49 Shearwater Lane (APN 052-291-12)
Residential Development

Biotic Report

Updated June 29, 2021

Biotic Resources Group

Biotic Assessments ◆ Resource Management ◆ Permitting

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Residential Development

Biotic Report

Prepared for
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c/o FUSE Architects + Builders
Attn: Jerrod Nicholls

Prepared by:
Biotic Resources Group
With
Dana Bland & Associates

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1.0 EXECUTIVE SUMMARY

A new single-family residence is proposed on the parcel at 49 Shearwater Lane. The parcel is located within the Pajaro Dunes development and is accessed from Beach Road and Rio Boca Road. The property is located within the Santa Cruz County coastal zone.

A biotic study was conducted in spring and fall 2020 to document biotic resources on the property, with a focus given to areas proposed for development and/or habitat management. The parcel was found to support two vegetation types: eucalyptus grove and coastal dune scrub. The coastal dune scrub is considered to be a sensitive habitat under County Code. Two special status plant species were found to occur on site: Monterey spineflower and Monterey paintbrush. One special status animal may occur on site: black legless lizard.

The parcel currently supports a single-family residence, with a development footprint of 1,898 square feet (existing parking area, pathways, and residence). The proposed project is to replace the existing 2-story house with the new 2-story house, with attached garage. The new development footprint will be 3,130 square feet and will affect portions of the parcel's dune scrub and eucalyptus grove, as well as 1,409 square feet of the existing residentially developed area. Temporary construction impacts will occur to 2,285 square feet of dune scrub, eucalyptus grove, and areas currently developed.

The biotic report outlines measures to avoid impacts to sensitive resources during project construction, including protecting/retaining existing dune scrub and special status plant species, implementing a pre-construction breeding bird nest survey, and monitoring construction for the black legless lizard. Mitigation measures also require development and implementation of a coastal dune scrub mitigation plan with on-site and off-site dune scrub restoration, including re-establishment of populations of Monterey spineflower and Monterey paintbrush. County Environmental Planning personnel have requested mitigation for permanent and temporary impacts to dune scrub at a 3:1 compensation ratio. On-site dune scrub restoration (4,743 square feet) and off-site dune restoration (4,167 square feet) is recommended. Successful implementation of these measures will reduce impacts to sensitive biotic resources to a less than significant level.

Intended Use of this Report

The findings presented in this biological report are intended for the sole use of the current property owners (Kevin and Ingrid Donahue), FUSE Architects + Builders, and Santa Cruz County in evaluating the proposed residential development project. The findings presented by the Biotic Resources Group in this report are for information purposes only; they are not intended to represent the interpretation of any State, Federal or County law or ordinance pertaining to permitting actions within sensitive habitat or endangered species. The interpretation of such laws and/or ordinances is the responsibility of the applicable governing body.

2.0 INTRODUCTION

The Biotic Resources Group assessed the biotic resources of the parcel in spring and fall 2020. The focus of the assessment was to identify sensitive biotic resources on the parcel and evaluate potential impacts to such resources from the proposed development. Measures to avoid, reduce or compensate for significant impacts were also identified. The findings of this evaluation are presented in this report.

2.1 Proposed Project

The project site is located along the north side of Shearwater Lane within the Pajaro Dunes residential development. The 8,440 square-foot parcel is accessed from a cul-de-sac on Shearwater Lane.

The parcel currently supports a single-family residence, with a development footprint of 1,898 square feet (existing parking area, pathways, and residence). The proposed project is to replace the existing 2-story house with the new 2-story house, with attached garage. The new development footprint will be 3,130 square feet, an increase of 1,232 square feet. Grading to accommodate the proposed development will temporarily impact 2,285 square feet, for a total disturbance area of 5,415 square feet (Disturbance Maps, prepared by RI Engineering, Inc., dated May 2021).

Areas temporarily graded/affected by construction will be available for dune restoration (2,285 square feet). In addition, retained dune scrub and a non-native eucalyptus grove area on the parcel are identified for dune scrub restoration. Off-site dune restoration is also required to meet the County-required mitigation ratio of 3:1.

2.2 Project History

A preliminary biotic survey report of the parcel was completed in June 2020 and submitted to the County for review. The County requested preparation of a biotic report. A biotic report was prepared in November 2020 and was submitted to the County for review. Comments were received (email from Matt Johnson, dated March 4, 2021) requesting additional compensation for impacts to dune scrub habitat using a 3:1 compensation ratio. Project architects and engineers revised site plans to reduce impacts, with plans dated May 2021.

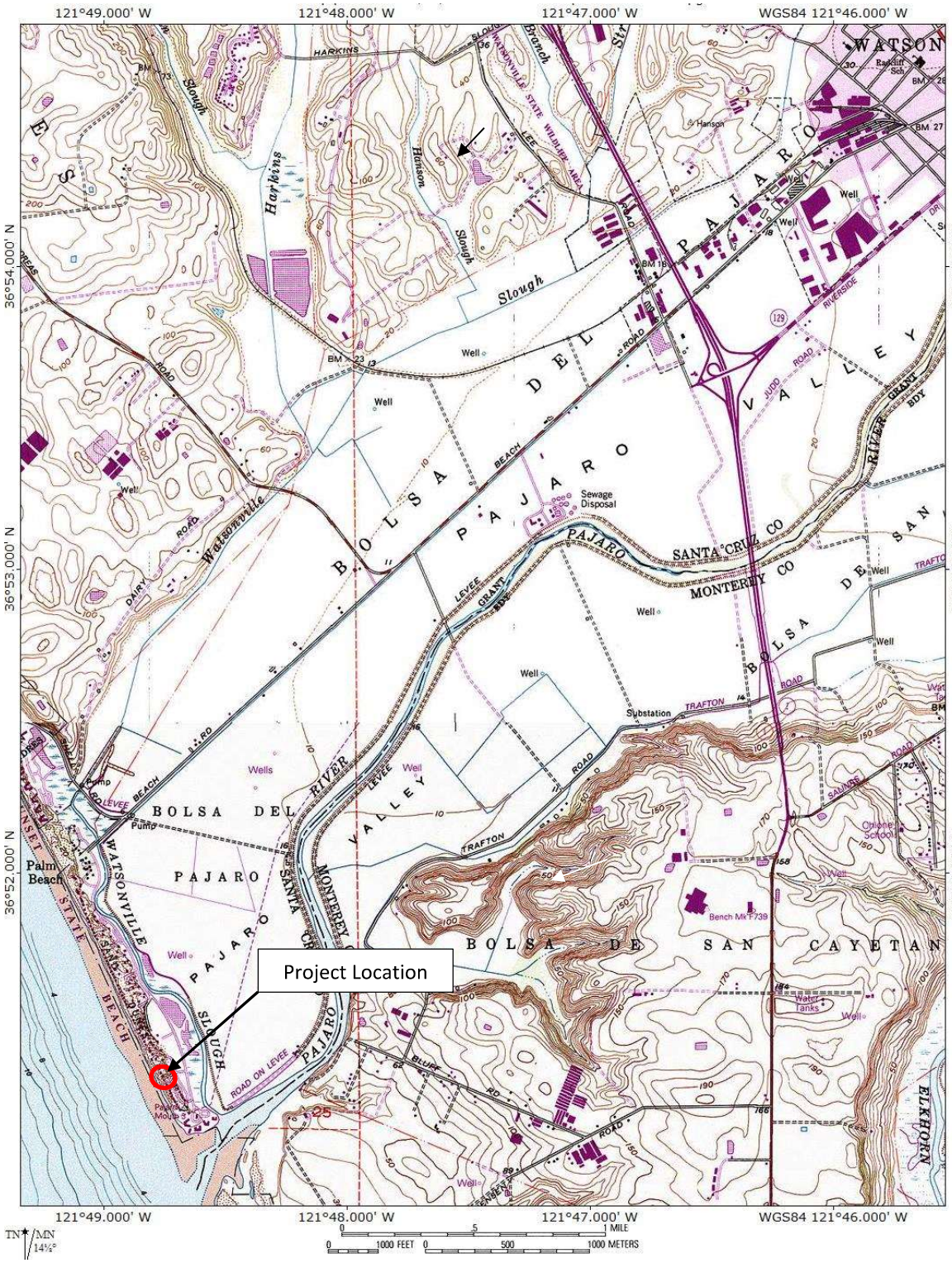

Figure 1. Location of 49 Shearwater Lane (USGS Watsonville West Topographic Map)

3.0 METHODOLOGY

The biotic resources on the parcel and immediate surrounding area was assessed through literature review and field observations. An initial site survey was conducted by Kathleen Lyons (plant ecologist) and Dana Bland (wildlife biologist) on April 22, 2020 to assess the proposed development area and surrounding areas of the parcel for sensitive habitat and/or potential rare species/habitat. The proposed development area outward of the footprint of the existing dwelling and surrounding portions of the property were traversed on foot to identify biological resources and habitat conditions. Site features were recorded in a notebook. Kathleen Lyons conducted a second site visit on November 13, 2020 to review areas suitable for habitat enhancement and restoration.

Vegetation was documented during the field surveys. The major plant communities on the parcel, based on the classification system in California Natural Communities List (CaCode) (California Department of Fish and Game, 2020) and *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995) and as amended to reflect site conditions, were identified during the field survey. Modifications to the classification system's nomenclature were made, as necessary, to accurately describe the site's resources. *An Annotated Checklist of the Vascular Plants of Santa Cruz County, California* (CNPS, 2013) was the principal taxonomic reference used for the botanical work.

To assess the potential occurrence of special status biotic resources, two electronic databases were accessed to determine recorded occurrences of sensitive plant communities and sensitive species. Information was obtained from the California Native Plant Society's (CNPS) Electronic Inventory (2020, 2021), and California Department of Fish & Wildlife (CDFW) RareFind database (CDFW, 2020, 2021) for the Watsonville West USGS quadrangle and surrounding quadrangles. The April 2020 field survey was conducted during the blooming/identification period for special status plant species.

4.0 RESULTS

The project site supports two vegetation types: coastal dune scrub (degraded) and non-native eucalyptus grove. The distribution of these vegetation types is presented on Figure 2.

4.1 Habitats

Coastal Dune Scrub. The dune scrub on the parcel is a mosaic of native and non-native plant species, all of which are growing on a stabilized sand dune that occurs north, west, and south of the existing residence. Three non-native, invasive plant species, European dune grass (*Ammophila arenaria)*, ice plant (*Carpobrotus edulis),* and ripgut brome (*Bromus diandrus)*, dominate the scrub, particularly areas north and west of the residence. These areas could be considered the European beach grass sward community, as per CDFW CaCode 42.010.00. The presence of these species is indicative of a degraded scrub habitat and is typical to the landscaping on adjacent/nearby parcels.

Native plant species are limited to areas where the European dune grass is sparse and where there are open sandy areas between the ice plant. Native species include mock heather (*Ericameria ericoides)*, beach primrose (*Camissonia cheiranthifolia),* beach sagewort (*Artemisia pycnocephalus)*, silver bush lupine (*Lupinus albifrons),* and yellow bush lupine (*Lupinus arboreus)*. These areas could be considered the yellow bush lupine -mock heather scrub community as per CaCode 32.080.03.

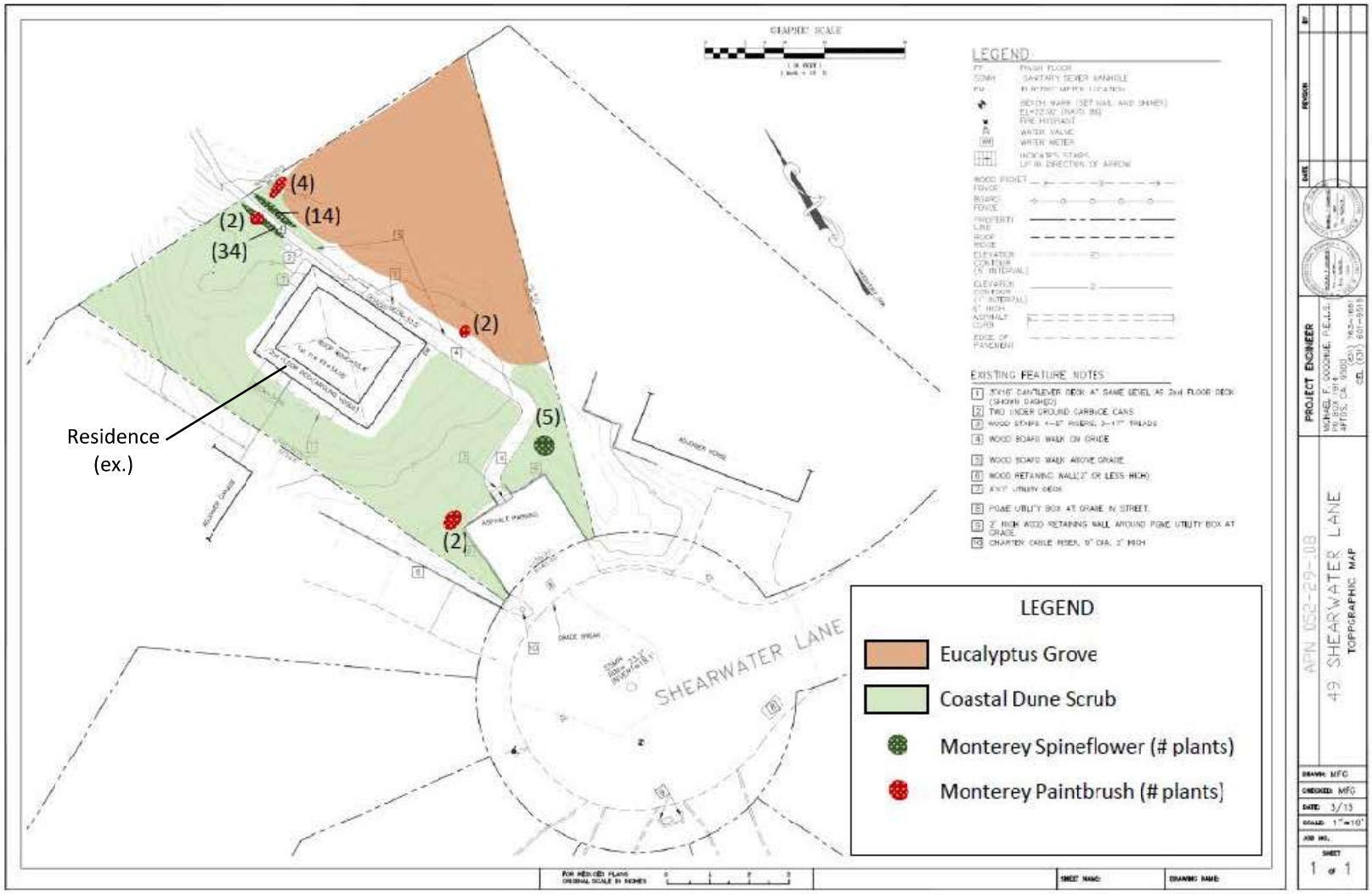

Figure 2. Distribution of vegetation types and special status plant species

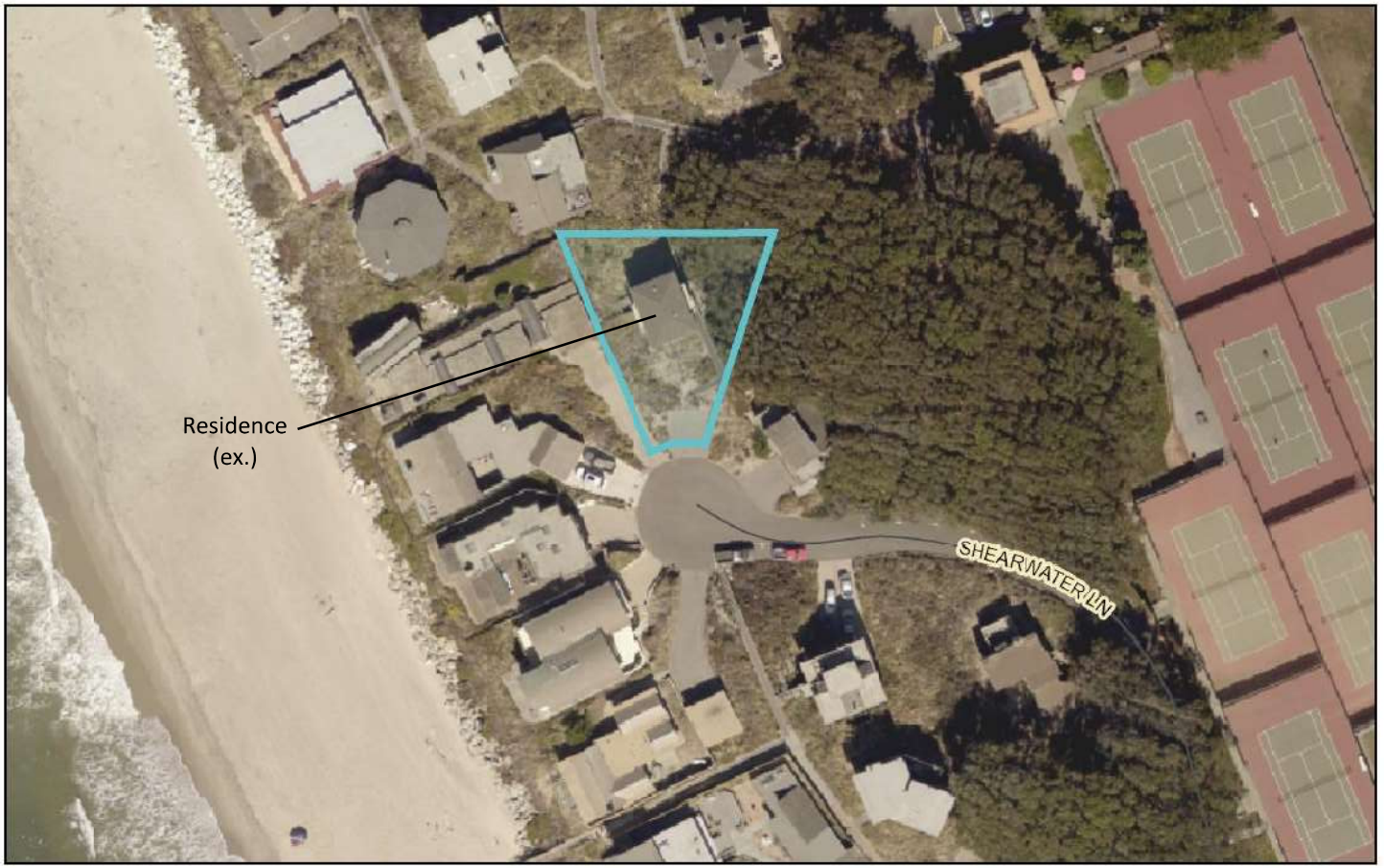

Figure 3. Location of parcel on aerial photo (Source: Santa Cruz County GIS)

Despite the degraded site conditions, two special status plant species were observed on the parcel: Monterey spineflower *(Chorizanthe pungens var. pungens)* and Monterey paintbrush (*Castilleja latifolia)*. These plant species were found in small patches, as depicted in Figure 2. Figure 3 is an aerial image of the parcel and surroundings. The character of the scrub is depicted in Figures 4 and 5.

Figure 4. Character of dune scrub in northern portion of parcel

Figure 5. Character of dune scrub in southern portion of parcel

Eucalyptus Grove. The eastern portion of the parcel supports a canopy of eucalyptus (*Eucalyptus sp.)* . The trees are multi-trunk, wind-pruned individuals that are rooted off the parcel; however, their limbs overhang the parcel. The understory is dominated by non-native grasses as fobs, such as ripgut brome (*Bromus diandrus)*, ice plant, Bermuda buttercup (*Oxalis pes-caprae)*, and European dune grass. Native

plant species were limited to small patches of Monterey paintbrush and wild cucumber (*Marah fabacean)*. Figures 6 and 7 depict the character of this vegetation type.

Figure 6. Character of eucalyptus tree limbs immediately east of existing residence


Figure 7. Multi-stemmed eucalyptus tree limbs east of existing residence

Wildlife Resources on Site. The dune scrub on this parcel is degraded and has little value to native wildlife. Common wildlife that may forage on the seeds or foliage of plants in the dune scrub include bushtit (*Psaltriparus minimus*), California towhee (*Pipilo crissalis*), song sparrow (*Melospiza melodia*), Brewer's blackbird *(Euphagus cyanocephallus*), Botta's pocket gopher (*Thomomys bottae*), and brush rabbit (*Sylvilagus bachmani*).

Eucalyptus is not native to California and does not support a very diverse wildlife assemblage. Common wildlife species that utilize eucalyptus groves include alligator lizard (*Gerrhonotus multicarinatus*), Anna's hummingbird (*Calypte anna*) and woodrat (*Neotoma fuscipes annectens)*. Eucalyptus trees are locally important as they may provide potential wintering habitat for monarch butterflies (*Danaus plexippus*). However, the eucalyptus grove adjacent to this property is not well protected from wind and therefore, is not expected to host to monarchs. The eucalyptus tree grove may provide potential roosting and nesting habitat for raptors such as red-shouldered hawk (*Buteo lineatus*) and great horned owl (*Bubo virginianus*), yet no nests were detected during site surveys in 2020.

4.2 Sensitive Biotic Resources

Sensitive habitats are defined by local, State, or Federal agencies as those habitats that support special status species, provide important habitat values for wildlife, represent areas of unusual or regionally restricted habitat types, and/or provide high biological diversity.

Regulated Habitats. The project area is located within an unincorporated area of Santa Cruz County, within the Coastal Zone. County Code (Sensitive Habitat Protection, Section 16.32) recognizes dune plant habitats as sensitive habitat. Under County Code only resource dependent uses are allowed in sensitive habitat. For dune areas, permitted uses include scientific research and education and wooden boardwalks for trails are required. In granting approval for development, County Code requires the development to mitigate significant impacts, protection of undisturbed area, and restoration of degraded areas commensurate with the scale of the development. The coastal dune scrub on the parcel meets the requirement of a sensitive habitat as defined in County Code. This is due to the general presence of the dune plant community (albeit degraded from the dominance by invasive, non-native plant species), but also the presence of the one special status plant species and one locally unique plant species.

The USACE regulates activities within waters of the United States pursuant to congressional acts: Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (1977, as amended). Section 10 of the Rivers and Harbors Act requires a permit for any work in, over, or under navigable waters of the United States. Navigable waters are defined as those waters subject to the ebb and flow of the tide to the Mean High-Water mark (tidal areas) or below the Ordinary High-Water mark (OHWM) (freshwater areas). Areas with a significant hydrological connection to navigable waters are also regulated by the USACE. The parcel is located outside of USACE jurisdiction.

Water quality in California is governed by the Porter-Cologne Water Quality Control Act and certification authority under Section 401 of the Clean Water Act, as administered by the Regional Water Quality Control Board (RWQCB). The Section 401 water quality certification program allows the State to ensure that activities requiring a Federal permit or license comply with State water quality standards. Water quality certification must be based on a finding that the proposed discharge will comply with water quality standards which are in the regional board's basin plans. The Porter-Cologne Act requires any person discharging waste or proposing to discharge waste in any region that could affect the quality of the waters of the state to file a report of waste discharge. The RWQCB issues a permit or waiver that includes implementing water quality control plans that take into account the beneficial uses to be protected. Waters of the State subject to RWQCB regulation extend to the top of bank, as well as isolated water/wetland features and saline waters. Should there be no Section 404 nexus (i.e., isolated feature not subject to USACE jurisdiction); a report of waste discharge (ROWD) is filed with the RWQCB. The RWQCB interprets waste to include fill placed into water bodies. The parcel is located outside of RWQCB jurisdiction.

California Department of Fish and Wildlife (CDFW) is a trustee agency that has jurisdiction under Section 1600 et seq. of the Sections 1600-1603 of the California Fish and Game Code. CDFW regulates all diversions, obstructions, or changes to the natural flow or bed, channel or bank of any river, stream or lake which supports fish or wildlife. CDFW also regulates the deposit of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake. CDFW defines a "stream" as a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having surface or subsurface flow that supports or has supported riparian vegetation. The parcel is located outside CDFW jurisdiction under Section 1600. CDFW also identifies sensitive natural communities. The yellow bush lupine scrub, with primary species of yellow bush lupine and mock heather (CaCode 32.080.03) is considered sensitive (CDFW, 2020).

4.3 Special Status Plant Species

Species of concern include those listed by either the Federal or State resource agencies as well as those identified as rare by CNPS (List 1B). Based on a search of the CNPS and CNDDB inventories, there are several species of concern within the greater project area, as listed in Table 1. One special status species was observed on site in April 2020: Monterey spineflower. Monterey paintbrush, a locally unique species (CNPS List 4, Watch list) was also observed. No other special status plant species were observed on site.

Monterey spineflower (*Chorizanthe pungens var. pungens).* This species is federally listed as endangered under the Federal Endangered Species Act (FESA). This species is also listed as rare (List 1B.1) by the California Native Plant Society and is considered rare by the County of Santa Cruz. The species is not listed under the California Endangered Species Act (CESA). The Monterey spineflower is an annual species that grows in sandy soils within portions of Santa Cruz County; there are several known occurrences from dune scrub habitat in the Pajaro Dunes development and from nearby Sunset State Beach.

The spineflower is characterized by its whitish to pinkish flowers, low-growing habit and spiny bracts surrounding the flowers. Individuals of Monterey spineflower were observed on the parcel during the April 2020 field survey. A colony was observed along both sides of the wooden pathway in the northwestern portion of the parcel. A second colony was observed north of the existing asphalt parking area. A total of 53 plants were found on site. The location (and number of plants) of this species is depicted on Figure 2. Figure 8 depicts this species.

Figure 8. Monterey spineflower on site

Monterey paintbrush (*Castilleja latifolia)*. Individuals of Monterey paintbrush, a locally unique species (CNPS List 4.3 – a watch list), were observed on the parcel during the April 2020 field survey. This hemiparasitic perennial plant grows amid the dune scrub. A colony was observed along both sides of the wooden pathway in the northwestern portion of the parcel. A second colony was observed northwest of the existing asphalt parking area. A total of 8 plants were found on site.

The location of this species is depicted on Figure 2. Figure 9 depicts this species.

Figure 9. Monterey paintbrush on site

Table 1. List of Special Status Plant Species Evaluated for 49 Shearwater Lane

Species	CNPS Ranking	State Status	Federal Status	Habitat Preference; closest Known Occurrences
Watsonville West Quadrangle				
Hooker's manzanita *(Arctostaphylos hookeri ssp. hookeri*)	List 1B.2	None	None	Sandy slopes, often intermixed with oak woodland; known from Buena Vista area; not observed
Pajaro manzanita *(Arctostaphylos pajaroensis*)	List 1B.1	None	None	Sandy slopes, often intermixed with oak woodland; recorded from NW of Watsonville and in Prunedale area; not observed
Congdon's tarplant (*Centromadia parryi ssp. congdonii)*	List 1B.2	None	None	Mesic grassland, heavy clay, alkaline; recorded from Ellicott Slough NWR; no suitable habitat
Monterey spineflower *(Chorizanthe pungens var. pungens)*	List 1B.2	None	Threatened	Sandy slopes, can be intermixed with oak woodland/maritime chaparral; recorded from Fiesta Way area, Manresa and Sunset State beaches; Day Valley area; Pajaro Dunes; observed on site
Robust spineflower *(Chorizanthe robusta var. robusta)*	List 1B.1	None	Endangered	Sandy slopes, often intermixed with oak woodland/maritime chaparral; recorded from Manresa State Beach; NE of Ellicott Pond, Aptos HS area; not observed

Table 1. List of Special Status Plant Species Evaluated for 49 Shearwater Lane

Species	CNPS Ranking	State Status	Federal Status	Habitat Preference; closest Known Occurrences
Sand-loving wallflower *(Erysimum ammophilium)*	List 1B.2	None	None	Coastal dunes; recorded from Sunset State Beach, along Shell Road; not observed
Sand gilia *(Gilia tenuiflora ssp. arenaria)*	List 1B.2	Threatened	Endangered	Coastal dunes; recorded from Sunset State Beach; not observed
Santa Cruz tarplant *(Holocarpha macradenia)*	List 1B.1	Endangered	Threatened	Grasslands, often on coastal terrace deposits; recorded from Harkins Slough area and Watsonville area; no suitable habitat.
Kellogg's horkelia *(Horkelia cuneata ssp. sericea)*	List 1B.1	None	None	Oak woodland and edges of grasslands; recorded from NW of Watsonville at Ellicott NWR; no suitable habitat
Woodland woollythreads *(Monolopia gracilens)*	List 1B.2	None	None	Chaparral; serpentine grassland; sandy/rocky areas; recorded from Corralitos area (1958); no suitable habitat
Dudley's lousewort *(Pedicularis dudleyi)*	List 1B.2	None	None	Woodlands; historic (1884) occurrence from Aptos; no suitable habitat
Choris's popcorn flower *(Plagiobothrys chorisianus var. chorisianus)*	List 1B.2	None	None	Mesic grasslands, often on coastal terrace deposits; recorded from north end of Watsonville Airport; no suitable habitat
Surrounding Quadrangles (Laurel, Loma Prieta, Watsonville East, Prunedale, Mt. Madonna, Soquel and Moss Landing)				
Bent-flowered fiddleneck (*Amsinckia lunaris)*	List 1B.2	None	None	Grassland; recorded from Scotts Valley and Davenport; no suitable habitat
Anderson's manzanita (*Arctostaphylos andersonii)*	List 1B.2	None	None	Chaparral and forests; recorded from UCSC area and Bonny Doon; not observed
King's Mountain manzanita (*Arctostaphylos regismontana)*	List 1B.2	None	None	Chaparral and forests; recorded from Skyline area; not observed
Santa Cruz Mtns. pussypaws *(Calyptridium parryi var. hesseae)*	List 1B.1	None	None	Ponderosa pine and chaparral in Zayante sands; known from Felton and Ben Lomond area; not observed
Deceiving sedge (*Carex saliniformis)*	List 1B.2	None	None	Mesic areas, marshes; historic record from Scotts Valley; no suitable habitat
Coyote ceanothus (*Ceanothus ferrisae)*	List 1B.1	None	Endangered	Chaparral, on serpentine; recorded from Anderson Reservoir and Uvas Canyon area; not observed
Ben Lomond spineflower *(Chorizanthe pungens var. hartwegiana)*	List 1B.1	None	Endangered	Ponderosa pine and chaparral in Zayante sands; recorded from Bonny Doon and Felton areas; not observed
Scotts Valley spineflower *(Chorizanthe robusta var. hartwegii)*	List 1B.1	None	Endangered	Grassland on sandstone outcrops; known only from Scotts Valley area; no suitable habitat
Seaside birds-beak (*Cordylanthus rigidus ssp.*	List 1B.1	Endangered	None	Maritime chaparral and closed cone forests; recorded from Monterey Co.; not observed

Table 1. List of Special Status Plant Species Evaluated for 49 Shearwater Lane

Species	CNPS Ranking	State Status	Federal Status	Habitat Preference; closest Known Occurrences
littoralis)				
Santa Clara Valley dudleya (*Dudleya abramsii ssp. setchellii)*	List 1B.1	None	Endangered	Serpentine chaparral and rock outcrops; no suitable habitat
Eastwood's goldenbush (*Ericameria fasciculata)*	List 1B.1	None	None	Chaparral and coastal scrub; recorded from Monterey Co.; not observed
Hoover's button-celery (*Eryngium aristulatum var. hooveri)*	List 1B.1	None	None	Mesic areas, vernal pools in grassland; recorded from San Benito Co.; no suitable habitat
Ben Lomond wallflower *(Erysimum teretifolium)*	List 1B.1	Endangered	Endangered	Ponderosa pine and chaparral in Zayante sands; known from Felton and Ben Lomond area; no suitable habitat
Minute pocket moss (*Fissidens pauperculus)*	List 1B.2	None	None	Sandstone outcrops in grassland and oak woodland; recorded from Scotts Valley region; no suitable habitat
Fragrant fritillary *(Fritillaria liliacea)*	List 1B.2	None	None	Moist serpentine areas in grassland; recorded from Santa Clara Co; no suitable habitat
Loma Prieta hoita *(Hoita strobilina)*	List 1B.1	None	None	Talus in chaparral and woodlands; 1936 herbarium record from Santa Cruz; no suitable habitat
Smooth lessingia *(Lessingia micradenia var. glabrata)*	List 1B.2	None	None	Serpentine soils in chaparral and grasslands; recorded from Santa Clara Co; no suitable habitat
Arcuate bush-mallow *(Malacothamnus arcuatus)*	List 1B.2	None	None	Chaparral and cismontane woodland; not observed
Hall's bush-mallow *(Malacothamnus hallii)*	List 1B.2	None	None	Chaparral and coastal scrub; not observed
Santa Cruz Mtns. beards tongue *(Penstemon rattanii var. kleei)*	List 1B.2	None	None	Woodland and chaparral; herbarium collections from Ben Lomond Mtn.; no suitable habitat
White-rayed pentachaeta *(Pentachaeta bellidiflora)*	List 1B.1	None	None	Cismontane woodland, valley and foothill grassland (often serpentinite); no suitable habitat
Monterey pine *(Pinus radiata)*	List 1B.1	None	None	Native stands limited to Ano Nuevo and Monterey peninsula; not observed
Yadon's piperia (*Piperia yadonii)*	List 1B.1	None	Endangered	Coastal scrub and oak woodland, often on talus/rocky areas; not observed
San Francisco popcorn flower (*Plagiobothrys diffusus)*	List 1B.2	Endangered	None	Mesic grasslands, often on coastal terrace deposits; no suitable habitat
Scotts Valley polygonum (*Polygonum hickmanii)*	List 1B.1	None	Endangered	Grasslands, on coastal terrace deposits; no suitable habitat
Pine rose (*Rosa pinetorum)*	List 1B.2	None	None	Closed cone pine forests; no suitable habitat

Table 1. List of Special Status Plant Species Evaluated for 49 Shearwater Lane

Species	CNPS Ranking	State Status	Federal Status	Habitat Preference; closest Known Occurrences
Most-beautiful jewel-flower (*Streptanthus albidus ssp. peramoenus)*	List 1B.2	None	None	Serpentine grassland; no suitable habitat
Santa Cruz Clover *(Trifolium buckwestiorum)*	List 1B.1	None	None	Mesic grasslands; no suitable habitat
Saline clover (*Trifolium depauperatum var. hydrophilum)*	List 1B.2	None	None	Mesic grasslands, alkaline; no suitable habitat

CNPS Status: List 1B: These plants (predominately endemic) are rare through their range and are currently vulnerable or have a high potential for vulnerability due to limited or threatened habitat, few individuals per population, or a limited number of populations. List 1B plants meet the definitions of Section 1901, Chapter 10 of the CDFG Code.

