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Commission Action:	

STAFF REPORT: REGULAR CALENDAR

APPLICATION NO.:	**1-10-004**
APPLICANT:	**CALIFORNIA DEPARTMENT OF PARKS & RECREATION**
PROJECT LOCATION:	Little River State Beach, off of Clam Beach Road, near Highway 101 & Crannel Avenue, McKinleyville area, Humboldt County (APNs 513-161-01 & 513-171-08)
PROJECT DESCRIPTION:	Various restoration and access enhancement activities including: (1) exotic plant removal including the removal of 74 nonnative Monterey cypress and Monterey pine trees and native dune habitat restoration(involving revegetation with appropriate native species; (2) creation of approximately 2.5-acres of woody dune swale habitat to increase wetland habitat and to act as a "sand fence" for the dunes west from the frontage road; and (3) various improvements to public access, including equestrian, pedestrian, and ADA access, through the development of parking improvements, a designated trail system including a new ADA-compliant

	trail, pedestrian and equestrian trails, and a designated segment of the California Coastal Trail, and new interpretive, informational, and regulatory signage.
GENERAL PLAN DESIGNATION:	Public Recreation (PR) as designated in the McKinleyville Area Plan
ZONING DESIGNATION:	Public Recreation with Coastal Wetland, Design Review, and Beach and Dune Area Combining Zones (PR-W/D/B)
LOCAL APPROVALS RECEIVED:	None Required
OTHER APPROVALS RECEIVED:	U. S. Fish & Wildlife Service Technical Assistance
OTHER APPROVALS REQUIRED:	None
SUBSTANTIVE FILE DOCUMENTS:	1) CDP File No. 1-04-071 (CDPR); 2) CDP File No. 1-09-026 (CDPR); 3) Final adopted CEQA document – Mitigated Negative Declaration dated February 24, 2009; 4) Little River State Beach Restoration and Enhancement Plan, prepared by North Coast Redwoods District, California State Parks, February 2009; and 5) Humboldt County Local Coastal Program

SUMMARY OF STAFF RECOMMENDATION

Staff recommends that the Commission approve with special conditions the coastal development permit for the proposed restoration and access enhancement project at Little River State Beach south of Trinidad in Humboldt County (Exhibit Nos. 1 and 2).

Little River State Beach is comprised of approximately 148 acres of beach and dunes habitats, which include dune systems, wetlands (dune hollows and woody dune swales), coastal scrub, and dune forest (Exhibit No. 3). Little River State Beach currently provides habitat for and/or has historically provided habitat for several California and federal special-status species including the western snowy plover (*Charadrius alexandrinus*), beach layia (*Layia carnosa*), and pink-sand verbena (*Abronia umbellata* ssp. *breviflora*). Western snowy plover has been observed nesting at LRSB since the early 1990s.

In October of 2009, the Commission approved CDP No. 1-09-026 for the removal of invasive species (primarily European beachgrass) and the restoration of native dune vegetation across approximately 80 acres of stabilized dunes at LRSB. The Department undertook the effort to increase habitat for western snowy plover and pink sand verbena in the area. This proposed project would continue restoration efforts through (1) additional exotic plant removal and native dune habitat restoration; (2) creation of woody dune swale habitats; and (3) implementation of an Access Enhancement Plan involving various improvements to public access, including parking, equestrian, pedestrian, and ADA access, through the development of parking improvements, a designated trail system including a new ADA-compliant trail, and new interpretive, informational, and regulatory signage. Each project component is discussed in more detail below. Detailed project plans are included as Exhibit Nos. 4, 5, and 6.

Staff believes that the project, as conditioned, is consistent with Section 30240 of the Coastal Act, as the project is inherently for restoration and nature study purposes and is designed to reduce visitor traffic through environmentally sensitive habitat areas. The purpose of the proposed project is to restore and protect native vegetation and natural function to the coastal dune habitats at LRSB through (1) exotic plant removal, (2) revegetation of exotic plant removal areas and way trails not proposed for designation in the official trail system, (3) creation of woody dune swale habitat areas, (4) installation of symbolic fencing to protect restored and revegetated habitats, (5) installation of informational, regulatory, and interpretive signage in dune habitats to protect sensitive habitats and resources in the area (e.g., by directing that people stay on designated trails, informing the public of regulations to protect sensitive habitats, such as no dogs, no vehicles, etc.) and to interpret the natural environment for state beach visitors, and (6) construction of an accessible interpretive trail through backdune scrub habitat. The proposed improvements within ESHA areas are limited to nature study use and improvements that are designed to restore the ESHA.

To ensure that the dune habitat restoration envisioned by the project that enables the Commission to characterize the development as a resource dependent use pursuant to Section 30240 is achieved, staff recommends Special Condition No. 1, which would require submittal of a revised final monitoring and reporting program for the review and approval of the Executive Director prior to the permit issuance. The revised final monitoring and reporting program would be required to substantially conform to the monitoring and reporting program detailed in Chapter 5 of the LRSB Restoration & Enhancement Plan dated February 2009 (Exhibit No. 5), except that the plan is to be revised to include the goal of ensuring that there will be no decrease in western snowy plover productivity, rare plant individuals or habitat, wetland area or function, or native vegetation diversity and abundance as a result of direct or indirect effects of the authorized restoration and enhancement activities (including, but not limited to, installation of signage in dune habitats, and development of the boardwalk through the backdunes). In addition, the revised final monitoring program would be required to monitor additional attributes beyond those already proposed, including (a) the usage of signage along the western boundary of the park as perching habitat for avian predators of

western snowy plover; (b) the restoration success of existing way trails not proposed as permanent trails; and (c) the direct and indirect effects of the new boardwalk trail on the diversity, abundance, and extent of native vegetation and habitat types (including wetlands) in the surrounding vicinity. Furthermore, Special Condition No. 1 would require the monitoring plan to include provisions for remediation to ensure that the goals and objectives of the project are achieved.

Overall, the project would restore and enhance dune habitat values and would produce generally beneficial environmental effects. However, depending on the manner in which the proposed project is conducted, significant adverse impacts could result. Thus, staff is recommending Special Condition No. 2 to ensure that the project is implemented in a manner that protects sensitive species and habitats. In addition, with the requirements of Special Condition No. 3 to monitor for archaeological resources during construction, the project would be conducted in a manner that would avoid significant disturbance of archaeological resources. Furthermore, public access would be maintained at Little River State Beach during the extent of the project, and the project would improve public access through the development of parking improvements, new trails, a designated trail system that formalizes use of certain way trails as well as the new trails to be created, and new interpretive and informational signage. In addition, the proposed ADA accessible boardwalk trail would enhance public access by providing interpretive exhibits to enhance the education and enjoyment of all users and enable people in wheelchairs and those with limited hiking abilities to access the area for the first time. Therefore, as conditioned, staff believes the proposed development is fully consistent with the ESHA protection, archaeological resource protection, public access, and all other applicable policies of Chapter 3 of the Coastal Act.

The Motion to adopt the Staff Recommendation of Approval with Conditions is on Page 5.

STAFF NOTES

1. Standard of Review

The proposed project area is bisected by the boundary between the retained coastal development permit jurisdiction of the Commission and the coastal development permit jurisdiction delegated to Humboldt County by the Commission through the County's certified local coastal program. The boundary lies somewhere in the back dunes near the frontage road that runs parallel to and west of Highway 101, with the Commission's jurisdiction lying westward of the line and the County's lying eastward of the line.

Section 30601.3 of the Coastal Act authorizes the Commission to process a consolidated coastal development permit application when requested by the local government and the applicant and approved by the Executive Director for projects that would otherwise require coastal development permits from both the Commission and from a local government with a certified LCP. In this case, the Humboldt County Board of

Supervisors adopted a resolution and both the applicants and the County submitted letters requesting consolidated processing of the coastal development permit application by the Commission for the subject project, which was approved by the Executive Director.

The policies of Chapter 3 of the Coastal Act provide the legal standard of review for a consolidated coastal development permit application submitted pursuant to Section 30601.3. The local government's certified LCP may be used as guidance.

I. MOTION, STAFF RECOMMENDATION & RESOLUTION

The staff recommends that the Commission adopt the following resolution:

MOTION

I move that the Commission approve Coastal Development Permit No. 1-10-004 pursuant to the staff recommendation.

STAFF RECOMMENDATION OF APPROVAL

Staff recommends a **YES** vote. Passage of this motion will result in approval of the permit as conditioned and adoption of the following resolution and findings. The motion passes only by affirmative vote of a majority of the Commissioners present.

RESOLUTION TO APPROVE THE PERMIT

The Commission hereby approves a coastal development permit for the proposed development and adopts the findings set forth below on grounds that the development as conditioned will be in conformity with the policies of Chapter 3 of the Coastal Act. Approval of the permit complies with the California Environmental Quality Act because feasible mitigation measures and/or alternatives have been incorporated to substantially lessen any significant adverse effects of the development on the environment.

II. STANDARD CONDITIONS: See Appendix A.

III. SPECIAL CONDITIONS

1. Revised Final Monitoring & Reporting Program

(A) **PRIOR TO ISSUANCE OF COASTAL DEVELOPMENT PERMIT NO. 1-10-004**, the applicant shall submit for review and approval of the Executive Director, a revised final monitoring and reporting program that substantially conforms to the monitoring and reporting program detailed in Chapter 5 of the LRSB Restoration & Enhancement Plan dated February 2009 (Exhibit No. 5), except that the plan shall be revised to include the following:

1. Performance standards that will assure achievement of (a) the goals and objectives set forth in Section 1.3 of the LRSB Restoration & Enhancement Plan dated February 2009, as summarized in Finding IV.D, "Environmentally Sensitive Habitat Areas," including, but not limited to, "Goal 5.1" and its associated objectives 5.1-A through 5.1-D (Exhibit No. 5); and (b) no decrease in western snowy plover productivity, rare plant individuals or habitat, wetland area or function, or native vegetation diversity and abundance as a result of direct or indirect effects of the authorized restoration and enhancement activities, including, but not limited to, (i) installation of signage in dune habitats, and (ii) development of the boardwalk through the backdunes.

2. Provisions for monitoring each of the following additional attributes (beyond those already proposed for monitoring in Chapter 5 of the February 2009 restoration and enhancement plan): (a) the usage of signage along the western boundary of the park as perching habitat for avian predators of western snowy plover; (b) the restoration success of existing way trails not proposed as permanent trails; and (c) the direct and indirect effects of the new boardwalk trail on the diversity, abundance, and extent of native vegetation and habitat types (including wetlands) in the surrounding vicinity.

3. Provisions for submittal within 30 days of completion of the initial authorized work of (a) "as built" plans demonstrating that the initial work has been completed in accordance with the approved restoration and enhancement plan and monitoring program, and (b) an assessment of the initial biological and ecological status of the "as built" enhancements. The assessment shall include an analysis of the attributes that will be monitored pursuant to the program, with a description of the methods for making that evaluation.

4. Provisions to ensure that the project site will be remediated within one year of a determination by the permittee or the Executive Director that monitoring results indicate that the site does not achieve the goals, objectives, and performance standards identified in the approved restoration and enhancement plan and in the approved final monitoring program, including (a) the goals and objectives set forth in Section 1.3 of the LRSB Restoration & Enhancement Plan dated February 2009, as summarized in Finding IV.D, "Environmentally Sensitive Habitat Areas," including, but not limited to, "Goal 5.1" and its associated objectives 5.1-A through 5.1-D (Exhibit No. 5); and (b) no decrease in western snowy plover productivity, rare plant individuals or habitat, wetland area or function, or native vegetation diversity and abundance as a result of direct or indirect effects of the authorized restoration and enhancement activities, including, but not limited to, (i) installation of signage in dune habitats, and (ii) development of the boardwalk through the backdunes.

5. Provisions for monitoring and remediation of the project site in accordance with the approved restoration and enhancement plan and the approved final monitoring program for a period of five (5) years.

6. Provisions for submittal of annual reports of monitoring results to the Executive Director by August 31 each year for the duration of the required monitoring period, beginning the first year after submission of the "as-built" assessment. Each report shall include a "Performance Evaluation" section where information and results from the monitoring program are used to evaluate the status of the restoration project in relation to the performance standards.

7. Provisions for submittal of a final monitoring report to the Executive Director at the end of the five-year reporting period. The final report must be prepared in conjunction with a qualified biologist. The report must evaluate whether the restoration site conforms to the goals, objectives, and performance standards set forth in the approved final restoration and enhancement plan and monitoring program. The report must address all of the monitoring data collected over the 5-year period.

(B) If the final report indicates that the project has been unsuccessful, in part, or in whole, based on the approved goals and objectives set forth in CDP Application No. 1-10-004 as summarized above, the applicant shall submit a revised or supplemental restoration and enhancement plan and monitoring program to compensate for those portions of the original program which did not meet the approved goals and objectives. The revised program shall be processed as an amendment to this coastal development permit, unless the Executive Director determines that no amendment is legally required.

(C) The permittee shall monitor and remediate the project site in accordance with the approved final monitoring program. Any proposed changes to the approved monitoring program shall be reported to the Executive Director. No changes to the approved monitoring program shall occur without a Commission amendment to this coastal development permit, unless the Executive Director determines no amendment is legally required.

2. <u>Protection of Sensitive Species & Habitats</u>

The permittee shall comply with all proposed measures to protect sensitive species and habitats, as proposed and listed in Exhibit No. 7 (except where modified by this special condition), as well as the following construction and post-construction related requirements:

(A) Heavy equipment use is prohibited during the western snowy plover reproductive season (February 15 through September 15);

(B) A minimum 50-meter buffer zone shall be applied between project activities and western snowy plovers during the non-breeding season (the buffer shall be increased to 100 meters at the direction of the plover compliance monitor if

avoidance behavior is observed), and a 100-meter buffer zone shall be applied between project activities and western snowy plovers during the breeding season;

(C) Way trails not proposed as permanent trails shall be eliminated and restored to habitat to direct human use away from dune mat and potential plover nesting sites;

(D) Nixalite or other anti-perching devices shall be applied atop "hard" signs (e.g., kiosks) within the proximity of current and future (e.g., if nesting plovers colonize restored sites within the vicinity of hard signs in the future) western snowy plover nesting sites to preclude perching by avian predators;

(E) No construction materials, debris, or waste shall be placed or stored where it may be subject to wave erosion and dispersion; any debris discharged into coastal waters shall be recovered immediately and disposed of properly;

(F) Any and all debris resulting from construction activities shall be removed from the project site and disposed of at an authorized disposal location within 10 days of project completion;

(G) Heavy equipment shall enter and exit the project area through the existing trail from the Clam Beach frontage road to the foredunes;

(H) Western snowy plover protection measures shall be implemented as proposed in Exhibit No. 7 (except as may be modified by this special condition);

(I) Sensitive plant protection measures shall be implemented as proposed in Exhibit No. 7;

(J) Any fueling and maintenance of construction equipment shall occur within upland areas outside of environmentally sensitive habitat areas or within designated staging areas; and

(K) Fuels, lubricants, and solvents shall not be allowed to enter the coastal waters or wetlands. Hazardous materials management equipment shall be available immediately on-hand at the project site, and a registered first-response, professional hazardous materials clean-up/remediation service shall be locally available on call. Any accidental spill shall be rapidly contained and cleaned up.

3. <u>Area of Archaeological Significance</u>

(A) If an area of cultural deposits is discovered during the course of the project all construction shall cease and shall not recommence except as provided in subsection (B) hereof; and a qualified cultural resource specialist shall analyze the significance of the find.

(B) A permittee seeking to recommence construction following discovery of the cultural deposits shall submit a supplementary archaeological plan for the review and approval of the Executive Director.

1. If the Executive Director approves the Supplementary Archaeological Plan and determines that the Supplementary Archaeological Plan's recommended changes to the proposed development or mitigation

measures are *de minimis* in nature and scope, construction may recommence after this determination is made by the Executive Director.

2. If the Executive Director approves the Supplementary Archaeological Plan but determines that the changes therein are not de minimis, construction may not recommence until after an amendment to this permit is approved by the Commission.

IV. FINDINGS & DECLARATIONS

The Commission hereby finds and declares as follows:

A. Project Location

Little River State Beach (LRSB) is located 13 miles north of Eureka and five miles south of Trinidad off of Clam Beach Road near Highway 101 and Crannel Avenue in Humboldt County (see Exhibit Nos. 1-2). The state beach extends approximately two miles in length along the coast between Moonstone County Park to the north and Clam Beach County Park to the south, with a small stretch of private property adjacent to the north. Highway 101 lies immediately east of a frontage road (Clam Beach Road) that traverses the east side of the park adjacent to the backdunes (Exhibit Nos. 2 and 3). Little River State Beach and the surrounding area is characterized by an extensive stretch of coastal dunes and an expansive, flat, sandy beach. Little River flows across the northern end of the state beach toward Moonstone Beach where it empties into the Pacific Ocean.

The subject site was acquired by the Department of Parks and Recreation in 1931 and was designated as state beach in 1963 at which time the existing State Park regulations came into effect. On the western boundary of the park, the State Park property extends to the ambulatory mean high tide line (Exhibit No. 3). The State Lands Commission has jurisdiction over lands below mean high tide to the west of LRSB. Vehicle use is prohibited anywhere on LRSB property outside of roads and designated parking areas. The southern boundary of LRSB abuts Clam Beach County Park. The county parking lot provides the primary access to and parking for both Clam Beach and the state beach. Although there is no separate parking lot dedicated specifically for use of visitors to LRSB, additional access and limited parking to the state beach exists along the frontage road adjacent to the park to the east. The proposed project would, among other things, increase parking access for the state beach by creating two new formal parking areas on the east side of the park along the frontage road as well as improvements to the existing Clam Beach parking lot, a portion of which is on LRSB property (according to a recent official land survey completed by the park).

Allowable uses at LRSB include passive day-use recreation such as hiking, bird watching, beachcombing, and picnicking. Currently, the property boundaries between the county park and state beach and between the state beach and land under the jurisdiction of the State Lands Commission are not clearly and accurately marked. Thus, it is unclear to visitors to the site where the jurisdictions of each regulatory entity begin and end. The

proposed project would, among other things, help identify state beach boundaries and post the regulations applicable to the area to provide increased user education and assist with increased enforcement efforts.

B. Environmental Setting & Background

Little River State Beach is comprised of approximately 148 acres of beach and dunes habitats. The area contains an extensive dune system comprised of beach strand, foredunes, dune ridges, deflation plains, stabilized back dunes, and a small dune forest. The Little River flows across the northern end of the state beach, through the dune system, toward Moonstone Beach, where it empties into the Pacific Ocean. As a result of the river's current location, there is a small island of stabilized dunes on the north side of the river adjacent to Highway 101.

The proposed project area is relatively flat, at elevations ranging from sea level to approximately 40 feet. Habitat types in the area include dune systems, wetlands (dune hollows and woody dune swales), coastal scrub, and dune forest (Exhibit No. 3). These habitat types currently support various vegetation communities (referred to as "series" in Sawyer & Keeler-Wolf 1995) that are separated into units based on dominant vegetation: European beachgrass (*Ammophila arenaria*) series, yellow bush lupine (*Lupinus arboreus*) series, coyote brush (*Baccharis pilularis*) series, slough sedge (*Carex*) series, Sitka spruce (*Picea sitchensis*) series, and shore pine (*Pinus contorta* ssp. *contorta*) series. The European beachgrass and yellow bush lupine vegetation types are largely comprised of invasive, non-native plant species that are detrimental to the native dune environment. In addition, the forest communities and stabilized backdunes contain numerous nonnative Monterey cypress (*Hesperocyparis macrocarpa*) and Monterey pine (*Pinus radiata*) trees.

Little River State Beach currently provides habitat for and/or has historically provided habitat for several California and federal special-status species including the western snowy plover (*Charadrius alexandrinus*), beach layia (*Layia carnosa*), and pink-sand verbena (*Abronia umbellata* ssp. *breviflora*). These species often occur in the Sand verbena-Beach bursage and Native dunegrass vegetation communities, which since the 1930s, have been steadily displaced by European beachgrass and yellow bush lupine, which in turn has contributed to the decrease, and in some cases extirpation, of native beach and dune species entirely. Currently pink sand verbena (remnant occurrences) and snowy plovers are the only known special-status species to occur at LRSB.

Western snowy plover has been observed nesting at LRSB since the early 1990s. The species is listed as "threatened" under the federal Endangered Species Act and is classified at the state level as a "species of special concern" throughout all of California. At LRSB, the species nests in nearshore dune habitats with mostly native dune mat vegetation. LRSB contains approximately 40 acres of nearshore dune habitat. Snowy plovers have been adversely impacted at LRSB and adjacent county beaches over the years due to unauthorized and indiscriminate vehicle use of beach and dune areas, the

proliferation of invasive species (especially European beachgrass), harassment by unleashed dogs, and other causes.

In October of 2009, the Commission approved CDP No. 1-09-026 for the removal of invasive species (primarily European beachgrass) and the restoration of native dune vegetation across approximately 80 acres of stabilized dunes at LRSB. The Department undertook the effort to increase habitat for western snowy plover and pink sand verbena in the area. Initial treatment efforts were conducted across 34 acres of nearshore dune habitats from late October through mid-November of 2009. Both a bulldozer and excavator were used to treat 28 acres and bury the removed vegetation, as authorized by the CDP. Both California Conservation Corps and Cal-Fire inmate crews were used to hand treat six acres that were within heavy equipment exclusion areas that had been established around environmentally sensitive habitat areas (herbaceous dune hollow wetlands). The westward side of the project area was reshaped to resemble a natural foredune, and no sand was added or removed from the project area. Additional hand treatment was used in dune forest habitat to remove English ivy (*Hedera helix*) and in the backdunes to remove jubata grass (*Cortaderia jubata*) and yellow bush lupine. Retreatment of the areas (using manual removal and flaming methods) occurred in February of 2010, and additional (manual) retreatment is scheduled for October of 2010 and January of 2011. Revegetation of the treatment area is expected to occur through natural recolonization by surrounding native dune species, and additional revegetation efforts in the treatment areas are scheduled for this coming fall. The first (of five) annual monitoring report is due for submittal to the Executive Director by August 31 of this year, as required by Special Condition No. 1 of the permit. The report is to present information and results from the monitoring program used to evaluate the status of the restoration project in relation to the approved performance standards designed to assure achievement of the restoration goals and objectives set forth in the CDP application.

C. Proposed Project Description

Under the current CDP application, the Department proposes various restoration and access enhancement activities including: (1) additional exotic plant removal and native dune habitat restoration; (2) creation of woody dune swale habitats; and (3) implementation of an Access Enhancement Plan involving various improvements to public access, including parking, equestrian, pedestrian, and ADA access, through the development of parking improvements, a designated trail system including a new ADA-compliant trail, and new interpretive, informational, and regulatory signage. Each project component is discussed in more detail below. Detailed project plans are included as Exhibit Nos. 4, 5, and 6.

1. Exotic Plant Removal & Native Dune Habitat Restoration

Proposed exotic plant removal involves both initial and follow-up treatments in various areas and habitat types including (a) backdunes dominated by scrub (i.e., primarily European beachgrass, coyote brush, and yellow bush lupine; see “Area B” in Exhibit No. 5); (b) backdunes dominated by forest (mostly Sitka spruce and shore pine); and (c) woody swales and wetlands (see “Area C” in Exhibit No. 5). Manual removal techniques,

using hand tools such as shovels and chainsaws (for the removal of 74 nonnative Monterey cypress and Monterey pine trees, as seen in Exhibit No. 4), would be employed in all areas. Heavy equipment (excavator) would be used for initial treatment only in backdune areas with scrub habitat (not in forested backdunes or wetland areas). The primary weeds that would be targeted by the heavy equipment removal in these backdune scrub areas would be yellow bush lupine and European beachgrass. Target plant rhizomes would be dug to a depth of approximately 6.6 feet (2 meters), and the existing topography would be retained as much as possible. Nonnative vegetation removed would be staged in piles for subsequent hauling off site to Patrick's Point State Park (approximately 10 miles north of the project area) to be burned later and/or composted at a local facility. Some of the vegetation would be bagged prior to removal.

In addition to manual removal techniques and the use of heavy equipment for nonnative plant removal in backdune scrub areas, additional removal techniques that are proposed include hot water treatment (to be used in scrub and forested backdunes, primarily along roadsides) and flaming treatment (in scrub and forested backdunes). The proposed hot water treatment involves the use of a Waipuna system to deliver a hot water-foam mixture through hoses to a variety of target weeds. The superheated steam is trapped on the plants between the foam and the ground. The foam is non-toxic, has no smell, and is bitter tasting so as not to attract animals. It is made from naturally occurring compounds in sugar, and is not labeled as an herbicide by the U.S. EPA. The proposed flaming treatment, which is a method that was used in the restoration efforts authorized under CDP No. 1-09-026, would utilize a small torch to wilt the weed (green flaming) or to incinerate it (black flaming). Both flaming techniques would be used to treat small nonnative plants after the larger woody shrubs have been manually removed. Flaming would be conducted during the wet season only and would not result in any ground disturbance. Vegetation treated by both the hot water and flaming methods would be left in place to decay naturally.

All exotic plant removal areas would be retreated on a regular basis (approximately once every three months or as funding allows) until the nonnative plants are controlled or eradicated and success criteria are met. Only manual removal techniques would be employed for retreatment efforts in the wetland habitats, whereas hot water treatments (where feasible), flaming, and manual techniques would be used for all retreatment efforts in the upland dune habitat types.

As proposed in the proposed restoration plan (Exhibit No. 5), revegetation of restored habitats would involve natural recolonization, seeding, or transplanting, depending on the area, habitat type, and success of the initial revegetation. A combination of direct seed sowing, transplanting from native stock, and propagating and transplanting by seed would be used to revegetate the upland dune habitats and the newly created woody dune swales (described below). All seed and plant stock used for revegetation would consist of native species of local genetic stock.

Symbolic fencing and signage would be used around the revegetated areas to protect the restoration efforts. Informational and closure signs would be placed with the fencing to

inform the public of the closure and to explain the restoration efforts underway. Symbolic fencing may be used in some areas for up to three growing seasons, depending on revegetation success. Corridors between symbolic fencing would allow for public access to the waveslope, interior dunes, and river.

2. Creation of Dune Swale Habitat

The Department proposes to create a series of woody dune swales across approximately 2.5 acres in the stabilized backdunes located west of the frontage road (Exhibit Nos. 4 and 5). Currently this upland habitat consists of scrub vegetation dominated mostly by coyote brush, yellow bush lupine, European beachgrass, and other species. The purpose of the woody dune swale creation would be twofold: (1) to remove invasive species and increase the woody dune swale habitat type for its own intrinsic value and for its value to the native coastal fauna, and (2) to serve as a "sand fence" to trap an increased amount of blowing sand that is expected to result from the combined extensive European beachgrass removal authorized under CDP No. 1-09-026 and under the current permit application, which, over several decades could eventually inundate public infrastructure and road corridors. European beachgrass and other invasive species have a stabilizing effect on the dunes at LRSB. Under natural conditions, the dunes would be more exposed and subject to aeolian processes, resulting in a more dynamic geologic setting. The Department completed a geologic analysis to study the effects of extensive invasive species removal on dune geologic processes (Exhibit No. 9). Specifically, the analysis examined aeolian and surf effects that could result from removal of the stabilizing invasive plants across the LRSB. The report concluded in part that the creation of a vegetative barrier (using vegetation effective at sand trapping, such as willows) could help to inhibit sand migration into the public roadway.

An excavator or bulldozer would be used to remove vegetation and sand to create woody dune swales that mimic those found in the project area already. Newly created swales would be revegetated with Hooker willow (*Salix hookeriana*), wax myrtle (*Morella californica*), silk-tassel (*Garrya elliptica*), and other appropriate native species. The areas would be retreated for exotic plant removal on a regular basis (approximately once every three months or as funding allows) until the nonnative plants are controlled or eradicated and success criteria are met. Only manual removal techniques would be employed for retreatment efforts in these areas. As discussed above, symbolic fencing and signage would be used around the newly created woody dune swales to protect the restoration efforts. Informational and closure signs would be placed with the fencing to inform the public of the closure and to explain the restoration efforts underway. Symbolic fencing may be used in some areas for up to three growing seasons, depending on revegetation success. Corridors between symbolic fencing would allow for vertical public access through the area.

3. Access Enhancement Plan

The Department proposes various improvements to public access, including parking, equestrian, pedestrian, and ADA access, through the development of parking improvements, a designated trail system including a new ADA-compliant trail, and new

interpretive and informational signage. The various components of the proposed Access Enhancement Plan (Exhibit Nos. 4 and 5) are discussed below:

a) Proposed Parking Improvements

As described above, LRSB does not have any formally designated parking lots within the park. Park visitors use the existing parking lot for Clam Beach County Park at the south end of LRSB (a portion of the existing lot is on LRSB property) as well as two unofficial parking areas along the frontage road. The unofficial parking areas currently used by the public include a small paved area near the Crannel overpass and a dirt area on the east side of the frontage road. The existing parking lot at the southern end of LRSB is for day use only and is used by the public visiting both LRSB and Clam Beach County Park. The parking lot is sufficiently large to accommodate horse trailers, and equestrians can gain quick access to the beach by riding west across the dunes from this lot. This parking area also provides the only public restroom facilities for LRSB. The lot currently has 23 parking spaces, including one ADA parking space.

The Department proposes to create one additional ADA parking space in this existing parking lot by converting three of the existing parking spaces to the one ADA parking space, a loading area, and a pedestrian walkway leading to the proposed ADA-accessible trailhead (described below). The proposed ADA parking space would be located near the trailhead access area. The Department also proposes to create two new official parking areas at the sites of the two unofficial parking areas along the frontage road between Highway 101 and LRSB. The Department believes that the absence of official parking along the frontage road has led to dispersed parking all along the frontage road adjacent to the LRSB, which in turn has been responsible in part for the development of numerous way trails in the park's backdune areas. In the absence of focused parking areas and trailheads that correspond to those parking facilities, the public is accessing the dunes and beach from numerous points along the frontage road. Thus, to resolve this issue, the Department proposes to create two new parking areas and focused trailheads, as described below.

The two proposed parking lots (referred to as Parking Lot A and Parking Lot B) would provide the public with access to the north end of the park (see Exhibit No. 4). The proposed parking lot areas, which are located in a narrow strip of land between Highway 101 and the frontage road, consist of flat terrain dominated by mostly invasive nonnative species. Each proposed parking area would have a maximum capacity of 10 vehicles. In addition, proposed Parking Lot A would have two additional spaces for at least two horse trailers. The surface of the two new lots would be 1.5-inch crushed rock, and the perimeters of the two lots would be defined by large (1/2- to 1-ton) rocks. Signage identifying the parking areas would be installed along the frontage road, as discussed in more detail below. A set of animal-proof trash cans would be installed at each new parking lot.

Finally, a 12-foot-wide, steel vehicle gate would be installed across from Parking Lot A and adjacent to the trailhead. Vehicular access through the gate would be restricted

to Park staff and emergency personnel that need access to the beach for work or an emergency. This additional access is deemed necessary as the access at the southern end of Clam Beach County Park is inaccessible part of the year due to the depth of the crossing across Strawberry Creek.

b) Proposed Trails

Currently the LRSB has no formal, designated trail system. Historically, park visitors, including pedestrians and equestrians, have accessed the park by a system of "way trails" created by the public without planning, environmental review, or professional design or construction. Existing way trails emanate from the existing parking lot at the southern end of LRSB and from the frontage road on the east side of LRSB. There are a total of 3.4 miles of way trails in the park, many of which traverse through sensitive habitats including wetlands, rare plant habitat, and snowy plover habitat. There is a great amount of duplicity in these trails, many of which are deeply entrenched. Thus, the Department proposes to designate, and in part construct, a public trail system, a portion of which would be part of the California Coastal Trail, through the LRSB that protects both access for a variety of user groups and the fragile dune environment and its associated native species and sensitive habitats. Portions of the existing way trails not proposed for designation in the LRSB trail system would be revegetated with native species as described in the proposed restoration plan (Exhibit No. 5).

First, the Department proposes to create a new ADA-accessible loop interpretive trail that would emanate from the existing parking lot at the southern end of LRSB (Exhibit Nos. 4 and 5). The trail would be approximately 0.68-mile in length and would traverse through the backdune environment, which currently consists mostly of native and nonnative upland scrub vegetation. Three viewing platforms would be constructed, each with an ADA-compliant redwood slab bench, along the length of the loop trail – one overlooking an existing prominent dune wetland, one other overlooking the nearshore dunes and beach environment, and one along a spur trail that overlooks the beach (Exhibit No. 4). The trail would be constructed using a boardwalk design with plastic/wood composite decking and redwood bull rail edge protection. The boardwalk would be 4 feet wide, with 5-foot-wide passing spaces every 1,000 feet. The proposed trail would be supported above the dunes by a combination of mud sill and joist design (to be used in areas that are flat and dry all year) and helical anchor, header and joist design (to be used in areas where the ground is uneven or seasonally wet) (Exhibit No. 6). Two 32-foot-x-5-foot bridges would be constructed where the proposed trail would cross two seasonal wetlands, and no fill would be placed in the wetlands, as bridge abutments would be sited entirely outside of wetland areas. The trail would include interpretive signage and brochures to inform state beach visitors about the natural dune environment.

