Golden Gate National Recreation Area
Stinson Beach Park
California

National Park Service
U.S. Department of the Interior

# Golden Gate National Recreation Area
# Stinson Beach Lifeguard Tower Upgrade
## DUNE MITIGATION AND MONITORING REPORT

March 2024

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## Acronyms and Abbreviations

| | |
|---|---|
| CCC | California Coastal Commission |
| GGNRA | Golden Gate National Recreation Area |
| IPM | Integrated Pest Management |
| NPS | National Park Service |
| UPPP | Under an Acre Pollution Prevention Plan |
| USACE | U.S. Army Corps of Engineers |

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# 1 Introduction

## 1.1 Project Description

The proposed project (Project) involves the re-establishment, enhancement, and/or restoration in-kind of dunes temporarily and permanently impacted as a result of updating the Stinson Beach lifeguard tower and grill. Temporary impacts to vegetated dunes will occur surrounding the facility and will require re-establishment to preconstruction conditions within one year of the project completion. Permanent impacts will also occur as a result of the project and will require restoration at a 4:1 mitigation ratio or existing dune enhancement at an 8:1 mitigation ratio. A preferred restoration alternative to mitigate the permanent dune impacts has been selected by NPS and includes creating a foredune zone that will be revegetated with native dune plants that will accelerate dune development and increase plant diversity of the area. Additionally, temporarily impacted wetlands and dunes will be restored by preserving existing vegetation to the extent possible, introducing native species to the area, and treating non-native species present on the site.

Initial studies demonstrated that it will not be possible to reconstruct the building within its current interior configuration while also being able to fulfill both the lifeguard and concessioner program needs. Therefore, an alternative design is proposed within the existing structure footprint that will improve the efficiency of the layout and meet the essential requirements of both the lifeguard program in the "Tower" and Food Service operations in the "Grill." The updates to the facilities present are needed because it has been determined that the existing lifeguard tower and grill is unsuitable for repair and rehabilitation based on its condition and degree of deterioration. The existing location provides an ideal vantage for lifeguards to monitor Stinson Beach because it is centrally located at an elevated position. The building's elevation above the surrounding terrain also provides natural protection from flooding. The existing structure sits within/on top of the existing dunes and needs to remain there in order to provide the best view for lifesaving and rescue operations (Map 1).

The construction plan for the facility includes architectural changes, interior structure changes, enclosing a deck, installing a new boardwalk, and installing a new garage. Map 1 displays the project plans and the existing footprint of the lifeguard tower, which encompasses an approximate area of 0.35 acres (15,000 sq. ft.).

## 1.2 Site Description

Stinson Beach Park is located in Marin County, California, next to the village of Stinson Beach and within the Golden Gate National Recreation Area (GGNRA), operated by the National Park Service (NPS) (Map 2). The property totals approximately 275-acres of beach and dune habitat. The site was transferred from the State of California to NPS in 1977 and has been managed as a public park since 1939. Visitors go to Stinson Beach for daytrips and multi-night stays to enjoy the beach, picnicking, swimming, surfing, and sunbathing, and to visit the shops and restaurants. Stinson Beach Park is GGNRA's only designated swimming beach with seasonal lifeguards. NPS visitor facilities at Stinson Beach include three parking lots for beach access, three restrooms, picnic areas, an accessible boardwalk, a lifeguard tower, and a small walk-up café (operated by a concessioner).

Stinson Beach is located within Bolinas Bay, extending approximately 2.8-miles from southeast to northwest, and ending at the mouth of Bolinas Lagoon (ESA 2021). NPS has jurisdiction over 0.6 miles along the southeastern-most stretch of beach and the remaining 2.2 miles is under Marin county's jurisdiction. Multiple factors make the NPS portion of Stinson Beach unique relative to the rest of the beach. Along the NPS beach near the lifeguard tower, high groundwater seeps and springs support several patches of foredune wetland scrub and marsh vegetation. These are hydrologically and geomorphically unique features along the Central Coast of California. The high groundwater saturating the backshore and foreshore in this area strongly influences vegetation composition and management. The NPS stretch of Stinson Beach is characterized by a wide, gently sloped backshore, prevalence of finer medium sand, and the greatest exposure to dominant westerly winds. These characteristics make the NPS stretch of beach the most conducive to potential natural foredune accretion (ESA 2021).

The vegetation within the vicinity of the lifeguard tower consists of coastal shrubland dunes and emergent wetlands. Vegetated dunes to the north and south of the lifeguard facility are largely dominated by dense, tall stands (3-6 meters) of arroyo willow (*Salix lasiolepis*) intermixed with some yellow willow (*Salix lasiandra*), wax myrtle (*Morella californica*), and dogwood (*Cornus sp*.). The willow shrubland understory contains a variety of native species, including blackberry (*Rubus ursinus*), California man-root (Marah fabacea), and poison oak *(Toxicodendron diversilobum).* In wetter areas, Pacific oenanthe (*Oenanthe sarmentosa*), tall flatsedge (*Cyperus eragrostis*), and clustered dock (*Rumex conglomeratus*) are also common. Invasive species such as Himalayan blackberry (*Rubus armeniacus*), iceplant (*Carpobrotus edulis)*, cape ivy (*Delairea odorata*), and English ivy (*Hedera helix*) are also present throughout the vegetated dunes. Fortunately, the non-native invasive, European dune grass (*Amophila arenaria*) is not abundant at Stinson Beach. Emergent wetlands occur within and adjacent to the willow dunes where groundwater is high. Species found in these areas include common three square (*Schoneoplectus pungens*), cattails (*Typha spp.)*, brass buttons (*Cotula coronopifolia*), Oregon gumweed (*Grindelia stricta)*, coastal saltgrass (*Distichlus spicata*), and salt rush (*Juncus lescurii*). Grass-dominated foredunes are present along the periphery of willow-dominated dunes to the south of the lifeguard tower and contain Vancouver wild rye (*Leymus x vancouvernisi)*, creeping wildrye (*Elymus triticoides*), beach bur (*Ambrosia chamissonis*), and *Abronia spp*.

## 1.3 Report Purpose & Goals

The purpose of this document is to present project objectives, designs, revegetation methods, and weed management methods for impacted dune habitat resulting from the improvement of the Stinson Beach lifeguard tower and grill. Project goals were created to align with requirements of the California Coastal Act. Key project goals and components include:

- Identify the preferred Project dune restoration and enhancement location and outline design elements based on regulatory requirements, site constraints, feasibility, and long-term sustainability;
- Develop a dune restoration and enhancement mitigation solution that complies with relevant laws and regulations, enhances existing habitats, reduces existing non-native plant presence, and improves flood and erosion protection against weather patterns and future sea level rise;
- Provide appropriate restoration techniques for the recommended dune restoration and enhancement;

- Identify and outline project best management practices aimed to minimize permanent and temporary impacts, and adequately restore areas disturbed to preconstruction or better conditions;
- Provide monitoring techniques to assess the success of the improvements made as part of the Project.

# 2 Methods

## 2.1 Desktop Analysis

To initiate the analysis, DHM Design Ecological Services staff completed a comprehensive desktop analysis to assess and evaluate existing data and reporting for the Site. The desktop review includes all data and information provided to date by NPS. In addition, DHM conducted a further-refined review of available resource data for the Project Area to best support the restoration plan. This analysis provides the most available resource data to date, including but not limited to:

- Aquatic Resources Delineation Report CA FTNP FOPO 110(1) & GOGA 205(1) Golden Gate National Recreation Area Parking Areas (Atkins 2020)
- Delineation of Potential Jurisdictional Wetlands and "Other Waters" Stinson Beach Park Golden Gate National Recreation Area (NPS 2021)
- Stinson Beach Nature-Based Adaptation Study (ESA 2021)
- California Natural Diversity Database
- US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Geospatial Data Gateway (2020)
- U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPAC)
- National Wetlands Inventory (NWI) Wetland Mapper (USFWS) 2020
- National Hydrography Dataset (NHD) Data 2020
- NRCS Web Soils Mapper (2020)
- Google Earth Imagery

## 2.2 Relevant Regulations, Policies, & Programs

### *2.2.1 California Coastal Act*

The Coastal Act guides how the land along the coast of California is developed, or protected from development (CCC 2022). It emphasizes the importance of the public being able to access the coast, and the preservation of sensitive coastal and marine habitat and biodiversity. It dictates that development be clustered in areas to preserve open space, and that coastal agricultural lands be preserved. It prioritizes coastal recreation as well as commercial and industrial uses that need a waterfront location. It calls for orderly, balanced development, consistent with these priorities and taking into account the constitutionally protected rights of property owners (CCC 2022).

