Appendix F

Special Status Plant Survey and Vegetation Community Mapping/ESHA/Wetland Baseline Evaluation Technical Memorandum

Technical Memorandum

16 February 2021

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Subject: **Special Status Plant Survey and Vegetation Community Mapping/ESHA/Wetland Baseline Evaluation, Rev. 1**

1. Introduction

1.1 Summary

This Technical Memorandum reports the results of botanical studies at the Samoa Peninsula Land-based Aquaculture Project proposed by Nordic Aquafarms California, LLC. (NAFC). Botanical studies consisted of seasonally appropriate floristic surveys for special status plants, vegetation mapping, and assessment of Sensitive Natural Communities, Environmentally Sensitive Habitat Areas (ESHA), and wetlands. GHD conducted surveys for special status plant species and vegetation mapping during the spring and summer of 2020 (March 24-July 27).

1.2 Project Description

The Samoa Peninsula Land-based Aquaculture Project (Project) would be located at the site of the former Freshwater Tissue Samoa Pulp Mill located on the Samoa Peninsula in the unincorporated community Samoa in Humboldt County, California. See Figure 1 for the Vicinity Map in Appendix A. The Project would include brownfield redevelopment with demolition of existing pulp mill infrastructure and construction of a sustainable land-based finfish aquaculture facility. The land-based finfish aquaculture facility and associated infrastructure would cover approximately 36 acres. Although much of the proposed development would occur within the current footprint of the pulp mill, it is also proposed to expand into the undeveloped, but previously impacted, area of the parcel.

1.3 Location

The Project Site is located within Assessor Parcel Number (APN) 401-112-021. The site of the planned aquaculture facility (APN 401-112-021) is owned by the Humboldt Bay Development Association, Inc. (HBDA), and is leased to the Humboldt Bay Harbor, Recreation and Conservation District (HBHRCD).

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The Project Site is located in the California Coastal Zone, with primary permitting jurisdiction with the Humboldt County Local Coastal Program. The Project Site is designated for Industrial, Coastal Dependent (MC) land use and is zoned Industrial/Coastal Dependent. Prior to development for use as a pulp mill over 50 years ago, the location on the Samoa peninsula historically consisted of mobile and vegetated coastal dunes. The natural topography of the area has been altered, and the remaining degraded dunes in the project area have been subject to regular anthropogenic disturbance. The industrially developed parcel is bordered by Humboldt Bay to the east, highly invaded coastal dunes to the west and south, and developed area to the north.

2. Regulatory Setting

2.1 State Listed and CNPS Rare Species

Special status plant species under State jurisdiction include those listed as endangered, threatened, or as candidate species by the California Department of Fish and Wildlife (CDFW) under the California Endangered Species Act (CESA). Plant species on California Native Plant Society's (CNPS) California Rare Plant Ranking (CRPR) Lists 1 and 2 are considered eligible for state listing as Endangered or Threatened pursuant to the California Fish and Game Code and CDFW has oversite of these special status plant species as a trustee agency. As part of the CEQA process, such species should be considered as they meet the definition of Threatened or Endangered under Sections 2062 and 2067 of the California Fish and Game Code. CRPR List 3 and 4 plants do not have formal protection under CEQA. CDFW publishes and periodically updates lists of special status species. Additionally, there are 64 plant species designated as "rare" which is a special designation created before plants were rolled into CESA in the 1980s (CDFW 2020a). A project is required to have a "Scientific, Educational, or Management Permit" from CDFW for activities that would result in "take," possession, import, or export of state-listed plant species including research, seed banking, reintroduction efforts, habitat restoration, and other activities relating to any plant designated SE (State endangered), ST (State threatened), SR (State rare), or SC (State candidate for listing).

2.2 Federally Listed Species

Special status plant species under Federal jurisdiction include those listed as endangered, threatened, or as candidate species by the Fish and Wildlife Service (USFWS) under the U.S. Endangered Species Act (ESA).

2.3 Sensitive Plant Communities

CDFW provides oversight of habitats (i.e. plant communities) listed as Sensitive in the California Natural Diversity Database (CNDDB) and on the California Sensitive Natural Communities List, based on global and state rarity rankings. The natural communities are broken down to alliance level for vegetation types affiliated with ecological sections in California. The list and alliances coincide with A Manual of California Vegetation (Sawyer et al. 2009). CDFW considers alliances and associations with a S1 to S3 rank to be Sensitive (CDFW 2019).

2.4 Environmentally Sensitive Habitat Areas/Wetlands

Environmentally Sensitive Habitat Areas (ESHAs) are defined by the Coastal Commission as follows:

> *"Environmentally sensitive area" means 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.* (Pub. Resources Code, § 30107.5)

The Coastal Commission's designation of ESHA generally includes vegetation alliances listed in CDFW's California Sensitive Natural Communities List with an S1- S3 ranking. The Coastal Commission's ESHA category is broadly defined, and it includes habitat for special-status species, wetlands, riparian areas, and other areas that provide important ecosystem functions. There is not a specific list of habitats considered to be ESHA for the State or County. The Coastal Commission's definition of wetlands includes areas that meet at least one wetland parameter (dominance of hydrophytic plants, hydric soils, or hydrology). The Coastal Commission's regulations define wetlands as follows:

> *Wetland shall be defined as land where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes, and shall also include those types of wetlands where vegetation is lacking and soil is poorly developed or absent as a result of frequent and drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salts or other substances in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within, or adjacent to, vegetated wetlands or deep-water habitats.* (14 CCR Section 13577)

The Coastal Commission and local counties or municipalities associated with the Local Coastal Program (LCP) are the jurisdictional agencies that exert authority in identifying and protecting ESHA in the course of project activities. The Army Corps of Engineers (USACE) regulates wetlands under Section 404 of the Clean Water Act. The USACE uses a three-parameter definition for wetlands. In order to be a USACE wetland, an area must have wetland plants, hydric soil, and wetland hydrology.

3. Methods

3.1 Area of Potential Effect

The Area of Potential Effect (APE) was broadly defined to encompass the project footprint and all areas of potential direct or indirect effects. A buffer was mapped between the project boundary and APE boundary to the east (variable width averaging greater than 250 feet) and west (variable width averaging greater than 100 feet). To the south, a buffer of approximately 50 feet between the project boundary and APE was also subject to field investigations. The area south of the project and APE boundary is privately owned and was not accessible for field investigations. The area north of the project is a developed industrial area absent botanical resources; thus a buffer was not necessary. Adding an additional, second buffer to the APE was not deemed necessary, as ground disturbance and other potential impacts to botanical or wetland resources have no potential to occur beyond the APE. Areas beyond the project footprint to the west of Vance Avenue

were also included in the surveys and evaluation within the APE. Areas east of the project footprint, toward the shoreline of Humboldt Bay, were also included in the surveys and evaluation within the APE. Properties located to the south and north of the proposed project are privately owned and thus were not accessible to field investigations. Humboldt County Web GIS resources were referenced in mapping and field investigations; however, these resources are not a suitable substitute for on-the-ground mapping of sensitive resources, which was confined to the APE.

3.2 Pre-Survey Investigations

A scoping list of CRPR plant species and habitats with recorded occurrences in the project vicinity was compiled prior to surveys by consulting the *California Natural Diversity Database* (CNDDB) [CDFW 2020b], the CNPS *Inventory of Rare and Endangered Vascular Plants* (CNPS 2020), and the IPaC database of federally listed plant species maintained by the U.S. Fish and Wildlife Service (USFWS 2020). The scoping list (Appendix B) includes special status plants that occur in habitat similar to the project area with documented occurrences on the Ferndale USGS quadrangle or adjacent quadrangles. The scoping list also contains other taxa that may occur in the project area whose habitat is suitable if the project is within or near the known range of the species. Due to the proximity of the Eureka quadrangle to the coast, the assessment area was defined as the six USGS 7.5' minute quadrangles centered around the Eureka quadrangle (Tyee City, Arcata North, Arcata South, Cannibal Island, Fields Landing, and McWhinney Creek USGS 7.5' quadrangles). The query yielded 33 special status plant species with CRPR rank of 1B or 2 and 14 species with CRPR of 4. All species were reviewed prior to the field survey. For simplicity, only CRPR list 4 species with at least low potential (or greater) to occur within the project area are included in the scoping table. Of the species identified during scoping, eight have a moderate probability of occurring within the study area. CNDDB also documents four Sensitive Habitats (classified according to Holland, 1986) within the assessment area, and these communities were included in the scoping process (CDFW 2020c). Soils were mapped and reviewed (Figure 2 – Soils Map).

3.3 Special Status Plant Surveys

3.3.1 Floristic Surveys

Floristic surveys were conducted by Amy Livingston, Kelsey McDonald, and Misha Schwarz. Amy Living is qualified as a botanist and wetland scientist with an M.S. in Botany and more than ten years of professional experience. Kelsey McDonald is a CNPS Certified Consulting Botanist with over six years of experience conducting floristic surveys according to CDFW protocols. Misha Schwarz is Certified Professional Soil Scientist and a Professional Wetlands Scientist with over 35 years of experience.

GHD Botanist Amy Livingston conducted an early season survey of the entire APE for special status plant species occurred on April 17, 2020. GHD Botanist Kelsey McDonald conducted follow-up surveys on May 5, May 9, May 22, and June 29. All surveys were conducted during suitable overcast to clear weather conditions absent precipitation. The special status plant surveys were floristic in nature following *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* by the California Natural Resource Agency (CDFW 2018) and *General Rare Plant Survey Guidelines by the*

Endangered Species Recovery Program (USFWS 2002). An intuitively controlled survey was conducted that sampled and identified potential habitats for special status species. Plants were identified to the lowest taxonomic level necessary for rare plant identification. Nomenclature follows *The Jepson Manual* (Baldwin et al 2012). The special status plant survey was conducted by walking the site looking for the presence of target species and habitats identified on the scoping list, as well as presence of any other incidental sensitive-listed plant species. A list of species observed within the APE is included (Appendix C). GHD Botanist Amy Livingston and GHD Senior Environmental Scientist Misha Schwarz spent a total of 5 person-hours on the April 17, 2020 early season survey. GHD Botanist Kelsey McDonald spent a total of 20 hours on special status plant surveys between May 5 and June 29.

3.3.2 Dark-eyed Gilia Population Estimation

A population estimate was calculated for dark-eyed gilia (*Gilia millefoliata*), a CNPS-listed (1B.2) special status plant occurring on the property. The annual dune plant was first observed in flower on May 5, 2020 within the Area of Potential Effect and was too numerous to establish total population size with a direct count. Population sampling using a systematic sampling scheme occurred on May 22, 2020. Average population density in 1 square-meter quadrats within the bounds of the largest population polygon provided the basis for calculating population size over the total polygon area. Direct counts determined the number of individuals in small outlier clumps separated from the main population. Pink flagging and points taken on a Trimble XH GPS unit showed the extent of the population within the APE prior to sampling. The flagged boundary of the main population polygon served as a macroplot for systematic sampling along transects. A baseline transect was established along the southern fence that bisects the population, and north-south transects were placed every 60ft on both sides of the fence. The number of dark-eyed gilia plants was counted within 1 square-meter quadrats placed every 15 feet along the north-south transects after a random start between 0-15. Average density within the 1 square-meter quadrats was multiplied by the total area of the macroplot to obtain population estimates for the area.