Second, the Department proposes to formally designate 2.41-miles of hiking trails for pedestrian access in a series of stacked loops, a portion of which would be shared with the proposed equestrian trial (described below). The proposed hiking trail system

would provide the public trail user with multiple access trails to the beach, nearshore dunes, backdunes, dune forest, wetland viewing areas, accessible and equestrian trails, as well as proposed new parking areas along the frontage road (Exhibit No. 4). All proposed trails (except for a portion of the proposed equestrian trail, described below) would occur atop existing way trails that historically have been used by the public, and no new trail construction would be needed (other than some light brushing/trimming of vegetation in some areas). The remainder of way trails not proposed for designation in the formal trail system would be revegetated with native, appropriate dune species. As discussed above [subsection (a)], symbolic fencing and signage would be used around the revegetated areas to protect the restoration efforts.

Third, the Department proposes to designate and partially construct a new 1.34-mile-long equestrian trail extending from the existing parking lot to the Little River, in part through the backdune environment (Exhibit Nos. 4 and 5). LRSB is a popular riding area for local equestrians, who currently park at the existing southern parking lot and ride out to the beach to ride either north to the mouth of the Little River or south to the mouth of the Mad River. Currently horses are permitted only along the waveslope below the mean high tide at LRSB. Approximately 4,113 feet of the proposed new equestrian trail would follow existing developed way trails currently used by both equestrians and hikers, and approximately 3,000 feet of the trail would require new construction. The proposed new section of trail to be constructed would occur immediately adjacent to the frontage road from the existing parking lot at the southern end of LRSB to approximately across from proposed Parking Lot B. This proposed new trail section would be constructed on the paved western shoulder of the frontage road by removing a 3-foot-wide section of existing pavement along the road shoulder from the existing southern parking lot to proposed Parking Lot A and placing a crushed rock and soil mix trail surface in its place. The portion of the proposed new equestrian trail extending from across the frontage road from Parking Lot A to across the frontage road from Parking Lot B would run along the base of the (road) fill slope parallel and adjacent to the frontage road shoulder (atop existing flat terrain dominated mostly by herbaceous invasive weeds) and would have a 4-foot-wide native surface.

Finally, the Department proposes to designate a portion of the trail system at LRSB as a segment of the California Coastal Trail (CCT), a state-directed project of the Coastal Conservancy aimed at creating a proposed 1,300-mile-long trail system that extends the length of the California coast. The designated CCT segment at LRSB would consist of multiple trails accessible to various user groups including bicyclists, equestrians, and pedestrians. One segment proposed for CCT designation would be a dedicated bike lane extending from the existing parking area at the southern end of LRSB north along a 4- to 6-foot-wide paved portion of the frontage road (designated by a white stripe 4 to 6 feet from the edge of the pavement) to the south end of the Highway 101 bridge over the Little River. The northern end of this segment would link to the proposed equestrian trail, which would provide CCT pedestrian users with vertical access across the dunes to the beach. A second segment proposed for CCT designation would follow the proposed new equestrian trail starting at the existing

parking lot at the southern end of LRSB, along the backdunes to the far northeast end of the proposed equestrian trail loop, and down a short spur trail to the southern end of the Highway 101 bridge over the Little River. The proposed CCT through LRSB would be linkable with the existing Hammond Trail (a designated segment of the CCT) at the southern end of Clam Beach County Park. Although the CCT is not yet completed/designated north of the Little River, when it is completed in the future, the portion that passes through LRSB would be ready with development of the proposed project.

c) Proposed Signage

The Department proposes to install both interpretive and regulatory signs and displays to enhance public awareness and education at LRSB and to ensure that visitors understand the park's special resources and restrictions. Each of the three parking lots at LRSB would have interpretive and informational kiosks; a self-guided interpretive program would be developed along the proposed accessible boardwalk using brochures and interpretive signs; interpretive panels would be installed at key locations along the trails to interpret resource management activities or sensitive habitats; and property boundary and regulatory signs would be installed around the perimeter of the state beach to inform the public of park restrictions and regulations on dogs, horses, vehicles, etc. (see Exhibit Nos. 4 and 5). Additionally, some existing signage in the area would be removed, including property boundary signs along the north and south ends of the LRSB determined to be inaccurate after completion of an official land survey of the area in 2006.

The proposed parking lot kiosks (one at each parking area) would be constructed on 6-foot wooden posts placed into the ground two feet and secured in place with road base (Exhibit No. 6). The kiosks would display information and regulations pertaining to LRSB (as well as the adjacent Clam Beach County Park in the case of the proposed kiosk at the existing southern parking lot). The informational displays would be easily changeable to allow the Department to update regulatory and natural history information as necessary.

The proposed trail signs would include directional, regulatory, and interpretive signs (Exhibit No. 6). Signs installed near snowy plover nesting habitat would consist mostly of flexible carsonite posts (6 feet x 2 inch by 1 inch posts with 2-inch by 2-inch stickers with words and symbols showing No Camping, No Dogs, No Horses, etc.) placed 3 feet into the ground. This type of sign is designed not to allow perching by avian predators that feed on snowy plover eggs and chicks. Signs installed in other areas (not near snowy plover nesting habitat) would be no greater than 2 feet x 2 feet in size installed on carsonite, wood, or corten steel posts. Signs would be installed in the three parking lot areas, at trailheads and trail junctions, along the accessible boardwalk trail, and along the length of the western boundary of the park and portions of the northern and southern park boundaries. The proposed boundary signs would consist of the carsonite post sign type described above installed every approximately

115 to 132 feet for a total of 70 carsonite posts (Exhibit Nos. 4 and 6). The posts would be white in color.

The following measures, among others, have been proposed by the Department to minimize potential impacts to coastal resources (see Exhibit No. 7 for all proposed minimization measures):

- Prior to operations, botanical surveys would be conducted by a qualified botanist, with the botanical results to be submitted to the Department of Fish and Game for review;
- A 5-meter heavy equipment exclusion zone (EEZ) would be established around all sensitive resources including sensitive plants, wetlands, and cultural resources. Restoration activities within the EEZ would be restricted to manual removal techniques;
- Heavy equipment would enter the project area through an existing trail from the Clam Beach frontage road to the foredunes, where it would be stored at the interface of European beachgrass and Coyote brush plant series. Heavy equipment would remain onsite until the completion of each year's implementation phase, at which time equipment would exit in the same route as it entered;
- Heavy equipment would be fueled at the start of every day at a predetermined location. Fuel would be delivered via a fuel dispenser held in the bed of a 4 X 4 truck that would enter the beach from the Clam Beach County Park vehicle entrance. A snowy plover monitor would walk in front of the vehicle from the waveslope to/from the western ¼ of the treatment area to fuel the equipment;
- Western snowy plover mitigation measures, including pre-development surveys, biological monitoring, 50- to 100-meter buffer zones (in the non-breeding and breeding-seasons, respectively), and other measures, would be applied whenever operations are occurring in the nearshore dune habitat.

Little River State Beach was surveyed in July of 2004 for prehistoric and historic cultural resources by a State Park Archeologist. A confidential report was prepared, and two cultural significant sites were located, along with six new findings that could be of some historical significance (Gruver 2004). The two important culturally significant sites date back to prehistoric and historical times. Although prehistoric and historic cultural sites have been documented within LRSB, the sites are not within the project area. Regardless, the applicant proposes that a cultural monitor would be on site during the treatment phase to ensure the protection of any new findings or unknown cultural artifacts that may become unearthed. If an artifact were to become exposed, heavy equipment use in that area would stop, and consultation with the monitor, local tribes, and the State Park Archeologist would begin to determine the appropriate course of action (see Exhibit No. 7 for specific proposed archaeological resources protection measures).

D. Environmentally Sensitive Habitat Areas (ESHA)

1. Summary of Applicable Coastal Act Policies

Coastal Act Section 30107.5 defines "environmentally sensitive habitat area" as:

> *…any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments.*

Coastal Act Section 30240 states in part that:

> *(a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on such resources shall be allowed within such areas.*
>
> *(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.*

2. Consistency Analysis

Section 30240(a) of the Coastal Act limits activities within environmentally sensitive habitat areas (ESHAs) to only uses that are dependent on the resources of the ESHA. In addition, ESHA must be protected against any significant disruption of habitat values. Section 30240(b) requires that development in areas adjacent to ESHA shall be sited and designed to prevent impacts which would significantly degrade the ESHA, and that development shall be compatible with the continuance of the adjacent ESHA.

The dune habitats at Little River State Beach, which contain snowy plover nesting and wintering habitat, pink sand verbena habitat, and wetland habitat, constitute ESHA, as they are rare or especially valuable habitats that are easily disturbed or degraded by human activities and developments. The upland dunes themselves, in the absence of sensitive plant or animal species, also constitute ESHA, as the County's certified Land Use Plan for the area (the McKinleyville Area Plan) recognizes, in general, "*Vegetated dunes at Clam Beach, Little River Beach, and the banks of the Mad River*" as a type of ESHA (Section 3.41A.1.c) subject to the ESHA protection provisions of Coastal Act Section 30240. Furthermore, coastal dunes are easily disturbed and degraded by human activities and developments and have in fact been destroyed by development over large areas of the state.

Coastal dunes once were widespread all along the west coast, but through the combined impacts of development, off-road vehicles, and the invasion of nonnative species, only relatively small, fragmented patches of intact coastal dune habitat remain today. Compared to its natural distribution and abundance, coastal dunes are in decline, and their decline is due in large part to destruction by human activities. Historic photos and reports indicate that prior to the construction of Highway 101, dune swales were more abundant at the LRSB than currently. The reduction of dune swales in the area has been attributed in part to invasive plant species, dune stabilization, and the construction of Highway 101. California's dunes in general were formed over thousands of years, yet today, dune erosion is outstripping sand deposition as dams trap river sediments, depleting the sand supply, and coastal protective structures such as seawalls disrupt the

natural recycling of sand from sandbar to beach. Coastal development has disturbed dunes at many points along the coast. Off-road vehicles, foot traffic, and horses can damage dune plants, loosening the sands and leaving the dunes vulnerable to wind erosion and blowouts.

Coastal dunes provide important ecological functions, as discussed above. Even disturbed or degraded coastal dunes may provide essential habitat for breeding birds and other animals, they may contribute to the local diversity of vegetation, and they may themselves be a rare habitat type inherently deserving of protection wherever they are found. Therefore, the Commission finds that the coastal dune habitat in which certain activities are proposed, including exotic plant removal, revegetation, woody dune swale creation, trail designation and creation (in part), and signage installation (in part), constitutes ESHA as defined by Section 30107.5 of the Coastal Act.

As cited above, Section 30240(a) of the Coastal Act limits activities within environmentally sensitive habitat areas (ESHAs) to only uses that are dependent on the resources of the ESHA (such as restoration and nature study). In addition, ESHA must be protected against any significant disruption of habitat values.

The purpose of the proposed project is in part to restore and protect native vegetation and natural function to the coastal dune habitats at LRSB through (1) exotic plant removal, (2) revegetation of exotic plant removal areas and way trails not proposed for designation in the official trail system, (3) creation of woody dune swale habitat areas, (4) installation of symbolic fencing to protect restored and revegetated habitats, (5) installation of informational, regulatory, and interpretive signage in dune habitats to protect sensitive habitats and resources in the area (e.g., by directing that people stay on designated trails, informing the public of regulations to protect sensitive habitats, such as no dogs, no vehicles, etc.) and to interpret the natural environment for state beach visitors, and (6) construction of an accessible interpretive trail through backdune scrub habitat.

The proposed trail improvements within ESHA areas are limited to nature study use and improvements that are designed to restore the ESHA for various reasons. First, none of the trails except for the boardwalk will require new trail construction within the dune ESHA. The portions of the trails to be designated within the ESHA are limited to locations where there are existing way trails currently used by public access users where no new construction is proposed and where designation of the trail will help channel and direct public access use away from other way trails and from undisturbed portions of the dunes, thereby helping to maintain and restore the dune ESHA. Second, the 3,000 feet of new equestrian trail construction is confined to the edge of the existing frontage road in areas that are either currently part of the road shoulder or immediately adjacent flat areas of ruderal vegetation that is not environmentally sensitive. The portions of the equestrian trail to be designated within the ESHA are limited to existing way trails that have previously been used by horses, and the surrounding ESHA is not likely to be adversely affected by additional equestrian use. The existing equestrian trails to be utilized are wide enough to accommodate horse use without danger that the trails will be widened out by increased use. Third, the proposed California Coastal Trail improvements will consist

only of striping a bike lane within the paved areas of the existing frontage road and its shoulder outside of any ESHA and designating portions of the trail system as part of the Coastal Trail. Fourth, the proposed boardwalk construction will be located within the dune ESHA, but it will be located within existing way trails and limited in width to the minimum width necessary to meet ADA requirements. Fifth, the two proposed bridges will completely span the dune wetland areas they cross without any fill in the wetlands. Finally, the proposed loop interpretive trail will include interpretive signs to educate users about the natural dune environment they are passing through.

Thus, as the project is inherently for restoration and nature study purposes and is designed to reduce visitor traffic through environmentally sensitive habitat areas, the Commission finds that the proposed development activities within the environmentally sensitive dune habitats, including exotic plant removal, revegetation, dune swale creation, trail designation and creation, and signage and symbolic fencing installation, are for a use dependent on the resources of the ESHA.

This finding that the proposed project constitutes "a use dependent on the resources of the ESHA" is based, in part, on the assumption that (1) the proposed exotic plant removal, revegetation, dune swale creation, and symbolic fencing will be successful in restoring native dune habitat values as proposed; and (2) the proposed signage and trail plans will be successful in concentrating public access use on designated trails and away from other parts of the fragile dune environment, where such use historically has degraded the environment and its associated sensitive species. Should the project be unsuccessful, or worse, if the proposed impacts of the project actually result in long term degradation of the habitat, the proposed development would not be for "restoration purposes."

The U.S. Fish and Wildlife Service (FWS) commented on the proposed project in a technical assistance letter dated May 22, 2009 (Exhibit No. 8), since the federally threatened western snowy plover and its designated critical habitat are known to occur within the project area. One of the general comments offered by the FWS encouraged the Department to install park boundary signs along the southern boundary of the park within the intertidal zone rather than signing the western boundary of the park as proposed in part as a means to increase compliance with park regulations prohibiting vehicles. Illegal and indiscriminate vehicle use of beach and dune areas has had adverse impacts on plovers over the years both on LRSB property and adjacent county property. Regulation of the intertidal zone by the Department would require interagency coordination with the State Lands Commission, which retains jurisdiction of the waveslope below the mean high tide line where County regulations currently permit vehicle use. Specific comments offered by the FWS include in part suggestions to (1) avoid the use of heavy equipment between February 15 and September 15 (plover reproductive season); (2) apply a 50- to 100-meter buffer zone between project activities and plovers (in the non-breeding and breeding seasons, respectively); (3) restore the existing way trails not proposed as permanent trails to direct human use away from dune mat and potential plover nesting sites, (4) not construct the accessible boardwalk trail as proposed, since it may lead to habitat loss for native plants and plovers, serve as a vector for unauthorized uses, and require extensive long-term maintenance; and (5) preclude perching on "hard" signs

(such as kiosks) by avian predators (such as gulls, corvids, and raptors that may feed on plovers) by using "Nixalite" (porcupine wire) or other methods. The FWS commented that the installation of Nixalite on carsonite posts (such as those proposed along the western perimeter of the state beach) is impractical and generally unnecessary, since the posts generally move too much to be effective perch sites and are lower to the ground, making them less desirable to corvids and raptors than other perches. The FWS did generally comment however that the proposed horizontal signing of the state beach's western boundary may provide additional perch opportunities for snowy plover predators, giving them an unnatural surveillance point over much of the beach.

As discussed below, the FWS recommendations regarding timing of construction, plover buffer width, restoration of way trails, and the installation of anti-perching devices atop hard signs such as kiosks have been incorporated into attached special conditions. Although the FWS expressed concerns in its Technical Assistance letter that the boardwalk would lead to habitat loss, would serve as a vector for unauthorized uses, and would be infeasible to maintain over the long term, the Department disagrees with these contentions for the following reasons. First, the proposed boardwalk will be constructed in stabilized backdune areas where plover are not found. The proposed restoration plan does not propose to restore the backdune area to native dune mat and a dynamic sand dune system due to adjacent existing infrastructure (Clam Beach Drive and Highway 101) and the potential damage that could occur from sand moving across these areas. Because of this limitation, it is not a goal of the LRSB restoration plan to completely restore a functional dune system with moving sand sheets. Instead, the proposed plan will restore the backdunes to dune scrub habitat, which is naturally more stabilizing than dune mat and does not provide suitable habitat for nesting plovers. Snowy plovers use the nearshore dunes at LRSB, and the Department does propose to restore nearshore dune habitat across dozens of acres at the state beach to improve and expand habitat for plovers. Second, the Department does not believe that the proposed boardwalk will experience significant vandalism or misuse based on experiences with floating boardwalks in other state beaches managed by the Department of Parks and Recreation with higher visitor use than seen at LRSB. Furthermore, although there may be maintenance involved with the proposed boardwalk, the Department asserts that there is always necessary maintenance involved with any trail system. Because the boardwalk will be floating above the dunes, the chance of sand blowing on top of it will be reduced, and daylight will be able to reach dune vegetation growing under the proposed boardwalk. Based on the Department's representation, the Commission finds that the proposed boardwalk will not result in the degradation of environmentally sensitive habitat.

The Department prepared a monitoring and reporting plan (Chapter 5 of Exhibit No. 5) designed to meet the goals and objectives of the proposed project, including, in part, the following: "Goal 5.1: Monitor habitat and sensitive species productivity and LRSB to determine the successfulness of the restoration and enhancement efforts," with the following objectives: (a) Western snowy plover productivity will be monitored before, during, and after restoration efforts; (b) Percent cover of native and nonnative plant species will be monitored to determine the success of the restoration efforts; (c) Beach

and dune topography features will be monitored before, during, and after restoration efforts to determine sand movement patterns; and (d) Visitor use patterns will be monitored to determine the success of the trail system, symbolic fencing, vegetation barriers, and interpretive signage.

Although the measures proposed in the monitoring and reporting program are appropriate, in some cases they do not go far enough or fail to address certain factors to ensure that permissible development does not result in long-term degradation of the surrounding habitats. For example, the plan proposes to monitor certain attributes such as western snowy plover productivity (both compliance monitoring and restoration response monitoring), rare plant locations on an annual basis, vegetation diversity and abundance before and after selected treatment efforts, and other attributes. However, no performance standards or remedial action measures are identified to assure achievement of the stated goals and objectives (including, presumably, no decrease in western snowy plover productivity, rare plants, or native vegetation diversity and abundance as a result of the proposed restoration and enhancement activities). Furthermore, there are no monitoring protocols proposed for ensuring that the proposed signing of the western boundary of the park will not lead to an increase in perching sites for western snowy plover predators. Moreover, the proposed monitoring plan does not address the potential impacts that the proposed boardwalk trail may have on native dune vegetation diversity and abundance or impacts associated with noncompliance (e.g., visitors detouring off trail and creating new "way trails" through the fragile dune environment).

To ensure that the proposed project achieves the objectives for which it is intended and does not degrade environmentally sensitive habitat areas at LRSB, the Commission attaches **Special Condition No. 1**, which requires the applicant to submit a revised final monitoring and reporting program for the review and approval of the Executive Director prior to the issuance of the permit. The revised final monitoring and reporting program is required to substantially conform to the monitoring and reporting program detailed in Chapter 5 of the LRSB Restoration & Enhancement Plan dated February 2009 (Exhibit No. 5), except that the plan is to be revised to include the goal of ensuring that there will be no decrease in western snowy plover productivity, rare plant individuals or habitat, wetland area or function, or native vegetation diversity and abundance as a result of direct or indirect effects of the authorized restoration and enhancement activities (including, but not limited to, installation of signage in dune habitats, and development of the boardwalk through the backdunes). In addition, the revised final monitoring program is to monitor additional attributes beyond those already proposed, including (a) the usage of signage along the western boundary of the park as perching habitat for avian predators of western snowy plover; (b) the restoration success of existing way trails not proposed as permanent trails; and (c) the direct and indirect effects of the new boardwalk trail on the diversity, abundance, and extent of native vegetation and habitat types (including wetlands) in the surrounding vicinity. Furthermore, Special Condition No. 1 requires the monitoring plan to include provisions for remediation to ensure that the goals and objectives of the project are achieved.

The proposed project includes various measures designed to prevent significant disruption of dune habitat values, including measures to avoid disturbance of sensitive plants and the threatened snowy plover. To ensure that the applicant implements the project in a manner that protects ESHA and is compatible with the continuance of environmentally sensitive habitats at LRSB, and to ensure that the recommendations of the FWS to protect western snowy plovers are followed, the Commission attaches **Special Condition No. 2**. This condition requires adherence to various measures including (A) heavy equipment use is prohibited during the western snowy plover reproductive season (February 15 through September 15); (B) a minimum 50-meter buffer zone shall be applied between project activities and western snowy plovers during the non-breeding season (the buffer shall be increased to 100 meters at the direction of the plover compliance monitor if avoidance behavior is observed), and a 100-meter buffer zone shall be applied between project activities and western snowy plovers during the breeding season; (C) way trails not proposed as permanent trails shall be restored to direct human use away from dune mat and potential plover nesting sites; (D) Nixalite or other anti-perching devices shall be applied atop "hard" signs (e.g., kiosks) within the proximity of current and future (e.g., if nesting plovers colonize restored sites within the vicinity of hard signs in the future) western snowy plover nesting sites to preclude perching by avian predators; (E) no construction materials, debris, or waste shall be placed or stored where it may be subject to wave erosion and dispersion; (F) any and all debris resulting from construction activities shall be removed from the project site and disposed of at an authorized disposal location within 10 days of project completion; (G) heavy equipment shall enter and exit the project area through the existing trail from the Clam Beach frontage road to the foredunes; (H) western snowy plover protection measures shall be implemented as proposed in Exhibit No. 5; (I) sensitive plant protection measures shall be implemented as proposed in Exhibit No. 5; (J) any fueling and maintenance of construction equipment shall occur within upland areas outside of environmentally sensitive habitat areas or within designated staging areas; and (K) fuels, lubricants, and solvents shall not be allowed to enter the coastal waters or wetlands; hazardous materials management equipment shall be available immediately on-hand at the project site, and a registered first-response, professional hazardous materials clean-up/remediation service shall be locally available on call; any accidental spill shall be rapidly contained and cleaned up.

Therefore, the Commission finds that the proposed project, as conditioned, is consistent with Section 30240 of the Coastal Act, as: (1) development approved within the ESHA is for a use dependent on the resources of the environmentally sensitive dune habitats and will not result in a significant disruption to ESHA; and (2) development approved adjacent to ESHA and parks and recreation areas is sited and designed to prevent impacts which would significantly degrade those areas and be compatible with the continuance of the adjacent ESHA.

E. Archaeological Resources

Coastal Act Section 30244 provides for protection of archaeological and paleontological resources and requires reasonable mitigation where development would adversely impact such resources.

Little River was the natural feature that separated two prehistoric Native American tribes: the Yurok to the north and Wiyot to the south. The Yurok had over 50 named villages clustered along the Klamath River and coastal lagoons and creeks, including 17 villages on the coast. The Wiyot lived along the coast around Humboldt Bay, extending 35 miles from Little River to the Eel River.

Both the Yurok and Wiyot have historically utilized both the north and south sides of Little River. Little River State Beach was surveyed in July of 2004 for prehistoric and historic cultural resources by a State Park Archeologist. A confidential report was prepared, and two cultural significant sites were located, along with six new findings that could be of some historical significance (Gruver 2004). The two culturally significant sites known to be of importance date back to prehistoric and historical times. Although these significant cultural sites have been documented within LRSB, the sites are not within the project area.

The Department prepared a monitoring and reporting plan (Exhibit No. 5) designed to meet the goals and objectives of the proposed project, including, in part, the following: (1) "Protect culturally significant sites during and after restoration efforts at LRSB," with the following objectives: (a) Culturally significant sites will be identified through consultation with the Wiyot and Yurok Tribes as well as through a CSP archeological review; (b) Restoration within areas identified as culturally significant will be performed by hand and monitored by a cultural specialist (Tribal monitor or CSP Archeologist); and (c) The trails will be designed in such a way that areas identified as culturally significant are not impacted by the trails or park visitors. This will be achieved by routing the trails around and away from these areas, encouraging visitors to use other areas of the Park. The Department indicates that a cultural monitor will be on site during the treatment phase to ensure the protection of any new findings or unknown cultural artifacts that may become unearthed. If an artifact were to become exposed, heavy equipment use in that area would stop, and consultation with the monitor, local tribes, and the State Park Archeologist would begin to determine the appropriate course of action.

To ensure protection of any cultural resources that may be discovered at the site during construction of the proposed project, and to implement the recommendation of the archaeologist, the Commission attaches **Special Condition No. 3**. This condition requires that requires that if an area of cultural deposits is discovered during the course of the project, all construction must cease, and a qualified cultural resource specialist must analyze the significance of the find. To recommence construction following discovery of cultural deposits, the applicant is required to submit a supplementary archaeological plan for the review and approval of the Executive Director to determine whether the changes are *de minimis* in nature and scope, or whether an amendment to this permit is required.

Therefore, the Commission finds that the proposed project, as conditioned, is consistent with Coastal Act Section 30244, as the development will not adversely impact archaeological resources.

F. Public Access

Coastal Act Sections 30210, 30211, and 30212 require the provision of maximum public access opportunities, with limited exceptions. Coastal Act Section 30210 requires, in applicable part, that maximum public access and recreational opportunities be provided when consistent with public safety, private property rights, and natural resource protection. Section 30211 requires, in applicable part, that development not interfere with the public's right of access to the sea where acquired through use (i.e., potential prescriptive rights or rights of implied dedication). Section 30212 requires, in applicable part, that public access from the nearest public roadway to the shoreline and along the coast be provided in new development projects, except in certain instances, such as when adequate access exists nearby or when the provision of public access would be inconsistent with public safety. In applying Sections 30211 and 30212, the Commission is limited by the need to show that any denial of a permit application based on these sections, or any decision to grant a permit subject to special conditions requiring public access, is necessary to avoid or offset a project's adverse impact on existing or potential public access.

As discussed above, Little River State Beach does not have a designated trail system, although the dunes within the park are laced with numerous "way trails" that have been created by informal public use of the dunes. A major component of the proposed project is to implement the proposed Access Enhancement Plan, which proposes various improvements to public access through the development of parking improvements, new trails, a designated trail system that formalizes use of certain way trails as well as the new trails to be created, and new interpretive and informational signage. Although some of the existing way trails that traverse the backdunes, many of which are duplicitous and poorly sited, will be revegetated, and symbolic fencing will be installed to discourage entrance into restored habitat areas, overall access will be enhanced and allowed to continue throughout the dunes, to and along the waveslope, and around the fenced restoration areas throughout the duration of the project. In addition, the proposed ADA accessible boardwalk will enhance public access by providing interpretive exhibits to enhance the education and enjoyment of all users and enable people in wheelchairs and those with limited hiking abilities to access the area for the first time. Moreover, the parking lot improvements will facilitate use of the state beach for public access purposes. Furthermore, access from the frontage road and adjacent county parking lot at the southern end of LRSB to the beach will not be disrupted during this project construction.

Therefore, the Commission finds that the proposed project is consistent with the requirements of Coastal Act Sections 30210, 30211, and 30212.

G. Protection of Visual Resources

Section 30251 of the Coastal Act states that the scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance, and requires, in applicable part, that permitted development be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, and to be visually compatible with the character of surrounding areas.

The signs proposed to be placed in the area will be compatible in their size, design, and color with signs common to other state parks and beaches (Exhibit No. 6). The proposed parking lot kiosks (one at each parking area) will be constructed on 6-foot wooden posts placed into the ground two feet. The proposed trail signs will consist either of 3-foot-high by 2 inch by 1 inch carsonite posts (with 2-inch by 2-inch stickers with words and symbols showing No Camping, No Dogs, No Horses, etc.), or signs no greater than 2 feet by 2 feet in size installed on carsonite, wood, or corten steel posts. Signs will be installed in the three parking lot areas, at trailheads and trail junctions, along the accessible boardwalk trail, and along the length of the western boundary of the park and portions of the northern and southern park boundaries. The boundary signs will consist of the carsonite post sign type described above installed every approximately 115 to 132 feet for a total of 70 carsonite posts. The distance between signs for the western boundary is proposed at a frequency that will ensure that the public is aware of the boundary location and the allowable uses within in (as posted on the proposed signs), while the narrow, short, and white design of the boundary signs as proposed will ensure that the signs do not block views to and along the coast or significantly degrade the scenic values of the beach and dunes in the area, which is characterized by an expansive, flat sandy beach. Moreover, as discussed above, the signs will help deter illegal uses of the beach and dunes habitats (e.g., unleashed dogs, vehicles, etc.) that could degrade the environmentally sensitive habitat areas of the state beach. Finally, the signs will not result in an alteration of natural land forms, as no grading is proposed or required along the beach or dunes to install the signs.

Therefore, the Commission finds that the proposed project is consistent with Coastal Act Section 30251 as the development will not block views to and along the coast, will not involve any alteration of land forms, and will be visually compatible with the character of surrounding areas.

H. California Environmental Quality Act (CEQA)

The Department of Parks and Recreation served as the lead agency for the project for CEQA purposes. The Department completed a final mitigated negative declaration for the project in June of 2009 (SCH No. 2009042121).

Section 13906 of the California Code of Regulation requires Commission approval of a coastal development permit application to be supported by findings showing that the application, as modified by any conditions of approval, is consistent with any applicable requirements of the CEQA. Public Resources Code Section 21080.5(d)(2)(A) of CEQA prohibits a proposed development from being approved if there are feasible alternatives

or feasible mitigation measures available, which would significantly lessen any significant effect that the activity may have on the environment.

The Commission incorporates its findings on conformity with Coastal Act policies at this point as if set forth in full. These findings address and respond to all public comments regarding potential significant adverse environmental effects of the project that were received prior to preparation of the staff report. As discussed herein in the findings addressing the consistency of the proposed project with the Coastal Act, the proposed project has been conditioned in order to be found consistent with the policies of the Coastal Act. As specifically discussed in these above findings which are hereby incorporated by reference, mitigation measures which will minimize all adverse environmental impact have been required. As conditioned, there are no feasible alternatives or feasible mitigation measures available, beyond those required, which would substantially lessen any significant adverse impact that the activity would have on the environment. Therefore, the Commission finds that the proposed project, as conditioned to mitigate the identified impacts, can be found consistent with the requirements of the Coastal Act and to conform to CEQA.

V. EXHIBITS

1. Regional Location Map
2. Vicinity Map
3. Existing Vegetation in the Project Area
4. Proposed Project Plans (Site Plan Maps)
5. Proposed Restoration and Enhancement Plan (excerpt)
6. Proposed Sign, Trail, & Parking Improvement Design Details
7. Measures Proposed to Protect Sensitive Species and Cultural Resources
8. U.S. Fish & Wildlife Service Technical Assistance Letter
9. Geologic Analysis

APPENDIX A

STANDARD CONDITIONS

1. Notice of Receipt and Acknowledgment. The permit is not valid and development shall not commence until a copy of the permit, signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.

2. Expiration. If development has not commenced, the permit will expire two years from the date on which the Commission voted on the application. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.

3. Interpretation. Any questions of intent of interpretation of any condition will be resolved by the Executive Director or the Commission.

4. Assignment. The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

5. Terms and Conditions Run with the Land. These terms and conditions shall be perpetual, and it is the intention of the Commission and the permittee to bind all future owners and possessors of the subject property to the terms and conditions.

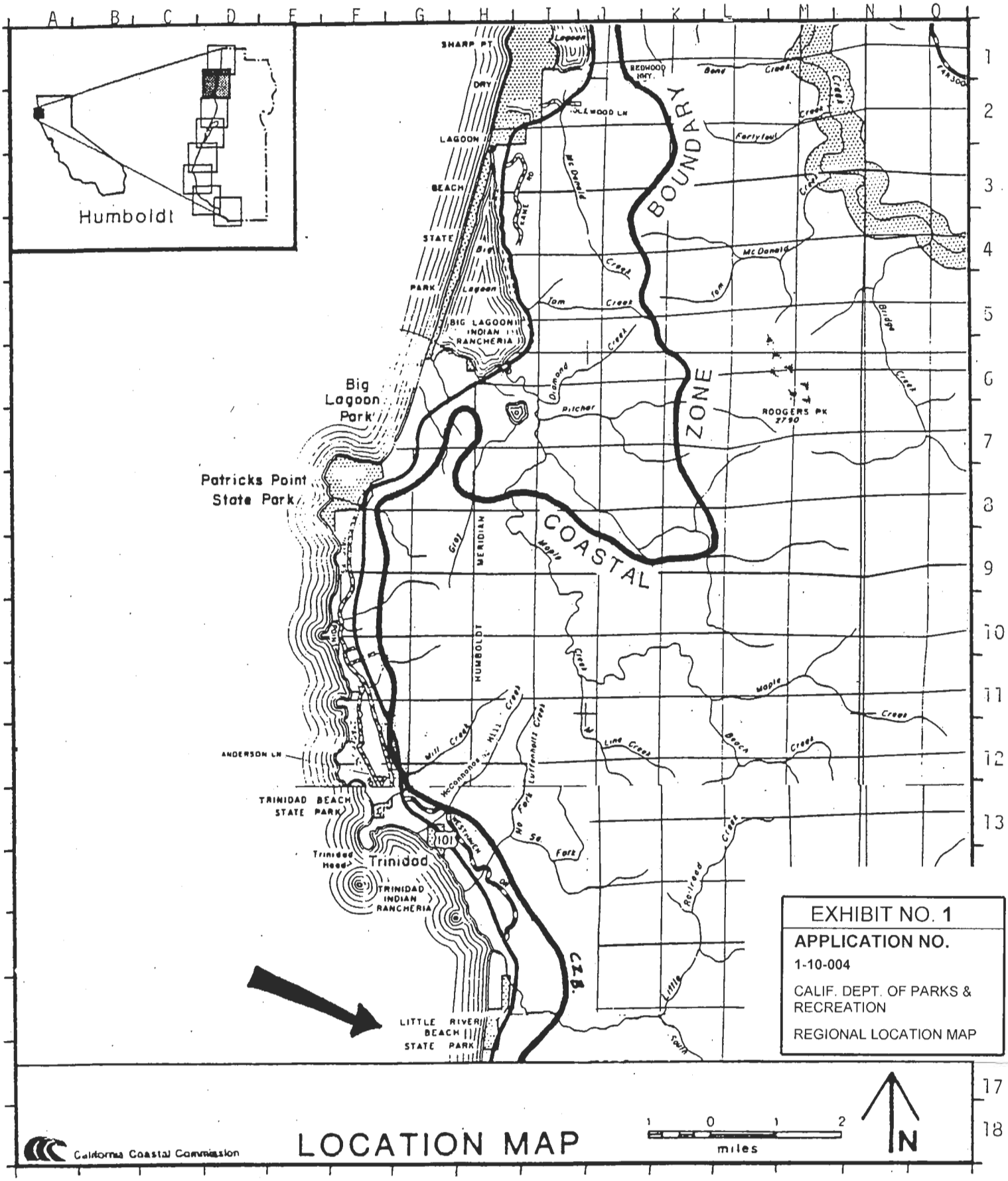


EXHIBIT NO. 1

APPLICATION NO.