4.4 Special Status Wildlife Species

Special status wildlife species include those listed, proposed or candidate species by the Federal or the State resource agencies, as well as those identified as State species of special concern. All raptor nests are protected by California Fish and Wildlife codes, and all migratory bird nests are protected by the Federal Migratory Bird Treaty Act. In addition, most birds that nest within the state of California are afforded further protections under California Fish and Wildlife (CDFW) code. Section 3503 of CDFW code states "It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto." The only two exceptions to the regulations in this code are the European starling and the house sparrow.

Table 2 lists the wildlife species of concern evaluated for the site and their predicted occurrence.

Table 2. Special status wildlife species and their predicted occurrence 49 Shearwater Lane, Pajaro Dunes, Watsonville, CA, Watsonville West Quad.

SPECIES	STATUS[1]	HABITAT	POTENTIAL OCCURRENCE ON SITE
Invertebrates			
Monarch butterfly *Danaus plexippus*	*	Eucalyptus, acacia and pine trees groves provide winter habitat when they have adequate protection from wind and nearby source of water	Unlikely. None known from any Eucalyptus groves in Pajaro Dunes.
Fish			
Steelhead *Oncorhynchus mykiss*	FT	Perennial creeks and rivers with gravels for spawning.	Known from Pajaro River, but no suitable habitat on site.
Tidewater goby *Eucyclogobius newberryi*	FE, CSC	Coastal lagoons and associated creeks up to 1 mile inland	Known from Pajaro River lagoon and upstream to 2 mi., but no suitable habitat on site.
Amphibians			
California tiger salamander *Ambystoma californiense*	FT, ST	Ponds, vernal pools for breeding, grasslands with burrows for upland habitat	None, no suitable habitat on site.

Table 2. Special status wildlife species and their predicted occurrence 49 Shearwater Lane, Pajaro Dunes, Watsonville, CA, Watsonville West Quad.

SPECIES	STATUS[1]	HABITAT	POTENTIAL OCCURRENCE ON SITE
Santa Cruz long-toed salamander *Ambystoma macrodactylum croceum*	FE, SE	Ponds for breeding with water at least into June. Riparian, oak woodland, coastal scrub for upland habitat.	None, no suitable habitat on site.
Santa Cruz black salamander *Aenides flavipunctatus niger*	CSC	Mesic forests of fog belt; terrestrial, lives under logs, rocks, etc.	None, no suitable habitat on site.
California giant salamander *Dicamptodon ensatus*	CSC	Wet coastal forests near streams and seeps; breed in streams	None, no suitable habitat on site.
Foothill yellow-legged frog *Rana boylii*	ST	Perennial creeks with cobble substrate for egg attachment.	None. No suitable habitat.
California red-legged frog *Rana draytonii*	FT, CSC	Riparian, marshes, estuaries and ponds with still water at least into June.	None, no suitable habitat on site.
Reptiles			
Western pond turtle *Emys marmorata*	CSC	Creeks and ponds with water of sufficient depth for escape cover, and structure for basking; grasslands or bare areas for nesting.	None, no suitable habitat on site.
Black legless lizard *Anniella pulchra nigra*	CSC	Sand dunes with native vegetation	Habitat marginal, but possible in larger patches of native dune vegetation.
Birds			
White tailed kite *Elanus leucurus*	FP	Nests in riparian and other mixed deciduous forests with adjacent open areas for foraging	None, no suitable habitat on site.
Western snowy plover *Charadrius alexandrinum nivosus*	FT, CSC	Nests on sandy beach, shores of salt ponds	No suitable habitat at this site, but nests at Pajaro River mouth.
Burrowing owl *Athene cunicularia*	CSC	Nests and winters in grasslands with burrows and short vegetation	No suitable habitat on or near this site.
Bank swallow *Riparia riparia*	ST	Vertical banks of rivers, lakes, ocean shorelines with sandy soils for digging nests	None, no suitable habitat on site.
Olive-sided flycatcher *Contopus cooperi*	CSC	Coniferous and oak forests with tall trees or snags for nesting	None, no suitable habitat on site.
Yellow warbler *Dendroica petechia brewsteri*	CSC	Riparian woodlands with dense understory plants	None, no suitable habitat on site.
Tricolored blackbird *Agelaius tricolor*	CSC	Dense bulrush and/or cattail vegetation adjacent to freshwater marshes	None, no suitable habitat on site.

Table 2. Special status wildlife species and their predicted occurrence 49 Shearwater Lane, Pajaro Dunes, Watsonville, CA, Watsonville West Quad.

SPECIES	STATUS[1]	HABITAT	POTENTIAL OCCURRENCE ON SITE
Mammals			
Santa Cruz kangaroo rat *Dipodomys venustus venustus*	*	Silverleaf manzanita and mixed scrub in Zayante soils	None, no suitable habitat on site.
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	CSC	All types of forests and dense scrub habitats	Possibly occurs in the adjacent Eucalyptus, but no suitable habitat on site.
American badger *Taxidea taxus*	CSC	Grasslands with friable soils for digging dens	None, no suitable habitat on site.

[1] Key to status:

FE	=	Federally listed as endangered species
FT	=	Federally listed as threatened species
SE	=	State listed as endangered species
ST	=	State listed as threatened species
CSC	=	California species of special concern
*	=	Species of local concern in Santa Cruz County

Monarch Butterfly (*Danaus plexippus)*. The large eucalyptus grove at the terminus of Beach Street (north of entrance to the Pajaro Dunes development) provides potential monarch roosting habitat, but none have been reported in the CNDDB (CDFW 2020) nor in multiple surveys conducted by State Parks (Chris Spohrer, State Parks, pers. com. 2008). The windswept eucalyptus grove adjacent to 49 Shearwater Lane does not provide suitable habitat for monarchs, as monarchs require protection from wind in order to fly and forage. Monarch butterflies are not expected to occur on or adjacent to this property.

Black legless lizard (*Anniella pulchra nigra*). The black legless lizard is a California species of special concern. It was proposed for federal listing as endangered in 1995 (USFWS 1995), but it was subsequently determined that listing was not warranted based primarily on the preservation of a large section of the former Fort Ord where this lizard occurs (USFWS 1998). The black legless lizard inhabits coastal dunes in Monterey County between the Salinas and Carmel Rivers (USFWS 1998). This lizard burrows into loose sand under plants including bush lupine, mock heather, mock aster (Jennings and Hayes 1994). It hunts for its insect prey while concealed in the leaf litter below the plants, and is rarely observed on the ground surface.

The dune scrub habitat at this site provides only marginal habitat for the black legless lizard, due to the sparse occurrence of native vegetation which this species is usually associated with, fragmentation of habitat from other suitable dune areas, and the predominance of dense mats of non-native plants, such as ice plant. However, this lizard has a slight chance to occur in the areas in small numbers where loose sand, leaf litter, and adequate prey base exists.

Western snowy plover (*Charadrius alexandrinum nivosus*). This bird is federally listed as a threatened species and is a California species of special concern. The population segment of western snowy plover that is protected by the Federal Endangered Species Act is described as the Pacific Coast Population and includes nesting populations along the coast of California, Oregon, and Washington in areas adjacent to tidal waters, including the mainland cost, peninsulas, offshore islands, adjacent bays, estuaries, and coastal rivers (USFWS 1999). The breeding season for snowy plovers on the Central California coast extends from early March to mid-September, and there is some overlap of wintering birds from northern areas arriving in mid to late summer. Nests are built in loosely arranged colonies, eggs are laid in a

shallow depression scraped in the sand, chicks hatch after an average 27-day incubation period, and juveniles are able to fly within 31 days of hatching (Warriner et al. 1986). Snowy plovers forage on invertebrates along intertidal areas. The primary threats to the species include loss and degradation of nesting and foraging habitat, human disturbances at nesting, wintering, and forging areas, and predation of eggs and chicks by mammals (e.g., red fox) and other birds (e.g., ravens).

Western snowy plovers are known to nest on the beach at the mouth of the Pajaro River (CNDDB 2020), and in 2008 there were an estimated 20 nesting pairs (R. Warriner, pers. comm.). Each spring, the California Department of Parks places stakes and flagging with signs around the nesting colony to deter beach users from entering the nesting colony, and if necessary, individual nests are fenced to exclude predators (Chris Spohrer, pers. comm.). The Point Reyes Bird Observatory has been monitoring and studying this population of snowy plovers for over a decade. This nesting colony is within designated critical habitat for the snowy plover, Unit 1 (Sunset Beach) of Site CA-7 (USFWS 1999).

However, the property at 49 Shearwater Lane has no suitable habitat for snowy plovers. The parcel (and adjacent areas) lacks open sandy beach type areas, and is well removed from any intertidal areas with suitable forage. Snowy plovers do not occur at this site.

5.0 IMPACT ASSESSMENT AND MITIGATION

5.1 Impact Criteria

The thresholds of significance presented in the CEQA Guidelines, updated December 2018, were used to evaluate project impacts and to determine if implementation of the proposed Project would pose significant impacts to botanical resources. For this analysis, significant impacts are those that substantially affect, either directly or through habitat modifications:

a) A species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by CDFW or USFWS;
b) Riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS;
c) State or Federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance;
f) Conflict with the provisions of an adopted Habitat Conservation plan, Natural Community Conservation plan, or other approved local, regional, or state habitat conservation plan.

5.2 Impact Analysis

a) **Special Status Species.** The site supports one rare species (Monterey spineflower) and one locally unique species (Monterey paintbrush). The proposed residential project will avoid direct impact to three colonies of Monterey spineflower; however, one colony (5 plants) will be in close proximity to site grading. Inadvertent impact could occur to this colony. The project will impact two of the four colonies of Monterey paintbrush, affecting four plants. Mitigation Measure BIO-1 will reduce this impact.

The CNDDB Rarefind 5 database shows only one special status wildlife species that may occur at this site, the black legless lizard, a California species of special concern. This species lives in dune habitats with native plants such as mock heather. The lizard burrows deep into the sand and rises to the surface to feed on spiders and other invertebrates that live on the native plants. However, the dense ice plant growing under the scattered bushes of mock heather, as well as the dense European dune grass at this site greatly reduces the potential for occurrence of legless lizard. The only area observed where this lizard may occur is in portions of the site where the dune scrub is free of non-native plants, such as ice plant and European dune grass. Grading has the potential to kill or injure legless lizards if any are present on the site.

Monarch butterflies are not expected to occur in eucalyptus tree limbs that overhang the parcel or the adjacent tree grove. These trees are subject to wind which makes them unsuitable for monarchs which require protection from wind, or they would be unable to fly and forage.

Mitigation Measure BIO-1 Special Status Plant Species. Prior to construction, install orange construction fencing at the limit of grading line. Install silt fencing around the rare plant colonies (Monterey spineflower and Monterey paintbrush) that are to be retained (inside and outside of limit of

grading line). Retain a qualified botanist to field check the placement of the fencing prior to any other site work.

In the summer prior to construction, collect Monterey spineflower seed from the parcel and utilize this seed in the on-site dune restoration areas created after construction. Under the direction of a qualified revegetation specialist, hand broadcast seed into designated open sandy areas of the on-site dune restoration areas. Retain a qualified botanist to monitor the progress of the Monterey spineflower revegetation for a minimum of 3 years. Seeded spineflower areas should achieve a minimum of 15 plants each year for a period of 5 years. This will provide a 3:1 replacement ratio for plants impacted by the project.

In the summer prior to construction, collect Monterey paintbrush seed from the parcel and utilize this seed in the on-site dune restoration areas created after construction. Under the direction of a qualified revegetation specialist, have a minimum of 14 replacement plants grown at a native plant nursery, then outplant these plants into the on-site dune restoration area. Retain a qualified botanist to monitor the progress of the Monterey paintbrush revegetation for a minimum of 3 years. Installed plants should achieve an 80% survival rate (12 plants) each year for a period of 5 years. This will provide a 3:1 replacement ratio for plants impacted by the project.

Mitigation Measure BIO-2. Special Status Wildlife. The applicant shall retain a qualified biologist to monitor the initial ground stripping and grading of the development area for black legless lizards. If any black legless lizards are observed during the work, the biologist shall capture the lizards by hand or net, place the individuals in a bucket with sand, and relocate the individuals to an adjacent area of suitable habitat outside the construction zone. The biologist shall obtain all necessary permits from CDFW (e.g., Memorandum of Understanding, Scientific Collecting Permit) to handle and relocate black legless lizards for this project. Immediately prior to any ground disturbing activity the biologist shall be given enough time to manually rake underneath suitable native plants (e.g., mock heather) to locate any lizards.

b) **Sensitive Habitat**. The site supports coastal dune scrub, a sensitive habitat under County Code as well as being ranked S3 (sensitive/imperiled) by CDFW. The project will encompass 5,415 square feet, which is comprised of 3,130 square feet of permanent disturbance and 2,285 square feet of temporary disturbance. A portion of the new development will occur in areas that already support a residence, parking area and/or pathways. Impacts by resource type are presented in Table 3.

Table 3. Impacts to Habitat Types, June 2021

Habitat	Existing Resources (sq. ft.)	Residential Development Permanent Impact (Sq. ft.)	Residential Development Temporary Impact (Sq. ft.)	Total Impact by Resource (Sq. ft.)
Dune Scrub	3,726	1,669	1,490	3,159
Eucalyptus Grove	2,816	52	306	358
Existing Residential Development	1,898	1,409	489	1,898
Total	8,440	3,130	2,285	5,415

Figure 10 depicts the temporary and permanently impacted areas and plant community types.

Mitigation Measure BIO-3. Coastal Dune Scrub Restoration and Revegetation. To compensate for the removal of dune scrub vegetation, the landowner shall develop and implement a dune restoration plan that provides a 3:1 restoration to impact ratio for temporary and permanent impacts to this habitat. This ratio will provide suitable mitigation by restoring degraded scrub with higher quality dune scrub that supports native dune plant species and creating new dune scrub on site. The plan shall specify restoration and management of a minimum of 9,477 square feet of dune scrub on site and off-site, as presented in Table 4.

The plan shall identify existing dune areas to be enhanced as well as new dune areas to be created; a preliminary restoration concept is depicted on Figure 11. The plan shall identify the specific areas to be revegetated, site preparation and soil requirements, plant species palette, planting methodology, and supplemental irrigation requirements. The plan shall identify the location and techniques for the removal and control of invasive, non-native plant species from retained dune scrub and the dune scrub restoration areas. (i.e., control/removal of ice plant and European dune grass). The plan shall identify maintenance and monitoring actions, and indicate a minimum 5-year monitoring and reporting program, or as so indicated by County Conditions of Approval.

Figure 11 shows dune scrub restoration on the subject parcel and a potential off-site area to the north on a neighboring parcel. The property owners shall be responsible for the dune restoration on their property as identified on Figure 11, plus some other part of Pajaro Dunes, as approved by Santa Cruz County, that is of equal square footage to the specified area beyond the property, should the neighboring property not elect for dune restoration work.

Table 4. Dune Scrub Restoration Requirements, June 2021

Habitat	Retained on Site After Construction and Restored (sq. ft.)	On-Site Dune Scrub Restoration (Sq. ft.)	Off-Site Dune Scrub Restoration (Sq. ft.)	Total Restoration by Resource (Sq. ft.)
Dune Scrub	567	1,490	4,167	6,224
Eucalyptus Grove	0	2,764	-	2,764
Previously Disturbed Residential Development	0	489	-	489
Total	567	4,743	4,167	9,477

c) **Wetlands.** No impact, none on site.

d) **Nesting Birds.** The removal of limbs and noise from construction may impact active bird nests in the eucalyptus grove if any are present. Loud noise and dust may cause adult birds to abandon eggs or chicks, causing nest failure.

Mitigation Measure BIO-4. Schedule construction to occur between September 1 and February 1, which is outside the nesting bird season for the Central Coast. If this is not practical, retain a biologist to conduct a survey for active bird nests no more than 14 days prior to onset of construction. If active bird nests are observed, the biologist will designate a buffer area between the nest and work area.

e) **Local Policies**. Section 16.32 Sensitive Habitat Protection in County Code regulates activities within the dune scrub and areas that support special status species. Provision within this code are applicable to the proposed project. Mitigation Measures BIO-1, 2, and 3 provide compensatory mitigation as allowed in the code.

f) **Conflict with HCP or NCCP**. The site is not located within an area covered by an HCP or NCCP.

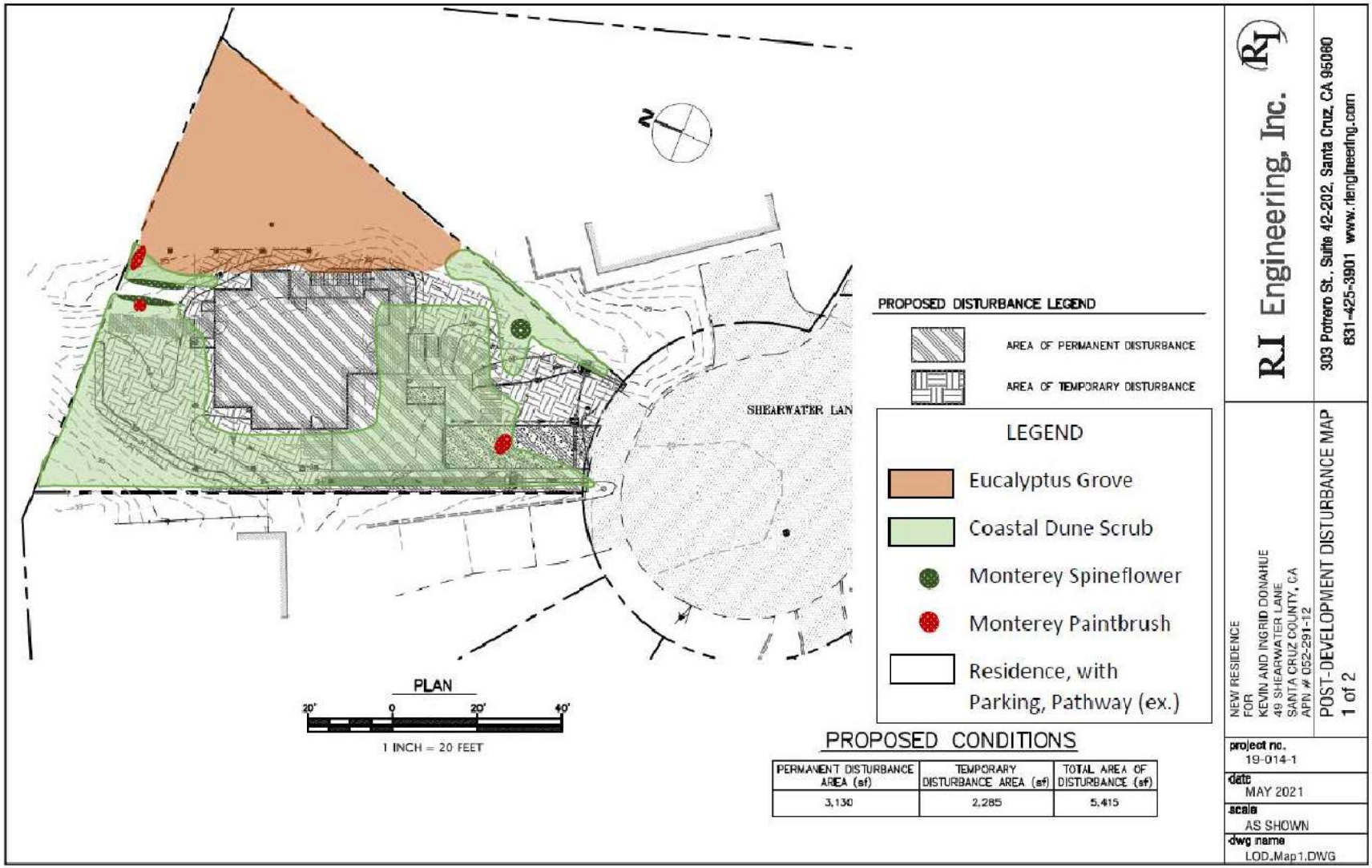

Figure 10. Existing vegetation types within proposed residential development area, showing permanent and temporary impact areas

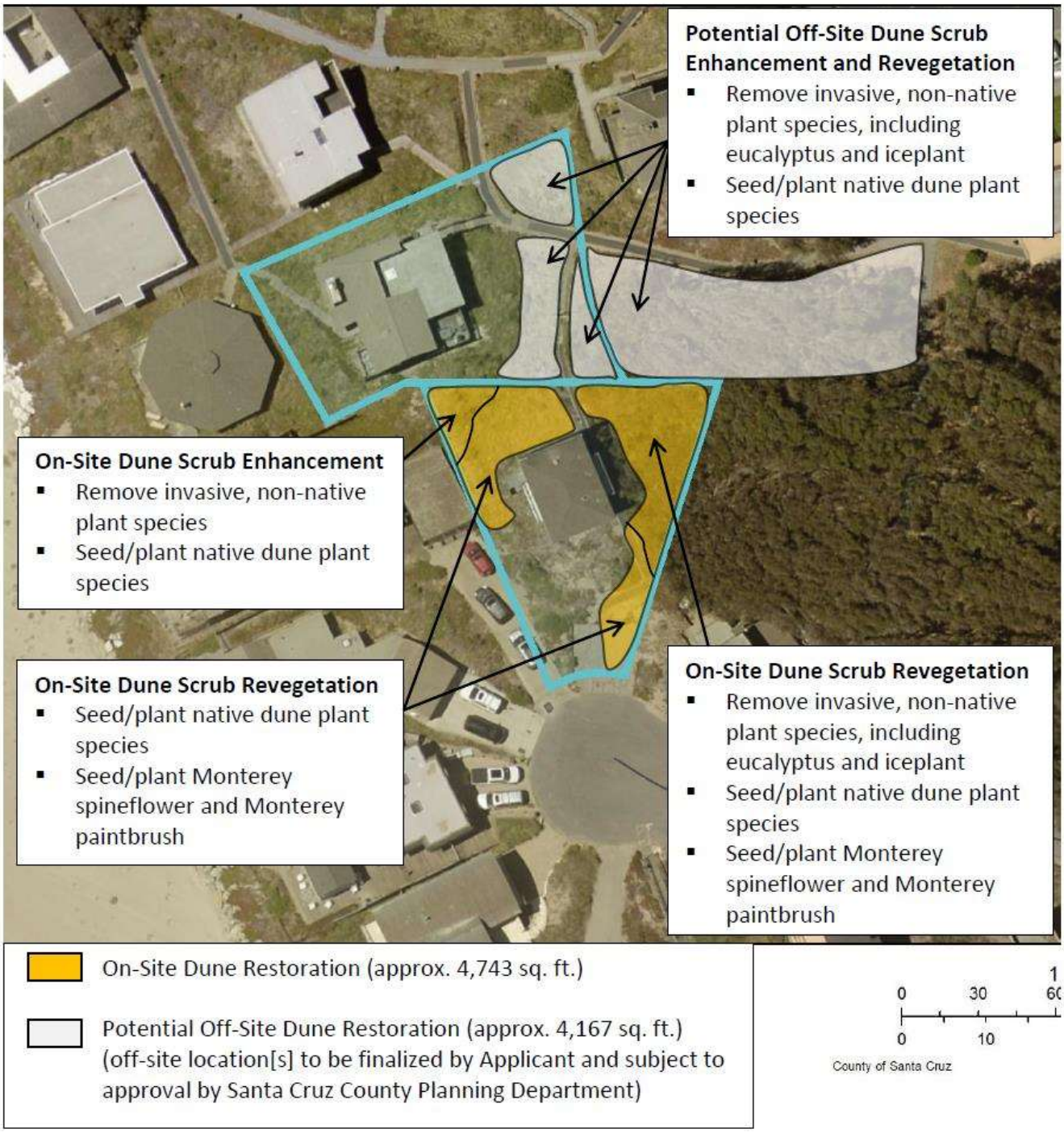

Figure 11. Conceptual dune restoration, on-site area and potential off-site areas.

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Biotic Resources Group

Biotic Assessments ♦ Resource Management ♦ Permitting

April 26, 2022

Jerrod Nichols
FUSE Architects + Builders
411 Capitola Avenue
Capitola CA 95010

RE: Addendum to Biotic Report and Conceptual Restoration Plan, 49 Shearwater Lane, Pajaro Dunes South (APN 052-29-108)

Dear Jerrod,

The Biotic Resources Group has prepared this addendum to the Biotic Report, (Biotic Resources Group, June 29, 2021) in response to comments from the County (email dated March 2, 2022, Matt Johnston). The addendum addresses the issue of proposed dune scrub restoration areas that could be shaded by decks and provides an updated conceptual dune scrub restoration plan.

Shade Analysis

FUSE Architects + Builders conducted a shade analysis of the proposed residence. The analysis, based on the approximate sun shadow at noon on the summer solstice, identified that 764.75 square feet of potential proposed dune restoration area would be located in these shadows. This shade analysis is depicted on Figure A-1, attached. As per the County's concerns that shaded areas would be unsuitable for dune scrub restoration, these shaded areas will be excluded from areas considered for dune restoration. However, any existing dune scrub vegetation that occurs in these shaded areas will be retained as is.

As per the Site Plan, as depicted on Figure A-1, areas temporarily impacted by construction will be restored. This area encompasses 2,805 square feet. This is an update to the area identified for on-site restoration in the Biotic Report, dated June 29, 2001.

To meet the County's requirement for mitigation, 5,101 square feet of off-site dune restoration will occur. This is an update to the area identified for off-site restoration in the Biotic Report, dated June 29, 2001. This updated information is portrayed on Figure A-2.

Updated Conceptual Dune Scrub Restoration

Figure A-2 shows the updated conceptual dune restoration areas – on-site and off-site.

All other mitigation measures presented in the Biotic Report, dated June 29, 2021 remain valid.

Please call me if you have any questions on these findings.

Sincerely,

Kathleen Lyons
Principal/Plant Ecologist

Attachments: Figure A-1, Figure A-1.

