mature may help reduce its spread but cut stems may re-root. Neither burning nor flooding has been shown to be an effective control method (Bossard et al. 2000; DiTomaso and Healy 2003). Chemical control is currently not an option for treatment in Humboldt County. Herbicide treatment had been previously proposed to treat populations along the Eel River in Humboldt County, but the planned spraying has been halted until a full environment impact report is prepared under the guidelines of the California Environmental Quality Act. Another option for control is the use of a biocontrol agent to eradicate and limit the spread of purple loosestrife. Biocontrol has been used with some success in the eastern United States. The Illinois Department of Natural Resources has been using three beetle species since 1994 to feed on the roots, leaves and growing tips of purple loosestrife. Reductions in up to 95% of the plant’s biomass have been observed (Blossey 2011).

**Harding grass:** This perennial grass spreads by seed (produced May-September) and also by rhizome. Seeds last between 1-3 years. The best time to control this weed is in the dry summer months of June and July. Before this time it is difficult to distinguish this grass and after this window the grass has already gone to seed. This species grows in large clumps along the coast and can be found invading grasslands and other habitats including waterways. Hand pulling small clumps is feasible for small populations. Larger populations must be controlled by cutting around the base clump with a Pulaski and digging out all roots longer than 2 inches. Mulching is recommended to discourage re-sprouts. Repeated mowing and herbicide are other techniques used for control of this species. Mowing is only a control however, and will not eradicate this species.

**Bull thistle:** Bull thistle is a biennial or perennial species which invades a range of habitats usually favoring recently or repeatedly disturbed areas such as pastures. This species thrives in moist conditions. Bull thistle reproduces solely by seed and can be controlled by manual methods before flowering. The taproot should be removed to prevent flowering in subsequent years. Combinations of mechanical, cultural, and chemical methods are more effective than any methods used alone. All methods of control require persistence and care.

**Canada thistle:** Canada thistle is a perennial species that forms dense colonies spreading by its extensive root system and by seed. Canada thistle will grow in moist soils but does not survive in saturated soil. The most effective control of this species will depend on the extent of infestation. Care must be taken when implementing control for this species as it may sprout from any small root fragments left in the soil.

**Fennel:** Fennel is an erect perennial herb which can alter the composition of several plant communities including wetlands. Fennel reproduces from both the root crown and by seeds. Seeds production is prolific, generally occurring in May, and seed maturation may continue through early November. Management of small stands can be done by hand. Individual plants should be dug out. Cutting, mowing, or chopping reduces the height of plants but leaves roots alive that will support the regrowth of shoots. Repeated cutting may help reduce denser stands over time, but time between cutting should be short as fennel recovers quickly from cutting.

**Himalayan blackberry:** Himalayan blackberry is a sprawling, evergreen shrub that occurs along disturbed areas and streambanks. It is commonly found in riparian areas, where it forms dense thickets. It can tolerate periodic inundation in both fresh and brackish conditions. It also can readily colonize disturbed areas. Once it is established, it can form impenetrable thickets that shade and outcompete native vegetation, including native blackberry. Mechanical removal or burning are potential methods of removing the plants, but these methods require persistent treatment to be successful. Removing only the
aboveground growth will stimulate the growth of root sprouts. Repeated cutting, particularly while the plant is flowering can help in exhausting the root stores. The canes and the roots also need to be removed as Himalayan blackberry can easily resprout from any remaining roots, in addition to regenerating from seed.

4.10 Performance Standards

4.10.1 Overview

Performance standards are based upon the mitigation project’s goals and objectives for habitat function and abundance, as well as designated mitigation ratios.

4.10.2 Mitigation Site

Tidal Wetland Mitigation Site

Mitigation site hydrology shall be within ranges that maintain suitable wetland habitat as defined by the Army Corps of Engineers (2005). Fourteen (14) or more consecutive days of flooding or ponding, or a water table 12 in (1 foot) or less below the soil surface, during the growing season at a minimum frequency of 5 years in 10 (50 percent or higher probability).

4.10.3 Vegetation Criteria

Tidal Wetland Mitigation Areas

Tidal wetland post-planting shall meet the annual criteria described in Table 4-1.

Table 4-11: Tidal Wetlands Mitigation Sites Success Criteria
### Table 4-11: Tidal Wetlands Mitigation Sites Success Criteria

<table>
<thead>
<tr>
<th>Estuarine Wetland Success Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Year 4</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Year 5</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>All Years</strong></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Absolute cover refers to the ratio of named plant species relative to entire site, including bare ground, open water, etc. Target non-native invasive species are identified in Table 4-10.

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**Palustrine Emergent Wetland Mitigation Areas**

Freshwater marsh and agricultural wetland post-planting shall meet the annual criteria described in Table 4-12 below. This criteria is based on existing condition of agricultural wetlands on the site and the continued management of these wetlands for agricultural purposes. See discussion of non-natives and potential for seeding with pasture species in these areas in 4.9.3.
**Table 4-12: Freshwater Wetland Mitigation Sites Success Criteria**

<table>
<thead>
<tr>
<th>Year</th>
<th>Success Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>50 percent (≥) absolute cover of native wetland species, of which: No more than 20 percent absolute cover of non-native species, of which &lt; 10 percent absolute cover is target non-native invasive species.</td>
</tr>
<tr>
<td>Year 2</td>
<td>40 percent (≥) absolute cover of native wetland species, of which: No more than 35 percent absolute cover of non-native species, of which &lt; 10 percent absolute cover is target non-native invasive species.</td>
</tr>
<tr>
<td>Year 3</td>
<td>30 percent (≥) absolute cover of native wetland species, of which: No more than 45 percent absolute cover of non-native species, of which &lt; 10 percent absolute cover is target non-native invasive species.</td>
</tr>
<tr>
<td>Year 4</td>
<td>20 percent (≥) absolute cover of native wetland species, of which: No more than 55 percent absolute cover of non-native species, of which &lt; 10 percent absolute cover is target non-native invasive species.</td>
</tr>
<tr>
<td>Year 5</td>
<td>10 percent (≥) absolute cover of native wetland species, of which: No more than 65 percent absolute cover of non-native species, of which &lt; 10 percent absolute cover is target non-native invasive species.</td>
</tr>
</tbody>
</table>
| All Years | * Native wetland species consist of OBL/FACW/FAC species.  
  * No large non-vegetated bare spots (greater than 25 percent) or erosional area and no permanent inundation during five year monitoring period  
  Absolute cover refers to the ratio of named plant species relative to entire site, including bare ground, open water, etc. Target non-native invasive species are identified in Table 4-10. |
**Snowy Plover Habitat Mitigation Areas**

Snowy Plover habitat mitigation shall meet the criteria specified in Table 4-13.

| Snowy Plover Habitat Mitigation Site Success Criteria |  
|------------------------------------------------------|--------------------------------------------------|
| All Years                                            | • ≤ 10 percent absolute cover of target on-native invasive plants  
|                                                     | • ≥ 80 percent absolute cover bare ground         |
|                                                      | Absolute cover refers to the ratio of named characteristic relative to entire site, including plants, bare ground, open water, etc. Target non-native invasive species are identified in Table 4-10. |

### 4.11 Monitoring

#### 4.11.1 Reference Sites

As described in section 4.5.3 reference sites for wetlands will be chosen that are within 20 ft of six of the re-established mitigation wetlands. Three specific reference locations will be chosen for the tidal wetlands and three for the freshwater wetlands. No data will be collected from the reference sites unless any unusual conditions are observed at mitigated wetland locations. In this case, the reference sites would be monitored to assess the extent of the unexpected conditions. Examples of unusual conditions might be large deposits of sand, or patterns of plant mortality.

Reference sites for Lyngbye’s sedge will be the large existing population at the site that will not be impacted by construction. As stated in section 4.5.3, consideration will be given to the fact that it will take time for new populations of Lyngbye’s sedge to achieve the same density of that which occurs at existing reference sites.

#### 4.11.2 Wetland Monitoring

The following wetland monitoring activities are applied to each of the mitigation areas in accordance with Table 4-14.

<p>| Table 4-14: Monitoring Activities by Mitigation Area |<br />
|------------------------------------------------------|--------------------------------------------------|</p>
<table>
<thead>
<tr>
<th>Wetland Mitigation Sites</th>
<th>Snowy Plover Mitigation Area</th>
<th>Lyngbye’s sedge Re-establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetative Cover</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Non-native Invasive Plant Monitoring</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Photo Monitoring Stations</td>
<td>■</td>
<td>■</td>
</tr>
</tbody>
</table>
Sample Size

Power analysis
The appropriate number of sampling plots will be determined for each wetland mitigation area annually using the following methodology. Power analyses will be used in both an *a priori* and *post hoc* manner to evaluate the efficacy of sampling efforts to detect target plant cover changes that correspond to success criteria. Year 1 sampling efforts (i.e., sample size) will be determined using perceived variability of plant cover across the landscape, balanced by the logistical constraints of the initial field effort. In general, an initial sampling effort of 40 or more sample plots is recommended, a sample size of 30 should be considered the minimum effort.

Following year 1 sampling, a *post hoc* power analysis will be conducted to evaluate the probability of detecting the observed change in plant cover given the observed variability among sample points. These values will inform the year 2 sampling effort while also evaluating the adequacy of the year 1 effort. The year 2 sampling effort will be determined by the *a priori* constraints of the power analysis resulting from the data from year 1. These constraints include: 1) the target effect size (year 2 success criteria minus year 1 success criteria), 2) the desired significance level (e.g., a *P*-value of 0.05, 95% confidence), and 3) the desired power (e.g., 80% likelihood of detecting the desired effect size when it is real). In subsequent years, continued *a priori* power analyses will be used to determine the ongoing monitoring efforts and will be tied directly to the success criteria of each subsequent year.

Annual Vegetation Sampling
Monitoring data will be collected using a randomized plot based sampling approach. Placement of sampling plots for each wetland will be determined using the ESRI "Create Random Points" tool on maps of mitigated wetland areas prior to data collection. Quantitative data will be collected within 1 meter square quadrats inside the boundaries of the re-establishing wetlands. Attribute data collected for each plot will include:

- Absolute cover of all plant species in each plot should be estimated, including native, non-native, and target non-native invasive species. Estimates will include all bare earth or surface water within each plot.
- The wetland indicator status of each plant in the sample plots will be recorded.

Year Five Wetland Delineation
In addition to the year five annual vegetation sampling, monitoring efforts in year five will include a wetland delineation to determine whether the 4.33 acres of mitigated wetlands re-established successfully.

Non-native Invasive Plant Monitoring
During spring or early summer of in years one through five, target non-native invasive plant cover will be calculated from the data collected, as described above. In addition to this monitoring, areas with greater than ten percent cover of the target non-native plant species will be mapped using GPS as long as areas are safely accessible. Maintenance activities to control non-native invasive species will focus on these areas. Each year the acreage of mapped target non-native invasive species will be reported.
Photo Monitoring Stations

Permanent photo-documentation points will be established within the project site. A minimum of one photopoint is required for each monitored re-established wetland. GPS coordinates will be collected at each photopoint, and the point will be included on a map of the sites.

Photographs will be taken throughout the monitoring period at each monitoring event. Photographs will be taken from each monitoring point and the cardinal direction will be recorded for repeatability. Photos will be taken with a digital camera with a moderate wide angle lens (approximately 35mm focal length if a full-frame sensor, approximately 24mm focal length if a DX sensor, at the widest setting if a consumer-level digital camera with a built in zoom). The make and model of camera and type and focal length of lens will be noted in monitoring documentation. Photographs will be taken from about five feet in height, ideally from a tripod with the height noted, consistent from year to year.

4.11.3 Monitoring Schedule

Monitoring results will be submitted in an annual report for a total of five monitoring reports over the five-year monitoring period. In addition to the quarterly inspections described in Section 4.9.2, wetland monitoring will occur annually for five years in June or July. Some flexibility to account for annual variation in weather conditions is acceptable. The Snowy Plover habitat mitigation area will be monitored quarterly. Quarterly observations will be summarized in an annual monitoring report. Qualitative data will also be noted at monitoring sites including any notable conditions such as patterns of invasion of target non-native invasive species, vitality of plant survivorship, erosion, or illegal dumping or trespass. The re-establishment areas for Lyngbye’s sedge will also be monitored annually and total re-established acreage and density will be reported. Annual monitoring reports for all mitigation sites should describe any maintenance activity occurring at mitigation sites. In addition, annual reports should include descriptions of dense-flowered cordgrass control.