3.4 Sensitive Natural Communities and Environmentally Sensitive Habitat Areas

3.4.1 Vegetation Mapping

GHD conducted vegetation mapping on March 24, March 25, April 8, April 23, June 29, and July 27, 2020. GHD vegetation mapping in 2020 expanded and updated SHN's previous mapping efforts overlapping the area around Vance Avenue. Vegetation was mapped to the Alliance level according to *A Manual of California Vegetation* (Sawyer et al. 2009). Vegetation Rapid Assessments were completed to characterize the dune mat community and adjacent areas that were strongly dominated by non-native species (Appendix D).

3.4.2 Sensitive Natural Community Assessment

The quality of dune habitats was quantitatively assessed by collecting percent cover data in randomized 1 square-meter plots. Sampling of the degraded dune area near the current footprint of development (north of the southerly cyclone fence) occurred on March 24 and March 25, 2020. Vegetation data was collected in twenty randomized plots north of the fence. Six of these plots were determined to be within the highly invaded yellow bush lupine scrub, and 14 were within the dune mat community. Sampling percent cover of

dune mat areas south of the fence occurred concurrently with dark-eyed gilia sampling on May 22, 2020 using a subset of the randomized plots occurring within the dune mat community.

Plot locations were randomized in the field by establishing baseline transects inward from the fence lines and selecting random distances along regularly placed transects perpendicular to the baselines. The northern dune assessment area excluded the approximately 50-foot wide strip of land parallel to the western fence line, which had previously been mapped by SHN, and a 25-foot strip of land parallel to the southern fence line.

Absolute percent cover was estimated for all species and bare areas at each 1 square-meter plot. Not all plants could be identified to species during the early survey due to the timing of data collection. Absolute cover of native, non-native, total vascular cover for each plot were used to calculate relative cover of native and non-native species, and to assess the "value" of these plant communities.

3.4.3 Potential Wetlands Investigation

On March 25 and May 22, 2020, Misha Schwarz, a GHD wetlands scientist, investigated the Area of Potential Effect (APE) to map wetland boundaries that meet the three-parameter definition of the U.S. Army Corp of Engineers (USACE) and the one-parameter definition of the Coastal Commission, Coastal Act and Local Coastal Plan. The wetlands delineation followed the approach from the USACE Wetlands Delineation Manual (USACE 1987) and Regional Supplement to the USACE Wetland Delineation Manual: Western Mountains, Valleys and Coast Region (USACE 2010) throughout the APE. Soil pits were dug to approximately 30 inches. Data on soil color, texture and redoximorphic features were collected. Data on hydrologic conditions were collected if observed. The delineation was conducted in the early/late spring once one-half of the annual average rainfall has occurred.

Vegetation data collection consist of listing the dominant species at each plot. The species were then classified as to whether or not they are wetlands indicators, using the most current standard reference for plant wetlands indicators: National Wetland Plant List: Western Mountains, Valleys, and Coast 2012 Final Regional Wetland Plant List (Lichvar 2012). The list classifies plants based on the probability that they would be found in wetlands, ranging from Obligate (almost always in wetlands), Facultative/wet (67% to 99% in wetlands), Facultative (34% to 66% in wetlands), Facultative/up (1% to 33% in wetlands) to Non-indicator (less than 1% in wetlands). Plants not listed are included in the uplands category. If 50% or greater of the dominant plant species at each plot are classified as either Obligate (OBL), Facultative/wet (FACW), or Facultative (FAC), the vegetative mix is determined to be hydrophytic (wetland plants). A determination of the wetland boundary will be made based on soil, hydrology (if present), and vegetative parameters (three-parameter USACE definition) and the Coastal Commission one-parameter definition.

Areas with coastal willow (*Salix hookeriana*) and other wetland indicator plants were investigated for a dominance of hydrophytic species, hydric soils on the dates mentioned above on the southwestern portion of the APE, east of Vance Avenue. Both 1-parameter and 3-parameter wetlands characterized by coastal willow west of Vance Avenue have been mapped by SHN for a different project (see Figure 3a in SHN 2018), and these areas were not further analyzed or investigated.

4. Results

4.1 Special Status Plant Surveys

4.1.1 Floristic Surveys

Rare dark-eyed gilia (*Gilia millefoliata*) was detected in flower on May 5, 2020 in the degraded dune habitat on the southern side of the project area. No other special status plant species were found within the APE. Dark-eyed gilia is protected under CEQA as a CNPS-listed 1B.2 rare plant. The 1B.2 rank indicates that it is rare or endangered throughout its range, which extends from Northern California into Southern Oregon, and it is fairly endangered within California. NatureServe also ranks dark-eyed gilia as Imperiled globally (G2) and within the state of California (S2). Dark-eyed gilia was identified by its densely glandular stem and calyx, dissected leaves with linear lobes, short pedicels, and yellow funnel-shaped corolla throat with two purple splotches per lobe. Photos can be found in Appendix E.

Floristic surveys were appropriately timed to capture the blooming period of early and late blooming special status plants with the potential to occur in the area. The early season survey on April 17, 2020 was timed to target early blooming special status species with potential to occur in the project area, including the two Federally endangered species with potential habitat in the project area, beach layia (*Layia carnosa*) and Menzies' wallflower (*Erysimum menziesii*). At the time of the early survey, Menzies's wallflower had been observed blooming in the dunes in Humboldt County. Beach layia was observed blooming at a nearby reference site in mobile foredunes west of Samoa Blvd. prior to the survey on May 9. Although populations of these endangered foredune species occur nearby, these species are typically found in less degraded areas with intact dune topography, and they are less likely to occur in the project area. No habitat is present within the project areas for western lily (*Lilium occidentale*), the third federally endangered species identified during scoping.

4.1.2 Dark-Eyed Gilia Population

An estimated population of approximately 100,000 dark-eyed gilia plants occurs within the Area of Potential Effect (APE). See Appendix F for the California Native Species Field Survey Form, which has been submitted to CDFW's CNDDB, as required by CDFW. Dark-eyed gilia had a clustered distribution scattered from the area west of the clarifiers across the southern end of the property, and extending south beyond the edge of the APE (Appendix A ,Figure 3). The highest density of dark-eyed gilia occurred north of the fence along the disturbed access road and in a couple of small patches near the clarifiers. A total of 133 dark-eyed gilia plants were counted in two small, dense clusters west of the clarifiers. A sparser patch on the east side of the property near the current footprint contained 415 plants. Systematic sampling of the main population macroplot (n=146) showed an average density of 17 (± SE of 7) plants per 1 square-meter quadrat area in the area north of the southern cyclone fence, resulting in an estimate of ~60,000 individuals north of the cyclone fence over the ~3700 square-meter area. Sampling the macroplot south of the cyclone fence showed an average density of seven dark-eyed gilia plants (± SE of 2) per 1 square-meter quadrat, resulting in an estimate of ~40,000 individuals in the ~5600 square-meter macroplot within the APE south of the cyclone fence (Table 1, Figure 1).

Table 1. Dark-Eyed Gilia Population Estimates by Area

	Area (sqft)	Density (#/sqm)	Number of Plants	Population Estimate Error
Main Population North of Fence	39,950	17	60,000	± 30,000
Main Population South of Fence	60,400	7	40,000	± 10,000
Northeastern Subpopulation	2,990	1.5	415	± 10
Northwestern Subpopulation	40	33	133	± 10

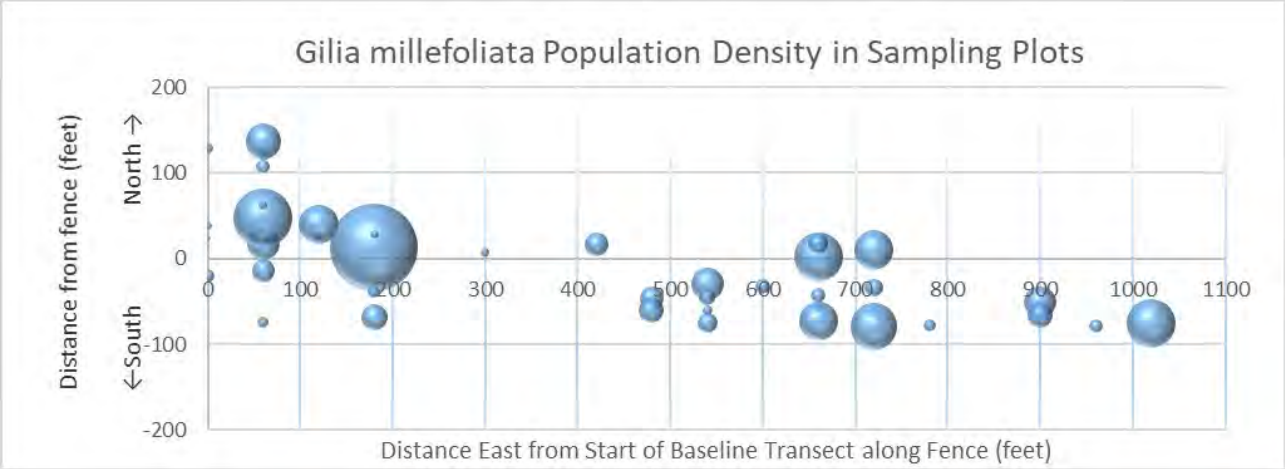


Figure 1. Spatial Distribution of Dark-Eyed Gilia Density around the Southern Fence Line

Dark-eyed gilia was most concentrated in the unpaved access road north of the southern cyclone fence line, where intermittent disturbance appears to have prevented dense establishment of vegetation. The rare annual appeared to favor disturbed areas with lower non-native vegetation cover, such as in the access road north of the fence, and the population appeared to be sparser and patchily distributed closer to the former pulp mill and clarifiers. Some small but dense patches also occurred in open tire tracks through the sand around the clarifiers. Dark-eyed gilia also occurred at moderate density in clusters throughout the dune mat community south of the cyclone fence. Dark-eyed gilia was fairly abundant but stunted in areas where shell and gravel have been distributed in the power-pole access area to the south of the cyclone fence. Dark-eyed gilia often associated with native dune mat species such as seaside buckwheat (*Eriogonum latifolium*), yellow sand verbena (*Abronia latifolia*), sand mat (*Cardionema ramosissimum*), beach strawberry (*Fragaria chiloensis*), and dune knotweed (*Polygonum paronychia*), disturbance-associated native miniature lupine (*Lupinus bicolor*), as well as many non-native invasive species such as ripgut brome (*Bromus diandrus*), sheep sorrel (*Rumex acetosella*), and English plantain (*Plantago lanceolata*). Dark-eyed gilia did not occur in areas with high percent cover (>80%) of European beachgrass or other invasive plants. Dark-eyed gilia was in peak flower during May surveys and was >50% in fruit during the June 29th site visit. The annual plant was >90% in fruit and dropping seeds during the July 27th visit.