2551 S. Rodeo Gulch Road #12 ♦ Soquel, California 95073 ♦ (831) 476-4803 ♦ brg@cruzio.com

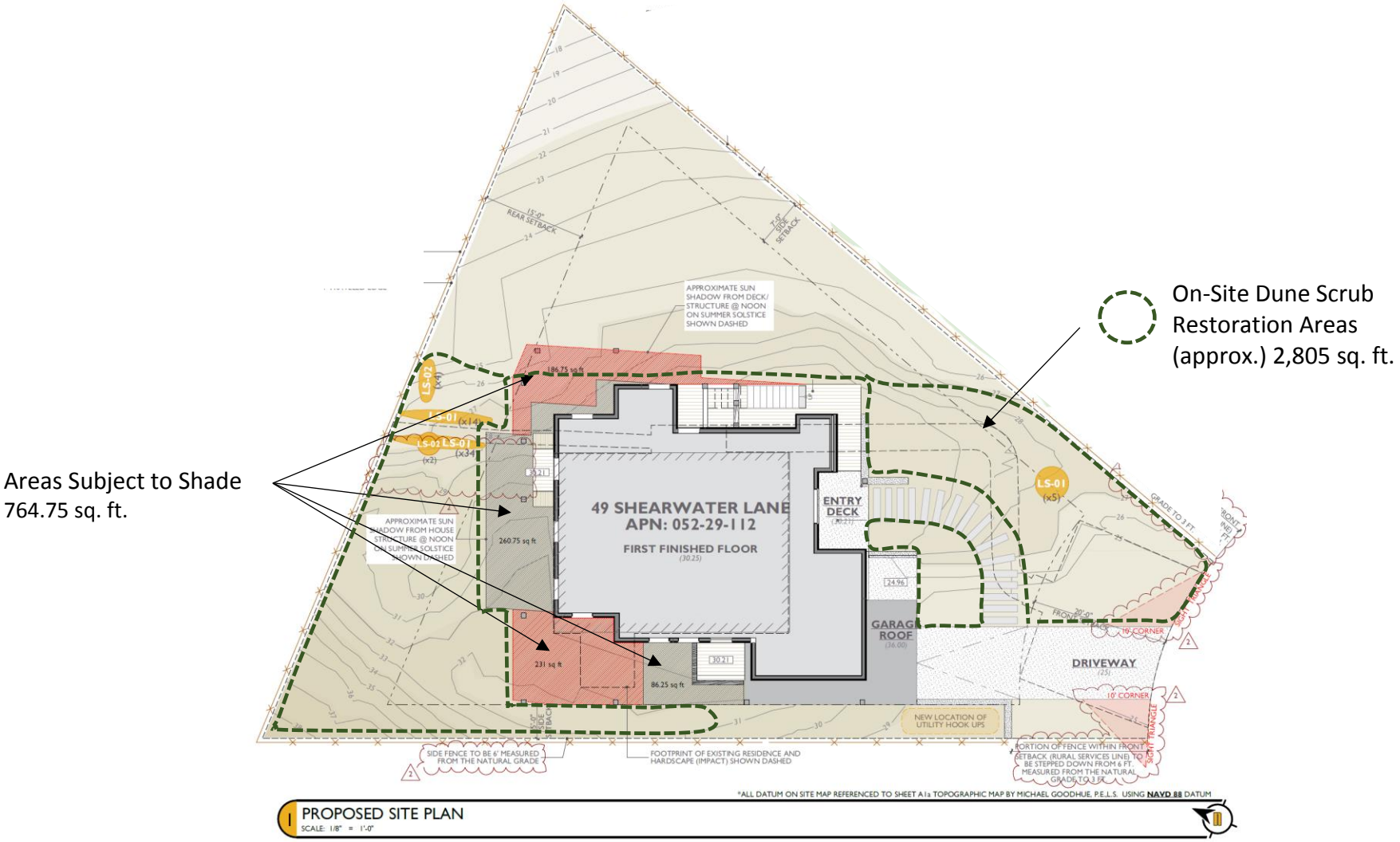

Figure A-1. Site Plan, with Shade Analysis and Areas of On-Site Dune Restoration

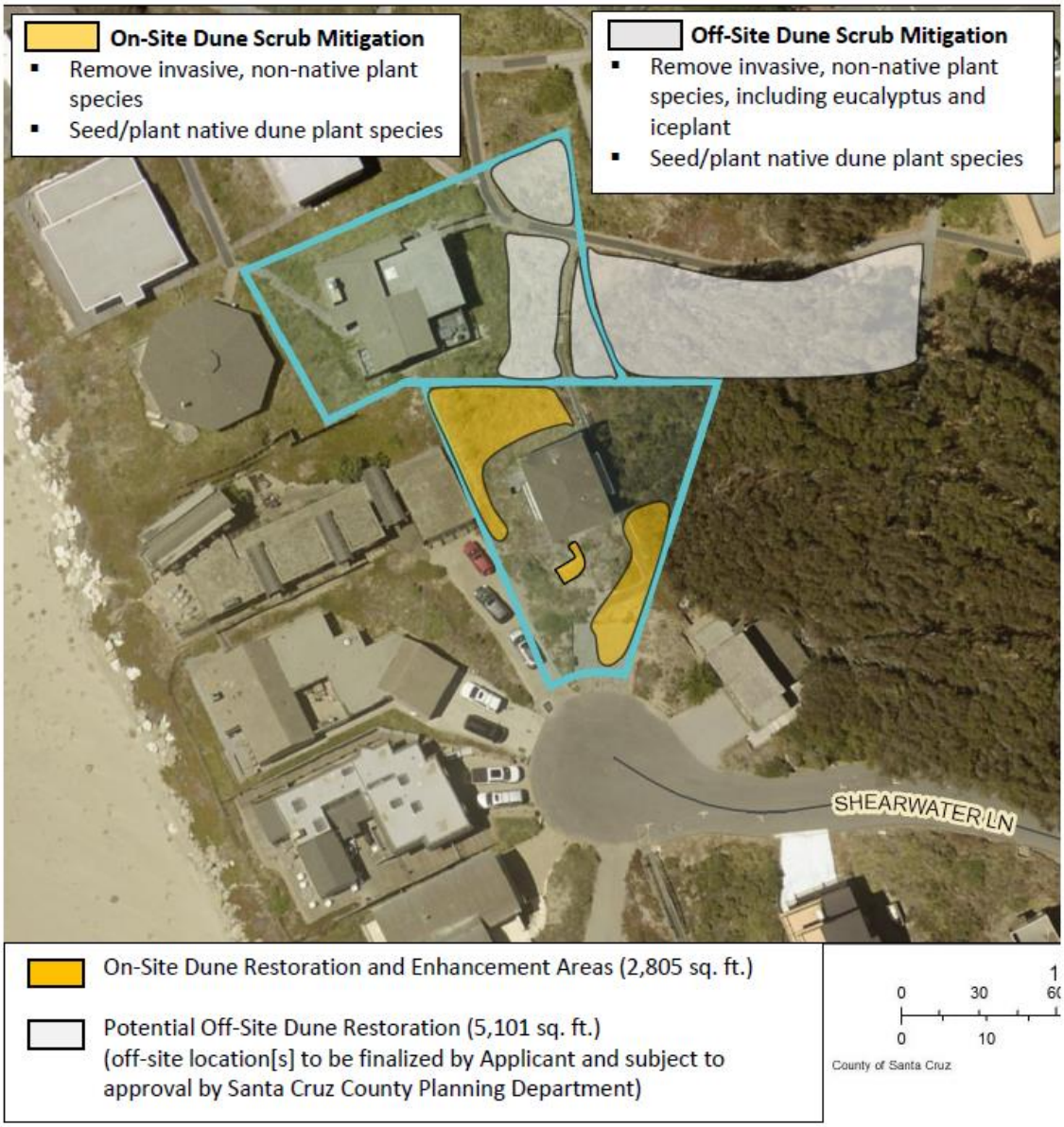

Figure A-2. Conceptual Dune Scrub Restoration Areas

County of Santa Cruz

PLANNING DEPARTMENT
701 Ocean Street, 4th floor, Santa Cruz, Ca 95060
(831) 454-2580 Fax: (831) 454-2131 Tdd: (831) 454-2123

November 10, 2021

Jerrod Nicholls
FUSE Architects + Builders
411 Capitola Avenue
Capitola CA 95010

Subject: 49 Shearwater Lane Biotic Report Review
APN: 052-291-12
Application #: REV201090; 201238

Attachment 1. Biotic Report
Attachment 2. Proposed Site Plan Limits of Disturbance

Dear Mr. Nicholls,

The Planning Department received and reviewed a Biotic Report, dated June 29, 2021 prepared by Biotic Resources Group for APN 052-291-12 (Attachment 1). The Biotic Report Review was required because of the potential for sensitive habitats and protected species in the disturbance area for this project where demolition and reconstruction of a single-family dwelling is proposed. The project is located at 49 Shearwater Lane in the Pajaro Dunes gated community.

The proposed project involves replacement of the existing 2-story house with a new 2-story house, with attached single car garage. The existing development footprint on the property is approximately 1842 square feet including the existing parking area, pathways, and house. The development footprint of the proposed project is approximately 2610 square feet, overlapping the existing developed area. The project would increase the permanent development footprint on the parcel by approximately 768 square feet. Grading to accommodate the proposed development would temporarily impact approximately 2805 additional square feet around the new developed area during construction. These calculations were provided by the project architect and are shown, along with the location of proposed development, on the Site Plan included as Attachment 2.

Background

In July of 2020, Environmental Planning Staff received and reviewed a Biotic Survey Results Memo (dated June 10, 2020) for the project prepared by Biotic Resources Group. In September of 2020, the County issued a letter explaining that the memo did not provide adequate analysis to evaluate or compensate for the level of impact to sensitive habitat, and the project as designed did not demonstrate consistency with the County's Sensitive Habitat Protection Ordinance (SCCC Section 16.32) because it did not meet the County's requirements to avoid and minimize impacts to sensitive species and habitats. The letter summarized the biotic constraints on the parcel and outlined actions necessary to move forward with Biotic Report Review.

In December of 2020, the Planning Department received and reviewed a Biotic Report (dated November 24, 2020) prepared by Biotic Resources Group for the project. This Biotic Report confirmed the presence of sensitive habitat and protected plant species on the parcel but did not address the actions outlined in the County's September 2020 letter. No changes were made to the proposed project design, and no explanation was provided to demonstrate avoidance or minimization of impacts to sensitive species or habitats. In January of 2021, the County issued a 2nd letter stating that Biotic Approval could not be issued until the necessary actions outlined in the September 2020 letter are addressed.

In September of 2021, the County received revised project plans and a revised biotic report dated June 29, 2021. Revisions to the project design include a different configuration for the proposed house which reduces the project footprint and reduction in the size of the originally proposed development footprint as well as additional measures to avoid, minimize, and/or mitigate impacts to sensitive habitat and special status species.

Baseline Environmental Conditions

The Study Area covered in the Biotic Report includes the entire approximately 8,440 square foot parcel 052-291-12 located within the Coastal Zone. The parcel is currently developed with one single family home, two walkways providing access to the front and rear of the parcel, and a paved parking area in the southern (front) portion of the property.

The Biotic Report identifies two vegetation communities on the property: dune scrub and non-native eucalyptus grove. The majority of the coastal dune scrub on the property is dominated by non-native invasive plant species. The north and northwest sides of the property support a dense mat comprised of invasive European dune grass (*Ammophila arenaria*), ice plant (*Carpobrotus edulis*), and ripgut brome (*Bromus diandrus*). East of the existing residence, the parcel slopes downward. The northeastern corner of the triangular shaped property is dominated by an overstory of very large eucalyptus trees growing on and at the bottom of the slope, with large branches overhanging in a westerly direction toward the house. In the southern portion of the property, and along the east side of the existing residence at the top of the slope, iceplant is interspersed with a mosaic of native species including two special-status species: Federal Threatened Monterey spineflower (*Chorizanthe pungens* var. *pungens*) and Monterey paintbrush (*Castilleja latifolia*), a locally unique plant species. Figure 2 of the Biotic Report shows the location of these communities and special-status species identified on the parcel.

Analysis

Coastal Dune Scrub, Dune Plant Habitat, Dunes, and habitat for special-status species are considered sensitive under Santa Cruz County's Sensitive Habitat Protection ordinance (Chapter 16.32). The purpose of Chapter 16.32 is to minimize the disturbance of biotic communities which are rare or especially valuable because of their special nature or role in an ecosystem. The project site is located on a coastal dune and the entire parcel is considered sensitive habitat.

Biological Resources including special-status species and their habitats and other sensitive natural communities as identified by local policies, CDFW, or USFWS are also protected under the California Environmental Quality Act (CEQA). Additionally, Coastal Dune Scrub, Dune Plant Habitat, and habitat for special-status species are offered special protections under the California Coastal Act as Environmentally Sensitive Habitat Areas (ESHA). Santa Cruz County Code Section 13.20.130(B)(2) includes requirements for minimizing site disturbance associated with grading, earth moving, and removal of major vegetation in the Coastal Zone.

Several colonies of Monterey spineflower are present on the property: one along the rear walkway and one in the southeast portion of the parcel north of the asphalt parking area. Monterey paintbrush is also present along the rear walkway and in the southwest portion of the parcel within the project impact area. The project site contains suitable habitat for two wildlife State Species of Special Concern: Northern California legless lizard (*Anniella pulchra*) and coast horned lizard (*Phrynosoma blainvillii*). The eucalyptus grove in the northeastern corner of the property does not have the necessary habitat elements to provide adequate overwintering habitat for monarch butterflies. Impacts to monarchs are not expected.

The project site and adjacent areas provide potential nesting and foraging habitat for birds of prey and migratory birds. Birds of prey and migratory birds are offered protection under the California Fish and Game Code, and the Federal Migratory Bird Treaty Act (MBTA). Under the MBTA, it is "unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill" a migratory bird unless and except as permitted by regulations.

The proposed project will result in approximately 0.02 acre (768 square feet) of permanent impacts to coastal dune habitat by increasing the development footprint on the parcel through construction of the new residence. Construction access and site grading would result in an additional 0.06 acre (2805 square feet) of temporary impacts. Construction of the new garage and driveway would result in direct permanent impacts to the colony of Monterey paintbrush located in the southwest portion of the parcel.

Conditions have been included below to compensate for temporary and permanent impacts to sensitive habitats and special-status species.

Conclusion

Coastal Dune habitat occurs throughout the property. The anticipated impacts were minimized during project design by concentrating permanent development around the footprint of existing development, reducing the size of the originally proposed development footprint, and reducing the length of the driveway by utilizing the existing paved parking area. The project will also restore a portion of the asphalt parking area east of the new driveway by removing the existing asphalt, re-contouring the sand to match surrounding area, and restoring with native plants.

Construction of the new garage and driveway will result in direct impacts to a colony of Monterey paintbrush. Avoidance of impacts to this population while maintaining the objective of the project is not possible given its location near the existing parking area and the other resource constraints on the parcel. Conditions have been included below that require seed salvage and relocation of this population to a protected area on site and maintenance and monitoring to ensure relocation success.

All suitable areas on the parcel, not permanently impacted by proposed development, must be restored to native dune habitat following a restoration plan prepared and implemented by a qualified restoration professional. Additional off-site mitigation is also required to compensate for permanent impacts to Coastal Dune Habitat.

Pursuant to SCCC 13.20, mature trees in the Coastal Zone should be retained when possible. The eucalyptus grove in the northeast corner of the parcel is considered less suitable for dune restoration than the off-site neighboring locations proposed for restoration in the conceptual restoration plan on Figure 11 of the Biotic Report.

Full restoration of the eucalyptus grove may not be feasible or preferable due to the size of the trees and the other ecological functions they provide. While this area is technically "degraded" as dune habitat, these trees provide shade and other ecosystem functions that iceplant and European dune grass do not. If suitable contiguous area cannot be identified on adjacent parcels, eucalyptus trees may be trimmed back to provide suitable areas for restoration. If this is proposed, treatment of the branches over time should be included in the restoration plan and monitoring reports.

There are sensitive habitat constraints on the project site associated with coastal dune scrub habitat, special-status species, and habitat for nesting birds that must be considered prior to and during project implementation. Conditions have been included below to ensure that impacts to special-status species, their habitats, and other sensitive habitats will be *less than significant,* and should therefore be incorporated as mitigation measures pursuant the California Environmental Quality Act.

The Conditions of Approval below shall be incorporated into all phases of development for this project and shall also apply to all future development activities engaged in on the property.

If you have any questions regarding this letter, please feel free to contact me by email or telephone at Juliette.Robinson@santacruzcounty.us or 831-454-3156.

Sincerely,

Juliette Robinson
Resource Planner IV, Biologist

CC: Matt Johnston, Environmental Coordinator
Leah MacCarter, Area Resource Planner
Shila Bagley, Project Planner

Conditions of Approval

In order to conduct development activities on APN 052-291-12, the following conditions shall be adhered to. These Conditions have been included to ensure that impacts to special-status species, their habitats, and other sensitive habitats will be *less than significant.* The Conditions of Approval below shall be incorporated into all phases of development for this project (201238) and shall also apply to all future development activities proposed on the property.

1. Prior to any site disturbance, a pre-construction meeting shall be conducted. The purpose of the meeting will be to ensure that the conditions set forth in the proposed project description and Conditions of Approval are communicated to the various parties responsible for constructing the project. The meeting shall involve all relevant parties including the project proponent, construction supervisor, Environmental Planning Staff, and the project biologist.
2. A qualified biologist shall be on site to monitor initial ground disturbance and vegetation removal activities to recover any coast horned lizards or Northern California legless lizards that may be excavated/unearthed. If the animals are in good health, they will be immediately relocated to a designated release site outside of the work area. If they are injured, the animals will be released to a CDFW-approved rehabilitation specialist until they are in a condition to be released into the designated release site.
3. If a special-status animal is identified at any time prior to or during construction, work shall cease immediately in the vicinity of the individual. The animal shall either be allowed to move out of harm's way on its own or a qualified biologist shall move the animal out of harm's way to a safe relocation site.
4. Every individual working on the Project must attend biological awareness training prior to working on the job site. The training shall be delivered by a qualified biologist and shall include information regarding the location and identification of sensitive habitats and all special-status species with potential to occur in the project area, the importance of avoiding impacts to special-status species and sensitive habitats, and the steps necessary if any special-status species is encountered at any time.
5. Prior to commencement of construction, the location and boundaries of existing Monterey spineflower and Monterey paintbrush on the property shall be re-confirmed by a qualified biologist. Impacts to special-status plant species shall be avoided to the maximum extent possible. High visibility construction fencing or flagging shall be installed, with the assistance of a qualified biologist, to indicate the limits of work and prevent inadvertent grading or other disturbance within the surrounding sensitive habitats including rare plant colonies to be retained. Silt fencing shall also be installed around the protected plant colonies. No work-related activity including equipment staging, vehicular access, and grading shall be allowed within sensitive habitat areas.
6. One existing walkway in the front is proposed for removal as part of the project and the area beneath it shall be restored with native dune vegetation. If the rear walkway near the existing populations of special-status plant colonies is proposed for removal, it shall be removed by hand and the area restored. Care shall be taken to protect the special-status plants that occur there.

7. To compensate for impacts to Coastal Dune habitat, Monterey paintbrush, and habitat for special-status species, and to comply with the Santa Cruz County General Plan Policy 5.1.12, restoration of degraded sensitive habitat on site and off site is required. All restoration activities shall follow the project-specific Mitigation Plan outlined below.

8. All areas temporarily disturbed as a result of the project shall be re-vegetated with native dune plant species with the purpose of restoring the native plant structure and species composition of local Coastal Dune habitat.

9. All suitable degraded habitat on the parcel, not temporarily or permanently impacted by proposed development, must be restored to native dune habitat, following the project-specific Mitigation Plan outlined below.

10. Permanent impacts to Coastal Dune habitat shall be compensated for by restoring degraded Coastal Dune habitat at a minimum 3:1 ratio (minimum 2,304 square feet) in suitable areas on site and at designated off-site restoration locations on nearby properties in the Pajaro Dunes. Off-site mitigation areas should be contiguous with and/or as close as possible to the restoration areas occurring on the project site.

11. A project-specific Mitigation Plan shall be prepared by a qualified biologist or restoration professional. Restoration activities shall be focused on restoring the native plant structure and species composition of local Coastal Dune habitat. The Mitigation Plan must include the following minimum elements:

    a. A map of all designated on-site and off-site restoration areas including:

        i. Identification of areas on site where temporary disturbance and re-establishment of native habitat shall occur.
        ii. Identification of additional on-site *and* off-site restoration areas intended to compensate for permanently impacted dune habitat at 3:1 ratio.
        iii. The location of any transplanted special-status plant species on site.
        iv. The location of existing special-status plant colonies on the property to be protected during and after construction and monitored for success.

    b. Written permission from the property owners where off-site restoration is proposed. Written permission shall include signed approval for the proposed restoration work on their property and the continued maintenance/monitoring as required by the conditions in this letter.

    c. Seed collection and transplantation strategies for the Monterey spineflower and Monterey paintbrush on site. Seeds from Monterey spineflower and Monterey paintbrush should be collected from the colonies on this parcel during the appropriate season before construction and used in the on-site dune restoration.

    d. Plan for removal of non-native species and a management strategy to control re-establishment of invasive non-native species.

    e. A planting plan with species, size, and locations of all restoration plantings. These plantings shall occur at sizes and ratios determined by the restoration specialist to adequately restore native habitat while maximizing plant health and survivability of individual plants.

f. Information regarding the methods of irrigation for restoration plantings.

g. The Restoration Plan shall include a 5-year Management Plan for maintenance and monitoring of restored areas, including a proposed mechanism for evaluating success. Annual reports outlining the progress and success of the restoration and monitoring shall be submitted to the County Environmental Coordinator by December 31 of each monitoring year.

h. In addition to the required 5-year annual monitoring and reporting, a 10-year monitoring report shall be prepared and submitted to the County Environmental Coordinator outlining the continued implementation and results of annual Coastal Dune Scrub Management over the 10-year period.

12. The Mitigation Plan shall be submitted to Environmental Planning staff for approval prior to implementation and shall be implemented prior to final building inspection.

13. Any seed mix used for erosion control purposes on exposed soils shall be limited to seeds of native species common to the surrounding habitat and/or sterile seeds.

14. Pursuant to SCCC Section 13.20.130(B)(2) removal of mature trees should be avoided if possible.

A copy of this biotic approval, including all attachments, should be submitted with any future permit applications.

Attachment 1

49 Shearwater Lane (APN 052-291-12)
Residential Development

Biotic Report

Updated June 29, 2021

Biotic Resources Group

Biotic Assessments ◆ Resource Management ◆ Permitting

Biotic Resources Group
Biotic Assessments ◆ Resource Management ◆ Permitting

49 Shearwater Lane (APN 052-291-12)
Residential Development

Biotic Report

Prepared for
Kevin and Ingrid Donahue
c/o FUSE Architects + Builders
Attn: Jerrod Nicholls

Prepared by:
Biotic Resources Group
With
Dana Bland & Associates

Original Report: November 24, 2020
Updated Report: June 29, 2021

2551 South Rodeo Gulch Road #12 ◆ Soquel, Californica 95073 ◆ (831) 476-4803 ◆ brg@cruzio.com

1.0 EXECUTIVE SUMMARY

A new single-family residence is proposed on the parcel at 49 Shearwater Lane. The parcel is located within the Pajaro Dunes development and is accessed from Beach Road and Rio Boca Road. The property is located within the Santa Cruz County coastal zone.

A biotic study was conducted in spring and fall 2020 to document biotic resources on the property, with a focus given to areas proposed for development and/or habitat management. The parcel was found to support two vegetation types: eucalyptus grove and coastal dune scrub. The coastal dune scrub is considered to be a sensitive habitat under County Code. Two special status plant species were found to occur on site: Monterey spineflower and Monterey paintbrush. One special status animal may occur on site: black legless lizard.

The parcel currently supports a single-family residence, with a development footprint of 1,898 square feet (existing parking area, pathways, and residence). The proposed project is to replace the existing 2-story house with the new 2-story house, with attached garage. The new development footprint will be 3,130 square feet and will affect portions of the parcel's dune scrub and eucalyptus grove, as well as 1,409 square feet of the existing residentially developed area. Temporary construction impacts will occur to 2,285 square feet of dune scrub, eucalyptus grove, and areas currently developed.

The biotic report outlines measures to avoid impacts to sensitive resources during project construction, including protecting/retaining existing dune scrub and special status plant species, implementing a pre-construction breeding bird nest survey, and monitoring construction for the black legless lizard. Mitigation measures also require development and implementation of a coastal dune scrub mitigation plan with on-site and off-site dune scrub restoration, including re-establishment of populations of Monterey spineflower and Monterey paintbrush. County Environmental Planning personnel have requested mitigation for permanent and temporary impacts to dune scrub at a 3:1 compensation ratio. On-site dune scrub restoration (4,743 square feet) and off-site dune restoration (4,167 square feet) is recommended. Successful implementation of these measures will reduce impacts to sensitive biotic resources to a less than significant level.

Intended Use of this Report

The findings presented in this biological report are intended for the sole use of the current property owners (Kevin and Ingrid Donahue), FUSE Architects + Builders, and Santa Cruz County in evaluating the proposed residential development project. The findings presented by the Biotic Resources Group in this report are for information purposes only; they are not intended to represent the interpretation of any State, Federal or County law or ordinance pertaining to permitting actions within sensitive habitat or endangered species. The interpretation of such laws and/or ordinances is the responsibility of the applicable governing body.

2.0 INTRODUCTION

The Biotic Resources Group assessed the biotic resources of the parcel in spring and fall 2020. The focus of the assessment was to identify sensitive biotic resources on the parcel and evaluate potential impacts to such resources from the proposed development. Measures to avoid, reduce or compensate for significant impacts were also identified. The findings of this evaluation are presented in this report.

2.1 Proposed Project

The project site is located along the north side of Shearwater Lane within the Pajaro Dunes residential development. The 8,440 square-foot parcel is accessed from a cul-de-sac on Shearwater Lane.

The parcel currently supports a single-family residence, with a development footprint of 1,898 square feet (existing parking area, pathways, and residence). The proposed project is to replace the existing 2-story house with the new 2-story house, with attached garage. The new development footprint will be 3,130 square feet, an increase of 1,232 square feet. Grading to accommodate the proposed development will temporarily impact 2,285 square feet, for a total disturbance area of 5,415 square feet (Disturbance Maps, prepared by RI Engineering, Inc., dated May 2021).

Areas temporarily graded/affected by construction will be available for dune restoration (2,285 square feet). In addition, retained dune scrub and a non-native eucalyptus grove area on the parcel are identified for dune scrub restoration. Off-site dune restoration is also required to meet the County-required mitigation ratio of 3:1.

2.2 Project History

A preliminary biotic survey report of the parcel was completed in June 2020 and submitted to the County for review. The County requested preparation of a biotic report. A biotic report was prepared in November 2020 and was submitted to the County for review. Comments were received (email from Matt Johnson, dated March 4, 2021) requesting additional compensation for impacts to dune scrub habitat using a 3:1 compensation ratio. Project architects and engineers revised site plans to reduce impacts, with plans dated May 2021.

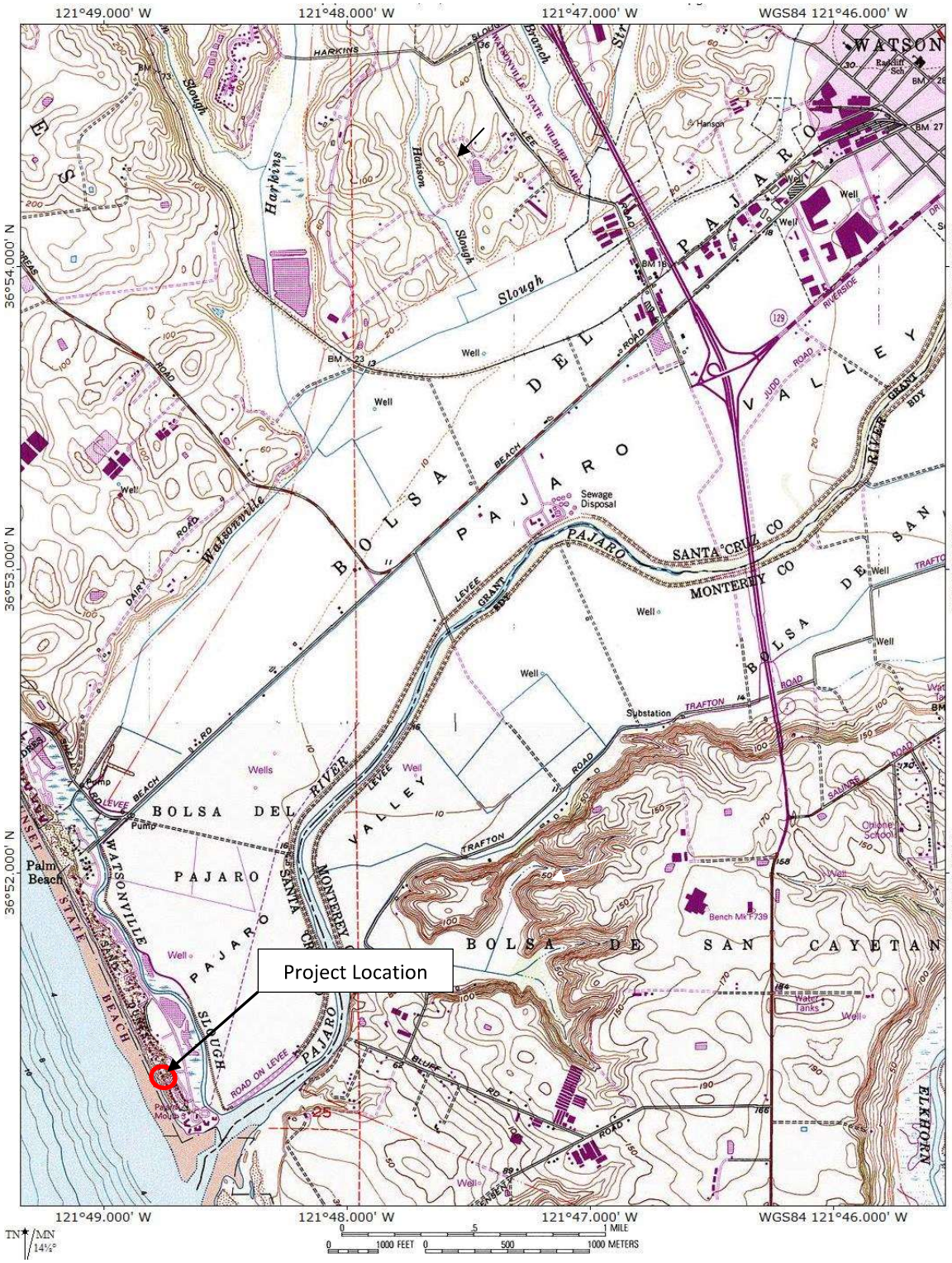

Figure 1. Location of 49 Shearwater Lane (USGS Watsonville West Topographic Map)

3.0 METHODOLOGY

The biotic resources on the parcel and immediate surrounding area was assessed through literature review and field observations. An initial site survey was conducted by Kathleen Lyons (plant ecologist) and Dana Bland (wildlife biologist) on April 22, 2020 to assess the proposed development area and surrounding areas of the parcel for sensitive habitat and/or potential rare species/habitat. The proposed development area outward of the footprint of the existing dwelling and surrounding portions of the property were traversed on foot to identify biological resources and habitat conditions. Site features were recorded in a notebook. Kathleen Lyons conducted a second site visit on November 13, 2020 to review areas suitable for habitat enhancement and restoration.

Vegetation was documented during the field surveys. The major plant communities on the parcel, based on the classification system in California Natural Communities List (CaCode) (California Department of Fish and Game, 2020) and *A Manual of California Vegetation* (Sawyer and Keeler-Wolf 1995) and as amended to reflect site conditions, were identified during the field survey. Modifications to the classification system's nomenclature were made, as necessary, to accurately describe the site's resources. *An Annotated Checklist of the Vascular Plants of Santa Cruz County, California* (CNPS, 2013) was the principal taxonomic reference used for the botanical work.

To assess the potential occurrence of special status biotic resources, two electronic databases were accessed to determine recorded occurrences of sensitive plant communities and sensitive species. Information was obtained from the California Native Plant Society's (CNPS) Electronic Inventory (2020, 2021), and California Department of Fish & Wildlife (CDFW) RareFind database (CDFW, 2020, 2021) for the Watsonville West USGS quadrangle and surrounding quadrangles. The April 2020 field survey was conducted during the blooming/identification period for special status plant species.

4.0 RESULTS

The project site supports two vegetation types: coastal dune scrub (degraded) and non-native eucalyptus grove. The distribution of these vegetation types is presented on Figure 2.

4.1 Habitats

Coastal Dune Scrub. The dune scrub on the parcel is a mosaic of native and non-native plant species, all of which are growing on a stabilized sand dune that occurs north, west, and south of the existing residence. Three non-native, invasive plant species, European dune grass (*Ammophila arenaria)*, ice plant (*Carpobrotus edulis),* and ripgut brome (*Bromus diandrus)*, dominate the scrub, particularly areas north and west of the residence. These areas could be considered the European beach grass sward community, as per CDFW CaCode 42.010.00. The presence of these species is indicative of a degraded scrub habitat and is typical to the landscaping on adjacent/nearby parcels.

Native plant species are limited to areas where the European dune grass is sparse and where there are open sandy areas between the ice plant. Native species include mock heather (*Ericameria ericoides)*, beach primrose (*Camissonia cheiranthifolia),* beach sagewort (*Artemisia pycnocephalus)*, silver bush lupine (*Lupinus albifrons),* and yellow bush lupine (*Lupinus arboreus)*. These areas could be considered the yellow bush lupine -mock heather scrub community as per CaCode 32.080.03.