The Coastal Act defines the area of the coast that comes under the jurisdiction of the California Coastal Commission, which is called the "coastal zone (CCC 2022)." The Coastal Zone extends seaward to the state's outer limit of jurisdiction (three miles), including offshore islands. The inland boundary varies according to land uses and habitat values. In general, it extends inland 1,000 yards from the mean high tide line of the

sea, but is wider in areas with significant estuarine, habitat, and recreational values, and narrower in developed urban areas (CCC 2022).

The Coastal Act (30001.5) declares that the basic goals of the state for the coastal zone are to (CCC 2022):

> (a) Protect, maintain, and where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources.
>
> (b) Assure orderly, balanced utilization and conservation of coastal zone resources considering the social and economic needs of the people of the state.
>
> (c) Maximize public access to and along the coast and maximize public recreational opportunities in the coastal zone consistent with sound resources conservation principles and constitutionally protected rights of private property owners.
>
> (d) Assure priority for coastal-dependent and coastal-related development over other development on the coast.
>
> (e) Encourage state and local initiatives and cooperation in preparing procedures to implement coordinated planning and development for mutually beneficial uses, including educational uses, in the coastal zone.

## 2.3 Field Site Visit

DHM Design Ecological Services staff completed a high-level pedestrian ecological survey of the Project Area and potential restoration sites on November 17, 2022 with NPS staff Kristen Ward and Maria Alvarez. DHM surveyed the entire Project Area to assess and map existing ecological conditions and evaluate opportunities and constraints for dune restoration and enhancement. Staff also surveyed and reviewed areas outside of the direct Project Area to identify potential restoration and enhancement opportunities. GPS data were collected in ArcGIS Collector on a handheld mobile device connected to an external GNSS receiver. The average accuracy for data collection was 2-8 inches.

# 3 Dune Restoration & Enhancement

## 3.1 Project Impacts & Mitigation Requirements

As previously stated, temporary impacts to vegetated dunes will occur surrounding the facility and will require re-establishment to preconstruction conditions within one year of the project completion. Permanent impacts will also occur as a result of the project and will require restoration at a 4:1 mitigation ratio or existing dune enhancement at an 8:1 mitigation ratio. It is estimated the Project will involve 3,860 SF of temporary and 701 acres of permanent dune impacts and 40 SF of temporary wetland impacts (*Table 1*). Following ground disturbing activities, all pervious areas would be revegetated with native plants in accordance with this project-specific restoration plan once construction is complete. Map 3 displays the anticipated impact areas to dunes and wetlands as a result of the project.

*Table 1*. Summary of Temporary and Permanent Impacts to Dunes and Wetlands Resulting from the Project.

| Area | Impacts (SF [acres]) | | Mitigation Requirement (SF [acres]) | |
|---|---|---|---|---|
| | | | 4:1 Restoration | 8:1 Enhancement |
| Dunes | Permanent | 701 (0.016) | 2,804 (0.064) | 5,608 (0.128) |
| | Temporary* | 3,860 (0.089) | NA | NA |
| Wetlands | Temporary* | 40 (.0001) | NA | NA |
| **Mitigation in kind is not required for temporary impacts* | | | | |

## 3.2 Temporary Impact Restoration

A total of 3,860 SF of temporary dune impacts and 40 SF of temporary wetland impacts will occur as a result of the project. The temporarily impacted areas will be restored within one year of the completion of the project to pre-project conditions. To reduce or lessen the severity of temporary impacts, best management practices such as exclusion fencing, vegetation trimming practices, noxious weed management, mulching and willow staking will be included during and after the construction activities. More information about details and specifications for the practices are provided in Section 3.4 and with associated project site restoration plan sheets.

## 3.3 Permanent Impact Mitigation

DHM Design and NPS staff identified several areas that in combination could be restored or enhanced to satisfy mitigation requirements for permanent impacts to dune habitat. The following sections outline the alternatives considered and the preferred option.

Three options were considered for dune restoration and enhancement resulting from the permanent impacts of constructing the Stinson Beach lifeguard tower and grill and are provided in Table 2 and on Map 4, with overall area available for use and the type of mitigation (restoration or enhancement). The preferred alternative for the mitigation would be restoring a part of Option 1, located south of the lifeguard tower.

*Table 2*. Dune Restoration and Enhancement Options and Areas.

| Option | Mitigation Type | Available Area (SF [acres]) |
|---|---|---|
| Option 1 (*Preferred Alternative*) | Dune Restoration | 14,170 (0.325) |
| Option 2 | Dune Enhancement | 5,481 (0.126) |
| Option 3 | Dune Enhancement | 2,365 (0.054) |

Ultimately, NPS chose Option 1 as the preferred alternative for the project and intends to pursue the option for various reasons, including:

- The location of the restoration area being in close vicinity to the project and away from high pedestrian use zones.
- The similarity of the habitats in this area relative to the areas of impact; the area identified for mitigation provides opportunities to restore willow-dominated dunes as well as areas influenced by freshwater seeps.
- The opportunity to create natural dune ecology that helps to further protect the existing dunes and infrastructure present in the area.

- The lower level of aggressive non-native species, such as cape ivy, which will reduce the weed maintenance and management requirement.
- The higher likelihood of restoration success due to low pedestrian activity and non-native species density.
- The amount of space available in the area allows for flexibility in restoration design.

Options 2 through 4 were considered during the process and were reviewed in the field, along with several other areas. The other options pose potential hurdles with restoration design and implementation that may make the project less successful in the long-term.

### *3.3.1 Option 1 – Dune Restoration (Preferred Alternative)*

The area identified for Option 1 contains approximately 14,170 SF of land available for restoration, which is much more than the required 4:1 restoration mitigation ratio of 2,804 SF. NPS would identify a specific area within this zone where successful mitigation would be likely to meet the required mitigation acreage. The area encompassing Option 1 is primarily composed of sand and lacks any vegetation, although it naturally would likely contain foredune graminoid and forb species. The topography is relatively flat and is not reflective of natural dune topography. Additionally, a gap between two existing dunes is present, where visitors have tracked a social trail to nearby restroom facilities. Other trails are present in the area leading to the destination, and therefore this trail is unnecessary. A drainage is also present in the northern portion of the area that would allow for some wetland enhancement as part of the project. Restoration activities would promote natural dune development and may include:

- Extending the existing dune towards the coast, up to 50 feet from the current dune boundary
- Installing exclusion fencing around the expanded dune footprint to prevent visitors from disturbing the restored area.
- Minor grading of the site to create topography reflective of natural foredunes in the area.
- Filling a gap in the existing dunes, where a social trail cuts through the dunes near the south restroom. This particular trail is redundant and has exacerbated local dune erosion from coastal storms.
- Installing native dune and wetland plants (if appropriate) depending on the site hydrology and water table.
- Dispersing dune and wetland (if appropriate) seed mixes throughout the restored area.
- Installing sand fencing to assist in the development of foredunes or employing other methods to promote dune accretion (e.g., strategic placement of natural wrack or brush plugs - see Baye 2023 for details).
- Treating non-native species, such as cape ivy, English ivy, and ice plant, in the immediate vicinity to prevent encroachment into the newly restored area.
- Implementation of photo and plant census monitoring.
- Installing educational and regulatory signage as appropriate.

### *3.3.2 Option 2 – Dune Enhancement*

The area identified for Option 2 contains approximately 5,481 SF of existing willow-scrub dune for enhancement, which is slightly less than the required 8:1 enhancement mitigation ratio of 5,608 SF. This site is directly south of the lifeguard tower. Vegetative composition of the dune includes dense willows and a high concentration of non-native plants, including cape ivy and Himalayan blackberry, which compete

with native plant species. This site was identified as a good candidate for successful control of non-native species because it is discontinuous with surrounding dunes and would be far less susceptible to re-invasion from surrounding areas. Habitat enhancement activities at this site would include:

- Intensive treatment of non-native species, such as cape ivy, Himalayan blackberry, English ivy, and ice plant to eliminate them from the targeted area.
- Installing dune forb, graminoid, and woody plants where feasible to diversify the existing habitat.
- Implementation of photo and plant census monitoring.

### *3.3.3 Option 3 – Dune Enhancement*

The area identified for Option 3 contains approximately 2,365 SF of land available for enhancement, which is less than the required 8:1 enhancement mitigation ratio of 5,608 SF. This site follows a social trail created by Park visitors, between the central restroom facility and the central parking lot. The area contains invasive species including non-native trees (Monterey pine and Monterey cypress). Both of these trees tend to drop large quantities of needles/leaves in the sand, adding organic matter and changing the soil chemistry to favor non-native plants. The site is also trampled and flattened by frequent pedestrian traffic. Enhancement activities at this site would include:

- Girdling or cutting back large non-native trees to promote natural secession and ultimately reduce excessive litter.
- Treating non-native species, such as cape ivy, English ivy, and ice plant, in the immediate vicinity of the project area to prevent encroachment into the newly restored area.
- Installing dune forb, graminoid, and woody plants.
- Dispersing dune seed mixes throughout the restored area as appropriate.
- Installing exclusion fencing and signage to permanently close social trails and prevent visitors from disturbing the restored area.
- Implementation of photo and plant census monitoring.