4.2 Sensitive Natural Communities and Environmentally Sensitive Habitat Areas

4.2.1 Vegetation Assessment and Mapping

Dune mat (*Abronia latifolia-Ambrosia chamissonis* Alliance) (G3 S3)

Herbaceous vegetation (less than 10% shrub cover) with characteristic presence of dune mat species keyed to the *Abronia latifolia-Ambrosia chamissoni*s Alliance in *A Manual of California Vegetation* (MCV). Dune mat is a Sensitive Natural Community ranked by NatureServe as Vulnerable globally (G3) and within the state of California (S3). Much of the APE contains dune mat species at diagnostic levels. Dune mat within the APE was primarily characterized by yellow sand verbena, seaside buckwheat, dune knotweed, beach strawberry, and sandmat. Rare dark-eyed gilia, which typically occurs in stabilized dunes, was also widespread in this community. Previous leveling of the natural dune topography, continued anthropogenic disturbance, and the introduction of invasive non-native species have degraded dune mat communities in the area. Much of the area was highly invaded by non-native grasses and forbs, including ripgut brome, sweet vernal grass (*Anthoxanthum odoratum*) and sheep sorrel. Patches of higher quality dune mat were mapped in areas that have retained >50% relative native cover and more natural dune processes with undulating topography and greater sand mobility as a result of lower overall vegetative cover. A total of 6.8 acres of the APE was mapped as dune mat, and an additional 0.34 acres was mapped as high quality dune mat (Appendix A, Figure 4, Table 2).

Yellow bush lupine scrub (*Lupinus arboreus* Alliance)

Areas dominated by invasive yellow bush lupine (*Lupinus arboreus*) in the shrub layer were mapped as yellow bush lupine scrub. These areas contained high absolute cover of non-native species and very few native plants. Species commonly associated with yellow bush lupine scrub within the APE included ripgut brome, sweet vernal grass, and velvetgrass (*Holcus lanatus*) among many other non-native weedy species. Yellow bush lupine also appears to be encroaching into areas currently mapped as dune mat, with many seedlings occurring at the transition zone between yellow bush lupine and dune mat communities. Some areas previously mapped as generic non-native vegetation or dune mat were dominated by yellow bush lupine at the time of surveys in 2020, and these areas were updated to show current conditions. An area near the western parking lot previously designated as non-native appeared to have been managed for yellow bush lupine (cut and piled bush lupine and stumps apparent in the area), and this area has been identified as a dune mat community based on current vegetation with at least 10% cover of native dune species. A total of 2.18 acres of yellow bush lupine scrub occurs on the property (Appendix A, Figure 4, Table 2).

European beach grass swards (*Ammophila arenaria* Semi-Natural Stand)

European beach grass (*Ammophila arenaria*) has invaded a great deal of the remaining dune topography within the APE, and it is widespread in dunes in the surrounding areas. European beach grass swards were mapped according to MCV online membership rules, and only include areas with >80% relative cover of European beach grass. European beach grass swards covered 0.70 acres of the APE (Appendix A, Figure 4, Table 2).

Coastal willow thickets (*Salix hookeriana* Alliance) (G4 S3)

Coastal willow thickets were dominated my mature *Salix hookeriana,* with lower cover of other shrub species such as coyote brush (*Baccharis pilularis*). Coastal willow thickets are a Sensitive Natural Community with a state rank of S3. Coastal willow thickets primarily occurred in swale topography along Vance Ave (east and west), and Brewer's rush (*Juncus breweri*) was common in the understory. Coastal willow thickets were first mapped in the area by SHN in 2018 mapping for the Samoa Peninsula Wastewater Project. Spatial data showing coastal willow thickets from the previous SHN mapping effort was incorporated into current mapping, and the southern willow thicket east of Vance Ave. was expanded slightly to include associated swale vegetation. Coastal willow thickets cover 0.27 acres of the APE (Appendix A, Figure 4, Table 2). See section 4.2.3 below with regard to these willow thickets and their wetlands status.

Coastal brambles (*Rubus ursinus* Alliance) (G4 S3)

Coastal brambles are a Sensitive Natural Community with a state rank of S3. Coastal brambles within the APE primarily consisted of mixed native shrubs, co-dominated by California blackberry (*Rubus ursinus*) with coast silk tassel (*Garrya elliptica*), coyotebrush (*Baccharis pilularis*), and wax myrtle (*Morella californica*). A mixture of native and non-native species occurred in the herbaceous layer. SHN identified and mapped coastal brambles within the APE for the Samoa Peninsula Wastewater Project in 2018, and this spatial data was incorporated into current vegetation mapping. Coastal brambles occurred in a single 0.20 acre patch along the roadside ridge east of Vance Ave (Appendix A, Figure 4, Table 2).

Table 2. Acreage of Vegetation Types within the APE

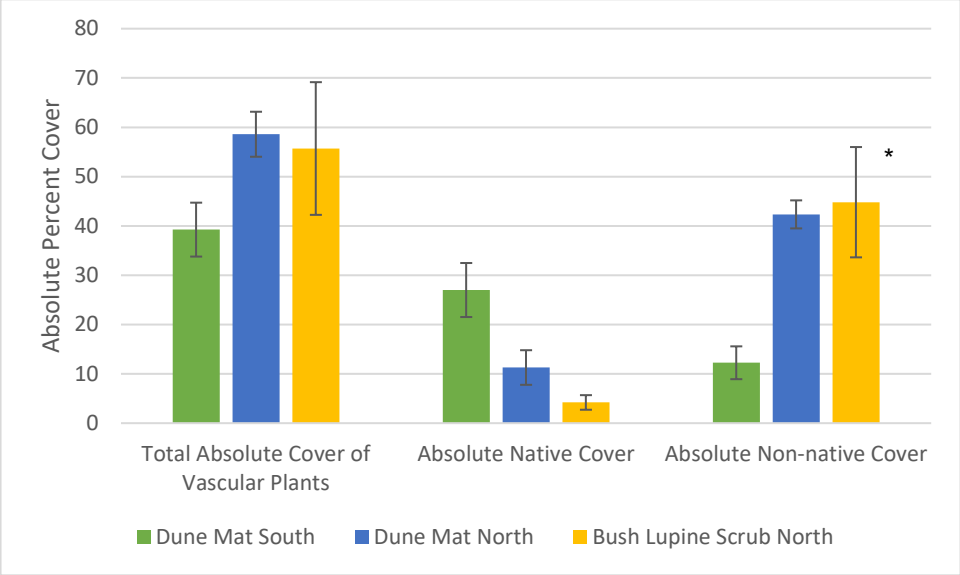
Vegetation Type	Area (acres)
Coastal Brambles	0.20
Coastal Willow Thicket	0.27
Developed	30.27
Dune Mat	6.81
High Quality Dune Mat	0.34
Invasive European Beach Grass Swards	0.70
Invasive Yellow Bush Lupine Scrub	2.18
Grand Total	**40.77**

4.2.2 Sensitive Natural Community Assessment

The quality of the dune mat Sensitive Natural Community varied within the project's APE, and randomized percent cover plots were used to characterize the dune mat community and yellow bush lupine scrub. Quantitative analysis showed that dune mat to the north of the fence has intermediate levels of native cover compared to high quality dune mat to the south and adjacent invasive bush lupine scrub (Figure 4). The northern dune mat area also had high non-native cover similar to bush lupine scrub (Figure 4). Dune mat areas south of the cyclone fence (n=6) contained a dominance of native species, low overall cover of

vascular plants, and low cover of non-native species. The area south of the cyclone fence contains a berm structure that is similar to natural dune topography, and areas of high-quality dune mat mapped in the area are characterized by mobile sand and a strong dominance of dune mat species (68% relative native cover, 27% absolute native cover). European beach grass swards and yellow bush lupine scrub also occur in the APE south of the cyclone fence.

In contrast, dune mat plots north of the cyclone fence (n=14), near the current footprint of the pulp mill, showed diagnostic levels of native dune species (11% absolute cover), but they are dominated by non-native species (76% relative cover of non-native species). The project area north of the cyclone fence is former coastal dune habitat that has been leveled during construction of the pulp mill in the mid to late 60s. Although the natural dune topography has been removed, many dune mat plants, including the rare dark-eyed gilia, have persisted in this altered and highly invaded habitat. Plots within the adjacent yellow bush lupine scrub (n=6) near the footprint of the former pulp mill showed similar total vascular plant cover and presence of non-native plants, but very low cover of native species (4% absolute cover). The access road north of the southern fence line, where dark-eyed gilia was concentrated, appeared to have more areas with open sand and a higher percentage of native dune mat species, but no plots occurred within this area.



*Error bars represent standard error.

Figure 2. Mean Absolute Percent Cover in Dune Habitats

4.2.3 Potential Wetlands Investigation

A U.S. Army Corp of Engineers formatted wetland report was not prepared because there are no three-parameter wetlands within the project footprint, no three-parameter wetlands would be impacted by the project, and Clean Water Act Section 401 and 404 permits, as administered by the North Coast Regional

Water Quality Control Board and the U.S. Army Corps of Engineers, respectively, are not needed for the project.

Coastal willow thickets within the APE are characterized by a strong dominance of *Salix hookeriana*, a Facultative-Wetland species, and qualify as one-parameter wetlands in addition to being S3 Sensitive Natural Communities. The coastal willow thickets east of Vance Avenue were investigated as potential three or one-parameter wetlands on May 22, 2020. The first willow thicket investigated was the most southerly, on the southwest corner of the APE (see Appendix A, Figure 4). A soil pit was dug to 30 inches and consisted of sand with a matrix color of 2.5Y 3/2 with no redoximorphic features. The soil in this pit was dripped with alpha-alpha-Dipyridyl at 10" and at 20", and no reaction was observed. Sandy soils have very low iron due to their coarse texture. A negative reaction to alpha-alpha-Dipyridyl in sandy soils does not necessarily mean the soil are not saturated within the growing zone during the growing season. Soils were moist when observed and a pit was dug to 30 inches (deeper than normally dug for wetlands investigations) to ensure groundwater was absent far beneath the 12-inch requirement for wetlands hydrology. No groundwater was observed. The second willow thicket investigated was just north of the first willow thicket investigated. A soil pit was dug to 30 inches and consisted of sand with a matrix color of 2.5Y 3/2 with no redoximorphic features. The soil in this pit was dripped with alpha-alpha-Dipyridyl at 10" and at 20", and no reaction was observed. Soils were moist. No groundwater was observed. Based on the lack of hydric soil, absence of observable groundwater and negative reaction to alpha-alpha-Dipyridyl both of the willow thickets are judged to be one-parameter wetlands. The investigation was appropriately conducted during early and late spring after half of the annual rainfall in 2020. Additional site visits are planned for early spring 2021, after half of the average annual rainfall, to confirm findings.