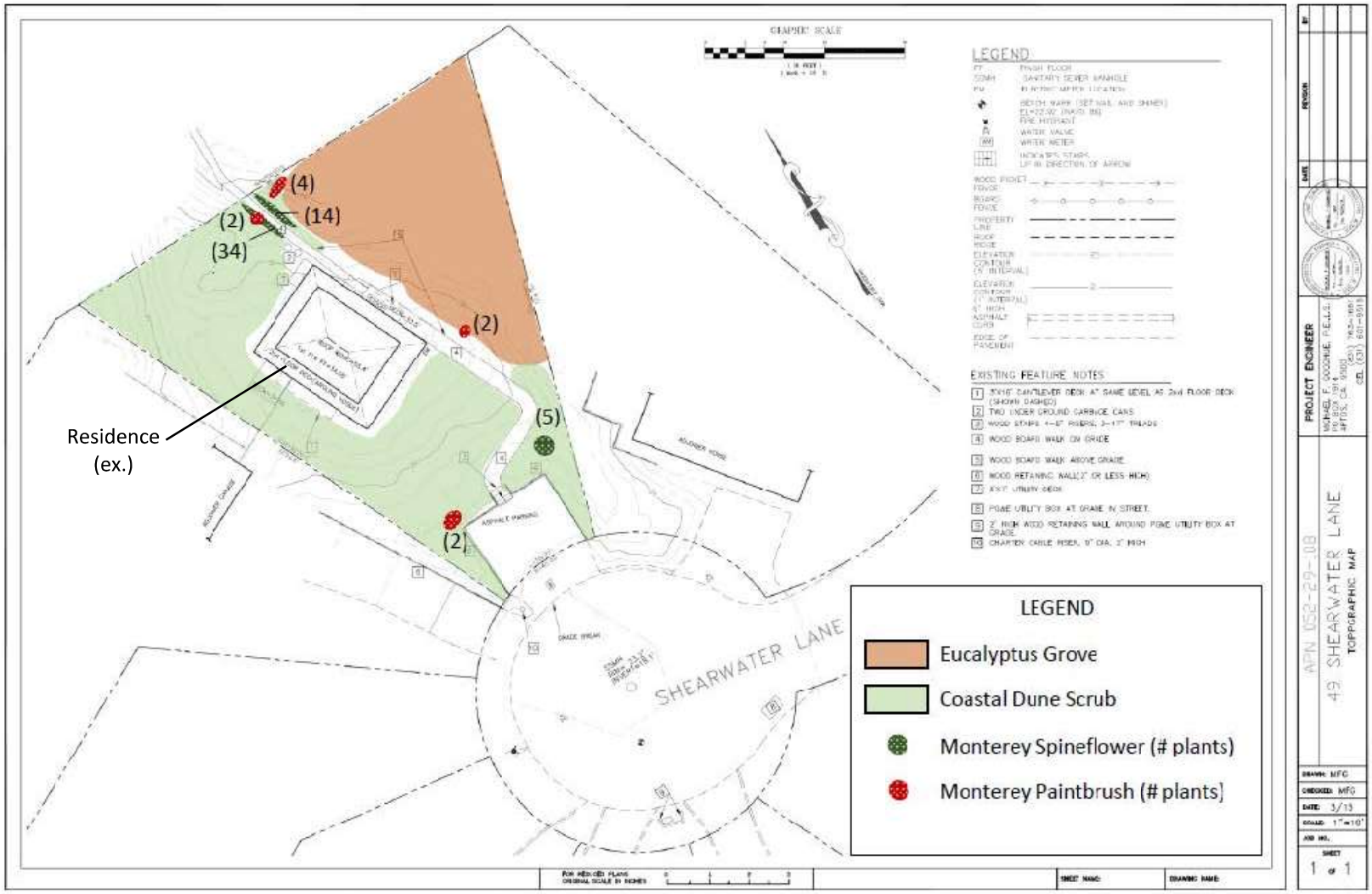

Figure 2. Distribution of vegetation types and special status plant species

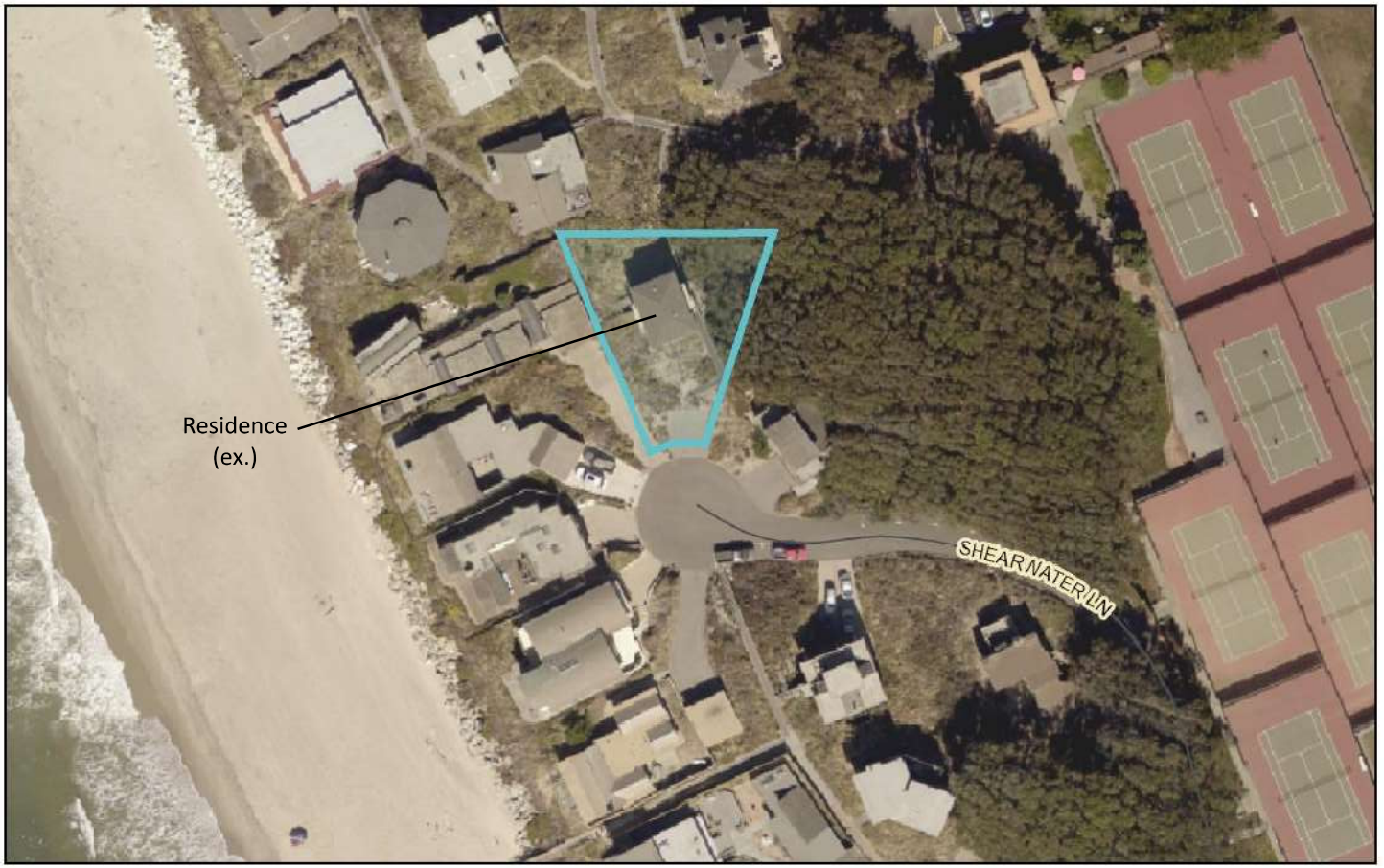

Figure 3. Location of parcel on aerial photo (Source: Santa Cruz County GIS)

Despite the degraded site conditions, two special status plant species were observed on the parcel: Monterey spineflower *(Chorizanthe pungens var. pungens)* and Monterey paintbrush (*Castilleja latifolia)*. These plant species were found in small patches, as depicted in Figure 2. Figure 3 is an aerial image of the parcel and surroundings. The character of the scrub is depicted in Figures 4 and 5.

Figure 4. Character of dune scrub in northern portion of parcel

Figure 5. Character of dune scrub in southern portion of parcel

Eucalyptus Grove. The eastern portion of the parcel supports a canopy of eucalyptus (*Eucalyptus sp.)* . The trees are multi-trunk, wind-pruned individuals that are rooted off the parcel; however, their limbs overhang the parcel. The understory is dominated by non-native grasses as fobs, such as ripgut brome (*Bromus diandrus)*, ice plant, Bermuda buttercup (*Oxalis pes-caprae)*, and European dune grass. Native

plant species were limited to small patches of Monterey paintbrush and wild cucumber (*Marah fabacean)*. Figures 6 and 7 depict the character of this vegetation type.

Figure 6. Character of eucalyptus tree limbs immediately east of existing residence


Figure 7. Multi-stemmed eucalyptus tree limbs east of existing residence

Wildlife Resources on Site. The dune scrub on this parcel is degraded and has little value to native wildlife. Common wildlife that may forage on the seeds or foliage of plants in the dune scrub include bushtit (*Psaltriparus minimus*), California towhee (*Pipilo crissalis*), song sparrow (*Melospiza melodia*), Brewer's blackbird *(Euphagus cyanocephallus*), Botta's pocket gopher (*Thomomys bottae*), and brush rabbit (*Sylvilagus bachmani*).

Eucalyptus is not native to California and does not support a very diverse wildlife assemblage. Common wildlife species that utilize eucalyptus groves include alligator lizard (*Gerrhonotus multicarinatus*), Anna's hummingbird (*Calypte anna*) and woodrat (*Neotoma fuscipes annectens)*. Eucalyptus trees are locally important as they may provide potential wintering habitat for monarch butterflies (*Danaus plexippus*). However, the eucalyptus grove adjacent to this property is not well protected from wind and therefore, is not expected to host to monarchs. The eucalyptus tree grove may provide potential roosting and nesting habitat for raptors such as red-shouldered hawk (*Buteo lineatus*) and great horned owl (*Bubo virginianus*), yet no nests were detected during site surveys in 2020.

4.2 Sensitive Biotic Resources

Sensitive habitats are defined by local, State, or Federal agencies as those habitats that support special status species, provide important habitat values for wildlife, represent areas of unusual or regionally restricted habitat types, and/or provide high biological diversity.

Regulated Habitats. The project area is located within an unincorporated area of Santa Cruz County, within the Coastal Zone. County Code (Sensitive Habitat Protection, Section 16.32) recognizes dune plant habitats as sensitive habitat. Under County Code only resource dependent uses are allowed in sensitive habitat. For dune areas, permitted uses include scientific research and education and wooden boardwalks for trails are required. In granting approval for development, County Code requires the development to mitigate significant impacts, protection of undisturbed area, and restoration of degraded areas commensurate with the scale of the development. The coastal dune scrub on the parcel meets the requirement of a sensitive habitat as defined in County Code. This is due to the general presence of the dune plant community (albeit degraded from the dominance by invasive, non-native plant species), but also the presence of the one special status plant species and one locally unique plant species.

The USACE regulates activities within waters of the United States pursuant to congressional acts: Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (1977, as amended). Section 10 of the Rivers and Harbors Act requires a permit for any work in, over, or under navigable waters of the United States. Navigable waters are defined as those waters subject to the ebb and flow of the tide to the Mean High-Water mark (tidal areas) or below the Ordinary High-Water mark (OHWM) (freshwater areas). Areas with a significant hydrological connection to navigable waters are also regulated by the USACE. The parcel is located outside of USACE jurisdiction.

Water quality in California is governed by the Porter-Cologne Water Quality Control Act and certification authority under Section 401 of the Clean Water Act, as administered by the Regional Water Quality Control Board (RWQCB). The Section 401 water quality certification program allows the State to ensure that activities requiring a Federal permit or license comply with State water quality standards. Water quality certification must be based on a finding that the proposed discharge will comply with water quality standards which are in the regional board's basin plans. The Porter-Cologne Act requires any person discharging waste or proposing to discharge waste in any region that could affect the quality of the waters of the state to file a report of waste discharge. The RWQCB issues a permit or waiver that includes implementing water quality control plans that take into account the beneficial uses to be protected. Waters of the State subject to RWQCB regulation extend to the top of bank, as well as isolated water/wetland features and saline waters. Should there be no Section 404 nexus (i.e., isolated feature not subject to USACE jurisdiction); a report of waste discharge (ROWD) is filed with the RWQCB. The RWQCB interprets waste to include fill placed into water bodies. The parcel is located outside of RWQCB jurisdiction.

California Department of Fish and Wildlife (CDFW) is a trustee agency that has jurisdiction under Section 1600 et seq. of the Sections 1600-1603 of the California Fish and Game Code. CDFW regulates all diversions, obstructions, or changes to the natural flow or bed, channel or bank of any river, stream or lake which supports fish or wildlife. CDFW also regulates the deposit of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake. CDFW defines a "stream" as a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having surface or subsurface flow that supports or has supported riparian vegetation. The parcel is located outside CDFW jurisdiction under Section 1600. CDFW also identifies sensitive natural communities. The yellow bush lupine scrub, with primary species of yellow bush lupine and mock heather (CaCode 32.080.03) is considered sensitive (CDFW, 2020).

4.3 Special Status Plant Species

Species of concern include those listed by either the Federal or State resource agencies as well as those identified as rare by CNPS (List 1B). Based on a search of the CNPS and CNDDB inventories, there are several species of concern within the greater project area, as listed in Table 1. One special status species was observed on site in April 2020: Monterey spineflower. Monterey paintbrush, a locally unique species (CNPS List 4, Watch list) was also observed. No other special status plant species were observed on site.

Monterey spineflower (*Chorizanthe pungens var. pungens).* This species is federally listed as endangered under the Federal Endangered Species Act (FESA). This species is also listed as rare (List 1B.1) by the California Native Plant Society and is considered rare by the County of Santa Cruz. The species is not listed under the California Endangered Species Act (CESA). The Monterey spineflower is an annual species that grows in sandy soils within portions of Santa Cruz County; there are several known occurrences from dune scrub habitat in the Pajaro Dunes development and from nearby Sunset State Beach.

The spineflower is characterized by its whitish to pinkish flowers, low-growing habit and spiny bracts surrounding the flowers. Individuals of Monterey spineflower were observed on the parcel during the April 2020 field survey. A colony was observed along both sides of the wooden pathway in the northwestern portion of the parcel. A second colony was observed north of the existing asphalt parking area. A total of 53 plants were found on site. The location (and number of plants) of this species is depicted on Figure 2. Figure 8 depicts this species.

Figure 8. Monterey spineflower on site

Monterey paintbrush (*Castilleja latifolia)*. Individuals of Monterey paintbrush, a locally unique species (CNPS List 4.3 – a watch list), were observed on the parcel during the April 2020 field survey. This hemiparasitic perennial plant grows amid the dune scrub. A colony was observed along both sides of the wooden pathway in the northwestern portion of the parcel. A second colony was observed northwest of the existing asphalt parking area. A total of 8 plants were found on site.

The location of this species is depicted on Figure 2. Figure 9 depicts this species.

Figure 9. Monterey paintbrush on site

Table 1. List of Special Status Plant Species Evaluated for 49 Shearwater Lane

Species	CNPS Ranking	State Status	Federal Status	Habitat Preference; closest Known Occurrences
Watsonville West Quadrangle				
Hooker's manzanita *(Arctostaphylos hookeri ssp. hookeri*)	List 1B.2	None	None	Sandy slopes, often intermixed with oak woodland; known from Buena Vista area; not observed
Pajaro manzanita *(Arctostaphylos pajaroensis*)	List 1B.1	None	None	Sandy slopes, often intermixed with oak woodland; recorded from NW of Watsonville and in Prunedale area; not observed
Congdon's tarplant (*Centromadia parryi ssp. congdonii)*	List 1B.2	None	None	Mesic grassland, heavy clay, alkaline; recorded from Ellicott Slough NWR; no suitable habitat
Monterey spineflower *(Chorizanthe pungens var. pungens)*	List 1B.2	None	Threatened	Sandy slopes, can be intermixed with oak woodland/maritime chaparral; recorded from Fiesta Way area, Manresa and Sunset State beaches; Day Valley area; Pajaro Dunes; observed on site
Robust spineflower *(Chorizanthe robusta var. robusta)*	List 1B.1	None	Endangered	Sandy slopes, often intermixed with oak woodland/maritime chaparral; recorded from Manresa State Beach; NE of Ellicott Pond, Aptos HS area; not observed

Table 1. List of Special Status Plant Species Evaluated for 49 Shearwater Lane

Species	CNPS Ranking	State Status	Federal Status	Habitat Preference; closest Known Occurrences
Sand-loving wallflower *(Erysimum ammophilium)*	List 1B.2	None	None	Coastal dunes; recorded from Sunset State Beach, along Shell Road; not observed
Sand gilia *(Gilia tenuiflora ssp. arenaria)*	List 1B.2	Threatened	Endangered	Coastal dunes; recorded from Sunset State Beach; not observed
Santa Cruz tarplant *(Holocarpha macradenia)*	List 1B.1	Endangered	Threatened	Grasslands, often on coastal terrace deposits; recorded from Harkins Slough area and Watsonville area; no suitable habitat.
Kellogg's horkelia *(Horkelia cuneata ssp. sericea)*	List 1B.1	None	None	Oak woodland and edges of grasslands; recorded from NW of Watsonville at Ellicott NWR; no suitable habitat
Woodland woollythreads *(Monolopia gracilens)*	List 1B.2	None	None	Chaparral; serpentine grassland; sandy/rocky areas; recorded from Corralitos area (1958); no suitable habitat
Dudley's lousewort *(Pedicularis dudleyi)*	List 1B.2	None	None	Woodlands; historic (1884) occurrence from Aptos; no suitable habitat
Choris's popcorn flower *(Plagiobothrys chorisianus var. chorisianus)*	List 1B.2	None	None	Mesic grasslands, often on coastal terrace deposits; recorded from north end of Watsonville Airport; no suitable habitat
Surrounding Quadrangles (Laurel, Loma Prieta, Watsonville East, Prunedale, Mt. Madonna, Soquel and Moss Landing)				
Bent-flowered fiddleneck (*Amsinckia lunaris)*	List 1B.2	None	None	Grassland; recorded from Scotts Valley and Davenport; no suitable habitat
Anderson's manzanita (*Arctostaphylos andersonii)*	List 1B.2	None	None	Chaparral and forests; recorded from UCSC area and Bonny Doon; not observed
King's Mountain manzanita (*Arctostaphylos regismontana)*	List 1B.2	None	None	Chaparral and forests; recorded from Skyline area; not observed
Santa Cruz Mtns. pussypaws *(Calyptridium parryi var. hesseae)*	List 1B.1	None	None	Ponderosa pine and chaparral in Zayante sands; known from Felton and Ben Lomond area; not observed
Deceiving sedge (*Carex saliniformis)*	List 1B.2	None	None	Mesic areas, marshes; historic record from Scotts Valley; no suitable habitat
Coyote ceanothus (*Ceanothus ferrisae)*	List 1B.1	None	Endangered	Chaparral, on serpentine; recorded from Anderson Reservoir and Uvas Canyon area; not observed
Ben Lomond spineflower *(Chorizanthe pungens var. hartwegiana)*	List 1B.1	None	Endangered	Ponderosa pine and chaparral in Zayante sands; recorded from Bonny Doon and Felton areas; not observed
Scotts Valley spineflower *(Chorizanthe robusta var. hartwegii)*	List 1B.1	None	Endangered	Grassland on sandstone outcrops; known only from Scotts Valley area; no suitable habitat
Seaside birds-beak (*Cordylanthus rigidus ssp.*	List 1B.1	Endangered	None	Maritime chaparral and closed cone forests; recorded from Monterey Co.; not observed

Table 1. List of Special Status Plant Species Evaluated for 49 Shearwater Lane

Species	CNPS Ranking	State Status	Federal Status	Habitat Preference; closest Known Occurrences
littoralis)				
Santa Clara Valley dudleya (*Dudleya abramsii ssp. setchellii)*	List 1B.1	None	Endangered	Serpentine chaparral and rock outcrops; no suitable habitat
Eastwood's goldenbush (*Ericameria fasciculata)*	List 1B.1	None	None	Chaparral and coastal scrub; recorded from Monterey Co.; not observed
Hoover's button-celery (*Eryngium aristulatum var. hooveri)*	List 1B.1	None	None	Mesic areas, vernal pools in grassland; recorded from San Benito Co.; no suitable habitat
Ben Lomond wallflower *(Erysimum teretifolium)*	List 1B.1	Endangered	Endangered	Ponderosa pine and chaparral in Zayante sands; known from Felton and Ben Lomond area; no suitable habitat
Minute pocket moss (*Fissidens pauperculus)*	List 1B.2	None	None	Sandstone outcrops in grassland and oak woodland; recorded from Scotts Valley region; no suitable habitat
Fragrant fritillary *(Fritillaria liliacea)*	List 1B.2	None	None	Moist serpentine areas in grassland; recorded from Santa Clara Co; no suitable habitat
Loma Prieta hoita *(Hoita strobilina)*	List 1B.1	None	None	Talus in chaparral and woodlands; 1936 herbarium record from Santa Cruz; no suitable habitat
Smooth lessingia *(Lessingia micradenia var. glabrata)*	List 1B.2	None	None	Serpentine soils in chaparral and grasslands; recorded from Santa Clara Co; no suitable habitat
Arcuate bush-mallow *(Malacothamnus arcuatus)*	List 1B.2	None	None	Chaparral and cismontane woodland; not observed
Hall's bush-mallow *(Malacothamnus hallii)*	List 1B.2	None	None	Chaparral and coastal scrub; not observed
Santa Cruz Mtns. beards tongue *(Penstemon rattanii var. kleei)*	List 1B.2	None	None	Woodland and chaparral; herbarium collections from Ben Lomond Mtn.; no suitable habitat
White-rayed pentachaeta *(Pentachaeta bellidiflora)*	List 1B.1	None	None	Cismontane woodland, valley and foothill grassland (often serpentinite); no suitable habitat
Monterey pine *(Pinus radiata)*	List 1B.1	None	None	Native stands limited to Ano Nuevo and Monterey peninsula; not observed
Yadon's piperia (*Piperia yadonii)*	List 1B.1	None	Endangered	Coastal scrub and oak woodland, often on talus/rocky areas; not observed
San Francisco popcorn flower (*Plagiobothrys diffusus)*	List 1B.2	Endangered	None	Mesic grasslands, often on coastal terrace deposits; no suitable habitat
Scotts Valley polygonum (*Polygonum hickmanii)*	List 1B.1	None	Endangered	Grasslands, on coastal terrace deposits; no suitable habitat
Pine rose (*Rosa pinetorum)*	List 1B.2	None	None	Closed cone pine forests; no suitable habitat

Table 1. List of Special Status Plant Species Evaluated for 49 Shearwater Lane

Species	CNPS Ranking	State Status	Federal Status	Habitat Preference; closest Known Occurrences
Most-beautiful jewel-flower (*Streptanthus albidus ssp. peramoenus)*	List 1B.2	None	None	Serpentine grassland; no suitable habitat
Santa Cruz Clover *(Trifolium buckwestiorum)*	List 1B.1	None	None	Mesic grasslands; no suitable habitat
Saline clover (*Trifolium depauperatum var. hydrophilum)*	List 1B.2	None	None	Mesic grasslands, alkaline; no suitable habitat

CNPS Status: List 1B: These plants (predominately endemic) are rare through their range and are currently vulnerable or have a high potential for vulnerability due to limited or threatened habitat, few individuals per population, or a limited number of populations. List 1B plants meet the definitions of Section 1901, Chapter 10 of the CDFG Code.

4.4 Special Status Wildlife Species

Special status wildlife species include those listed, proposed or candidate species by the Federal or the State resource agencies, as well as those identified as State species of special concern. All raptor nests are protected by California Fish and Wildlife codes, and all migratory bird nests are protected by the Federal Migratory Bird Treaty Act. In addition, most birds that nest within the state of California are afforded further protections under California Fish and Wildlife (CDFW) code. Section 3503 of CDFW code states "It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto." The only two exceptions to the regulations in this code are the European starling and the house sparrow.

Table 2 lists the wildlife species of concern evaluated for the site and their predicted occurrence.

Table 2. Special status wildlife species and their predicted occurrence 49 Shearwater Lane, Pajaro Dunes, Watsonville, CA, Watsonville West Quad.

SPECIES	STATUS[1]	HABITAT	POTENTIAL OCCURRENCE ON SITE
Invertebrates			
Monarch butterfly *Danaus plexippus*	*	Eucalyptus, acacia and pine trees groves provide winter habitat when they have adequate protection from wind and nearby source of water	Unlikely. None known from any Eucalyptus groves in Pajaro Dunes.
Fish			
Steelhead *Oncorhynchus mykiss*	FT	Perennial creeks and rivers with gravels for spawning.	Known from Pajaro River, but no suitable habitat on site.
Tidewater goby *Eucyclogobius newberryi*	FE, CSC	Coastal lagoons and associated creeks up to 1 mile inland	Known from Pajaro River lagoon and upstream to 2 mi., but no suitable habitat on site.
Amphibians			
California tiger salamander *Ambystoma californiense*	FT, ST	Ponds, vernal pools for breeding, grasslands with burrows for upland habitat	None, no suitable habitat on site.

Table 2. Special status wildlife species and their predicted occurrence 49 Shearwater Lane, Pajaro Dunes, Watsonville, CA, Watsonville West Quad.

SPECIES	STATUS[1]	HABITAT	POTENTIAL OCCURRENCE ON SITE
Santa Cruz long-toed salamander *Ambystoma macrodactylum croceum*	FE, SE	Ponds for breeding with water at least into June. Riparian, oak woodland, coastal scrub for upland habitat.	None, no suitable habitat on site.
Santa Cruz black salamander *Aenides flavipunctatus niger*	CSC	Mesic forests of fog belt; terrestrial, lives under logs, rocks, etc.	None, no suitable habitat on site.
California giant salamander *Dicamptodon ensatus*	CSC	Wet coastal forests near streams and seeps; breed in streams	None, no suitable habitat on site.
Foothill yellow-legged frog *Rana boylii*	ST	Perennial creeks with cobble substrate for egg attachment.	None. No suitable habitat.
California red-legged frog *Rana draytonii*	FT, CSC	Riparian, marshes, estuaries and ponds with still water at least into June.	None, no suitable habitat on site.
Reptiles			
Western pond turtle *Emys marmorata*	CSC	Creeks and ponds with water of sufficient depth for escape cover, and structure for basking; grasslands or bare areas for nesting.	None, no suitable habitat on site.
Black legless lizard *Anniella pulchra nigra*	CSC	Sand dunes with native vegetation	Habitat marginal, but possible in larger patches of native dune vegetation.
Birds			
White tailed kite *Elanus leucurus*	FP	Nests in riparian and other mixed deciduous forests with adjacent open areas for foraging	None, no suitable habitat on site.
Western snowy plover *Charadrius alexandrinum nivosus*	FT, CSC	Nests on sandy beach, shores of salt ponds	No suitable habitat at this site, but nests at Pajaro River mouth.
Burrowing owl *Athene cunicularia*	CSC	Nests and winters in grasslands with burrows and short vegetation	No suitable habitat on or near this site.
Bank swallow *Riparia riparia*	ST	Vertical banks of rivers, lakes, ocean shorelines with sandy soils for digging nests	None, no suitable habitat on site.
Olive-sided flycatcher *Contopus cooperi*	CSC	Coniferous and oak forests with tall trees or snags for nesting	None, no suitable habitat on site.
Yellow warbler *Dendroica petechia brewsteri*	CSC	Riparian woodlands with dense understory plants	None, no suitable habitat on site.
Tricolored blackbird *Agelaius tricolor*	CSC	Dense bulrush and/or cattail vegetation adjacent to freshwater marshes	None, no suitable habitat on site.

Table 2. Special status wildlife species and their predicted occurrence 49 Shearwater Lane, Pajaro Dunes, Watsonville, CA, Watsonville West Quad.

SPECIES	STATUS[1]	HABITAT	POTENTIAL OCCURRENCE ON SITE
Mammals			
Santa Cruz kangaroo rat *Dipodomys venustus venustus*	*	Silverleaf manzanita and mixed scrub in Zayante soils	None, no suitable habitat on site.
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	CSC	All types of forests and dense scrub habitats	Possibly occurs in the adjacent Eucalyptus, but no suitable habitat on site.
American badger *Taxidea taxus*	CSC	Grasslands with friable soils for digging dens	None, no suitable habitat on site.

[1] Key to status:

FE	=	Federally listed as endangered species
FT	=	Federally listed as threatened species
SE	=	State listed as endangered species
ST	=	State listed as threatened species
CSC	=	California species of special concern
*	=	Species of local concern in Santa Cruz County

Monarch Butterfly (*Danaus plexippus)*. The large eucalyptus grove at the terminus of Beach Street (north of entrance to the Pajaro Dunes development) provides potential monarch roosting habitat, but none have been reported in the CNDDB (CDFW 2020) nor in multiple surveys conducted by State Parks (Chris Spohrer, State Parks, pers. com. 2008). The windswept eucalyptus grove adjacent to 49 Shearwater Lane does not provide suitable habitat for monarchs, as monarchs require protection from wind in order to fly and forage. Monarch butterflies are not expected to occur on or adjacent to this property.

Black legless lizard (*Anniella pulchra nigra*). The black legless lizard is a California species of special concern. It was proposed for federal listing as endangered in 1995 (USFWS 1995), but it was subsequently determined that listing was not warranted based primarily on the preservation of a large section of the former Fort Ord where this lizard occurs (USFWS 1998). The black legless lizard inhabits coastal dunes in Monterey County between the Salinas and Carmel Rivers (USFWS 1998). This lizard burrows into loose sand under plants including bush lupine, mock heather, mock aster (Jennings and Hayes 1994). It hunts for its insect prey while concealed in the leaf litter below the plants, and is rarely observed on the ground surface.

The dune scrub habitat at this site provides only marginal habitat for the black legless lizard, due to the sparse occurrence of native vegetation which this species is usually associated with, fragmentation of habitat from other suitable dune areas, and the predominance of dense mats of non-native plants, such as ice plant. However, this lizard has a slight chance to occur in the areas in small numbers where loose sand, leaf litter, and adequate prey base exists.

Western snowy plover (*Charadrius alexandrinum nivosus*). This bird is federally listed as a threatened species and is a California species of special concern. The population segment of western snowy plover that is protected by the Federal Endangered Species Act is described as the Pacific Coast Population and includes nesting populations along the coast of California, Oregon, and Washington in areas adjacent to tidal waters, including the mainland cost, peninsulas, offshore islands, adjacent bays, estuaries, and coastal rivers (USFWS 1999). The breeding season for snowy plovers on the Central California coast extends from early March to mid-September, and there is some overlap of wintering birds from northern areas arriving in mid to late summer. Nests are built in loosely arranged colonies, eggs are laid in a

shallow depression scraped in the sand, chicks hatch after an average 27-day incubation period, and juveniles are able to fly within 31 days of hatching (Warriner et al. 1986). Snowy plovers forage on invertebrates along intertidal areas. The primary threats to the species include loss and degradation of nesting and foraging habitat, human disturbances at nesting, wintering, and forging areas, and predation of eggs and chicks by mammals (e.g., red fox) and other birds (e.g., ravens).

Western snowy plovers are known to nest on the beach at the mouth of the Pajaro River (CNDDB 2020), and in 2008 there were an estimated 20 nesting pairs (R. Warriner, pers. comm.). Each spring, the California Department of Parks places stakes and flagging with signs around the nesting colony to deter beach users from entering the nesting colony, and if necessary, individual nests are fenced to exclude predators (Chris Spohrer, pers. comm.). The Point Reyes Bird Observatory has been monitoring and studying this population of snowy plovers for over a decade. This nesting colony is within designated critical habitat for the snowy plover, Unit 1 (Sunset Beach) of Site CA-7 (USFWS 1999).

However, the property at 49 Shearwater Lane has no suitable habitat for snowy plovers. The parcel (and adjacent areas) lacks open sandy beach type areas, and is well removed from any intertidal areas with suitable forage. Snowy plovers do not occur at this site.

5.0 IMPACT ASSESSMENT AND MITIGATION

5.1 Impact Criteria

The thresholds of significance presented in the CEQA Guidelines, updated December 2018, were used to evaluate project impacts and to determine if implementation of the proposed Project would pose significant impacts to botanical resources. For this analysis, significant impacts are those that substantially affect, either directly or through habitat modifications:

a) A species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by CDFW or USFWS;
b) Riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by CDFW or USFWS;
c) State or Federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance;
f) Conflict with the provisions of an adopted Habitat Conservation plan, Natural Community Conservation plan, or other approved local, regional, or state habitat conservation plan.

5.2 Impact Analysis

a) **Special Status Species.** The site supports one rare species (Monterey spineflower) and one locally unique species (Monterey paintbrush). The proposed residential project will avoid direct impact to three colonies of Monterey spineflower; however, one colony (5 plants) will be in close proximity to site grading. Inadvertent impact could occur to this colony. The project will impact two of the four colonies of Monterey paintbrush, affecting four plants. Mitigation Measure BIO-1 will reduce this impact.

The CNDDB Rarefind 5 database shows only one special status wildlife species that may occur at this site, the black legless lizard, a California species of special concern. This species lives in dune habitats with native plants such as mock heather. The lizard burrows deep into the sand and rises to the surface to feed on spiders and other invertebrates that live on the native plants. However, the dense ice plant growing under the scattered bushes of mock heather, as well as the dense European dune grass at this site greatly reduces the potential for occurrence of legless lizard. The only area observed where this lizard may occur is in portions of the site where the dune scrub is free of non-native plants, such as ice plant and European dune grass. Grading has the potential to kill or injure legless lizards if any are present on the site.