4.12 Long Term Management

Long-term management is a strategy for managing the site once the performance standards are achieved (assumed to be after five years of monitoring) to ensure the long-term post monitoring viability of the resource. While the site has been designed to restore self-sustaining ecological processes and functions and to perform in perpetuity, there will still be a need to make occasional inspections and if necessary, perform maintenance tasks to assure the viability of the mitigation site. The site is private property and will remain under the management of the Wildlands Conservancy.

Wildlands Conservancy staff will work in-house and as needed with maintenance crews to attend to the state of the mitigation areas, including periodic trash removal, erosion of wetland areas, and observations of invasions of non-native plants. Should failure of the wetlands or invasive species incursions occur, the Wildlands Conservancy will refer to the Adaptive Management Plan to aid in formulating a forward practical approach.

As noted in Section 4.6, the mitigation project will remain in The Wildlands Conservancy ownership. Long term management will be conducted by The Wildlands Conservancy, or through contracted agents acting on their behalf. Any ongoing management activities will be scheduled by The Wildlands Conservancy at that time and are not expected to require reporting to agencies. However, the Water Levels Management Plan (WLMP) and Adaptive Management Plan (AMP) contained within the project’s Eel River Estuary
Preserve Management Plans (EMP) document serve as guiding references that are subject to periodic regulatory agency review and reporting.

4.13 Adaptive Management for HMMP

Adaptive management is a tool used to cope with the inherent changes and instability fundamental to natural resources and the ecological processes that encompass them. It is a process derived from a collection of practical methods based in research and monitoring. As a philosophy, it holds that conservation and restoration programs should be designed in ways that accumulate knowledge as quickly and accurately as possible so that the management plan can be adapted promptly to better management efforts. This approach allows managers to learn by experience within site specific environments and apply lessons learned to remedy deficiencies using a controlled and scientific approach.

Adaptive management procedures will be recommended on a case-by-case basis, to address any issues identified at the sites during monitoring or maintenance activities. Adaptive management actions could include one or more of the following activities (not exclusive) if success criteria are not met:

1. Adjusted weeding methods to reduce weeds around mitigation sites;
2. Supplemental planting for areas that have deficiencies in the seeding or planted material stock;
3. Supplemental replacement (may be in-kind, or if a particular species is not doing well at the site, a suitable replacement species can be supplemented for original plant species);
4. Supplemental watering (for non-performing plants that required supplemental planting);
5. Additional erosion control; and/or;
6. Hydrologic modification or minor regarding.

Unpredictable natural changes could alter the mitigation area and consequently necessitate changing the goals, objectives, strategies, and actions set forth in this plan. These changed conditions include but are not limited to:

1. Unusual weather patterns, such as extended drought or excessive rainfall;
2. Change in species composition, such as through invasion of a new invasive plant or wildlife species to the site, or increase in spread of existing target non-native invasive plants as listed in Table 4-10, or any new invasive plant species not considered in this document which exhibit similar adverse characteristics of a plant ranked as high, or a change in the ranking of invasive plants;
3. Change in the listing of species status species that could occur or have potential to occur in the habitat mitigation area, or;
4. Erosion or deposition of sediments.

4.13.1 Initiating Procedures

Adaptive management may be implemented if:

- The absolute percent cover of native plants in any monitoring year (averaged over sample plots) is 15 percent below the target level described under “Annual Success Criteria,” or if absolute cover of target non-native invasive species is more than 15 percent over target in monitoring years three, four or five; or if additional final criteria are not met.
Performance criteria are not met for three consecutive years, and monitoring indicates that conditions are not improving.

If adaptive management is determined to be necessary, a report shall be prepared analysing the cause of failure and, if necessary, proposing remedial action. A meeting will then be scheduled with the appropriate resource agencies, depending on the specific issue(s), and consensus reached on the best method(s) to address the issue.

**Revegetation**

Vegetation monitoring surveys may reveal the poor survival rates of seeded or planted stock or inadequate natural recruitment. Replanting will be recommended if monitoring reveals that plant success is failing to meet target thresholds and if it is thought to be the best procedure to attain success criteria. The recommended thresholds for reseeding or replanting are the same criteria listed above for initiating adaptive management.

Reseeding or replanting may also be deemed appropriate to replace dead plants. Plants should be replaced during the next rainy season. This should be considered throughout the monitoring period. If revegetation is initiated and irrigation is required for those plants to become established then the monitoring period shall be extended by one year for each year of additional irrigation and the monitoring period will be reset to year one (in these specific locations) to ensure the plants are self-sustaining, based on Regional Water Quality Control Board recommendations.

Additional adaptive considerations include:

- If a particular species has poor success throughout the site it may be replaced with a different species better suited to actual conditions in the mitigation areas.
- If selected areas are receiving too much or too little water, the system may be modified accordingly.
- Use of weed mats or mulch as remedial action to reduce invasive plant recruitment.

**Invasive Species Control**

An early detection rapid response mechanism should be in place for weed management throughout the year. Control of invasive plants should occur throughout the year as needed. Invasive species control will likely require repeated effort for at least several years and possibly throughout the monitoring period. Specific needs will be identified based on each year of monitoring, and documented in annual reports. Appropriate control methods will be utilized depending on the species, the abundance and distribution of the species, and the location within the site relative to wetlands or other sensitive resources. With dense-flowered cordgrass, removal shall follow the procedures established in the Final Programmatic Environmental Impact Report for the Humboldt Bay Regional Spartina Eradication Plan and related Mitigation and Monitoring Plan.

- Reducing target invasive non-native plants should occur throughout the year if needed.
- When new control methods are released that are more effective than a previously employed method for control and removal the plan should accommodate the new techniques for the remainder of the monitoring period.
- Target invasive non-native plants will be removed extending three to five feet into areas surrounding the re-established habitat.
• Routine weeding will be implemented as part of the maintenance.

4.14 Financial Assurances

The Wildlands Conservancy is committed to ensuring the success of the mitigation projects described herein, and has successfully demonstrated its commitment to ecological restoration at multiple preserves throughout the state of California. The Wildlands Conservancy manages its funds to adequately cover costs of the mitigation and monitoring period, which come from its general operating funds, and targeted fundraising activities.

Given its track record, The Wildlands Conservancy requests that no financial assurances, such as a performance bonds, irrevocable trusts, escrow accounts, letters of credit, etc. be required as a part of this project.
5. **Adaptive Management Plan (AMP)**

5.1 **Adaptive Management Approach**

The purpose of the Adaptive Management Plan (AMP) is to provide guidance to property managers in the event that the project fails to meet design targets and goals, or that other unforeseen events occur that threaten the success of the project. It is not intended to be a “catch-all” for disaster management or to supplant activities under the HMMP or regular, principally-permitted, land management activities. This plan does have some overlap with the HMMP, however. The HMMP will include monitoring of mitigation areas through an establishment period of five years. Adaptive management techniques are a standard section of the HMMP to troubleshoot mitigation establishment. This AMP governs areas not covered by the HMMP during the establishment period, and governs both mitigation and non-mitigation areas post-establishment as well as informing the operations described in the WLMP. The HMMP Adaptive Management section and this AMP share approaches and strategies.

The AMP assumes that natural processes drive habitat structure and function, and that habitats exhibit resilience and adaptation to significant disturbance events. Adaptive management therefore should be called for when environmental or human influences negatively affect project goals or designed elements do not exhibit the same level or resilience or adaptability as the natural system.

5.2 **Rationale for Adaptive Management**

This project will benefit from an adaptive management plan for a number of reasons. The watershed is situated in a region with a combination of a relatively active tectonic regime, highly erodible soils, high rates of annual precipitation, frequent flood events, a strong tidal influence and frequent wave incursion. This creates an extremely dynamic natural system in which to work. Given the large scale of the EREP Project, the variety of habitats and hydrologic conditions, the high initial disturbance to the ecosystem, interactions with agricultural land uses, and typical level of uncertainty associated with the evolution of ecosystem restoration projects, this project will benefit from an adaptive management plan. Additionally, in light of the technical challenges involved in maintaining the restored channel, and resultant complexity of the associated monitoring program, this AMP has been developed as the most effective and flexible management tool.

Adaptive management is a systematic and iterative process that provides for feedback between monitoring and management actions. The feedback mechanism is engaged when monitoring data are analyzed, and the results are utilized to adjust project operations in a manner that optimizes the achievement of project goals.

Adaptive management employs a structured approach, yet it is also a flexible tool that can adjust to a dynamic environment and an evolving project. Adaptive management can thereby keep a project ‘on track’ toward meeting its goals and objectives, despite the variability inherent in dynamic, natural systems over spatial and temporal scales. Adaptive management assists managers in responding to unanticipated changes in the various components of a project such as hydrology, sedimentation, target habitat development, or changes in the species’ response along a restoration trajectory (NRC 2004).
5.3 Adaptive Management Participants

While there are many agencies, stakeholders, and participants involved in the planning, implementation and management of the EREP Project, the primary land managers are The Wildlands Conservancy or their designees. Given the volatility of weather, ocean and seismic events in the area, and subject to spending caps that may be negotiated with funders and agencies in the context of catastrophic events or Acts of God which may damage or severely impact the goals and objectives of the project, TWC is responsible for ensuring that the project goals and objectives are met. This includes day-to-day and long-term decision-making and ensuring that adaptive management decisions are implemented. TWC is also responsible for ensuring that adequate funding is available to ensure that project goals and objectives are met, which includes funding for implementation, restoration, monitoring and adaptive management, maintenance, and daily operations. They will also be responsible for any ongoing communication that needs to be distributed to the rest of the Adaptive Management Participants. Table 5-1: Management Roles describes the relationship between TWC and parties to the drainage easement for roles and responsibilities of management.

Table 5-1: Management Roles

<table>
<thead>
<tr>
<th>TASK</th>
<th>PARTICIPANT ROLES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Project Components Defined in Current and Assumed to be Amended Drainage Easement</td>
</tr>
<tr>
<td></td>
<td>All Other Project Components</td>
</tr>
<tr>
<td>1. Monitoring</td>
<td>TWC in accordance to this plan and optional for parties to Drainage Easement</td>
</tr>
<tr>
<td>2. Reporting</td>
<td>TWC in accordance to this plan and optional for parties to Drainage Easement</td>
</tr>
<tr>
<td>3. Operations</td>
<td>TWC in accordance to this plan</td>
</tr>
<tr>
<td>4. Maintenance</td>
<td>Parties to the Drainage Easement in accordance to this plan</td>
</tr>
<tr>
<td>5. Fundraising</td>
<td>Parties to the Drainage Easement</td>
</tr>
<tr>
<td>6. Advisory</td>
<td>Technical (Consultants, Outside Reviewers, Independent Experts), Regulatory and other Stakeholders</td>
</tr>
</tbody>
</table>

5.4 Adaptive Management Process

Two key elements of this AMP are 1) a description of the Participants that will implement the adaptive management participants (Table 5-1), and 2) the conceptual model of the adaptive management process itself (Figure 5-1). This AMP also provides descriptions of the monitoring activities, management triggers and actions, and other elements that together constitute a functional AMP. This AMP is a companion document to the project’s CEQA document, the Habitat Mitigation and Monitoring Plan (HMMP), Water Level Management Plan (WLMP) and the other various technical documents that are incorporated into the project’s regulatory permits, such as the Biological Opinions (BO).

Monitoring activities, including simple observation that is part of daily management, may identify triggers for specific adaptive management activities. The triggers are organized around the natural processes that
shape habitats and specific constructed elements of the project. If project monitoring determines that a trigger has been "activated" then there are 3 possible response pathways:

1. Determine that more data is required and continue (or modify) monitoring,
2. Identify and implement a remedial action, or
3. Modify project goals and objectives (this option would only be considered as a last resort and upon careful consideration by and consensus of TWC

There may be multiple management action options when a particular trigger or threshold is activated, depending on a variety of factors such as how far the project is from achieving a specific goal, whether the situation is an imminent threat to local infrastructure, ecosystem services/functions or site stability, etc. The adaptive management process applies to the project as a whole, but management actions can be identified and implemented on individual reaches or sub-reaches, as needed. The process is flexible as it allows for a wide range of management actions but just as importantly it imposes a structured approach as management actions must derive from monitoring results. The adaptive management process also accommodates different physical and temporal scales for management actions. The annual procedures are depicted in Figure 5-2.
Figure 5-1: Adaptive Management Conceptual Model
Figure 5-2: Annual Adaptive Management Process
5.4.1 Data Collection, Analysis and Storage

Data analysis will be conducted as soon as possible following collection of field data. Minimizing delays between data collection and analysis will provide an opportunity to return to the project area to verify any discrepancies encountered during analysis and to conduct further field sampling if necessary. Data analysis will be conducted using standard spreadsheet, database, and statistical software as applicable. Any field notes, photos, datasheets and numerical or statistical data shall be stored in raw data format for 10 years after current monitoring year or until the completion of the project or for such terms as may be required by permits or funders. All electronically stored data shall be kept for at least 10 years after the completion of the project.