A small patch of coastal willow (*Salix hookeriana*) was identified in an area northwest of the western clarifier within the APE on March 23, 2020, and this area was investigated as a potential wetland. The coastal willow was growing with California blackberry (*Rubus ursinus*) in the shrub stratum. Sweet vernal grass (*Anthoxanthum odoratum*), was the most dominant herbaceous species. Of the three dominant species, only the coastal willow classifies as wetland vegetation, and therefore the vegetation did not pass the dominance test for wetland vegetation. A soil pit was dug to 30 inches to investigate soils and potential hydrology. No groundwater was observed. From 0-4", the matrix color was 10YR 3/2 and the texture was sand. From 4-10" the matrix color was 2.5 Y 3/2 and the texture was gravelly sand (consisting of fill material). Form 10-14" the matrix color was 2.5 Y 3/2 and the texture was silt loam (fill material). Form 14-30" the matrix color was 2.5 Y 3/2 and the texture was gravelly sand (fill material). No redoximorphic features were observed. The soil in this pit was dripped with alpha-alpha-Dipyridyl at 10" and at 20", and no reaction was observed. This small willow patch does not meet criteria for jurisdictional (3-parameter) or Coastal Commission (1-parameter) wetlands, nor ESHA. There are piles of cut vegetation in this area, and it appears this small willow patch may have sprouted from previously cut willow branches.

5. Conclusion

The purpose of this evaluation was to conduct seasonally appropriate surveys for state, federal, and other sensitive listed plant species, and Sensitive Natural Communities per CDFW or Environmentally Sensitive Habitat Areas (ESHA) and wetlands per the Coastal Commission and Local Coastal Plan guidelines within

the project area. This evaluation does not include impact assessment for special-status plants, ESHAs, or wetlands. Impact assessment, including avoidance and minimization measures is included in the project's CEQA Initial Study/Mitigated Negative Declaration and the Restoration and Monitoring Plan (GHD 2020a, GHD 2020b).

A rare plant population of ~100,000 rare dark-eyed gilia (*Gilia millefoliata*) (2B.2) occurs within dune mat in the APE, and the population extends out of the APE to the south of District-owned land. Dark-eyed gilia was most concentrated near the southern fence line and appeared to be associated with open patches of lower vegetative cover and the presence of other native dune mat species.

Sensitive Natural Communities within the APE include dune mat (G3 S3), coastal willow thickets (G4 S3), and coastal brambles (G4 S3). Dune mat quality varies in the area, with higher quality patches characterized by a dominance of native dune mat species, lower total vascular plant cover, and undulating topography. Lower quality dune mat with higher percent cover of invasive species and lower percent cover of native species occurred to the north. Invasive, nitrogen-fixing yellow bush lupine has established strong dominance in several areas around the APE, and these areas were associated with high percent cover of invasive annual grasses and other non-native species. Invasive European beach grass has also established strong dominance in dune habitat south of the fence.

Coast willow thickets, a Sensitive Natural Community (G4 S3), east of Vance Avenue are also considered one-parameter wetlands. Areas with coast willow (*Salix hookeriana*) east of Vance Avenue were investigated for potential jurisdictional one or three-parameter wetlands, but no hydric soils or wetlands hydrology occurred in these areas, and thus they are judged to be one-parameter wetlands. Coastal willow thickets west of Vance Avenue were mapped by SHN (2018), and these include 1-parameter and 3-parameter wetlands that were not investigated further for this study. Native coastal brambles, another previously mapped Sensitive Natural Community (G4 S3), occurred on the ridge east of Vance Ave. In summary, although previous land use and invasive plants have degraded habitat quality in the area, the Samoa Peninsula Land-based Aquaculture Project APE contains sensitive botanical resources, including a population of rare plants and three Sensitive Natural Communities.

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Appendices

A. Map Figures

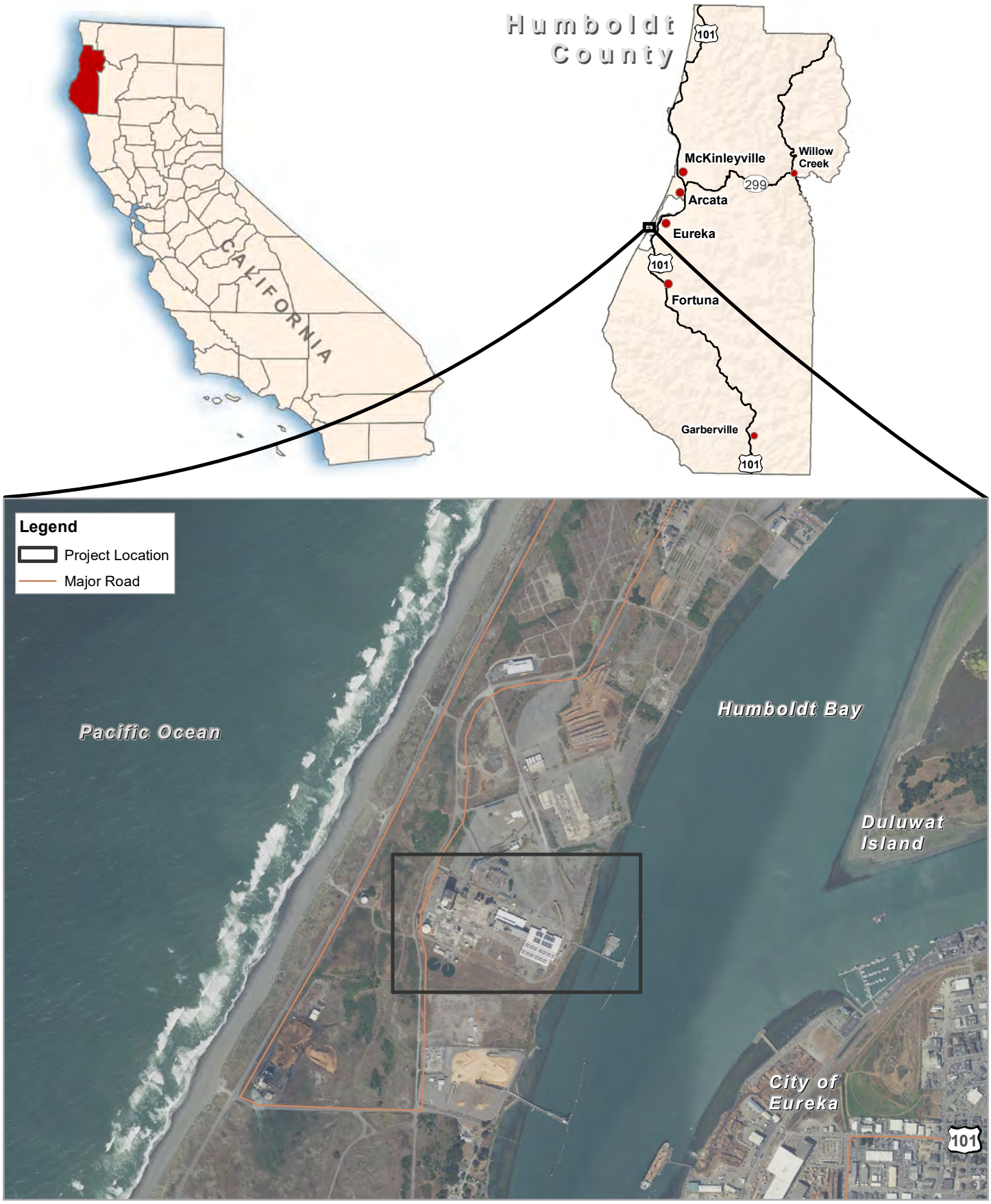
B. Scoping Table

C. Plant Species Observed

D. Rapid Assessment Data Sheets

E. Photo Index

F. CNDDB Field Survey Forms



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GHD

Nordic Aquafarms California, LLC
Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Vicinity Map

Project No. **11205607**
Revision No. **1**
Date **Jan 2021**

FIGURE 1

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Map Projection: Lambert Conformal Conic
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Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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GHD

Nordic Aquafarms California, LLC
Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

NRCS Soils

Project No. **11205607**
Revision No. **1**
Date **Jan 2021**

FIGURE 2

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

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GHD

Nordic Aquafarms California, LLC
Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Project No. **11205607**
Revision No. **1**
Date **Jan 2021**

Sensitive Plant Species

FIGURE 3

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Feet

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

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GHD

Nordic Aquafarms California, LLC
Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Project No. **11205607**
Revision No. **1**
Date **Feb 2021**

Sensitive Vegetation Communities

FIGURE 4

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Appendix B Nordic Farms - 7-QUAD Database Search of USFWS IPaC, CDFW CNDDB, CNPS 4/17/20										
Scientific Name	**Common Name**	**FESA**	**CESA**	**GRank**	**SRank**	**CRPR**	**Habitats**	**General Habitat**	**Micro Habitat**	**Potential to Occur***
Abronia umbellata var. breviflora	pink sand-verbena	None	None	G4G5T2	S2	1B.1	Coastal dunes	Coastal dunes and coastal strand.	Foredunes and interdunes with sparse cover. A. umbellata var. breviflora is usually the plant closest to the ocean. 0-75 m.	**Moderate Potential**. Known from near project. Abronia sp. is present in project area. It was not flowering during early season visit. A survey for this species during its blooming period (June-Oct) should occur.
Angelica lucida	sea-watch	None	None	G5	S3	4.2	Coastal bluff scrub, Coastal dunes, Coastal scrub, Marshes and swamps (coastal salt). 0-150 m.			**Moderate Potential.** Some low quality coastal dune habitat occurs within project area.
Astragalus pycnostachyus var. pycnostachyus	coastal marsh milk-vetch	None	None	G2T2	S2	1B.2	Coastal dunes | Coastal scrub | Marsh & swamp | Wetland	Coastal dunes,marshes and swamps, coastal scrub.	Mesic sites in dunes or along streams or coastal salt marshes. 0-155 m.	**Low Potential. L**ow quality coastal dune habitat is present, but specific habitat for this species are not present.
Bryoria spiralifera	twisted horsehair lichen	None	None	G1G2	S1S2	1B.1	North coast coniferous forest	North coast coniferous forest.	Usually on conifers. 5-30 m.	**No Potential**. North coast coniferous forest is not present.
Cardamine angulata	seaside bittercress	None	None	G4G5	S3	2B.1	Lower montane coniferous forest | North coast coniferous forest | Wetland	North coast coniferous forest, lower montane coniferous forest.	Wet areas, streambanks. 5-515 m.	**No Potential.** Habitat for this species does not occur in project area.
Carex arcta	northern clustered sedge	None	None	G5	S1	2B.2	Bog & fen | North coast coniferous forest | Wetland	Bogs and fens, north coast coniferous forest.	Mesic sites. 60-1405 m.	**No Potential.** Habitat for this species does not occur in project area.