1-10-004

CALIF. DEPT. OF PARKS & RECREATION

REGIONAL LOCATION MAP

California Coastal Commission

LOCATION MAP

1 0 1 2 miles

N

County of Humboldt

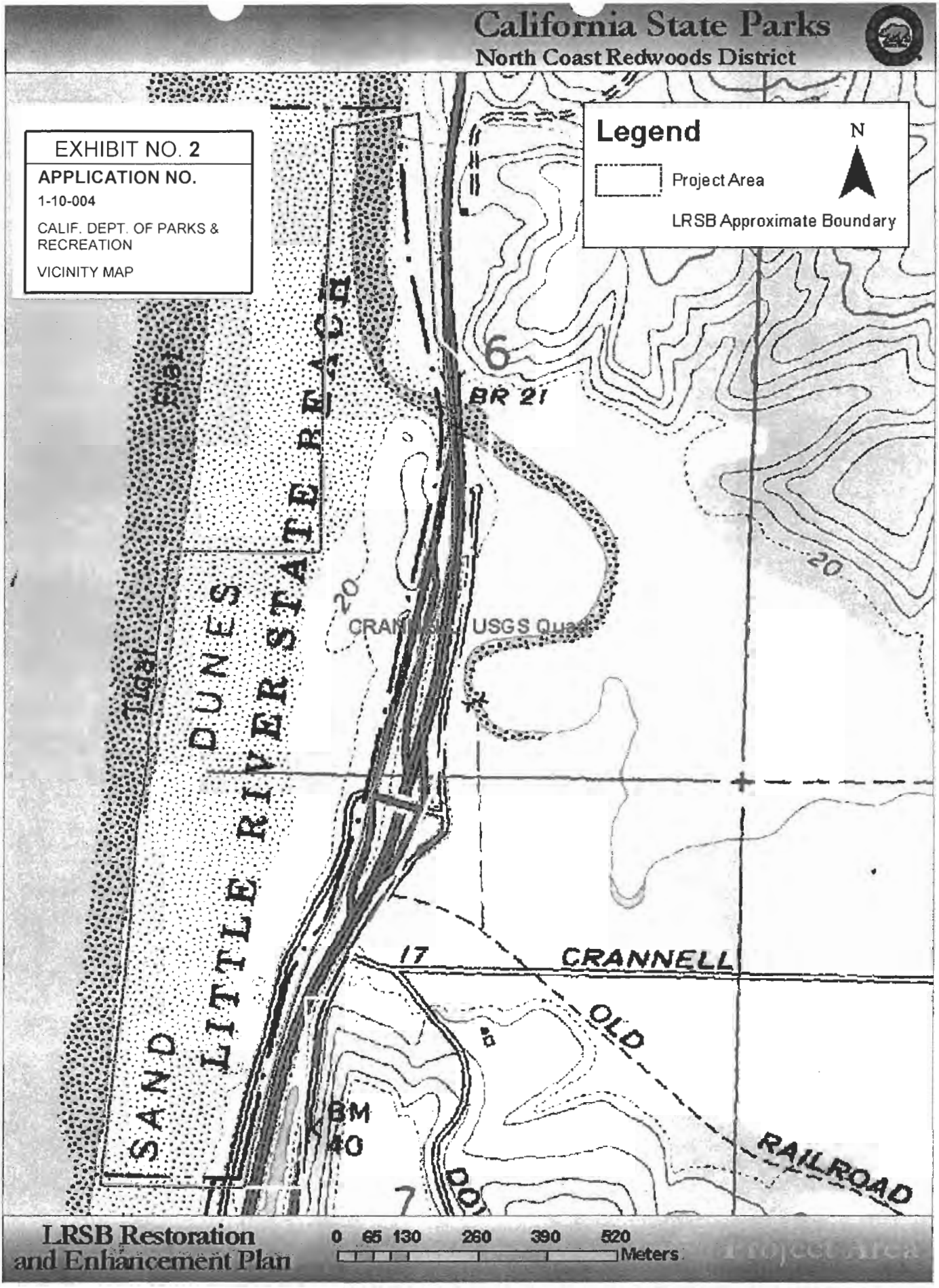

California State Parks
North Coast Redwoods District
EXHIBIT NO. 2
APPLICATION NO.
1-10-004
CALIF. DEPT. OF PARKS & RECREATION
VICINITY MAP
Legend
N
Project Area
LRSB Approximate Boundary
SAND LITTLE RIVER STATE REACH DUNES
BR 21
CRANNELL
OLD
RAILROAD
BM 40
LRSB Restoration and Enhancement Plan
0 65 130 260 390 520
Meters

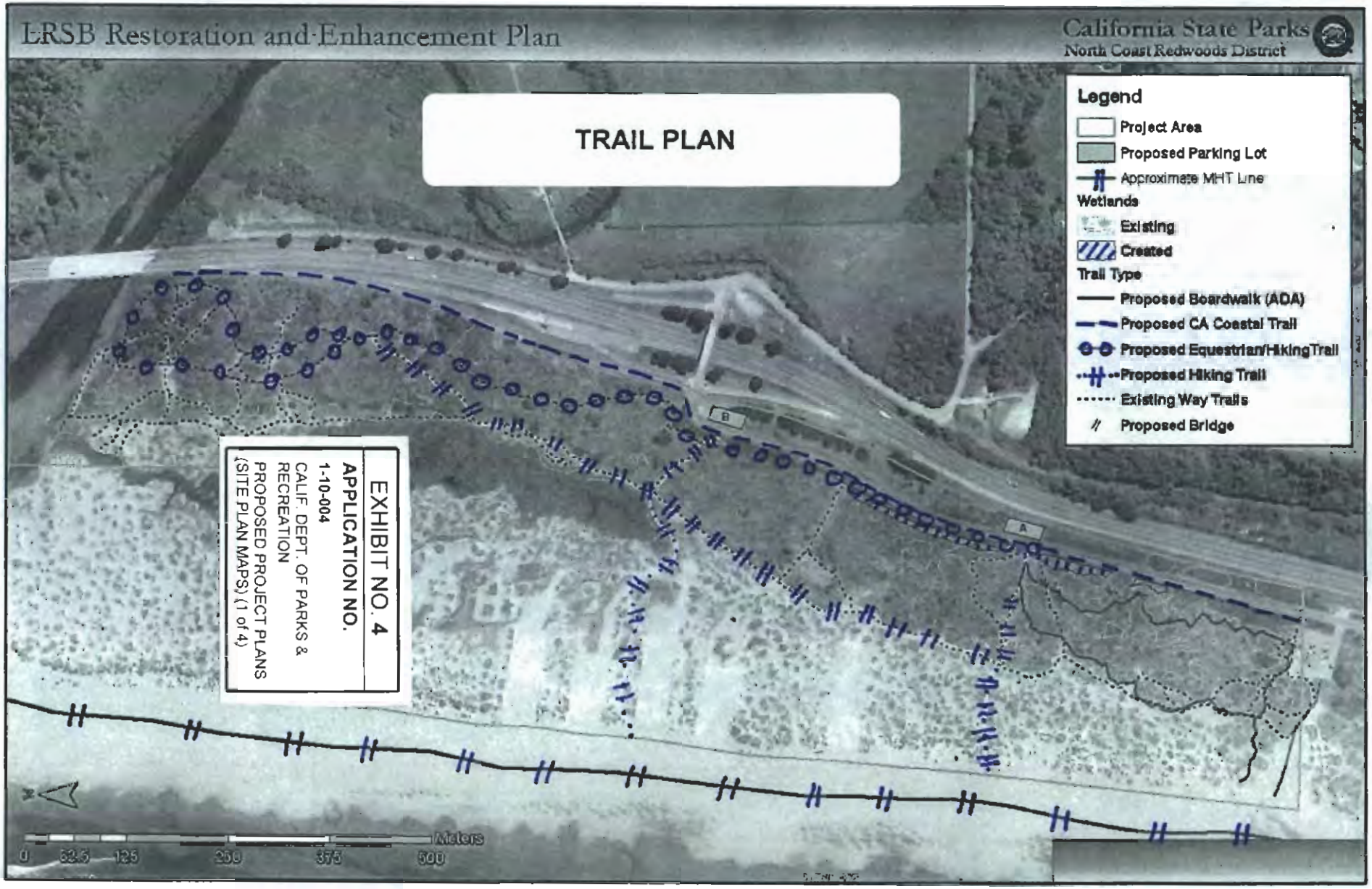
EXHIBIT NO. 3

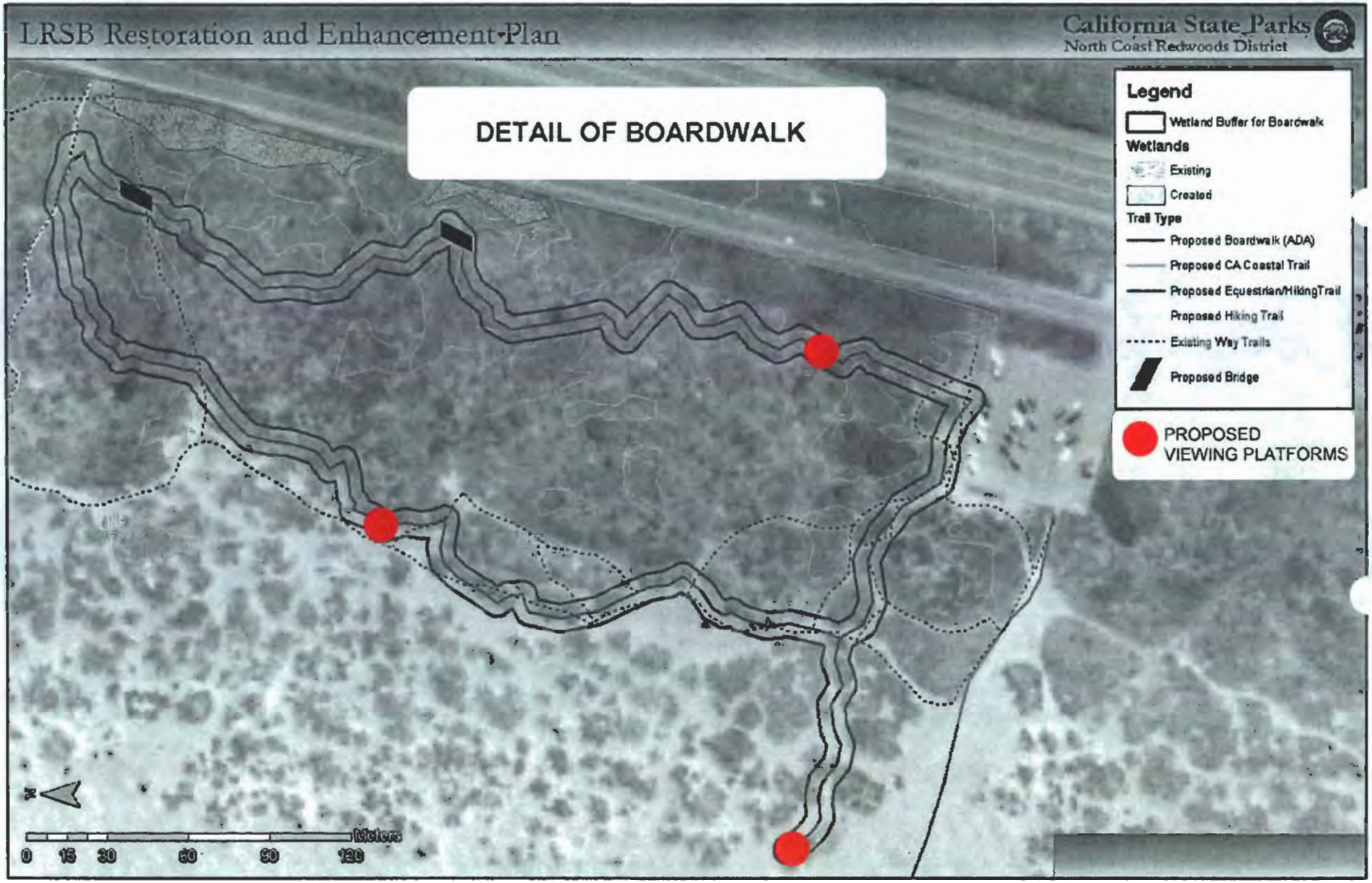
APPLICATION NO.

1-10-004

CALIF. DEPT. OF PARKS & RECREATION

EXISTING VEGETATION


LRSB Restoration and Enhancement Plan
California State Parks
North Coast Redwoods District
TRAIL PLAN
Legend
Project Area
Proposed Parking Lot
Approximate MHT Line
Wetlands
Existing
Created
Trail Type
Proposed Boardwalk (ADA)
Proposed CA Coastal Trail
Proposed Equestrian/Hiking Trail
Proposed Hiking Trail
Existing Way Trails
Proposed Bridge
EXHIBIT NO. 4
APPLICATION NO.
1-10-004
CALIF. DEPT. OF PARKS & RECREATION
PROPOSED PROJECT PLANS (SITE PLAN MAPS) (1 of 4)
Meters
0
62.5
125
250
375
500


LRSB Restoration and Enhancement Plan
California State Parks
North Coast Redwoods District
DETAIL OF BOARDWALK
Legend
Wetland Buffer for Boardwalk
Wetlands
Existing
Created
Trail Type
Proposed Boardwalk (ADA)
Proposed CA Coastal Trail
Proposed Equestrian/HikingTrail
Proposed Hiking Trail
Existing Way Trails
Proposed Bridge
PROPOSED VIEWING PLATFORMS
N
Meters
0 15 30 60 90 120

here


LRSB Restoration and Enhancement Plan
California State Parks
North Coast Redwoods District
PROPOSED SIGN PLAN
Legend
Project Area
Proposed LRSB Parking Lot
Approximate MHT Line
Sign Type
Interpretive
Regulatory
Trail
Carsonite Boundary
Proposed Viewing Platform
Trail Type
Proposed Boardwalk (ADA)
Proposed CA Coastal Trail
Proposed Equestrian/Hiking Trail
Proposed Hiking Trail
Proposed Bridges
Proposed Gate
N
Meters
0 62.5 125 250 375 500


LRSB Restoration and Enhancement Plan
California State Parks
North Coast Redwoods District
Legend
Project Area
Approximate MHT Line
Cupressus macrocarpa
Pinus radiata
Cupressus macrocarpa
Pinus radiata
15 Trees
26 Trees
N
Meters
0 45 90 180 270 360
Tree Removal Locations

Little River State Beach

Restoration and Enhancement Plan

EXHIBIT NO. 5

APPLICATION NO.

1-10-004 - CALIF. DEPT. OF PARKS & RECREATION

PROPOSED RESTORATION & ENHANCEMENT PLAN (EXCERPT) (1 of 39)

North Coast Redwoods District

February 2009

Prepared by Michelle Forys, Amber Transou, Don Beers, and Patrick Vaughan

Table of Contents

Table of Figures

Table of Tables

1.3 GOALS AND OBJECTIVES

This section identifies the management goals and objectives of the LRSB Restoration and Enhancement Plan. Specific restoration and enhancement actions resulting from the following goals and objectives are provided in Chapter 3.0, 4.0, and 5.0.

1. Restoration

- **Goal 1.1:** Restore the ecological function and native flora of beach and dune habitat at LRSB.
  - **Objective 1.1-A:** Non-native plant species will be removed from within the beach and dunes system.
  - **Objective 1.1-B:** Foredunes and dune hummocks will be re-contoured where artificially high due to the invasion of European beachgrass.
  - **Objective 1.1-C:** Woody dune swales will be established.
  - **Objective 1.1-D:** Should the existing seed bank prove to be insufficient to re-establish native vegetation, reseeding or transplanting of native plant species will occur.
  - **Objective 1.1-E:** Beach layia will be re-introduced at LRSB where feasible.

2. Education and Interpretation

- **Goal 2.1:** Improve educational and interpretation opportunities and experiences for park visitors at LRSB.
  - **Objective 2.1-A:** Beach and dune interpretative and regulatory materials will be developed and utilized in interpretative kiosks and displays at access points.
  - **Objective 2.1-B:** Beach and dune ecosystem interpretative materials will be developed and utilized along designated trails and symbolic fencing.
  - **Objective 2.1-C:** Beach and dune restoration interpretative materials will be developed and used at restoration work areas.

3. Recreation

- **Goal 3.1:** Improve beach and dune access for park visitors at LRSB.
  - **Objective 3.1-A:** A removable pedestrian trail (ADA accessible) will be developed and installed, using floating boardwalks at LRSB.
  - **Objective 3.1-B:** Two parking areas will be improved and or established at LRSB.
- **Goal 3.2:** Improve beach and dune recreational experiences while protecting sensitive species.
  - **Objective 3.2-A:** Symbolic fencing and vegetation barriers will be utilized in conjunction with the trails to provide recreational

opportunities such as wildlife viewing, hiking, and equestrian use for park visitors while protecting sensitive species.

4. Cultural

- **Goal 4.1:** Protect culturally significant sites during and after restoration efforts at LRSB.
  - **Objective 4.1-A:** Culturally significant sites will be identified through consultation with the Wiyot and Yurok Tribes as well as through a CSP archeological review.
  - **Objective 4.1-B:** Restoration within areas identified as culturally significant will be performed by hand and monitored by a cultural specialist (Tribal monitor or CSP Archeologist).
  - **Objective 4.1-C:** The trails will be designed in such a way that areas identified as culturally significant are not impacted by the trails or park visitors. This will be achieved by routing the trails around and away from these areas, encouraging visitors to use other areas of the Park.
- **Goal 4.2:** Improve Native American (Wiyot and Yurok Tribes) traditional uses within the beach and dune habitat at LRSB.
  - **Objective 4.2-A:** Plant species native to the beach and dune habitat at LRSB that are culturally significant. These will be identified through consultation with the Wiyot and Yurok Tribes.
  - **Objective 4.2-B:** Native plants that were identified as culturally significant, such as Sitka spruce, will be used in combination with other native plants for revegetation efforts, when feasible and appropriate.

5. Monitoring and Research

- **Goal 5.1:** Monitor habitat and sensitive species productivity at LRSB to determine the successfulness of the restoration and enhancement efforts.
  - **Objective 5.1-A:** Western snowy plover productivity will be monitored before, during, and after restoration efforts.
  - **Objective 5.1-B:** Percent cover of native and non-native plant species will be monitored to determine the success of the restoration efforts.
  - **Objective 5.1-C:** Beach and dune topography features will be monitored before, during, and after restoration efforts to determine sand movement patterns.
  - **Objective 5.1-D:** Visitor use patterns will be monitored to determine the success of the trail system, symbolic fencing, vegetation barriers, and interpretative signage.

It is our intent that this plan will address the actions needed to provide restoration of the beach and dune habitat at LRSB, while providing adequate recreational and interpretation opportunities, in a manner consistent with the goals and objectives of the NCRD-BDMP.


LRSB Restoration and Enhancement Plan
California State Parks
North Coast Redwoods District
Legend
Project Area
Vegetation Series
Open Sand
European beachgrass
Coyote brush
Sitka spruce
Sedge
Hooker Willow/Sedge
Red Alder
Meters
0
62.5
125
250
375
500

3 RESTORATION PLAN

Goal 1.1 of this plan calls for restoration of the beach and dune habitat to a functioning system comprised primarily of native flora and fauna. To meet this goal approximately 60 hectares (148 acres) of upland and wetland habitat is proposed for treatment. This chapter presents the restoration objectives and specific techniques to meet the proposed restoration goal. To facilitate restoration efforts, the project area has been separated into smaller areas based on dune morphology and vegetation growth.

The upland dune restoration includes two areas: the foredune and hummocks of the nearshore dunes (Area A) and the stabilized backdunes (Area B) (Figure 3.1). Three existing wetland habitats: herbaceous dune swales, woody dune swales, and a northern riparian wetland comprise Area C (Figure 3.1). In Area D woody dune swales will be created to enhance adjacent wetlands (Figure 3.1). In addition, deflation plains and low-lying sand troughs occur throughout the project area, but these areas have not been proposed for restoration as they are ephemeral and lack vegetation.

The following provides a brief description of the proposed treatment areas and ecological considerations that may be pertinent to restoration activities. A detailed account of the dune formations and vegetation communities within the project area can be found in Appendices A and B.

Foredune and hummocks (Area A): This area, part of the nearshore dunes, consists of the foredune and dune hummocks. The elevation of the foredune is thought to be "artificially high" due to the invasion and dune stabilization properties of European beachgrass. The European beachgrass series is the dominate vegetation type in this area with little native species diversity.

Backdunes (Area B): The backdunes consist of coastal scrub and forest habitats that are heavily infested with invasive, non-native plants, primarily yellow bush lupine, European beachgrass, and non-native grasses. The invasion by nitrogen fixing exotic plants such as yellow bush lupine is largely responsible for the stabilization of the backdunes (Pickart et. al. 1989). A small Sitka spruce dominated dune forest is present in the northeastern corner of the project area, near Little River. With approximately a dozen trees over 20 meters tall, the dune forest does not have a dense crown cover. The shrub layer is denser and includes native dune forest plant species such as salal (*Gaultheria shallon*), silk tassel (*Garrya elliptica*), and twinberry (*Lonicera involucrate*).

Dune Swales and Wetlands (Area C): Area C is comprised of existing wetland habitats, including: herbaceous swales, woody dune swales and northern riparian. Historic photos and reports indicate prior to the construction of HWY 101 woody dune swales were more abundant, as seen on the east side of HWY 101 and south at CBCP. This reduction in woody dune swales has been attributed to: invasion of non-native plant species, dune stabilization and the construction of HWY 101.

Woody Dune Swale Creation (Area D): Area D is dominated by vegetation found in the yellow bush lupine series and is located near existing woody dune swales. Area D will be converted from degraded scrub to woody dune swales dominated by the Hooker willow series.

3.1 RESTORATION OBJECTIVES AND SUCCESS CRITERIA

As presented in Chapter 1 of this plan, the following objectives have been established to meet Restoration Goal 1.1 and Cultural Goal 4.2. Restoration and cultural objectives and associated success criteria are presented below with a quantitative measure for restoration success that will aid in the facilitation of adaptive management where needed.

- **Objective 1.1-A:** Non-native plant species will be removed from within the beach and dunes system at LRSB.
- **Objective 1.1-B:** The foredune and dune hummocks will be re-contoured where artificially high due to the invasion of European beachgrass.
- **Objective 1.1-C:** Woody dune swales will be established.
- **Objective 1.1-D:** Should the existing seed bank prove to be insufficient to re-establish native vegetation, reseeding and transplanting of native plant species will occur.
- **Objective 1.1-E:** Beach layia will be re-introduced at LRSB where feasible.
- **Objective 4.2-A:** Plant species native to the beach and dune habitat at LRSB that are culturally significant. These will be identified through consultation with the Wiyot and Yurok Tribes.
- **Objective 4.2-B:** Native plants that were identified as culturally significant, such as Sitka spruce, will be used in combination with other native plants for revegetation efforts, when feasible and appropriate.

The project area consists of a combination of vegetation types with varying levels of degradation, therefore success criteria varies among each area. Success criteria will be based on a cover-abundance scale of native and non-native plant species occurrence. Table 3.1 summarizes the desired vegetation results and specific success criteria for each area.


LRSB Restoration and Enhancement Plan
California State Parks
North Coast Redwoods District
Legend
Project Area
Restoration Areas
A
B
C
D
Meters
0
62.5
125
250
375
500

Table 3-1. Current project conditions and proposed restoration results.

Area	Pre Restoration Vegetation*	Post Restoration Vegetation	Post Hectares	Success Criteria
Foredune and Dune Hummocks (Area A)	European beachgrass series[1] and Yellow bush lupine[1] series	Sand-verbena-beach bursage[2] and Native dunegrass[2] series	28	Invasive plant species < 5% total area cover and native nearshore dune species > 10%
Stabilized Dunes (Scrub) (Area B)	European beachgrass[1], Coyote brush, and Yellow bush lupine[1] series	Northern coastal scrub[2]	19	Invasive plant species < 25% total area cover and native dune scrub species > 35%
Stabilized Dunes (Forest) (Area B)	Sitka spruce series[2]	Sitka spruce series[2] and Shore pine series[2]	5	Invasive plant species < 15% total area cover and native dune forest species > 35%
Dune Swales and Wetlands (Area C)	Hooker willow series[2], Sedge series[2], Red alder series[2]	Hooker willow series[2], Sedge series[2], Red alder series[2]	7	Invasive plant species < 25% total area cover and native wetland species > 25%
Dune Swale Creation (Area D)	European beachgrass[1], Coyote brush, and Yellow bush lupine[1] series	Hooker willow series[2], Sedge series[2]	1	Invasive plant species < 25% total area cover and native wetland species > 25%

[1] Non-native vegetation series; [2] Native vegetation series; estimated hectares for habitats based on aerial photograph interpretation and Transou's 2006[b] wetland map.

3.2 PREFERRED RESTORATION METHODS

Proposed restoration involves the removal of non-native plant species, the re-establishment of native vegetation, and the re-contouring of topography where appropriate. Proposed treatments vary for each area, and are based on a number of factors including the type and degree of exotic species invasion, vegetation series to be restored, site accessibility, and proximity to sensitive resources. The following sections provide the proposed methods for the initial exotic removal, woody dune swale creation, re-treatment, disposal, and revegetation for each area.

3.2.1 INITIAL EXOTIC PLANT REMOVAL

A combination of restoration techniques will be employed in the treatment areas. Each area has its own set of parameters under which restoration can occur. So, although each method described below will be used during restoration efforts, not all techniques will be employed in each treatment area. The initial treatment methods and where they will be used within the project area are discussed below and summarized in Table 3.2.

Table 3-2. Preferred initial treatment methods for each habitat type (area).

Area and Habitat Type	Dozer	Excavator	Manual Removal	Hot Water	Flaming
A – Foredune and Hummocks	X	X	X		X
B – Backdunes (Scrub)		X	X	X	X
B – Backdunes (Dune Forest)			X	X	X
C – Woody Swales and Wetland			X		
D – Creation of Woody Swales	X	X	X		

Mechanical Removal Techniques: Heavy equipment will be used for the initial treatment of Area A and portions of Area B. Two different methods, primarily the Dozer-Grade and secondarily the Excavator technique will be employed in Area A. Each heavy equipment method will involve the movement of sand and vegetation resulting in cutting and filling to reduce the foredune and to grade the area. Area A will be reshaped to resemble the natural foredune, but no sand will be added or removed from the project area. Along the west side of Area B equipment will remove exotic plants and create a smooth transition between the nearshore and backdunes. A 5 m (16.5 ft) heavy equipment exclusion zone will be placed around all sensitive natural and cultural resources. Initial treatment methods using heavy equipment are described below.

Dozer-Grade Technique:
This technique is similar to that used in the LRSB Pilot Habitat Restoration Project (Transou et al. 2007) and by the Bureau of Land Management (BLM) at the South Spit of Humboldt Bay (USDI 2002). A D8 or equivalent dozer will be used to remove the European beachgrass and any other non-native plants to a depth below the rhizomes (3 m, 9.9 ft). The European beachgrass removed from the ridges will be moved behind the foredune prior to grading the foredune (Appendix G). The foredune will then be graded to a 1.0-2.5 percent slope depending on seasonal sand deposition. The exotic plants will be buried beneath the reduced graded foredune, approximately 2 m (6.6 ft) deep (Appendix G). The highest point of the graded slope will be less than 4 m (13.2 ft).

Excavator Technique:
This technique, used in the LRSB Pilot Habitat Restoration Project (Transou et al. 2007), will be employed throughout the nearshore dunes, where needed. Rhizomes will be dug to a depth of 2 m (6.6 ft) and the existing topography will be retained as much as possible. The excavator will stage the removed mixture in piles for disposal. This method will be employed where the dozer techniques cannot be utilized.

Manual Removal Technique: Manual removal will occur throughout the entire project area. In Area A manual removal techniques will be used in and around all sensitive areas and species. The primary initial removal method for all areas other than Area A is manual removal. Manual removal techniques will be performed using hand tools such as shovels to dig up European beachgrass and any other non-native plant species. The non-native plant species will be dug to a depth of 0.6 meters (2 ft) (Bossard et. al. 2000). Care will be taken to not disturb any sensitive resources. Non-native trees, such as Monterey cypress will be removed throughout the entire project area using hand and power tools, such as a chainsaw.

Flaming Technique: Flaming is a removal technique that can effectively control a variety of plant species, without disturbing the ground. Two types of flaming are commonly used: green and black. Green flaming sometime called wilting or blanching utilizes a small torch that is applied just long enough to wilt the plant. Although the plants do not brown and look dead until the next day, this is enough heat to actually kill many species of plants. Black flaming utilizes the same equipment, but the torch is left on the plant long enough to actually cause it to incinerate. Both techniques will be utilized to treat small non-native plants after the larger woody shrubs have been manually removed. Flaming will be conducted during the wet season. The NCRD's fire

specialist conducted a risk and complexity analysis (Appendix H) and determined that this technique does not pose a fire danger at LRSB (Underwood pers. com. 2007). Any necessary permits will be obtained prior to employing this treatment method.

Hot Water Technique (Waipuna): The Waipuna system delivers a hot water - foam mixture through hoses to the target plants (Tu 2004, Waipuna Manual 2006). The superheated steam is trapped on the plants between the foam and the ground. The foam is non- toxic, has no smell, and is bitter tasting so it will not attract animals. Made from naturally occurring compounds in sugar, the foam is not labeled by the US Environmental Protection Agency (EPA) as an herbicide (Tu 2004, Waipuna Manual 2006). This technique works on a variety of weeds and will be used primarily along the roadsides (75 m reach) on all non-native plants with the exception of large woody plants, such as trees. Only State Park personnel with an Applicator's Certification from Waipuna, ensuring they have gone through the proper training, will be allowed to operate the machine (Waipuna Manual 2006). All required safety gear and precautions will be taken prior to operating the machine.

Whichever treatment method is utilized, safety should always be of concern. Mechanical removal with heavy equipment warrants attention to detail, requiring increased preparation and safety. The NCRD has adopted a general safety protocol for heavy equipment operations which will be utilized for this project. The general protocol outlines broad safety issues common to all projects and presents guidelines on how to address those issues. The general protocol also directs project managers to develop a project specific safety plan for each rehabilitation project (Appendix I). The safety plan shall identify existing emergency plans. This project is designed to avoid any conflicts with existing plans.

3.2.2 Woody Dune Swale Creation

Part of the restoration efforts includes the creation of additional woody dune swales (Area D). These woody dune swales will be created in the stabilized backdunes east of the scrub (Figure 3.1). The swales are being created to increase both wetland habitat and act as a sand fence for the dunes west from the frontage road. An excavator will be used to remove vegetation and sand to create dune swales that mimic those found in the project area already. Should ground water be present in the swale prior to reaching the desired depth, the dune swale will be created at the depth of the ground water. A dozer (D8 or equivalent) may be used to create the dune swales should the excavator not achieve the desired outcome. The removed vegetation and sand will be disposed of on site by contouring the material into the nearest dune ridge. Revegetation of the newly created swales will occur after excavation and is discussed in more detailed in Section 3.2.5. Creation of these swales will be conducted in the fall prior to the first rain, when the water table should be at the lowest level. A 5 m (16.5 ft) heavy equipment exclusion zone will be created around existing known wetlands as defined by the USFWS (Cowardin et al. 1979).

3.2.3 Retreatment Methods

All restoration areas will be retreated on a regular basis (once every 3 months or as funding allows), until the non-native plants are controlled or eradicated and success criteria is met. Timely retreatment of European beachgrass and other invasive, non-native plants is essential for their control and eradication. European beachgrass will re-

establish itself rather aggressively if not retreated within a few months of the initial removal effort (Bossard et. al. 2000, Pickart and Sawyer 1998). Only manual removal techniques will be utilized for retreatment efforts in the wetland habitats (Areas C). Hot water treatments (where feasible), flaming, and manual removal techniques will be employed for all retreatment efforts in the upland dune habitat types (Areas A and B).