## 3.4 Restoration & Enhancement Methods

Methods described below are intended to offset temporary and permanent impacts to dunes resulting from the construction of the Stinson Beach lifeguard tower and grill project, and to restore dunes outlined in Option 1, above. Other methods that would be required to implement dune restoration or enhancement in Options 2-3 are not provided in the following sections.

### *3.4.1 Dune Creation & Stabilization*

Dune creation and stabilization may include supplementing the dune expansion footprint with native sand displaced due to construction activities and salvaged and stockpiled on site. Additional techniques will be used to promote natural dune accretion. Native sand that is displaced due to project construction activities should be sorted, salvaged, and stockpiled for use in the project. If native sand is available, it would be added to the dune creation area and graded to create natural dune contours. Prior to adding sand, the dune creation area will initially be cleared of non-native plants or debris if needed (see Section 3.4.4). After adding sand, the dunes should be irrigated, if necessary, to create wet, sandy soils that are less likely to be transported by wind. Other methods, such as, straw crimping, and other stabilization techniques may be required on an as-needed basis during construction and restoration. Sand fences should also be installed around created dunes to assist in the continued accretion of sand in the area of the created dunes. The process for installing and use of sand fences are provided below, in Section 3.4.3.1. The use and installation of straw plugs is described in Baye (2023).

#### *3.4.1.1 Techniques to Promote Natural Dune Accretion*

Additional techniques will be used to promote natural dune accretion. This could include:

- Planting creeping perennial dune and beach grasses in mitigation areas to assist in trapping wind-blown sand at the site. Species such as beach wildrye (*Leymus mollis*) and Vancouver wildrye (*Leymus x vancouveriensis*) are especially efficient. Additionally, although less efficient at trapping sand and dune building, creeping perennial plants such as beach bur (*Ambrosia chamissonis*) and yellow sand-verbena (*Abronia latifolia*) assist in dune building, as they are able to colonize areas quickly, but slowly build mounded foredunes (Baye 2023). These plants have all been included in the plant list for the site.
- Cobble berm (buried or exposed) constructed seaward of artificial foredunes could be used to help with sand accretion but would potentially affect the establishment of plants. Plant lists and placement would need to be reviewed if this option is pursued (Baye 2023).

More information about these methods are described in detail in Baye (2023)

### *3.4.2 Revegetation*

An important objective to the Stinson Beach lifeguard tower and grill dune restoration project is to facilitate the re-establishment of dune plant species, mimicking plant composition of the dune vegetation types present in adjacent areas. A combination of seed, woody species staking, and plant plugs will be used to establish dune vegetation at the restoration site. NPS will be responsible for distributing native seed in bare areas periodically throughout the process, but the contractor will not conduct this process. NPS will propagate and provide plants native to the area of the project from agency nurseries or at on-site plant storage.

Timing of the introduction of plant materials will likely be in the winter season, but may vary based on the site selected, non-native species control, and the seasonal conditions. Natural recruitment through re-colonization from surrounding vegetation is also expected. Because the site will mostly likely be re-vegetated with native plants during the winter season, no irrigation is anticipated. However, irrigation may be used if planting is delayed to the warmer months of the year and supplemental water is necessary.

#### *3.4.2.1 Plants*

Live woody stakes and plant plugs will be used in temporary and permanent project disturbance areas. All plants will be grown in the Golden Gate National Parks Conservancy's native plant nursery or salvaged on site for transplanting. Prior to planting, NPS officials or restoration specialists should delineate the different planting zones with flagging. Potential plants for various planting zones areas are provided below (*Table 3*), and methods for installation are described in the following sections. The final list may vary depending on nursery availability. A full list of approved plants suitable for use at the site is provided in *Appendix C*.

*Table 3*. Plant List.

| Scientific Name | Common Name | Size | Outplanting Zone |
|---|---|---|---|
| *Ambrosia chamissonis* | Beach bur | Any size available | Foredune/backshore beach |
| *Carex obnupta* | Slough sedge | 12" minimum | Freshwater seeps |
| *Cornus sericea* | Dogwood | Stake | Willow-riparian |

| Scientific Name | Common Name | Size | Outplanting Zone |
|---|---|---|---|
| *Distichlus spicata* | Salt grass | Buried root and rhizome fragments | Foredune/backshore beach |
| *Grindelia stricta* | Gumweed | 12" minimum | Dune scrub and willow-riparian understory |
| *Juncus lescurii* | Salt rush | 12" minimum | Freshwater seeps |
| *Leymus mollis and/or Leymus x vancouverensis* | American dunegrass | 12" minimum | Foredune/backshore beach |
| *Rubus ursinus* | California blackberry | #1 count | Dune scrub and willow-riparian understory |
| *Salix lasiolepis* | Arroyo willow | Stake | Willow-riparian |
| *Schoenoplectus pungens* | Coast bulrush | Any size available | Freshwater seeps |
| *Stachys chamissonis* | Coastal hedge-nettle | 12" minimum | Freshwater seeps |

*Woody Species Staking*

Live woody stakes from existing willow and dogwood plants in the vicinity of the project area may be harvested for the restoration of temporary and permanent impacts of the project. Single stick-stakes, measuring approximately 24" long and 1"-2" in diameter, should be harvested from the lower stems of healthy, actively grown plants. Stakes should be set aside, bundled in groups of 25 for ease of counting. Stakes should be replanted as soon as possible after cutting to maximize regrowth, but if storage is required, stakes should be kept in the shade and stored in water to prevent from drying out in the sun and promote adventitious root formation. Stakes should be planted in holes created with punch bars or rebar in the ground 24" and protruding from the ground 4" to 6". Woody stakes will be used for the restoration areas and will be assigned to the appropriate, field-verified zone based on grade and hydrological conditions.

*Nursery Grown Plants and Field-to-Field Divisions*

Dune and wetland plants were chosen based on site conditions and native plants present. Plant plugs will be used for the restoration areas and will be assigned to the appropriate, field-verified zone based on grade and hydrological conditions. *Table 3* provides a potential plant list for various planting zones to restore temporary and permanent disturbance areas. A full list of plants suitable for use at the site is provided in *Appendix C*.

### *3.4.3 Restoration Infrastructure*

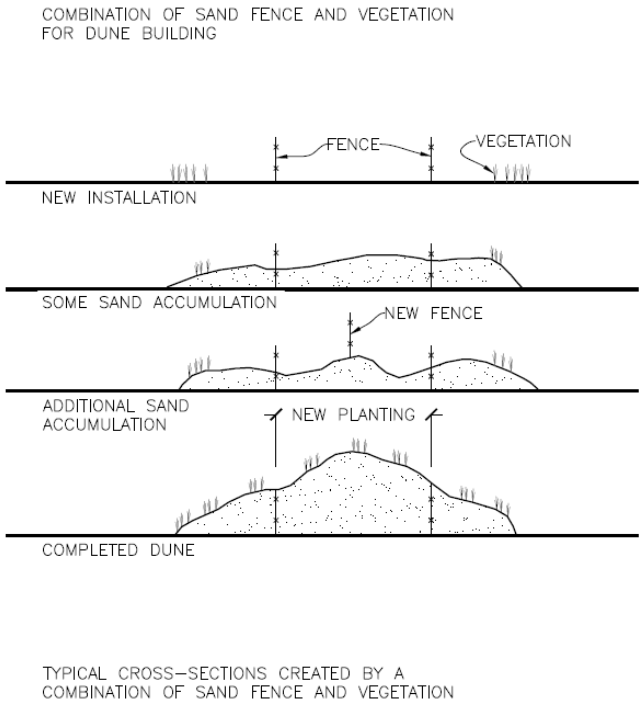
To facilitate dune stabilization and prevent human disturbance of the restored or enhanced dunes, restoration infrastructure may be required. These methods will be implemented based on the exact site chosen and site vegetative cover, wind exposure, and management objectives. Some options are described below.

### *3.4.3.1 Fencing*

*Sand Fencing*

Sand fencing is typically comprised of evenly spaced wood slats or synthetic material held together with wire, with approximately 1.5" spaces between slats (*Figure 1*). Sand fencing is placed perpendicular to prevailing winds and is supported at the end of a segment by posts. Sand fences assist in reducing wind velocity at ground level, accelerating the accretion of sand around the fence, and eventually creates a more stable dune. With the addition of native vegetation to the dune area, the sand fence being buried over time, and the continual accumulation of sand around the fence that will widen and lengthen throughout time, a robust dune has more potential to form. The graphic below outlines the typical dune creation process with the use of sand fences and revegetation (*Figure 1*).