Scientific Name	Common Name	FESA	CESA	GRank	SRank	CRPR	Habitats	General Habitat	Micro Habitat	Potential to Occur*
Carex leptalea	bristle-stalked sedge	None	None	G5	S1	2B.2	Bog & fen | Freshwater marsh | Marsh & swamp | Meadow & seep | Wetland	Bogs and fens, meadows and seeps, marshes and swamps.	Mostly known from bogs and wet meadows. 3-1395 m.	**No Potential.** Habitat for this species does not occur in project area.
Carex lyngbyei	Lyngbye's sedge	None	None	G5	S3	2B.2	Marsh & swamp | Wetland	Marshes and swamps (brackish or freshwater).	0-200 m.	**No Potential.** No marsh or swamp habitat occurs in project area.
Carex praticola	northern meadow sedge	None	None	G5	S2	2B.2	Meadow & seep | Wetland	Meadows and seeps.	Moist to wet meadows. 15-3200 m.	**No Potential.** No meadow or seep habitat within project area.
Castilleja ambigua var. humboldtiensis	Humboldt Bay owl's-clover	None	None	G4T2	S2	1B.2	Marsh & swamp | Salt marsh | Wetland	Marshes and swamps.	In coastal saltmarsh with Spartina, Distichlis, Salicornia, Jaumea. 0-20 m.	**No Potential.** No coastal salt marsh habitat within project area.
Castilleja litoralis	Oregon coast paintbrush	None	None	G3	S3	2B.2	Coastal bluff scrub | Coastal dunes | Coastal scrub	Coastal bluff scrub, coastal dunes, coastal scrub.	Sandy sites. 5-255 m.	**Low Potential.** Some low quality dune habitat is present, but not coastal bluff of coastal scrub habitat.
Chloropyron maritimum ssp. palustre	Point Reyes salty bird's-beak	None	None	G4?T2	S2	1B.2	Marsh & swamp | Salt marsh | Wetland	Coastal salt marsh.	Usually in coastal salt marsh with Salicornia, Distichlis, Jaumea, Spartina, etc. 0-115 m.	**No Potential.** No coastal salt marsh or swamp habitat is present.
Collinsia corymbosa	round-headed Chinese-houses	None	None	G1	S1	1B.2	Coastal dunes	Coastal dunes.	0-30 m.	**Moderate Potential**. Some low quality coastal dune habitat occurs within project area.

Scientific Name	Common Name	FESA	CESA	GRank	SRank	CRPR	Habitats	General Habitat	Micro Habitat	Potential to Occur*
Erysimum menziesii	Menzies' wallflower	Endangered	Endangered	G1	S1	1B.1	Coastal dunes	Coastal dunes.	Localized on dunes and coastal strand. 1-25 m.	**Moderate Potential.** Some low quality coastal dune habitat occurs within project area. This species is known form surrounding area. Coastal strand habitat is not present.
Erythronium revolutum	coast fawn lily	None	None	G4G5	S3	2B.2	Bog & fen | Broadleaved upland forest | North coast coniferous forest | Wetland	Bogs and fens, broadleafed upland forest, north coast coniferous forest.	Mesic sites; streambanks. 60-1405 m.	**No Potential.**The specific habitats for this species are not present within the project area.
Fissidens pauperculus	minute pocket moss	None	None	G3?	S2	1B.2	North coast coniferous forest | Redwood	North coast coniferous forest.	Moss growing on damp soil along the coast. In dry streambeds and on stream banks. 30-1025 m.	**No Potential.**The specific habitats for this species are not present within the project area.
Gilia capitata ssp. pacifica	Pacific gilia	None	None	G5T3	S2	1B.2	Chaparral | Coastal bluff scrub | Coastal prairie | Valley & foothill grassland	Coastal bluff scrub, chaparral, coastal prairie, valley and foothill grassland.	5-1345 m.	**No Potential.**The specific habitats for this species are not present within the project area.
Gilia millefoliata	dark-eyed gilia	None	None	G2	S2	1B.2	Coastal dunes	Coastal dunes.	1-60 m.	**High Potential/Occuring.** This species can occur in stabilized dunes, and has been previously mapped on the edge of the APE. Found on property 5/5/2020.
Glehnia littoralis ssp. leiocarpa	American glehnia	None	None	G5T5	S2S3	4.2	Coastal dunes. 0-20 m.			**Moderate Potential.** Some low quality coastal dune habitat occurs within project area.

Scientific Name	Common Name	FESA	CESA	GRank	SRank	CRPR	Habitats	General Habitat	Micro Habitat	Potential to Occur*
Hesperevax sparsiflora var. brevifolia	short-leaved evax	None	None	G4T3	S2	1B.2	Coastal bluff scrub | Coastal dunes | Coastal prairie	Coastal bluff scrub, coastal dunes, coastal prairie.	Sandy bluffs and flats. 0-640 m.	**Low Potential.** Some low quality coastal dune habitat occurs within project area.
Lasthenia californica ssp. macrantha	perennial goldfields	None	None	G3T2	S2	1B.2	Coastal bluff scrub | Coastal dunes | Coastal scrub	Coastal bluff scrub, coastal dunes, coastal scrub.	5-185 m.	**Low Potential.** Some low quality coastal dune habitat occurs within project area.
Lathyrus japonicus	seaside pea	None	None	G5	S2	2B.1	Coastal dunes	Coastal dunes.	3-65 m.	**Moderate Potential.** Some low quality coastal dune habitat occurs within project area.
Lathyrus palustris	marsh pea	None	None	G5	S2	2B.2	Bog & fen | Coastal prairie | Coastal scrub | Lower montane coniferous forest | Marsh & swamp | North coast coniferous forest | Wetland	Bogs & fens, lower montane coniferous forest, marshes and swamps, north coast coniferous forest, coastal prairie, coastal scrub.	Moist coastal areas. 2-140 m.	**Low Potential.** Specific habitats of this species are generally lacking. However, low quality coastal dune habitat occurs with some mesic habitat.
Layia carnosa	beach layia	Endangered	Endangered	G2	S2	1B.1	Coastal dunes | Coastal scrub	Coastal dunes, coastal scrub.	On sparsely vegetated, semi-stabilized dunes, usually behind foredunes. 3-30 m.	**Low Potential.** Low quality coastal dune habitat is present. Foredunes are not present. This species is known from the surrounding area.

Scientific Name	Common Name	FESA	CESA	GRank	SRank	CRPR	Habitats	General Habitat	Micro Habitat	Potential to Occur*
Lilium occidentale	western lily	Endangered	Endangered	G1	S1	1B.1	Bog & fen | Coastal bluff scrub | Coastal prairie | Coastal scrub | Freshwater marsh | Marsh & swamp | North coast coniferous forest | Wetland	Coastal scrub, freshwater marsh, bogs and fens, coastal bluff scrub, coastal prairie, north coast coniferous forest, marshes and swamps.	Well-drained, old beach washes overlain with wind-blown alluvium and organic topsoil; usually near margins of Sitka spruce. 3-110 m.	**No Potential.** The specific habitats of this species are lacking within the project area.
Monotropa uniflora	ghost-pipe	None	None	G5	S2	2B.2	Broadleaved upland forest | North coast coniferous forest	Broadleafed upland forest, north coast coniferous forest.	Often under redwoods or western hemlock. 15-855 m.	**No Potential.** The specific habitats of this species are lacking within the project area.
Montia howellii	Howell's montia	None	None	G3G4	S2	2B.2	Meadow & seep | North coast coniferous forest | Vernal pool | Wetland	Meadows and seeps, north coast coniferous forest, vernal pools.	Vernally wet sites; often on compacted soil. 10-1215 m.	**No Potential.** The specific habitats of this species are lacking within the project area.
Oenothera wolfii	Wolf's evening-primrose	None	None	G2	S1	1B.1	Coastal bluff scrub | Coastal dunes | Coastal prairie	Coastal bluff scrub, coastal dunes, coastal prairie, lower montane coniferous forest.	Sandy substrates; usually mesic sites. 0-125 m.	**Moderate Potential.** Low quality costal dune habitat is present within the project area.
Puccinellia pumila	dwarf alkali grass	None	None	G4?	SH	2B.2	Marsh & swamp | Wetland	Marshes and swamps.	Mineral spring meadows and coastal salt marshes. 1-10 m.	**No Potential.** The specific habitats of this species are lacking within the project area.

Scientific Name	Common Name	FESA	CESA	GRank	SRank	CRPR	Habitats	General Habitat	Micro Habitat	Potential to Occur*
Sidalcea malviflora ssp. patula	Siskiyou checkerbloom	None	None	G5T2	S2	1B.2	Coastal bluff scrub | Coastal prairie | North coast coniferous forest	Coastal bluff scrub, coastal prairie, north coast coniferous forest.	Open coastal forest; roadcuts. 5-1255 m.	**No Potential.** The specific habitats of this species are lacking within the project area.
Sidalcea oregana ssp. eximia	coast checkerbloom	None	None	G5T1	S1	1B.2	Lower montane coniferous forest | Meadow & seep | North coast coniferous forest | Wetland	Meadows and seeps, north coast coniferous forest, lower montane coniferous forest.	Near meadows, in gravelly soil. 5-1805 m.	**No Potential.** The specific habitats of this species are lacking within the project area.
Silene scouleri ssp. scouleri	Scouler's catchfly	None	None	G5T4T5	S2S3	2B.2	Coastal bluff scrub | Coastal prairie | Valley & foothill grassland	Coastal bluff scrub, coastal prairie, valley and foothill grassland.	5-315 m.	**No Potential.** The specific habitats of this species are lacking within the project area.
Spergularia canadensis var. occidentalis	western sand-spurrey	None	None	G5T4	S1	2B.1	Marsh & swamp | Wetland	Marshes and swamps (coastal salt marshes).	0-3 m.	**No Potential.** No marsh or swamp habitat occurs in project area.
Trichodon cylindricus	cylindrical trichodon	None	None	G4G5	S2	2B.2	Broadleaved upland forest | Meadow & seep | Upper montane coniferous forest	Broadleafed upland forest, upper montane coniferous forest, meadows and seeps.	Moss growing in openings on sandy or clay soils on roadsides, stream banks, trails or in fields. 35-2005 m.	**No Potential.** The specific habitats of this species are lacking within the project area.
Viola palustris	alpine marsh violet	None	None	G5	S1S2	2B.2	Bog & fen | Coastal scrub | Wetland	Coastal scrub, bogs and fens.	Swampy, shrubby places in coastal scrub or coastal bogs. 0-150 m.	**No Potential.** The specific habitats of this species are lacking within the project area.

Scientific Name	Common Name	FESA	CESA	GRank	SRank	CRPR	Habitats	General Habitat	Micro Habitat	Potential to Occur*
Northern Coastal Salt Marsh	Northern Coastal Salt Marsh	N	N	G3	S3.2		Marsh & swamp | Wetland			**Not Present** within project area.
Sitka Spruce Forest	Sitka Spruce	N	N	G1	S1.1		Marsh & swamp | Wetland			**Not Present.**
Coastal Terrace Prairie	Coastal Terrace Prairie	N	N	G2	S2.1		Coastal prairie			**Not Present.**
Northern Foredune Grassland	Northern Foredune Grassland	N	N	G1	S1.1		Coastal dunes		Coastal dunes	**Not Present.** Altered, low quality dune habitat is present but natural foredune habitat is not present.