5.4.2 Review and Assess Monitoring Results

Monitoring results will be assessed in context of the project objectives and will be compared to the success criteria outlined in this AMP, the HMMP, the project’s permit requirements, Biological Opinions (BO’s), and other documents. This assessment will evaluate the original criteria and objectives given current knowledge to determine if the project is progressing along a trajectory toward meeting the project’s success criteria and objectives. This assessment will evaluate whether the system is functioning as designed and whether or not the original criteria and objectives are reasonable and attainable at this point in time.

5.4.3 Quality Assurance/Quality Control (QA/QC)

Quality control (QC) is a system of routine checks to ensure the integrity, correctness, and completeness of the project data. This system may include spot-checks on methods, data acquisition, calculations, and appropriate use of any statistical analyses. Quality control is expected to be performed by the entity conducting the monitoring, and will include a careful review by the Program Coordinator of the data input and analysis, project documentation, and data storage.

Quality assurance (QA) provides for a system of review procedures conducted by individuals/entities no directly involved in the collection/compilation of monitoring data. Quality assurance will be performed after the data is finalized and the quality control is performed. Additional QA and QC will occur during review of the Annual Report.

5.4.4 Reporting and Report Distribution

Monitoring results will be compiled into an annual report and distributed to the regulatory agencies and parties of the drainage easement for review and comment.

5.4.5 Evaluate Triggers

Monitoring results will be reviewed by TWC and compared with management triggers to determine whether project objectives are being met. If the management triggers are activated, TWC will suggest potential management actions that will be discussed during the annual meeting or any necessary follow-up meetings.

5.4.6 Annual Meeting/Adaptive Management Decision-Making

Each year, the Adaptive Management Participants group, consisting of TWC, the regulatory agencies and parties to the drainage easement will meet to review the status of the project. TWC will give a project
update and present the results of the annual monitoring. The monitoring results will be compared with the project goals and objectives, the HMMP and the AMP and determine any potential required management actions.

5.5 Adaptive Management Elements

Natural ecosystems are dynamic and subject to change over time. This is especially true within the EREP project area where physical processes such as flow, tidal exchange, dune migration and sediment transport influence habitat function and value. Adaptive management may be necessary to help the project meet the long-term goals. The project goals and objectives that could require adaptive management were consolidated to fit into the following three elements and related to the geographic or technical focus of specific long-term management actions.

Element 1: Geomorphic, Erosion/Sedimentation Monitoring and Adaptive Management

Element 2: Hydrology/Water Quality Monitoring and Adaptive Management

Element 3: Habitat Development, Vegetation Management and Invasive Species Monitoring and Adaptive Management

The three elements are further described below and section 5-6 contains the actual monitoring methods, triggers and management action for each element.

5.5.1 Element 1: Geomorphic, Erosion/Sedimentation Monitoring and Adaptive Management

Channel design criteria for the EREP project that relate to erosion and sediment deposition monitoring and adaptive management are to reestablish connectivity of Russ Creek to Centerville Slough in a highly sedimentation prone area that is anticipated to form alluvial fans and distributary channels.

The adaptive management triggers for erosion and sediment deposition control in the Russ Creek channel that will dictate the necessity and/or scale of adaptive management actions include: threats to adjoining property, excessive sediment deposition in the channel/floodplain corridor, excessive sediment deposition in an adjacent Sediment Management Area, excessive bank or bed erosion in the channel, large debris dams, failure to extend the tidal prism in Centerville Slough, severely muted tides in up gradients tidal wetlands, portion of the channel, road and stream crossings and culverts that are not functioning due to excessive sedimentation, impeded fish passage at high and/or low flows, and failure or excessive maintenance of sediment management areas.

A degree of erosion and deposition is expected along the Russ Creek channel as it naturally reshapes to reach a state of equilibrium after construction, and some limited erosion is expected upstream as the channel profile adjusts. Significant erosion requiring adaptive management would include: erosion that undermines the integrity of the restored channel banks and causes a significant loss of existing and planted stream-side vegetation; and erosion that threatens infrastructure such as bridge foundations and road beds. In most cases, significant erosion, deposition, or debris plugs would be anticipated to take place during the winter rainy season. Unless an emergency situation arose as a result, no action would be taken until the dry season. Management actions will be determined based on an analysis of the effects of the event on overall function. This analysis will be based on monitoring data, such as the annual channel cross sections and longitudinal profiles. Examples of an emergency situation requiring immediate action include erosion or deposition that threatens the integrity of infrastructure such as bridges, culverts,
and roads, or a massive debris jam that plugs the entire creek/slough, thereby threatening the hydraulic and sediment transport performance.

Periodic maintenance/sediment removal within the channel and specified project Sediment Management Areas will be required to maintain design width and depth and to maintain the flow and sediment transport capacity and a functional tidal prism. The accumulation of excess sediment in the Sediment Management Areas is due to high sediment loading from Russ Creek. Major geomorphic modifications would be deemed necessary only if it is determined that no other procedure could be used to ensure achievement of the target restoration goals.

Sediment capture and removal (sediment management) will be integral to the success of the project to help sustain hydraulic conveyance and ecologic function. A major goal of the design effort is to minimize the frequency and need for excavation of the majority of the channels/slough through strategic design of the Sediment Management Area. In addition, the project will facilitate an amendment to the existing drainage easement.

Upslope sediment reduction activities are also ongoing at Russ and Shaw Creek watersheds. These activities will be defined on a project-by-project basis and may include stream bank stabilization and road drainage improvements. Adaptive management for these individual activities is not included in this document as these individual activities have not been fully defined at this time. Even with upslope sediment reduction activities, periodic removal of deposited sediments from lower, near-river Sediment Management Areas and possibly the Russ Creek/Centerville Slough channels will be required to maintain the restored geomorphology.

**Short-Term Erosion and Sediment Control**

Erosion and sediment control during construction will be conducted in accordance with the construction documents and project permits, including a Stormwater Pollution Prevention Plan (SWPPP) administered by the State General Permit for Storm Water Discharges associated with Construction and Land Disturbance Activities (Order No. 2009-0009 DWQ, NPDES No. CAS000002). The SWPPP shall be developed by a Qualified SWPPP Developer (QSD) and implemented by a Qualified SWPPP Practitioner (QSP) to ensure the receiving waterbodies are not impacted as a result of erosion and sedimentation during construction activities and until the disturbed areas are stabilized and sheet and rill erosion potential are minimized and a Notice of Termination of the general permit has been filed with the Regional Board.

The SWPPP will detail the location and type of erosion and sediment control Best Management Practices (BMPs) for the project area. These BMPs may shift and require short-term adaptive management to find the best solutions to control effects from sediment sources during and immediately following construction. Sediment source control BMPs that may be applicable for this project include, but are not limited to: silt fencing, fiber rolls, rock slope protection, turbidity curtain, controlled dewatering and handling of turbid water, sediment management areas, and check dams. These measures will be implemented prior to and during grading activities and removed once the site has stabilized. Applicable erosion control BMPs including seeding, mulching, erosion control blankets, plastic coverings and geotextiles. Erosion control BMPs describing seed mixes and possible seeding techniques and mulching requirements are covered in the HMMP.
Erosion and Sediment Deposition Monitoring of Russ Creek and Centerville Slough

Quantification of the geomorphic and hydrologic functions will allow TWC to determine whether the objective of sustaining a dynamic corridor with optimal flow and sediment conveyance is being met. Monitoring to quantify the geomorphic and hydrologic function will include a preliminary visual reconnaissance of the corridor channel to identify potential areas of concern, followed by physical surveys (topographic measurements to include channel cross-sections and a longitudinal thalweg profile) throughout Russ Creek and Centerville Slough. The preliminary visual reconnaissance will be conducted in the early to mid-spring, at the termination of the wet season high flows. The physical surveys will help to quantify the height/depth of erosion or sedimentation within the channel and floodplain as well as quantify any changes in channel flow conveyance area. Prior to the Year 1 monitoring, locations for the cross-sections will be determined once construction is complete and will be focused on areas where erosion or sedimentation events have the greatest potential to occur. Pending findings from the annual visual channel reconnaissance, cross-section locations may be relocated or added to best address altered areas. Physical surveys of the channel will be completed annually for the first 5 years, and then biannually through Year 10. End points of all cross-sections shall be monumented pursuant to standard methods in order to replicate surveys during future surveys. All survey elevations shall be reported in the NAVD88 vertical datum. The longitudinal thalweg profile survey along the entire project reach shall be completed annually, with thalweg elevations shot at least every 200 feet (ft), at a minimum. If there are significant changes in elevations at survey locations or locations identified during the visual reconnaissance as a result of storm damage, excessive accumulation of vegetation and sedimentation, corrective actions will be evaluated and, if determined appropriate, a solution will be proposed to the regulatory agencies. Frequency of surveys beyond Year 10 will be determined by TWC.

Photos will be taken to document channel conditions during the annual visual reconnaissance visits and during winter and summer baseflow conditions at permanently marked photo-documentation points. The number and location of these photo-documentation points will be determined after the construction is complete and will be selected with the long-term monitoring in mind. The locations and orientations of the photo-documentation points will be included in the Record Drawings for the project. These photos will document any changes occurring along the channel. Additional photos shall be taken during/after 2-year storm events to record any damage from flooding or erosion. Photos will be included in annual reports and also used in conjunction with other long-term monitoring methods to determine whether adaptive management actions are warranted.

Sediment Management Areas (SMA)

As described in Chapter 1, to accommodate natural floodplain processes, a sediment management area (SMA) is proposed in an avulsion prone region near the confluence of Russ Creek and Centerville Slough. The SMA will be constructed to emulate a distributary channel network within an alluvial fan by separating existing or created floodplains and low-lying areas with low-relief berms. Large portions of the SMA will be subject to regular inundation, sedimentation and periodic rerouting of Russ Creek through natural fluvial processes. Accumulated sediment in the SMA will be reworked (leveled or tilled), seeded and irrigated as needed to enhance agricultural productivity in those areas.

In the event the SMA performance is not capable of eliminating undesirable sediment accumulation in Russ Creek and/or Centerville Slough, or if sediment accumulation poses an undesirable threat to property or project performance, excavation may be performed on a small scale within Russ Creek and/or Centerville Slough corridor (excavating specific areas of the channel and SMA). Larger-scale excavation/removal may be necessary as well as breaches in the proposed guide berm to provide
add additional sedimentation capacity. Routine vegetation maintenance within the SMA will occur during late summer or early fall months when Russ Creek flows are lowest to minimize potential erosion and sediment transport and to minimize impacts to salmonid and wildlife species. Monitoring and adaptive management activities are tabulated in the subsequent section of this AMP, as well as vegetation removal methods such as controlled flash grazing, manual removal and mechanical removal.

**Bridge, Culvert and Tidegate Monitoring/Inspections**

Bridge, culvert crossings and tidegates will be monitored to ensure that flow pathways are maintained free of blockages or sedimentation and that erosion around these structures is minimal. Cross-section surveys at these crossings will be conducted annually for the first 5 years, and then biannually through Year 10 to determine if any significant changes are occurring and whether any adaptive management actions may be required. The elevations will be compared to the elevations on the Record Drawings. Qualitative surveys will consist of visual inspections following flood flow events exceeding a 1-year recurrence. Adaptive management may consist of pre- and post-storm maintenance such as clearing or excavating sediment from these locations or may require repair of any failed or damaged road or stream crossings. Frequency of surveys beyond Year 10 will be determined by TWC in consultation with the parties to the drainage easement. Regular maintenance and monitoring will follow procedures outlined in the project’s BO to protect fish species such as salmonids and tidewater goby.

**Channel and Marshplain Evolution of Inner Marsh**

The Inner Marsh portion of the project is designed primarily to reestablish muted tidal exchange to the 125-acres. The increase in tidal prism will also increase sediment re-entrainment potential to help maintain the width and depth of the restored sloughs and maintain optimal tidal exchange between estuary and restored wetlands. This tidal connectivity will also allow for the natural evolution of intertidal mudflat, salt and brackish tidal marshes, and shallow water habitats.

The adaptive management triggers for erosion and sediment deposition within the tidal wetlands include lack of tidal prism establishment, severely muted tides, evidence of erosion on the constructed setback berm, sediment deposition in marsh channels, indications that existing and constructed berms are not functioning as designed or are at risk for failure, and erosion and/or stagnant waters that are contributing to low vegetation establishment. This section of the AMP includes measures to monitor and adaptively manage erosion.