*Figure 1*. Process of sand accumulation and dune creation using sand fences.




*Exclusion Fencing*

Exclusion fencing should be erected around restoration areas to prevent visitors from encroaching on the newly restored area. Additionally, some consideration should be given to including exclusion fencing that restricts deer access, to prevent herbivory of restoration plantings. Exclusion fencing can be used during initial re-vegetation to prevent visitor access during construction. Where feasible, exclusion fencing may be left in place for long-term protection of habitat areas.

Simple slat wood fence with wire is currently specified for the project, but other types of fencing may be used appropriately throughout the project. Different fencing options may be suitable for various areas or during different times of year due to weather. For instance, the slat wood and wire fence may not withstand winter storm surges and may be replaced with T-posts or thimble eye and rope fencing, that is more stable. However, the slat wood and wire fencing may be more effective with deterring trampling of vegetation in restoration areas by pedestrian traffic during busy spring and summer months. All fencing options include:

- Slat wood and wire fence
- Simple Cable and Post fence
- Cable and thimble eye fence
- Rope and T-posts fence

#### *3.4.3.2 Signage*

The successful restoration of dunes on Stinson Beach will require limiting access to previously used areas, where restoration activities will occur. NPS should plan to distribute signage, notifying the public prior to and during the project implementation, of the project goals, length, and implementation practices. Signs, in addition to fencing, should also be erected after the restoration for the foreseeable future, informing visitors that the area is closed for restoration. A sign similar to one used on a portion of the County beach to the north of the NPS beach could be used for this project (*Appendix B*). Interpretive signage should also be considered.

### *3.4.4 Invasive Species Control*

Control and eradication of high-priority invasive plant species, such as cape ivy, English ivy, ice plant, and Himalayan blackberry, will be conducted throughout the project. Weed management includes supervision of both paid vegetation workers and NPS volunteers. Weed treatments may include hand removal, the use of power tools, and utilization of other Integrative Pest Management (IPM) strategies. Specific management techniques for the four high priority weed species are provided in following sections.

*Ice Plant*

Ice plant is a mat-forming succulent perennial plant native to South Africa. It initially was planted as a way to stabilize dunes or as roadside cover (Au 2000). The species is also often planted as an ornamental landscaping plant in privately owned yards. As a result of these actions, ice plant has escaped into coastal natural areas, including the Stinson Beach area. Ice plant may reproduce sexually or clonally, making its spread much easier. It is known to displace native plant species, hybridize with native ice plant species, change the microclimate of habitats, and alter natural ecosystem regimes. Ice plant outcompetes native vegetation by forming dense mats and smothering species present or by altering soil chemistry to make the environment unable to support native plant species (Au 2000).

Ice plant was documented in the Stinson Beach shrubland dune areas and removal and treatment of the species will likely be required in temporary and permanent impact areas. Introducing native seed and plants in disturbed areas of the construction zones is the most reliable preventive measure that can be taken following ice plant removal. Ice plant may be removed by using mechanical and chemical control methods outlined below:

- Because ice plant is shallowly rooted, mats of the species may be “rolled-up” as a large carpet and removed from the site. Plant native vegetation and reseed shortly after removal to prevent the any new germination of the species.
- Chemical treatment of ice plant with glyphosate may be used. Consult with NPS about application rates and ratios.

*Cape Ivy*

Cape ivy is a climbing vine that sends out runners, which easily root to create new plants (SFEI 2003). The species may also resprout from fragments of runners or roots, as small as ½ of an inch, which can make its removal and eradication especially difficult. Cape ivy flourishes in shady, damp and/or disturbed environments and outcompetes native vegetation by smothering plants and reducing access to sun (Alvarez 1997; SFEI 2003). Cape ivy often reduces native species richness and seedling recruitment into a vegetative

community (Ditomaso & Kyser 2013). This species has been identified as a vegetation management priority by natural resource managers in the GGNRA (Alvarez 1997).

Cape ivy is prevalent in the Stinson wetlands and Beach dune areas that contain arroyo willow and removal and treatment of the species would be required in order to restore temporary and permanent impact areas. Additionally, preventive measures would need to be implemented to ensure the success of restoration efforts in dune creation areas. Continued monitoring and documentation of treatment areas and new populations would need to occur to maintain control of cape ivy, as it is extremely aggressive and can completely take over an area in a short period of time if not addressed. Adding seed or plantings will not out compete Cape-ivy (SFEI 2003).

Cape ivy may be removed by using mechanical and chemical control methods outlined below (Alvarez 1997; SFEI 2003; Ditomaso & Kyser 2013):

- Use a pointed or pronged rake to remove plant stems, roots, and rhizomes before plant goes to seed. Place all plant materials in a bag and remove from site. Introduce native vegetation to disturbed area to prevent erosion or continued invasion by cape ivy or other non-native species. Follow-up removal by removing resprouts as native vegetation establishes. Do not mow this species, as new plants may establish from pieces of stems.
- Glyphosate and triclopyr have been found effective at treating cape ivy, in late spring, after flowering. Consult with NPS about application rates and ratios.

*English Ivy*

English ivy is an evergreen, woody vine that is fast-growing and can vigorously climb and blanket other vegetation present (Ditomaso & Kyser 2013). Birds and other animals may eat fruit produced and disperse seeds. Additionally, stem fragments of the plant may resprout into a new plant if left in contact with soil. Plants can live to be over 100 years old (Ditomaso & Kyser 2013).

English ivy is present within the willow stabilized dunes and the wetland project area and removal or treatment of the species would be required to restore areas to a natural condition (Ditomaso & Kyser 2013).

- Remove all runners and stems off the ground and allow to dry out in a place not in contact with soil. Cut ivy at the ground level before it flowers to deplete the plant's energy reserves. Remove English ivy from trees. Preventing upright growth prevents it from flowering and setting seed. Follow up mechanical removal with chemical treatments. Do not mow the species, as it may spread from stem fragments.
- Several options for chemical treatments exist, including the use of Picloram, Triclopyr, Glyphosate, and Imazapyr. Consult with NPS about application rates and ratios.

*Himalayan Blackberry*

Himalayan blackberry is a thicket-forming, woody plant with arching stems, curved spines, and leaves that contain five leaflets with sharply toothed edges (SFEI 2003). Many wildlife species feed on the fruit the species produces, which facilitates the spread of the species. Additionally, roots and stems often resprout and stems that contact the ground may create daughter plants. The species is often found in disturbed, moist areas that receive ample sunlight. Himalayan blackberry creates dense thickets that shade native plants (SFEI 2003).

Himalayan blackberry is present within the project area and removal or treatment of the species would be required to restore areas to a natural condition. Introducing native seed and plants in disturbed areas of the construction zones is the most reliable preventive measure that can be taken following Himalayan blackberry removal. Himalayan blackberry may be removed by using mechanical and chemical control methods outlined below (SFEI 2003):

- Do not only cut stems, as the roots of the plants will resprout. Hand dig and remove roots crowns and root fragments to prevent resprouting. Alternatively, repetitively mowing or hand trimming plants at the beginning of the flowering period may work at depleting food supply, but roots still have the potential to resprout.
- Apply glyphosate or triclopyr to young, actively growing leaves, before any mechanical treatments (cutting) has occurred.

### *3.4.5 Best Management Practices*

Best Management Practices (BMPs) are proactive, operational management techniques that avoid or limit adverse impacts to resources. Park staff, contractors, and volunteers should utilize these techniques to limit or prevent impacts to resources during project activities.

#### *3.4.5.1 Additional Vegetation and Habitat Protection*

- Minimize disturbance to vegetation within the construction corridor. Cut only the minimal amount of vegetation required to perform the task at hand.
- Plywood or other material will be placed on the ground in wetland areas where equipment will be used in order to distribute the weight of equipment and minimize rutting and other damage.
- Erosion control measures will be installed to prevent runoff of sediment or sediment-laden water from the site into adjacent waterbodies. Erosion control measures shall consist of any and all BMPs for storm water discharges, including but not limited to silt fencing, barrier protectors, straw bales, temporary soil retention blankets, excelsior drainage filters, sediment traps and berms.
- All soil disturbing work will be returned to pre-construction condition or equivalent at the end of each workday. Equivalent condition means disturbed soils such as those from trench excavation are required to be hauled away, backfilled into the trench, and/or covered at the end of the construction day. If rain occurs during work, a gravel bag berm or fiber rolls may be warranted downgradient of the work area, and these BMP materials shall be kept on-hand in case of such events.
- Contractors hired to perform the lifeguard tower construction will be required to complete a Under an Acre Pollution Prevention Plan (UPPP) in accordance with NPS.. Additional water quality protection measures and BMPs will be described in the draft UPPP

#### *3.4.5.2 Invasive Species*

- Pre and post construction sweeps for invasive species will occur in the area; specifically, the area will be swept for cape ivy, English ivy, ice plant, and Himalayan blackberry.
- Any materials brought into the site should be weed free. All staging areas and stockpile locations will be inspected by an NPS botanist to ensure soils and plants are not imported with construction materials. and any instances of priority invasive plants in these areas will be addressed prior to use.
- BMPs will be enforced upon all staff and contractors working in the area: All vehicles, ATVs, boots, equipment, and tools must be power washed to remove soil and plant fragments before entering GGNRA property. Equipment also needs to be cleaned when moving between work zones. All

boots, equipment and tools must be disinfected prior to arrival and between sites using a 10% bleach solution or 70% isopropyl alcohol to prevent pathogen spread.