3.2.4 Disposal Methods

During manual retreatment efforts, non-native vegetation will be bagged and hauled offsite to Patrick's Point State Park (PPSP) to be burned later and or composted at a local facility. Vegetation left after flaming and hot water treatments will be left in place. Very little if any material will be generated during the later two retreatment methods. The disposal method for the initial treatment using heavy equipment will be through burying. The method is described below and has been used successfully during the LRSB Pilot Habitat Restoration Project (Forys and Transou 2004[a]).

Burying Technique: During heavy equipment removal the non-native vegetation will be removed and deposited on the leeward side of the foredune prior to grading. When the foredune is graded, the deposited vegetation will be buried up to 2 m (6.6 ft) below the new reduced foredune (Appendix G). The sand moved by grading will bury the vegetation deep enough to prevent re-sprouting (Transou et al. 2007).

3.2.5 Revegetation Methods

Due to the level of habitat degradation few native plant species are left to naturally re-colonize the proposed restoration areas. The upland dune treatment areas (Areas A and B) will be manually revegetated with native dune vegetation (Figure 3.1). With the exception of Area D, the wetland habitats will not be actively revegetated (Figure 3.1). Once treated for exotic plant species, the native wetland plants species will be allowed to re-colonize Area C naturally. Revegetation should occur within one growing season after each area has been initially treated. Additional revegetation efforts may occur in following years depending on initial success.

It is important to use locally adapted native plants and seeds to reflect those adaptations to their unique environment (Pickart and Sawyer 1998). Failure to ensure genetic integrity could result in seed and transplant death, and failure of the restoration efforts (Pickart and Sawyer 1998). Guidelines for collection of native plants for revegetation within California State Parks and the NCRD are aimed at ensuring genetic integrity during all revegetation efforts and can be found in Appendix J. These guidelines will be followed during all collection efforts.

Revegetation of the dunes can be accomplished by sowing seeds directly, transplanting from native stock, or propagating and transplanting by seed (Pickart and Sawyer 1998). Studies have shown varying results in regards to which revegetation method is the most successful (Pickart 1988, Newton 1989, Miller et al. 1992). Past experiments have shown that revegetation success is largely based on site-specific conditions (Barry 1987, Pickart 1990), warranting the following of the genetic guidelines. A combination of techniques will be utilized to revegetate the upland dune habitats (Areas A and B) and the newly created woody dune swales (Area D). These methods are described below.

Seeding Technique: Seeds can be applied in a variety of ways and with or without additions, such as fertilizers. Direct seeding will be primarily used for revegetation efforts on the foredune and dune ridges (Area A) and partially in Area B.

Seed Collection and Storage:
Collection of seeds will be conducted under the direction of a State Park Environmental Scientist by either State Park Natural Resource staff or by a local certified nursery. Seed will be collected at the seasonally appropriate time of the year, cleaned, and placed in cold storage in an airtight container until use (Pickart and Sawyer 1998). Seeds will be used within 2 years of the storage date.

Seed Mix and Application Rates:
The use of an appropriate seed mix and application rate is critical to revegetation success (Pickart and Sawyer 1998). Species composition of vegetation series and associations should be respected (Pickart and Sawyer 1998). Area A will be revegetated with native plant species found within the Native dunegrass series and the Sand-verbena - beach bursage series to create a diverse community of dune mat (Figure 3.1). Some authors (Parker 1974, Labanca 1993) have documented species found in these vegetation series at LRSB. Remnant plants associated with these vegetation series can still be found within the project area (Appendix C). Some of these native species, such as beach bursage and beach pea, are considered native sand stabilizers and or dune builders (Ternyik 1979, Woodhouse 1982), and should help prevent accelerated sand movement during initial restoration efforts in Area A and B-1. Although part of the restoration goal is to reduce the stabilization effects of European beachgrass, native dune plants can also have this effect but to a lesser extent.

Area A will be divided into three sections (A-1, A-2, and A-3) for revegetation efforts (Figure 3.2). Each sub area will have slightly different species composition for the revegetation effort. Revegetation along the foredune (Area A-1) will include species found in the Native dunegrass series (Figure 3.2). The species that will be used for seeding Area A-1 (approximately 4 hectares), if available, and the seed mix and their relative proportions can be found in Table 3.3.

Table 3-3. Proposed species, seed mix, and their relative proportions for the vegetation of the foredune (Area A-1).

Species	Monoculture Rate (lb. per hectare)	Proportion of Seed Mix by Species	Pounds of seed for 448 lb. mix
Abronia latifolia	40	36%	161.3
Ambrosia chamissonis[1]	30	27%	121.0
Calystegia soldanella[1]	20	18%	80.6
Lathyrus littoralis[1]	22	19%	85.1

[1] Species known to be dune builders (pioneer) and or normally occupy areas with active sand movement (Pickart and Sawyer 1998, Woodhouse 1982, Wiedemann et al. 1969).

Species found in the *Poa-Lathyrus* association (Pickart 1987), also referred to as Northern dune mat (Duebendorfer 1992) association of the Sand-verbena-beach bursage series will be used to revegetate Areas A-2 and A-3 (Figure 3.2). The species that will be used for seeding Areas A-2 (approximately 8 hectares), if available, and the seed mix and their relative proportions can be found in Table 3.4.

Table 3-4. Proposed species, seed mix, and relative proportions for the revegetation of Area A-2.

Species	Monoculture Rate (lb. per hectare)	Proportion of Seed Mix by Species	Pounds of seed for 1,227.2 lb. mix
Abronia latifolia	40	26%	319.1
Ambrosia chamissonis[1]	30	20%	245.4
Calystegia soldanella[1]	20	13%	159.5
Camissonia cheiranthifolia	1.1	1%	12.3
Lathyrus littoralis[1]	22	14%	171.8
Erigeron glaucus	17	11%	135.0
Glehnia littoralis leiocarpa[1]	20	13%	159.5
Eriogonum latifolium	3.3	2%	24.6

[1] Species known to be dune builders (pioneer) and or normally occupy areas with active sand movement (Pickart and Sawyer 1998, Woodhouse 1982, Wiedemann et al. 1969).

Area A-3, approximately 16 hectares, will be revegetated using both seeding and transplanting methods. The species that will be used for seeding Area A-3, if available, and the seed mix and their relative proportions can be found in Table 3.5.

Table 3-5. Proposed species, seed mix, and relative proportions for the revegetation of Area A-3.

Species	Monoculture Rate (lb. per hectare)	Proportion of Seed Mix by Species	Pounds of seed for 1,846.4 lb. mix
Ambrosia chamissonis[1]	30	26%	480.1
Camissonia cheiranthifolia	1.1	1%	18.4
Lathyrus littoralis[1]	22	19%	350.8
Erigeron glaucus	17	15%	277.0
Solidago spathulata	22	19%	350.8
Glehnia littoralis leiocarpa[1]	20	17%	313.9
Eriogonum latifolium	3.3	3%	55.4

[1] Species known to be dune builders (pioneer) and or normally occupy areas with active sand movement (Pickart and Sawyer 1998, Woodhouse 1982, Wiedemann et al. 1969).

Area B, the stabilized dune scrub will be revegetated using native plant species found within the Northern coastal scrub series (Holland 1986) (Figure 3.1). Due to the level of habitat degradation, few native plant species exist to naturally re-colonize portions of Area B once exotic plants are removed. Revegetation efforts will be divided into three areas (B-1, B-2, and B-3), but only B-1 will employ seeding methods (Figure 3.2). Area B-1, approximately 2 hectares, will be revegetated using species found in both the *Poa-Lathyrus* association of the Sand-verbena-beach bursage series and species found in the Northern coastal scrub series (Figure 3.2). Area B-1 will be revegetated as a transition zone between the major habitat types. Table 3.6 lists the native plant species that if available will be used for seeding Area B-1.


LRSB Restoration and Enhancement Plan
California State Parks
North Coast Redwoods District
Legend
Project Area
Revegetation Areas
Area A-1
Area A-2
Area A-3
Area B-1
Area B-2
Area B-3
Area D
N
Meters
0 50 100 200 300 400 500

Table 3-6. Proposed species, seed mix, and relative proportions for the revegetation of Area B-1.

Species	Monoculture Rate per hectare	Proportion of Seed Mix by Species	Pounds of seed for 128.6 lb. mix
Lathyrus littoralis[1]	22	34%	43.7
Erigeron glaucus	17	26%	33.5
Solidago spathulata	22	34%	43.7
Eriogonum latifolium	3.3	6%	7.7

[1] Species known to be dune builders (pioneer) and or normally occupy areas with active sand movement (Pickart and Sawyer 1998, Woodhouse 1982, Wiedemann et al. 1969).

Seed Sowing:
Sowing will be accomplished by broadcasting the seed manually or with a seeder (Pickart and Sawyer 1998). Seeds will then be raked into the sand about 2.5 cm (1 in) deep (Newton 1985). Sowing will occur in the fall (October to November) during the natural germination period for coastal dune species in northern California (Pickart and Sawyer 1998). This should result in a greater probability of germination success (Pickart and Sawyer 1998).

Two additional species, beach layia and pink sand verbena, will be used to revegetate Area A. Both species are considered sensitive and limited in their range, thus seed can be scarce and should be used sparingly (pers. com. Imper 2007, pers. com. Pickart 2007, Kaye 2004). Due to these factors, pink sand verbena will be used for seeding in Area A-2, beach layia will be used for seeding in area A-3, and only after native dune plants have become established. Seeds will be scattered in and around the existing native cover to help decease the chances of disturbance by wind (pers. com. Pickart 2007, pers. com. Wheeler 2007). The amount of seed used will be determined by the availability of seed at collection sites.

Transplanting Technique: Some plant species do not establish well from seeds and primarily reproduce through vegetative growth. Transplanting divisions or entire plants has been successful for species such as American dune grass or beach strawberry (Pickart and Sawyer 1998). Revegetation with plants in their vegetative state will occur as cuttings (a portion of the above ground material), divisions (a portion of the entire plant, including the roots), and or whole transplants (entire plant) (Pickart and Sawyer 1998). Transplanting will be used in Areas A, B and D (Figure 3.2). Protective garden netting may be used to protect transplants from animal browse. Should there not be sufficient native plants to collect from within the project area, collection will occur along the north spit of Humboldt Bay. Permission to collect outside the project area will be obtained prior to collection.

Plant species that will be used as transplants for revegetation efforts on the foredune and dune hummocks can be found in Table 3.7. The stabilized backdune area will be revegetated using native plant species found within the Northern coastal scrub series (Holland 1986). The dune forest (Area B-3) will be revegetated using native plant species found within the Bishop pine series and Sitka spruce series (Figure 3.1). Plants will be collected as whole plants, cuttings, and or divisions from within the project area or near by. Plant species that will be used for the revegetation of Area B-1 (2 hectares), B-2 (17 hectares), B-3 (5 hectares), if available, can be found in Table 3.8.

Table 3-7. Proposed transplant species, type of collection, and the location of plantings being used for the revegetation of Area A.

Species	Type of Harvest	Area Planted
Leymus mollis[1]	Whole Plant and or Divisions	A-1, A-2
Camissonia cheiranthifolia	Whole Plant	A-1, A-2
Polygonum paronychia	Whole Plant	A-2, A-3
Fragaria chiloensis	Whole plant and or Divisions	A-2, A-3

[1] Species known to be dune builders (pioneer) and or normally occupy areas with active sand movement (Pickart and Sawyer 1998, Woodhouse 1982, Wiedemann et al. 1969).

Table 3-8. Proposed transplant species, type of collection, and the location of plantings being used for the revegetation of Area B.

Species	Type of Harvest	Area Planted
Fragaria chiloensis[1]	Whole plant and or Divisions	B-1
Garrya elliptica[2]	Whole Plant and or Divisions	B-2
Polygonum paronychia[1]	Whole Plant and or Divisions	B-1, B-2
Gaultheria shallon[2]	Whole Plant and or Divisions	B-1, B-2, B-3
Polystichum munitum	Whole Plant and or Divisions	B-1, B-2, B-3
Pteridium aquilinum	Whole Plant	B-1, B-2, B-3
Myrica californica[2]	Cuttings	B-2, B-3
Rubus californica	Whole Plant and or Divisions	B-2, B-3
Ribes sanguineum	Whole Plant	B-2, B-3
Pinus contorta[2]	Whole Plant	B-3
Vaccinum ovatum	Whole Plant and or Divisions	B-3

[1] Species known to be dune builders (Pickart and Sawyer 1998, Woodhouse 1982, Wiedemann et al. 1969);[2] Species known to normally occupy areas with stabilized sand (Pickart and Sawyer 1998, Ternyik 1979, Wiedemann et al. 1969).

Dune swales created with heavy equipment will be revegetated with Hooker willow (*Salix hookeriana*) and other species found within the Hooker willow series (Figure 3.2). Revegetation will occur within one week of the dune swales being excavated. Transplants and cuttings will be utilized to revegetate the newly created dunes swales. Plant species that will be used for the revegetation of Area D (1 hectare), if available can be found in Table 3.9.

Table 3-9. Proposed transplant species and type of harvest being used for the revegetation of the newly created woody dune swales.

Species	Type of Collection	Area Planted
Salix hookeriana[1]	Cuttings	D
Myrica californica	Cuttings	D
Garrya elliptica	Whole Plant and or Divisions	D

[1] Species known to occupy woody dune swales (Pickart and Sawyer 1998, Duebendorfer 199; Wiedemann et al. 1969);

Collection:
To collect the plant species, culms, divisions, or whole plants will be severed from the underground roots using a hand trowel or entire plants will be removed with a small shovel. Some plants may be collected as cuttings from above ground parts. Plant species will be removed during the winter and as close to the planting date as feasible. American dune grass leaves will be trimmed so plants are no longer than 50 cm (2 in) and any long roots will be removed (Pickart and Sawyer 1998, Wheeler pers. com. 2007). Removed whole plants, such as *Myrica californica* and *G. elliptica,* will be planted in plastic gardening pots or the most appropriate medium for transportation to the revegetation site. Hooker willow cuttings will be taken by removing 1.8 to 2.4 m (3 to 4 ft) long sections from existing shrubs, after the autumn leaf drop (Pickart and Sawyer 1998). The basal ends will be cut at a 45-degree angle (Pickart and Sawyer 1998). The cuttings will then be bundled in groups of three, stacked, and covered for transportation to the revegetation location.

Transplanting:
Transplanting may occur directly after or within a few weeks of collection. If transplanting cannot occur immediately after harvesting, the culms or whole plants will be "heeled" in the planting area if feasible (Pickart and Sawyer 1998). Hardier transplants may be kept at PPSP where they can be monitored and watered easily until planting can be accomplished. Transplanting should occur between fall and early winter months (Pickart and Sawyer 1998, Newton 1989). Since irrigation is not available, planting will be timed to take advantage of the full rainy season for establishment and growth (Pickart and Sawyer 1998, Woodhouse 1982).

Transplants in Area A and B-1 will be planted in rows, 46-60 cm (18 to 24 in) apart, with two culms or 1 whole plant per hole (Pickart and Sawyer 1998, Newton 1989, Woodhouse 1982, Ternyik 1979). Each row will be approximately 75 to 100 cm (31 to 41 in) apart (Woodhouse 1982). Transplants will be spaced equally along planting lines and the arrangement of plant species will be random (Pickart and Sawyer 1998, Pickart 1998, Pickart 1993, Newton 1989, Barry 1987). Plants will be buried to fully cover all roots, approximately 30 cm (12 in) (Woodhouse 1982). Transplants will be planted where necessary throughout the treated backdunes (B-2 and B-3). Depending on the species and type of transplant, each planting may have one (whole plant) or up to three divisions or cuttings per hole. Density will be determined by site-specific conditions and based on the actual size of the treated area.

The newly created dune swales in Area D will be revegetated with three species (Table 3.9). *Myrica californica* and *G. elliptica* will be planted approximately 0.3 m (1 ft) deep. Hooker willow cuttings will be planted approximately 0.6 m (2 ft) deep or with approximately 2/3 of the cuttings into the ground (Pickart and Sawyer 1998, Newton 1989). A rooting hormone may be applied to the basal ends of the willow cuttings to help increase rooting success (Pickart and Sawyer 1998, Newton 1989). All three species will be planted in rows approximately 1.0 m (3.3 ft) apart, with two cuttings, one whole plant, or one bundle per hole (Pickart and Sawyer 1998, Newton 1989). Depending on the depth of the newly created dune swale, approximately 1 to 3 rows of plants will be established along the crest and leeward slope of the swale (Pickart and Sawyer 1998). Each row will be approximately 1.0 m (3.3 ft) apart (Pickart and Sawyer

1998, Newton 1989). Deer netting may be used if transplants begin to show signs of animal browse.

Symbolic Fencing: Symbolic fencing and signage will be used around the revegetated areas to protect the restoration efforts (Appendix K). Informational and closure signs will be placed with the fencing to inform the public of the closure, the reasons why, and to explain the restoration efforts underway. It is anticipated that symbolic fencing may be used in some areas for up to 3 growing seasons and is dependent on revegetation success. Corridors between symbolic fencing will allow for public access to the waveslope, interior dunes, and river. It is anticipated that initial treatment and revegetation of most areas will be completed in two to four phases depending on funding. The proposed timeline for project implementation is discussed in Chapter 6 of this plan.

4 ACCESS ENHANCEMENT PLAN

Providing access to LRSB represents the challenge of protecting fragile and sensitive resources, providing meaningful and stimulating access to a variety of trail users, educating and sensitizing the public to resource management needs and goals, and linking the LRSB trails to important State and Regional trails. This chapter presents the proposed trails, parking lot improvements, and the sign plan design to meet Goals 2.1, 3.1, and 3.2 discussed in Chapter 1 of this plan.

4.1 PARKING

Little River State Beach does not have any formally designated parking lots within the Park. The primary public access point is the CBCP parking lot on the south end of LRSB (Figure 4.1). Over the last 10 years, two other unofficial areas along the frontage road have been utilized by visitors to access LRSB. Theses areas include a paved area near the Crannell overpass and a dirt area on the east side of the frontage road. Under this plan, these two areas will be developed into two frontage road parking lots.

4.1.1 HUMBOLDT COUNTY PARKING LOT

This large paved parking lot, of which a portion occurs on LRSB, is for day use only and is used by the public visiting both LRSB and CBCP. This parking lot serves as the only designated equestrian parking area at LRSB. It is sufficiently large enough to accommodate horse trailers and equestrians can gain quick access to the beach by riding west across the dunes from this lot. This parking area also provides the only public restroom facilities for LRSB. The restrooms are vault toilets and they meet current accessibility standards. This parking lot will continue to serve as the main public access point for LRSB and the north end of CBCP.

The proposed accessible and equestrian trails will both emanate from this parking lot. The trails start near the northeast end of the parking lot (Figure 4.1). This starting location is desirable because the southwestern end of the parking lot currently floods during rainstorms. This problem can only be corrected by either elevating the entire parking lot or installing a culvert that would drain water from the southwest corner of the lot to a lower elevation in the dunes approximately 100 feet to the south. However, any water draining off of the parking lot would likely contain petroleum residues from the vehicles as well as other contaminants. A sump with a water separation system would have to be installed and maintained to eliminate these contaminates from entering the dunes. This issue will not be addressed under this plan.

Currently this lot has 23 parking spaces. The one ADA designated parking space is located near the restrooms across the parking lot from the proposed accessible trailhead. To accommodate both facilities an additional ADA parking space will be created near the trailhead access area (Appendix L). Three of the existing parking spaces will be converted to one ADA parking space, a loading area, and a pedestrian walkway leading to the accessible trailhead (Appendix L). The pedestrian walkway will be located adjacent to the ADA parking space loading area and will lead to the accessible trailhead (Appendix L).

4.1.2 LITTLE RIVER STATE BEACH PARKING LOTS

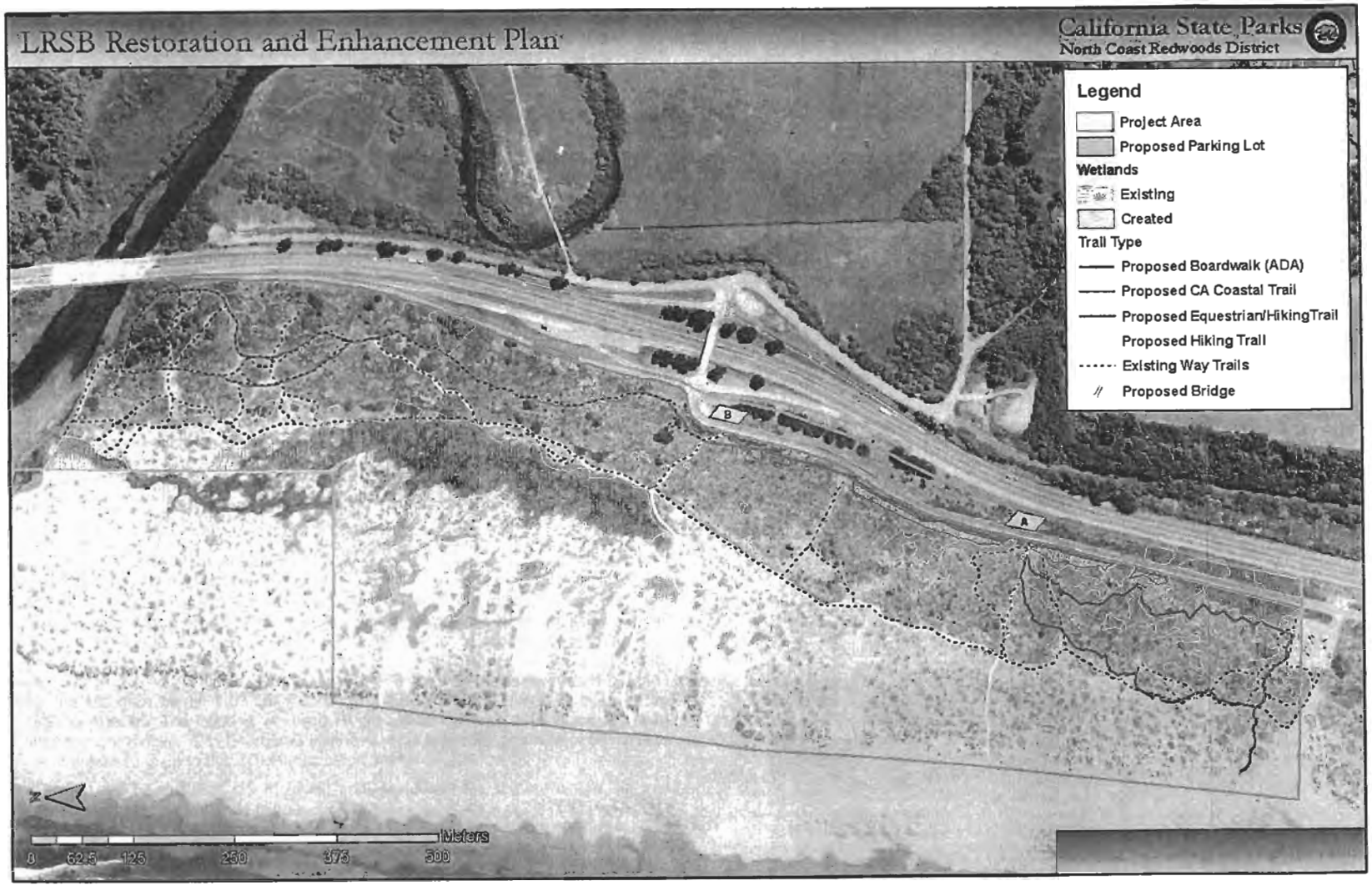
Currently, public parking along the west side of the frontage road between the CBCP parking lot and the Crannell overpass is allowed between the hours of 5:00 AM to 10:00 PM. This dispersed parking is partially responsible for the development of the numerous way trails in the backdune area. In the absence of focused parking areas and trailheads that correspond to those parking facilities, the public is accessing the dunes and beach from wherever they park along the frontage road. To resolve this issue two parking areas (Parking Lot A and B) will be constructed on the east side of the frontage road (Figure 4.1). These lots will be adjacent to trailheads so that the public can gain quick and direct access to the trails and beach. Since the western edge of the paved frontage road will be used as the California Coastal Trail (CCT) bicycle route, it is imperative that vehicles not park along the west side of the road shoulder.

These two proposed parking lots will provide the public with access to the north end of the Park. They will be relatively primitive in their development and have a maximum capacity of 10 vehicles each, with the exception of Parking Lot A that will include additional spaces for at least 2 horse trailers. The parking surface will be 3.8 cm (1.5 inch) minus crushed rock and the perimeter of the vehicle parking will be defined by large rocks (Appendix M and N). No ADA accessible parking spaces will be provided due to the lack of accessible trails near these two parking lots and due to the material used for the parking surface. These parking lots will be designed for vehicles to pull in and park perpendicular to the frontage road and parallel to each other with the except of horse trailers at Parking Lot A (Appendix M and N). Horse trailers will park parallel to the access road in an area created behind the vehicle parking area (Appendix N). Crosswalk stripping will be painted across the road from the trailheads to the two parking lots. Signing that identifies the parking areas will also be installed along the frontage road and is discussed in more detail in Section 4.3 of this plan.

Across from Parking Lot A and adjacent to the trailhead a vehicle gate will be installed (Figure 4.1). This gate will be made of steel and approximately 3.6 m (12 ft) across (Appendix O). Access through the gate will be restricted to Park staff and emergency personnel that need to access the beach for work or an emergency. This additional access is deemed necessary as the access at the southern end of CBCP has become inaccessible part of the year due to the depth of the crossing across Strawberry Creek.

4.2 TRAIL SYSTEM

Traditionally, Park visitors have accessed the project area by a system of way trails created by the public without planning, environmental review, or professional design and construction. These trails are used by both hikers and equestrians. They emanate from the CBCP day use parking lot on the south end of LRSB and from the frontage road on the east side of LRSB (Figure 4.1). There are currently 5.5 km (3.4 miles) of way trails at LRSB. In addition, many of these trails traverse through sensitive wetlands, fragile native dune vegetation and snowy plover habitat. There is also a great amount of duplicity in these trails since they were created without any planning or forethought. Since the soil characteristics of the dune formation on which these trails were developed lacks structure and has very low capabilities these way trails are deeply entrenched. To correct these problems a well-planned trail system needs to be developed at LRSB that integrates the Park's long-range resource management goals and public access needs.


LRSB Restoration and Enhancement Plan
California State Parks
North Coast Redwoods District
Legend
Project Area
Proposed Parking Lot
Wetlands
Existing
Created
Trail Type
Proposed Boardwalk (ADA)
Proposed CA Coastal Trail
Proposed Equestrian/HikingTrail
Proposed Hiking Trail
Existing Way Trails
Proposed Bridge
B
A
N
Meters
0 62.5 125 250 375 500

4.2.1 ACCESSIBLE TRAILS

One of the most important goals in the California State Park System is to provide access to all State Park visitors to the unique, beautiful, and varied lands we manage. Little River State Beach provides that opportunity. Conveniently located off of HWY 101 the project area can be easily seen and accessed by the thousands of people that drive by every day. The opportunity to see the wildlife and plant communities associated with the beach and dune environments along with the sweeping coastal vistas is a special experience that needs to be available to all visitors. To this end, the trail system will include an accessible loop trail that emanates from the CBCP parking lot at the south end of LRSB. This trail will begin at the northeast end of the parking lot and will traverse across the backdunes in a northerly direction adjacent to prominent wetlands (Figure 4.1). There will be one viewing platform located along this segment overlooking a wetland. At its northern terminus this trail intersects with the hiking trail that emanates from Parking Lot A. The trail will then arc towards the nearshore dunes in a westerly direction and traverse back towards the CBCP parking lot in a southerly direction (Figure 4.1). There will be one viewing platform located along this segment that will overlook the nearshore dunes and the beach. This last segment will also have a spur trail that will access a viewing platform that overlooks the beach (Figure 4.1). This trail will be approximately 1.09 km (0.68 miles) long and will be designed and constructed to comply with California State Park's and the U.S. Access Board's accessible trail design and construction standards.

Because the land that this trail traverses over has poor soil capabilities and is somewhat sensitive, the accessible trail will be constructed using a boardwalk design. The boardwalk will be four feet wide and will be supported above the dunes by a combination of mud sill and joist design and helical anchor, header and joist design (Appendix P and Q). The mud sill and joist design will be used in areas that are flat and dry all year and the helical anchor, header and joist design will be used in areas where the ground is uneven or seasonally wet. This boardwalk will essentially span over most of the sensitive dune environment and will leave a very small footprint. It will also provide a very firm and stable walking surface for all visitors. Passing spaces a minimum of five feet wide will be provided every 304 m (1,000 ft). Edge protection will be provided in the form of a 1.57 cm x 2.36 cm (4 in x 6 in) con heart redwood bull rail that will be fastened to the decking with a 2.54 cm (1 in) air gap for drainage. The mud sills will be 3.94 cm x 3.94 cm x 1.21 m (10 in x 10 in x 4 ft) con heart redwood, the headers will be 1.57 cm x 3.15 cm x 1.21 m (4 in x 8 in x 4 ft) pressure treated Douglas fir and the stringers will be 1.57 cm x 3.15 cm x 3.03 m (4 in x 8 in x 10 ft) pressure treated Douglas fir. The decking will be 0.79 cm x 2.36 cm 1.21 m (2 in x 6 in x 4 ft) plastic/wood composite. The boardwalk will have an average linear grade of 5% or less with some short runs up to 8%. The cross slope will be level.

Two 9.69 m x 1.52 m (32 ft x 5 ft) hiking bridges will be constructed where the trail crosses two ephemeral wetlands (Appendix R). This will be a standard DPR trail bridge design. The mud sills will be 5.51 cm x 5.51 cm x 3.6 m (14 in x 14 in x 12 ft) con heart redwood, the stringers will be 6.59 cm x 7.68 cm x 3.64 m (16.75 in x 19.5 in x 32 ft) pressure treated laminated beams. The post sills will be 1.57 cm x 3.15 cm x 3.6 m (4 in x 8 in x 12 ft) con heart redwood, the posts, post braces and handrails will be 1.57 cm x 2.36 cm (4 in x 6 in) con heart redwood and the decking will be 0.79 cm x 2.36 cm x

1.52 m (2 in x 6 in x 5 ft) plastic wood composite. Bridge abutments will be placed outside of the wetland. The viewing platforms will be constructed of the same materials as the boardwalk except it will be 1.82 m x 3.03 m (6 ft x 10 ft) in dimension and have 1.57 cm x 2.36 cm (4 in x 6 in) con heart redwood post and handrails. All handrail heights will be 14 cm (36 in) from the decking. Each viewing platform will also have a redwood slab bench that is compliant with accessibility standards (Appendix S).

4.2.2 PEDESTRIAN TRAILS

In addition to the accessible trail, pedestrian hikers will be able to use a 3.88 km (2.41 miles) trail that provides a series of stacked loops around the north end of LRSB. The hiking trail has three loops. One loop is stacked on top of the other. A portion of these loops will be shared with equestrians. The first loop emanates from the proposed Parking Lot A along the frontage road that is immediately north of the CBCP parking lot (Figure 4.1). After leaving the parking lot and dropping down into the backdunes this trail connects to the accessible trail. The southern portion of this loop follows the accessible trail for a short distance to the west then branches away from the accessible trail when it arcs back to the south. This segment of the loop trail continues west to the nearshore dunes. At the western terminus of this trail there is a three-way intersection (Figure 4.1). Heading straight to the west the hiker accesses the beach. Turning to the north the hiker stays on the first loop and traverses along the eastern side the nearshore dunes. This western section of the first loop trail continues north until it approaches the large wetland area located near the center of LRSB. At this location there is a four-way intersection (Figure 4.1). Turning to the west the hiker accesses the beach again. Heading straight to the north the hiker enters the second loop. Turning to the east the trail traverses toward Parking Lot B along the frontage road which is near the Crannell overpass. At the intersection below Parking Lot B heading straight east the trail connects to a short hiking trail that accesses the parking lot. Turning south the trail connects to a horse trail that is running parallel to the frontage road along the base of the road embankment. This segment provides the eastern portion of the first loop and hiking this trail back to Parking Lot A completes this loop experience. The first loop provides access to the beach, viewing of the wetlands and viewing of the nearshore dunes and backdune environments.

The second loop emanates from the trail intersection near the Parking Lot B. The southern end of this loop is also the northern end of the first loop. Heading west on this segment leads back to the intersection at the south end of the large wetland. From this intersection the trail turns north and traverses the east side of the wetland. This section of the trail provides excellent viewing of the wetland. After a distance, this segment begins to pull away from the wetland towards the northeast into the backdunes where it intersects with the equestrian trail segment coming from Parking Lot B. Taking the equestrian trail south back to Parking Lot B completes the second loop (Figure 4.1).

The third loop is a shared equestrian and pedestrian trail. From the northern terminus of the second loop this trail traverses north and loops around the highest ground on LRSB. Being on higher ground this trail segment offers view sheds in all directions. It also passes through the dune forest that has the largest concentration of Sitka spruce at LRSB.

Counting the accessible trail, pedestrians have four loop trail segments that they can hike. This system offers pedestrians a variety of hiking experiences and opportunities.