Numerous existing drainage ditches will be filled on site and new, more sinuous, tidal channels will be excavated to enhance the habitat function and quality of the restored marshplain. Monitoring of the geomorphic and hydrologic function of the Inner Marsh wetlands will include an annual preliminary visual reconnaissance of the wetland to identify potential areas of concern, followed by physical surveys (topographic measurements to include combined marshplain/channel cross-sections and longitudinal channel profiles). Surveys will be based on the conditions described in the Record Drawings completed for the project after construction is complete. The preliminary visual reconnaissance will be conducted during low tide in the early to mid-spring, at the termination of the wet season high flows. The physical surveys will help to quantify the height/depth of erosion or sedimentation within the slough channels and marshplain as well as quantify any changes in channel tidal exchange capacity. Pending findings from the annual visual channel reconnaissance, cross-section locations will be sited to best address the project conditions and potential problem areas.
Physical surveys within Inner Marsh will be completed annually for the first 5 years, and then biannually through Year 10. If there are significant changes in elevations at survey locations or locations identified during the visual reconnaissance as a result of tidal scour, or excessive accumulation of vegetation and sediment, corrective actions will be evaluated and, if determined appropriate, a solution will be proposed to the regulatory agencies. Frequency of surveys beyond Year 10 will be determined by The Wildlands Conservancy.

Photos will be taken to document channel conditions during the annual visual reconnaissance and during spring and summer at permanently marked photo-documentation points. These photos will document any changes occurring within the tidal marsh, the berms, the filled drainage ditches, the salt marsh/upland ecotone, and along the channel. Additional photos shall be taken during/after large storm events to record any damage from flooding or erosion. Photos will be included in annual monitoring reports and will also be used in conjunction with other long-term monitoring methods to determine whether adaptive management actions are warranted.

**Setback Berm Maintenance**

A new guide berm will be constructed from sediments excavated from Centerville Slough and Russ Creek. The setback berm is designed with a varying interior slope (7H:1V and 3H:1V) to minimize impacts to existing wetlands, minimize wave erosion and create salt marsh/upland ecotone transition habitat. The berm is designed with a crest elevation of approximately 8.0 ft NAVD88 and an anticipated top width of approximately 12 ft. The design includes culverts with radial or tide gates to provide drainage for the outboard ditch, access ramps; and a wide surface for maintenance access, and protection of adjacent grazing lands, roads and structures from tidal flooding. The base of the outboard slope will host cattle exclusion fencing to prohibit erosion from livestock access. All berm slopes will be well vegetated to provide erosion protection.

The setback berm is designed to operate without extensive maintenance. Monitoring will consist of qualitative monitoring including visual inspections performed annually and after major storm and high tide events by an individual qualified to perform these inspections. Monitoring will look for evidence of obvious flooding and erosion or erosion resulting from wind generated waves. If significant erosion or signs of potential failure are observed, engineering surveys will be performed to determine whether any structural repairs are needed.

**Dune Reconfiguration**

The project seeks to implement passive and active techniques in dune management aimed at increasing resiliency to sea level rise while minimizing impacts to the Western Snowy Plover. Techniques that will be used to re-establish dune configuration are listed in the HMMP and are also described in the DEIR. The design and configuration of Project features will ensure the ability of dunes to migrate eastward, facilitating the re-establishment of zones of recruitment in the dune network capable of protecting the dune system from episodic disturbance. Additionally, relinquishing the need for drainage conveyance in the Western Drainage Ditch allows for dune migration inland as part of its recovery process. Restriction of off road vehicles through signage and fencing of the immediate enhancement area will be implemented to limit use of these areas.

Natural sand dunes are generally self-maintaining, however their form and dynamics are influenced by vegetation, sediment recruitment, storm/wave length, geologic changes and other factors. Both natural and anthropogenic influences can disturb dune formation. Over time natural processes and storm actions
may re-shape any alterations that are made. Further storm events could cause scarping, potentially further inland from the mean high water mark due to the absence of stabilized vegetation. Performance measures and actions are necessary for tracking changes with time, as are plans for corrective action to ensure the success of the re-established dune configuration.

The areas where dunes will be reconfigured will be monitored to assess the success of re-establishment efforts. Monitoring techniques include: visual inspections, transect surveys, and photo point monitoring. Monitoring will occur along transects established in locations based on final designs that will allow for an assessment of the success of dune building processes. Transect monitoring will include monitoring of vegetation to describe general trends in overall vegetative cover and percentages of native and non-native species. Qualitative observations will be recorded in areas that are planted, to assess the success of establishment. Photos will be taken to document the changing conditions during annual reconnaissance visits at permanently marked phot-documentation points. Dune monitoring will be conducted in collaboration with the Climate Ready Grant Program funded by the State Coastal Conservancy and administered by the USFWS. See the HMMP for specific monitoring details for Snowy Plover Mitigation.

5.5.2 Element 2: Hydrology/Water Quality Monitoring and Adaptive Management

Short-term water quality monitoring and adaptive management measures are covered in the Stormwater Pollution Prevention Plan (SWPPP) (to be prepared). The SWPPP identifies potential sources of pollution that may affect the quality of water discharged from the project area during and immediately after construction. The SWPPP proposes best management practices to minimize the effects of pollution on water quality and outlines short-term adaptive management measures should water quality be adversely affected. It is anticipated that the SWPPP adaptive management measures will apply to the project until such time as the soils at the site stabilize and the grasses begin to establish (approximately 6 months after construction).

Tidal Exchange and Water Level Monitoring

Salinity in the project reaches is primarily controlled by estuary salinity, thus, salinity in the project area will show more temporal change than lateral change. It is anticipated that the majority of the project area (Inner Marsh and Centerville Slough in particular) will have marine salinity in the summer and freshwater salinity in the winter. Multi-parameter water level and salinity recorders will be used to determine seasonal changes in the tidal salinity gradient. In order to quantify and evaluate tidal and salinity exchange up Centerville Slough, a network of 5 multi-parameter recorders (measuring water level, temperature, salinity) are proposed in the Inner Marsh, Centerville Slough, Cut-off Slough and outboard Eel River Estuary. The recorders shall be installed at the following locations: 1) outboard of the tidegates; 2) inboard of MTR; 3) inboard of existing Cut-off Slough tidegate; 4) Centerville Slough near confluence with Russ Creek and 5) Centerville Slough near southern Russ property boundary. Water surface elevation monitoring shall be completed to verify the design intent is being achieved per the WLMP operations. In addition to these measurements, dissolved oxygen monitoring is proposed during July/August when seasonal freshwater flows are low, temperatures are high, and DO levels are anticipated to be at their lowest concentration as well as during the operational transition periods (October/November and April/May). Dissolved oxygen monitoring will consist of hourly measurements using a DO probe at each of the recorder sites over a 2-week tidal cycle. Dissolved oxygen measurements shall be collected within and near the bottom of the water column. The initiation of monitoring will be weather dependent and instruments shall not be installed until after the threat of high flows but initiated early enough to capture
the transition from freshwater to marine conditions in the estuary and project wetlands associated with the seasonal flow recession.

Additionally groundwater monitoring wells will be installed to measure water levels in areas preserved for agricultural use. Well locations will be determined upon completion of construction and placed in similar locations where pre-project monitoring occurred.

As part of data analysis and reporting, all water levels shall be reported in elevations tied to the NAVD88 datum and compared to Pacific Ocean tide ranges as reported by NOAA at their Humboldt Bay, North Spit tide gauge. If it is determined that anticipated tidal exchange has not been established in the project area (compared to model projections or design capacity), water surface elevation monitoring shall continue in conjunction with any adaptive management required to correct problems with tidal exchange. If no adverse tidal exchange conditions are identified during the first 5 years, and the parties to the drainage easement no longer see the need, then Tidal Exchange Monitoring shall be eliminated unless channel capacity monitoring indicates changes that would likely affect tidal exchange. The above described monitoring data shall be utilized to confirm no abrupt changes in water quality will occur during the transitions between seasonal operations and as further described in the Biological Opinion (BO).

**Water Quality**

Long-term water quality elements that will be adaptively managed include dissolved oxygen, temperature, and salinity. The objective of the dissolved oxygen monitoring will be to meet the water quality standards as set out in the North Coast Regional Water Quality Control Plan (NCRWQCB 2007) and to achieve dissolved oxygen levels suitable to support salmonids and the tidewater goby. The temperature objective is designed to maintain a temperature range that supports salmonids. The salinity objective is designed to inform whether the saline, brackish, and freshwater tidal areas of the project are located near to where they were predicted.

**Dissolved Oxygen.** Adequate dissolved oxygen (DO) is a necessary component of good water quality and a healthy biotic system and dissolved oxygen concentrations can determine the suitability for aquatic plant and animal life. For example, relatively high DO is associated with fish reproduction and rearing and low DO levels can cause stress or death for many aquatic organisms. Dissolved oxygen concentration can vary with water depth and with the flow rate of the water. The NCRWQCB standards recommend minimum DO concentrations of 7.0 mg/L. DO is unlikely to be low where there is good tidal circulation; however, in created backwater habitats for tidewater goby, DO could become low. DO is usually lowest in the early morning before aquatic plant photosynthesis begins and in the summer when the temperatures are highest. Continuous monitoring of DO is proposed over a 2-week tidal cycle during the summer (July/August) at habitats created for tidewater goby. Monitoring shall be performed within and near the bottom of the water column. This monitoring shall provide information on whether conditions in these created habitats are approaching levels of concern for tidewater goby or salmonids.

**Temperature.** Water temperature may be a concern during the summer, when it is possible that temperatures could become warm enough to affect aquatic species. Water temperature in Russ Creek and Centerville Slough will be monitored from June 1 to October 1 to ensure that it does not limit or control the aquatic species that will inhabit the channel. Water temperature monitoring can also be used to assess the significance of other water quality parameters, such as the amount of oxygen that can dissolve in water, salinity, and conductivity. Water temperature monitoring locations and approach are described above under the Section heading, “Tidal Exchange Monitoring”.

Exhibit 5: Mitigation Monitoring and Reporting Program and Adaptive Management Plan
Salinity. Slight changes in salinity can have substantial effects on aquatic plant and animal life. The project will create saline, brackish, and freshwater tidal areas along the channel accommodating salt and brackish marsh plant species as well as freshwater riparian plant species. These habitats will support wildlife species that depend on specific salinity ranges including tidewater goby and salmonid species. Continuous water surface elevation and salinity monitoring will be conducted as described above under the Section heading, “Tidal Exchange Monitoring”.

5.5.3 Element 3: Habitat Development, Vegetation Management and Invasive Species Monitoring and Adaptive Management

The HMMP covers specific monitoring, reporting and success criteria for mitigation created habitats. The AMP elements pertaining to habitat development address the broader issues of long-term adequacy and sustainability in attaining project goals and objectives for non-mitigation created habitats. Adaptive management elements presented here address long-term adequacy in obtaining goals and objectives to improve habitat for specific plant and wildlife species.

Salmonid and Tidewater Goby (Eucyclogobius newberryi) Habitat

The restored Centerville Slough, Inner Marsh and Russ Creek will create Essential Fish Habitat (EFH) and has in part been designed to provide a migration corridor for adult salmonids and rearing habitat for juvenile salmonids, especially cutthroat trout, coho salmon, chinook salmon and steelhead. Habitat types will include off-channel habitat, large woody material, and freshwater-tidal ecotone habitat. Studies in nearby Salt River Ecosystem Restoration Project indicate the relevance of tidal freshwater habitat for salmonid rearing (HCRCD 2016). Restoration of Inner Marsh and Centerville Slough shall provide overwintering rearing habitat for juvenile salmonids as well as habitat important for fish transitioning between the ocean and freshwater stream habitats; e.g., adults moving upstream from the ocean to upstream freshwater spawning habitat and juveniles moving downstream from freshwater rearing habitat to coastal marine habitats (e.g., during smoltification). Tidewater goby habitat creation and enhancement is targeted through the creation of tidal marsh, off-channel and tidal channel habitat. Tidewater goby require habitat that allows them to complete their annual life cycle (e.g., adult spawning to pelagic larval phase to benthic juveniles/adults). Tidewater goby have been found to tolerate water quality conditions varying from nearly fresh to hypersaline, and with very low dissolved oxygen; however, conditions that are likely to be more favorable for tidewater goby include well-oxygenated water with salinities <15 ppt (Stillwater Sciences 2006).