- The construction footprint will be maintained weed-free for the duration of the project. Apply 2-inch (50-mm) average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems Application of much should be placed on the surface as needed to prevent weed establishment during construction.

#### *3.4.5.3 Regrading and Site Preparation*

- Any trenches will be backfilled with the sidecast native soil. Stockpiled topsoils will be returned as top dressing.
- Areas affected by construction activity will be assessed for soil compaction and soils will be de-compacted using hand methods where needed.
- Areas disturbed by excavation activity will be restored to pre-construction grades which conform with surrounding grades, and which re-establish any flow paths through the wetland that may be disrupted by site excavation.

#### *3.4.5.4 Vegetation Trimming*

When willows or dogwood are present and need to be trimmed to avoid interference with construction activities, actions can be taken to better preserve and protect the existing plants so they may resprout following construction. Additionally, trimmed materials may be collected, stored, and used in the temporary disturbance zones and restoration areas. Information about staking collected woody species is provided in Section 3.4.3.2. The following measures are recommended for vegetation trimming (Lezberg & Giordanengo 2008):

- Minimize disturbance to vegetation within the construction corridor. Cut only the minimal amount of vegetation required to perform the task at hand.
- Using gardening shears, cleanly cut the willow or dogwood stem at a diagonal angle at the base of the stem.
- Clip the terminal bud with a horizontal cut to stimulate growth and create a flat surface for aiding in installation. Remove all lateral stems with diagonal cuts near the main stem.
- Attempt to remove no more than 1/3$^{rd}$ of the branches from any single shrub or tree.
- Do not remove more than 40 percent of the overall shrub or tree canopy cover.
- Try to harvest stems throughout a plant and not just from one side. It is understood this may be difficult for the project, as the purpose of trimming the plants is to remove materials from the construction impact zone.

# 4 Monitoring

Monitoring would occur before and following the restoration and/or enhancement of dunes for the Stinson Beach project. Pre-construction monitoring would occur to document baseline conditions at the site and post-construction monitoring would occur for one year following the restoration activities. Two types of monitoring are proposed for the project:

## 4.1 Photo Monitoring

Photo monitoring points would be established prior to the construction of the lifeguard tower and restoration/enhancement of dunes. One to two photo monitoring points would be established per distinct area in temporary and permanent dune and wetland impact areas. Photos would be taken once monthly in the four cardinal directions at each point to document the existing conditions at the site, the damage created by construction, and the progress and effectiveness of temporary and permanent impact best management practices and restoration/enhancement activities. The intention of the photo monitoring is to document pre-construction conditions and ensure that the post-construction restoration results match earlier site conditions in temporary impact areas and the permanent impact restoration areas meet mitigation requirements. Variables that may be noted in the photo documentation include non-native species presence and density, plant mortality, and plant herbivory.

## 4.2 Census Monitoring

Plant census monitoring would occur in the dune restoration/enhancement areas in order to monitor plant success rates. Approximately 10 percent of all plants of a single species planted would be flagged for monitoring. Monitoring of the flagged individuals would occur once a month for a year and plant vigor and health would be assessed. Plants in poor health would be identified for replacement throughout the process and would be replaced with the same or another approved species. Re-planting within restored areas will be done as needed if survivorship of initial outplantings is low. This will be determined by visual observations conducted during routine inspections associated with invasive plant sweeps. Plant success rates and goals will be set for the project after further development of the restoration process.

## 4.3 Invasive Plant Monitoring

Invasive plant monitoring would occur in the dune restoration/enhancement areas following the completion of the process. Restored areas would be inspected at least three times per year to determine whether priority invasive species area present. If present, they will be treated immediately using hand control methods.

# 5 References

Alvarez ME. 1997. Management of Cape-ivy (*Delairea odorata*) in the Golden Gate National Recreation Area.

Au L. 2000. Carpobrotus edulis in Coastal California Plant Communities. University of Minnesota, Department of Horticulture Science, St. Paul, Minnesota.

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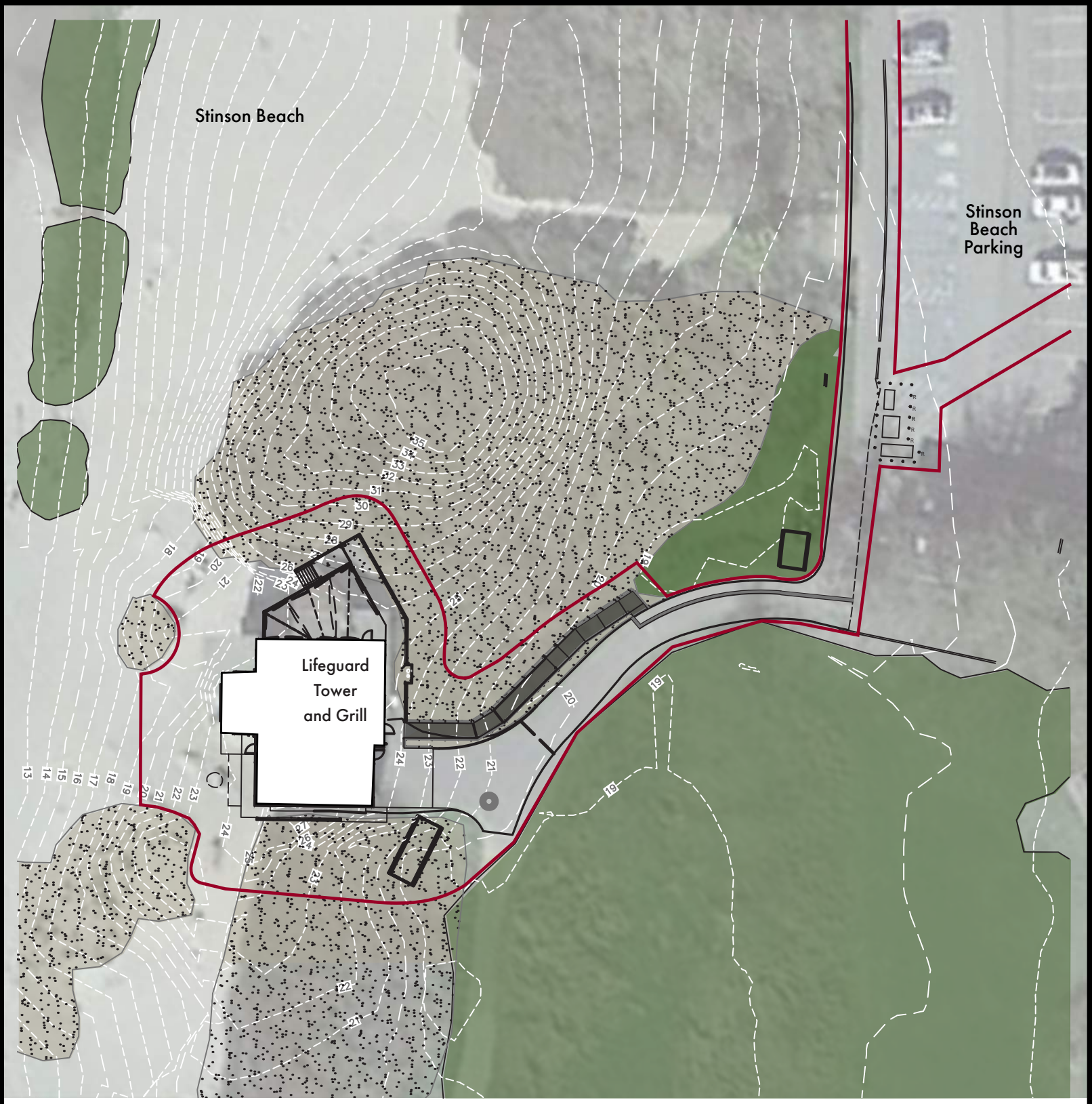
CCC. 2022. An Introduction to the California Coastal Act. California Coastal Commission.

Ditomaso JM, Kyser GB. 2013. Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California.