***Potential to Occur:**

No Potential	Habitat on and adjacent to the site is clearly unsuitable for the species requirements (cover, substrate, elevation, hydrology, plant community, etc.)
Low Potential	Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable.
Moderate Potential	Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable.
High Potential	All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable.

**Microhabitat details from CNDDB 2019

Key:	
FE = Federal Endangered	1A = CRPR List 1A: Plants presumed extinct in California
FT = Federal Threatened	1B = CRPR List 1B: Plants rare, threatened or endangered in California and elsewhere
FC = Federal Candidate	2 = CRPR List 2: Plants rare, threatened, or endangered in California, but more common elsewhere
FD = Federal Delisted	3 = CRPR List 3: Plants about which more information is needed (a review list)
BCC = USFWS Birds of Conservation Concern	4 = CRPR List 4: Plants of limited distribution (a watch list)
SE = State Endangered	
SD = State Delisted	
ST = State Threatened	
SR = State Rare	
SSC = CDFG Species of Special Concern	
CFP = CDFG Fully Protected Animal	

Appendix C. Plant Species Observed

Scientific Name	Common Name	Family	Status	Observer
Abronia latifolia	yellow sand verbena	Nyctaginaceae	native	KM
Achillea millefolium	western yarrow	Asteraceae	native	AL
Acmispon sp.	lotus	Fabaceae		AL
Ammophila arenaria	European beachgrass	Poaceae	invasive	AL
Anthemis cotula	dog fennel	Asteraceae	non-native	KM
Anthoxanthum odoratum	sweet vernal grass	Poaceae	invasive	AL
Anthriscus caucalis	bur chervil	Apiaceae	non-native	KM
Armeria maritima subsp. californica	sea thrift	Plumbaginaceae	native	AL
Artemisia pycnocephala	beach sagewort	Asteraceae	native	KM
Avena barbata	slender oats	Poaceae	invasive	AL
Baccharis pilularis	coyote brush	Asteraceae	native	AL
Bellardia trixago	Mediterranean lineseed	Orobanchaceae	invasive	KM
Briza maxima	rattlesnake grass	Poaceae	invasive	AL
Briza minor	annual quaking grass	Poaceae	non-native	AL
Bromus diandrus	ripgut brome	Poaceae	invasive	AL
Bromus hordeaceus	soft chess brome	Poaceae	invasive	AL
Calandrinia ciliata	red maids	Montiaceae	native	AL
Calytonia rubra subsp. depressa	red stemmed spring beauty	Montiaceae	native	AL
Camissoniopsis cheiranthifolia	beach evening primrose	Onagraceae	native	AL
Cardamine oligosperma	Idaho bittercress	Brassicaceae	native	KM
Cardionema ramosissimum	sand mat	Caryophyllaceae	native	AL
Carpobrotus chilensis	sea fig	Aizoaceae	invasive	KM
Carpobrotus edulis	iceplant	Aizoaceae	invasive	KM
Castilleja attenuata	narrow leaved owl's clover	Orobanchaceae	native	KM
Cerastium glomeratum	mouse-eared chickweed	Caryophyllaceae	non-native	AL
Cetranthus ruber	red valerian	Valerianaceae	non-native	KM
Clarkia davyi	Davy's clarkia	Onagraceae	native	KM
Claytonia perfoliata	miner's lettuce	Montiaceae	native	AL
Conium maculatum	poison hemlock	Apiaceae	invasive	KM
Cortaderia jubata	purple pampas grass	Poaceae	invasive	AL
Crocosmia ×crocosmiiflora	monbretia	Iridaceae	invasive	KM

Scientific Name	Common Name	Family	Status	Observer
Cryptantha leiocarpa	popcorn flower	Boraginaceae	native	KM
Cynosurus echinatus	hedgehog dogtail	Poaceae	invasive	AL
Cyperus eragrostis	tall nutsedge	Cyperaceae	native	AL
Cytisus scoparius	scotch broom	Fabaceae	invasive	AL
Daucus carota	Queen Anne's lace	Apiaceae	non-native	KM
Elymus mollis	American dune grass	Poaceae	native	KM
Epilobium ciliatum	slender willow herb	Onagraceae	native	KM
Equisetum telmateia ssp. braunii	giant horsetail	Equisetaceae	native	KM
Erigeron canadensis	horseweed	Asteraceae	native	KM
Eriogonum latifolium	seaside wild buckwheat	Polygonaceae	native	AL
Erodium cicutarium	redstem filaree	Geraniaceae	invasive	AL
Euphorbia peplus	Petty spurge	Euphorbiaceae	non-native	KM
Festuca myuros	rattail grass	Poaceae	invasive	AL
Festuca rubra	red fescue	Poaceae	native	AL
Foeniculum vulgare	fennel	Apiaceae	invasive	AL
Fragaria chiloensis	beach strawberry	Rosaceae	native	AL
Galium aparine	goose grass	Rubiaceae	native	AL
Gamochaeta ustulata	featherweed	Asteraceae	native	KM
Garrya elliptica	coast silk tassel	Garryaceae	native	KM
Geranium dissectum	cutleaf geranium	Geraniaceae	invasive	AL
Gilia millefoliata	dark-eyed gilia	Polemoniaceae	rare, native	KM
Hedera helix	English ivy	Araliaceae	invasive	KM
Hirschfeldia incana	mustard	Brassicaceae	invasive	KM
Holcus lanatus	velvet grass	Poaceae	invasive	AL
Hypochaeris glabra	smooth cat's ear	Asteraceae	non-native	KM
Hypochaeris radicata	hairy cats ear	Asteraceae	invasive	KM
Juncus breweri	Brewer's rush	Juncaceae	native	KM
Juncus patens	rush	Juncaceae	native	KM
Lamium purpureum	dead nettle	Lamiaceae	non-native	AL
Linum bienne	pale flax	Linaceae	non-native	AL
Logfia gallica	narrow leaf cotton rose	Asteraceae	non-native	KM
Lonicera involucrata	twinberry	Caprifoliaceae	native	AL
Lotus corniculatus	bird's-foot trefoil	Fabaceae	non-native	AL
Lupinus arboreus	yellow bush lupine	Fabaceae	invasive	AL

Scientific Name	Common Name	Family	Status	Observer
Lupinus arboreus x	blue hybrid bush lupine	Fabaceae	invasive	KM
Lupinus bicolor	miniature lupine	Fabaceae	native	AL
Lysimachia arvensis	scarlet pimpernel	Myrsinaceae	non-native	AL
Lythrum hyssopifolia	hyssop loosestrife	Lythraceae	invasive	AL
Malva neglecta	dwarf mallow	Malvaceae	non-native	KM
Matricaria discoidea	pineapple weed	Asteraceae	native	AL
Medicago polymorpha	California burclover	Fabaceae	invasive	AL
Melilotus alba	white sweetclover	Fabaceae	non-native	AL
Mentha pulegium	pennyroyal	Lamiaceae	invasive	AL
Morella californica	wax myrtle	Myricaceae	native	AL
Nuttallanthus canadensis	Canada toadflax	Scrophulariaceae	native	KM
Oxalis articulata ssp. rubra	windowbox wood sorrel	Oxalidaceae	non-native	KM
Parentucellia viscosa	yellow glandweed	Scrophulariaceae	invasive	AL
Petrohagia dubia	proliferous pink	Caryophyllaceae	non-native	AL
Plantago coronopus	cut leaf plantain	Plantaginaceae	non-native	AL
Plantago erecta	California plantain	Plantaginaceae	native	KM
Plantago lanceolata	English plantain	Plantaginaceae	invasive	AL
Platystemon californicus	cream cups	Papaveraceae	native	AL
Polygonum paronychia	dune knotweed	Polygonaceae	native	AL
Polypodium glycyrrhiza	licorice fern	Polypodiaceae	native	KM
Pseudognaphalium luteoalbum	Jersey cudweed	Asteraceae	non-native	KM
Raphanus sativus	radish	Brassicacae	invasive	AL
Rubus armeniacus	Himalayan blackberry	Rosaceae	invasive	AL
Rubus ursinus	California blackberry	Rosaceae	native	AL
Rumex acetosella	common sheep sorrel	Polygonaceae	invasive	AL
Salix hookeriana	coastal willow	Salicaceae	native	AL
Salix lasiandra var. lasiandra	Pacific willow	Salicaceae	native	KM
Salix lasiolepis	arroyo willow	Salicaceae	native	KM
Scrophularia californica	California figwort	Schrophulariaceae	native	AL
Silene gallica	common catchfly	Caryophyllaceae	non-native	KM
Solidago spathulata	coast goldenrod	Asteraceae	native	AL
Sonchus oleraceus	common sow thistle	Asteraceae	non-native	KM
Spartina densiflora	dense-flowered cord grass	Poaceae	invasive	KM

Scientific Name	Common Name	Family	Status	Observer
Tanacetum bipinnatum	dune tansy	Asteraceae	native	AL
Tanacetum parthenium	feverfew	Asteraceae	non-native	AL
Trifolium dubium	little hop clover	Fabaceae	non-native	AL
Trifolium repens	white clover	Fabaceae	non-native	AL
Tropaeolum majus	garden nasturtium	Tropaeolaceae	non-native	KM
Typha latifolia	broad-leaved cattail	Typhaceae	native	KM
Vicia americana subsp. americana	American vetch	Fabaceae	native	AL
Vicia benghalensis	purple vetch	Fabaceae	non-native	KM
Vicia hirsuta	tiny vetch	Fabaceae	non-native	KM
Vicia sativa	garden vetch	Fabaceae	non-native	AL
Vicia tetrasperma	sparrow vetch	Fabaceae	non-native	AL
Vicia villosa ssp. villosa	hairy vetch	Fabaceae	non-native	KM
Zantedeschia aethiopica	callalily	Araceae	invasive	KM

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Yellow bush lupine scrub Association Lupinus arboreus/Bromus diandrus

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0001	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: Collector — For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME ___ UTMN ___ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ___.___ LONG ___.___

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME ___ UTMN ___

Camera Name: iphone Cardinal photos at ID point: NESW 1054AM

Other photos:

Stand Size (acres): (<1), 1-5, >5 | Plot Area (m²): 100 / _____ | Plot Dimensions ____ x ____ m | RA Radius 30 m

Exposure, Actual °: _____ NE NW SE SW (Flat) Variable | Steepness, Actual °: _____ (0°) 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex (flat) concave undulating

Geology code: _____ Soil Texture code: sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H20: 0 BA Stems: 30 Litter: 20 Bedrock: 0 Boulder: 0 Stone: 0 Cobble: 0 Gravel: 5 Fines: 45 =100%

% Current year bioturbation 2 Past bioturbation present? (Yes) / No | % Hoof punch _____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Previously graded, highly disturbed sand substrate has been colonized by invasive Lupinus arboreus, Rubus armeniacus, Brassica nigra, Raphanus sativus, Bromus diandrus, Anthoxanthum odoratum, Briza maxima, Vicia villosa. Almost no native species in center of polygon, fades to invaded dune mat characterized by Abronia latifolia, Fragaria chiloensis, Eriogonum latifolium at edges.