Control of Target Non-native Invasive Species

Control of target non-native invasive species shall be performed in the Western Snowy Plover and wetland mitigation areas per the HMMP during the five year establishment period. If the abatement procedures for target non-native invasive species have not been successful (see success criteria in HMMP), The Wildlands Conservancy will continue to perform control of these species on a regular basis to ensure that these species do not dominant mitigation areas. This maintenance shall continue until weedy species no longer present a detriment toward maintaining self-sustaining habitat for snowy plover, or mitigated wetlands (see HMMP for assessment standards).

Dense-flowered Cordgrass (Spartina densiflora)

Dense-flowered cordgrass (Spartina densiflora) is a non-native invasive perennial that competes with native salt marsh species and typically invades bare mudflat and pickleweed habitats to replace native salt marsh habitat with dense monospecific stands. Dense-flowered cordgrass is a perennial grass that...
Cordgrass reproduces through seed and spreads by tillers. Colonization by dense-flowered cordgrass in channel areas can also result in increased sedimentation. Dense-flowered cordgrass is difficult to eradicate and current eradication techniques being used with some success in Humboldt County include mowing and hand-digging.

Cordgrass has infested an estimated 90% of salt marshes in Humboldt Bay and the adjacent Eel and Mad River estuaries (USFWS 2015). The Outer Marsh north of the Inner Marsh is dominated by invasive cordgrass as is much of the northern Eel River estuary. Discrete isolated patches of cordgrass also exist within Centerville Slough and Cut-Off Slough. The Humboldt Bay Regional Spartina Eradication Plan (Regional Plan) and corresponding Programmatic Environmental Impact Report (PEIR) describe a programmatic approach for eradicating invasive cordgrass at a regional scale (H.T. Harvey & Associates 2012). The proposed Project does not include activities within the Outer Marsh and therefore removal of cordgrass in this area will be subject to available funding and implemented over-time in accordance with the Regional Plan.

Some patches of cordgrass are present south of the dike inside the inner marsh, within the Project footprint. In order to reduce the likelihood of dense-flowered cordgrass (Spartina) colonizing tidal marsh, existing populations in and adjacent to (north of the tidegates) the Project footprint shall be controlled prior to construction using manual, mechanical, and/or approved chemical methods, and in compliance with appropriate methods analysed and disclosed in the Regional Plan and the associated PEIR. Cordgrass located on the edges of Centerville and Cut-Off Sloughs on ORF property will be removed on a site-by-site basis in coordination with the O’Rourke Foundation. This area is less than one acre in size.

Colonization of the Inner Marsh and other portions of the Project footprint by cordgrass will be monitored and controlled for ten years in collaboration with the region-wide eradication program. Invasive weed removal shall be conducted as part of Project maintenance. Weed removal techniques may include manual, mechanical, and/or approved chemical means (including mowing, cutting, pulling, grinding, and/or excavation and burial) as approved by jurisdictional agencies. Heavy equipment would be required to be cleaned and weed-free before entering the site.

It is anticipated that ongoing long-term maintenance will be required to continue to eradicate Spartina unless it is controlled throughout all of Humboldt Bay. During the first 10 years of the project, the project site will be monitored annually. If new areas of Spartina colonization are mapped within the project footprint they will be flagged for eradication. Eradication of any newly establishing Spartina shall be performed at least once a year using current methods in the Humboldt Bay Regional Spartina Eradication Plan. These methods may include manual, mechanical, and/or any approved chemical methods. After the initial 10-year monitoring period, a funding mechanism shall be set in place by the The Wildlands Conservancy to provide long-term maintenance and monitoring to ensure that invasive Spartina does not re-invade within the project area.

### 5.6 Adaptive Management Summary Tables

A series of Adaptive Management Summary tables have been developed to provide descriptions of how the AMP process will be used to evaluate progress toward individual goals and objectives and permitting requirements. The tables are summarized as follows:

- Table 5-2: Project Elements and Objectives
- Table 5-3: Monitoring Methods and Frequency
5.6.1 **Project Elements and Objectives**

Table 5-2 describes the basic project elements that have been identified per the project goals and objectives and spelled out in the various project permits or supporting documents. Individual objectives within each table, linked to specific elements, represent outcomes that can be measured, and help define progress towards the overall project goals.

### Table 5-2: Guiding Management Table - Restoration Project Elements and Objectives

<table>
<thead>
<tr>
<th>Project Elements</th>
<th>Objectives</th>
<th>Monitoring Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimize areas of excessive sediment deposition in Shaw Creek, Russ Creek and Centerville Slough channels</td>
<td>Visual Inspections</td>
</tr>
<tr>
<td></td>
<td>Minimize bank erosion and/or threats to public infrastructure</td>
<td>Photo-point Monitoring</td>
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<tr>
<td></td>
<td>Increased tidal prism helps maintain the channel geomorphology and conveyance</td>
<td>Informal Interviews</td>
</tr>
<tr>
<td></td>
<td>Minimize cost, frequency, and extent of sediment management maintenance activities</td>
<td>Cross Sectional and Longitudinal Surveys</td>
</tr>
<tr>
<td>1. Geomorphology/Sediment Management/</td>
<td>Establish complex tidal channel network</td>
<td>Engineered Structure Surveys/Inspections</td>
</tr>
<tr>
<td>Structural Integrity</td>
<td>Minimal maintenance of new channels or filled areas or ditches</td>
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<tr>
<td></td>
<td>Create a template of naturally evolving tidal drainage network to benefit target fish and wildlife species.</td>
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<td></td>
<td>Support aeolian dune building process and re-establishment of dune form</td>
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<tr>
<td></td>
<td>Protect adjacent grazing lands, roads, and structures from flooding</td>
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<tr>
<td></td>
<td>Achieve stable berm with minimal erosion and maintenance</td>
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</tr>
<tr>
<td>2. Hydrology and Water Quality</td>
<td>Inform seasonal operations of tidegates</td>
<td>Visual Inspections</td>
</tr>
<tr>
<td></td>
<td>Maintain channel flow and control flow to minimize erosion</td>
<td>Photo-point Monitoring</td>
</tr>
<tr>
<td></td>
<td>Integrate sediment management actions to help sustain hydraulic conveyance and ecological function</td>
<td>Water Level/Quality Monitoring</td>
</tr>
<tr>
<td></td>
<td>Maintain drainage of selected properties</td>
<td></td>
</tr>
<tr>
<td>Project Elements</td>
<td>Objectives</td>
<td>Monitoring Methods</td>
</tr>
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<td>---------------------------------------------------------------------------</td>
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</tr>
<tr>
<td></td>
<td>around project area</td>
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<td></td>
<td>Meets water quality standards for Dissolved Oxygen (DO) as found in the</td>
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</tr>
<tr>
<td></td>
<td>North Coast Regional Water Quality control plan (NCR WQCB 2007)</td>
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<tr>
<td></td>
<td>Supports dissolved oxygen levels in an acceptable range for salmonids and tidewater goby</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temperature range supports salmonids and tidewater goby</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Establish diverse tidal wetland habitat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Restore and enhance aquatic habitat</td>
<td></td>
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<tr>
<td></td>
<td>Avoid and minimize stranding of fish species in sediment management areas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Saline, brackish, and freshwater tidal areas are located where projected, and marsh habitats are created</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Salinity levels to support tidewater goby and salmonid species, including freshwater tidal habitat during the summer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Create habitat and water quality conditions that support salmonids and tidewater goby</td>
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<tr>
<td></td>
<td>Restore and expand transition zone between tidal wetland and riparian/upland habitat by creating a salt marsh/riparian upland ecotone along the constructed setback berm</td>
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</tr>
<tr>
<td></td>
<td>Control of invasive species</td>
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<tr>
<td></td>
<td>Vegetation maintenance does not contribute to erosion</td>
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</tr>
</tbody>
</table>

### 5.6.2 Monitoring Methods and Frequency

The purpose of monitoring is to observe and document progress towards meeting the project’s goals and objectives, and to observe the progress of desired habitat establishment and structures. The success of constructed elements, such as tidegates, graded channels, etc, also require observation to ensure proper function. In cases where the constructed elements are natural features such as graded channels,
monitoring is to ensure that natural processes smoothly complete the design process begun by human action.

For each management element, a proposed monitoring method has been chosen that is the most effective way to assess change with respect to the monitoring targets. Details of specific monitoring methods may be more fully described in other documents, such as the project’s Biological Opinion (BO), the HMMP, and permit documents. Table 5-3 summarizes the variables to be measured and the general monitoring approach (i.e., cross-sections, qualitative evaluations, etc). The table also contains the monitoring frequency which is based on the temporal scales of the success criteria for each individual management objective. The frequency is determined as the period in which adverse change could realistically be detected and in which management actions could be implemented if the project is not meeting specific goals or to avoid adverse environmental impacts. The monitoring frequency is subject to change, depending upon achievement of project goals and objectives and may vary between project objectives. For example, annual monitoring may be sufficient to determine whether plant survival is within acceptable limits, but more frequent monitoring may be required to ensure that the channel hydrology is functioning as designed while the channel is reaching an equilibrium condition. Some monitoring may be relevant over longer temporal scales (i.e., determining that restoration of the riparian forested community is on a successful trajectory after Year 5 may only require monitoring every 2-3 years).

Table 5-3: Guiding Management Table – Monitoring Methods and Frequency

<table>
<thead>
<tr>
<th>Monitoring Methods</th>
<th>Monitoring detail</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
</table>
| Visual Inspection                  | Inspection of marsh/channel development                                                                                                                                                                                | Time marsh inspections with tidal monitoring:
<pre><code>                                                                                                                                                                                                                     | Low tide in early to mid-spring, at termination of wet season high flows.                                                                                                                                               |
</code></pre>
<p>|                                    | Inspect all culverts, tidegates, bridges, and other conveyance and levee/berm structures, including natural channels and sediment management area connection to channel, for evidence of erosion, uneven settlement, cracking, flow obstructions. | At completion of project, then annual for Years 1-5, Years 7, 9, 10 and after major storm events or extreme high tides.                                                                                                                                               |
|                                    | Sediment Management Area (SMA):                                                                                                                                                                                        | SMA:                                                                                                                                                                                                                | Year 1: monthly during rainy season, after storms.                                                                                                                                                                     |
|                                    | • Sediment accumulation or erosion, damage, or other maintenance. Inspect inflow, outflow, floodplain, channel, sediment removal access points and haul routes.                                                         | Year 2 onward:                                                                                                                                                                                                     | After storms, and once annually                                                                                                                                                                                      |
|                                    | • Inspect vegetation growth in and around sediment management areas.                                                                                                                                                   | Vegetation: in summer, annually, for life of                                                                                                                                                                      |</p>
<table>
<thead>
<tr>
<th>Monitoring Methods</th>
<th>Monitoring detail</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dune Reconfiguration:</td>
<td>Inspect dune fencing for dune capture progress and/or hazards.</td>
<td>Year 1: monthly&lt;br&gt;Years 2-5: quarterly&lt;br&gt;Years 6-10: biannually</td>
</tr>
<tr>
<td>Informal Interviews</td>
<td>Consult with neighboring landowners and other stakeholders</td>
<td>Periodically</td>
</tr>
<tr>
<td>Cross-Section/Transects and longitudinal profile surveys</td>
<td>Sloughs, Inner Marsh, Russ Creek:&lt;br&gt;A minimum of 12 cross-sections through Cut-off Slough, Inner Marsh, Centerville Slough and Russ Creek. Include denotation of vegetation locations and type.&lt;br&gt;A longitudinal thalweg profile survey of Centerville Slough and Russ Creek.&lt;br&gt;Additional locations to be determined upon completion of As-Built Drawings.</td>
<td>Annually for Years 1-5, then Year 7, 9, 10.&lt;br&gt;Surveys will only be conducted after Year 10 if annual qualitative assessments indicate excessive erosion or sedimentation is occurring.</td>
</tr>
<tr>
<td>Dune Reconfiguration:</td>
<td>Locations to be determined upon completion of As-Built Drawings.&lt;br&gt;Observations will include height and structure of dunes, characteristics of dune building or erosional processes will be described.</td>
<td>Annually for Years 1-5, then Year 7, 9, 10.&lt;br&gt;Surveys will only be conducted after Year 10 if annual qualitative assessments indicate excessive erosion or accretion is occurring.</td>
</tr>
<tr>
<td>Photo-point monitoring</td>
<td>Establish photo-points to document areas of potential erosion or sedimentation. Record GPS coordinates for these points for future use.</td>
<td>Photo point monitoring during preliminary visual reconnaissance and during winter and summer baseflows concurrent with channel surveys.</td>
</tr>
<tr>
<td>Monitoring Methods</td>
<td>Monitoring detail</td>
<td>Monitoring Frequency</td>
</tr>
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</tr>
</tbody>
</table>
| Dune Reconfiguration: | Establish photo-points to document areas of dune formation, vegetative recovery or invasion by non-native species. Record GPS coordinates for these points for future use. | Years 1-5: biannually  
Year 6-10: As needed to document changes or potential issues |
| Water Level/Quality Monitoring | Measure:  
Surface- and groundwater levels  
Salinity/conductivity. Monitor at same locations as tidal water levels, DO, and temperature following same criteria.  
Dissolved oxygen: Measure over two week tidal cycle when DO is expected to be lowest. Monitor at bottom of channel, in range of conditions including tidewater goby habitat.  
Compare to Pacific Ocean tide ranges as reported by NOAA at their Humboldt Bay, North Spit tide gauge and conditions in Eel River estuary.  
Temperature: Monitor at same time and locations as tidal water levels and DO. Monitor at range of conditions including tidewater goby habitat.  
Monitoring locations as previously described and to be verified upon completion of As-Built Drawings. | Continuous  
Minimum during transitional periods between seasonal operations  
Salinity: Annually for Years 1-5, every other year if no adverse tidal exchange conditions and no large flood events on Eel River  
DO: Annually in summer (July-August)  
Temp: In warmest months of summer (i.e. July/August), for at least 60 days, concurrent with salinity and DO |
| Structure Surveys | Survey inverts of bridges, culverts, and other drainage structures.  
Note: Cross-sectional and longitudinal surveys covers this for channels. | Initial survey upon completion of construction.  
Periodic surveys (every 3-5 years) afterwards. |
| Fish Surveys | Tidewater goby and salmonids: Beach seine or dip net surveys at locations to be determined upon completion of As Built Drawings.  
Follow USFWS protocol for gobies in habitats specifically created to support gobies.  
For juvenile salmonids, use baited traps or | Years 1-5:  
TWG: one event in spring; one event in summer.  
Years 6+ - if gobies present every year in |
### Monitoring Methods