Lezberg A, Giordanengo J. 2008. A Guide for Harvesting, Storing, and Planting Dormant Willow Cuttings. Wildlands Restoration Volunteers, Fort Collins, CO. Available from https://riversedgewest.org/sites/default/files/resource-center-documents/WRV_Willow_Training_Manual.pdf.

SFEI. 2003. Practical Guidebook for the Identification and Control of Invasive Aquatic and Wetland Plants in the San Francisco Bay-Delta Region. San Francisco Estuary Institute, Oakland, CA.

# Appendix A - Project Maps




LEGEND

- Project Boundary
- Proposed Building & Hardscape
- Existing Wetlands
- Existing Dune Vegetation

0 40 80 Feet

NPS - Stinson Beach Lifeguard Tower and Canteen Replacement
PMIS No. GOGA 311816

**MAP 1 - PROJECT PLAN**

DHM DESIGN

FEBRUARY 2024

LEGEND

Project Location

0 100 200 Feet

NPS - Stinson Beach Lifeguard Tower and Canteen Replacement
PMIS No. GOGA 311816

**MAP 2 - PROJECT LOCATION**

DHM DESIGN

FEBRUARY 2024

LEGEND

- Project Boundary
- Proposed Building & Hardscape
- Existing Wetlands
- Existing Dune Vegetation
- Temporary Dune Impacts (3860 SF)
- Permanent Dune Impacts (701 SF)
- Temporary Wetland Impacts (40 SF)

0 40 80 Feet

NPS - Stinson Beach Lifeguard Tower and Canteen Replacement
PMIS No. GOGA 311816

**MAP 3 - ANTICIPATED PROJECT IMPACTS**

DHM DESIGN

FEBRUARY 2024

LEGEND

- Project Boundary
- Existing Wetlands
- Existing Dune Vegetation

**Dune Restoration & Enhancement Options**

- Option 1 - Preferred Alternative
- Option 2
- Option 3

0 150 300 Feet

NPS - Stinson Beach Lifeguard Tower and Canteen Replacement
PMIS No. GOGA 311816

## MAP 4 - DUNE RESTORATION & ENHANCEMENT OPTIONS

DHM DESIGN

FEBRUARY 2024

# Appendix B - Project Site Photos

**Photo 1.** Photo of willow scrub vegetated dunes present near the lifeguard tower.

**Photo 2.** Photo of graminoid vegetated dunes present near the lifeguard tower.

**Photo 3.** Photo of existing conditions in the Option 1 restoration area. Photo taken facing south.

**Photo 4.** Photo of existing conditions in the Option 1 dune resotoration area. Photo taken facing east.

**Photo 5.** Photo of existing conditions in the Option 2 dune enhancement area. Photo taken facing northeast..

**Photo 6.** Photo of existing conditions in the Option 3 dune enhancement area. Photo taken facing southeast.

**Photo 7.** Photo of non-native ice plant seen in the Project Area.

**Photo 8.** Photo of non-native cape ivy seen in the Project Area.

**Photo 9.** Photo of non-native Himalayan blackberry seen in the Project Area.

**Photo 10.** Photo of non-native English ivy seen in the Project Area.

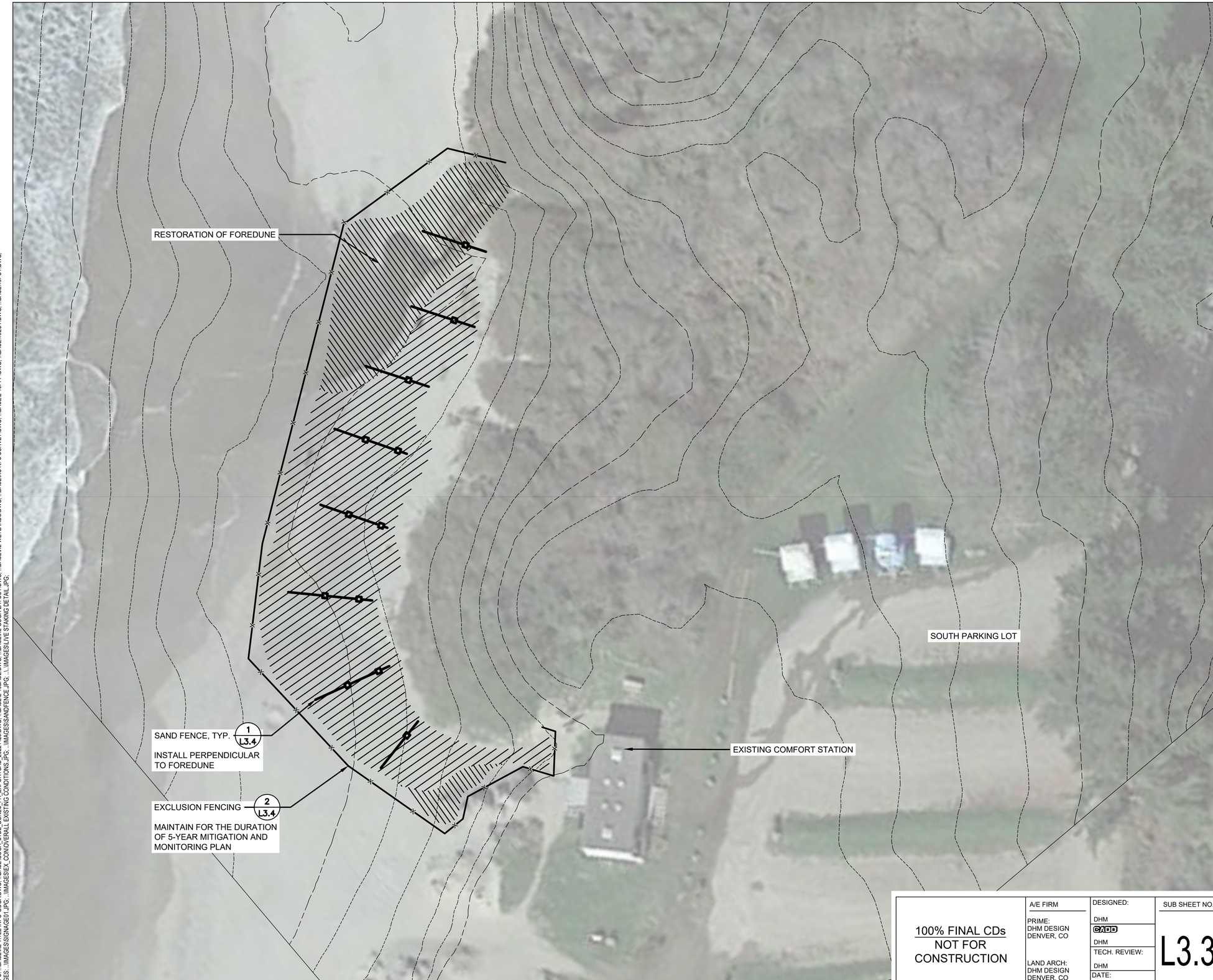
**Photo 11.** Existing sand fencing present north of the lifeguard tower on Stinson Beach in a dune restoration area.

**Photo 12.** Dune restoration signage present in a restoration area north of the lifeguard tower on Stinson Beach.

# Appendix C – Approved Plant List

| Scientific Name | Common Name |
|---|---|
| *Foredune* | |
| *Abronia latifolia* | Yellow sand verbena |
| *Ambrosia chamissonis* | Beach bur |
| *Camissoniopsis cheiranthifolia* | Beach evening primrose |
| *Calystegia soldanella* | Beach morning glory |
| *Distichlis spicata* | Salt grass |
| *Elymus triticoides* | Creeping wild rye x Vancouverensis |
| *Juncus breweri* | Salt Rush |
| *Juncus lescurii* | Dune Rush |
| *Leymus mollis* | American dune grass |
| *Reardune / Dune Scrub / Backshore Beach* | |
| *Artemesia pycnocephala* | Coastal sagewort |
| *Cardionema ramosissimum* | Sand mat |
| *Distichlis spicata* | Saltgrass |
| *Elymus triticoides* | Creeping wild rye x Vancouverensis |
| *Eriophyllum stachaedifolium* | Lizard tail |
| *Grindelia stricta* | Coastal Gum weed |
| *Lupinus arboreus* | Bush lupine |
| *Leymus mollis* | American dune grass |
| *Willow Riparian* | |
| *Achillea millefolium* | Yarrow |
| *Bromus sitchensis var. carinatus* | California brome |
| *Claytonia perfoliata* | Miner's lettuce |
| *Galium aparine* | Goose grass |
| *Marah fabacea* | Wild cucumber |
| *Polygonum paronychia* | Dune knotweed |
| *Pteridium aquilinum* | Western bracken fern |
| *Rubus ursinus* | Calif. blackberry |
| *Scrophularia californica* | California bee plant |
| *Toxicodendron diversilobum* | Poison oak |
| *Dune Swale Wetlands* | |
| *Distichlis spicata* | Salt grass |
| *Juncus bufonius* | Toad rush |
| *Rumex salicifolius* | Willow dock |
| Freshwater Wetlands | |
| *Calystegia* | Morning glory |
| *Carex obnupta* | Slough sedge |
| *Cornus sericea* | Dogwood |
| *Diplacus guttatus* | Seep spring monkey flower |
| *Juncus breweri* | Salt Rush |
| *Juncus lescurii* | Dune Rush |
| *Polygonum* | Water smartweed |
| *Schoenoplectus pungens* | Bulrush |
| *Stachys chamissonis* | Costal hedge-nettle |