Disturbance code / Intensity (L,M,H): 05/H 1/H 2/M ___/___ ___/___ "Other" _____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Lupinus arboreus semi-natural stand

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: Dune Mat / S, E / _____

Confidence in Alliance identification: L (M) H Explain: Indistinct line between non-native/dune mat

Phenology (E,P,L): Herb P Shrub P Tree / Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised March 27, 2018)
SPECIES SHEET

Database #: NORD0001

IV. VEGETATION DESCRIPTION

% NonVasc cover: ___ **Total % Vasc Veg cover:** 80+

% Cover - **Conifer tree / Hardwood tree:** 0 / 0 **Regenerating Tree:** — **Shrub:** 35 **Herbaceous:** 50

Height Class - Conifer tree / Hardwood tree: NA / — **Regenerating Tree:** — **Shrub:** 2 **Herbaceous:** 1-2

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular
% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	Lupinus arboreus	25		
S	Rubus armeniacus	5		
H	Brassica nigra	8		
H	Raphanus sativus	4		
H	Vicia villosa	5		
H	Bromus diandrus	25		
H	Anthoxanthum odoratum	15		
H	Briza maxima	3		
H	Rumex acetosella	5		
H	Festuca bromoides	3		
H	Bromus hordeaceus	1		
H	Erigeron canadensis	1		
H	Plantago lanceolata	2		
H	Hypochaeris glabra	1		
H	Avena barbata	4		
H	Silybum marianum	1		
H	Malva neglecta	<1		
H	Anthemis cotula	<1		
H	Cortaderia jubata	<1		
H	Parentucellia viscosa	<1		
H	Clarkia davyi (throughout)	<1		
H	Eriogonum latifolium	<1		
H	Lupinus bicolor	<1		
H	Juncus breweri	<1		
H	Fragaria chiloensis	<1		
H	Abronia latifolia	1		
H	Polygonum paronychya	<1		
H	Solidago spathulata	<1		

Native spp present at edges

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Dune mat Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0002	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: Collector — For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME ___ UTMN ___ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ___.___ LONG ___.___

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME ___ UTMN ___

Camera Name: iphone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): <1, (1-5), >5 | Plot Area (m²): 100 / _____ | Plot Dimensions ___ x ___ m | RA Radius 30 m

Exposure, Actual °: _____ NE NW SE SW (Flat) Variable | Steepness, Actual °: _____ (0°) 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex (flat) concave undulating

Geology code: _____ Soil Texture code: Sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H₂0: BA Stems: 30 Litter: 15 Bedrock: Boulder: Stone: Cobble: Gravel: 5 Fines: 50 =100%

% Current year bioturbation 1 Past bioturbation present? (Yes) / No | % Hoof punch _____

Fire evidence: Yes / (No) (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Highly invaded dune mat, previously graded, irregularly driven across. Gilia millefoliata present, especially abundant in road along fenceline (unpaved sand w/ tire tracks). Percent cover varies widely, with invasive dominance and up to 100% cover natives in stabilized areas (especially around Lupinus arboreus), and open patches of higher-quality dune mat interspersed throughout, especially where sand appears to be mobilized by intermittent disturbance.

Disturbance code / Intensity (L,M,H): 05 / H 02 / M 01 / M ___/___ ___/___ "Other" _____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), (S2) young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: (H1) (<12" plant ht.), (H2) (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Abronia latifolia-Ambrosia chamissonis-DuneMat

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: Lupinus arboreus / N, E, Ammophila arenaria / SE

Confidence in Alliance identification: L (M) H Explain: Highly invaded, but dune species present

Phenology (E,P,L): Herb P Shrub P Tree — Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised March 27, 2018)
SPECIES SHEET

Database #: NORD0002

IV. VEGETATION DESCRIPTION

% NonVasc cover: 20 **Total % Vasc Veg cover:** 60

% Cover - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 3 **Herbaceous:** 57

Height Class - Conifer tree / Hardwood tree: — / — **Regenerating Tree:** — **Shrub:** 1 **Herbaceous:** 1

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular
% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
H	Abronia latifolia	12		
H	Eriogonum latifolia	4		
H	Polygonum paronychia	4		
H	Clarkia davyi	3		
H	Ammophila arenaria	2		
H	Anthoxanthum odoratum	10		
H	Bromus diandrus	30		
H	Rumex acetosella	10		
H	Armeria maritima	3		
H	Hypochaeris glabra	3		
H	Bromus hordeaceus	1		
S	Lupinus arboreus	3		
H	Festuca rubra	5		
H	Juncus breweri	1		
H	Briza maxima	1		
H	Achillea millefolium	1		
H	Fragaria chiloensis	3		
H	Lupinus bicolor	4		
H	Brassica nigra	1		
H	Parentucellia viscosa	1		
H	Cardionema ramosissimum	3		
H	Avena barbata	<1		
H	Festuca bromoides	<1		
H	Plantago lanceolata	1		
H	Solidago spathulata	<1		more abundant in western portion of dune mat
H	Artemisia pycnocephala	<1		

Unusual species: Gilia millefoliata <1

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Yellow bush lupine scrub Association Lupinus arboreus / Anthoxanthum odoratum

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0003	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: Collector — For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME ____ UTMN ____ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ____ . ____ LONG ____ . ____

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID ____ Projected UTMs: UTME ____ UTMN ____

Camera Name: iphone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): (<1,) 1-5, >5 | Plot Area (m²): 100 / ____ | Plot Dimensions ____ x ____ m | RA Radius 30 m

Exposure, Actual °: ____ NE NW SE SW Flat Variable | Steepness, Actual °: ____ 0° 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex (flat) concave undulating

Geology code: ____ Soil Texture code: Sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H2O: BA Stems: 80 Litter: 10 Bedrock: Boulder: Stone: Cobble: Gravel: 5 Fines: 5 =100%

% Current year bioturbation ____ Past bioturbation present? Yes / No | % Hoof punch ____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Highly invaded eastern edge along Humboldt Bay. Characterized by Lupinus arboreus, Cortaderia jubata, Anthoxanthum odoratum, Holcus lanatus, Dune mat species <20% cover, Abronia latifolia present, but high shrub cover.

Disturbance code / Intensity (L,M,H): CS / H 01 / H 02 / L ___ / ___ ___ / ___ "Other" ____ / ___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), (S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), (H2 (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Lupinus arboreus semi-natural stand

Field-assessed Association name (optional): ____

Adjacent Alliances/direction: Dune mat / W, Ammophila arenaria / S

Confidence in Alliance identification: L (M) H Explain: Highly invaded and human-modified

Phenology (E,P,L): Herb P Shrub P Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised March 27, 2018)
SPECIES SHEET

Database #: NORD-0003

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 95+

% Cover - **Conifer tree / Hardwood tree:** – / – **Regenerating Tree:** – **Shrub:** 40 **Herbaceous:** 60

Height Class - **Conifer tree / Hardwood tree:** – / – **Regenerating Tree:** – **Shrub:** 3 **Herbaceous:** 1-3

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular
% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	Lupinus arboreus	40		
H	Holcus lanatus	10		
H	Anthoxanthum odoratum	15		
H	Cortaderia jubata	3		
H	Bromus diandrus	5		
H	Briza maxima	8		
H	Juncus breweri	3		
H	Avena barbata	10		
H	Raphanus sativus	2		
H	Vicia villosa	1		
H	Brassica nigra	1		
H	Fragaria chiloensis	3		
H	Abronia latifolia	10		
H	Hypochaeris radicata	1		
H	Festuca rubra	1		
H	Rumex acetosella	2		

Unusual species: ______

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Dune mat Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0004	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: _____ For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ___ ___ . ___ ___ ___ ___ ___ ___ LONG ___ ___ ___ . ___ ___ ___ ___ ___ ___

GPS within stand? Yes / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___

Camera Name: iphone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): <1, (1-5), >5 | Plot Area (m²): 100 / _____ | Plot Dimensions ____ x ____ m | RA Radius 30 m

Exposure, Actual °: _____ NE NW SE SW (Flat) (Variable) | Steepness, Actual °: _____ (0°) 1-5° >5-25° (>25)

Topography: Macro: top upper mid lower bottom | Micro: convex (flat) concave (undulating)

Geology code: _____ Soil Texture code: Gravel, sand | (Upland) or Wetland/Riparian (circle one) Berm

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H20: BA Stems: Litter: Bedrock: Boulder: Stone: Cobble: Gravel: Fines: =100%

% Current year bioturbation _____ Past bioturbation present? Yes / No | % Hoof punch _____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Eastern area South of the fence has been highly modified and invaded, but dune mat species still present at diagnostic levels. Juncus breweri ~35% cover on man-made berm w/ dense Anthoxanthum odoratum (50% cover) and Ammophila arenaria (10%). Scoured area under telephone poles has low vascular cover (~25%) and relatively high non-vascular cover (~25%) forming biotic crust in some areas on the gravel & shells. Eriogonum latifolium & Fragaria chiloensis are characteristic w/ high densities of Gilia millefoliata growing stunted on the biotic crust.

Disturbance code / Intensity (L,M,H): 05/M 01/H 02/H ___/___ ___/___ "Other" _____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), (S3) mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: (H1) (<12" plant ht.), (H2) (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Dune mat

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: Lupinus arboreus / E, Ammophila arenaria / W, SE

Confidence in Alliance identification: (L) M H Explain: Unnatural topography, highly invaded

Phenology (E,P,L): Herb P Shrub P Tree — Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: NORD-0004

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 15 Total % Vasc Veg cover: 50

% Cover - Conifer tree / Hardwood tree: — / — Regenerating Tree: — Shrub: 1 Herbaceous: 100/25

Height Class - Conifer tree / Hardwood tree: — / — Regenerating Tree: — Shrub: 2 Herbaceous: 1-2

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	Baccharis pilularis	<1		
S	Lupinus arboreus	<1		
H	Eriogonum latifolium	10		
H	Fragaria chiloensis	5		
H	Juncus breweri	10		
H	Anthoxanthum odoratum	12		
H	Ammophila arenaria	10		
H	Briza maxima	2		
H	Logfia gallica	4		
H	Bromus diandrus	5		
H	Scrophularia californica	1		
H	Plantago lanceolata	5		
H	Achillea millefolium	1		
H	Leontodon taraxacoides	2		
H	Festuca myuros	2		
H	Calandrinia ciliata	1		
H	Rumex acetosella	2		
H	Cynosurus echinatus	1		
H	Trifolium spp.	R		

Unusual species: Gilia millefoliata <1

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Dune Mat Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION

circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0005	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: _____ For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ___ ___ . ___ ___ ___ ___ ___ ___ LONG ___ ___ ___ . ___ ___ ___ ___ ___ ___

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___

Camera Name: iphone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): (<1,) 1-5, >5 | Plot Area (m²): 100 / _____ | Plot Dimensions ____ x ____ m | RA Radius 30 m

Exposure, Actual °: _____ NE NW SE SW Flat Variable | Steepness, Actual °: _____ 0° 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex flat concave (undulating)

Geology code: _____ Soil Texture code: Sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H20: BA Stems: (30) Litter: 35 Bedrock: Boulder: ◯ Stone: ◯ Cobble: ◯ Gravel: | Fines: 34 =100%

% Current year bioturbation 1 Past bioturbation present? (Yes) No | % Hoof punch _____

Fire evidence: Yes / (No) (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Appears to be the best natural dune mat community on the property, with undulating topography and only moderately invaded. Dense patches of Gilia millefoliata present. Characterized by Abronia latifolia, Eriogonum latifolium, polygonum paronychia. Areas with <80% cover of Ammophila arenaria and not dominated by Lupinus arboreus are included as dune mat. High non-vascular cover (~30%), low vascular cover near fence, where it is less invaded.