It also provides direct access to the beach at three separate locations counting the trail that accesses the beach from the CBCP parking lot. Having a trail system that provides this level of access and brings the hikers into close contact with all the unique experiences at LRSB will ultimately encourage Park visitors to stay on the designated trail system and reduce the proliferation of way trails and their associated resource degradation.

For the most part the pedestrian hiking trails identified in this plan already exist. Some light brushing is all that is required to use these trails. Again, given the low capabilities of the dune soils investing funds to improve the trail tread on these trails would be futile. If properly managed they will not degrade past their current condition.

4.2.3 EQUESTRIAN TRAILS

Little River State Beach is a popular riding area for local equestrians. From the CBCP parking lot equestrians currently ride out to the beach and can go either south to the mouth of Mad River or north to the mouth of Little River. Horses are currently only permitted along the waveslope below the mean high tide at LRSB. However, equestrians have been riding in the nearshore dunes and backdunes for many years and have developed a maze of way trails. The proposed equestrian trail seeks to provide this user group access to the backdunes and maintain their access and use of the waveslope. To access the backdunes from the CBCP parking lot a trail will be constructed from the northeast corner of the entrance road that will traverse along the western shoulder of the frontage road (Figure 4.1). This trail will head north along the road shoulder until it reaches a location west from where Parking Lot A will be constructed. Here it will drop down from the road edge to the base of the fill slope. The new equestrian trail will then proceed north along the base of the fill slope to a location west of the Crannell overpass. There the equestrian trail will connect to an existing trail that traverses northward towards the dune forest in the northeast corner of LRSB. Prior to reaching this area the trail comes to an intersection that will be part of a loop that traverses around the dune forest. At this location the rider can either fork to the right or left and follow the trail around the backside of the dune forest along Little River. Either trail brings the rider back to this intersection. In the northeast corner of this loop a spur trail will be constructed to provide access to the CCT (Figure 4.1). This segment of the CCT will eventually cross Little River via the highway bridge but is not part of this plan.

This equestrian trail will be 2.16 km (1.34 miles) long. Approximately 0.91 km (3,000 ft) of this trail will be new construction and 1.25 km (4,113 ft) will use existing trails. The section of new trail from the CBCP parking lot to the bottom of the fill slope near Parking Lot A will be constructed on the west shoulder of the frontage road. To facilitate its construction a portion of the existing asphalt road approximately three feet wide will be removed and the shoulder will be widened 30 cm to 60 cm (1 ft to 2 ft). In its place a crushed rock and soil mix trail surface will be installed (Appendix T). Once this section of new trail reaches the area adjacent to Parking Lot A, it will traverse down the fill slope to where the fill slope interfaces with the backdunes. This completes the section of new equestrian trail to be surfaced with a crushed rock and soil mix. From this location another section of new equestrian trail will be constructed along the base of the fill slope heading north. This section of trail will have a native surface and be 1.22 m (4 ft) wide. Its construction will terminate where it intersects with an existing trail just west of the Crannell overpass.

4.2.4 CALIFORNIA COASTAL TRAIL

In addition to the trails for LRSB, this plan also addresses the continuation of the CCT. The current proposed route for the CCT is on the frontage road that runs along LRSB and part of CBCP. This route connects to Humboldt County's' Hammond Trail at the south end of CBCP. The Hammond Trail is designated as part of the CCT. At the north end of the frontage road the CCT will follow the truck scale road to where it terminates near the Little River HWY 101 Bridge (Figure 4.1). In the future, the CCT will cross the Little River Bridge and follow the old railroad grade just west of HWY 101 to Moonstone Beach. Although the CCT may not be completed north of LRSB for some time, when it is completed the portion that passes through LRSB will be ready.

The CCT on CSP land begins at its property boundary at the south end of LRSB. From the entrance to the CBCP parking lot, bicyclist will ride north on a 1.22 m to 1.83 m (4 to 6 ft) wide paved portion of the frontage road. This path will be on the west side of the frontage road and is already designated by a white stripe 1.22 m to 1.83 m (4 to 6 ft) from the edge of the pavement. This paved riding area will continue to the Crannell Overpass. There it will follow the frontage road northward towards the California Highway Patrol's Truck Scale Station. This route will continue along the west side of the truck scale road until it terminates near the south end of the Little River HWY 101 Bridge.

Equestrians and hikers will follow the new equestrian trail starting at the north side of the CBCP parking lot entrance at the south end of LRSB. This crushed rock and soil mix trail previously discussed will parallel the bicyclist route on the west side of the frontage road until it traverses down the fill slope near Parking Lot A. From there it will follow the equestrian trail route along the backdunes until it reaches the far northeast end the horse trail loop (Figure 4.1). From that location a short spur trail will traverse down the backdunes and terminate at the south end of the Little River Bridge (Figure 4.1). In addition, pedestrians can use the accessible trail and stacked loop trail system to reach this same location if they choose. This routing of the CCT provides the best combination of experiences for the various user groups. Bicyclists can stay on a paved surface that will parallel the equestrian trail for only a short distance (426 m), equestrians will ride on non-paved surfaces and will also only have to parallel the bike route for a short distance, and pedestrians will have multiple routes to choose from.

4.3 SIGN PLAN

An essential element of any enhancement plan is public awareness and education. There is a need to address such questions as why is LRSB important, what are some of the interesting and unique features of this Park, what are the critical resource protection and management issues and how can the public help protect these resources? This can be accomplished through a public information and interpretation sign plan. The basic elements of this plan would be interpretive and information kiosks at each of the three parking lots; developing a self guided interpretive program along the accessible boardwalk using brochures and interpretive signs; and installing interpretive panels at key locations along the trails that interpret resource management activities or sensitive plant and animal habitat. Additionally the public needs to be informed of the regulations in place to help protect the Park ecosystems. To achieve this, the sign plan includes both interpretative and regulatory signs and displays.

4.3.1 PROPERTY BOUNDARY AND FRONTAGE ROAD

Currently there is variety of regulatory signs placed along what was once thought to be the LRSB boundary running east to west. These signs include State Park Property, No Dogs, No Horses, and No Vehicles signs. An official land survey of LRSB was conducted in 2006 and the property boundaries were marked and recorded. It has become obvious that the existing signs delineating the north and south boundaries of LRSB are not on the true boundary. As part of the sign plan, all of these signs will be removed. Along the true boundary line, approximately 70 carsonite posts will be placed approximately 35 to 40 m (115 to 132 ft) apart from each other along the western, southern, and northern boundaries of the Park (Figure 4.2).

Each carsonite post is approximately 0.79 cm x 0.40 cm x 1.82 m (2 in x 1 in x 6 ft) and will be placed approximately 1.18 m (3 ft) into the ground (Appendix U). Multiple signs (stickers), approximately 0.79 cm x 0.79 cm (2 in x 2 in) in size, will be placed on each post. Most posts will have no more than 6 signs, depending on the location of the post in proximity to other facilities (Figure 4.2). These signs include words and symbols showing No Camping, No Dogs, No Horses, Horses Okay, No Vehicles, Hiking Okay, Bicycles Okay, No Bicycles, and a CSP Logo (Appendix U). Due to the size of the post, anti-perching devices will not be used.

Multiple signs have been previously installed along the frontage road within LRSB. These signs included LRSB regulatory signs, unit identification signs, and parking regulation signs. Some of these signs will remain in place if appropriate. Two groups of signs, No Dog, No Horse, and State Park Property, are currently adjacent to two of the proposed trailheads in this plan. Once the trail is installed, these signs will be replaced by trailhead markers and a carsonite post, which are discuss below in Section 4.3.4 Trail System.

4.3.2 HUMBOLDT COUNTY PARKING LOT

It became apparent after the land survey that the northern most CBCP parking lot is partially on CSP property. Because of this, multiple CBCP signs are technically on LRSB. Some of these signs state regulations pertaining to CBCP only and contradict some of the CSP regulations which can be misleading to visitors. To rectify this problem these signs will be removed. All existing signs on CBCP property within the project area will remain.

Along the north side of the parking lot, which is entirely CSP property, all parking regulatory signs will remain, but other regulatory signs will be removed. One ADA accessible parking space will be installed next to the ADA trailhead on the north side of the parking lot. This parking space will be in conformance with ADA specifications and a Handicap Parking Only sign (12 in x 18 in) on a corten steel post will be installed indicating the space is for handicapped parking only (Appendix V). The 3 m (10 ft) post will be installed in the ground approximately 30 in. (2.5 ft) with road base to help ensure sign stability (Appendix W). Due to the proximity of these signs to snowy plover habitat, anti-perching devices are not warranted and will not be used.

On the west edge of the parking lot where the two property boundaries meet, a wooden information kiosk will be installed. Information and regulations pertaining to LRSB and CBCP will be included as part of the content in the kiosk. This kiosk will display material to help visitors better understand regulations in both parks and about the natural history

of the area. This kiosk is designed to allow the display to change easily. The wooden posts are typically 1.8 m x 1.8 m (6 ft x 6 ft) and will be placed in the ground approximately 1.2 m (2 ft). Road base will be used to help hold the posts in place.

4.3.3 Little River State Beach Parking Lots

A wooden kiosk (described above) will be installed at each of the two proposed parking lots (Figure 4.2). These kiosks will be the same type and dimensions as the kiosk at the CBCP parking lot (Appendix V). A variety of information will be provided in the displays and will most likely be changed regularly. In addition a set of animal proof trash cans will be installed at each new parking lot (Appendix W). Pedestrian crossing signs will be installed on each side of the two proposed parking lots at LRSB (Figure 4.2). These signs are 61 cm x 61 cm (24 in x 24 in) will be placed on a corten steel post. The 3 m (10 ft) post will be installed in the ground approximately 30 in (2.5 ft) with road base to help ensure sign stability. Additional signs will be installed along the eastern edge of each parking lot indicating parking hours (15 in x 10 in) and how to park within the lot (Appendix V). These signs will indicate to park at a right angle (12 in x 18 on) and that trailers are not allowed (18 in x 12 in). Three posts will be installed at each parking lot. Each post will have one to five parking signs on it (Appendix V). Due to the proximity of parking lots to snowy plover habitat, anti-perching devices are not warranted and will not be used on the signs.

4.3.4 Trail Signs

The LRSB trail sign plan will utilize three types of signs, directional, regulatory, and interpretative signs. The directional signs include trailhead and trail junction signs (Figure 4.2). Trailhead signs usually indicate information about the trail such as mileage and where it leads to. These are usually located at the beginning of a trail near a parking location. Where as trail junction signs are found within the trail system where two trails cross and or meet each other. At each trailhead within LRSB a sign (18 in x 12 in) will be installed, on one side of the trail, indicating particular information about that trail (Appendix X). Each post will be approximately 1.51 m (5 ft) long with 0.75 m (2.5 ft) underground and 0.75 m (2.5 ft) above ground. Road base will be used in the posthole to help secure the post if deemed necessary. In addition, a carsonite post with regulatory signs will be placed on the opposite side of the trail (Appendix T). These signs will be used at all trailheads (Figure 4.2). Due to the proximity of these signs to snowy plover habitat, anti-perching devices are not warranted and will not be used, with the exception of the two most western trail head signs.

Depending on the type of trail, each trail junction will require different signs. Trail junction signs typically indicate the direction each trail takes that meets at that intersection. Although some trail junction signs indicate the direction of a general destination. These signs are typically made of aluminum and mounted onto a 1.57 cm x 1.57 cm (4 in x 4 in) wooden post (Appendix X). Two signs will be placed on 2 to 4 sides of the post; a direction arrow octagon shaped, 9 cm x 9 cm (3.5 cm x 3.5 cm), sign and a vertical, 9 cm x 61 cm (3.5 in x 24 in), sign stating the trail information and distance (Appendix W). Depending on the trail junction, some sides of the post will not have a sign. Each post will be approximately 1.51 m (5 ft) long with 0.75 m (2.5 ft) underground and 0.75 m (2.5 ft) above ground. Road base will be used in the posthole to help secure the post if deemed necessary. Due to the proximity of these signs to snowy plover habitat, anti-perching devices are not warranted and will not be used.


LRSB Restoration and Enhancement Plan
California State Parks
North Coast Redwoods District
Legend
Project Area
Proposed LRSB Parking Lot
Sign Type
Interpretive
Regulatory
Trail
Carsonite Boundary
Proposed Viewing Platform
Trail Type
Proposed Boardwalk (ADA)
Proposed CA Coastal Trail
Proposed Equestrian/Hiking Trail
Proposed Hiking Trail
Proposed Bridges
Proposed Gate
N
Meters
0 62.5 125 250 375 500

Interpretive signs will be placed at each of the viewing platforms (Figure 4.2). The signs will be the appropriate ADA viewing size and height. The posts will be made of corten steel or wood and attached to the boardwalk. The actual sign content and size will be developed at a later date. Due to the type and location of these signs, anti-perching devices are not warranted and will not be used.

5 PROJECT MONITORING AND REPORTING

This chapter discusses the monitoring and reporting methods designed to meet Goals 4.1, and 5.1 discussed in Chapter 1 of this plan. In addition, this chapter discusses the plan's adaptive management approach and how monitoring is essential for responding to unpredicted obstacles and or restoration results. Both restoration and access enhancement activities will be monitored. Finally, a yearly report will be produced addressing the restoration and access enhancement work completed, monitoring results, and the overall status of the implementation of the plan.

5.1 ADAPTIVE MANAGEMENT APPROACH

The concept of adaptive management will be utilized during the implementation of this plan where appropriate and necessary. This management approach will be used to attain the highest level of resource protection and public access possible. The key concept in the adaptive management approach is the willingness to let new information drive adaptations in the plan based on changing conditions and information. In order to be successful, the plan must have the ability to adapt and respond to new information on a regular basis. As components of the plan are completed, pre and post monitoring results will be analyzed. Based on these results, actions can be adjusted to best meet the plan's overall goals. Most adjustments will fall within the realm of restoration, with possible minor adaptations to the access enhancement efforts.

5.2 RESTORATION MONITORING

In order to respond appropriately to restoration results, one must monitor multiple environmental factors before, during, and after each treatment phase. Besides monitoring the environmental conditions, cultural and biological monitors will be on site throughout most of the initial treatment phases of the project. The biological monitor will be primarily concerned with preventing take of snowy plovers and any other possible sensitive species that may occur in the project area. The cultural monitor will ensure that culturally significant areas are not disturbed. Finally, each day a general project monitoring sheet will be filled out by the project lead on site. Each method of monitoring, and where it will occur within the project area is described below.

5.2.1 VEGETATION

Vegetation monitoring will consist of both rare plant surveys and vegetation sampling. A rare plant survey will be conducted annually prior to restoration activities to document any special status species that may occur within the current year restoration area. Vegetation sampling will be conducted pre and post selected treatment efforts to determine restoration success. Each method of vegetation monitoring is described below.

Rare Plant Surveys: Multiple plant surveys have been conducted over the years within the project area. A summary of the survey results can be found in Appendix C. One sensitive plant species, pink sand verbena, has been found within the project area (Appendix D). A rare plant survey was conducted in the summer of 2008 (Appendix D) and surveys will be conducted prior to implementation of each phase at the floristically correct time of the year prior to each period of operation. The surveys will be conducted in compliance with approved state protocol (CDFG 2000). Should a special status plant

be located, a 5 m (16.5 ft) equipment exclusion zone will be established around the population. The area within the equipment exclusion zone will be treated by hand.

Vegetation Sampling: Simple stratified random sampling will be employed, using a base transect (length to be determined) through the center of predetermined treatment areas. Along each transect, base points will be systematically positioned at a distance (to be determined) that will allow for an adequate sample size. Diversity and abundance (via % cover) of vegetation will be estimated by placing 1 m^2 quadrats at randomly generated distances (length to be determined) from base points. Visual estimates of native and non-native plant cover within 1 m^2 quadrats will be collected by the same observers over time to minimize sampling error. Pre-treatment and immediate post-treatment data will be collected to assess the degree of change that is attributed to restoration activities as opposed to natural variation or external influences (Pickart and Sawyer 1998). Additional post-treatment data will be collected twice a year or as funding and time allows, helping determine long term success and trends.

5.2.2 WESTERN SNOWY PLOVER

Throughout the year, snowy plovers are found on the waveslope and in the nearshore dunes at LRSB. They breed, nest, and raise their young in and around the project area from March 15 through September 15. Area A and the western edges of Area B-1 and F are the only restoration areas that snowy plovers are found in or adjacent to. Two types of monitoring will occur relating to snowy plovers within Area A.

Compliance Monitoring: A permitted snowy plover biologist (Appendix Y) will be on site to monitor all operations that occur on the waveslope, in Area A, and along the western edges of Area B-1 and F. If snowy plovers are observed within 50-meter (164 feet) f the operational project area, work will stop and an alternative area where snowy plovers are not present will be picked to continue work activities. All staff and activities will remain in the operational work area in which presence/absence surveys have been conducted. Additional measures being taken to ensure that operations will not result in take of snowy plover can be found in Appendix F.

Restoration Response Monitoring: Although the habitat within the project area is degraded, western snowy plovers breed and winter throughout the area. In order to determine if the proposed restoration is providing suitable habitat for breeding snowy plovers, breeding monitoring will occur within the nearshore dunes in the project area for the duration of the project timeline.

5.2.3 CULTURAL

A State Park Archeologist surveyed Little River State Beach in July 2004 and June 2008 for prehistoric and historic cultural resources. A confidential report was prepared and two potentially cultural significant sites were located (Gruver 2004). These sites date back to prehistoric and historical times. A mechanical removal exclusion zone of 50 m (165 ft) will be placed around these two culturally significant sites (Gruver 2004). Only hand removal techniques will be employed within the exclusion zone with a cultural monitor present (Gruver 2004).

Should treatment require digging in the ground within 20 m (60 ft) of the two known cultural sites, a cultural monitor will be on site for that portion of the project. The cultural monitor will be there to help ensure the protection of any new findings or unknown

cultural artifacts that may become unearthed. If an artifact were to become exposed, treatment efforts in that area would stop and consultation with the monitor, local tribes, and a State Park Archeologist would begin to determine the appropriate course of action.

5.2.4 DUNE MORPHOLOGY

Vaughan and Fiori (2007, 2004) describe geologic and coastal processes relevant to the proposed restoration. Following monitoring of the pilot project Vaughan and Fiori later concluded that mechanical removal of exotic vegetation could be accomplished in the nearshore dunes at LRSB with minimal risk to nearby road infrastructure, at least within the average recurrence of infrequent, large scale events that are likely to dramatically change the beach and dune morphology.

Baseline Data: Before the initial large scale treatments commence a pre-treatment topographic survey of the entire State Park property, using RTK (real time kinematics) GPS or equivalent technology, will be performed. The survey will be performed at a time when it can extend to the mean high tide line. This portion of the survey will be performed on a day that does not have an extreme high tide. The survey will also extend along an imaginary line oriented approximately N45W from the most shoreward, northwestern corner of the State Park boundary, to the mean high tide line. The purpose of these extensions of the survey to the west and northwest is to characterize the off site sand sources.

Coastal Processes: The coastal process monitoring entails observation of the extent of wave run-up in response to the proposed restoration. The intent of this monitoring is to help assess if the restoration is allowing progressively greater run-up over time (calibrated to nearby tidal measurements at Trinidad). While the tidal data will provide some guidance for comparison, the wave run up will be affected by a host of factors. As a result this analysis will be used to track general trends that may shed light on some of interacting factors affecting run up (e.g., sea level, vegetation effects, and relative storm energy and storm order). Increasing run up will restore ecosystem processes to a greater portion of the beach through physical debris delivery (e.g., logs), redistribution of plant seed, and by chemical processes associated with the waves (increased eastward penetration of salt) or breakdown of the debris (organic matter). Potential disadvantages of increased wave run-up include greater distribution of anthropogenic debris, either from the ocean or from the beach. These data may aid or explain revegetation plans or results.

RTK or equivalent technology should be used to map the estimated maximum wave run up line observed on the beach. The wave run-up line can be recognized by the extent of fresh debris and preferably the location of wetter sand. The monitoring will ideally be performed shortly (within a day or so) after the maximum storm surge associated with a large winter storm. Monitoring work should not be performed under hazardous conditions from wave run-up. At least one survey should be performed each winter; multiple surveys may be performed if a sequence of large storms develops. If there is evidence of wave generated erosion of stabilized dunes (e.g. scarps), this should be noted as a point or line feature during the data collection.

Fluvial Transport: Little River has historically made periodic southward excursions across the present location of the LRSB. Should the river begin flowing south or cut its outlet through the current spit, the location of the eastern and southernmost banks of the river should be mapped with RTK or equivalent technology at the end of the rainy season. The intent of this monitoring element is to assist with explaining the processes related to sand transport, wave run-up and possibly to help guide or explain revegetation success as shifts in the river could result in changes in groundwater and surface water flow.

Sand Transport: It should be noted that the beach currently has prograded several hundred feet to the west and now has the most sand since the earliest historical records (from the late 1800's to early 1900's). Monitoring sand transport will provide early warning regarding the success of the revegetation effort with respect to moderating rates of physical processes on the beach. This is important to allow appropriate management response in the event infrastructure or sensitive cultural or biological sites are threatened by either erosion or burial. Knowledge of the relative sand flux may also have significance as a regional data point for assessing the relative sediment loading on this portion of the coast.

Sand will be monitored by using RTK or similar quality technology to compare aerial topography from monitoring period to monitoring period. This survey should be completed at the end of the windy season (early fall) to capture the most significant change from wind. The survey should extend over all treated areas and baseline areas noted west and northwest from the Park.

The measurements should be performed annually for at least three years following the initial treatment phase. In the event initial treatment shows unusually large change that could be adverse to project goals, subsequent treatment may be redesigned or temporarily suspended until adequate solutions to the change are developed. Once the vegetation has reached desired cover and species composition, sand monitoring, using the technology and methods discussed here, should occur every three years to assess changes related to natural processes on the beach.

Data Storage and Reporting: Data will be reviewed by the surveyor upon download for accuracy. Data will be stored on the NCRD Geographic Information System (GIS) server and include a full metadata file including the surveyor's name and the time and date of collection. The NCRD geologist will compile a report of all of the data for that particular monitoring year according to the recommended schedules. All monitoring will be conducted annually for at least the first three years following treatment and subsequent monitoring will be performed at the maximum of three year intervals.

5.2.5 PHOTO DOCUMENTATION

Photo documentation will occur at least twice a year and will be paired with vegetation sampling and dune morphology monitoring, when possible. The photographs will be taken from established Global Positioning Unit (GPS) points throughout the project area and at selected vegetation plots. In addition, photographs will be taken from the Crannell overlook twice a year, to document the landscape level changes. Photo documentation can provide a valuable tool for assessing project success by documenting evidence of sand movement, vegetation growth, and colonization of native plant species.

5.3 PROJECT REPORTING

Project reporting is important for the overall success of the project and to help direct adaptive management. A summary report will be produced on a yearly basis throughout the implementation phases of the plan. This report will summarize the project tasks completed, the methods used, and the outcome of the associated monitoring activities. The report will be produced and authored by the project manager(s) with assistance from the District's Engineering Geologist and the District's Senior Environmental Scientist.

6 PROJECT TIME TABLE

This chapter describes the proposed time line in which the project will be implemented. The table below shows each task and the phase in which it will most likely be implemented (Table 6.1). Although this is only a seven-year plan, continued retreatment of exotic plants and minor monitoring will most likely occur indefinitely, depending on availability of funding. Furthermore, implementation of this timetable will be dependent on funding and may change over time as the project progresses. Should funding become available some phases may occur earlier than scheduled.

Table 6-1. The LRSB Restoration and Enhancement Plan Timetable.

Tasks	Phase (1 Year)						
Restoration and Establishment	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Initial Treatment of Area A (LRSB North)	X						
Initial Treatment of Area A (LRSB South)		X					
Initial Treatment of Area B (LRSB North)			X	X			
Initial Treatment of Area B (LRSB South)				X	X		
Initial Treatment of Area C (LRSB)		X					
Creation of Woody Swales – Area D (LRSB)		X	X				
Retreatment of Area A (LRSB North)		X	X	X	X	X	X
Retreatment of Area A (LRSB South)			X	X	X	X	X
Retreatment of Area B (LRSB North)			X	X	X	X	X
Retreatment of Area B (LRSB South)				X	X	X	X
Retreatment of Area C (LRSB)			X	X	X	X	X
Revegetation of Area A (LRSB North)	X	X	X				
Revegetation of Area A (LRSB South)		X	X	X			
Revegetation of Area B (LRSB North)				X	X	X	
Revegetation of Area B (LRSB South)					X	X	X
Monitoring	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Photo Documentation	X	X	X	X	X	X	X
Vegetation Monitoring	X	X	X	X	X	X	X
Cultural Monitoring		X	X	X	X	X	
Western Snowy Plover Monitoring	X	X	X	X	X	X	X
Dune Morphology Monitoring	X	X	X	X	X	X	X

Trails and Interpretation	1	2	3	4	5	6	7
Design Pedestrian Loop Trail Signs and Displays (LRSB)		X					
Install Pedestrian Loop Trail, Signs, and Displays (LRSB)			X	X			
Design ADA Trail Signs and Displays		X					
Install ADA Trail and Signs			X	X			
Install Parking Lots (LRSB)			X				
Install Equestrian Trail			X	X			
Install Coastal Trail along frontage road (LRSB)			X	X			

Appendix K. Symbolic Fencing Design

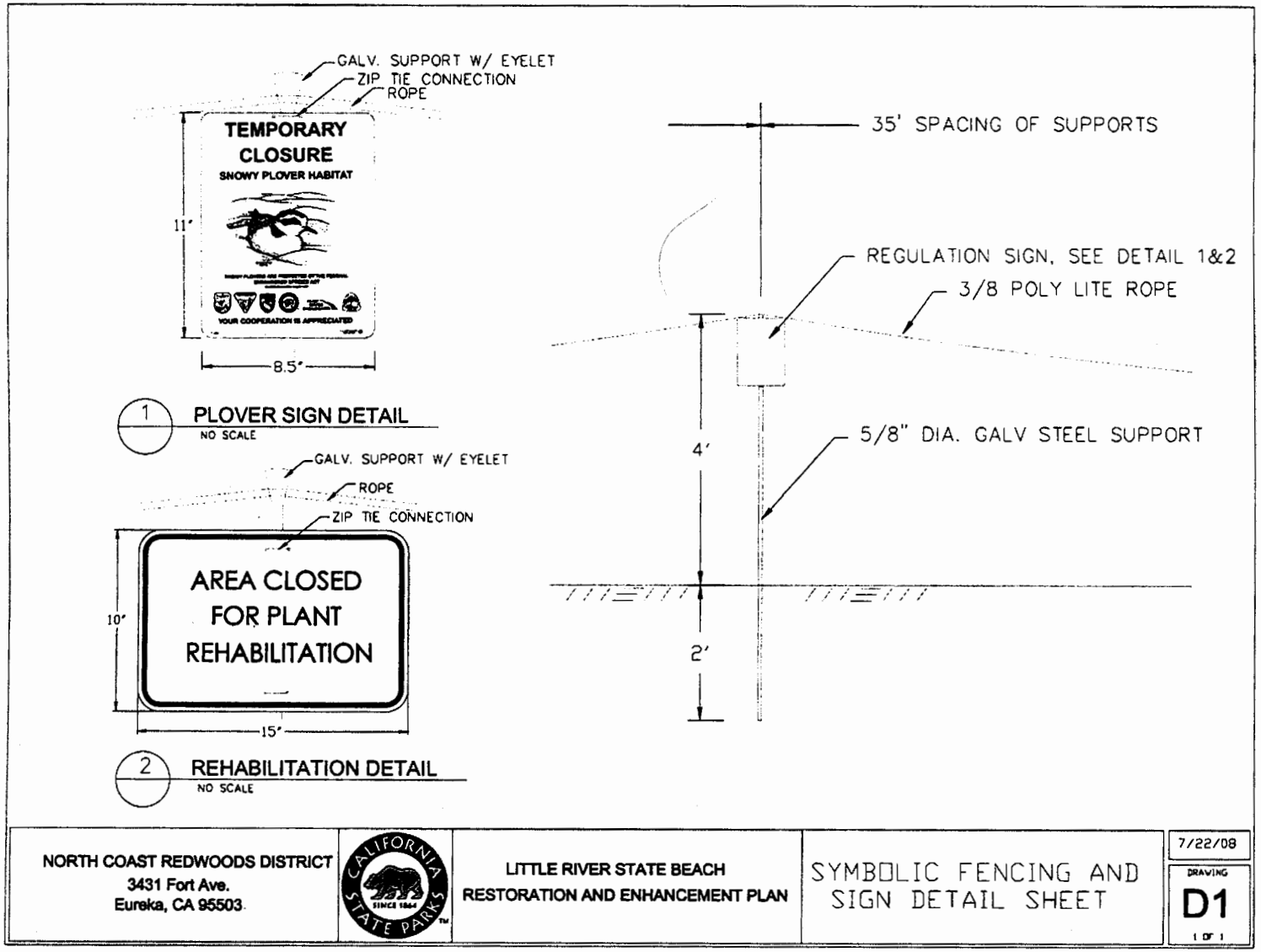
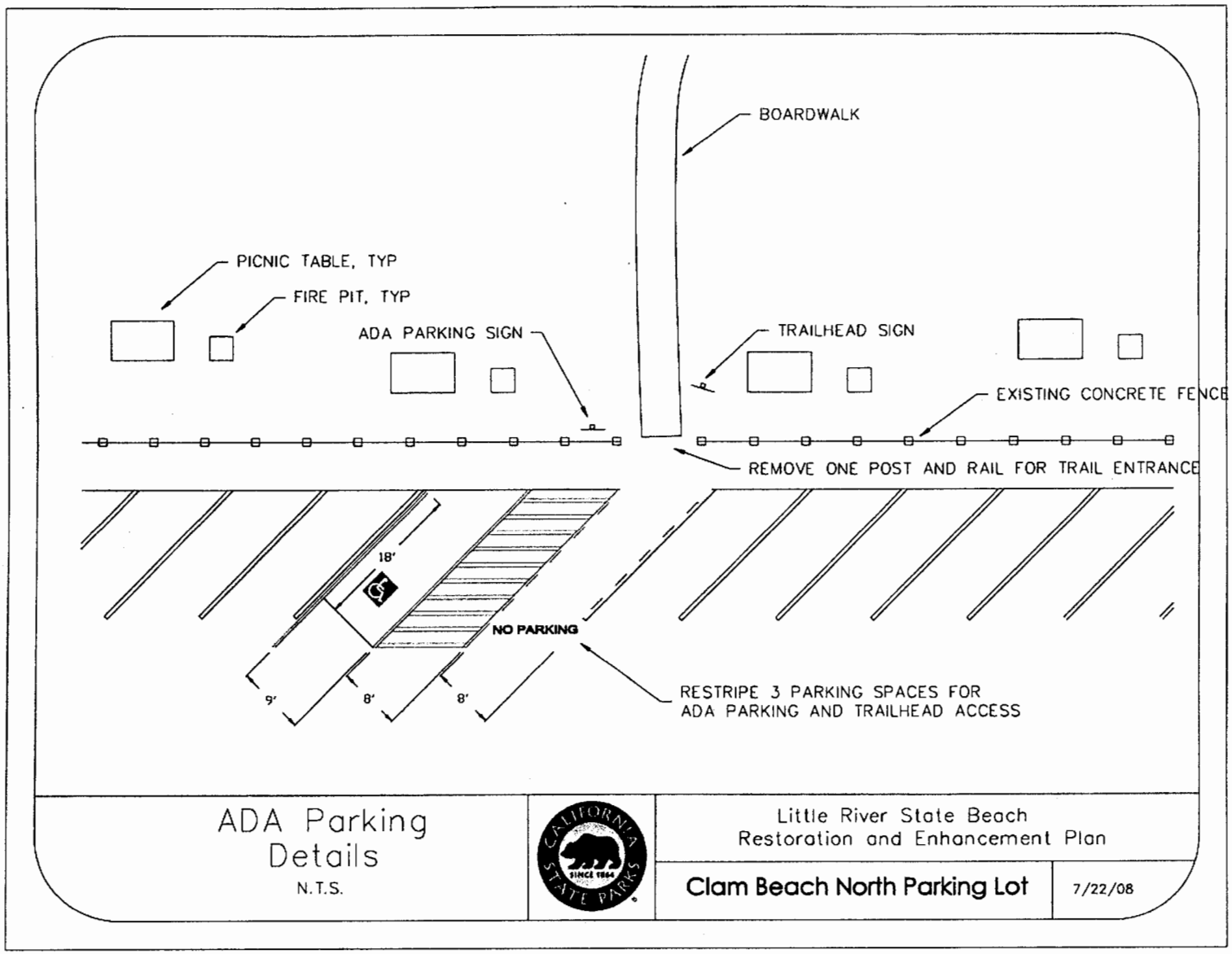
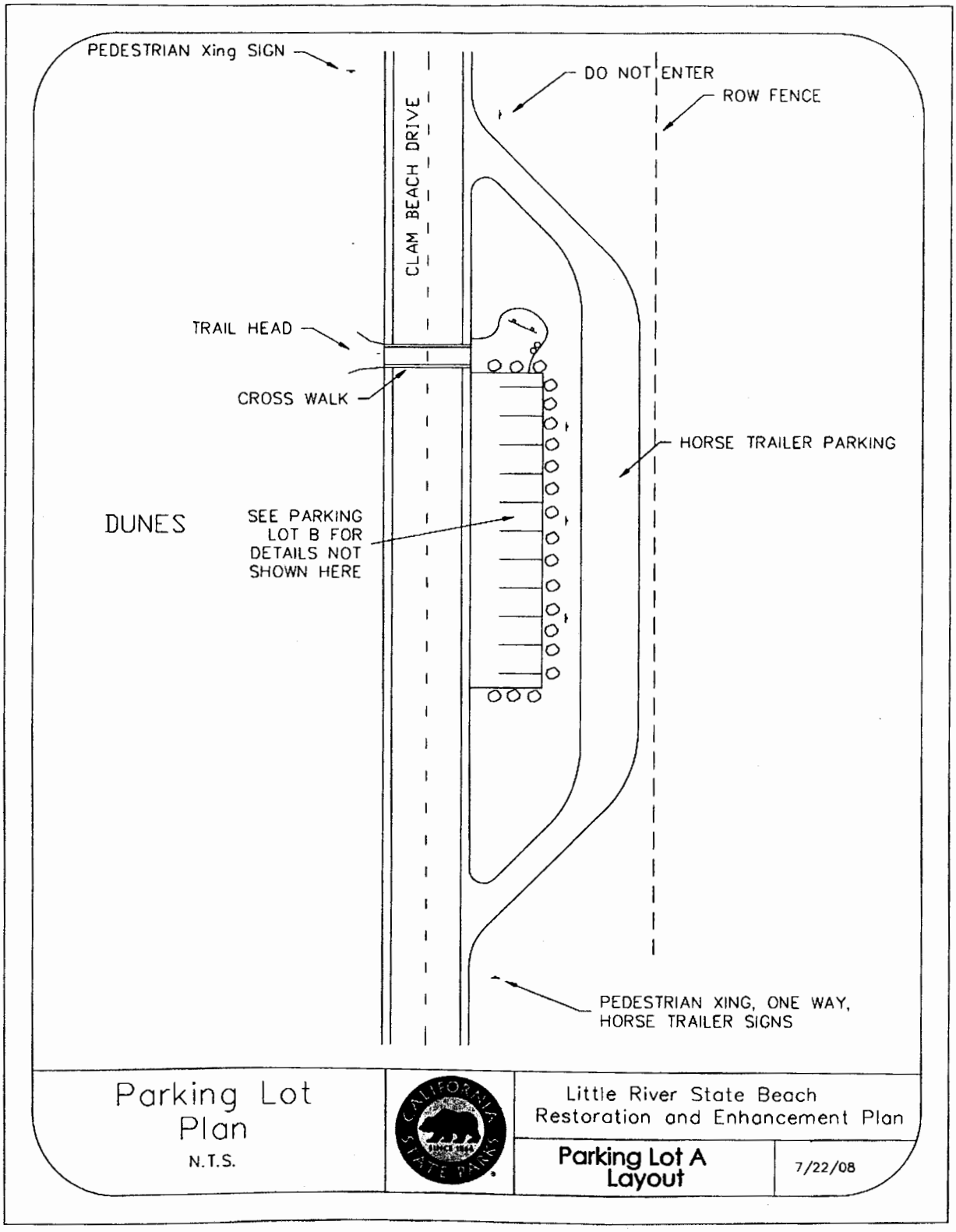