# Appendix D – Dune Mitigation Plan Sheets




LEGEND

- LIMITS OF CONSTRUCTION
- 35 EX MAJOR CONTOUR
- 36 EX MINOR CONTOUR
- EXCLUSION FENCING
- SAND FENCING
- DUNE MITIGATION PLANTING MIX
- WETLAND MITIGATION PLANTING MIX

NOTES

1. REFER TO SUPPLEMENTAL REPORTS - DUNE MITIGATION AND MONITORING REPORT FOR ADDITIONAL INFORMATION.
2. MITIGATION PLANTING SHALL OCCUR BETWEEN DECEMBER 1- DECEMBER 31. MONITOR ESTABLISHMENT AND PROVIDE SUPPLEMENTAL WATER IN JULY, AUGUST, AND SEPTEMBER OR AS NEEDED.
3. INSTALL AND MAINTAIN EXCLUSION FENCING FOR THE DURATION OF THE FIVE-YEAR MITIGATION PROJECT.
4. PROVIDE INVASIVE SPECIES CONTROL IN THE IMMEDIATE VICINITY PRE AND POST CONSTRUCTION. CONTROL SHALL BE MECHANICAL AND CHEMICAL AS APPROPRIATE TO CAPE IVY, ENGLISH IVY, ICE PLANT, AND HIMALAYAN BLACKBERRY.
5. PROVIDE FIVE YEARS OF MONITORING AND MAINTENANCE OF MITIGATION AREA. MONITORING TO INCLUDE PHOTO AND PLANT CENSUS MONITORING, AND ANNUAL REPORTING BY BIOLOGIST.
6. PROVIDE AND INSTALL (4) RIGID, WEATHER AND UV-RESISTANT SIGNS ALONG EXCLUSION FENCE. SIGNS SHALL BE APPROXIMATELY 24"x18" WITH TEXT TO INFORM VISITORS OF RESTRICTED AREA DURING RESTORATION. FINAL TEXT TO BE APPROVED BY CONTRACTING OFFICER. MAINTAIN SIGNAGE THROUGHOUT THE 5-YEAR MITIGATION PERIOD

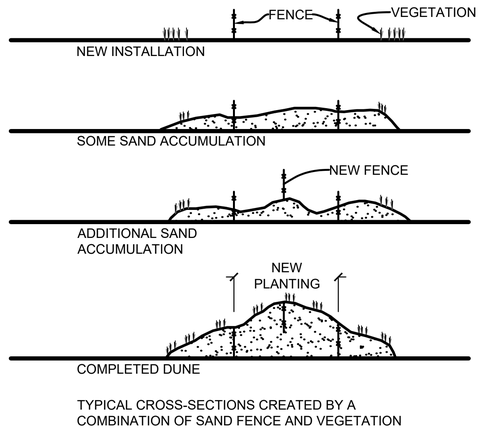
PRECEDENT IMAGE

20 0 20 40
SCALE OF FEET

| | | | | | |
|---|---|---|---|---|---|
| 100% FINAL CDs NOT FOR CONSTRUCTION | A/E FIRM<br>PRIME: DHM DESIGN DENVER, CO<br>LAND ARCH: DHM DESIGN DENVER, CO | DESIGNED: DHM<br>CADD DHM<br>TECH. REVIEW: DHM<br>DATE: 02/27/2024 | SUB SHEET NO.<br>L3.3 | TITLE OF SHEET<br>SITE MITIGATION PLAN<br>BID OPTION G<br>STINSON BEACH LIFEGUARD TOWER AND GRILL<br>GOLDEN GATE NATIONAL RECREATION AREA | DRAWING NO. 641 181643<br>PKG. NO. 318662<br>SHEET 13 OF 116 |

2/27/24 15:57 AMENENDEZ R24 P:\DENVER\NPS GOGA STINSON BEACH - 216097_CD\CAD\LA\L3-0_GOGA-SB_RESTORATION.DWG
XREFS: ..\BASE\XL-TITLE INFO-GOGA.DWG; ..\BASE\GOGA_STBE_DUNES_PA_EXPORTCAD_20221128.DWG; ..\BASE\L-10BASE.DWG; ..\BASE\XL-GOGA-LAYOUT.DWG; ..\BASE\XL-WETLANDS.DWG; ..\BASE\XC-NPS SURVEY.DWG; ..\BASE\L-10PFP.DWG; ..\BASE\10EUT.DWG; ..\BASE\10PUT.DWG;
IMAGES: ..\IMAGES\SIGNAGE01.JPG; ..\IMAGES\EX_CONOVERALL EXISTING CONDITIONS.JPG; ..\IMAGES\SANDFENCE.JPG; ..\..\IMAGES\LIVE STAKING DETAIL.JPG;

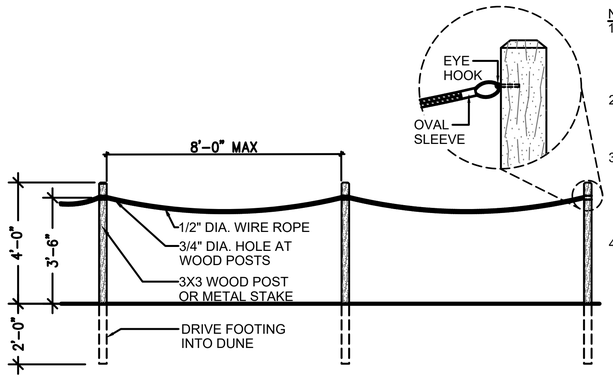
NOTES
1. SAND FENCING SHALL BE 4'-0" HIGH WOOD SLAT AND WIRE FENCING. DISTANCE BETWEEN SLATS IS APPROXIMATELY 1 1/2", WIRED TOGETHER.
2. PROVIDE AND INSTALL SAND FENCING TO PROTECT NEWLY PLANTED VEGETATION THROUGH ESTABLISHMENT.
3. REMOVE AND DISPOSE FENCE ONLY WITH APPROVAL OF CONTRACTING OFFICER'S REPRESENTATIVE.
4. SUPPORT FENCE WITH 3" DIAMETER POSTS DRIVEN INTO DUNE AT LEAST 24" DEEP AND SPACED AT 8'-0" O.C. SECURE FENCING TO WINDWARD SIDE OF POSTS WITH METAL OR NYLON TIES.
5. MOVE FENCE BASED ON SAND ACCUMULATION AS DIRECTED BY NPS.




TYPICAL CROSS-SECTIONS CREATED BY A COMBINATION OF SAND FENCE AND VEGETATION

## 1 L3.4 SAND FENCING

NTS

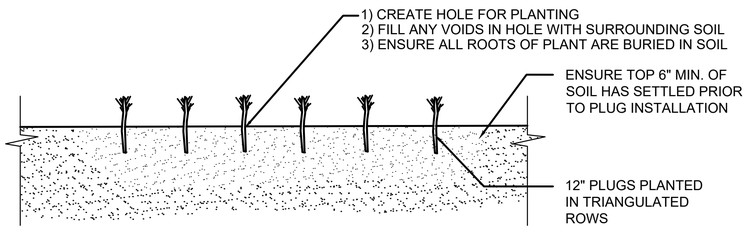



NOTES:
1. EXCLUSION FENCING INTENDED TO DETER TRESPASSING DURING ESTABLISHMENT OF VEGETATION. MAINTAIN THROUGHOUT ESTABLISHMENT.
2. FENCE POSTS MAY BE METAL OR WOOD. SUBMIT MATERIAL DATA AND DETAIL FOR FINAL APPROVAL BY CONTRACTING OFFICER.
3. FENCE RAIL MAY BE METAL, POLYPROPYLENE, OR NATURAL FIBER ROPE. SUBMIT MATERIAL DATA AND DETAIL FOR FINAL APPROVAL BY CONTRACTING OFFICER.
4. EXCLUSION FENCING MAY BE SAND FENCING MATERIAL PER FINAL APPROVAL OF CONTRACTING OFFICER.