Monarch butterflies are not expected to occur in eucalyptus tree limbs that overhang the parcel or the adjacent tree grove. These trees are subject to wind which makes them unsuitable for monarchs which require protection from wind, or they would be unable to fly and forage.

Mitigation Measure BIO-1 Special Status Plant Species. Prior to construction, install orange construction fencing at the limit of grading line. Install silt fencing around the rare plant colonies (Monterey spineflower and Monterey paintbrush) that are to be retained (inside and outside of limit of

grading line). Retain a qualified botanist to field check the placement of the fencing prior to any other site work.

In the summer prior to construction, collect Monterey spineflower seed from the parcel and utilize this seed in the on-site dune restoration areas created after construction. Under the direction of a qualified revegetation specialist, hand broadcast seed into designated open sandy areas of the on-site dune restoration areas. Retain a qualified botanist to monitor the progress of the Monterey spineflower revegetation for a minimum of 3 years. Seeded spineflower areas should achieve a minimum of 15 plants each year for a period of 5 years. This will provide a 3:1 replacement ratio for plants impacted by the project.

In the summer prior to construction, collect Monterey paintbrush seed from the parcel and utilize this seed in the on-site dune restoration areas created after construction. Under the direction of a qualified revegetation specialist, have a minimum of 14 replacement plants grown at a native plant nursery, then outplant these plants into the on-site dune restoration area. Retain a qualified botanist to monitor the progress of the Monterey paintbrush revegetation for a minimum of 3 years. Installed plants should achieve an 80% survival rate (12 plants) each year for a period of 5 years. This will provide a 3:1 replacement ratio for plants impacted by the project.

Mitigation Measure BIO-2. Special Status Wildlife. The applicant shall retain a qualified biologist to monitor the initial ground stripping and grading of the development area for black legless lizards. If any black legless lizards are observed during the work, the biologist shall capture the lizards by hand or net, place the individuals in a bucket with sand, and relocate the individuals to an adjacent area of suitable habitat outside the construction zone. The biologist shall obtain all necessary permits from CDFW (e.g., Memorandum of Understanding, Scientific Collecting Permit) to handle and relocate black legless lizards for this project. Immediately prior to any ground disturbing activity the biologist shall be given enough time to manually rake underneath suitable native plants (e.g., mock heather) to locate any lizards.

b) **Sensitive Habitat**. The site supports coastal dune scrub, a sensitive habitat under County Code as well as being ranked S3 (sensitive/imperiled) by CDFW. The project will encompass 5,415 square feet, which is comprised of 3,130 square feet of permanent disturbance and 2,285 square feet of temporary disturbance. A portion of the new development will occur in areas that already support a residence, parking area and/or pathways. Impacts by resource type are presented in Table 3.

Table 3. Impacts to Habitat Types, June 2021

Habitat	Existing Resources (sq. ft.)	Residential Development Permanent Impact (Sq. ft.)	Residential Development Temporary Impact (Sq. ft.)	Total Impact by Resource (Sq. ft.)
Dune Scrub	3,726	1,669	1,490	3,159
Eucalyptus Grove	2,816	52	306	358
Existing Residential Development	1,898	1,409	489	1,898
Total	8,440	3,130	2,285	5,415

Figure 10 depicts the temporary and permanently impacted areas and plant community types.

Mitigation Measure BIO-3. Coastal Dune Scrub Restoration and Revegetation. To compensate for the removal of dune scrub vegetation, the landowner shall develop and implement a dune restoration plan that provides a 3:1 restoration to impact ratio for temporary and permanent impacts to this habitat. This ratio will provide suitable mitigation by restoring degraded scrub with higher quality dune scrub that supports native dune plant species and creating new dune scrub on site. The plan shall specify restoration and management of a minimum of 9,477 square feet of dune scrub on site and off-site, as presented in Table 4.

The plan shall identify existing dune areas to be enhanced as well as new dune areas to be created; a preliminary restoration concept is depicted on Figure 11. The plan shall identify the specific areas to be revegetated, site preparation and soil requirements, plant species palette, planting methodology, and supplemental irrigation requirements. The plan shall identify the location and techniques for the removal and control of invasive, non-native plant species from retained dune scrub and the dune scrub restoration areas. (i.e., control/removal of ice plant and European dune grass). The plan shall identify maintenance and monitoring actions, and indicate a minimum 5-year monitoring and reporting program, or as so indicated by County Conditions of Approval.

Figure 11 shows dune scrub restoration on the subject parcel and a potential off-site area to the north on a neighboring parcel. The property owners shall be responsible for the dune restoration on their property as identified on Figure 11, plus some other part of Pajaro Dunes, as approved by Santa Cruz County, that is of equal square footage to the specified area beyond the property, should the neighboring property not elect for dune restoration work.

Table 4. Dune Scrub Restoration Requirements, June 2021

Habitat	Retained on Site After Construction and Restored (sq. ft.)	On-Site Dune Scrub Restoration (Sq. ft.)	Off-Site Dune Scrub Restoration (Sq. ft.)	Total Restoration by Resource (Sq. ft.)
Dune Scrub	567	1,490	4,167	6,224
Eucalyptus Grove	0	2,764	-	2,764
Previously Disturbed Residential Development	0	489	-	489
Total	567	4,743	4,167	9,477

c) **Wetlands.** No impact, none on site.

d) **Nesting Birds.** The removal of limbs and noise from construction may impact active bird nests in the eucalyptus grove if any are present. Loud noise and dust may cause adult birds to abandon eggs or chicks, causing nest failure.

Mitigation Measure BIO-4. Schedule construction to occur between September 1 and February 1, which is outside the nesting bird season for the Central Coast. If this is not practical, retain a biologist to conduct a survey for active bird nests no more than 14 days prior to onset of construction. If active bird nests are observed, the biologist will designate a buffer area between the nest and work area.

e) **Local Policies**. Section 16.32 Sensitive Habitat Protection in County Code regulates activities within the dune scrub and areas that support special status species. Provision within this code are applicable to the proposed project. Mitigation Measures BIO-1, 2, and 3 provide compensatory mitigation as allowed in the code.

f) **Conflict with HCP or NCCP**. The site is not located within an area covered by an HCP or NCCP.

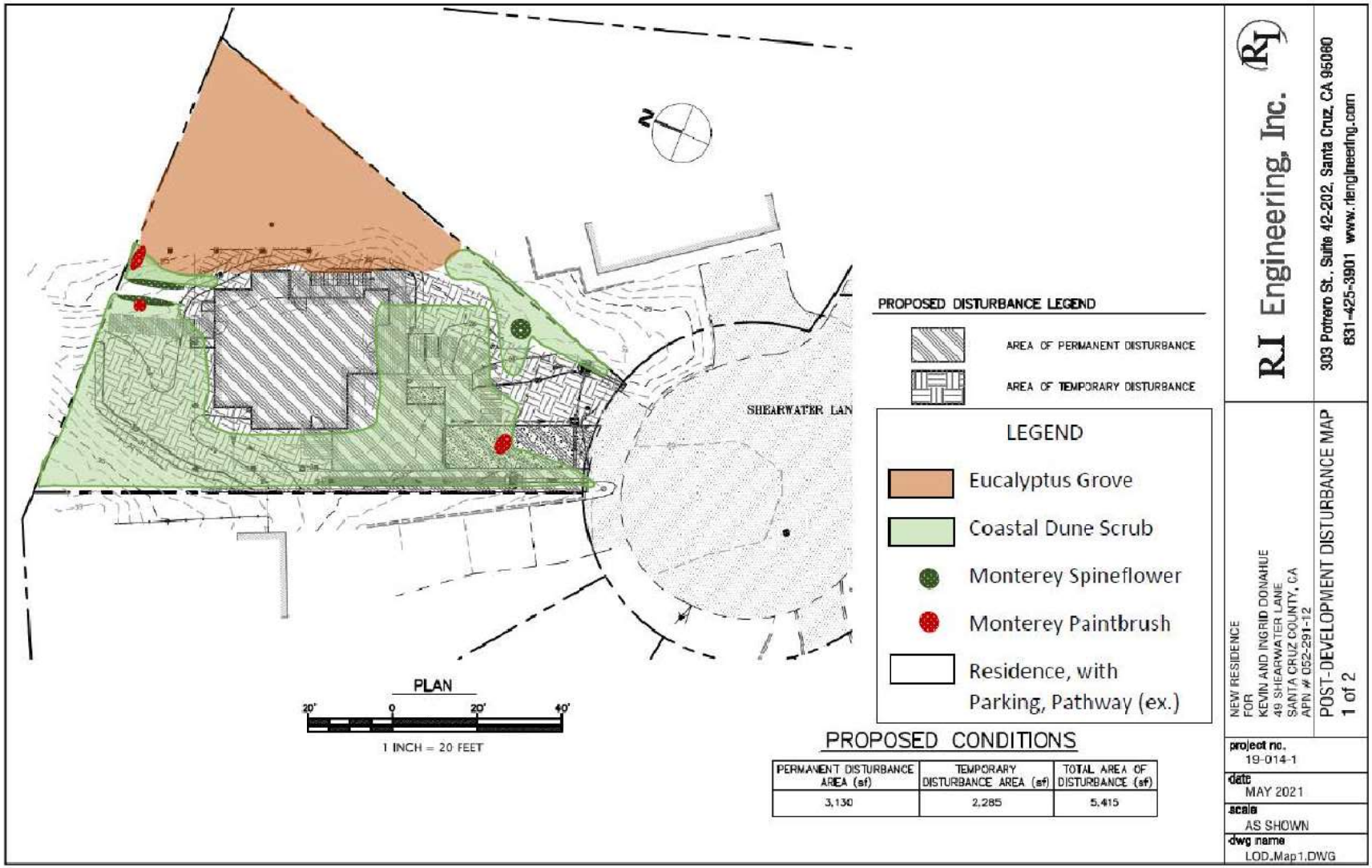

Figure 10. Existing vegetation types within proposed residential development area, showing permanent and temporary impact areas

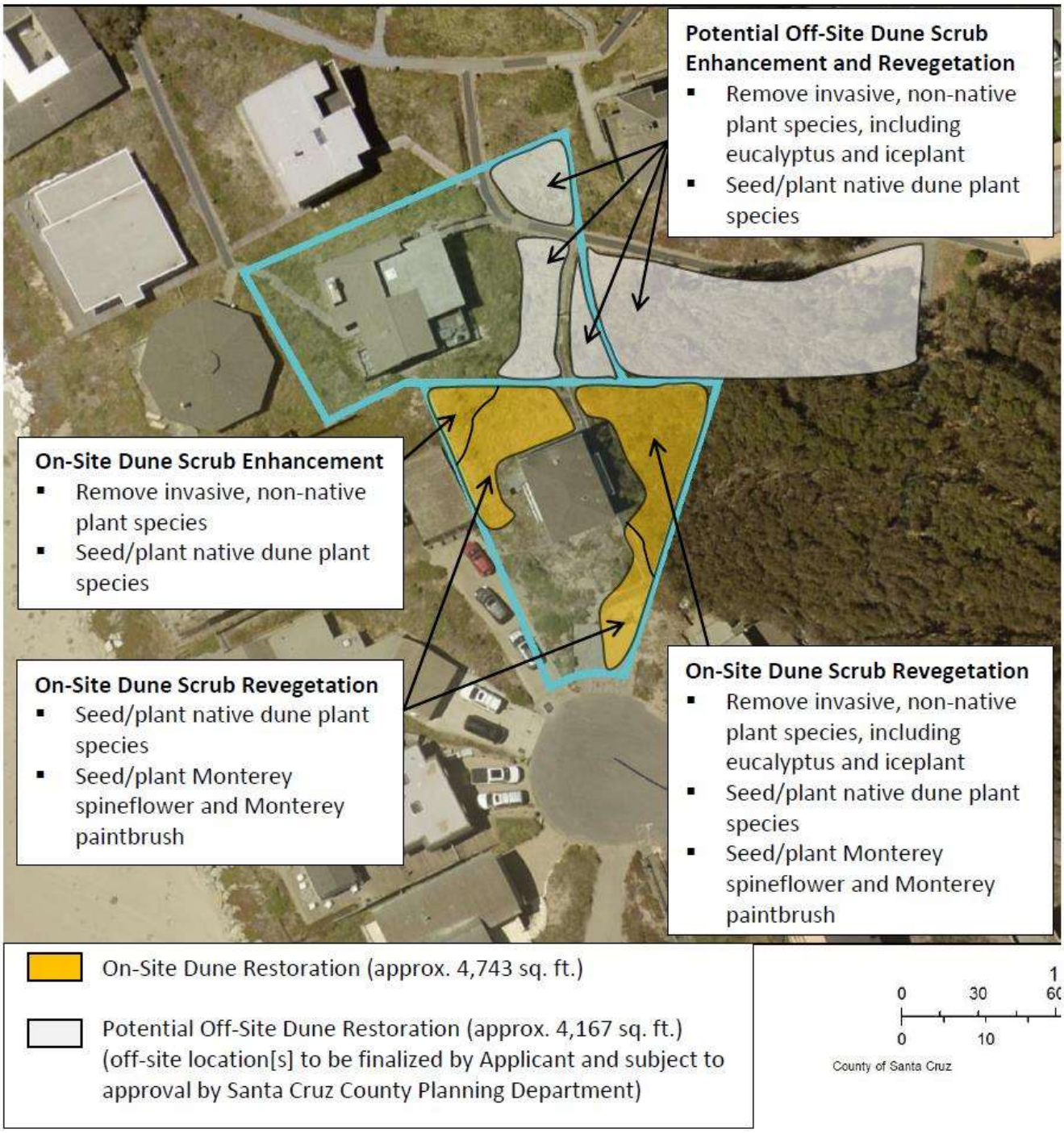

Figure 11. Conceptual dune restoration, on-site area and potential off-site areas.

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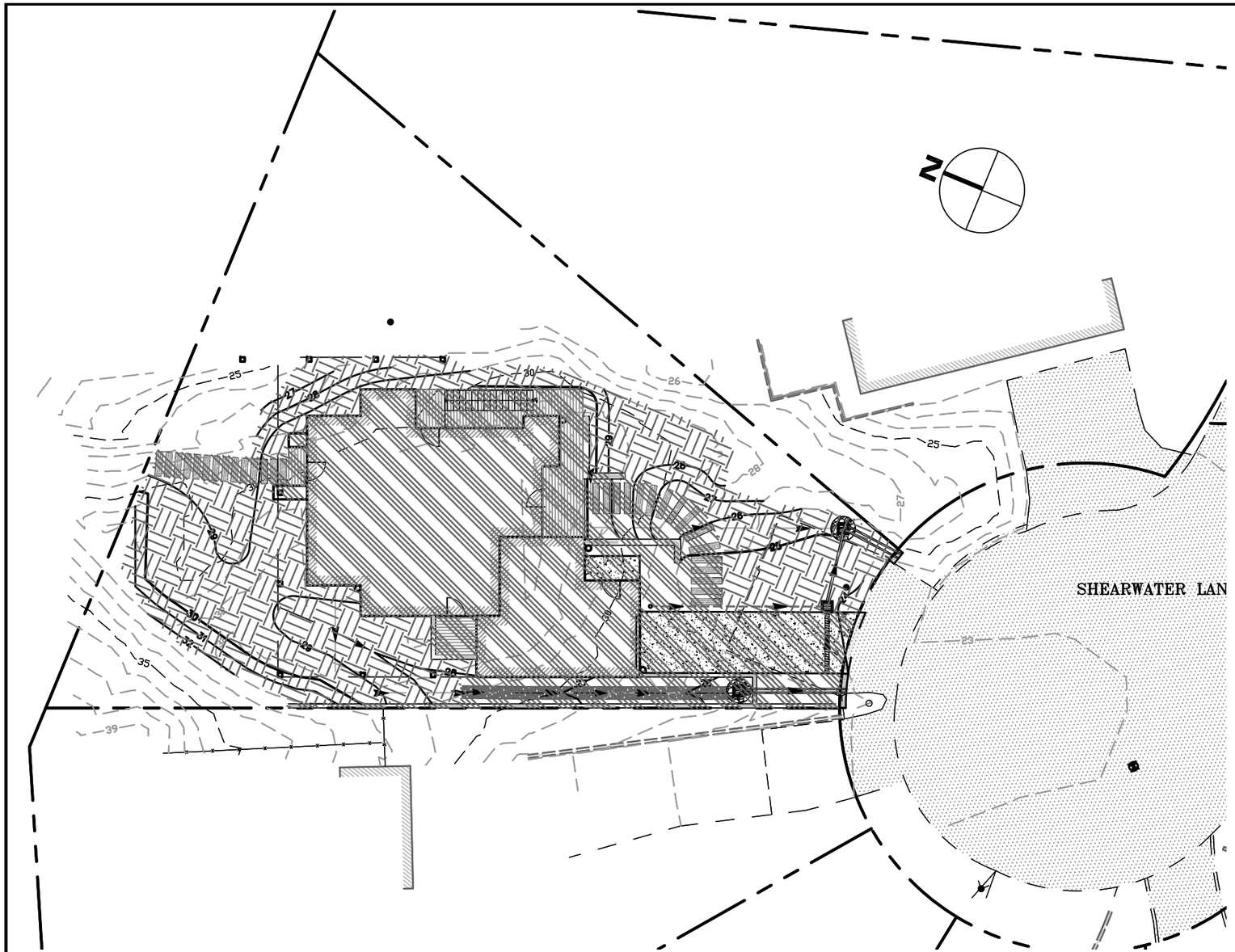
Attachment 2



PLAN

20' 0 20' 40'

1 INCH = 20 FEET

PROPOSED DISTURBANCE LEGEND

AREA OF PERMANENT DISTURBANCE

AREA OF TEMPORARY DISTURBANCE

PROPOSED CONDITIONS

PERMANENT DISTURBANCE AREA (sf)	TEMPORARY DISTURBANCE AREA (sf)	TOTAL AREA OF DISTURBANCE (sf)
2,610	2,805	5,415

RJ Engineering, Inc.

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831-425-3901 www.riengineering.com

NEW RESIDENCE
FOR
KEVIN AND INGRID DONAHUE
49 SHEARWATER LANE
SANTA CRUZ COUNTY, CA
APN # 052-291-12

POST-DEVELOPMENT DISTURBANCE MAP

1 of 2

project no.
19-014-1

date
MAY 2021

scale
AS SHOWN

dwg name
LOD.Map1.DWG

ROCK SOLID ENGINEERING, INC.
Soil Reports • Site Assessments • Manufactured Home Foundations • Expert Witness • Real Estate Inspections

GEOTECHNICAL INVESTIGATION-DESIGN PHASE

Proposed Single Family Residence
49 Shearwater Lane
Watsonville, California 95076
A.P.N.: 052-291-12

For:
Kevin and Ingrid Donahue
2153 Waverley Street
Palo Alto, California 94301

Project No. 15043-B
April 10, 2019

1100 Main Street, Suite A, Watsonville, CA 95076 • (831) 724-5868 • Fax: (831) 763-1578 • Email: yvette@rocksolidengineers.com

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Project No. 15043-B
April 10, 2019

Kevin and Ingrid Donahue
2153 Waverley Street
Palo Alto, California 94301

SUBJECT: **GEOTECHNICAL INVESTIGATION - DESIGN PHASE**
Proposed Single Family Residence
49 Shearwater Lane, Watsonville, California
APN 052-291-12

Dear Mr. and Mrs. Donahue:

In accordance with your authorization, we have completed an update to the geotechnical investigation for the currently proposed single family residence at 49 Shearwater Lane, in Pajaro Dunes, California. This report summarizes the findings, conclusions, and recommendations from our field exploration, laboratory testing, and engineering analysis. The conclusions and recommendations included herein are based upon applicable standards at the time this report was prepared.

It is a pleasure being associated with you on this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office.

Sincerely,

ROCK SOLID ENGINEERING, INC.

Signed: May 1, 2019

Dusty M. Osburn
Senior Engineer
R.C.E. 85113

Distribution: (1) Addressee and via email
(5) Jerrod Nicholls, Fuse Architects, and via email
(1) Leonard Willis, Redwood Engineering, via email

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Appendix A: Field Exploration and Laboratory Testing Program
Appendix B: Liquefaction Analysis

1. INTRODUCTION

1.1 Purpose

The purpose of this updated investigation is to provide preliminary geotechnical design parameters and recommendations for the proposed improvements. Conclusions and recommendations related to site grading, foundations, slabs-on-grade and retaining structures are presented herein.

1.2 Proposed Development

a. Based on our conversations with you, it is our understanding that the current project consists of the demolition of the existing residence and construction of a new single family residence in approximately the same footprint.

b. Proposed construction consists of wood frame construction with raised wood and slab-on-grade floors. Exact wall, column, and foundation loads are unavailable, but are expected to be typical of such construction.

c. Final structural and foundation plans were unavailable at the time of this report. It is our understanding that the information obtained during our investigation will be used in the development of a finalized plan set.

1.3 Scope of Services

The scope of services provided during the course of our investigation included:

a. Review of the referenced geotechnical, geologic, and seismological reports and maps pertinent to the development of the site (available in our files).

b. Laboratory testing of soil samples considered representative of subsurface conditions.

c. Geotechnical analyses of field and laboratory data.

d. Quantitative liquefaction analysis.

e. Preparation of a report (6 copies) presenting our findings, conclusions and recommendations.

1.4 Authorization

This investigation, as outlined in our Proposal dated January 15, 2019, was performed in accordance with your written authorization on January 26, 2019.

2. FIELD EXPLORATION AND LABORATORY TESTING PROGRAM

Details of the previous field exploration and laboratory testing from our November 9, 2015 investigation are presented in Appendix A.

3. SITE DESCRIPTION

3.1 Location

The subject project is located at 49 Shearwater Lane, in the Pajaro Dunes Community of Watsonville, California. The location is shown on the Location Map, **Figure 1**.

3.2 Surface Conditions

The subject site is located on the frontal dune adjacent to the beach. The site is gently sloping and is currently developed with an existing single family residence, driveway and associated improvements.

3.3 Subsurface Conditions

a. The results of our field exploration indicate that the subsurface soils present on the site are relatively consistent.

b. **Groundwater was encountered during the course of our field exploration at 19 feet below existing grade.**

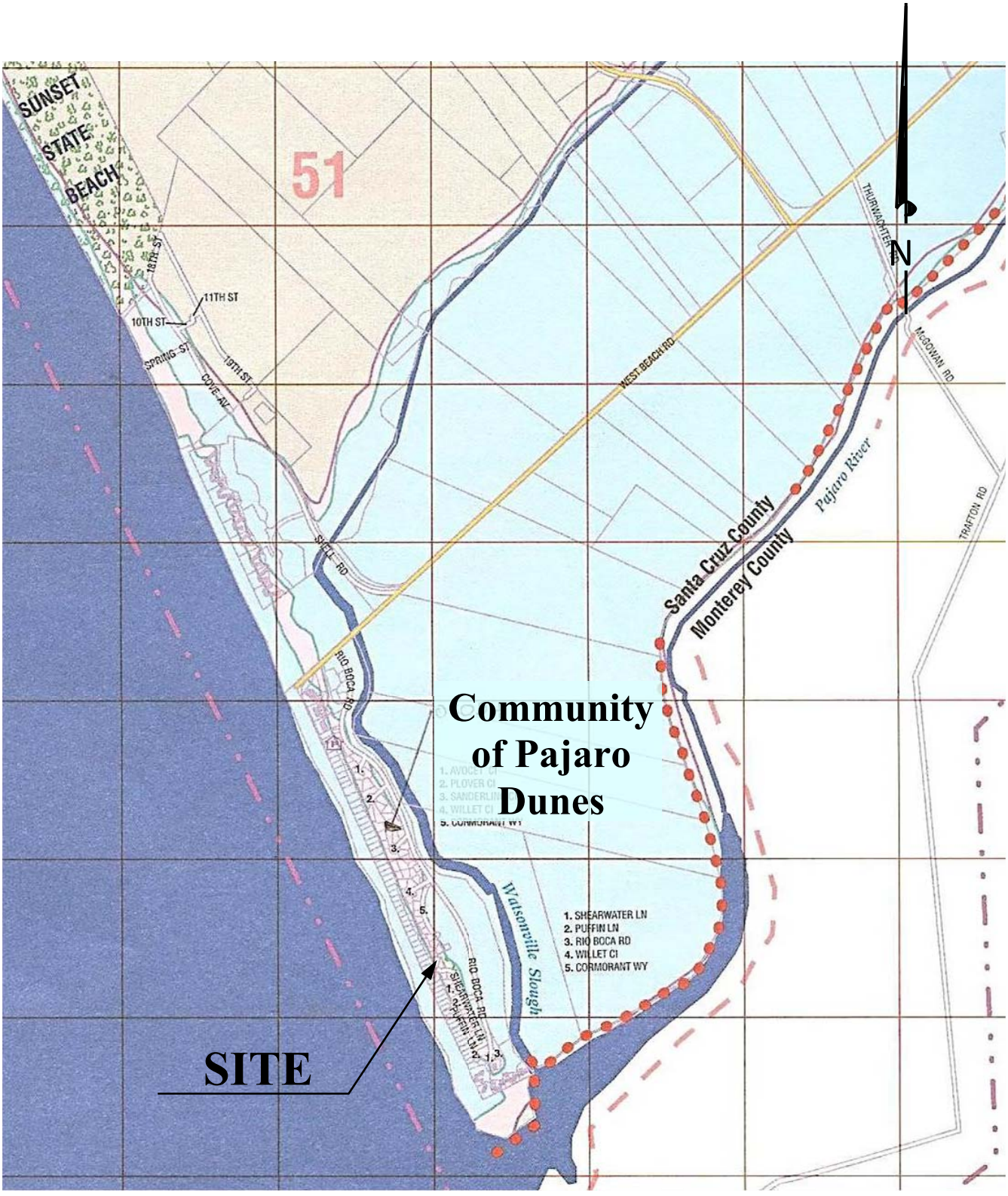
c. The soil stratum encountered throughout our borings consists of tan poorly graded clean sand. The sand was observed from the surface to the extent of our boring at approximately 44.5 feet below existing grade. This material is generally dry to saturated, loose to very dense, and non-plastic.

d. Complete soil profiles are presented on the Logs of Exploratory Borings and the boring locations are shown on the Boring Location Plan in Appendix A.

4. GEOTECHNICAL HAZARDS

4.1 General

a. Potential geotechnical hazards to man made structures include ground shaking, surface rupture, landsliding, liquefaction, and differential compaction. The potential for each of these to impact the site is discussed below.



REFERENCE: Barclay Mapworks, June 1999.

ROCK SOLID ENGINEERING, INC.	LOCATION MAP	FIGURE
	49 Shearwater Lane, Pajaro Dunes	1

b. Ground shaking caused by earthquakes is a complex phenomenon. Structural damage can result from the transmission of earthquake vibrations from the ground into the structure. The intensity of an earthquake at any given site depends on many variables including, the proximity of the site to the hypocenter, and the characteristics of the underlying soil and/or rock. The subject site is situated at the approximate latitude of 36°51'25" and longitude -121°48' 48". The project location (latitude and longitude) were used in conjunction with the Structural Engineers Association of California (SEAOC) and California Office of Statewide Health Planning and Development (OSHPD) website (Reference 11) to obtain the seismic design parameters presented in **Table 1**. All proposed structures at the subject site shall be designed with the corresponding seismic design parameters in accordance with the 2016 California Building Code (Reference 2).

Table 1
2016 CBC Seismic Design Criteria

SEISMIC DESIGN CRITERIA							
Site Class	Seismic Design Category	Spectral Response Accelerations					
		Ss	S1	SMs	SM1	SDs	SD1
D*	D	1.500	0.600	1.500	0.900	1.000	0.600

*Because the Fundamental Period of the Building is expected to be less than 0.5s, the Site Class has been assigned as D rather than F.

c. Surface rupture usually occurs along lines of previous faulting. Based on our review of the Faults and Their Potential Hazards in Santa Cruz County map (Reference 8), no faults are shown to cross the property. Therefore, the potential for surface rupture should be considered low.

d. Landslides are generally mass movements of loose rock and soil, both dry and water saturated, and usually gravity driven. Based on our review of the Preliminary Map of Landslide Deposits if Santa Cruz County (Reference 3), no landslides are mapped on the subject parcel. In addition, the subject site slopes only gently, therefore, the potential for landsliding to occur across the site a cause damage to structures should be considered low.

e. Liquefaction, lateral spreading, and differential compaction tend to occur in loose, unconsolidated, noncohesive soils with shallow groundwater. During our field exploration relatively loose, non-cohesive soils below the groundwater level were observed and a quantitative liquefaction analysis was deemed necessary. The results of our analysis are presented in Section 4.2 of this report, and the methodology and calculations are presented in Appendix B.

4.2 Liquefaction Analysis

4.2.1 General

a. The liquefaction analysis uses empirical predictions of earthquake-induced liquefaction potential and is based on the published methods used by Seed and others (Reference 10).

b. The sand stratum encountered below the groundwater table was generally characteristic of potentially liquefiable soil. The soil is composed of poorly graded sand. The sand was observed from the surface to approximately 44.5 feet below existing grade.

c. During the course of our field investigation, the groundwater table was located at approximately 19 feet below existing grade in the area of the proposed development. Our quantitative liquefaction analysis conservatively reflects the groundwater elevation at a depth of 14 feet to account for a rise in groundwater during the wetter winter months and corresponds to the adjacent FEMA AE Zone flood elevation.

4.2.2 Results

a. The results of our quantitative liquefaction analysis indicate that the underlying sand situated below the groundwater level to a depth of approximately 33 feet below existing grade is **susceptible** to liquefaction during the design seismic event.

b. We have calculated the resulting surface deformation due to liquefaction during the design seismic event to be approximately 4 inches. This settlement can occur beneath the entire structure, or differentially, across the least dimension of the structure. The liquefaction calculations are presented in Appendix B.

4.2.3 Discussion

a. It must be cautioned that liquefaction analysis is an inexact science and the empirical predictions of earthquake-induced liquefaction potential are based on a comparison of the subject site with areas that have experienced liquefaction. The soil configuration analyzed contains many simplifying assumptions, not the least of which are isotropy and homogeneity. Soil stratums deemed “susceptible” to liquefaction during the design seismic event will not necessarily liquefy, but the probability will be greater than a stratum deemed “not susceptible”.

b. Significant variations in the proposed grades may require that our analysis and the recommendations herein be reviewed and if necessary, amended.

c. Further discussion of our liquefaction analysis, methodology, and calculations are presented in Appendix B.

4.3 Primary Frontal Dune Analysis

4.3.1 General

The property is located in a FEMA VE Zone and is located on the Primary Frontal Dune as defined by FEMA. To determine if the eroded dune profile will affect the proposed structure, we have prepared an analysis of the primary frontal dune for this parcel based on FEMA's Guidance for Flood Risk Analysis and Mapping - Coastal Erosion (Reference 7).

4.3.2 Procedure

a. A cross section was developed from the beach through the subject property. The cross section is shown on **Figure 2**, attached.

b. Based on our review of the previous Flood Insurance Study for Santa Cruz County (Reference 6), the 100-year Stillwater level (SWEL) at Sunset Beach (located just north of the project) is 7.8 Feet NAVD for a 0.2 percent chance annual flood. This SWEL includes astronomical tides, storm surge and wave setup.

c. A projected sea level rise of 3.43 feet was added to the SWEL for a total of 11.23 feet NAVD.

d. The 100 year Stillwater level (SWEL) of 11.23 Feet (NAVD 88) was plotted on the cross section.

e. To model the eroded profile in case of duneface retreat, a vertical line was drawn from the surface of the frontal dune down until it intersected the SWEL horizontal line. The vertical line was adjusted until the calculated area of the sand dune reservoir exceeded 1,100 square feet (Coastal Construction Manual, Reference 5). The area of the sand reservoir is shown hatched on the Cross Section, **Figure 2**. The CAD software was used to calculate the area of the sand dune reservoir (hatched section) of 1,114 square feet.

f. Once the area of 1,100 square foot sand reservoir was determined, a 1:1 (H:V) slope was projected up, landward, from the intersection of the vertical line and the SWEL horizontal line until it intersected with the top of the dune, as shown below in **Figure 3**.