<table>
<thead>
<tr>
<th>Monitoring Methods</th>
<th>Monitoring detail</th>
<th>Monitoring Frequency</th>
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<tbody>
<tr>
<td>beach seining as per Wallace and Allen (2009). In addition to the monitoring described herein, monitoring may also prescribed per the HMMP and the project Biological Opinion/Biological Assessment, including:</td>
<td>Channel geomorphology monitoring, Vegetation monitoring per the HMMP, Invasive species monitoring, Fish monitoring, Water quality monitoring</td>
<td>Y1-5, no need for further monitoring. Juvenile salmonids: At least one monitoring event in summer, coinciding with temperature and DO monitoring.</td>
</tr>
<tr>
<td><strong>Vegetation Surveys</strong> Mitigated wetlands: sampling as described in HMMP. Non-mitigation wetland conversion: Collection of vegetation data along three elevational bands with 10 plots per band. Plot locations randomly generated in GIS. Absolute cover of all species will be estimated along with absolute cover of bare ground and water. Dike and channels will be excluded from sampling. Vegetation characteristics including cover of native and non-native species and species diversity will be assessed annually years 1-5 and in years 7 and 10. Annual monitoring for dense-flowered cordgrass.</td>
<td>Mitigation Wetlands: Annually Years 1-5, unless success criteria are not met, and as described in HMMP Non-Mitigation Wetland: Annually Years 1-5, then years 7 and 10</td>
<td></td>
</tr>
<tr>
<td><strong>Dune Reconfiguration:</strong> Areas of native and non-native vegetation cover. Qualitative observations of planted areas.</td>
<td>Dune reconfiguration: Years 1-5: Annually; Years 6-10: every other year or as needed.</td>
<td></td>
</tr>
</tbody>
</table>

### 5.6.3 Management Triggers and Actions

Every year TWC will review monitoring logs and compare to identified triggers to determine the need for adaptive management action. Some observations may result in a finding of monitoring with increased frequency, while others may result in the need to take action. This will be determined through the evaluation of triggers and goals. Management triggers define the specific point or a range of values where monitoring data indicate that the project may be developing along an unexpected or unfavorable
trajectory and where management actions may be necessary to ensure that the project meets habitat and regulatory performance goals. Table 5-4 contain management triggers and actions.

Management triggers may also include emergency maintenance items such as log jams and tree falls that may threaten channel and floodplain conditions or hydraulic functions. Triggers will be analysed based on effects of the event on overall habitat and channel function and management actions will be determined based on monitoring data, such as the annual channel cross sections and longitudinal profiles. Examples of emergencies requiring immediate action include erosion or deposition that threatens private property or human health/safety. Management triggers are activated at a point before a significant adverse environmental impact occurs. The triggers are purposely set at a low threshold to ensure that adaptive management will be triggered before adverse impacts occur. If assessment of monitoring results determines that no management trigger has been activated, then no management action is required.

The first step in evaluating a management trigger is to determine whether it is a result of the project or of outside factors (i.e., climate change, large-scale regional flooding, or adjacent landowner practices). If it is determined that the trigger has been activated as a result of the project, specific management actions will be applied based on the prescriptions spelled out in this AMP, the HMMP, project permits and documents.

Once a management trigger is activated, there are a range of possible management options. For example, 1) it may be determined that no management action is indicated or that additional (or modified) monitoring may be required to make a decision on whether or not remedial action is required, 2) monitoring results indicate that remedial action is required, or 3) careful consideration of monitoring results (likely over several years) indicate that the original goal was unrealistic or unattainable and that the goal may need to be modified. In the case of the latter this is considered a last resort and would require careful consideration and consensus by TWC, parties to the drainage easement and the regulatory agencies.

Potential management actions listed in the table are not intended to be an exhaustive list. Rather, they represent a likely range of options given the current knowledge of the system and anticipated management actions. Actual actions may deviate from this list given unforeseen monitoring results and/or site performance. Additionally, the details on the timing and degree of each of these actions are equally dependent upon the monitoring results. Final decisions of a course of action will be made annually with TWC, parties to the drainage easement and regulatory agencies. TWC will make the final decision on the appropriate actions to be taken in a given year, and the proposed activities will be reviewed by the regulatory agencies to ensure compliance with existing permits.

### Table 5-4: Guiding Management Table – Triggers and Actions

<table>
<thead>
<tr>
<th>Observation Issue/Area</th>
<th>Trigger</th>
<th>Potential Management Action</th>
</tr>
</thead>
</table>

Exhibit 5: Mitigation Monitoring and Reporting Program and Adaptive Management Plan
<table>
<thead>
<tr>
<th>Observation Issue/Area</th>
<th>Trigger</th>
<th>Potential Management Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion or sedimentation (Channels, Sloughs and Inner marsh)</td>
<td>Channel geometry has been reduced or enlarged by ≥25% compared to as-built conditions.</td>
<td>Follow up assessment of rates/causes of erosion or sedimentation, evaluation of effects relating to structure and function of channel. Site specific BMPs such as soil bioengineering, revegetation, or vegetative revetments.</td>
</tr>
<tr>
<td></td>
<td>Surveys show excessive flood/marshplain erosion or deposition that deviates from the habitat design intent (≥20% from baseline)</td>
<td>Increased monitoring. Excavation of sediment Regrading of channel profile, and/or re-fill or unplug distributary channels to improve hydrologic connectivity and fluvial processes. Plan and implement sediment management areas in upslope tributary watersheds.</td>
</tr>
</tbody>
</table>
| | Erosion or deposition:  
- channel bed and/or banks  
- bar development  
- drainage outfalls,  
Erosion can include knick-point formation or head cuts. | Seeding or revegetation. Apply erosion control fabrics, coconut fiber rolls, or other BMPs to redirect or reduce the energy of flows over erosion area. Look for potential causes of erosion (upstream effects, backwatering, obstructions) |
| | Bank erosion visible in vegetation removal areas or areas of bare soil that could promote erosion | |
| Erosion or aggradation that threatens infrastructure such as:  
- bridges  
- levees/berms  
- culverts  
- roads | Observe patterns of erosion and hydraulic conveyance to ascertain causes. Target solution to address sources of erosion where possible. Repair damaged structures. Conduct pre- or post-storm maintenance to remove excess sediment Remove obstructions Repair failed or damaged culverts, channel |
<table>
<thead>
<tr>
<th>Observation Issue/Area</th>
<th>Trigger</th>
<th>Potential Management Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>or tidegates</td>
<td>crossing, or bridges.</td>
<td>Rebuild damaged levees/berms, maintain repair access ramps and road atop berm.</td>
</tr>
<tr>
<td>Bridges or culverts are damaged by erosion or are not conveying flows as designed</td>
<td>Excavate plugged culverts, or replace or enlarge culverts as needed</td>
<td></td>
</tr>
<tr>
<td>Erosion control measures upstream and along channel (protecting bare soil, stabilizing banks, armoring, geotechnical bank protection, dissipating concentrated flows)</td>
<td>Implement site specific erosion control BMPs to protect bridge and culvert functions while minimizing channel and wetland habitat benefits.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sediment Management Area</th>
<th>SMA obstructions (log jams, debris flow, sediment slug) prevent alluvial fan formation</th>
<th>Remove obstruction to maintain flow conveyance or eliminate scour related to the obstruction.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment is depositing in downstream channels, not in SMA</td>
<td>Excavation sediment management area and deposit excavated sediment at designated reuse areas</td>
<td></td>
</tr>
<tr>
<td>Trim or remove undesirable vegetation</td>
<td>Implement site specific erosion control BMPs such as soil bioengineering and vegetative revetments as need to reduce streambank mass wasting while maintaining channel function and riparian habitat value.</td>
<td></td>
</tr>
<tr>
<td>Remove obstructions.</td>
<td>Remove existing berms to allow additional sedimentation areas to form.</td>
<td></td>
</tr>
<tr>
<td>Install or modify instream structures such as Large Woody Debris (LWD) to re-direct flow and, within SMA, to direct sediment deposition.</td>
<td>Re-visit sediment management area design and re-design individual feature as needed to adequately direct and collect sediment.</td>
<td></td>
</tr>
<tr>
<td>Observation Issue/Area</td>
<td>Trigger</td>
<td>Potential Management Action</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fish found during beach seine or dip net surveys in SMA</td>
<td>Collect and relocate fish to appropriate habitat; analyze whether modifications to sediment management areas are necessary to limit potential for fish stranding.</td>
<td></td>
</tr>
<tr>
<td>Non-mitigated wetland conversion: Tidal wetlands are not establishing in areas as projected. This would be determined by proposed habitat map and results of vegetation sampling along wetland elevation bands. Specific triggers (assessed through vegetation sampling) are invasive species, lack of species diversity, lack of diverse habitats, or drying vegetation (not seasonal senescence).</td>
<td>Review tidal exchange data to assess adequate water for plant survival. Test soil to determine if soil characteristics are limiting target plant establishment; amend soils if required. Monitor recolonization, replant if necessary. Evaluate in years 1-5 addressing invasive species annually. In year 5 if tidal wetlands not establishing the following management actions may be deemed necessary: 1) active planting or re-seeding, 2) raise and fill marsh plains, 3) adjust tidegate operations.</td>
<td></td>
</tr>
<tr>
<td>Vegetation in SMA or channels hinders sediment management capability or hydraulic conveyance in channels</td>
<td>Remove vegetation. Assess channel geometry for adequate slope, cross-sectional area for maintaining channel conditions. Adjust channel width/depth, meander, slope accordingly to achieve bankfull channel in dynamic equilibrium. Selected sediment removal from channel to achieve conditions indicated above.</td>
<td></td>
</tr>
<tr>
<td>Target invasive non-native species do not meet success criteria as defined in HMMP</td>
<td>Weed management/and or invasive species control</td>
<td></td>
</tr>
<tr>
<td>Weedy vegetation dominates the restoration area and threatens to spread to adjacent landowner properties</td>
<td>Continued/increased frequency of monitoring until infestation is under control.</td>
<td></td>
</tr>
<tr>
<td>Increases in salinity not consistent with planned seasonal shifts</td>
<td>Inspect system to determine source of problem (i.e., tidal channels are filling, or sediment management areas have reduced freshwater flows), and repair/modify</td>
<td></td>
</tr>
<tr>
<td>Observation Issue/Area</td>
<td>Trigger</td>
<td>Potential Management Action</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------</td>
<td>----------------------------</td>
</tr>
</tbody>
</table>
| Fishery Habitat        | Tidewater goby habitat not supporting tidewater goby | Discontinue monitoring after 5 years if salinity objectives are attained  
                        | Continue monitoring beyond 5 years until management triggers are no longer exceeded for at least 5 years.  
                        | Continue monitoring |
|                        | If gobies are not present, attempt to determine what is preventing them from using habitat and modify design if feasible.  
                        | If no salmonids are present at likely habitats tidal freshwater ecotone, TWC confers with Regulatory Agencies to determine what is preventing them from using habitat and modify design as feasible.  
                        | Sediment management if lack of connectivity is restricting species use.  
                        | Add habitat modifications (e.g., revegetation, channel shading, in-stream habitat features) |
|                        | Discontinue monitoring after 10 years if habitat objectives are met |
|                        | DO < 7.0 mg/L | Additional monitoring to establish temporal and spatial extent of low DO zone(s); compare to available pre-project DO data  
                        | Determine source of problem (e.g., poor circulation, sedimentation, excess decaying organic matter), and repair/modify (i.e., dredge channel, clean out sediment basin management area)  
                        | Discontinue monitoring after 5 consecutive years in which DO objectives are met; Monitoring duration will be dependent on flows and DO levels and could take longer than 5 years.  
                        | |
|                        | Water temperatures in excess of 22-23°C | Additional monitoring to establish temporal and spatial extent of high temperature zone(s)  
<pre><code>                    | Determine source of problem (e.g., poor |
</code></pre>
<table>
<thead>
<tr>
<th>Observation Issue/Area</th>
<th>Trigger</th>
<th>Potential Management Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>circulation, sedimentation) and repair or modify conditions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remove channel blockage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Discontinue monitoring after 5 years if thresholds not exceeded</td>
</tr>
<tr>
<td>Dying aquatic organisms</td>
<td></td>
<td>Evaluate for low DO, sudden change in salinity or temperature, or other disturbances to habitat.</td>
</tr>
<tr>
<td>Stagnant waters and/or salt pannes</td>
<td></td>
<td>Regrade terminal ponds and salt panne areas for better tidal exchange.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Change tidegate management, increase tidal exchange as can be safely allowed without flooding or backwatering adjacent properties.</td>
</tr>
<tr>
<td>Dune Reconfiguration Area</td>
<td>Dune fencing completely buried</td>
<td>Evaluate dune height. If greater height needed, install new fencing.</td>
</tr>
<tr>
<td></td>
<td>New overwash destroys fencing/dune reconfiguration</td>
<td>Remove debris (ie dune fencing).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evaluate goals and need. If dune rebuilding is still needed, rebuild dune before overwash area becomes attractive Snowy Plover habitat. Install dune fencing as needed. Replant dunemat plants for sand trapping and habitat benefit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reconstruct dune using mechanical means</td>
</tr>
<tr>
<td></td>
<td>Dune mat plants fail to establish.</td>
<td>Evaluate soil and water conditions. Consider replanting at optimal time of year.</td>
</tr>
</tbody>
</table>