EXHIBIT NO. 6
APPLICATION NO.
1-10-004 - CALIF. DEPT. OF PARKS & RECREATION
PROPOSED SIGN, TRAIL, & PARKING IMPROVEMENT DESIGN DETAILS (1 of 16)

Appendix L. CBCP/LRSB Parking Lot Handicap Improvement Plan

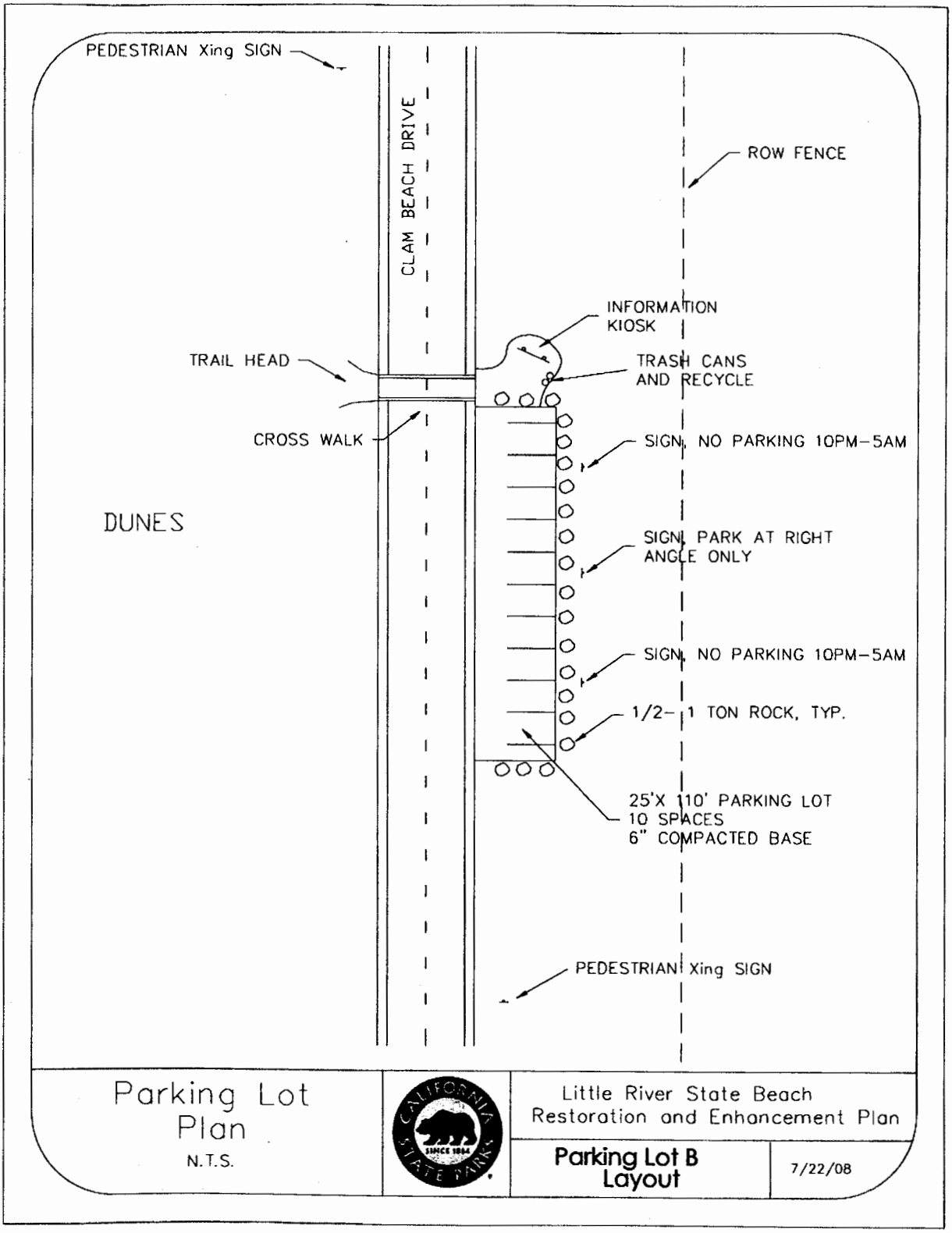


Appendix M. LRSB Parking Lot A Design



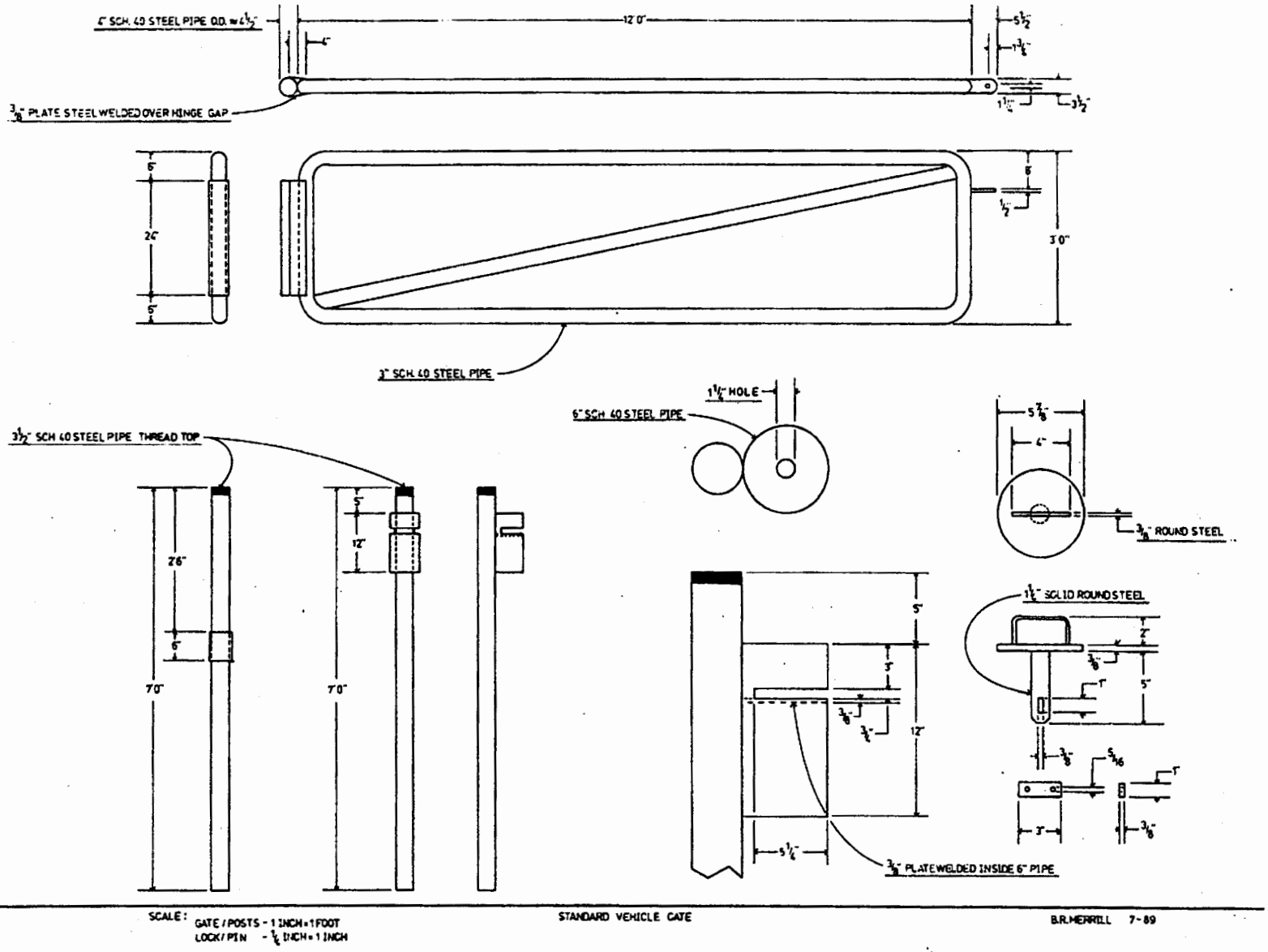
3 of 6

Appendix N. LRSB Parking Lot B Design



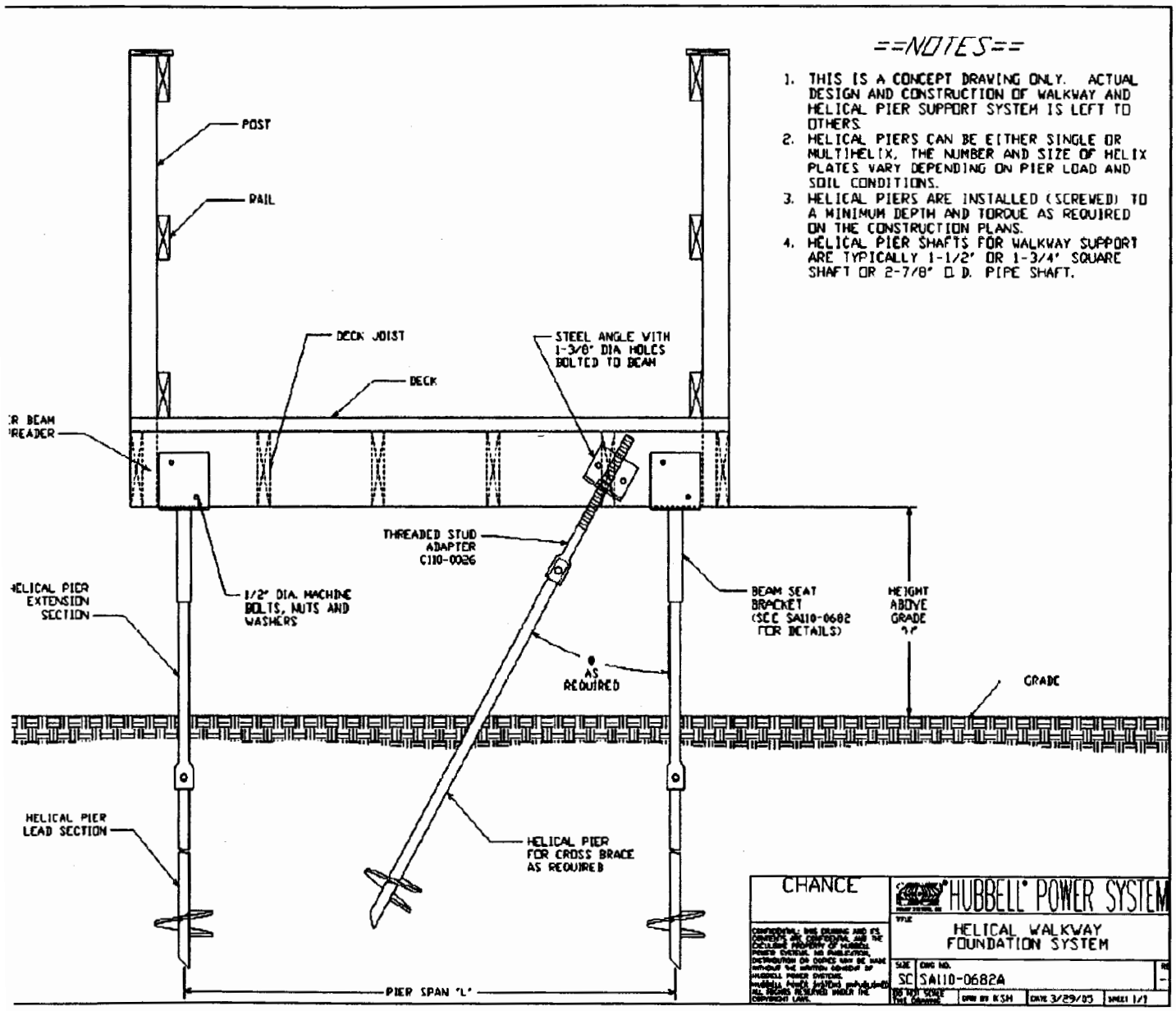
4 of 6

Appendix O. LRSB Gate Design



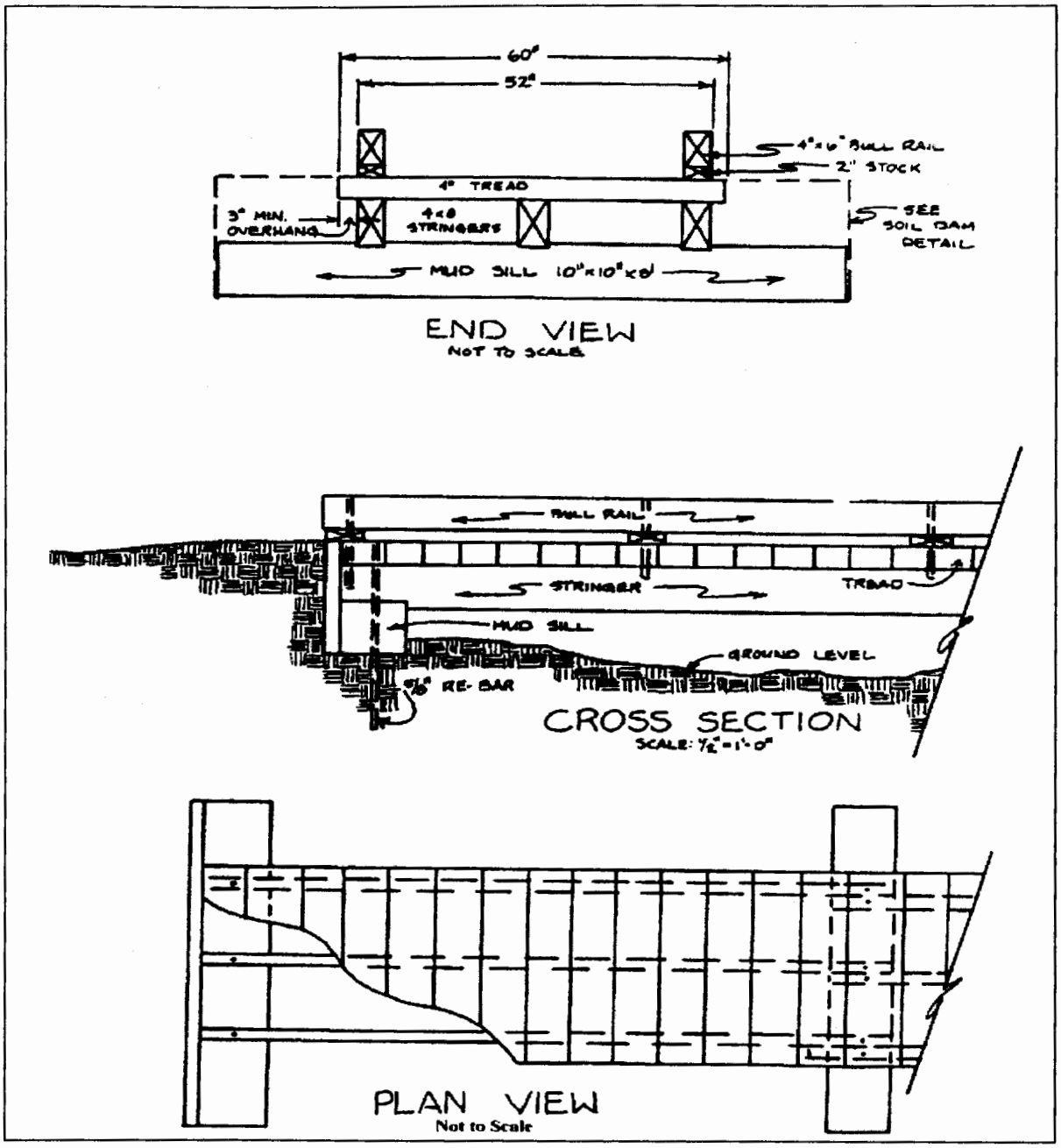
5816

Appendix P. LRSB Boardwalk Helical Screw Design



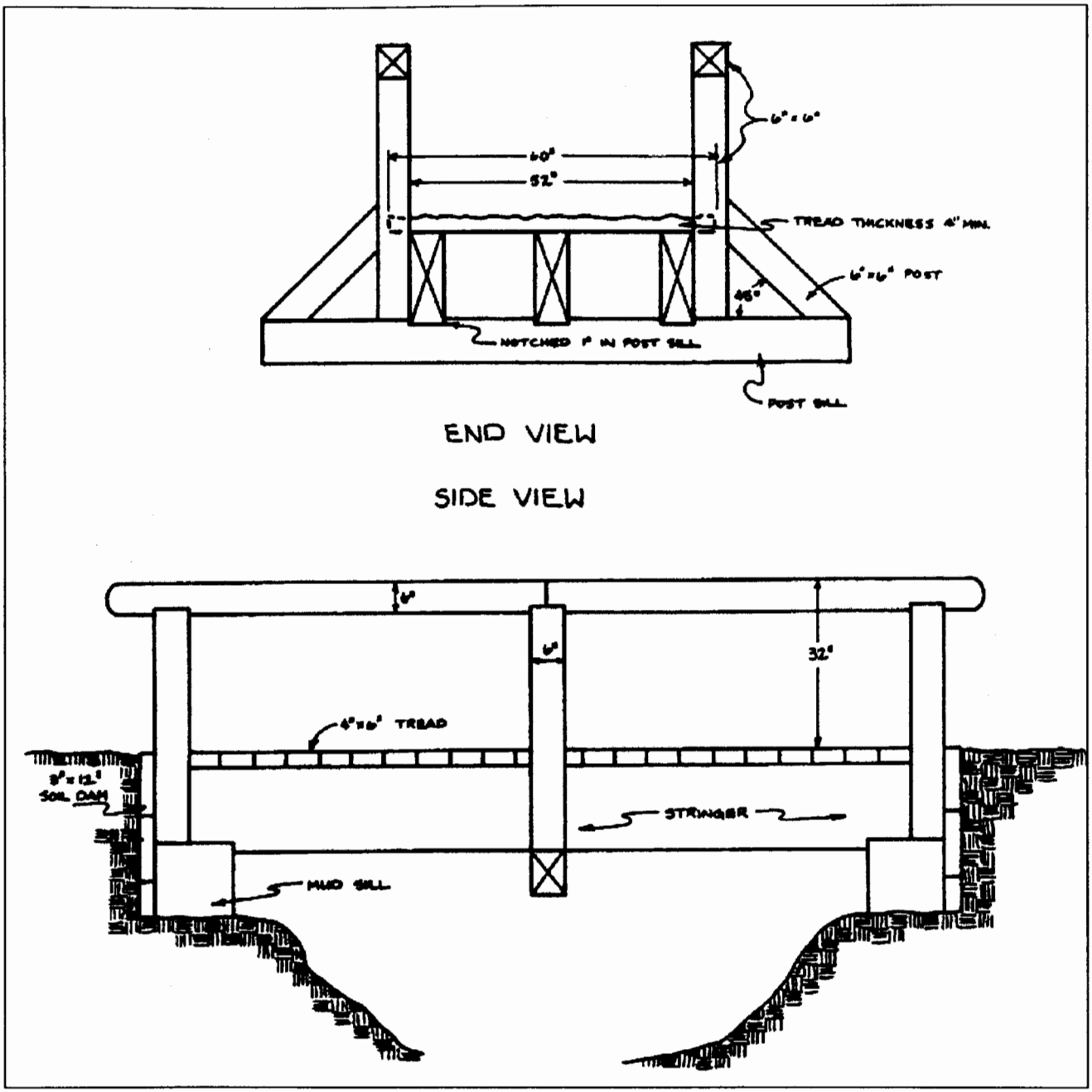
6 of 16

Appendix Q. LRSB Boardwalk Design



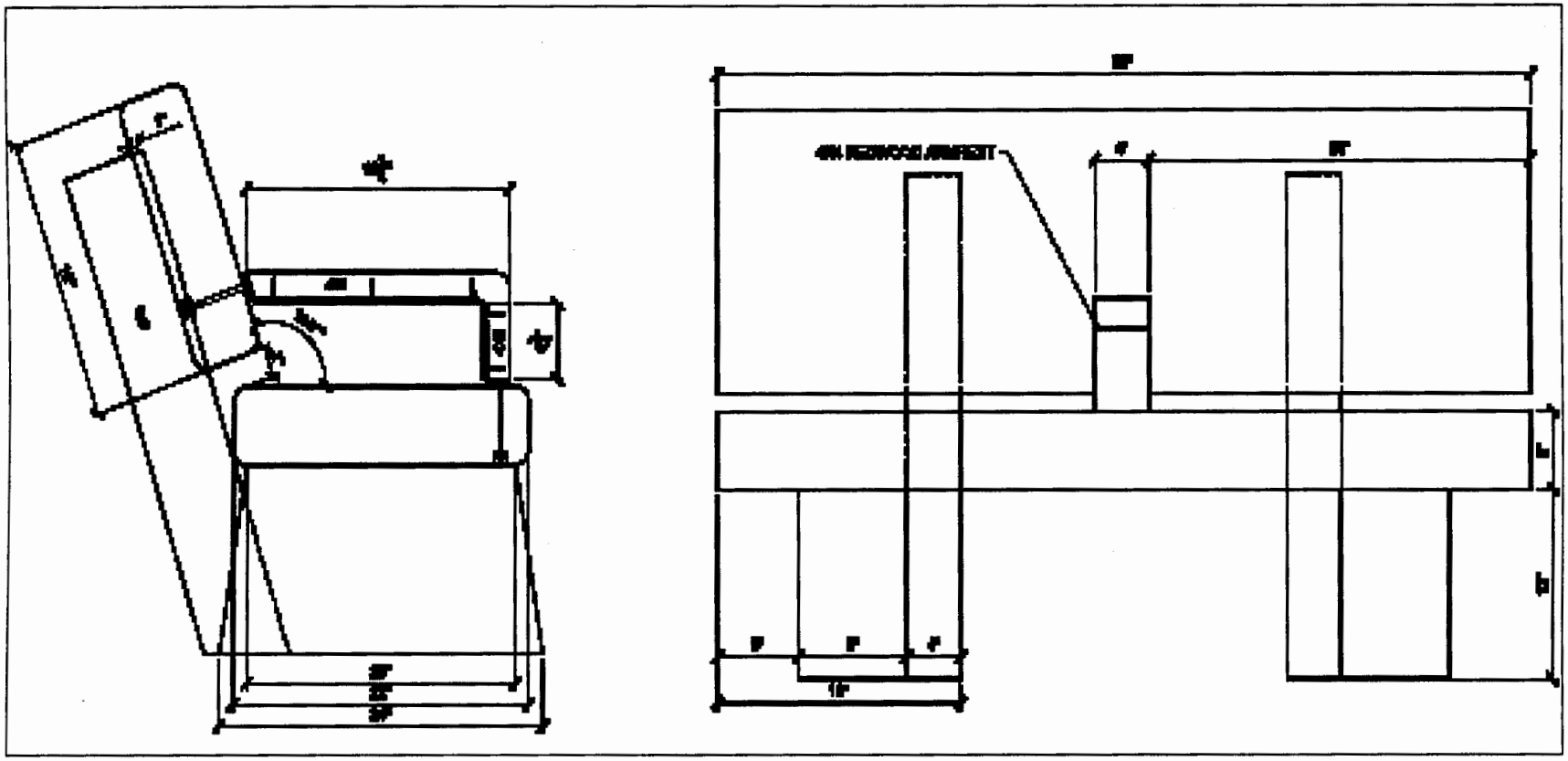
7/16

Appendix R. Detail Drawing of the LRSB Boardwalk Bridge

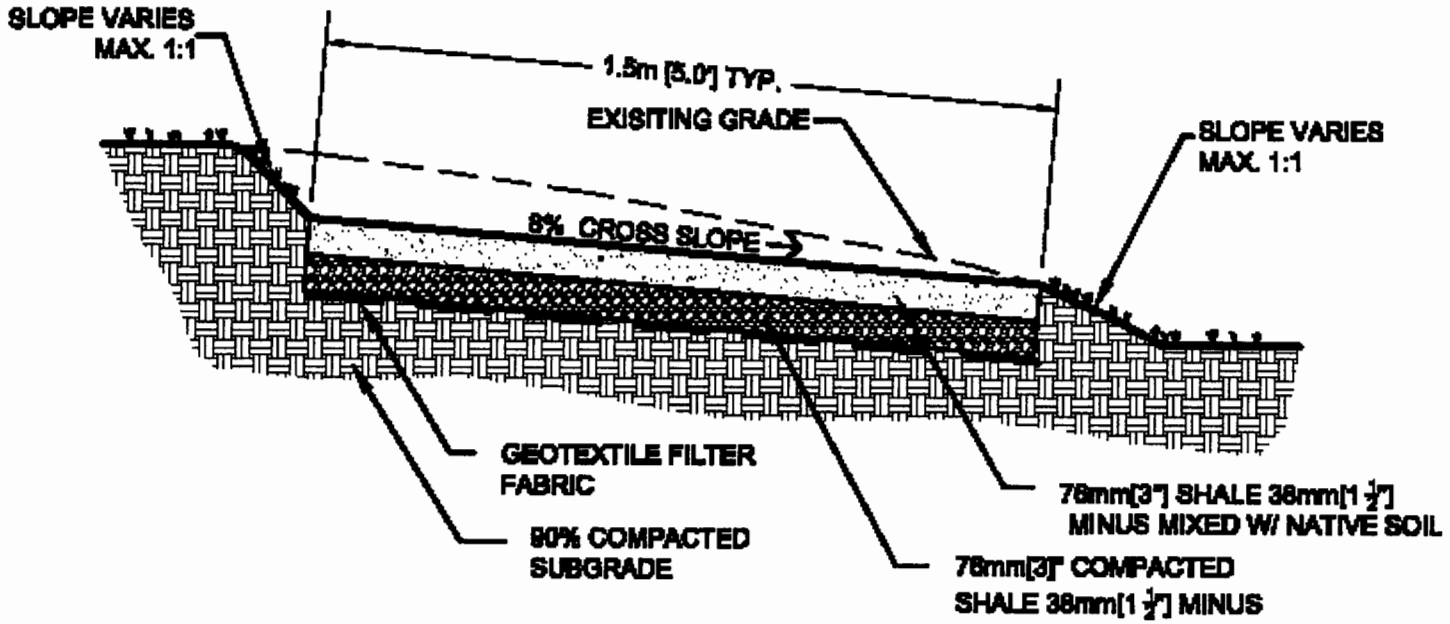


8916

Appendix S. Detail Drawing of Boardwalk Benches



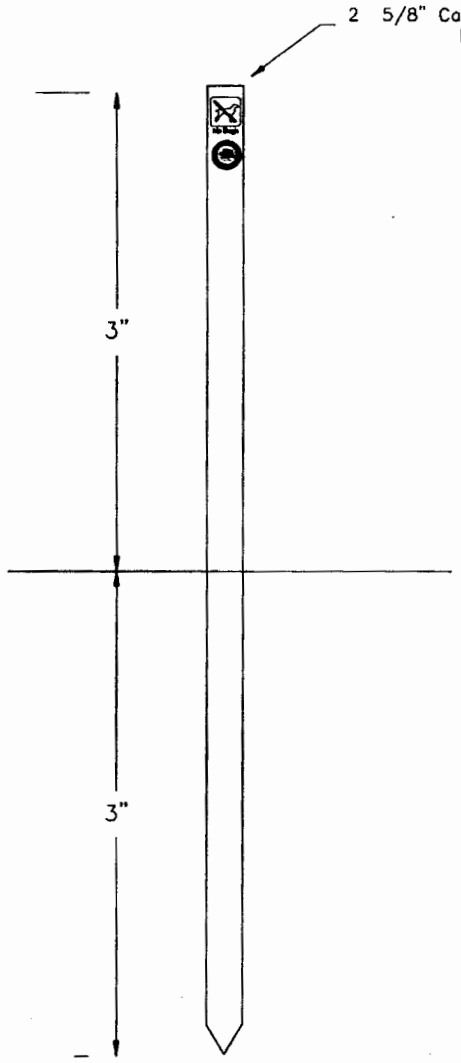
Appendix T. LRSB Equestrian Trail Detailed Plans



EQUESTRIAN TRAIL
(5% AND GREATER SIDE SLOPE)

NOT TO SCALE

Appendix U. Little River State Beach Boundary Signs



CARSONITE POST DETAIL
N.T.S.

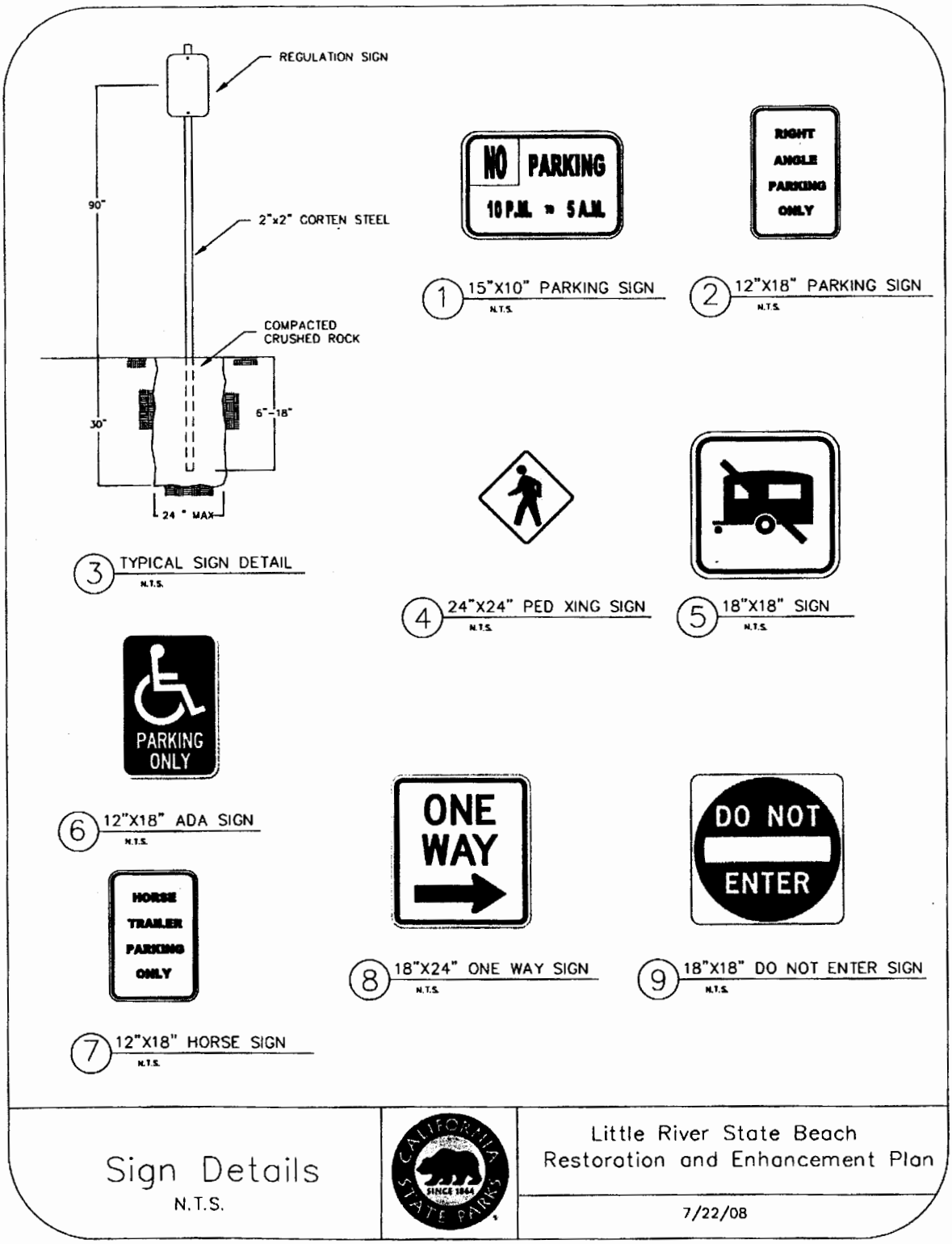
2"x2" REGULATION SIGNS
N.T.S.