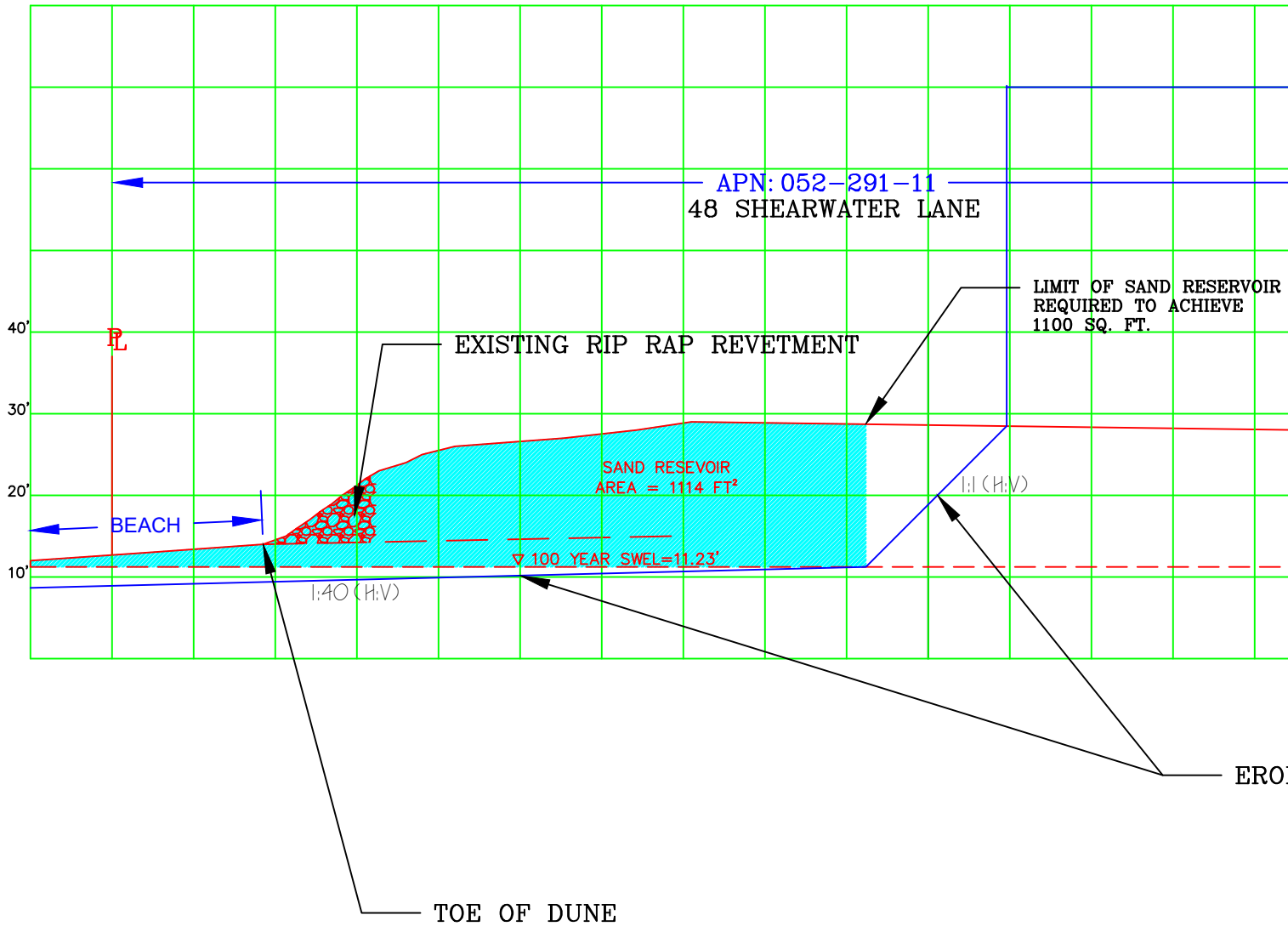


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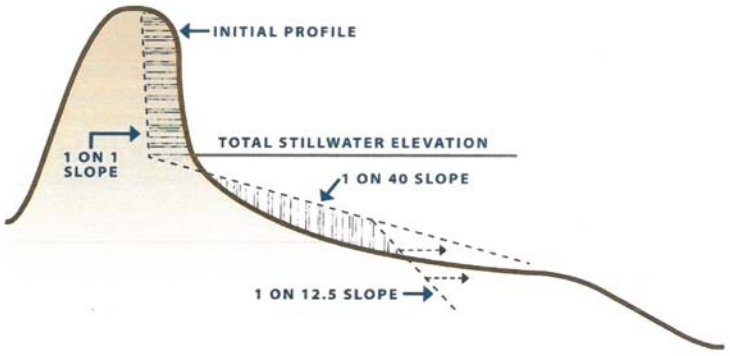
Figure 2.1.1-2. Procedure Giving Eroded Profile in Cases of Duneface Retreat, and Simplification of Dune Retreat Model Developed by Delft Hydraulics Laboratory of the Netherlands.



PROCEDURE:

1 - Construct retreated duneface with 540 ft² erosion ( ) above total stillwater elevation and seaward of 1 on 1 slope.

2 - Determine additional dune erosion quantity, shown dotted, in wedge between total stillwater elevation, 1 on 40 slope, and initial profile.

3 - Balance total dune erosion with postulated deposition ( ) by appropriate placement of 1 on 12.5 slope as limit to deposition.

Figure 3: Procedure Giving Eroded Profile in Case of Duneface Retreat Sketch

g. To complete the eroded dune profile a 1:40 (H:V) slope was projected seaward, from the intersection of the vertical line and the SWEL horizontal line, as shown below in Figure 3.

4.3.3 CONCLUSIONS

a. Based on our review of the Coastal Construction Manual (Reference 5), Section 3.6.8, the current FEMA procedures require that a dune have a minimum frontal dune reservoir of 540 square feet. However, the Coastal Construction Manual recommends a frontal dune reservoir of 1,100 square feet.

b. The 1,100 square feet minimum reservoir was used to determine the eroded dune profile based on FEMA's Guidance for Flood Risk Analysis and Mapping - Coastal Erosion (Reference 7). The limits of the eroded dune profile the property line of 49 Shearwater is located approximately 77 feet landward of the eroded dune profile.

c. As the property line of A.P.N.: 052-291-12 is setback 77 feet from the landward side of the eroded dune profile, erosion is not a design consideration for the proposed building pad.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 General

a. Based on the results of our investigation, it is our opinion that from the geotechnical standpoint, the subject site will be suitable for the proposed development provided the recommendations presented herein are implemented during grading and construction.

b. Based on our quantitative liquefaction analysis, it is our opinion that the subject site will be suitable for the support of the proposed single family residence on a **foundation system composed of a rigid mat or grade beam waffle**. Recommendations for these foundation systems are provided in Section 5.3.2.

c. Retaining walls which are structurally detached from the residence may be founded on a **conventional foundation system**. Recommendations for conventional foundations are presented in Section 5.3.3.

d. Site preparation, consisting of over excavation and recompaction of the native subgrade will only be required prior to placement of new slabs-on-grade and pavements. See Section 5.2.6 for Preparation of On-Site Soil recommendations.

e. At the time we prepared this report, grading and foundation plans had not been finalized. We request an opportunity to review these plans during the design stages to determine if supplemental recommendations will be necessary.

f. The design recommendations of this report must be reviewed during the grading phase when subsurface conditions in the excavations become exposed.

g. Field observation and testing must be provided by a representative of Rock Solid Engineering, Inc., to enable them to form an opinion regarding the adequacy of the site preparation, and the extent to which the earthwork is performed in accordance with the geotechnical conditions present, the requirements of the regulating agencies, the project specifications and the recommendations presented in this report. Any earthwork performed in connection with the subject project without the full knowledge of, and not under the direct observation of Rock Solid Engineering, Inc., the Geotechnical Consultant, will render the recommendations of this report invalid.

h. **The Geotechnical Consultant should be notified at least five (5) working days prior to any site clearing or other earthwork operations** on the subject project in order to observe the stripping and disposal of unsuitable materials and to ensure coordination with the grading contractor. During this period, a preconstruction conference should be held on the site to discuss project specifications, observation/testing requirements and responsibilities, and scheduling. This conference should include at least the Grading Contractor, the Architect, and the Geotechnical Consultant.

5.2 Grading

5.2.1 General

All grading and earthwork should be performed in accordance with the recommendations presented herein and the requirements of the regulating agencies.

5.2.2 Site Clearing

a. Prior to grading, the areas to be developed for structures, pavements and other improvements, should be stripped of any vegetation and cleared of any surface or subsurface obstructions, including any existing foundations, utility lines, basements, septic tanks, pavements, stockpiled fills, and miscellaneous debris.

b. All pipelines encountered during grading should be relocated as necessary to be completely removed from construction areas or be capped and plugged according to applicable code requirements.

c. Any wells encountered shall be capped in accordance with **Santa Cruz County** Health Department requirements. The strength of the cap shall be at least equal to the adjacent soil and shall not be located within 5 feet of any structural element.

d. Surface vegetation and organically contaminated topsoil should be removed from areas to be graded. The required depth of stripping will vary with the time of year the work is done and must be observed by the Geotechnical Consultant. It is generally anticipated that the required depth of stripping will be 6 to 12 inches.

e. Holes resulting from the removal of buried obstructions that extend below finished site grades should be backfilled with compacted engineered fill.

5.2.3 Excavating Conditions

a. We anticipate that excavation of the on-site soils may be accomplished with standard earthmoving and trenching equipment.

b. Groundwater was encountered during the course of our field exploration at 19 feet below grade. However, due to the water depth below existing grade and the shallow grading depths anticipated, is not expected to present a problem during construction.

c. The suburface soils are clean sands. **Caving of excavations and the need for shoring should be anticipated.** Excavations should be kept moist during to aid in reducing caving.

d. Any excavations adjacent to existing structures should be reviewed, and recommendations obtained to prevent undermining or distress to these structures.

5.2.4 Fill Material

a. The on-site soils **may** be used as compacted fill.

b. All soils, both on-site and imported, to be used as fill, should contain less than 3% organics and be free of debris and cobbles over 6 inches in maximum dimension.

c. Any imported soil to be used as engineered fill shall meet the following requirements:

(i) free of organics, debris and other deleterious materials
(ii) be granular (sandy) in nature and have sufficient fines to allow for excavation of the foundation trenches.
(iii) free of rock and cobbles in excess of 3 inches
(iv) have an expansion potential not greater than low (EI<20)
(v) have a soluble sulfate content less than 150 ppm

d. Imported fill material should be approved by the Geotechnical Consultant prior to importing. The Geotechnical Consultant should be notified not less than 5 working days in advance of placing any fill or base course material proposed for import. Each proposed source of import material should be sampled, tested and approved by the Geotechnical Consultant prior to delivery of any soils imported for use on the site.

5.2.5 Fill Placement and Compaction

a. Any fill or backfill required should be placed in accordance with the recommendations presented below.

b. Material to be compacted or reworked should be moisture-conditioned or dried to achieve near-optimum conditions, and compacted to achieve the following minimum relative compaction:
   (a) All fill and compacted building subgrade: 90%
   (b) Upper 6 inches of subgrade in pavement/drive areas: 95%
   (c) Baserock and subbase: 95%.

c. The placement moisture content of imported material should be evaluated prior to grading.

d. The relative compaction and required moisture content shall be based on the maximum dry density and optimum moisture content obtained in accordance with ASTM D-1557.

e. The in-place dry density and moisture content of the compacted fill shall be tested in accordance with ASTM D-8167/D8167M-18 or ASTM D-2922/ASTM D-3017.

f. The number and frequency of field tests required will be based on applicable county standards and at the discretion of the Geotechnical Consultant. As a minimum standard every 1 vertical foot of engineered fill placed within a building pad area, and every 2 vertical feet in all other areas shall be tested, unless specified otherwise by a Rock Solid Engineering, Inc. representative.

g. Fill should be compacted by mechanical means in uniform horizontal loose lifts not exceeding 8 inches in thickness.

h. All fill should be placed and all grading performed in accordance with applicable codes and the requirements of the regulating agency.

5.2.6 Preparation of On-Site Soils

a. Site preparation, consisting of over excavation and recompaction of the native subgrade will only be required prior to placement of new slabs-on-grade pavements.

b. Recompaction of the native subgrade beneath **shallow foundations will not** be required provided that the footings are embedded per Section 5.3.

c. The native subgrade beneath **new slabs-on-grade** should be reworked to a depth sufficient to provide a zone of compacted fill extending at least 8 inches below the bottom of the capillary break.

d. The native subgrade beneath **new pavements** should be reworked to a depth sufficient to provide a zone of compacted fill extending at least 8 inches below the bottom of aggregate base coarse. The zone of compacted fill must extend a minimum of 2 feet laterally beyond all pavements.

e. A representative of our firm shall observe the bottom of the excavations once the required depth of overexcavation has been achieved to verify suitability. Prior to replacing the excavated soil, the exposed surface should be scarified to a depth of 6 to 8 inches, moisture conditioned, and compacted.

f. The depths of reworking required are subject to review by the Geotechnical Consultant during grading when subsurface conditions become exposed.

5.2.7 Groundwater Table

Groundwater **was** encountered during the course of our exploration at 19 feet below the existing grade. The depth of the groundwater table is at least 5 feet below the lowest depth of the foundation of the proposed construction, therefore, it is not expected to interfere with the construction.

5.2.8 Expansive Soils

Our laboratory testing indicates that the near surface soil contains less than 10% fines passing the No. 200 sieve. In accordance with Section 1803.5.3 of the 2016 C.B.C., the near surface soils shall be considered **not expansive**.

5.2.9 Sulfate Content

The results of our laboratory testing indicate that the soluble sulfate content of the on-site soils likely to come into contact with concrete is below the 150 ppm generally considered to constitute an adverse sulfate condition. **Type II cement** is therefore considered adequate for use in concrete in contact with the on-site soils.

5.2.10 Surface Drainage

a. Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. Where soil is adjacent to foundations, a minimum gradient of **5 percent for a distance of no less than 10 feet** measured perpendicularly from the wall face, should be maintained and drainage should be directed toward approved swales or drainage facilities. If 10 horizontal feet can not be satisfied due to lot lines or physical constraints, the drainage shall be designed in accordance with the requirements of Section 1804.4 of the 2016 California Building Code.

b. Swales and impervious surfaces shall be sloped a minimum of 2 percent towards an approved drainage inlet or discharge point.

c. All roof eaves should be guttered with the outlets from the downspouts provided with adequate capacity to carry the storm water away from the structure to reduce the possibility of soil saturation and erosion. The connection should be to a splash blocks or solid pipes that discharge at an approved location.

d. Drainage patterns approved at the time of construction should be maintained throughout the life of the structures. The building and surface drainage facilities must not be altered nor any grading, filling, or excavation conducted in the area without prior review by the Geotechnical Consultant.

e. Irrigation activities at the site should be controlled and reasonable. Planter areas should not be sited adjacent to walls without implementing approved measures to contain irrigation water and prevent it from seeping into walls and under foundations and slabs-on-grade. Large trees should be planted a minimum distance of ½ their mature height away from the foundation.

5.2.11 Utility Trenches

a. Bedding material may consist of sand with SE not less than 20 which may then be jetted, unless local jurisdictional requirements govern.

b. Existing on-site soils may be utilized for trench backfill, provided they are free of organic material and rocks over 6 inches in diameter.

c. If sand is used, a 3 foot concrete plug should be placed in each trench where it passes under the exterior footings.

d. Backfill of all exterior and interior trenches should be placed in thin lifts and mechanically compacted to achieve a relative compaction of not less than 95% in paved areas and 90% in other areas per ASTM D-1557. Care should be taken not to damage utility lines.

e. Utility trenches that are parallel to the sides of a building should be placed so that they do not extend below a line sloping down and away at an inclination of 2:1 (H:V) from the bottom outside edge of all footings.

f. Trenches should be capped with 1.5± feet of impermeable material. Import material must be approved by the Geotechnical Consultant prior to its use.

g. Trenches must be shored as required by the local regulatory agency, the State Of California Division of Industrial Safety Construction Safety Orders, and Federal OSHA requirements.

5.3 Foundations

5.3.1 General

a. Based on our quantitative liquefaction analysis, it is our opinion that the subject site will be suitable for the support of the proposed residence on a **foundation system composed of a rigid mat or grade beam waffle**. Recommendations for this foundation type are presented in Section 5.3.2.

b. Retaining walls which are structurally detached from the residence may be founded on a **conventional foundation system**. Recommendations for conventional foundations are presented in Section 5.3.3.

c. At the time we prepared this report, grading and foundation plans had not been finalized. We request an opportunity to review these plans during the design stages to determine if supplemental recommendations will be necessary.

5.3.2 Rigid Mat or Grade Beam Waffle Foundations

a. Based on our liquefaction analysis, we recommend this foundation system be **designed for 4 inches of differential settlement across the least dimension of the structure, as well as a total loss of soil support over an area with a 8 feet diameter occurring at any point beneath the structure.**

b. Minimum embedment depth for the thickened edge sections of the rigid mat or the perimeter grade beams of the waffle should be 18 inches below lowest exterior grade.

c. The uniform allowable bearing capacity shall not exceed **1,500 psf**.

d. **The modulus of subgrade reaction (k_s) is 250 lbs/in^3** for the native sands below the rigid mat.

e. If a grade beam waffle foundation system is used, we recommend a maximum span of 15 feet between grade beam connections.

f. The friction factor between rough concrete and the native, near-surface **sand** is **0.40**.

g. For rigid mat foundations, it is important that the subgrade soils be thoroughly saturated for 24 to 48 hours prior to the time the concrete is poured. **For near-surface soils with a low expansion potential, the subgrade should be presoaked 4 percentage points above optimum, or 120% of optimum, whichever is greater; to a depth of 1.0 feet.**

h. The rigid mat or grade beam waffle foundation system used on this project may be combined with **flexible utility connections** in order to prevent breakage should the foundation tilt as a result of differential settlement.

i. The rigid mat or grade beam waffle foundation system has the advantage that should the design seismic event produce significant soil deformation beneath the structure, the resulting tilting should produce only moderate architectural damage. The damage may be repaired by pressure grouting or other leveling procedures.

5.3.3 Conventional Shallow Foundations (Structurally Detached Retaining Walls)

a. Footing widths should be based on the allowable bearing values. **The minimum recommended depth of embedment is 12 inches for all footings.** Should local building codes require deeper embedment of the footings or wider footings the codes must apply.

b. Footing excavations must be checked by the Geotechnical Consultant before steel is placed and concrete is poured to insure bedding into proper material. Excavations should be thoroughly wetted down just prior to pouring concrete.

c. The **allowable bearing capacity** shall not exceed **1,500 psf.**

d. The allowable bearing capacity values above may be increased by one-third in the case of short duration loads, such as those induced by wind or seismic forces.

e. In the event that footings are founded in structural fill consisting of imported soil, the recommended allowable bearing capacity may need to be re-evaluated.

5.4 Settlements

a. Total and differential settlements beneath foundation elements due to static structural loading are expected to be within tolerable limits. Vertical movements are not expected to exceed 1 inch. Differential movements are expected to be within the normal range (½ inch) for the anticipated structural loads. These preliminary estimates should be reviewed by the Geotechnical Consultant when foundation plans for the proposed structures become available.

b. Potential settlement due to liquefaction at the subject site during the design seismic event is estimated to be approximately 4 inches. This settlement can occur beneath the entire structure, or differentially, across the least dimension of the structure. Details of our liquefaction analysis are presented in section 4.2 and Appendix B.

5.5 Retaining Structures

5.5.1 General

a. Retaining walls which are structurally detached from the proposed structure may be founded on conventional shallow foundations. Recommendations for this foundation system are provided in section 5.3, Foundations. Retaining walls integral with the structure should be designed as part of the rigid foundation system.

b. A basement level is proposed for the new residence. The subsurface soils are clean sands. **We therefore anticipate the need for shoring of the basement excavation**. Excavations over 5 feet in depth must be either sloped, shored, or shielded to meet current OSHA standards.

5.5.2 Lateral Earth Pressures

a. The lateral earth pressures presented in **Table 2** are recommended for the design of retaining structures with a gravel backdrain and backfill soils of expansivity not higher than Medium. Should the slope behind the retaining walls be other than level or 3:1 horizontal to vertical, supplemental design criteria will be provided for the active earth or at-rest pressures for the particular slope angle.

Table 2
Lateral Earth Pressures

Type	Soil Profile	Soil Pressure (psf/ft)	
		Unrestrained Wall	Rigidly Supported Wall
Active Pressure	Level 3:1	35 45	- -
At-Rest Pressure	Level 3:1	- -	57 87
Passive Pressure* * Neglect upper 2'	Level 3:1	400 300	200 150

b. The friction factor between rough concrete and the native, near-surface **sand** is **0.40**.

c. Where both friction and the passive resistance are utilized for sliding resistance, either of the values indicated should be reduced by one-third.

d. Lateral load due to earthquakes may be calculated as $12xH^2$ acting at 0.6H above the base of the wall.

e. These are ultimate values, no factor of safety has been applied.

f. Although not anticipated, pressure due to any surcharge loads from adjacent footings, traffic, etc., should be analyzed separately. Pressures due to these loading configurations can be supplied upon receipt of the appropriate plans and loads.

5.5.3 Backfill

a. Backfill should be placed under engineering control.

b. It is recommended that granular, or relatively low expansivity, backfill be utilized, for a width equal to approximately 1/3 x wall height, and not less than 2 feet, subject to review during construction.

c. The granular backfill should be capped with at least 12 inches of relatively impermeable material.

d. Backfill should be compacted to achieve a minimum 90 percent relative compaction, the compaction standard being obtained in accordance with ASTM D-1557.

e. Precautions should be taken to ensure that heavy compaction equipment is not used immediately adjacent to walls, so as to prevent undue pressures against, and movement of, the walls.

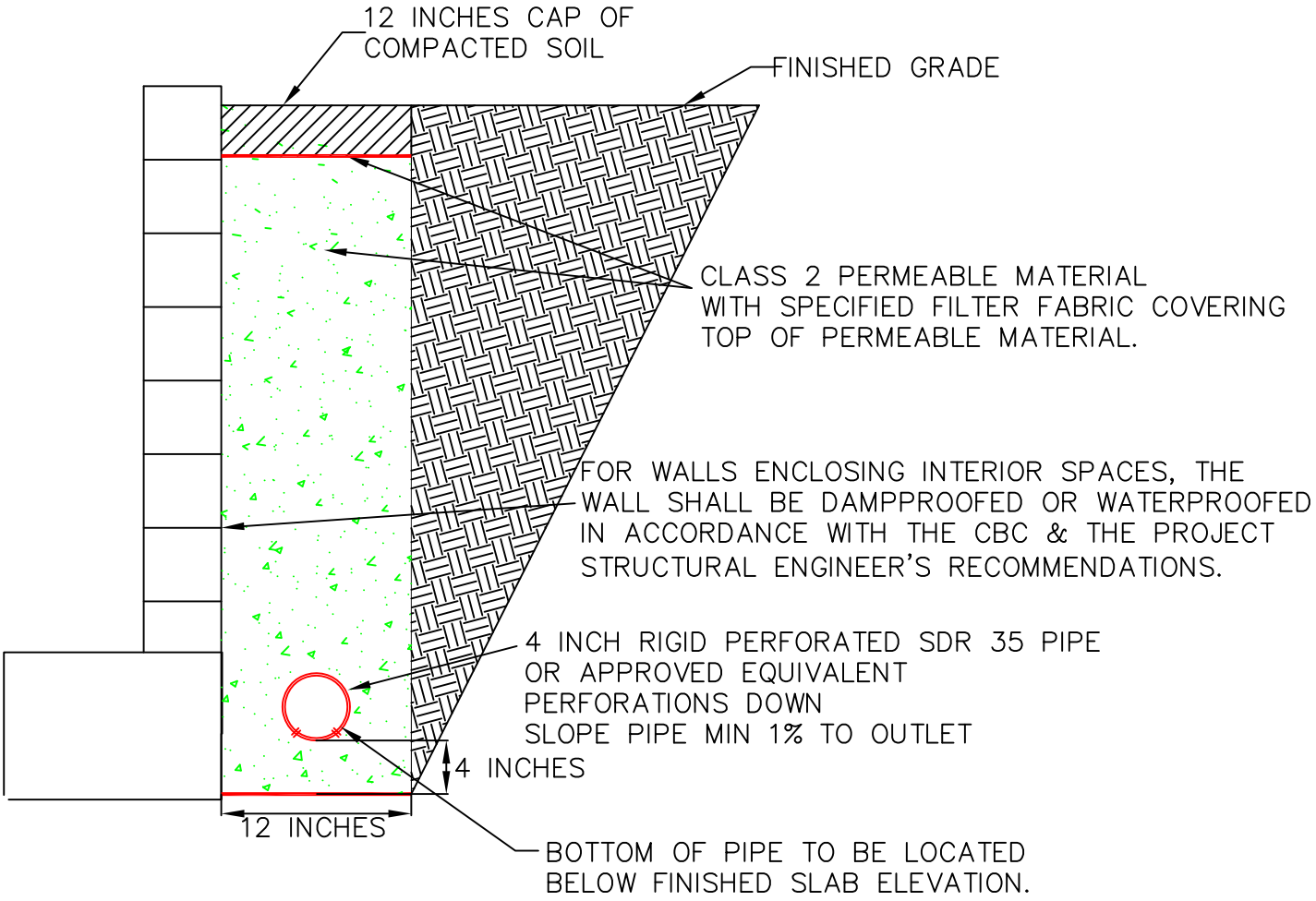
f. The use of water-stops/impermeable barriers and appropriate waterproofing should be considered for any basement construction, and for building walls which retain earth.

5.5.4 Backfill Drainage

a. Backdrains should consist of a minimum 4-inch diameter, perforated, SDR 35 pipe or equivalent, embedded in permeable material meeting the State of California Standard Specification Section 68-2.02F(3), Class 2, or equivalent. A layer of **Mirafi 180N Filter Fabric**, or equivalent, shall be placed over the permeable material and the remaining 12 inches shall be capped with compacted native soil. The pipe should be approximately 4 inches above the trench bottom with a gradient of at least 1% being provided to the pipe and trench bottom, discharging to an approved location. See **Figure 4** for Retaining Wall Backdrain Configuration.

b. Perforations in backdrains are recommended as follows: 3/8-inch diameter, in 2 rows at the ends of a 120 degree arc, at 3-inch centers in each row, staggered between rows, placed downward.

c. Backdrains placed behind retaining walls should be approved by the Geotechnical Consultant prior to the placement of backfill.



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RETAINING WALL BACKDRAIN CONFIGURATION

FIGURE 4

d. An unobstructed outlet should be provided at the lower end of each segment of backdrain. The outlet should consist of an unperforated pipe of the same diameter, connected to the perforated pipe and extended to a protected outlet at a lower elevation on a continuous gradient of at least 1%.

e. When terrace retaining walls are proposed, the upper retaining wall should have a backdrain which extends below the elevation of the top of the lower retaining wall backdrain. This will prevent spring effects and seepage between the terraced walls.

5.6 Exterior Slabs-on-Grade

a. Exterior concrete slabs may be founded on compacted engineered fill per the recommendations in Section 5.2.6. The subgrade should be proof-rolled just prior to construction to provide a firm, relatively unyielding surface, especially if the surface has been loosened by the passage of construction traffic.

b. It is important that the subgrade soils be thoroughly saturated for 24 to 48 hours prior to the time the concrete is poured. **For compacted engineered fill with a low expansion potential, the subgrade should be presoaked 4 percentage points above optimum, or 120% of optimum, whichever is greater; to a depth of 1.0 feet**.

c. Slab thickness, reinforcement, and doweling should be determined by the Project Structural Engineer, based on the design live and dead loads, including vehicles.

6. LIMITATIONS

a. Our investigation was performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or implied, is provided as to the conclusions and professional advice presented in this report.

b. The samples taken and tested, and the observations made, are considered to be representative of the site; however, soil and geologic conditions can vary significantly between sample locations.

c. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by the Project Geotechnical Consultant and the Geologist, and revised recommendations be provided as required.

d. This report is issued with the understanding that it is the responsibility of the Owner, or of his Representative, to ensure that the information and recommendations contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans, and that it is ensured that the Contractor and Subcontractors implement such recommendations in the field.

e. This firm does not practice or consult in the field of safety engineering. We do not direct the Contractor's operations, and we are not responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the Contractor. The Contractor should notify the Owner if he considers any of the recommended actions presented herein to be unsafe.

f. The findings of this report are considered valid as of the present date. However, changes in the conditions of a site can occur with the passage of time, whether they be due to natural events or to human activities on this or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge.

g. Accordingly, this report may become invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and revision as changed conditions are identified.

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APPENDIX A

FIELD EXPLORATION AND LABORATORY TESTING PROGRAM

- Field Exploration Procedures — Page A-1
- Laboratory Testing Procedures — Page A-2
- Boring Location Plan — Figure A-1
- Key to Logs — Figure A-2
- Logs of Exploratory Borings — Figures A-3 & A-4
- Summary of Laboratory Test Results — Figure A-5
- Direct Shear Test Results — Figure A-6
- Consolidation Test Results — Figure A-7

FIELD EXPLORATION PROCEDURES

A-1. Subsurface conditions were previously explored by drilling 2 borings to depths between 4.5 and 44.5 feet below existing grade. Boring B1 was advanced with a truck mounted drill rig equipped with 8 inch hollow stem augers. Boring B2 was advanced with a hand auger equipped with a 4 inch bit. The approximate locations of the borings are shown on the Boring Location Plan, **Figure A-1**. The Key to Logs, **Figure A-2**, gives definitions of the terms used in the Logs of Exploratory Borings. The Logs of Exploratory Borings are presented in **Figures A-3** and **A-4**.

A-2. Drilling of the borings was observed by our Field Engineer who logged the soils and obtained bulk and relatively undisturbed samples for classification and laboratory testing. The soils were classified, based on field observations and laboratory testing, in accordance with Unified Soil Classification System.

A-3. Relatively undisturbed soil samples were obtained by means of a drive sampler. The hammer weight and drop being 140 pounds and 30 inches, respectively for Boring B-1. Due to limited access, Boring B-2 was hand sampled with a hammer weight of 45 pounds. The number of "Blows/Foot"required to drive samplers are indicated on the logs.

A-4. Exploratory borings were located in the field by measuring from know landmarks. The locations, as shown, are therefore within the accuracy of such a measurement.

A-5. Groundwater was encountered at a depth of 19 feet below existing grade during the course of our field exploration.

LABORATORY TESTING PROCEDURES

A-6. Classification

Soils were classified in accordance with the Unified Soil Classification System. Moisture content and in-situ density determinations were made from relatively undisturbed soil samples. The results are presented in the Logs of Exploratory Borings and in the Summary of Laboratory Test Results, **Figure A-5**.

A-7. Direct Shear

Direct shear strength tests were performed on representative samples of the on-site soils in accordance with laboratory test standard ASTM D 3080-98. Samples were relatively undisturbed, or remolded as specified. To simulate possible adverse field conditions, the samples were saturated prior to testing unless otherwise noted. A saturating device was used which permitted the samples to absorb moisture while preventing volume change. The direct shear test results are presented in **Figure A-6**.