### 5.7 Attainment of Various Permit Requirements

Short-term monitoring under the HMMP and long-term monitoring under the AMP has been designed to ensure that the project complies with the various permits and biological documents required for this project. A list of these permits is included here. This is not an exhaustive list and additional permits/biological documentation may be required as the permitting process progresses:

- Humboldt County Conditional Use and Grading Permits
- RWQCB Section 401 Water Quality Certification
5.8 **Develop Action Plan**

Every year, at the same time of year, an annual action plan will be developed to identify any necessary adaptive management activities. The annual plan allows TWC to assess severity of need, optimal timing, and whether or not activities can or should be folded into routine operations or maintenance actions.

The Annual Action Plan will be structured according to the following format:

1. Cover Page:
2. Table of Contents
3. Site Map with locations of workplan project locations denoted
4. Workplan

For each workplan project, describe:

a. The triggers and evaluation process
b. Workplan activities or BMPs to remediate issues. See Management Actions in Section 5.10.

Monitoring data and follow up documentation of actions taken to satisfy the Annual Action Plan will be stored in a data management system with the plan.

Annual Action Plans and follow up documentation will be preserved and included in annual reports to the resource agencies. They will also be presented at the five and ten year interim reviews.

5.9 **Emergency Management**

Unique circumstances may arise that require emergency adaptive management actions. The threshold for determining if these actions should occur includes these questions:

- Does the delay threaten human life or safety?
- Does the delay threaten property or risk other imminent liabilities?
- Would the delay trigger endangered species or other environmental enforcement actions?

These shall be implemented on an as-needed basis using the best judgement of the EREP management team.
Documentation of any emergency management activities shall take place upon completion of the adaptive management action. An Emergency Management Brief (EMB) shall describe the crisis situation, circumstances justifying emergency action, adaptive management solution, and provide follow up documentation. EMBs will be included in the Annual Report.

5.10 Implementation of Management Actions

Management triggers may be corrected by a range of management actions, indicated in compliance with project permits. Table 5-5 contain Potential Management Actions (PMAs) that should be followed when management actions are conducted. These PMAs also correlate with Mitigation Measures detailed in the Project Environmental Impact Report and identified Best Management Practices.
<table>
<thead>
<tr>
<th>Potential Management Actions¹</th>
<th>Location</th>
<th>Work Window²</th>
<th>Work Duration</th>
<th>Anticipated Frequency³</th>
<th>Description of Equipment / Methods</th>
<th>Description of Quantities² / Material</th>
<th>Impact Avoidance Measure⁶ and Best Management Practices</th>
<th>WETLANDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Implement site specific erosion control BMPs such as soil bioengineering and vegetative revetments¹</td>
<td>Project-wide</td>
<td>June 1 – October 15</td>
<td>0-120 days</td>
<td>Frequent</td>
<td>Heavy equipment and hand crews</td>
<td>0-10 Acres of Erosion Control BMPs using vegetation, soil bioengineering</td>
<td>FEIR MMRP BMP: a, b, k</td>
<td></td>
</tr>
<tr>
<td>2 Remove obstructions if deemed necessary to maintain habitat and hydrologic function</td>
<td>Project-wide</td>
<td>June 1 – October 15</td>
<td>0-60 days</td>
<td>Frequent</td>
<td>Heavy equipment and hand crews</td>
<td>0-50 obstructions including debris jams, trees, sediment plugs (0-10,000 CY)</td>
<td>FEIR MMRP BMP: c, d, k</td>
<td></td>
</tr>
<tr>
<td>3 Install or modify instream structures such as Large Woody Debris (LWD) to re-direct flow and sediment conveyance to floodplains and SMAs</td>
<td>Project-wide</td>
<td>June 1 – October 15</td>
<td>0-60 days</td>
<td>Moderate</td>
<td>Heavy equipment and hand crews</td>
<td>Install 0-15 Instream Structures’ Modify or adjust existing instream structures</td>
<td>FEIR MMRP BMP: b, e, k</td>
<td></td>
</tr>
<tr>
<td>4 Sediment excavation to improve channel function</td>
<td>In channel, Project-wide</td>
<td>June 1 – October 15</td>
<td>0-120 days</td>
<td>Moderate</td>
<td>Heavy equipment for excavation</td>
<td>0-25,000 CY of Sediment and 2,000 LF of sediment Removal</td>
<td>FEIR MMRP BMP: d, f, k</td>
<td></td>
</tr>
<tr>
<td>5 Additional berm breaches and/or levee lowering</td>
<td>Project-wide</td>
<td>June 1 – October 15</td>
<td>0-60 days</td>
<td>Infrequent</td>
<td>Heavy equipment for grading and excavation</td>
<td>0-5,000 CY of Excavation</td>
<td>FEIR MMRP BMP: k</td>
<td></td>
</tr>
<tr>
<td>6 Conduct pre- or post-storm maintenance to remove excess sediment</td>
<td>In channel, Project-wide</td>
<td>June 1 – Nov. 30</td>
<td>0-120 days</td>
<td>Moderate</td>
<td>Heavy equipment and hand crews</td>
<td>0-25,000 CY of Sediment</td>
<td>FEIR MMRP BMP: f, g, k</td>
<td></td>
</tr>
<tr>
<td>7 Repair failed or damaged road-stream crossings¹</td>
<td>Within 100 feet of road-stream crossings</td>
<td>June 1 – October 15</td>
<td>0-60 days</td>
<td>Infrequent</td>
<td>Heavy equipment and hand crews</td>
<td>0-5 Crossings 0-1,000 CY Excavation/Grading/Crossing 0-500 CY Rock Fill/Crossing</td>
<td>FEIR MMRP BMP: f, g, k</td>
<td></td>
</tr>
<tr>
<td>8 Excavate plugged culverts and conduct maintenance on tide gates Replace or enlarge culverts and tides gates as needed¹</td>
<td>Within 100 feet of existing culverts</td>
<td>June 1 – October 15</td>
<td>0-30 days</td>
<td>Moderate</td>
<td>Heavy equipment and hand crews</td>
<td>0-5 Crossings 0-1,000 CY Excavation/Grading/Crossing 0-500 CY Rock Fill/Crossing</td>
<td>FEIR MMRP BMP: d, f, g, k</td>
<td></td>
</tr>
<tr>
<td>9 Excavated and/or till sediment management area and distributary channels and deposit excavated sediment at designated reuse areas including application/placement of excavated sediment on agricultural lands</td>
<td>Sediment Management Areas</td>
<td>June 1 – October 15</td>
<td>0-120 days</td>
<td>Frequent</td>
<td>Heavy equipment for sediment removal and transport to reuse areas</td>
<td>0-5,000 CY of Sediment</td>
<td>FEIR MMRP BMP: d, h, k</td>
<td></td>
</tr>
</tbody>
</table>

¹ Potential Management Actions
² Location
³ Work Window and Duration
⁴ Anticipated Frequency
⁵ Description of Equipment / Methods
⁶ Description of Quantities and Material
⁷ Impact Avoidance Measures and Best Management Practices
<table>
<thead>
<tr>
<th></th>
<th>POTENTIAL MANAGEMENT ACTIONS</th>
<th>LOCATION</th>
<th>WORK WINDOW</th>
<th>WORK DURATION</th>
<th>ANTICIPATED FREQUENCY</th>
<th>DESCRIPTION OF EQUIPMENT / METHODS</th>
<th>DESCRIPTION OF QUANTITIES / MATERIAL</th>
<th>IMPACT AVOIDANCE MEASURE$^3$ AND BEST MANAGEMENT PRACTICES$^4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Trim or remove vegetation and/or invasive vegetation as necessary to maintain stream function per project design plans$^1$</td>
<td>Outside of planted areas, (i.e. SMA)</td>
<td>Year-round, with the exception of the bird breeding and nesting season between 1 March and 1 July.</td>
<td>0-120 days</td>
<td>Frequent</td>
<td>Herbicides, hand pruning tools and possibly chainsaws and brush cutter/mowing or other light equipment</td>
<td>Limited annually to 5 ac or less within SMAs, active bench areas, and active channel areas only. Only trees and shrubs less than 5 years old and no larger than 4” dbh</td>
<td>FEIR MMRP BMP: c, l, k, m</td>
</tr>
<tr>
<td>11</td>
<td>Excavation of tidal channels and/or re-fill or plugged drainage ditches to improve hydrologic connectivity$^2$</td>
<td>Project-wide</td>
<td>June 1-October 15</td>
<td>0-90 days</td>
<td>Infrequent</td>
<td>Heavy equipment and hand crews</td>
<td>0-5,000 LF of tidal channels/ditches 0-10,000 LF of berm outboard ditch</td>
<td>FEIR MMRP BMP: d, g, k</td>
</tr>
<tr>
<td>12</td>
<td>Repair eroded sections and employ erosion control measures (protecting bare soil, stabilizing banks, armoring, geotechnical bank protection, dissipating concentrated flows)$^2$</td>
<td>Project-wide</td>
<td>June 1-October 15</td>
<td>0-120 days</td>
<td>Moderate</td>
<td>Heavy equipment and hand crews</td>
<td>0-1,000 CY of Rock Fill 0-10,000 CY of Grading/Excavation</td>
<td>FEIR MMRP BMP: k, l</td>
</tr>
<tr>
<td>13</td>
<td>Raise height of berms without expanding footprint and/or filling wetlands</td>
<td>Existing berm locations only</td>
<td>June 1-October 15</td>
<td>0-120 days</td>
<td>Infrequent</td>
<td>Heavy equipment for grading</td>
<td>0-9,000 LF of BERM</td>
<td>FEIR MMRP BMP: k, l</td>
</tr>
<tr>
<td>14</td>
<td>Maintain or repair (as-built) access ramps, access roads and road atop berms</td>
<td>Existing berm locations and other access road ramps</td>
<td>June 1-October 15</td>
<td>0-60 days</td>
<td>Moderate</td>
<td>Heavy equipment for grading and repairs</td>
<td>0-1,000 CY of Road Base 0-1,000 CY of Grading</td>
<td>FEIR MMRP BMP: d, k, l</td>
</tr>
<tr>
<td>15</td>
<td>Provide additional revegetation with native plants</td>
<td>Project-wide</td>
<td>Year-round</td>
<td>0-60 days</td>
<td>Moderate</td>
<td>Hand tools and possibly small augering devices/light equipment</td>
<td>0-1,000 plants</td>
<td>FEIR MMRP BMP: k</td>
</tr>
<tr>
<td>16</td>
<td>Apply/place excavated sediment on Agricultural Lands</td>
<td>Agricultural Lands</td>
<td>April 1-Nov. 30</td>
<td>0-120 days</td>
<td>Moderate</td>
<td>Heavy/farm equipment</td>
<td>0-100,000 CY of Sediment</td>
<td>BMP: d</td>
</tr>
<tr>
<td>17</td>
<td>Install Exclusion Fence</td>
<td>Project-wide</td>
<td>Year-round</td>
<td>0-120 days</td>
<td>Moderate</td>
<td>Heavy equipment and hand crews</td>
<td>0-7,500 LF</td>
<td>FEIR MMRP BMP: b, j, k</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th>LOCATION</th>
<th>WORK WINDOW</th>
<th>WORK DURATION</th>
<th>ANTICIPATED FREQUENCY</th>
<th>DESCRIPTION OF EQUIPMENT / METHODS</th>
<th>DESCRIPTION OF QUANTITIES / MATERIAL</th>
<th>IMPACT AVOIDANCE MEASURE AND BEST MANAGEMENT PRACTICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Flash Grazing</td>
<td>Limited to active planting areas and areas of naturally recruiting plants</td>
<td>Spring</td>
<td>Limited time periods as needed for weed control</td>
<td>Frequent</td>
<td>Temporary livestock exclusion fence using temporary electrical fencing</td>
<td>Sheep/goats</td>
</tr>
<tr>
<td>20</td>
<td>Raise/Re-configure dunes</td>
<td>Over-wash areas</td>
<td>Year round with exception of active nesting season</td>
<td>0-30 days</td>
<td>Moderate</td>
<td>Heavy equipment and hand crews</td>
<td>0-10 Acres</td>
</tr>
<tr>
<td>21</td>
<td>Install Sand Fencing</td>
<td>Over-wash areas</td>
<td>Year round with exception of active nesting season</td>
<td>0-30 days</td>
<td>Moderate</td>
<td>Heavy equipment and hand crews</td>
<td>0-10 Acres</td>
</tr>
</tbody>
</table>