Disturbance code / Intensity (L,M,H): 05 / M 02 / L 03 / M ___ / ___ ___ / ___ "Other" _____ / ___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), (S3) mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: (H1) (<12" plant ht.), (H2) (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Dune mat

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: Ammophila arenaria / W , Lupinus arboreus / S, E

Confidence in Alliance identification: L (M) H Explain: Edges of Ammophila arenaria & Lupinus arboreus dom.

Phenology (E,P,L): Herb ___ Shrub ___ Tree ___ Other identification or mapping information: not clearly defined

Combined Vegetation Rapid Assessment and Relevé Field Form

Database #: NORDOCOS

(Revised March 27, 2018)

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 15 **Total % Vasc Veg cover:** 30

% Cover - **Conifer tree / Hardwood tree:** – / – **Regenerating Tree:** – **Shrub:** 1 **Herbaceous:** 30 ☐

Height Class - **Conifer tree / Hardwood tree:** – / – **Regenerating Tree:** – **Shrub:** 2-3 **Herbaceous:** 1 ☐

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m ☐

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
H	Abronia latifolia	5		
H	Eriogonum latifolium	6		
H	Polygonum paronychia	6		
H	Cardionema ramosissimum	3		
H	Rumex acetosella	3		
H	Ammophila arenaria	10		
H	Lupinus bicolor	2		
H	Anthoxanthum odoratum	3		
H	Calandrinia ciliata	<1		
H	Briza maxima	2		
H	Clarkia davyi	1		
H	Bromus diandrus	1		
H	Plantago erecta	2		
H	Hypochaeris glabra	1		
H	Armeria maritima	1		
S	Lupinus arboreus	1		
H	Festuca myuros	1		

Unusual species: Gilia millefoliata - 1

Appendix E. Photo Index

Photo 1. Rare annual dark-eyed gilia (*Gilia millefoliata*) May 5, 2020.

Photo 2. Dark-eyed gilia in stabilized dune mat.

Photo 3. Dark-eyed gilia with invasive ripgut brome (*Bromus diandrus*).

Photo 4. Dune mat habitat characterized by yellow sand verbena (*Abronia latifolia*) in the area north of the fence, where dark-eyed gilia was concentrated.

Photo 5. Dark-eyed gilia in an open patch of sand surrounded by ripgut brome.

Photo 6. Dark-eyed gilia beginning to drop seeds in June 29, 2020.

Photo 7. Dune mat habitat near the clarifiers.

Photo 8. Dune mat habitat with beach sagewort (*Artemisia pycnocephala*) and dune goldenrod (*Solidago spathulata*) on the southeast side of the property.

Photo 9. High quality dune mat south of the fence

Photo 10. The intersection of high quality dune mat (left), European beach grass swards (right), and yellow bush lupine scrub in the distance to the east.

Photo 11. Yellow bush lupine scrub east of the clarifiers with high cover of non-native species.

Photo 12. Yellow bush lupine scrub on the southeast end of the property.

Photo 13. Coast willow (*Salix hookeriana*) thickets with Brewer's rush (*Juncus breweri*) (left), a small patch of dune mat (right), and Eurpean beach grass swards beyond it to the north.

Photo 14. Yellow bush lupine scrub and native coastal brambles along the ridge east of Vance Ave.

Photo 14. Dune mat also occurred along the east side of Vance Ave.

CNDDB Online Field Survey Form Report

California Natural Diversity Database
Department of Fish and Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: 916.324.0475
cnddb@wildlife.ca.gov
www.dfg.ca.gov/biogeodata/cnddb/

This data has been reported to the CNDDB, but may not have been evaluated by the CNDDB staff

Source code MCD20F0006
Quad code 4012472
Occ. no.
EO index no.
Map index no.

Scientific name: *Gilia millefoliata*

Common name: dark-eyed gilia

Date of field work (mm-dd-yyyy): 07-27-2020

Comment about field work date(s): Observed in flower:5/5/20, 5/22/20; going to fruit 6/29/20; dropping seeds 7/27/20

OBSERVER INFORMATION

Observer: Kelsey McDonald

Affiliation: GHD

Address: 718 Third Street , Eureka, CA 95501

Email: kelsey.mcdonald@ghd.com

Phone: (707) 798-7494

Other observers:

DETERMINATION

Keyed in: Jepson Manual

Compared w/ specimen at:

Compared w/ image in: CalPhotos

By another person:

Other:

Identification explanation: Dark-eyed gilia was identified by its densely glandular stem and calyx, dissected leaves with linear lobes, short pedicels, and yellow funnel-shaped corolla throat with two purple splotches per lobe.

Identification confidence: Very confident

Species found: Yes **If not found, why not?**

Level of survey effort: five survey visits with population counts March 24-July 27 2020

Total number of individuals: ~100,000

Collection? No **Collection number:**

Museum/Herbarium:

PLANT INFORMATION

Phenology:

vegetative	flowering	fruiting
1 %	9 %	90 %

SITE INFORMATION

Habitat description: Brownfield and surrounding area with variable habitat quality and many invasive species. Dark-eyed gilia often associated with native dune mat species such as seaside buckwheat (Eriogonum latifolium), yellow sand verbena (Abronia latifolia), sand mat (Cardionema ramosissimum), beach strawberry (Fragaria chiloensis), and dune knotweed (Polygonum paronychia), disturbance-associated native miniature lupine (Lupinus bicolor), as well as many non-native invasive species such as ripgut brome (Bromus diandrus), sheep sorrel (Rumex acetosella), and English plantain (Plantago lanceolata). Dark-eyed gilia did not occur in areas with high percent cover (>80%) of European beachgrass or other invasive plants.

Slope: variable/flat

Aspect: variable/flat

Land owner/manager: Humboldt Bay Harbor District/Nordic Aquafarms

Site condition + population viability: Good

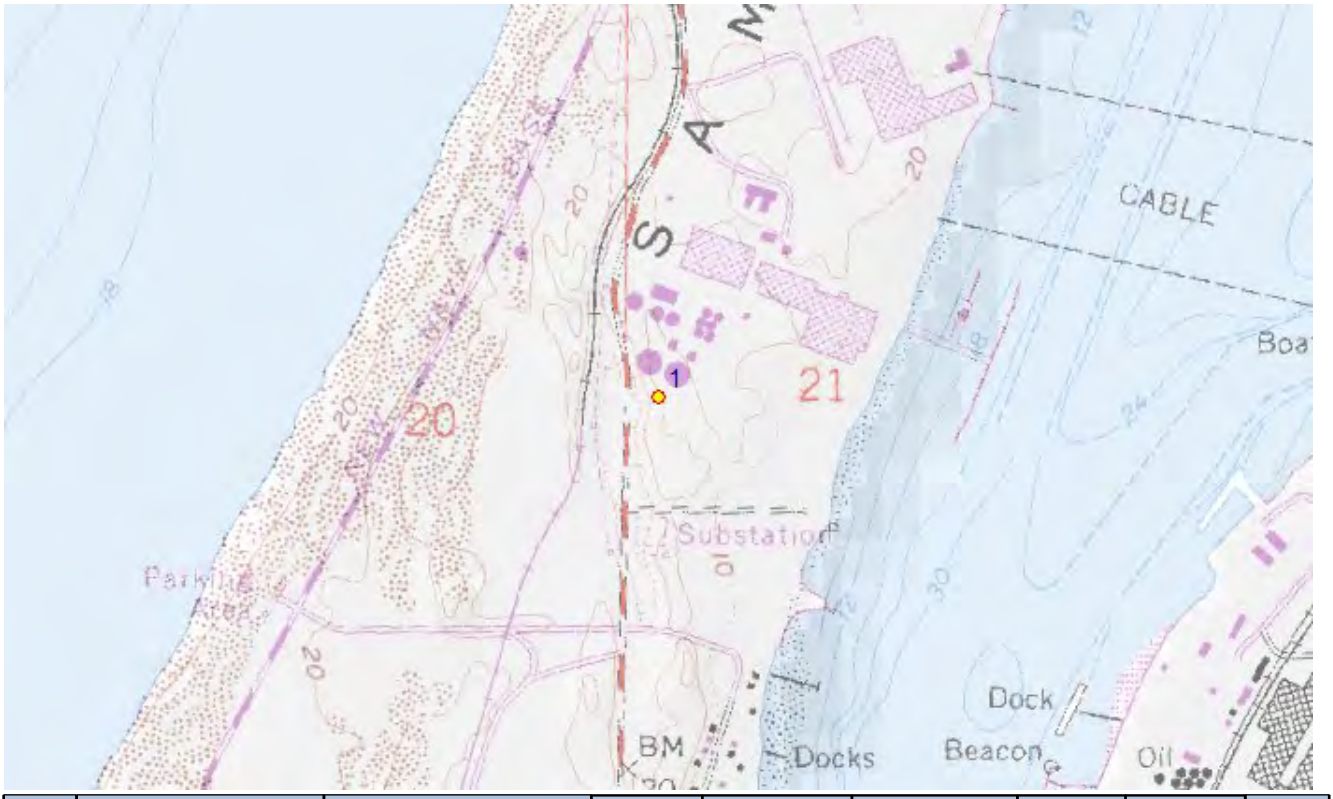
Immediate & surrounding land use: Industrial

Visible disturbances: Site previously graded and regularly disturbed (gilia growing in tire tracks).

Threats: To be developed for aquaculture. A Habitat Mitigation and Monitoring Plan has been developed for preservation of remainder onsite and translocation for offsite restoration.

General comments:

MAP INFORMATION



ID	County	24K Quadrangle	Elev. (ft)	Latitude NAD83	Longitude NAD83	UTM E NAD83	UTM N NAD83	UTM Zone
	Humboldt	Eureka	23	40.80274	-124.19600	399114	4517548	10
1	**Public Land Survey**	**Feature Comment**						
	H T05N R01W 21	Approximate centroid of population on parcel						

The mapped feature is accurate within: 20 m

Source of mapped feature: digitally placed on map

Mapping notes: Precise population boundaries were mapped in the field with a high accuracy Trimble GPS unit, and an approximate centroid is provided here.

Location/directions comments: East of Vance Avenue, north of the powerlines on the southern end of the Harbor District property.

Attachment(s):