Regulatory Sign Details N.T.S.		Little River State Beach Restoration and Enhancement Plan
		7/22/08

11916

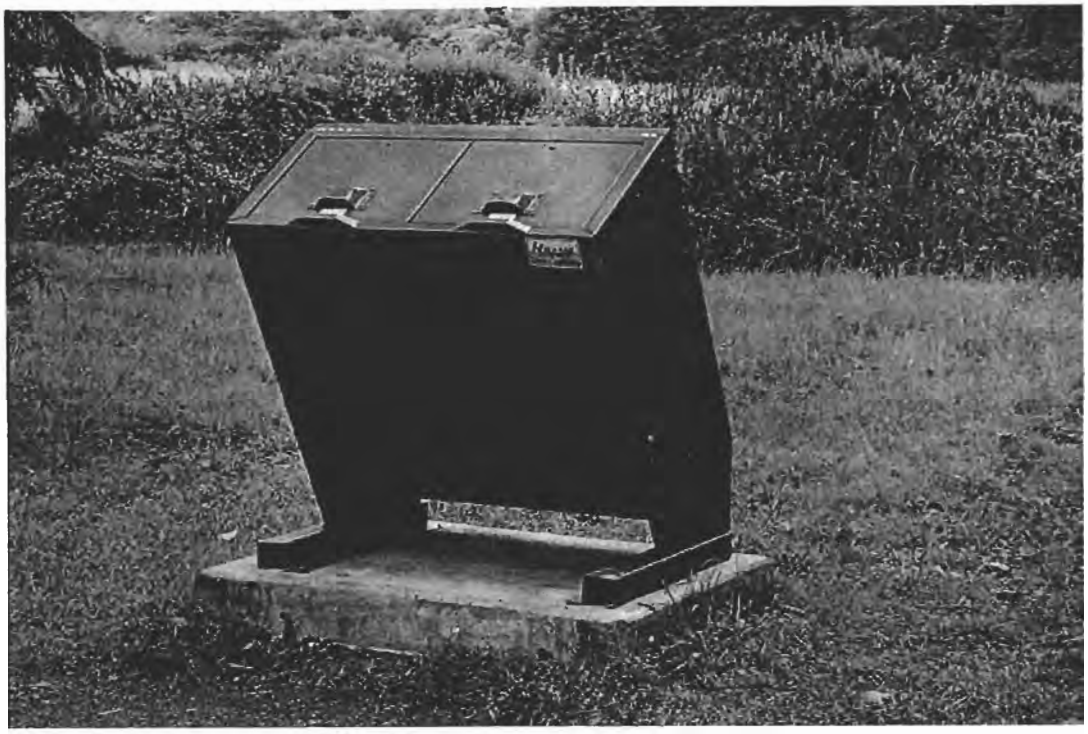
13916

Appendix V. Example of Parking Lot Signs



14916

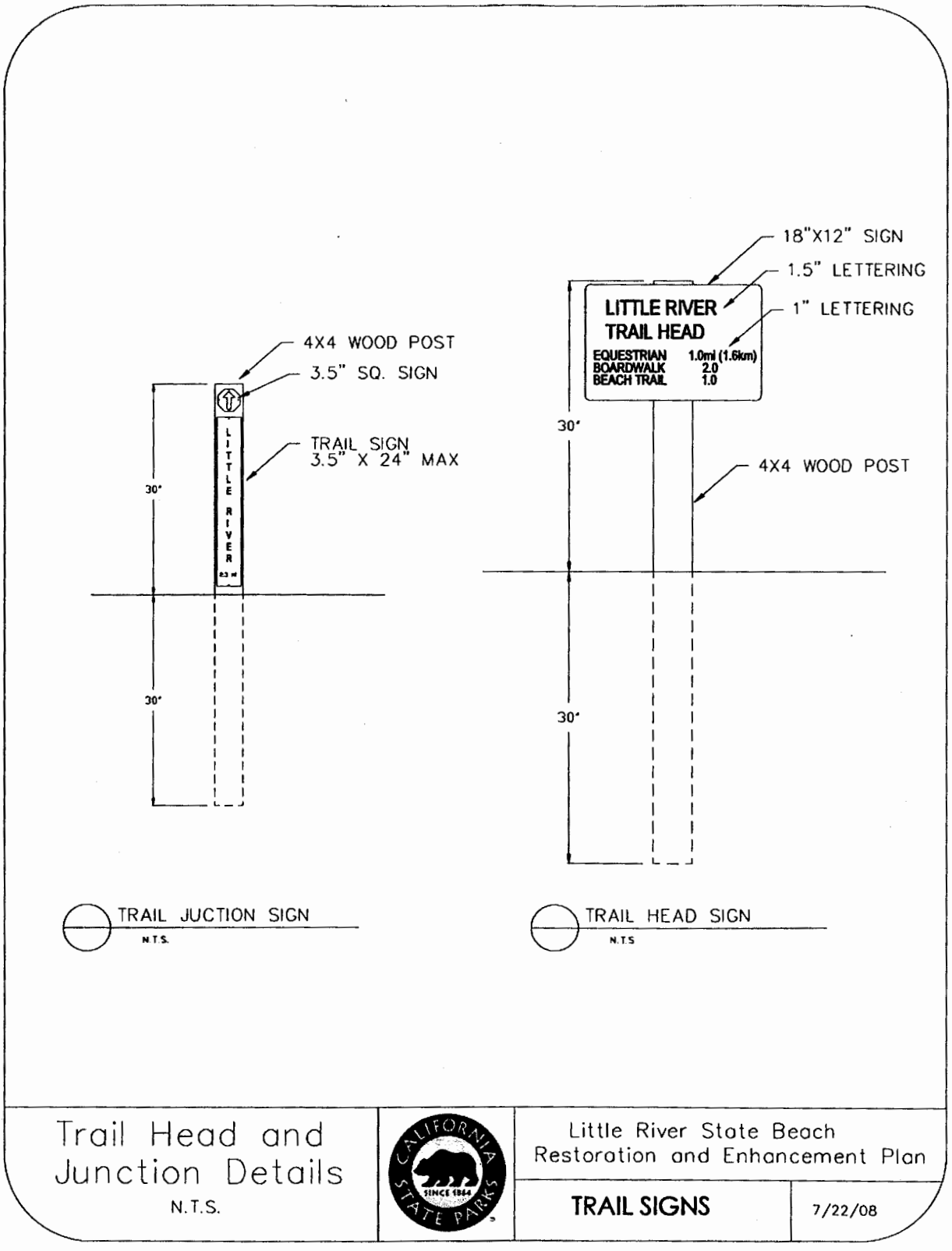
Appendix W. Animal Proof Trash Receptacles and Interpretative Display



An example of animal proof disposal trash receptacles to be used at the proposed LRSB parking lots.

An example of the interpretative display case to be used at the three of the proposed LRSB trailheads.

Appendix X. Example of Trailhead and Junction Signs



Appendix F. Measure to Avoid Take of Sensitive Natural or Resources

This refers to all listed and or sensitive species and culturally significant features.

WESTERN SNOWY PLOVER

- Western snowy plover mitigation measures will be applied whenever operations are occurring in the nearshore dune habitat.
- Permitted snowy plover monitors will survey areas that work will be conducted in each day prior to operation. Snowy plover monitors will be onsite for the entire duration of operational hours to ensure that there are no snowy plovers present within the established spatial buffer zone and that they have not moved on site. If snowy plovers are observed within the spatial buffer zone of project activities, an alternative area where snowy plovers are not present will be picked.
- All staff and activities will remain in delineated project area in which presence/absence surveys will be conducted.
- Heavy equipment operations will be conducted outside of the WSP breeding season between September 15th and March 1st. All operations will occur during daylight hours.
- During the non-breeding season, a 50 meter (164 feet) spatial buffer zone will be maintained between WSP and restoration/enhancement operations. If the WSP monitor determines that operations are resulting in a behavioral disturbance to WSP then operations will be moved far enough away so as to eliminate the disturbance to the plovers.
- During the breeding season, a 100 meter (330 feet) spatial buffer zone will be maintained between WSP and restoration/enhancement operations. If the WSP monitor determines that operations are resulting in a behavioral disturbance to WSP then operations will be moved far enough away so as to eliminate the disturbance to the plovers.
- All operations will occur during daylight hours.
- Vehicles driven on the beach will be limited to 10 mph, or the minimal speed required to prevent getting stuck in sand. Vehicles will remain on the wet sand until reaching the treatment area. All vehicles will be escorted by a permitted snowy plover biologist. A snowy plover monitor will walk in front of vehicles to and from the waveslope. This will be repeated in the afternoon when work is completed for the day. There will be no night driving or driving during periods of diminished visibility.
- Trash will be contained in predator-proof containers and transported off site at the end of each workday.
- Lunch and breaks will be taken at the work site to prevent workers from disturbing plovers.
- No dogs or other pets will accompany workers to the work site.
- Heavy equipment will be fueled at the start of every day at a predetermined location (western ¼ of the nearshore dunes). Fuel will be delivered via a 4x4

truck at the start of each workday, and be administered by a fuel dispenser held in the bed of the truck. The truck carrying the fuel dispenser will enter the beach at the Clam Beach County Park vehicle entrance or through the newly created access path through LRSB. A snowy plover monitor will walk in front of the vehicle from the waveslope to/from the western ¼ of the treatment area, where heavy equipment will be fueled.

- All staff and activities will remain in delineated project area in which presence/absence surveys will be conducted.
- Outreach will be conducted to explain the project and its benefits to plovers, other listed and rare species, and the native coastal dune ecosystem.

BOTANICAL

- Floristically appropriate surveys will be conducted prior to the initiation of project activities and shall be in conformance with DFG guidelines (CDFG 2008). If sensitive plant species are found, 5 m (16.5 ft) buffer will be allotted and flagged. Any removal efforts targeted within the protected buffer zone will be removed by hand.
- Heavy equipment will enter the project area through an existing trail from the Clam Beach frontage road to the foredune, where it will be stored at the interface of European beachgrass and Coyote brush plant series. Heavy equipment will remain onsite until the completion of each year's implementation phases, at which time that equipment will exit from where it came. Objects to obstruct the entrance to the path will be placed at the trailhead once heavy equipment moves through.
- Symbolic fencing will be erected around treated areas to avoid human disturbance of newly created habitat and reseeding efforts.
- Interpretive signs will be used on the symbolic fencing to inform the public of the restoration project and sensitive species. The signs will focus on the restoration project.
- A Hazardous Material Spill Contingency Plan and Safety Plan will be reviewed daily and kept onsite.

CULTURAL

- If it is determined the find indicates a sacred or religious site, the site will be avoided to the maximum extent practicable. Formal consultation with the State Historic Preservation Officer (SHPO) and review by the NAHC/tribal representatives will also occur as necessary to define additional site mitigation or future restrictions.
- Prior to operating in area(s) identified in the confidential 5024 document as potentially culturally sensitive, the project manager will contact the North Coast District Archaeologist at least two weeks prior to operations. The Archaeologist (or his designee) shall determine the boundaries of the sensitive area(s) and flag with black and yellow candy-stripe flagging. The Archaeologist will determine if a tribal monitor needs to be present during operations within these area(s). No

heavy equipment will be allowed within designated culturally sensitive area(s).

- In the event that human remains are discovered, work will cease immediately in the area of the find and the project manager/site supervisor will notify the appropriate DPR personnel. Any human remains and/or funerary objects will be left in place. The DPR Sector Superintendent (or authorized representative) will notify the Humboldt County Coroner, in accordance with §7050.5 of the California Health and Safety Code, and the Native American Heritage Commission (NAHC) will be notified within 24 hours of the discovery if the Coroner determines that the remains are Native American. The NAHC will designate the "Most Likely Descendent" (MLD) of the deceased Native American. The MLD will recommend an appropriate disposition of the remains. If a Native American monitor is on-site at the time of the discovery and that person has been designated the MLD by the NAHC, the monitor will make the recommendation of the appropriate disposition.
- If the coroner or a tribal representative determines that the remains represent Native American internment, the NAHC in Sacramento and/or tribe will be consulted to identify the Most Likely Descendent (MLD) and appropriate disposition of the remains. Work shall not resume in the area of the find until proper disposition is complete as part of PRC §5097.98. No human remains or funerary objects will be cleaned, photographed, analyzed, or removed from the site prior to determination.

LITERATURE CITED

California Department of Fish and Game. 2008. Natural Diversity Data Base. Sacramento California.

The following mitigation measures would be implemented by DPR as part of the LRSB Restoration and Enhancement Plan.

MITIGATION MEASURE BIOLOGICAL 1 – SENSITIVE PLANTS

- Prior to operations surveys will be conducted by a qualified botanist within the project boundaries (all areas of proposed operations and adjacent areas that could be impacted where sensitive plant habitat is present). Surveys will be conducted in conformance with the DFG "Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities". Results of the survey effort will be submitted to the Senior Environmental Scientist and the DFG at least 10 business days prior to commencing operations to allow sufficient time for review of the survey effort.
- The DPR's primary means of mitigation for plants listed as Rare, Threatened, and Endangered, or which occur on the CNPS Lists 1A, 1B or 2 will be avoidance. Sensitive plant locations will be identified prior to operations and provided with a 5-meter equipment exclusion zone (EEZ) buffer. Buffer zones will be flagged with Yellow and Black Candy-striped flagging in conformance with the Districts flagging policy. No heavy equipment operation will be allowed within this zone. Restoration activities within the EEZ will be restricted to hand pulling. CNPS List 3 and 4 plants will be avoided when feasible; however, mitigation will not be required.
- Heavy equipment will enter the project area through an existing trail from the Clam Beach frontage road to the foredunes, where it will be stored at the interface of European beachgrass and Coyote brush plant series. Heavy equipment will remain onsite until the completion of each year's implementation phases, at which time that equipment will exit from where it came. Objects to obstruct the entrance to the path will be placed at the trailhead once heavy equipment moves through.
- Heavy equipment will be fueled at the start of every day at a predetermined location (western ¼ of each treatment area). Fuel will be delivered via a 4x4 truck at the start of each workday, and be administered by a fuel dispenser held in the bed of the truck. The truck carrying the fuel dispenser will enter the beach at the Clam Beach County Park vehicle entrance or through the newly created access path through LRSB. A snowy plover monitor will walk in front of the vehicle from the waveslope to/from the western ¼ of the treatment area, where heavy equipment will be fueled.

MITIGATION MEASURE BIOLOGICAL 2 – WESTERN SNOWY PLOVER

- Western snowy plover mitigation measures will be applied whenever operations are occurring in the nearshore dune habitat.
- Permitted snowy plover monitors will survey areas that work will be conducted in each day prior to operation. Snowy plover monitors will be onsite for the entire duration of operational hours to ensure that there are no snowy plovers present within the established spatial buffer zone and that they have not moved on site. If snowy plovers are observed within the spatial buffer zone of project activities, an alternative area where snowy plovers are not present will be picked.
- All staff and activities will remain in delineated project area in which presence/absence surveys will be conducted.

- Heavy equipment operations will be conducted outside of the WSP breeding season between September 15th and March 1st. All operations will occur during daylight hours.
- During the non-breeding season, a 50 meter (164 feet) spatial buffer zone will be maintained between WSP and restoration/enhancement operations. If the WSP monitor determines that operations are resulting in a behavioral disturbance to WSP then operations will be moved far enough away so as to eliminate the disturbance to the plovers.
- During the breeding season, a 100 meter (330 feet) spatial buffer zone will be maintained between WSP and restoration/enhancement operations. If the WSP monitor determines that operations are resulting in a behavioral disturbance to WSP then operations will be moved far enough away so as to eliminate the disturbance to the plovers.
- All operations will occur during daylight hours.
- Vehicles driven on the beach will be limited to 10 mph, or the minimal speed required to prevent getting stuck in sand. Vehicles will remain on the wet sand until reaching the treatment area. All vehicles will be escorted by a permitted snowy plover biologist. A snowy plover monitor will walk in front of vehicles to and from the waveslope. This will be repeated in the afternoon when work is completed for the day. There will be no night driving or driving during periods of diminished visibility.
- Trash will be contained in predator-proof containers and transported off site at the end of each workday.
- Lunch and breaks will be taken at the work site to prevent workers from disturbing plovers.
- No dogs or other pets will accompany workers to the work site.

MITIGATION MEASURE BIOLOGICAL 3 – TREES

- Hooker willow, obtained from plants currently growing within LRSB and surrounding areas will be planted in the newly created dune swales (approximately 1 hectare).
- Bishop pine seedlings will be planted in and around the existing dune forest (approximately 1 hectare).
- Planting of trees species will be implemented to achieve a 3:1 ratio with the amount of non-native trees removed during restoration activities.

MITIGATION MEASURE CULTURAL – 1

- Prior to operating in area(s) identified in the confidential 5024 document as potentially culturally sensitive, the project manager will contact the North Coast District Archaeologist at least two weeks prior to operations. The Archaeologist (or his designee) shall determine the boundaries of the sensitive area(s) and flag with black and yellow candy-stripe flagging. The Archaeologist will determine if a tribal monitor needs to be present during operations within these area(s). No heavy equipment will be allowed within designated culturally sensitive area(s).

Proposed mitigation measures to minimize take of the Western Snowy Plover under the Little River State Beach Restoration and Enhancement Plan

- Western snowy plover (WSP) mitigation measures will be applied whenever operations are occurring in the nearshore dune habitats (areas designated as open sand, sedge or European beachgrass on the attached figure 2-3).
- Permitted snowy plover monitors will survey areas that work will be conducted in each day prior to operation. Snowy plover monitors will be onsite for the entire duration of operational hours to ensure that there are no snowy plovers present within the established spatial buffer zone and that they have not moved on site. If snowy plovers are observed within the spatial buffer zone of project activities, an alternative area where snowy plovers are not present will be picked.
- All staff and activities will remain in delineated project area in which presence/absence surveys have been conducted.
- Heavy equipment operations will be conducted outside of the WSP breeding season between September 15th and March 1st.
- During the non-breeding season, a 50-meter (164 feet) spatial buffer zone will be maintained between WSP and restoration/enhancement operations. If the WSP monitor determines that operations are resulting in a behavioral disturbance to WSP then operations will be moved far enough away so as to eliminate the disturbance to the plovers.
- During the WSP breeding season, a 100-meter (328 feet) spatial buffer zone will be maintained between WSP or their nests (including scrapes) and restoration/enhancement operations (non-heavy equipment). If the WSP monitor determines that operations are resulting in a behavioral disturbance to WSP then operations will be moved far enough away so as to eliminate the disturbance to the plovers.
- All operations will occur during daylight hours.
- Vehicles driven on the beach will be limited to 10 mph, or the minimal speed required to prevent getting stuck in sand. Vehicles will remain on the wet sand until reaching the treatment area. All vehicles will be escorted by a permitted snowy plover biologist. A snowy plover monitor will walk in front of vehicles to and from the waveslope. This will be repeated in the afternoon when work is completed for the day. There will be no night driving or driving during periods of diminished visibility.
- Trash will be contained in predator-proof containers and transported off site at the end of each workday.
- Lunch and breaks will be taken at the work site to prevent workers from disturbing plovers.
- No dogs or other pets will accompany workers to the work site.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arcata Fish and Wildlife Office
1655 Heindon Road
Arcata, California, 95521
Phone: (707) 822-7201 FAX: (707) 822-8411

In Reply Refer To:
8-14-2009-3669

MAY 22 2009

John E. Harris
Senior Environmental Scientist
North Coast Redwoods District
California Department of Parks and Recreation
P.O. Box 2006
Eureka, California 95502-2006

Subject: Requested Technical Assistance and Pre-Public Review of the Draft Little River State Beach Restoration and Enhancement Plan, and Associated Draft Mitigated Negative Declaration

Dear Mr. Harris:

We received your request for Technical Assistance (TA) on the subject plan on October 22, 2008. Subsequent to your request, we received a request on December 2, 2008, from your staff to review the plan and its associated draft Mitigated Negative Declaration (dMND). Lastly, we received your April 29, 2009, electronic message clarifying a portion of the project description. At issue is the potential affects of implementing the proposed plan on the Pacific Coast western snowy plover (*Charadrius alexandrinus nivosus*), a federally listed entity currently occurring within the project area. The Pacific Coast population of the western snowy plover (plover) is federally listed as threatened. The project area has been designated critical habitat for the plover; however, since there is no Federal nexus for the proposed project, impacts to designated critical habitat will not be considered in this TA. The affects of the proposed project on critical habitat may be considered under future projects that have a Federal nexus, and require section 7 consultation with the Federal action agency. The project area is habitat for the federally listed endangered beach Layia (*Layia carnosa*); however, beach Layia has not been observed during plant surveys at that location in recent years.

Your request for TA proposes some changes to operational procedures and minimization measures used previously for similar activities within western snowy plover habitat at Little River State Beach. The follow-up request for TA of the pre-Public review for the draft Little River State Beach Restoration and Enhancement Plan (Plan) and dMND outlines the actions that the North Coast Redwoods District intends to implement at Little River State Beach. You request that we identify concerns regarding potential impacts to federally listed species, and provide measures that avoid or minimize impacts. Our comments and suggestions are supplied below.

General Comments:

- We commend State Parks for improving conditions at Little River State Beach, and appreciate the opportunity to coordinate with you regarding federally listed species and their supporting habitat.

- We understand and appreciate the objectives of the proposed project, and State Parks' efforts to balance the needs of user groups and resource management.

- We encourage State Parks to regulate the intertidal zone at Little River State Beach in a manner consistent with other Park units throughout California. We believe less enforcement of Park regulations would be required to manage a vertical delineation (i.e. east to west) of the Park's southern boundary than attempting to get compliance in the Park above the wrackline, where regulations differ from those activities currently allowed on wetted sand. A horizontal signing of the Park's western boundary provides additional perch opportunities for snowy plover predators, giving them an unnatural surveillance point over much of the beach. Signing a vertical southern boundary as we recommend, reduces the overall number of potential perch sites, allows predators a vantage point over less beach than a horizontal line of signs along the western boundary, and would likely increase compliance with Park regulations by having the intertidal zone managed consistent with the remainder of the Park and other coastal units within the State Park System.

Specific Comments:

1. The proposed minimization measures for snowy plovers are similar to those used in the past for projects comparable to the proposed project, at the same location. However, State Parks proposes to use a 50 meter buffer zone (distance between plovers and heavy equipment) during the non-breeding season, whereas 100 meters has been used year-around in the past. You propose 50 meters based on observations of plovers by monitors during past projects using similar heavy equipment. Monitors observed snowy plovers entering an active worksite within 50 meters of machinery, prior to the shut down of equipment as agreed to under the 100 meter buffer zone measure.

   We concur with the modification of this measure, provided that plover monitors are aware that there is no authorization for take of plovers. Our past TA recommending 100 meters was based on limited observations near heavy equipment on other projects. Because plover monitors at Little River State Beach have additional data indicating that no take will occur at 50 meters, we therefore concur with your no take determination as it

applies outside of the breeding season. However, if plover monitors observe avoidance behavior to machinery or other project-related activities by plovers at less than 100 meters, then the monitors must have the authority to increase the buffer zone back to 100 meters to avoid take.

2. The proposed project will use heavy equipment between September 15 and March 1; outside of the plover breeding and rearing (i.e. reproductive) season.

   We suggest that the non-breeding season be defined as September 15 through February 15, as courtship and pair bonding can occur in our area in February. Copulation and scrapes have been observed in February as well. Therefore, to avoid take, we suggest using the larger 100 meter buffer zone after February 14th, and avoiding use of heavy equipment between February 15 and September 15.

3. We do not support the use of a boardwalk at Little River State Beach. We believe that the boardwalk will result in loss of habitat for native plants and the plover. Shading, provided by the boardwalk, may prevent native dune mat vegetation from becoming established. The boardwalk will likely stabilize dune habitat, lessening the importance of a dynamic sand dune system. The circular nature of the proposed trail will likely prevent plovers from using the area near and within the boardwalk loop due to disturbance from human activities. Plovers have nested and reared chicks in the vicinity of the proposed boardwalk in the late 1990s and early 2000s, prior to the intrusion of European beachgrass (*Ammophila arenaria*). The boardwalk may be a vector for unauthorized uses, such as bicycles (or motorcycles) and skateboarding. The boardwalk will likely be high maintenance; requiring frequent sand removal and repair from vandalism or misuse. We base our opinion on vandalism sustained to plover excloures in the past, a disregard for regulations on State Park and County Park lands, and photo-evidence of vehicles, dogs and visitors destroying snowy plover nests on adjacent County Park lands. We believe that the user group for both the County and State Parks is largely the same, and therefore believe that actions documented on County Park managed areas are likely to occur on State Park lands.

4. The design of the equestrian trail is likely to result in non-compliance with Park regulations. We suspect that some equestrians will continue to the Little River, and circle down to the surf zone along the river's southern bank. Dogs often accompany equestrians, and we believe this will continue to the back dunes along the equestrian trail, inviting a regulatory and management issue for the Park. Depending on the frequency and extent of use, the equestrian (and dog) use may preclude plovers from using restored back dunes.

5. We suggest that the existing "way trails," not proposed as permanent trails, be restored to direct human use away from dune mat and potential plover nesting areas.

6. "Hard" signs and structures, such as kiosks, should discourage perching by corvids and gulls; both of which are known nest predators. These "hard" structures should also ideally preclude perching by raptors that may feed on plover chicks and adults. "Nixalite", or porcupine wire, may be used to preclude the use of signs and structures as perches; however, other methods may be equally effective. We have found the installation of porcupine wire on "flexible" carsonite posts to be impracticable. Such

posts generally move too much to be effective perch sites, and are lower to the ground, making them less desirable to corvids and raptors than other perches.

7. We suggest that State Parks commit to increased law enforcement patrols and public outreach to educate user groups and ensure the level of desired resource management is obtained.

8. We encourage State Parks to continue to work closely with County Public Works to accomplish mutual management goals.

Conclusion:

We do not believe that implementation of the proposed Little River State Beach Restoration and Enhancement Plan would result in take, provided that installation and maintenance activities for the proposed facilities and infrastructure are conducted outside of the snowy plover breeding season; including the courtship period provided in our comments, and there is compliance with Park laws and implementing regulations.

This TA does not authorize take of snowy plovers, whether incidental or purposeful. We encourage the Park to use all of their authorities to maximize improvements for snowy plovers and other wildlife, and the habitat for which they depend. We believe that consistency in regulations and their enforcement between coastal Park units throughout the California State Park System will result in an increase in compliance because visitors will know what is expected of them.

We appreciate the opportunity to review and comment on your advance plan, and to assist you with plover management. We believe our comments will assist State Parks at avoiding take of federally listed species. If you have questions regarding our comments on your proposed project, please contact Jim Watkins of my staff at (707) 822-7201.

Sincerely,

Randy A. Brown

Randy A. Brown
Acting Field Supervisor

4 of 4

Pilot Project for Assessment of Sand Movement Following Vegetation Removal Little River State Beach, Humboldt County California

Prepared for California State Parks
North Coast Redwoods District

By
Patrick R. Vaughan, Engineering Geologist and Rocco A. Fiori, Engineering Geologist

October 2007

INTRODUCTION

The North Coast Redwoods District (NRCD) has proposed restoration of the Little River State Beach (Figure 1) ecosystem, largely through the mechanical removal of exotic vegetation (primarily *Ammophila arenaria,* hereinafter referred to as *Ammophila*). Potential issues surrounding the physical aspects of the project include blowing sand inundation of nearby public infrastructure, road corridors and wetlands, increased vulnerability of the infrastructure to oceanic hazards that might result from removal or changes in existing dune barriers, and estimation of restoration technique that would most rapidly and accurately mimic natural physical processes. The early conceptual vision for the project included mechanical removal of all exotic vegetation across the width of the beach; this design would have increased exposure of the nearby infrastructure to sand movement and oceanic hazards. As a result it was imperative to have some understanding of the physical processes operating on the beach. Following the earliest design proposals and since the initial monitoring period for this project new designs have been proposed that will retain most of the backdune topography and native vegetation (e.g., coyote brush and beach pine series, Figure 2). The modified conceptual design should decrease the potential exposure of the infrastructure (compared to initial proposals) though this study remains important to assess and document rates of change that could occur from the project and to provide information to fine tune the final conceptual design.

The NCRD initiated a pilot project for removing *Ammophila arenaria* with heavy equipment during the late winter of 2004-2005. The pilot project had many facets for analysis; this report focuses on the physical changes that resulted from the pilot project. The general physical setting and conceptual physical hazards associated with the site was described by Vaughan and Fiori (2004).

It should be noted that this study captures only one year of data in a very dynamic geologic setting. The study period captured a winter with above normal rainfall (~150%) and there was large surf that challenged the restoration plots; average wind frequency and velocity over the project period was slightly below normal. We believe that the data reflects a period within an "average" range of expected climatic conditions and can be used to extrapolate current "average" conditions over the next several years.

We strongly caution the reader that extreme oceanic or tectonic events could affect these results and that climate models indicate both warming and more precipitation over the next 80 years in northwestern California (Kuepppers et al., 2005). Climate change could affect vegetative response and other parameters that could influence the average trends predicted by this analysis (we factor some of these items into overall risk associated with the project). Though we are not climatologists we note that the explosion of *Ammophila* on North Coast beaches has occurred during a period global climatologists describe as the warmest in at least 400 years, even though *Ammophila* has persisted for over a century on some North Coast beaches (however, we did not investigate specific North Coast climate trends over the previous century).

2 of 18

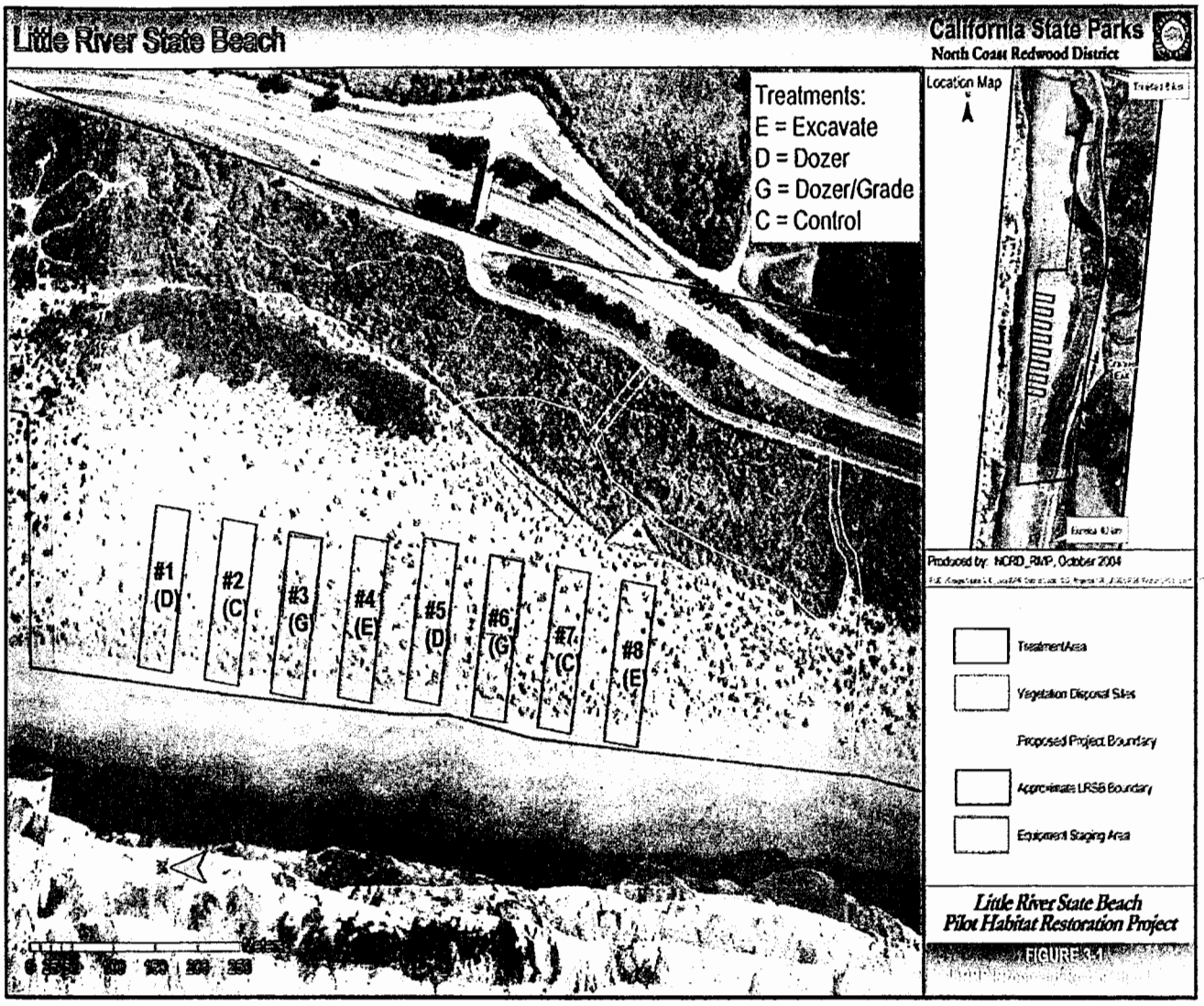
METHODS

AEOLIAN EFFECTS

Because there was little empirical data for assessing the change that might result from the mechanical treatments in this particular setting, and to diminish risk during the early analysis phase, sites were selected that were comparatively removed from existing infrastructure. A total of eight restoration plots in the nearshore dunes were developed, two each for three mechanical treatment methods (Dozer, Excavator, and Grade) and two untreated control plots (Figure 3). The 150 meter by 40 meter (492 feet by 131 feet) rectangular plots were oriented so that their long axes (roughly east-west) were roughly perpendicular to the surf and oblique to the prevailing wind direction (roughly N44W).