A-8. Consolidation

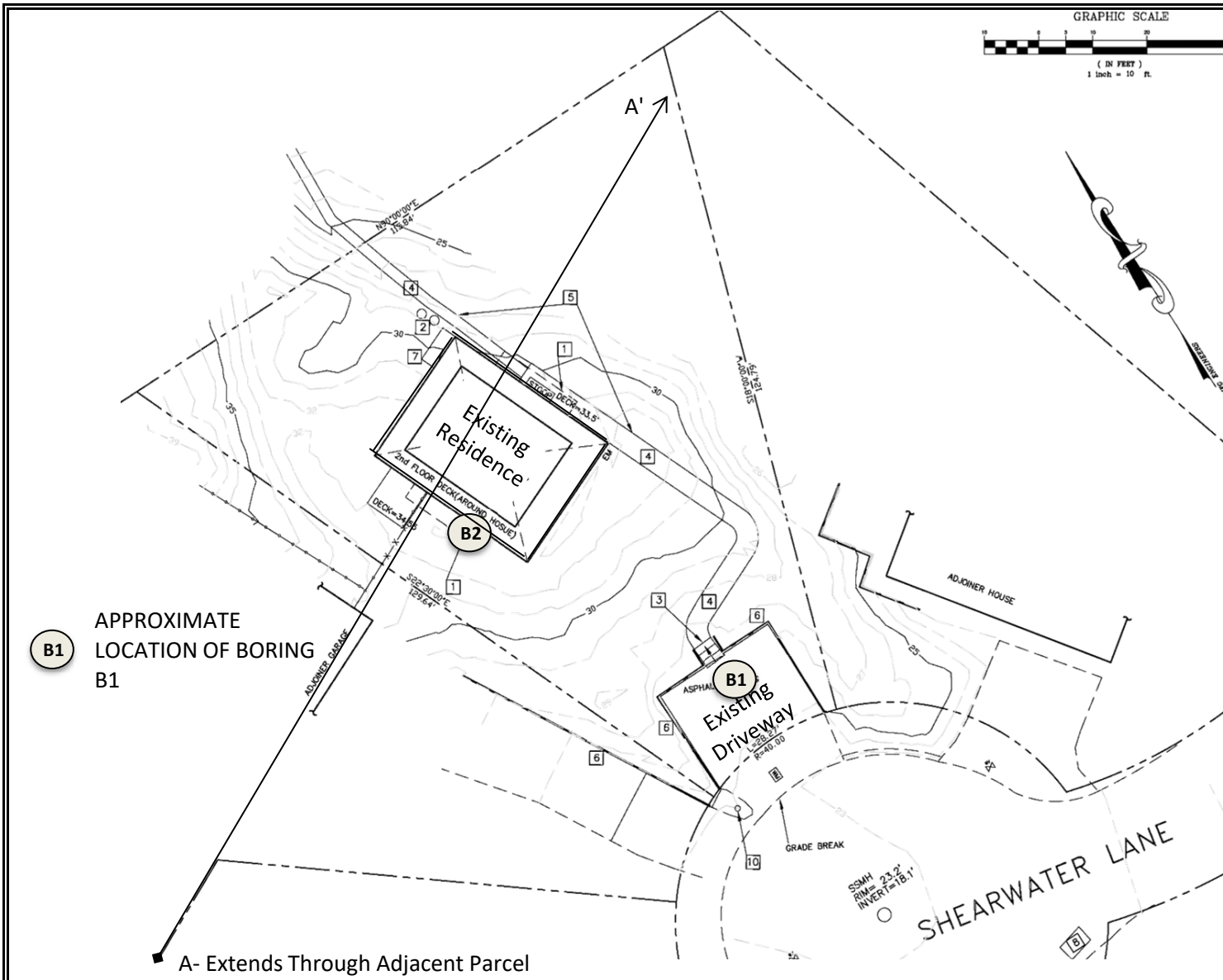
Consolidation tests were performed on representative, relatively undisturbed samples of the underlying soils to determine compressibility characteristics. The samples were saturated during the tests to simulate possible adverse field conditions. The test results are presented in **Figure A-7**.

A-9 Amount of Materials in Soil Finer than the No. 200 Sieve

Determination of the amount of materials in the soil finer than the No. 200 sieve analyses were performed on samples considered representative of the on-site soils. The laboratory test was performed in accordance with ASTM: D 1140. The test results are presented in **Figure A-5**.

A-10. Soluble Sulfates

The soluble sulfate content was determined for samples considered representative of the on-soils likely to come in contact with concrete in accordance with test method California 417. The test results are presented in **Figure A-5**.



Original Topographic Map By Mike Goodhue

ROCK SOLID ENGINEERING, INC.	**BORING LOCATION PLAN**
	49 Shearwater Lane, Pajaro Dunes

KEY TO LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of the material is larger than the No. 200 sieve	GRAVELS More than half of the coarse fraction is larger than the No. 4 sieve	CLEAN GRAVELS (Less than 5% fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	SANDS More than half of the coarse fraction is smaller than the No. 4 sieve	CLEAN SANDS (Less than 5% fines)	SW	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands, gravelly sands, little or no fines
		SAND WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS More than half of the material is smaller than the No. 200 sieve	SILTS AND CLAYS Liquid limit less than 50		ML	Inorganic silts and very fine sands, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomacaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils

GRAIN SIZE LIMITS

SILT AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		
No. 200	No. 40	No. 10	No. 4	3/4 in.	3 in.	12 in.	

US STANDARD SIEVE SIZE

RELATIVE DENSITY	
SAND AND GRAVEL	BLOWS/FT*
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

CONSISTENCY	
SILT AND CLAY	BLOWS/FT*
VERY SOFT	0 - 2
SOFT	2 - 4
FIRM	4 - 8
STIFF	8 - 16
VERY STIFF	16 - 32
HARD	OVER 32

MOISTURE CONDITION
DRY
DAMP
MOIST
WET

* Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch I.D.) split spoon (ASTM D-1586).

LOG OF EXPLORATORY BORING

Project No.:	15043	Boring:	B1
Project:	49 Shearwater Lane	Location:	Middle of Driveway
	Pajaro Dunes, California	Elevation:	~25'
Date:	September 25, 2015	Method of Drilling:	Truck Mounted Drill Rig
Logged By:	DO		8 in. Hollow Stem Auger, 140 lb. Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear φ °	Miscellaneous Laboratory Testing
				2" Asphalt over 8" Grey Baserock over Tan SAND. Dry, Non-Plastic. Fine Grained, Poorly Graded.							
	SP			Tan SAND. Moist, Medium Dense, Non-Plastic. Fine Grained, Poorly Graded.	22	97.8	2.5	100.2	210	33	Sulfate Consolidation #200 Wash
				Material Consistent.	34	94.6	3.4	98.0			
5											
				Material Consistent. Dense.	33		3.3				
10											
				Material Consistent.	68	101.9	3.2	105.1			
15											
	▽			Groundwater @ 19 Feet. Material Consistent. Saturated, Medium Dense.	27		16.2				
20											
				Material Consistent. Dense.	85	104.7	20.4	126.0			
25											

ROCK SOLID ENGINEERING, INC.

FIGURE A-3.1

LOG OF EXPLORATORY BORING

Project No.:	15043	Boring:	B1 Continued
Project:	49 Shearwater Lane	Location:	Middle of Driveway
	Pajaro Dunes, California	Elevation:	~25'
Date:	September 25, 2015	Method of Drilling:	Truck Mounted Drill Rig
Logged By:	DO		8 in. Hollow Stem Auger, 140 lb. Hammer

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear ϕ °	Miscellaneous Laboratory Testing
30	SP			Grey to Brown SAND. Saturated, Dense, Non-Plastic. Fine to Coarse Grained.	50		19.4				
				Grey Fat CLAY Encountered Above Sample.							
35				Grey Brown SAND. Saturated, Very Dense, Non-Plastic.	100+		14.9				
40				Material Consistent. 1/4" Thick Clay Layer Encountered Above Shoe.	100+		13.1				
				Material Consistent. Broken Cobble in Shoe.	100+		11.3				
45				Boring Terminated @ 44.5 ft. Groundwater Encountered @ 19 ft. Boring Backfilled With Cuttings.							
50											

LOG OF EXPLORATORY BORING

Project No.:	15043	Boring:	B2
Project:	49 Shearwater Lane	Location:	West Side of Residence
	Pajaro Dunes, California	Elevation:	~34'
Date:	October 23, 2015	Method of Drilling:	Hand Auger Equipped with 4 Inch Bit
Logged By:	DO		45 lb Hammer*

2" DIA Sample | 2.5" DIA Sample | Bulk Sample | Terzaghi Split Spoon Sample | Static Water Table

Depth (ft.)	Soil Type	Undisturbed	Bulk	Description	*Blows	Dry Density (pcf)	Moisture Content (%)	Wet Density (pcf)	Direct Shear c (psf)	Direct Shear ϕ °	Miscellaneous Laboratory Testing
				Tan SAND. Dry, Non-Plastic. Fine Grained, Poorly Graded.							
	SP			No Retrieval. Tan SAND. Dry, Loose, Non-Plastic. Fine Grained, Poorly Graded Sand.	31*						
				Material Consistent. Medium Dense.	60*		0.9				Sulfate
				Material Consistent.	60*		0.7				
5				Boring Terminated @ 4.5 ft. Groundwater Not Encountered. Boring Backfilled With Cuttings.							
10											
15											
20											
25											

ROCK SOLID ENGINEERING, INC.

FIGURE A-4

APPENDIX B

LIQUEFACTION ANALYSIS

- Methodology Page B-1
- Calculations Pages B-2 and B-3

METHODOLOGY

B-1. Our quantitative liquefaction analysis was performed on the observed soil configuration which is considered representative of the conditions at the subject site.

B-2. The analysis uses empirical predictions of earthquake-induced liquefaction potential and is based on the published methods used by Seed and others (Reference 10). This analysis is based on a comparison of the in-situ cyclic stress ration (CSR) with the CSR from historical data collected in areas which experienced liquefaction for a given magnitude earthquake and soil configuration.

B-3. The design seismic event was assumed to occur along the San Andreas Fault with a corresponding magnitude of M=7.9. Our analysis was performed assuming a peak ground acceleration (Pga) of 0.50g. This Pga corresponds to ground motions which have a 10% probability of being exceeded in 50 years.

B-4. In-situ water content and density were determined for samples considered representative of the potentially liquefiable soils encountered. The results of our laboratory testing are presented in Appendix A.

B-5. Material properties chosen for our analysis are conservatively based on laboratory test results and our experience in the vicinity.

B-6. Our calculations of the analyzed soil configuration are presented in tabular form in 1 foot increments below.

LIQUEFACTION ANALYSIS

Project No.: 15043
Project: 49 Shearwater Lane, Pajaro Dunes
Date: November 2, 2015
Run By: DO

Drilling Information	
Boring Diameter (in.):	8.0
C_E Value Based on Hammer Type:	0.4
Sampler Type:	Non-Standard SPT w/Liners Removed

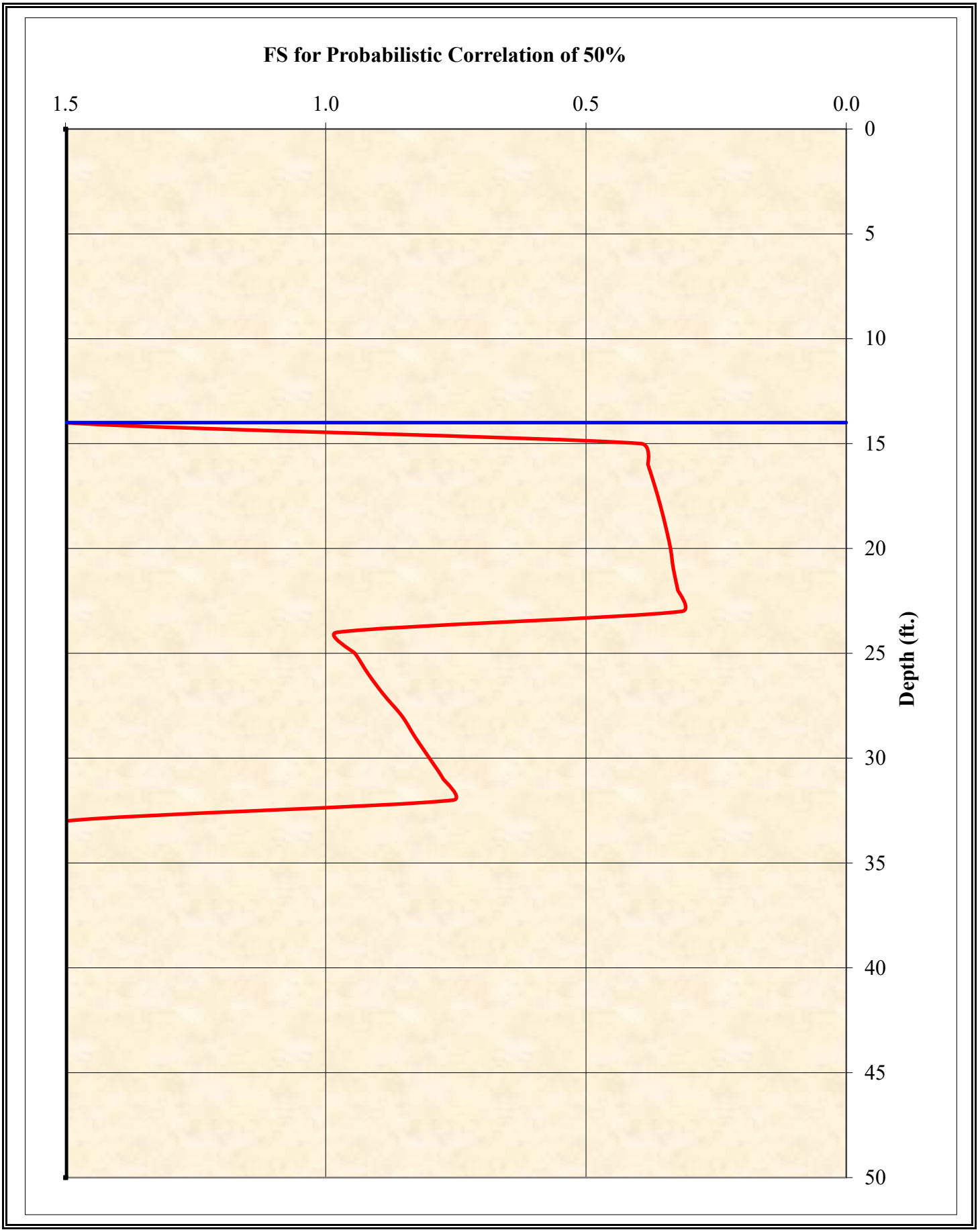
Site Information	
Design Fault:	San Andreas
Design Magnitude:	7.9
Latitude:	N36.85694
Longitude:	W121.81333
Design Pga (g):	0.50
Average Shear Wave Velocity (fps):	1000
Design Groundwater Depth (ft.)	14.0

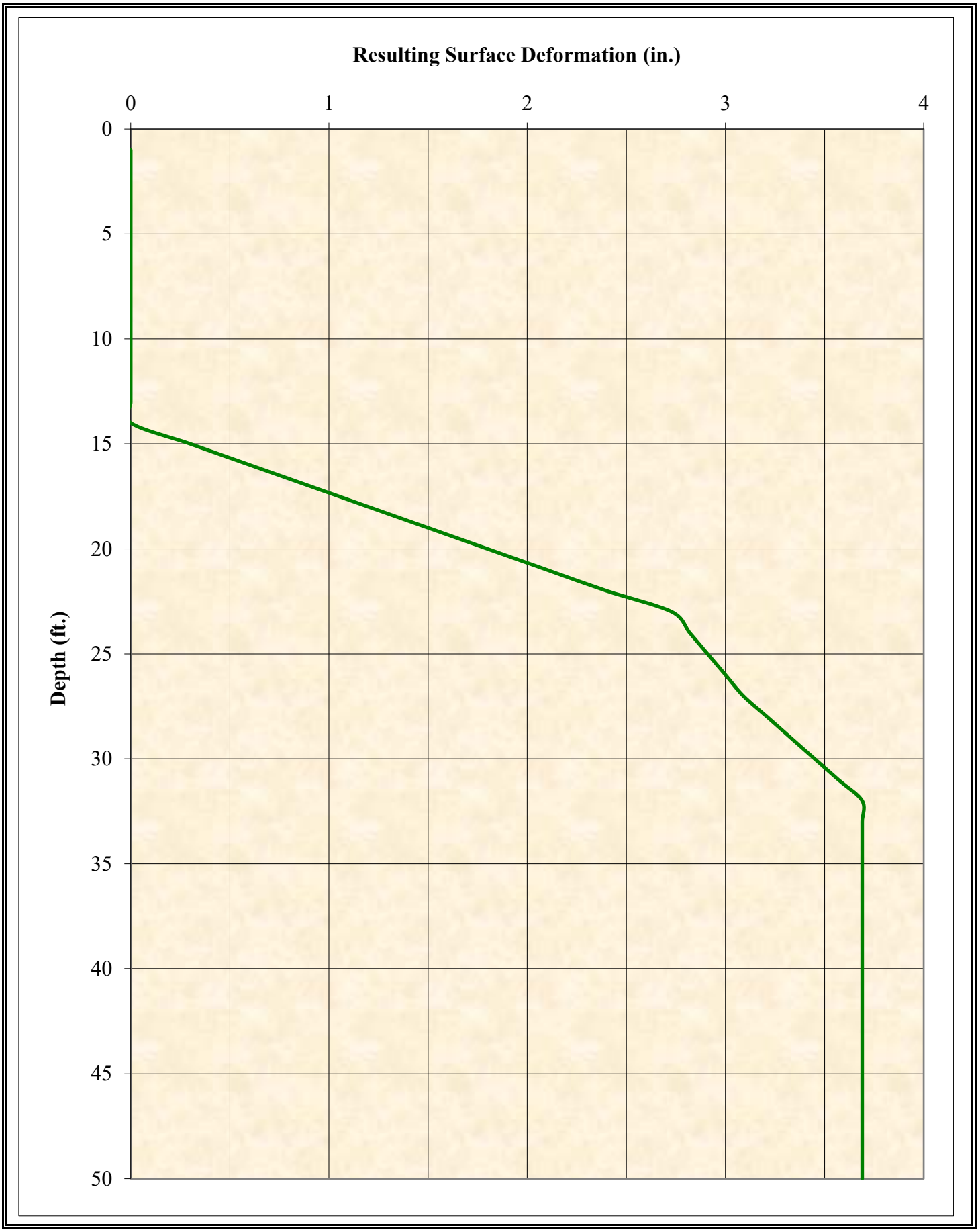
Calculations

DEPTH (ft.)	SOIL TYPE	TOTAL STRESS (psf)	EFFECTIVE STRESS (psf)	$(N_1)_{60CS}$	CSR*	SUSCEPTIBLE	CSR* NEEDED FOR LIQUEFACTION	FACTOR OF SAFETY	CUMULATIVE RECONSOLIDATION (in.)
1	SM	98	98	60.8	0.22	NO	N/A	N/A	N/A
2	SM	196	196	43.4	0.23	NO	N/A	N/A	N/A
3	SM	294	294	35.8	0.24	NO	N/A	N/A	N/A
4	SM	392	392	31.4	0.24	NO	N/A	N/A	N/A
5	SM	490	490	27.6	0.25	NO	N/A	N/A	N/A
6	SM	588	588	25.1	0.25	NO	N/A	N/A	N/A
7	SM	686	686	23.1	0.26	NO	N/A	N/A	N/A
8	SM	784	784	21.8	0.27	NO	N/A	N/A	N/A
9	SM	882	882	20.9	0.27	NO	N/A	N/A	N/A
10	SM	980	980	20.1	0.28	NO	N/A	N/A	N/A
11	SM	1078	1078	19.6	0.28	NO	N/A	N/A	N/A
12	SM	1176	1176	18.9	0.29	NO	N/A	N/A	N/A
13	SM	1281	1281	14.6	0.29	NO	N/A	N/A	N/A
14	SM	1386	1386	14.2	0.29	NO	N/A	N/A	N/A
15	SM	1491	1429	14.2	0.30	YES	0.12	0.39	0.30

Calculations (continued)

DEPTH (ft.)	SOIL TYPE	TOTAL STRESS (psf)	EFFECTIVE STRESS (psf)	$(N_1)_{60CS}$	CSR*	SUSCEPTIBLE	CSR* NEEDED FOR LIQUEFACTION	FACTOR OF SAFETY	CUMULATIVE RECONSOLIDATION (in.)
16	SM	1596	1472	14.2	0.32	YES	0.12	0.38	0.60
17	SM	1702	1514	14.3	0.33	YES	0.12	0.37	0.90
18	SM	1807	1557	14.2	0.34	YES	0.12	0.36	1.20
19	SM	1912	1600	14.2	0.35	YES	0.12	0.35	1.50
20	SM	2017	1642	14.2	0.35	YES	0.12	0.34	1.80
21	SM	2122	1685	14.1	0.36	YES	0.12	0.33	2.10
22	SM	2227	1728	14.0	0.37	YES	0.12	0.32	2.40
23	SM	2332	1771	13.9	0.37	YES	0.12	0.32	2.73
24	SM	2458	1834	28.5	0.37	YES	0.37	0.98	2.82
25	SM	2584	1898	28.1	0.38	YES	0.36	0.94	2.91
26	SM	2710	1961	27.7	0.38	YES	0.35	0.92	3.00
27	SM	2836	2025	27.3	0.38	YES	0.34	0.89	3.09
28	SM	2962	2089	26.9	0.38	YES	0.33	0.85	3.21
29	SM	3088	2152	26.5	0.38	YES	0.32	0.83	3.33
30	SM	3214	2216	26.1	0.38	YES	0.31	0.80	3.45
31	SM	3340	2279	25.7	0.38	YES	0.30	0.77	3.57
32	SM	3466	2343	25.4	0.38	YES	0.29	0.76	3.69
33	SM	3592	2407	52.0	0.38	NO	N/A	N/A	N/A
34	SM	3718	2470	51.4	0.38	NO	N/A	N/A	N/A
35	SM	3844	2534	50.8	0.38	NO	N/A	N/A	N/A
36	SM	3970	2597	50.3	0.38	NO	N/A	N/A	N/A
37	SM	4096	2661	49.7	0.38	NO	N/A	N/A	N/A
38	SM	4222	2725	49.2	0.39	NO	N/A	N/A	N/A
39	SM	4348	2788	48.7	0.38	NO	N/A	N/A	N/A
40	SM	4474	2852	48.1	0.38	NO	N/A	N/A	N/A
41	SM	4600	2915	47.6	0.38	NO	N/A	N/A	N/A
42	SM	4726	2979	47.1	0.39	NO	N/A	N/A	N/A
43	SM	4852	3043	46.7	0.38	NO	N/A	N/A	N/A
44	SM	4978	3106	46.3	0.38	NO	N/A	N/A	N/A
45	SM	5104	3170	45.8	0.38	NO	N/A	N/A	N/A
46	SM	5230	3233	45.4	0.38	NO	N/A	N/A	N/A
47	SM	5356	3297	45.0	0.38	NO	N/A	N/A	N/A
48	SM	5482	3361	44.6	0.38	NO	N/A	N/A	N/A
49	SM	5608	3424	44.2	0.38	NO	N/A	N/A	N/A
50	SM	5734	3488	43.8	0.38	NO	N/A	N/A	N/A


FS for Probabilistic Correlation of 50%
1.5
1.0
0.5
0.0
0
5
10
15
20
25
30
35
40
45
50
Depth (ft.)


Resulting Surface Deformation (in.)
0
1
2
3
4
Depth (ft.)
0
5
10
15
20
25
30
35
40
45
50

ROCK SOLID ENGINEERING, INC.
Geotechnical and Coastal Engineering • Soil Reports • Site Assessments • Expert Witness • Manufactured Homes

Project No. 15043-B
June 18, 2020

Kevin and Ingrid Donahue
2153 Waverly Street
Palo Alto, California 94301

SUBJECT: **UPDATE TO GEOTECHNICAL INVESTIGATION**
Proposed Single Family Residence
49 Shearwater Lane, Watsonville, California
APN: 052-291-12

REFERENCES: See Attached

Dear Mr. and Mrs. Donahue:

Per the request of your Project Manager, Jerrod Nichols of Fuse Architects and Builders, and in response to the County of Santa Cruz (Reference 4), we are providing this update to the Geotechnical Investigation report prepared by our firm in April 2019 (Reference 5).

As the California Building Code has been updated (effective January 1, 2020), we have made revisions to the following portions of the report to conform to the 2019 California Building Code:

- Geotechnical Hazards (Section 4)
- Liquefaction Analysis (Section 4.2)
- Surface Drainage (Section 5.2.11)
- Lateral Earth Pressures (Section 5.5.2)
- Slabs-on-Grade (Section 5.6)

In addition, we have addressed the county comments to update the liquefaction analysis to comply with ASCE 7-16 and provide the total seismically induced design settlements for saturated and unsaturated sands.

The following updated sections are numbered in accordance with the original soils report. The remaining portions of the report generally continue to apply.

4. GEOTECHNICAL HAZARDS

The following seismic design criteria has been updated in accordance with the 2019 California Building Code (CBC).

The subject site is situated at the approximate latitude of 36°51' 25" and longitude -121°48' 48". The project location (latitude and longitude) were used in conjunction with the American Society of Civil Engineers website (Reference 1) to obtain the seismic design parameters presented in **Table 1**. All proposed structures at the subject site shall be designed with the corresponding seismic design parameters in accordance with the 2019 California Building Code (Reference 3).

Table 1: 2019 CBC Seismic Design Criteria

Site Class	Seismic Design Category	Spectral Response Accelerations							
		S_S	S_1	F_A	F_V	S_{MS}	S_{M1}	S_{DS}	S_{D1}
C*	D	1.831	0.674	1.2	1.4	2.197	0.944	1.465	0.629

*Because the Fundamental Period of the Building is expected to be less than 0.5s, the Site Class has been assigned as C rather than F in accordance with ASCE 7-16 Section 20.3.

4.2 Liquefaction Analysis

We have updated our liquefaction analysis to reflect the changes in the California Building Code and ASCE 7-16. We have edited our calculation to include an updated peak ground acceleration (PGA_M) of 0.903. Additionally, we revised the Hammer Energy Transfer Ratio (ER). We have updated the Hammer Energy Transfer Ratio (ER) because our original calculation conservatively used the actual reported ratio (ER) as opposed to the standardized ratio (ER/60) as recommended in the Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California.

The results of our quantitative liquefaction analysis indicate that the underlying sand, situated below the groundwater level to a depth of approximately 33 feet below existing grade, remains **susceptible** to liquefaction during the design seismic event. The methodology and calculations of our analysis are presented in Appendix A.

In addition to the settlement caused by liquefaction of the soils below the groundwater table, the loose sand encountered above the groundwater table is prone to volumetric compression (dry sand settlements) during a seismic event. Therefore we have calculated the dry sand settlement for the site using the Tokimatsu and Seed method (1987).

Our calculations indicate that there is no change to the resulting surface deformation of the site due to liquefaction during the design seismic event. The calculated surface deformation for both dry sand settlement and surface deformation caused by liquefaction is calculated to be approximately 4 inches. This settlement can occur beneath the entire structure, or differentially, across the least dimension of the structure.

Based on our review of ASCE 7-16 (Reference 1), the design threshold for vertical displacement, as outlined in ASCE 7-16 (Section 12.13), is 0.10L, where L is a defined length. Per the project manager, Jerrod Nichols of Fuse Architects and Builders, the proposed structure will be 54 feet long and 46 feet 9 inches wide. The maximum allowed vertical displacement, is calculated to be 0.010*46.75ft*(12in/1ft)=**5.61** inches. Therefore, the vertical displacement calculated in our liquefaction analysis remains under the design thresholds outlined in ASCE 7-16.

5.2.11 Surface Drainage

a. Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. Where soil is adjacent to foundations, a minimum gradient of **5 percent for a distance of no less than 10 feet** measured perpendicularly from the wall face, should be maintained and drainage should be directed toward approved swales or drainage facilities. If 10 horizontal feet can not be satisfied due to lot lines or physical constraints, the drainage shall be designed in accordance with the requirements of Section 1804.4 of the 2019 California Building Code.

b. Swales and impervious surfaces shall be sloped a minimum of 2 percent towards an approved drainage inlet or discharge point or as specified by the Project Civil Engineer.

c. Where climatic conditions warrant, the slope of the ground away from the building foundation shall be permitted to be reduced to not less than 2 percent. Due to the presence of sand with little to no fines, rapid infiltration of surface runoff is anticipated. We consider the climatic conditions of the site warrant this reduction.

d. All roof eaves should be guttered with downspouts provided. The downspouts shall discharge to either splash blocks or solid pipe to carry the storm water away from the structure to reduce the possibility of soil saturation and erosion. It may be necessary to use swales or pipes to direct the runoff to an appropriate drainage system or discharge location.

e. Drainage patterns approved at the time of construction should be maintained throughout the life of the structures. The building and surface drainage facilities must not be altered nor any grading, filling, or excavation conducted in the area without prior review by the Geotechnical Consultant.

f. Irrigation activities at the site should be controlled and reasonable. Planter areas should not be sited adjacent to walls without implementing approved measures to contain irrigation water and prevent it from seeping into walls and under foundations and slabs-on-grade. Large trees should be planted a minimum distance of ½ their mature height away from the foundation.

5.5.2 Lateral Earth Pressures

When required by the code, lateral load due to earthquakes may be calculated as $17H^2$ acting at 0.6H above the base of the wall.

5.6 Slabs-on-Grade

a. Concrete floor slabs may be founded on compacted engineered fill per the recommendations in Section 5.2.6. The subgrade should be proof-rolled just prior to construction to provide a firm, relatively unyielding surface, especially if the surface has been loosened by the passage of construction traffic.

b. It is important that the subgrade soils be thoroughly saturated for 24 to 48 hours prior to the time the concrete is poured. **For compacted engineered fill with a low expansion potential, the subgrade should be presoaked 4 percentage points above optimum to a depth of 1.0 feet**.

c. The slab-on-grade section should incorporate a minimum 4 inch capillary break consisting of 3/4 inch, clean, crushed rock, or approved equivalent. Class II baserock is not recommended. Structural considerations may govern the thickness of the capillary break.

d. Where moisture sensitive floor coverings are anticipated or vapor transmission may be a problem, a 15 mil waterproof membrane should be placed between the floor slab and the capillary break in order to reduce moisture condensation under the floor coverings. Refer to ACI 302.2R-06 for additional criteria.

e. We have provided generalized recommendations associated with standard construction practices for the reduction of moisture transmission through concrete slab-on-grade floors. We are not moisture-proofing specialist. A waterproofing or moisture proofing expert should be consulted for project specific moisture protection recommendations

f. Slab thickness, reinforcement, and doweling should be determined by the Project Structural Engineer, based on the design live and dead loads, including vehicles.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office.

Sincerely,

ROCK SOLID ENGINEERING, INC.

Signed: June 19, 2020

Dusty M. Osburn, P.E.
Senior Engineer
R.C.E. 85113

Attachmets: Appendix A Liquefaction Analysis

Distribution: (4) Addressee and via email
(1) Jerrod Nichols and via email

REFERENCES

1. American Society of Civil Engineers, ASCE 7 Hazards Report, Site Utilized April 20, 2020. https://www.asce7hazardtool.online/

2. ASCE/SEI 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Copyright 2017.

3. California Building Standards Commission, July 2019, 2019 California Building Code, California Code of Regulations, Title 24, Part 2, Effective January 1, 2020.

4. County of Santa Cruz Planning Department, Project Site: 49 Shearwater Lane, APN 052-291-12, Application No. B-201105, Subject: Review of the Geotechnical Investigation for the Proposed Single-Family Residence at 49 Shearwater Lane/APN 052-291-12 dated 10 April 2019 by Rock Solid Engineering, Inc. - Project No. 15043-B, Dated 6 April 2020.

5. Rock Solid Engineering, Inc., Geotechnical Investigation-Design Phase, Proposed Single Family Residence, 49 Shearwater Lane, Watsonville, California 95076, APN 052-291-12, Project No. 15043-B, Dated April 10, 2019.

APPENDIX A

LIQUEFACTION ANALYSIS

- Methodology Page A-1
- Calculations Pages A-2 and A-3

METHODOLOGY

A-1. Our quantitative liquefaction analysis was performed on the observed soil configuration which is considered representative of the conditions at the subject site.

A-2. The analysis uses empirical predictions of earthquake-induced liquefaction potential and is based on the published methods used by Seed and others (Reference 10). This analysis is based on a comparison of the in-situ cyclic stress ration (CSR) with the CSR from historical data collected in areas which experienced liquefaction for a given magnitude earthquake and soil configuration.