## 2 L3.4 EXCLUSION FENCING

NTS

NOTES
1. ALL PLANTING AREAS TO BE MARKED IN FIELD AND APPROVED BY CONTRACTING OFFICER PRIOR TO PLANT INSTALLATION
2. ALL PLANT MATERIAL TO BE PLACED IN APPROPRIATE, FIELD VERIFIED ZONE.
3. EVENLY SPACE AND TRIANGULATE PLUGS AT 18" O.C. AND EVENLY DISTRIBUTE WITHIN DUNES.
4. DISTRIBUTE SPECIES RANDOMLY WITH NO MORE THAN SIX PLUGS OF SINGLE SPECIES GROUPED TOGETHER.

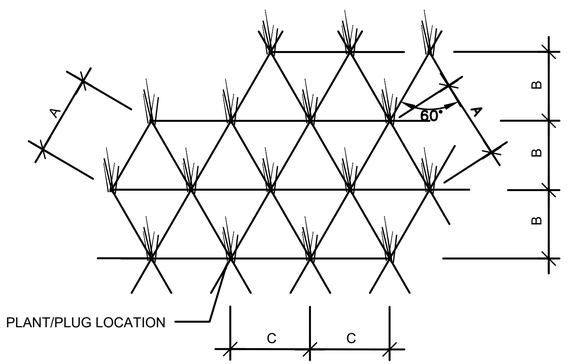



SECTION AT PLUGS

## 3 L3.4 PLUG PLANTING

NTS

| PLANT SPACING | A | B | C |
|---|---|---|---|
| 18" | 18" | 15½" | 18" |
| 24" | 24" | 21" | 24" |




## 4 L3.2 PLANT/PLUG TRIANGULAR SPACING

NTS

## PLANT SCHEDULE — TO BE PROPAGATED BY NPS

| BOTANIC NAME | COMMON NAME | QUANTITY | SIZE | SPACING |
|---|---|---|---|---|
| **DUNE MITIGATION PLANTING MIX** | | | | |
| **FOREDUNE** | | | | |
| ABRONIA LATIFOLIA | YELLOW SAND VERBENA | | 12" PLUG | 18" OC |
| AMBROSIA CHAMISSONIS | BEACH BUR | | 12" PLUG | 18" OC |
| CAMISSONIOPSIS CHEIRANTHIFOLIA | BEACH EVENING PRIMROSE | | 12" PLUG | 18" OC |
| CALYSTEGIA SOLDANELLA | BEACH MORNING GLORY | | 12" PLUG | 18" OC |
| DISTICHLIS SPICATA | SALT GRASS | | 12" PLUG | 18" OC |
| LEYMUS MOLLIS | AMERICAN DUNE GRASS | | 12" PLUG | 18" OC |
| ELYMUS TRITICOIDES | CREEPING WILD RYE X VANCOUVERENSIS | | 12" PLUG | 18" OC |
| JUNCUS LESCURII/BREWERI | SF RUSH/SALT RUSH | | 12" PLUG | 18" OC |
| **REARDUNE/DUNES SCRUB/BACKSHORE BEACH** | | | | |
| ARTEMESIA PYCNOCEPHALA | COASTAL SAGEWORT | | 12" PLUG | 18" OC |
| GRINDELIA STRICTA | COASTAL GUM WEED | | 12" PLUG | 18" OC |
| CARDIONEMA RAMOSISSIMUM | SAND MAT | | 12" PLUG | 18" OC |
| DISTICHLIS SPICATA | SALTGRASS | | 12" PLUG | 18" OC |
| ELYMUS TRITICOIDES | CREEPING WILD RYE X VANCOUVERENSIS | | 12" PLUG | 18" OC |
| ERIOPHYLLUM STACHAEDIFOLIUM | LIZARD TAIL | | 12" PLUG | 18" OC |
| LUPINUS ARBOREUS | BUSH LUPINE | | 12" PLUG | 18" OC |
| LEYMUS MOLLIS | AMERICAN DUNE GRASS | | 12" PLUG | 18" OC |
| **WILLOW RIPARIAN** | | | | |
| ACHILLEA MILLEFOLIUM | YARROW | | 12" PLUG | 18" OC |
| BROMUS SITCHENSIS VAR. CARINATUS | CALIFORNIA BROME | | 12" PLUG | 18" OC |
| CLAYTONIA PERFOLIATA | MINER'S LETTUCE | | 12" PLUG | 18" OC |
| GALIUM APARINE | GOOSE GRASS | | 12" PLUG | 18" OC |
| MARAH FABACEA | WILD CUCUMBER | | 12" PLUG | 18" OC |
| GALIUM APARINE | GOOSE GRASS | | 12" PLUG | 18" OC |
| MARAH FABACEA | WILD CUCUMBER | | 12" PLUG | 18" OC |
| RUBUS URSINUS | CALIF. BLACKBERRY | | 12" PLUG | 18" OC |
| POLYGONUM PARONYCHIA | DUNE KNOTWEED | | 12" PLUG | 18" OC |
| SCROPHULARIA CALIFORNICA | CALIFORNIA BEE PLANT | | 12" PLUG | 18" OC |
| PTERIDIUM AQUILINUM | WESTERN BRACKEN FERN | | 12" PLUG | 18" OC |
| TOXICODENDRON DIVERSILOBUM | POISON OAK | | 12" PLUG | 18" OC |
| **WETLAND MITIGATION PLANTING MIX** | | | | |
| **DUNE SWALE WETLANDS** | | | | |
| DISTICHLIS SPICATA | SALT GRASS | | 12" PLUG | 18" OC |
| JUNCUS BUFONIUS | TOAD RUSH | | 12" PLUG | 18" OC |
| RUMEX SALICIFOLIUS | WILLOW DOCK | | 12" PLUG | 18" OC |
| **FRESHWATER WETLANDS** | | | | |
| CALYSTEGIA | MORNING GLORY | | 12" PLUG | 18" OC |
| CAREX OBNUPTA | SLOUGH SEDGE | | 12" PLUG | 18" OC |
| CORNUS SERICEA | DOGWOOD | | 12" PLUG | 18" OC |
| STACHYS CHAMISSONIS | COSTAL HEDGE-NETTLE | | 12" PLUG | 18" OC |
| SCHOENOPLECTUS PUNGENS | BULRUSH | | 12" PLUG | 18" OC |
| POLYGONUM | WATER SMARTWEED | | 12" PLUG | 18" OC |
| JUNCUS LESCURII/BREWERI | SF RUSH/SALT RUSH | | 12" PLUG | 18" OC |
| DIPLACUS GUTTATUS | SEEP SPRING MONKEY FLOWER | | 12" PLUG | 18" OC |
| | APPROX | 7270 | PLUGS | 18" OC |

PLANT SCHEDULE NOTES:
1. PLANT MATERIAL SHALL BE PROPAGATED AND SUPPLIED BY THE PARK FOR OUTPLANTING IN THE WINTER OF 2025/26.
2. TRANSPORT OF PLANT MATERIAL FROM THE NPS NURSERY TO THE SITE, CARE OF THE LIVE PLANT MATERIAL, AND PLANTING BY THE CONTRACTOR.
3. PLANT LIST IS PRELIMINARY, TO BE FINALIZED PRIOR TO CONSTRUCTION AND INSTALLATION.

100% FINAL CDs
NOT FOR CONSTRUCTION

A/E FIRM
PRIME: DHM DESIGN DENVER, CO
LAND ARCH: DHM DESIGN DENVER, CO

DESIGNED: DHM
CADD: DHM
TECH. REVIEW: DHM
DATE: 02/27/2024

SUB SHEET NO. L3.4

TITLE OF SHEET
SITE MITIGATION DETAILS
BID OPTION G
STINSON BEACH LIFEGUARD TOWER AND GRILL
GOLDEN GATE NATIONAL RECREATION AREA

DRAWING NO. 641 181643
PKG. NO. 318662
SHEET 14 OF 116

2/27/24 15:57 AMENENDEZ R24 P:\DENVER\NPS GOGA STINSON BEACH - 216997_CD\CAD\ALL\3-0_GOGA-SB_RESTORATION.DWG
XREFS: ..\BASE\XL_TITLE INFO-GOGA.DWG; ..\BASE\GOGA_STBE_DUNES_PA_EXPORTCAD_20221128.DWG; ..\BASE\L-10BASE.DWG; ..\BASE\XL-GOGA-LAYOUT.DWG; ..\BASE\XL-WETLANDS.DWG; ..\BASE\XC-NPS SURVEY.DWG; ..\BASE\L-10PFP.DWG; ..\BASE1\10ELIT.DWG; ..\BASE1\10PUT.DWG;
IMAGES: ..\IMAGES\SIGNAGE01.JPG; ..\IMAGES\EX_CON\OVERALL EXISTING CONDITIONS.JPG; ..\IMAGES\SAND FENCE.JPG; ..\..\IMAGES\LUVE STAKING DETAIL.JPG;