1. Potential Management Actions considered to be "Development" under the Coastal Act and included in the Project’s CDP. Potential Actions considered to not be "Development" under the Coastal Act include and are limited to: Fence, Repair, Fence Replacement, Soil Sampling and all Monitoring Methods identified in the AMP.

2. Work window to be expanded if necessary for "Emergency" conditions. Out of channel grading, excavation, and other earth-moving activities may be extended from June 1 – October 15 to include and period of April 15 – Nov. 30 if predicted rainfall is less than 40% for Ferndale area, and work shall cease upon precipitation. In-channel grading, excavation, and other earth-moving activities shall be limited to June 1 – Nov. 30 only, and if predicted rainfall is less than 40% for Ferndale area, and work shall cease upon precipitation. More restrictive timeframe may be required by CDF&W, USFWS, or NOAA-Fisheries.

3. Quantities given and a maximum, not-to-exceed value for any given year. Quantities beyond what is specified here would require additional regulatory review/approval.

4. Anticipated Frequency categories include: Frequent (every 1-2 years), Moderate (every 2-5 years), Infrequent (every 5-15 years), and Rare (15+ years, or not at all)

5. See FEIR MMRP

6. BMP Notes
   - a - Utilize onsite native soil to the extent practical
   - b – Design techniques and standards shall be similar to those in project plans
   - c – Chip debris and utilize for onsite mulch to the extent practical
   - d - Dispose in uplands outside of Coastal Zone or designated sediment reuse areas on agricultural uplands in accordance to the Sediment Reuse Plan Template
   - e – Under the direction of a qualified biologist
   - f – Avoid removal of mature (>10 year) riparian vegetation
   - g – Avoid permanent placement of fill in wetlands
   - h – Removal of vegetation will be limited to excavation areas within SMAs and necessary to achieve design capacity
   - i - Per local invasive removal plans (e.g. Spartina Eradication Plan)
   - j – Shall not block public access
   - k – Conduct pre-construction surveys performed by a qualified biologist
   - l - Upon completion of ground disturbance activities and prior to the onset of the rainy season, all bare soil areas shall be seeded in compliance with the seed mix specified in the HMMP.
   - m- Survey results must indicate that no nesting habitat for any bird species is present in the area
   - n – Pre-construction rare plant surveys shall be conducted in suitable rare plant habitat
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5.10.1 **Annual Report**

The Annual Report will be structured according to the following format:

1. Cover Page:
2. Table of Contents
3. Site Map with locations of workplan project locations denoted
4. Yearly Review
   a. Provide data from monitoring activities
   b. Provide progress data/photos from prior year’s workplan projects
   c. Emergency Management Briefs, describing:
      i. The triggers and evaluation process
      ii. Emergency justification (why it was an emergency)
      iii. Emergency activities
5. Workplan

For each workplan project, describe:

   a. The triggers and evaluation process
   b. Workplan activities to remediate issues

6. Documentation of Project Implementation

5.10.2 **Data Management**

Field notes, photos, datasheets and numerical or statistical data shall be stored in raw data format for 10 years after current monitoring year or until the completion of the project or for such terms as may be required by permits or funders. All electronically stored data shall be kept for at least 10 years after completion of the project.

5.10.3 **Five and Ten Year Reviews**

Adaptive Management will be reviewed with the parties to the drainage easement on an annual basis and with the resource agencies at five and ten year intervals. The purpose of these meetings will be to review the previous annual reports, discuss adaptive management techniques employed and success, and to determine if modifications to the adaptive management protocol are needed. It is not the intent to create a new process but rather to refine triggers and solutions, potentially resulting in updated Guiding Management tables.

At Year 10, the Adaptive Management Plan permit will be up for renewal.
6. References


GHD, 2014a. Eel River Estuary Preserve Ecosystem Enhancement Project: Delineation of Uplands, Report Number 8410332. GHD, Eureka, California, USA

GHD. 2014b. Special-status species evaluation and special-status plant and animal surveys for Eel River Estuary Preserve (EREP) Memorandum. Report Number 8410882. GHD, Eureka, California, USA.


Kamman Hydrology & Engineering, 2016 Eel River Delta Plain Dune Assessment


Appendix A – Figures

Figure 1 Project Location
Figure 2 Existing Project Components
Figure 3 Proposed Project Components
Figure 4 Water Level Management
Figure 5 Existing Habitat
Figure 6 Proposed Habitat
Figure 7 Wetland Fill Mitigation Site
Figure 8 Special Status Species Avoidance
Figure 9 Proposed Conceptual Mitigation Plan
Figure 10 Snowy Plover Habitat Areas
Exhibit 5: Mitigation Monitoring and Reporting Program and Adaptive Management Plan

Project Area

Eel River Estuary Preserve (EREP)

Humboldt County

Counties

Freeway

Highway

Roadway

Waterways

Paper Size 8.5" x 11" (ANSI A)

Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

Eel River Estuary and Centerville Slough
Job Number 8410882
Revision A
Date 11 Oct 2016

Project Location

Figure 1

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Data source: USA Base Maps; USA Census; Humboldt County transportation data, 2008. Created by:plank2
Exhibit 5: Mitigation Monitoring and Reporting Program and Adaptive Management Plan

Existing Components:
- EREP Project Area
- Property Boundaries
- Bridge
- Buildings
- Local Roads
- Well
- Access Roads
- Dike/Berm
- Culvert
- Tideway
- Dike
- Tide Gates
- Dune Breach
- South Barn
- North Barn
- Quonset Hut
- Outer Salt Marsh
- Inner Marsh
- Freshwater Duck Ponds
- Eel River Estuary and Centerville Slough Enhancement Project HMMP

N:
US:
Eureka:
Projects:
Legacy:
Projects:
1000298
CalTrout:
Ecosystem:
Enhancement:
08:
GIS:
Maps:
Figures:
Permits:
EREP:
HMMP:
F2:
Existing:
Components:
mxd

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Job Number: 8410882.05
Revision: A
Date: 11 Oct 2016

Project Area and Existing Conditions

Map Projection: Lambert Conformal Conic
Horizontal Datum: NAD 1983 2011
Paper Size: 8.5" x 11" (ANSI A)

Data source: Google Earth Aerial, 2014; County of Humboldt: administrative boundaries. Created by jclark2
EREP Proposed Project Components

**Proposed Project Components**

- **Non-Native Beach Grass Removal**
- **Enhanced Freshwater Complex**
- **Brackish Off-Channel Habitat**
- **Primary Sediment Management Area**
- **Upland for Sediment Reuse (36.9 ac)**
- **Re-establish Dune Configuration**

**Seasonal Muted Tide Levels**

- Channel Re-establishment
- Freshwater Pond Conveyance

- **<2.5'**
- **<3.0'**
- **<3.5'**
- **<4.0'**
- **<5.0'**

**Eel River Estuary and Centerville Slough Enhancement Project**

**HIMMP**

**Figure 3**
**Project Boundary**
- Agricultural
  - Freshwater Emergent Herbaceous
  - Pasture and/or Agricultural Wetland
  - Forested Agricultural
- Non-Agricultural
  - Ammophila
  - Aquatic
  - Bare Ground
  - Dune Mat
  - Forested Riparian
  - Levee/Berm
  - Roads
  - Tidal Wetland (Saltmarsh/Brackish Herbaceous/Mudflat)
  - Scrub Shrub
  - Unmapped

**Existing Habitat Summary**

**Figure 5**

**Data source:** Wetland Mapping, GHD, 2013, and Mad River Biologists, 2011; Parcel Lines, Humboldt County, v41, 2010; Aerial Imagery, 4 band 0.5ft resolution, NOAA, 2010. Created by: jclark2

Eel River Estuary and Centerville Slough Enhancement Project

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Figure 7

**Eel River Estuary and Centerville Slough Enhancement Project**

**HMMP**

**Wetland Fill and Mitigation Sites**

**Job Number** 8410882.05

**Revision Date** 21 Oct 2016

**Site** | **Total**
---|---
VM-1 | 0.10
VM-2 | 0.27
VM-3 | 0.02
VM-4 | 0.02
VM-5 | 0.04
VM-6 | 0.00
VM-7 | 0.04
VM-8 | 0.07
VM-9 | 0.11
VM-10 | 0.20
VM-11 | 0.06
VM-12 | 0.07
VM-13 | 0.31
VM-14 | 0.25
VM-15 | 0.04
VM-16 | 0.13
VM-19 | 0.99
VM-20 | 0.00
VM-21 | 0.00
VM-22 | 0.28
VM-23 | 0.15
Total: | 4.13

**Ammophila Area Available for Mitigation (acres)**

**Site** | **Total**
---|---
SP-1 | 0.52

**Data source:** Google Earth imagery, 2014. Copyright of Humboldt administrative boundaries. Created by jclark2.
**Existing Special Status Species**

- Humboldt Bay’s Owl-Clover (CRPR List 1B.2) 0.41 acres
- Beach Layia (FE, SE, CRPR List 1B.1) 0.28 acres
- Dark Eyed Gilia (CRPR List 1B.2) 0.04 acres
- Sand Spurrey (CRPR List 2B.1) 0.001 acres

- Eel Grass Percent Cover (Dark = 15% Light = 0 - 5%) 2.07 acres
- Lyngbye’s sedge (CRPR List 2B.2) 10.05 acres

**Proposed Impacted Areas**

- Lyngbye’s sedge 0.05 acres

**Areas of Ground Disturbance**

- Fill
- Cut

---

**Special Status Species Avoidance**

---

Exhibit 5: Mitigation Monitoring and Reporting Program and Adaptive Management Plan

---

Existing Cutoff Slough Tidegate

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North Barn

---

Centerville Slough

---

Existing Special Status Species

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Eel River Estuary and Centerville Slough Enhancement Project

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HMMP

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Figure 8

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Job Number 8410882.05

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Revision Date 11-Oct-2016
Exhibit 5: Mitigation Monitoring and Reporting Program and Adaptive Management Plan

Snowy Plover Habitat Areas, Impact Site and Mitigation Site

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