The Grade treatments employed a dozer to remove *Ammophila* and grade the foredunes to an approximate 3 percent slope, smoothing the foredune sand landward until the sand supply was exhausted. This resulted in a shore parallel break-in-slope in the middle of the plot. The deflation planes, which occur approximately in the eastern two-thirds of the plot, were flattened so that it virtually had not relief. For the Dozer method a dozer with a brush rake attachment was used to remove *Ammophila* while attempting to retain the existing macro topography to the maximum extent possible. Similarly, for the Excavator method an excavator was employed to pluck *Ammophila* from the dunes while attempting to maintain the existing macro topography. In both the Dozer and the Excavator treatment plots, dozers were used to create two blow outs per plot in the foredune. Each blow out was approximately 3 to 7 meters (10 to 23 feet) wide and slightly above grade. The intent of the blow outs was to mimic natural foredune conditions.

Two disposal methods were originally proposed in the pilot restoration plan, one which involved the removal of *Ammophila* to an off-site facility and a second that involved on-site disposal. The off-site disposal proved to be infeasible due to the inability to separate the *Ammophila* from the sand. The on-site disposal method originally consisted of three disposal sites that were identified within the project area where the *Ammophila* would be buried a minimum of about 1 meter (3.3 feet) under clean sand. Two of these disposal sites were within the Grade treatment plots just behind the foredune. Here, the *Ammophila* that was removed from the site was buried up to 2 meters (6.6 feet) deep within the plot before final grading. The third burial site was located in the backdunes; however, due to a high water table sufficient depth could not be obtained in the disposal pit. Therefore a third method was employed where the *Ammophila* and sand were pushed through the back (east end) of the plots by a dozer and integrated into existing dune ridges outside of the plots. The piled vegetation was mixed with sand and masticated during transport; this mixed pile visually appeared to have little change in topographic form over the monitoring period. From this, and its



generally downwind location, we conclude that the organic matter acted as a mulch to help arrest this potential sand source and thus it did not have a significant impact on the plots.

We used a TOPCON GTS-212 electronic total station to measure elevation data across the eight plots shortly after the mechanical treatments. In general, staff measured visually significant breaks-in-slope that exceeded 0.3 to 0.6 meters (1 to 2 feet) along distinguishable dune forms. Sufficient data was collected at interdune areas to demonstrate the general character of the landform and to demonstrate that these areas had been considered in the mapping effort. We collected data from the entire plot and generally in a perimeter about 10 meters (~30 feet) outside of the plot, as we expected some change outside of the plots as sand escaped the plot in response to the vegetation removal.

There were three periods of detailed topographic survey. The first survey occurred as soon as practicable after the heavy equipment treatments (late winter of

4918

2004-2005) to provide baseline data. The second survey, in the fall of 2005, captured changes following the dominant period for prevailing northwesterly winds and before winter storms might affect the sand balance in the plots. The third survey, in the late winter and early spring of 2005-2006, provided data for an annual comparison. All data were referenced to known temporary benchmarks on the County road and tied into a permanent benchmark on the Highway 101 bridge across Little River.

We initially had a crew of two and sometimes three resources staff to complete the field surveys. The late winter 2004-2005 and fall 2005 survey crews had at least one member that had experience on three to four previous survey projects. The late winter 2005-2006 survey generally had no highly experienced staff members, though the survey crew was trained in the data collection techniques. Due to staffing shortages some of the data collection occurred over a few weeks for each survey interval. Therefore the comparative response intervals for the individual plots are not identical. We regard this difference to be insignificant in light of natural variability affecting the project.

Because of data collection and possibly some instrumentation error, some of the raw data were rotated from their true position; these errors were rectified with a generally high degree of confidence using detailed field notes during the processing phase of the analysis. The data from each period of survey were modeled using a TIN and kriging to capture the topographic forms and to extrapolate the data to areas with comparatively less coverage. The elevations between various periods of survey were compared to demonstrate areas of change over the period in question. The tolerance for the comparisons were set at 0.25 meters (0.82 feet), indicating that areas with less than this amount of change would display no change, which is reasonable given the tolerance on the data collection.

We also assessed aerial photography including newly discovered aerial photography obtained in 1988, just as the most modern *Ammophila* field began to take hold in the embryo dunes seaward from the coastal scrub vegetation. We also measured varves (individual growth layers of sand [assumed to be the equivalent of annual growth rings on a tree]) observed in the foredunes from mechanical cuts in the treatment plots to help corroborate the numerical analysis from the survey data.

Using tape and clinometer measuring techniques we developed a representative topographic profile across a prominent linear dune ridge that postdated the 1988 aerial photography for comparison with the more detailed information developed during plot measurements. We tape measured the maximum amount of wind blown sand movement observed in a dune form to estimate a maximum movement rate from the plots. We visually compared the results of our modeled topographic change surveys to actual field conditions and visually re-evaluated the changes over the last few years on the beach below the vista point at the south end of Clam Beach County Park.

SURF EFFECTS

We estimated wave run-up into the plots over the project period by examining the extent of logs, sticks and other beach debris that clearly had an oceanic origin and that were deposited over the initially debris limited plots. We visited the site shortly after a known period of wave run-up challenged the plots to observe the extent of continuous soil moisture within the plots that could only be attributed to wave run-up. We also visually monitored the plots during one of the major winter storms of the winter of 2005-2006.

SETTING AND ASSUMPTIONS

The eight plots are located in the nearshore dunes (consisting of the foredune and deflation plain) in the northern two-thirds of Little River State Beach, south from Little River. The volumetric comparisons focused on the four northernmost plots, one each for the three mechanical treatment styles and one untreated control plot. The most deflated portion of the eight plots (eastern half to quarter of the plots) typically had some quantity of water during rainy periods. The persistence of the water and its areal extent within the plots generally increased to the north. Soil moisture can inhibit wind blown sand movement (Gill, 1996). While this factor may have affected the results, our visual estimation of the water extent and review of monitoring photos from the winter period suggests that soil moisture differences did not substantially affect the aeolian results for the four northernmost plots. Our field observations of flow and visual assessment of the areas of change shown by the results (subsequent section) also suggest that there is an element of fluvial erosion of the sand on the east end of the plots that retained some component of their original topography. This should be considered in the overall analysis to estimate transport rates from the foredune to the backdunes; however, for comparative purposes of the treatment styles we assumed fluvial erosion to be equivalent at the measured plots (however, note that the grade plot did not have significant relief at its east end).

We also assumed that the critical fetch required to generate sand movement from the beach and into the foredune area and the prevailing winds were approximately equivalent (N44W) for the northernmost plots (there is a slight, progressively westerly swing in the prevailing wind going south along the beach due to the diminishing effect of Trinidad Head). Because there is a 40 meter (131 foot) wide strip of semi-continuous *Ammophila* between each of the treatment plots we also assumed that sand blown out of the plots would be captured by the vegetation before reaching the adjacent plot over the life of the monitoring period. We also assumed that volumetric change over the plots reflects roughly horizontal transport of sand in or out of the plot and does not reflect vertical consolidation of the sand over the monitoring period. This is a conservative assumption in that it will tend to maximize the estimated rate of sand transport, which is important for assessing the risk to infrastructure.

The distance between the foredune and the surf zone decreases somewhat to the south, making these sites more amenable to assessment of surf effects. Assessment of surf effects is more important in the southern part of the project area because of the lesser distance from the County road and paved parking lot to the wave slope.

RESULTS

PLOT CHANGES

The volumetric changes for each of the four plots revealed some mildly surprising results (Table 1). For example, the control plot actually had a decrease in sand volume over the approximately one year monitoring period (-0.03 meters^3/meters^2/year [$m^3/m^2/yr$]). The grade plot (0.04 $m^3/m^2/yr$) and dozer (0.05 $m^3/m^2/yr$) treatment plots had similar flux, while the excavator plot, which retained the most topography, had more than double the flux rate of the other plots (0.11 $m^3/m^2/yr$).

AIR PHOTO OBSERVATIONS

We examined rectified aerial photography from 1974 and a newly-discovered, enlarged print aerial photograph, from 1988, of the project area Figure 4. We also compared the 1988 photography with photography taken in 2000 (the year 2000 example of aerial photography is not shown but photographs of slightly later and earlier vintage are depicted on figure 4). This examination placed the 1974 vegetated dune extent slightly west from the current major wetland area (no clear major wetland area existed at that time). By 1988 the vegetated dunes had retreated slightly east from the current primary backdune ridge. The 1988 photography revealed a sheet of embryo dunes that extended from the wave slope to the area occupied by the current major wetland; a few isolated mats of dune vegetation extended across the beach, with slightly greater concentrations of scattered dune vegetation within the east side of the embryo dune complex. The major wetland still had not developed at its current location in 1988. Comparison of the 1974 and 1988 photography showed that the somewhat stable vegetated dunes (vegetation type not identified) extended about 100 meters (~330 feet) farther seaward in 1974, indicating that this vegetation was eroded by surf attack and/or consumed or buried by a pulse of sand during this period. From this comparison it appeared that the beach prograded westward (widened) about 120 meters (~395 feet) between 1974 and 1988 (8.6 meters [~28 feet] per year).

The 2000 photography revealed that the embryo dunes observed in 1988 had been replaced with a semi-continuous sequence of vegetated dunes and locally

7918

Table 1. Treatment method calculations.

Treatment style/plot #	Measured flux ($m^3/m^2/yr$)	Adjusted flux [1] (A) ($m^2/m/yr$)	Target storage compartment (central or south) area [2] (B) (m^2/m)	Time to fill one target compart-ment at flux rate - (B/A=C)) (yrs)	# of plot boxes (D) (fore dune to target)	Profile volume source - time to fill (CxD= E) (yrs)	Source volume adjust-ment [3] (Target area to north/tar-get area) (F)	Prevailing wind volume source - time to fill (ExF =G) (yrs)	Range for filling (E to G)(yrs) Rounded to nearest 5 yrs
Dozer plus excavator (1)	0.05	0.08	Central 1.95	24.4	4.5	109.8	.96	105.4	105-110
Dozer plus excavator (1)	0.05	0.08	South 0.94	11.8	2	23.6	2.07	48.9	25-50
Grade (3)	0.04	0.07	Central 1.95	27.9	4.5	125.6	.96	120.6	120-125
Grade (3)	0.04	0.07	South 0.94	13.4	2	26.8	2.07	55.5	25-55
Excavator (4)	0.11	0.14	Central 1.95	13.9	4.5	62.6	.96	60.1	60-65
Excavator (4)	0.11	0.14	South 0.94	6.7	2	13.4	2.07	27.7	15-30

1) Measured flux less flux within control plot

2) Derived from Figure 3 in Vaughan and Fiori, 2004

3) Based on orientation of prevailing wind with respect to profile and target location.

Figure 4. Sequential aerial photography at Little River State Beach (the red line delineates the property boundary).

deflated areas. A distinct backdune ridge near the eastern edge of the 1988 embryo dune sequence had developed, as well as the major wetland fronting the backdune ridge. The densely vegetated primary backdune ridge extended about 30 meters (~100 feet) seaward from the eastern edge of the active embryo dune sequence observed in 1988. By 2000 a foredune had also developed about 275 meters (~900 feet) seaward from the west edge of the current wetland. We estimate that the beach/dune complex prograded about 65 meters (~215 feet) between 1988 and 2000 (5.4 meters [~18 feet] per year). Between 1974 and 2000 the total progradation was about 185 meters, yielding a rate of about 7.1 meters (~23.3 feet) per year.

As part of the preceding analysis we measured the distance from a fixed location (the Crannell overpass over Highway 101) to the foam line observed in the surf on each air photo. While the measurement technique itself was consistent, the location of the foam line is dependent on many variables, such as wave energy, shape of the beach at the time of the photo, and tides, in addition to simple measurement error. As such the analysis should be viewed as a first approximation of measurable change. We therefore reviewed a more rigorous analysis of the entire California coastline by the United States Geological Survey (Hapke et al., 2006). This study examined both long term (mid-1800's to 2000) and short term (about 1970 to 2000) rates of coastal change, using rectified historical maps, air photos, and LiDAR. Hapke et al. developed an algorithm to examine error caused by the confounding factors in comparing measurements from various time periods, such as tides. Their analysis yielded a long term rate of accretion at Little River State Beach of about 2.5 meters per year and a short term rate of about 4.7 meters per year. They also estimated a regional measurement error of about 0.4 meter per year from this analysis. The 4.7 meters per year estimate is substantially less than our single point of reference for the entire period of air photo analysis (1974 to 2000, 7.1 meters per year) but comparable to our measured rate from 1988 to 2000 (5.4 meters per year). However, they also recognized that local error could be significantly greater than their regional estimate, particularly along beaches with gentle slopes, like Little River. Because of the rigor of their analysis the progradation rates proposed by the USGS should be used for initial reference; however, future monitoring should consider that local error may be high at this location and that shorter term accretion rates in the 5 to 7 meter per year range may be reasonable. Our air photo analysis also is consistent with another study at Gold Bluffs Beach where the rate was comparatively higher from the mid-1970's to the late 1980's and has since slowed, albeit at a still high rate of accretion (Vaughan, 2006).

FOREDUNE VARVE ACCUMULATION

Observation of the beach below the viewpoint at the south end of Clam Beach County Park in 2006 revealed a fairly dense network of *Ammophila* had reinvaded a nearly bare beach and embryo dune complex documented by 2001 aerial photography. While the recolonized *Ammophila* had not yet reorganized into a distinct foredune, it was trapping sand that locally had some aspects of an incipient foredune. This data supports the inference that *Ammophila* can begin having a significant effect on sand movement within about five years. State Park Environmental Scientist Amber Transou reported no *Ammophila* below the viewpoint about three years ago (personal communication, 2006), indicating that *Ammophila* can have an effect on sand transport

ID 418

within three years of sprouting. Transou's more limiting observation is likely more accurate.

In early 2005 we counted several distinct layers in representative mechanical cuts through the foredunes. Measurement of dune crest elevations on our three profile measurements near the plots (Vaughan and Fiori, 2004) revealed elevations of about 2.1, 3.2, and 4.2 meters (6.9, 10.5, and 13.8 feet), increasing northward (i.e., where the sand supply from Little River appears more accessible). We infer that each layer reflects an annual deposit of sand that was trapped during each *Ammophila* growth period. Generally, each of these layers had a thickness of about 0.1 to 0.2 meters (4 to 8 inches) in the middle of the treatment plots, the general vicinity of the dune crest measuring 3.2 meters (10.5 feet). Using the observed layer thickness range we find the following: the 2.1 meter (6.9 feet) dune could have formed in 10.5 to 21 years; the 3.2 meter (10.5 feet) dune could have formed in 16 to 32 years; and the 4.2 meter (13.8 feet) dune could have formed in 21 to 42 years. The 1988 air photo revealed no pronounced foredune; therefore the maximum age of the foredune is about 17 to 20 years (1988 to 2005, plus three years of incipient accumulation [using the vista point example]). All of the calculated rates for the development of each dune crest fall or nearly fall within the predicted range for foredune development calculated from the 1988 aerial photography limiting age and observations of *Ammophila* sprouts' effect on sand transport. More detailed investigation of each dune cut may have improved this age correlation at specific sites.

The primary backdune ridge crest, which post dates 1988 and is roughly coincident with the profile showing a foredune crest of about 3.2 meters (10.5 feet), had a measured elevation of about 3.3 meters (10.8 feet) in 2006. These data indicate a minimum vertical accumulation rate of 0.18 meters (0.6 foot) per year, within the range suggested by varve observation at the foredune, though clearly with a different sand source area (the nearshore dunes, rather than the beach).

Maximum Dune Front Migration

We measured one 0.9 to 1.5 meter (3.0 to 5.0 feet) thick dune lobe extending southeast from the grade plot as migrating a maximum of about 12.2 meters (40.0 feet) between February 2005 and July 2006, a maximum rate of about 0.75 meters (2.5 feet) per month. While this movement was the maximum observed in association with the heavy equipment work, it should be noted that the sand was over running areas that contained *Ammophila*, which could have retarded its migration.

Previous and Recent Beach Profile Work

As part of our earlier beach profile work we measured the amount of cut and fill that would result from restoring (i.e., flattening) the beach seaward from the more prominent back beach dune ridge (Vaughan and Fiori, 2004). This cross sectional profile had units of meters^2 to calculate area. We showed the area of fill that might result from sand blowing into the backdune area in units of meters^2/meter (m^2/m) for each of the three profiles to forecast the extent of dune burial in the backdune. This resulted in an estimated fill storage area of 0.94 m^2/m for the southernmost profile (by the parking lot), a fill storage area of 1.95 m^2/m for the central profile (which bisected restoration plot seven) and a fill storage area of 1.87 m^2/m for the northernmost profile

11418

(just north of restoration plot one). These profile results balance cutting from the nearshore dunes and filling (storage areas) in the backdunes within the plane of the profile, which is oriented more westerly than the prevailing wind direction.

We also calculated a fill rate to create the backdune ridge that we measured in June 2006. We found a vertical varve accumulation rate of about 0.18 meters/year (~7 inches/year) at the crest of this dune (see foredune varve accumulation rate). We found this post-1988 dune had an area of 0.69 m^2/m or a maximum accumulation rate of about 0.04 $m^2/m/yr$ over the last 18 years.

SURF OBSERVATIONS

The largest run-up reported during the project observation period occurred on March 9, 2005. This event was not associated with any particular storm observed on the coast, though-off shore storms and a relatively high tide (7.5 feet in Trinidad) may have accentuated the run-up. Run-up did not extend significantly past the eastern edge of the cuts in the foredune in any of the plots, except for plot four (excavator treatment), where the run-up extended nearly through the entire plot (about 115 meters [~375 feet] past the foredune). This site is in the middle of the treatment area and thus had an average distance from the wave slope (in comparison with the closer southern plots and the more removed northern plots).

ANALYSIS

AEOLIAN EFFECTS

The profile storage areas are oblique to the predicted sand sources. Because the Stanson property lies to the northwest, the receiving area at the northernmost profile will not be greatly affected by removal of vegetation on State Park land. Thus we used the storage areas at the central profile and the southernmost profile, in combination with the flux rate from the three treatments and the travel distance from the source areas to their targets, to estimate how long it would take to fill the potential storage areas. To facilitate comparison between a volume and areal measurement we assumed that the plots had an equal thickness of change over the entire plot (this is not accurate over the shorter duration of this monitoring period but is more accurate over the longer term and in the face of a uniform treatment style over the entire beach). Because we assume unity (or one) as the area of the equivalent thickness change in the plots we can convert our flux rate (in $m^3/m^2/yr$) to m^2/m (the storage area metric units) to see how long it would take to fill the storage areas. Our observation of the topography at the backdune ridge indicates that the topography in the third dimension has some uniformity, supporting this assumption. The three-dimensional storage compartments extend into the area behind the primary backdune ridge but are still generally removed from infrastructure, with the exception of the southernmost storage compartment. The centerline of any storage compartment is the storage (i.e., fill) area on the relevant profile line (see Figure 3 in Vaughan and Fiori, 2004). The compartment's lateral extent is approximately defined by the mid-point between the profiles as observed in plan view (see Figure 2 in Vaughan and Fiori, 2004), although the sand source areas are progressively farther north from the respective profiles as one travels seaward (because of prevailing winds).

12418

For this exercise we took the three flux rates and assumed that a restoration area was directly upwind from its target, in this case the central and southern compartments. We then measured the distance from potential restoration areas to their respective targets, to calculate how long it might take to fill the storage areas if the beach was relatively unvegetated. We have estimated a range of times for filling each of the two analyzed storage compartments to account for the greater potential volume of sand the profile data shows lies northwest from the profiles, rather than directly on the profile line. This analysis addresses sand that was actually stored at the foredune, within the plots or seaward from the backdune ridge between 2004 and 2006. Sand that is delivered to the beach in the future will likely continue to accumulate in the vicinity of the storage compartments – this is addressed in a later section.

We assume that the losses in the control plot largely result from fluvial erosion and possibly greater deflation at the back edge of the plot (these losses may have actually been greater as the control plot results integrate gains in the foredune but to simplify our analysis we have used the overall control plot result). Although we assumed fluvial erosion over the monitoring period to be equivalent for all of the measured plots, we anticipate that fluvial erosion and deflation will diminish in the dune swales as embryo dunes develop after the treatments and begin to bury and smooth the topography (c.f., the 1988 air photo). Therefore, one other adjustment that we made was to subtract the losses observed in the control plot from the other treatment methods to determine a final flux rate (e.g., the dozer plot [0.05 $m^3/m^2/yr$] minus the control plot [-0.03 $m^3/m^2/yr$] = 0.08 $m^3/m^2/yr$). This seems reasonable as the maximum accumulation rate for the primary backdune ridge that developed since 1988, largely from deflation of the dune swales, is 0.04 $m^3/m^2/yr$. We divided each respective storage area by the flux rate for each treatment style (e.g., 0.94 m^2/m [for the southern storage profile] divided by 0.08 $m^2/m/yr$ [for dozer] = 11.8 years) to determine how long it would take for the measured rate in the cross sectional line of a plot to fill the storage areas identified along the previously obtained long profiles (Vaughan and Fiori, 2004) – because we assumed uniformity in the third dimension, this also applies to volumetric calculations. We then measured the number of plots (i.e., graphic measurement of the number of plot outlines) that would need to be filled between the storage area and the foredune in the direction of the prevailing wind (e.g., 2 for the southern profile storage area). This number was multiplied by the duration of filling for one storage profile (e.g., 11.8 years x 2 = 23.6) to calculate the time needed to transfer the sand from the foredune and to fill the target storage area with the estimated source volume within the plane of the profile. To provide a range to account for the increasing sand volume to the north we multiplied that result by the ratio of the calculated storage area of the profile to the north to the calculated storage area within the target profile (e.g., central storage [[1.95 m^2/m] divided by southern storage [.94 m^2/m]] x 23.6 years = 48.9 years – say 50 years). Note that this final calculation will result in a substantial change in elevation in the stored material when compared to the storage areas shown in our earlier report (Vaughan and Fiori, 2004), being much higher in the southern storage area and slightly lower than shown for the central profile (we have disregarded the northern profile storage area because there will not be much treatment area on State Parks land northwest from that profile). The stability of the higher southern profile storage area at higher elevations

13 of 18

may be difficult to maintain at substantially higher elevations without intervention (see following discussion).

Using these criteria we find the following durations will be needed to fill the central storage area (by treatment technique): dozer -105 to 110 years; grade - 120 to 125 years; and excavator - 60 to 65 years. The southern storage area results show: dozer – 25 to 50 years; grade - 25 to 55 years; and excavator - 15 to 30 years. Final results for all calculations were rounded to the nearest five years.

To help constrain a more extreme case we calculated the travel time for the largest, clearly visible dune front that resulted from the treatments (grade plot, ~0.75 meters/month [~9 meters/year]; we visually estimated the dune front to measure ~one m^2/m). Because the accumulation appeared to be related to its proximity to the wave slope and currently active embryo dunes we used the area just inside the southernmost cut in the grade plot as the source location for this material. Other than this exception we generally used the same assumptions as used for the flux rate in terms of travel to and filling of storage areas. We did not use a ratio comparison of the storage areas because our estimation of the dune front area is based on direct observation. For this extreme example the sand from the grade plot would fill the southern compartment in about 25 years and the central compartment in about 90 years. Substantial filling of the respective compartments from foredune sources would begin in about 10 to 15 years and 30 years.

SURF RUN-UP

The plot number four treatment method (excavator) resulted in a slot in the foredune; this would tend to provide more impetus to surf that broached the slot. Retention of differentially lower topography east from the foredune likely encouraged surf that crossed the foredune to retain momentum and travel farther into the plot. If similar magnitude run up occurred in the southernmost plot (the narrower part of the beach) it would have fallen about 30 meters (100 feet) short of the backdune ridge.

DISCUSSION

Our estimates are based on simple volumetric calculations using empirical data from a one-plus year study. We have not estimated the frictional forces that might retard the migration rate while the sand over runs the existing coastal shrub vegetation, nor the potential release of sand that could occur if the coastal shrub was rapidly consumed. We imagine that there are other variables that could and will affect the final migration rate. However, the accumulation rates that we have observed and measured since the 1974 aerial photography are generally supportive of our findings.

Our visual observations of the measured plots and the graphic results of the changes indicate that unvegetated, higher topographic points received substantial deflation. We infer that this helps explain the doubling of the flux rate in the excavator treatment plot (attempted to retain existing topography), in comparison with the other two treatments, which either smoothed out or had more effect on the existing topography.

We walked through the target areas that might be affected by sand release and observed that the primary backdune ridge has a windward slope of about 24 degrees.

Slopes of 20 degrees or more are likely to intercept all but the finest sand (White and Tsoar, 1998). The slope will likely be able to maintain that angle either because of its currently dense cover of *Ammophila* or its proposed future cover of native vegetation. This dune ridge is more discontinuous and lower to the south. It is likely that some sand will be able to scale the ridge or travel through gaps in the dune more easily in this vicinity. Ideally, the sand would be stored as far from the infrastructure as reasonably possible to minimize the risk for offsite effects and possibly to minimize the impact to the existing coastal scrub vegetation. At the same time storing the sand more seaward will subject it more frequently to extreme oceanic events. However, we note that the back beach dune ridge that post dates 1988 actually prograded seaward as it was colonized by *Ammophila* and coyote brush and did not appear to be directly eroded by surf, at least recently.

One way to initially protect the coastal scrub, and possibly new plantings closer to the infrastructure, from the first pulses of sand would be to pile the masticated sand and *Ammophila* into the lower gaps in the prominent dune ridge. This technique was used successfully during the pilot project. This technique would help provide disposal, provide a mulch to help bind the relocated sand and provide an initial protective barrier to surf attack after the beach is lowered. This barrier is sufficiently removed from the wave slope so that attack will be sporadic (once the beach is opened up the largest run-up event we observed during the monitoring period would likely fall short of or barely reach such a barrier at the south end of the beach). Using the example of the backdune ridge that post dates 1988, this type of a barrier would tend to build seaward and initially diminish the potential for sand to over run the existing dune vegetation.

Based on our flux calculations the central compartment appears to have a very low risk for sand to migrate to areas of sensitive infrastructure within the effective design life of most engineered structures (50 years for most buildings – a road corridor requires some additional consideration however). The southern compartment has a moderate potential for sand to fill it within 50 years (depending on treatment style). Using maximum travel rates observed during the monitoring the compartments could fill within about half of the time reported by the flux rates – we do not consider this to be a representative measurement of how the site will initially respond over time. However, this rate should be considered in the timing for having some robust vegetation or barriers on site designed to begin intercepting more substantial quantities of wind blown sand (~10 to 15 years as a worst case under "average" conditions).

Our calculations mainly address sand that is currently in the nearshore dunes (between the foredune and primary backdune ridge). Sand accretion on the beach appears to have increased significantly after the 1964 flood. The average rate of accretion has slowed slightly in the last couple of decades, consistent with the pattern observed at the south end of Gold Bluffs Beach (Vaughan, 2006) though at lesser magnitude and with more recent reductions in accretion rate at Gold Bluffs Beach. Assuming a relative reduction in the accretion rate pattern persists, the aeolian accumulation rate will also decay over time. However, after sand from the treatment area is stored, additional sand will likely continue to fill the storage compartments as the beach continues to build seaward. Ideally, new and successive primary backdune ridges will migrate seaward with the accretion, thus creating new storage areas.

15 of 18

Evidence of this pattern was observed at the South Spit, where there are multiple backdune ridges.

In the event sand does migrate past the primary backdune ridge, the current restoration plan calls for creation of dune swales, which will include the planting of willows on the seaward side of the swales on the south end of the project area. These dune swales are largely targeted toward protecting the less elevated portion of the paved County road. This should help arrest sand that migrates beyond any natural or constructed barriers – it will be important that such barriers are functional if or when such migration begins. Monitoring of the effectiveness and adaptation of techniques to arrest sand in the future may be required as our calculations show that the southern backdunes will likely grow higher than the road (see earlier discussion regarding field height doubling that of our earlier profile estimates).

Our calculations reveal that it will take more than a decade, and likely a few decades, for the sand to have a substantial effect on the sand storage compartments. Because of the dynamic nature of the beach there is a moderate potential for either coastal flooding, tsunami, uplift or subsidence to overwhelm or alter the effects of this project over an assumed 50 year design life. This could result in either a positive or negative effect depending on the phenomenon being assessed. For example, we expect that a 100 year coastal flood would have substantial impact on the beach form (Vaughan and Fiori, 2004). The probability of a Cascadia subduction zone earthquake capable of producing a tsunami or affecting the elevation of the beach is greater than 35% over an estimated 50 year design life for the storage compartments (c.f., Waethrich, 1994). Therefore, while we regard this assessment important for assessing the offsite impacts of the project under "average" conditions, we also judge that this project has at least a moderate potential to take a different "long-term" path. If backdune barriers are constructed or develop as discussed here, the risk for coastal flooding and tsunami effects on the east side of the property will be reduced, though the magnitude of such an event will influence the final outcome.

The southern end of the continuous wetland is within the target area for sand migration once the treatments are initiated. In light of the moderately high concentration of *Ammophila* immediately adjacent we estimate the southern end of the wetland could disappear in 10 to 20 years at predicted rates of sand movement.

CONCLUSIONS

1) The flux rate from the four northernmost restoration plots revealed a loss of sand in the control plot, roughly equivalent gains in the grade and dozer plots, and more than double the gain of the those two treatments within the excavator plot.
2) Depending on treatment style the central storage compartment will take between about 60 and 125 years to fill, while the southern storage compartment will fill in about 15 to 50 years. It should be assumed for vegetative design purposes (e.g., willows, etc.) that significant quantities of sand could reach the southern storage compartment in ~10 to 15 years, if a proposed barrier to inhibit migration proved ineffective.
3) There is a moderate probability for oceanic or tectonic influences to reorganize the beach, and thus the results of this analysis, over an assumed 50 year design life for the project.
4) Enhancement of the primary backdune ridge could help slow dune migration to the east side of the property. Enhancing the barrier at this location would also place it beyond the reach of more frequent oceanic events than the foredune, thus preserving its integrity for a longer period of time. Moreover, wave energy would be more dissipated at the primary backdune ridge than at the foredune; therefore its influence on defeating wave attack could be relatively greater.
5) It is highly probable that the surface expression of the southern end of the current wetlands emanating from Little River will disappear or be substantially altered in the next couple of decades as sand migrates in response to the treatments.

RECOMMENDATIONS

1) While there may be other considerations, from a geological perspective either a grade or dozer treatment should be used to keep the rate of sand movement in line with historical norms. This will allow for a greater margin of error in terms of adaptive management, if needed.
2) Gaps in the primary backdune ridge should be plugged with masticated *Ammophila* and sand and matched as well as possible to the existing topography. The ridge's windward face should be as close as possible to 20 degrees or more. The ridge should be vegetated as soon as practicable with appropriate species selected by a qualified biologist.

17918

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GLOSSARY

Aeolian – Applied to the erosive action of the wind, and to deposits which are due to the transporting action of the wind (also eolian).

Flux Rates – The amount of change in flow (in this case, the flow of sand) over a specified area (in this case, a restoration plot) over a unit of time.

Storage Area – The area in the plane of the cross section profile that shows the amount of sand that would be deposited in the backdunes if all of the nearshore sand in the same profile migrated to that location.

Storage Compartment – The target area for migration of sand that could be released into the backdune from the nearshore dunes or the beach. This includes the areas north and south from any single cross section profile to a point equidistant between any two profiles. These compartments would have units of volume, as opposed to units of area.

Varves – Any sedimentary bed or lamination that is deposited within one year's time or a pair of contrasting laminae representing seasonal sedimentation within a single year.

18 of 18