A-3. The design seismic event was assumed to occur along the San Andreas Fault with a corresponding magnitude of M=7.9. Our analysis was performed assuming a peak ground acceleration (Pga) of 0.903g. This Pga corresponds to ground motions which have a 10% probability of being exceeded in 50 years.

A-4. In-situ water content and density were determined for samples considered representative of the potentially liquefiable soils encountered. The results of our laboratory testing are presented in Appendix A.

A-5. Material properties chosen for our analysis are conservatively based on laboratory test results and our experience in the vicinity.

A-6. Our calculations of the analyzed soil configuration are presented in tabular form in 1 foot increments below.

LIQUEFACTION ANALYSIS

Project No.: 15043-B - Update to 2019 Buidling Code
Project: 49 Shearwater Lane, Pajaro Dunes
Date: June 18, 2020
Run By: DO

Drilling Information	
Boring Diameter (in.):	8.0
C_E Value Based on Hammer Type:	0.6
Sampler Type:	Non-Standard SPT w/Liners Removed

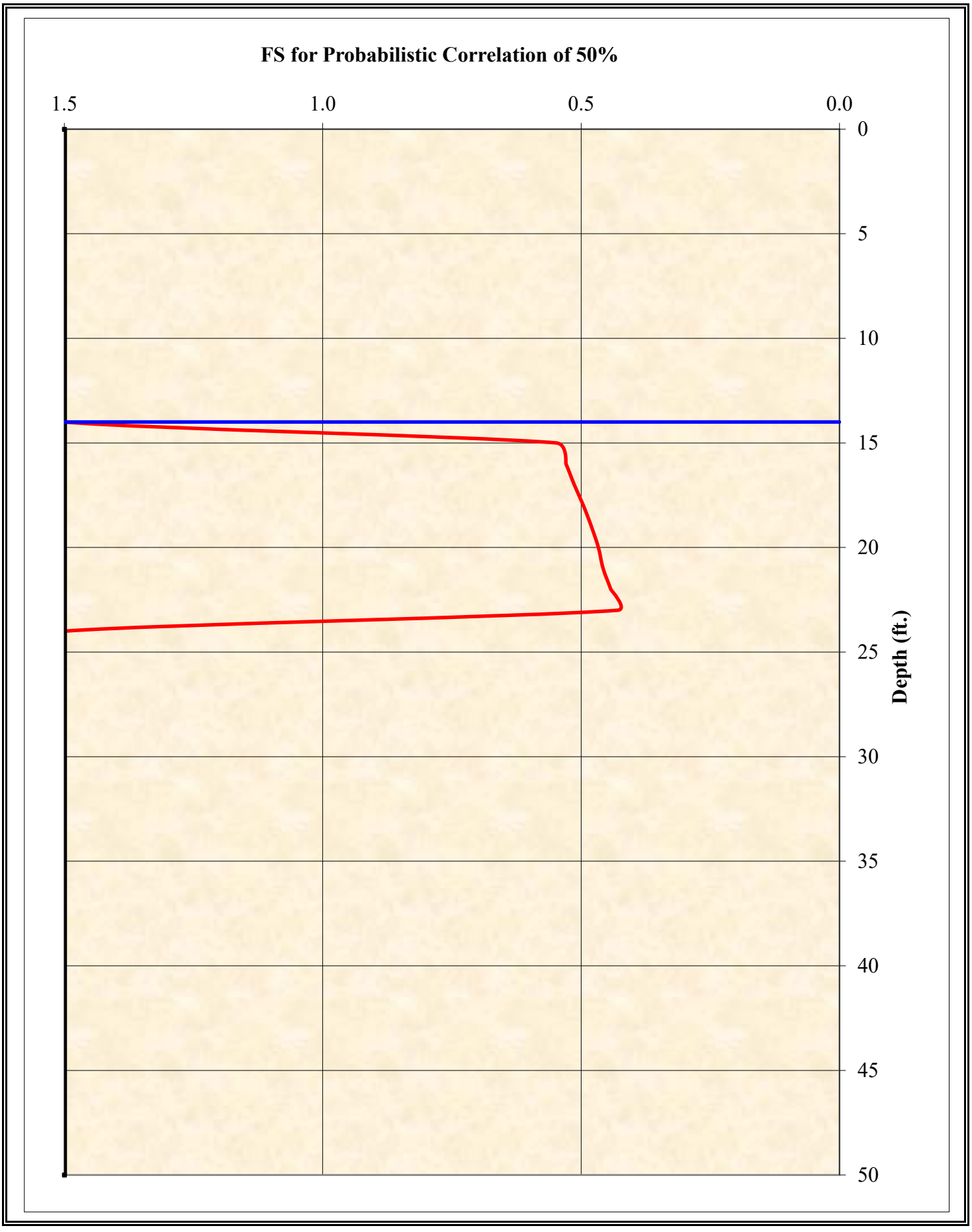
Site Information	
Design Fault:	San Andreas
Design Magnitude:	7.9
Latitude:	N36.85694
Longitude:	W121.81333
Design Pga (g):	0.90
Average Shear Wave Velocity (fps):	1000
Design Groundwater Depth (ft.)	14.0

Calculations

DEPTH (ft.)	SOIL TYPE	TOTAL STRESS (psf)	EFFECTIVE STRESS (psf)	$(N_1)_{60CS}$	CSR*	SUSCEPTIBLE	CSR* NEEDED FOR LIQUEFACTION	FACTOR OF SAFETY	CUMULATIVE RECONSOLIDATION (in.)
1	SM	98	98	101.2	0.40	NO	N/A	N/A	N/A
2	SM	196	196	72.1	0.41	NO	N/A	N/A	N/A
3	SM	294	294	59.5	0.42	NO	N/A	N/A	N/A
4	SM	392	392	52.2	0.44	NO	N/A	N/A	N/A
5	SM	490	490	47.0	0.45	NO	N/A	N/A	N/A
6	SM	588	588	43.5	0.46	NO	N/A	N/A	N/A
7	SM	686	686	40.7	0.47	NO	N/A	N/A	N/A
8	SM	784	784	38.7	0.48	NO	N/A	N/A	N/A
9	SM	882	882	37.5	0.49	NO	N/A	N/A	N/A
10	SM	980	980	36.3	0.50	NO	N/A	N/A	N/A
11	SM	1078	1078	35.5	0.51	NO	N/A	N/A	N/A
12	SM	1176	1176	34.4	0.52	NO	N/A	N/A	N/A
13	SM	1281	1281	26.6	0.52	NO	N/A	N/A	N/A
14	SM	1386	1386	25.9	0.53	NO	N/A	N/A	N/A
15	SM	1491	1429	25.9	0.55	YES	0.30	0.55	0.18

Calculations (continued)

DEPTH (ft.)	SOIL TYPE	TOTAL STRESS (psf)	EFFECTIVE STRESS (psf)	$(N_1)_{60CS}$	CSR*	SUSCEPTIBLE	CSR* NEEDED FOR LIQUEFACTION	FACTOR OF SAFETY	CUMULATIVE RECONSOLIDATION (in.)
16	SM	1596	1472	25.9	0.57	YES	0.30	0.53	0.36
17	SM	1702	1514	26.0	0.59	YES	0.30	0.51	0.54
18	SM	1807	1557	25.9	0.61	YES	0.30	0.50	0.75
19	SM	1912	1600	25.8	0.62	YES	0.30	0.48	0.96
20	SM	2017	1642	25.7	0.64	YES	0.30	0.47	1.17
21	SM	2122	1685	25.7	0.65	YES	0.30	0.46	1.38
22	SM	2227	1728	25.5	0.66	YES	0.29	0.44	1.59
23	SM	2332	1771	25.3	0.67	YES	0.29	0.43	1.80
24	SM	2458	1834	48.2	0.68	NO	N/A	N/A	N/A
25	SM	2584	1898	47.7	0.68	NO	N/A	N/A	N/A
26	SM	2710	1961	47.1	0.68	NO	N/A	N/A	N/A
27	SM	2836	2025	46.6	0.68	NO	N/A	N/A	N/A
28	SM	2962	2089	46.0	0.69	NO	N/A	N/A	N/A
29	SM	3088	2152	45.5	0.69	NO	N/A	N/A	N/A
30	SM	3214	2216	45.0	0.69	NO	N/A	N/A	N/A
31	SM	3340	2279	44.4	0.69	NO	N/A	N/A	N/A
32	SM	3466	2343	43.9	0.69	NO	N/A	N/A	N/A
33	SM	3592	2407	86.6	0.69	NO	N/A	N/A	N/A
34	SM	3718	2470	85.5	0.69	NO	N/A	N/A	N/A
35	SM	3844	2534	84.6	0.69	NO	N/A	N/A	N/A
36	SM	3970	2597	83.6	0.69	NO	N/A	N/A	N/A
37	SM	4096	2661	82.7	0.69	NO	N/A	N/A	N/A
38	SM	4222	2725	81.8	0.70	NO	N/A	N/A	N/A
39	SM	4348	2788	80.9	0.69	NO	N/A	N/A	N/A
40	SM	4474	2852	80.0	0.69	NO	N/A	N/A	N/A
41	SM	4600	2915	79.2	0.69	NO	N/A	N/A	N/A
42	SM	4726	2979	78.4	0.70	NO	N/A	N/A	N/A
43	SM	4852	3043	77.7	0.69	NO	N/A	N/A	N/A
44	SM	4978	3106	76.9	0.69	NO	N/A	N/A	N/A
45	SM	5104	3170	76.2	0.69	NO	N/A	N/A	N/A
46	SM	5230	3233	75.5	0.69	NO	N/A	N/A	N/A
47	SM	5356	3297	74.8	0.69	NO	N/A	N/A	N/A
48	SM	5482	3361	74.1	0.69	NO	N/A	N/A	N/A
49	SM	5608	3424	73.5	0.69	NO	N/A	N/A	N/A
50	SM	5734	3488	72.9	0.69	NO	N/A	N/A	N/A


FS for Probabilistic Correlation of 50%
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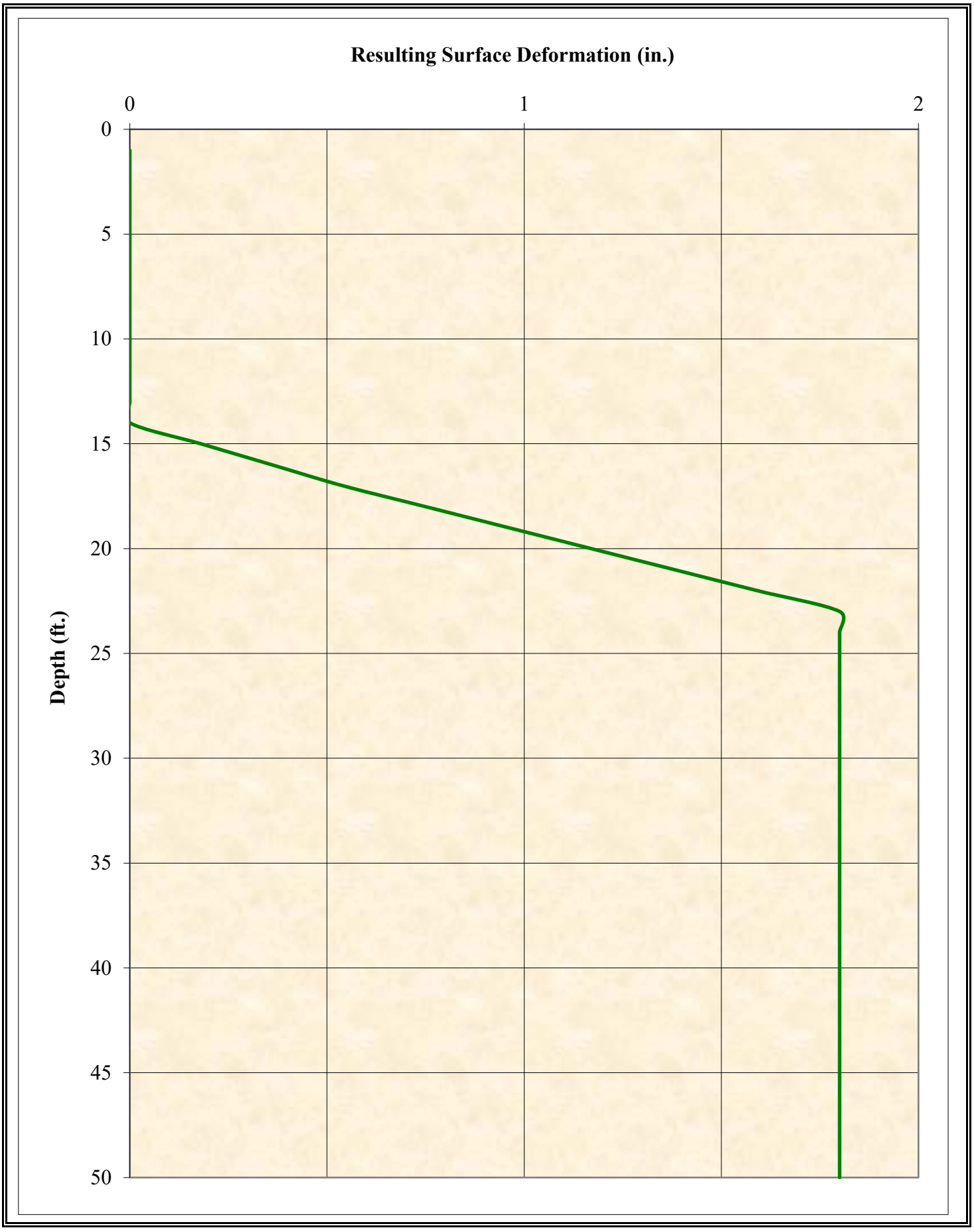
1.0
0.5
0.0
0
5
10
15
20
25
30
35
40
45
50
Depth (ft.)


Resulting Surface Deformation (in.)
0
1
2
Depth (ft.)
0
5
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20
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35
40
45
50

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Project No. 15043-B
June 18, 2020

Kevin and Ingrid Donahue
2153 Waverly Street
Palo Alto, California 94301

SUBJECT: **UPDATE TO GEOTECHNICAL INVESTIGATION**
Proposed Single Family Residence
49 Shearwater Lane, Watsonville, California
APN: 052-291-12

REFERENCES: See Attached

Dear Mr. and Mrs. Donahue:

Per the request of your Project Manager, Jerrod Nichols of Fuse Architects and Builders, and in response to the County of Santa Cruz (Reference 4), we are providing this update to the Geotechnical Investigation report prepared by our firm in April 2019 (Reference 5).

As the California Building Code has been updated (effective January 1, 2020), we have made revisions to the following portions of the report to conform to the 2019 California Building Code:

- Geotechnical Hazards (Section 4)
- Liquefaction Analysis (Section 4.2)
- Surface Drainage (Section 5.2.11)
- Lateral Earth Pressures (Section 5.5.2)
- Slabs-on-Grade (Section 5.6)

In addition, we have addressed the county comments to update the liquefaction analysis to comply with ASCE 7-16 and provide the total seismically induced design settlements for saturated and unsaturated sands.

The following updated sections are numbered in accordance with the original soils report. The remaining portions of the report generally continue to apply.

4. GEOTECHNICAL HAZARDS

The following seismic design criteria has been updated in accordance with the 2019 California Building Code (CBC).

The subject site is situated at the approximate latitude of 36°51' 25" and longitude -121°48' 48". The project location (latitude and longitude) were used in conjunction with the American Society of Civil Engineers website (Reference 1) to obtain the seismic design parameters presented in **Table 1**. All proposed structures at the subject site shall be designed with the corresponding seismic design parameters in accordance with the 2019 California Building Code (Reference 3).

Table 1: 2019 CBC Seismic Design Criteria

Site Class	Seismic Design Category	Spectral Response Accelerations							
		S_S	S_1	F_A	F_V	S_{MS}	S_{M1}	S_{DS}	S_{D1}
C*	D	1.831	0.674	1.2	1.4	2.197	0.944	1.465	0.629

*Because the Fundamental Period of the Building is expected to be less than 0.5s, the Site Class has been assigned as C rather than F in accordance with ASCE 7-16 Section 20.3.

4.2 Liquefaction Analysis

We have updated our liquefaction analysis to reflect the changes in the California Building Code and ASCE 7-16. We have edited our calculation to include an updated peak ground acceleration (PGA_M) of 0.903. Additionally, we revised the Hammer Energy Transfer Ratio (ER). We have updated the Hammer Energy Transfer Ratio (ER) because our original calculation conservatively used the actual reported ratio (ER) as opposed to the standardized ratio (ER/60) as recommended in the Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California.

The results of our quantitative liquefaction analysis indicate that the underlying sand, situated below the groundwater level to a depth of approximately 33 feet below existing grade, remains **susceptible** to liquefaction during the design seismic event. The methodology and calculations of our analysis are presented in Appendix A.

In addition to the settlement caused by liquefaction of the soils below the groundwater table, the loose sand encountered above the groundwater table is prone to volumetric compression (dry sand settlements) during a seismic event. Therefore we have calculated the dry sand settlement for the site using the Tokimatsu and Seed method (1987).

Our calculations indicate that there is no change to the resulting surface deformation of the site due to liquefaction during the design seismic event. The calculated surface deformation for both dry sand settlement and surface deformation caused by liquefaction is calculated to be approximately 4 inches. This settlement can occur beneath the entire structure, or differentially, across the least dimension of the structure.

Based on our review of ASCE 7-16 (Reference 1), the design threshold for vertical displacement, as outlined in ASCE 7-16 (Section 12.13), is 0.10L, where L is a defined length. Per the project manager, Jerrod Nichols of Fuse Architects and Builders, the proposed structure will be 54 feet long and 46 feet 9 inches wide. The maximum allowed vertical displacement, is calculated to be 0.010*46.75ft*(12in/1ft)=**5.61** inches. Therefore, the vertical displacement calculated in our liquefaction analysis remains under the design thresholds outlined in ASCE 7-16.

5.2.11 Surface Drainage

a. Pad drainage should be designed to collect and direct surface water away from structures to approved drainage facilities. Where soil is adjacent to foundations, a minimum gradient of **5 percent for a distance of no less than 10 feet** measured perpendicularly from the wall face, should be maintained and drainage should be directed toward approved swales or drainage facilities. If 10 horizontal feet can not be satisfied due to lot lines or physical constraints, the drainage shall be designed in accordance with the requirements of Section 1804.4 of the 2019 California Building Code.

b. Swales and impervious surfaces shall be sloped a minimum of 2 percent towards an approved drainage inlet or discharge point or as specified by the Project Civil Engineer.

c. Where climatic conditions warrant, the slope of the ground away from the building foundation shall be permitted to be reduced to not less than 2 percent. Due to the presence of sand with little to no fines, rapid infiltration of surface runoff is anticipated. We consider the climatic conditions of the site warrant this reduction.

d. All roof eaves should be guttered with downspouts provided. The downspouts shall discharge to either splash blocks or solid pipe to carry the storm water away from the structure to reduce the possibility of soil saturation and erosion. It may be necessary to use swales or pipes to direct the runoff to an appropriate drainage system or discharge location.

e. Drainage patterns approved at the time of construction should be maintained throughout the life of the structures. The building and surface drainage facilities must not be altered nor any grading, filling, or excavation conducted in the area without prior review by the Geotechnical Consultant.

f. Irrigation activities at the site should be controlled and reasonable. Planter areas should not be sited adjacent to walls without implementing approved measures to contain irrigation water and prevent it from seeping into walls and under foundations and slabs-on-grade. Large trees should be planted a minimum distance of ½ their mature height away from the foundation.

5.5.2 Lateral Earth Pressures

When required by the code, lateral load due to earthquakes may be calculated as $17H^2$ acting at 0.6H above the base of the wall.

5.6 Slabs-on-Grade

a. Concrete floor slabs may be founded on compacted engineered fill per the recommendations in Section 5.2.6. The subgrade should be proof-rolled just prior to construction to provide a firm, relatively unyielding surface, especially if the surface has been loosened by the passage of construction traffic.

b. It is important that the subgrade soils be thoroughly saturated for 24 to 48 hours prior to the time the concrete is poured. **For compacted engineered fill with a low expansion potential, the subgrade should be presoaked 4 percentage points above optimum to a depth of 1.0 feet**.

c. The slab-on-grade section should incorporate a minimum 4 inch capillary break consisting of 3/4 inch, clean, crushed rock, or approved equivalent. Class II baserock is not recommended. Structural considerations may govern the thickness of the capillary break.

d. Where moisture sensitive floor coverings are anticipated or vapor transmission may be a problem, a 15 mil waterproof membrane should be placed between the floor slab and the capillary break in order to reduce moisture condensation under the floor coverings. Refer to ACI 302.2R-06 for additional criteria.

e. We have provided generalized recommendations associated with standard construction practices for the reduction of moisture transmission through concrete slab-on-grade floors. We are not moisture-proofing specialist. A waterproofing or moisture proofing expert should be consulted for project specific moisture protection recommendations

f. Slab thickness, reinforcement, and doweling should be determined by the Project Structural Engineer, based on the design live and dead loads, including vehicles.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office.

Sincerely,

ROCK SOLID ENGINEERING, INC.

Signed: June 19, 2020

Dusty M. Osburn, P.E.
Senior Engineer
R.C.E. 85113

Attachmets: Appendix A Liquefaction Analysis

Distribution: (4) Addressee and via email
(1) Jerrod Nichols and via email

REFERENCES

1. American Society of Civil Engineers, ASCE 7 Hazards Report, Site Utilized April 20, 2020. https://www.asce7hazardtool.online/

2. ASCE/SEI 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Copyright 2017.

3. California Building Standards Commission, July 2019, 2019 California Building Code, California Code of Regulations, Title 24, Part 2, Effective January 1, 2020.

4. County of Santa Cruz Planning Department, Project Site: 49 Shearwater Lane, APN 052-291-12, Application No. B-201105, Subject: Review of the Geotechnical Investigation for the Proposed Single-Family Residence at 49 Shearwater Lane/APN 052-291-12 dated 10 April 2019 by Rock Solid Engineering, Inc. - Project No. 15043-B, Dated 6 April 2020.

5. Rock Solid Engineering, Inc., Geotechnical Investigation-Design Phase, Proposed Single Family Residence, 49 Shearwater Lane, Watsonville, California 95076, APN 052-291-12, Project No. 15043-B, Dated April 10, 2019.

APPENDIX A

LIQUEFACTION ANALYSIS

- Methodology Page A-1
- Calculations Pages A-2 and A-3

METHODOLOGY

A-1. Our quantitative liquefaction analysis was performed on the observed soil configuration which is considered representative of the conditions at the subject site.

A-2. The analysis uses empirical predictions of earthquake-induced liquefaction potential and is based on the published methods used by Seed and others (Reference 10). This analysis is based on a comparison of the in-situ cyclic stress ration (CSR) with the CSR from historical data collected in areas which experienced liquefaction for a given magnitude earthquake and soil configuration.

A-3. The design seismic event was assumed to occur along the San Andreas Fault with a corresponding magnitude of M=7.9. Our analysis was performed assuming a peak ground acceleration (Pga) of 0.903g. This Pga corresponds to ground motions which have a 10% probability of being exceeded in 50 years.

A-4. In-situ water content and density were determined for samples considered representative of the potentially liquefiable soils encountered. The results of our laboratory testing are presented in Appendix A.

A-5. Material properties chosen for our analysis are conservatively based on laboratory test results and our experience in the vicinity.

A-6. Our calculations of the analyzed soil configuration are presented in tabular form in 1 foot increments below.

LIQUEFACTION ANALYSIS

Project No.: 15043-B - Update to 2019 Buidling Code
Project: 49 Shearwater Lane, Pajaro Dunes
Date: June 18, 2020
Run By: DO

Drilling Information	
Boring Diameter (in.):	8.0
C_E Value Based on Hammer Type:	0.6
Sampler Type:	Non-Standard SPT w/Liners Removed

Site Information	
Design Fault:	San Andreas
Design Magnitude:	7.9
Latitude:	N36.85694
Longitude:	W121.81333
Design Pga (g):	0.90
Average Shear Wave Velocity (fps):	1000
Design Groundwater Depth (ft.)	14.0

Calculations

DEPTH (ft.)	SOIL TYPE	TOTAL STRESS (psf)	EFFECTIVE STRESS (psf)	$(N_1)_{60CS}$	CSR*	SUSCEPTIBLE	CSR* NEEDED FOR LIQUEFACTION	FACTOR OF SAFETY	CUMULATIVE RECONSOLIDATION (in.)
1	SM	98	98	101.2	0.40	NO	N/A	N/A	N/A
2	SM	196	196	72.1	0.41	NO	N/A	N/A	N/A
3	SM	294	294	59.5	0.42	NO	N/A	N/A	N/A
4	SM	392	392	52.2	0.44	NO	N/A	N/A	N/A
5	SM	490	490	47.0	0.45	NO	N/A	N/A	N/A
6	SM	588	588	43.5	0.46	NO	N/A	N/A	N/A
7	SM	686	686	40.7	0.47	NO	N/A	N/A	N/A
8	SM	784	784	38.7	0.48	NO	N/A	N/A	N/A
9	SM	882	882	37.5	0.49	NO	N/A	N/A	N/A
10	SM	980	980	36.3	0.50	NO	N/A	N/A	N/A
11	SM	1078	1078	35.5	0.51	NO	N/A	N/A	N/A
12	SM	1176	1176	34.4	0.52	NO	N/A	N/A	N/A
13	SM	1281	1281	26.6	0.52	NO	N/A	N/A	N/A
14	SM	1386	1386	25.9	0.53	NO	N/A	N/A	N/A
15	SM	1491	1429	25.9	0.55	YES	0.30	0.55	0.18

Calculations (continued)

DEPTH (ft.)	SOIL TYPE	TOTAL STRESS (psf)	EFFECTIVE STRESS (psf)	$(N_1)_{60CS}$	CSR*	SUSCEPTIBLE	CSR* NEEDED FOR LIQUEFACTION	FACTOR OF SAFETY	CUMULATIVE RECONSOLIDATION (in.)
16	SM	1596	1472	25.9	0.57	YES	0.30	0.53	0.36
17	SM	1702	1514	26.0	0.59	YES	0.30	0.51	0.54
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20	SM	2017	1642	25.7	0.64	YES	0.30	0.47	1.17
21	SM	2122	1685	25.7	0.65	YES	0.30	0.46	1.38
22	SM	2227	1728	25.5	0.66	YES	0.29	0.44	1.59
23	SM	2332	1771	25.3	0.67	YES	0.29	0.43	1.80
24	SM	2458	1834	48.2	0.68	NO	N/A	N/A	N/A
25	SM	2584	1898	47.7	0.68	NO	N/A	N/A	N/A
26	SM	2710	1961	47.1	0.68	NO	N/A	N/A	N/A
27	SM	2836	2025	46.6	0.68	NO	N/A	N/A	N/A
28	SM	2962	2089	46.0	0.69	NO	N/A	N/A	N/A
29	SM	3088	2152	45.5	0.69	NO	N/A	N/A	N/A
30	SM	3214	2216	45.0	0.69	NO	N/A	N/A	N/A
31	SM	3340	2279	44.4	0.69	NO	N/A	N/A	N/A
32	SM	3466	2343	43.9	0.69	NO	N/A	N/A	N/A
33	SM	3592	2407	86.6	0.69	NO	N/A	N/A	N/A
34	SM	3718	2470	85.5	0.69	NO	N/A	N/A	N/A
35	SM	3844	2534	84.6	0.69	NO	N/A	N/A	N/A
36	SM	3970	2597	83.6	0.69	NO	N/A	N/A	N/A
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38	SM	4222	2725	81.8	0.70	NO	N/A	N/A	N/A
39	SM	4348	2788	80.9	0.69	NO	N/A	N/A	N/A
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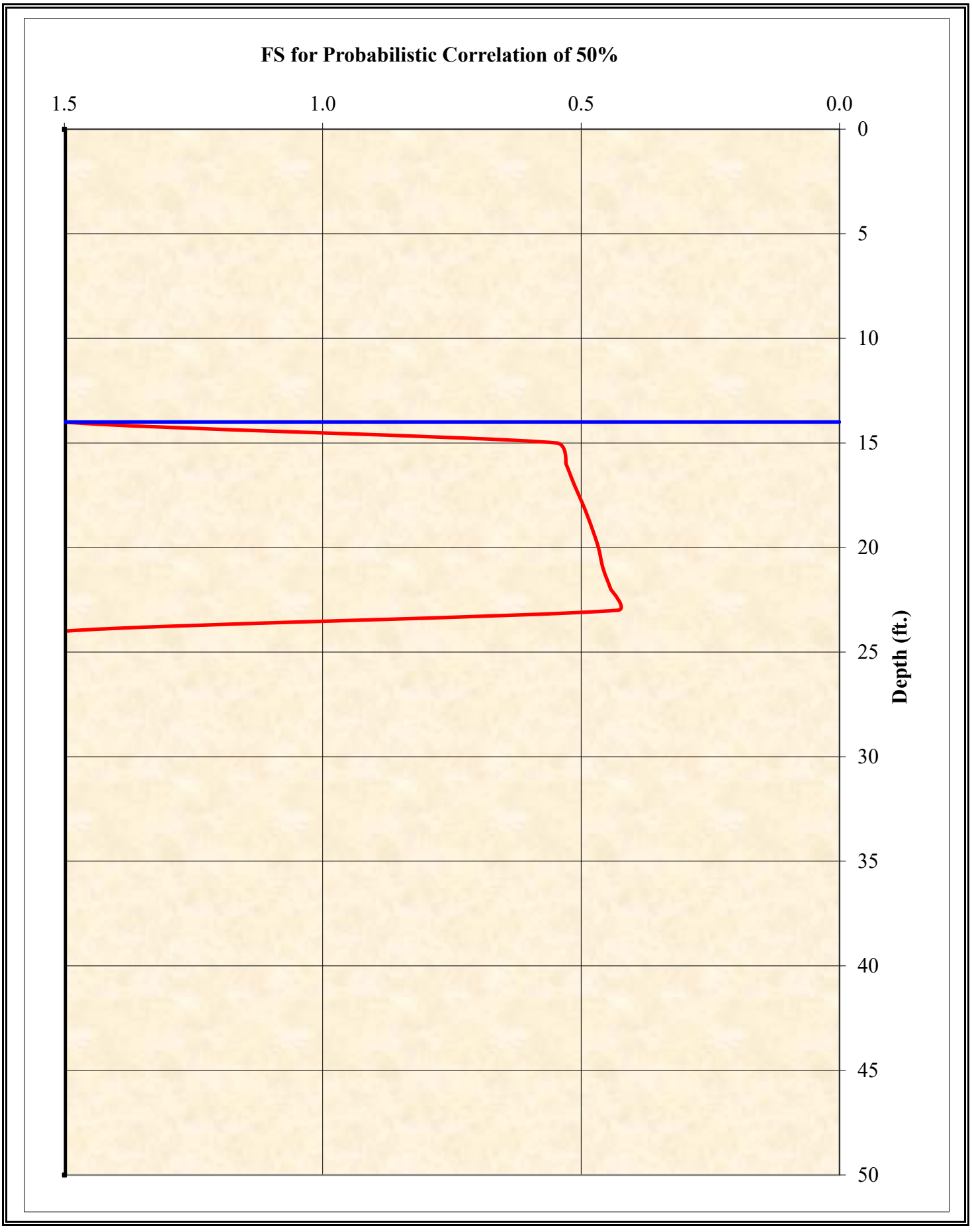
41	SM	4600	2915	79.2	0.69	NO	N/A	N/A	N/A
42	SM	4726	2979	78.4	0.70	NO	N/A	N/A	N/A
43	SM	4852	3043	77.7	0.69	NO	N/A	N/A	N/A
44	SM	4978	3106	76.9	0.69	NO	N/A	N/A	N/A
45	SM	5104	3170	76.2	0.69	NO	N/A	N/A	N/A
46	SM	5230	3233	75.5	0.69	NO	N/A	N/A	N/A
47	SM	5356	3297	74.8	0.69	NO	N/A	N/A	N/A
48	SM	5482	3361	74.1	0.69	NO	N/A	N/A	N/A
49	SM	5608	3424	73.5	0.69	NO	N/A	N/A	N/A
50	SM	5734	3488	72.9	0.69	NO	N/A	N/A	N/A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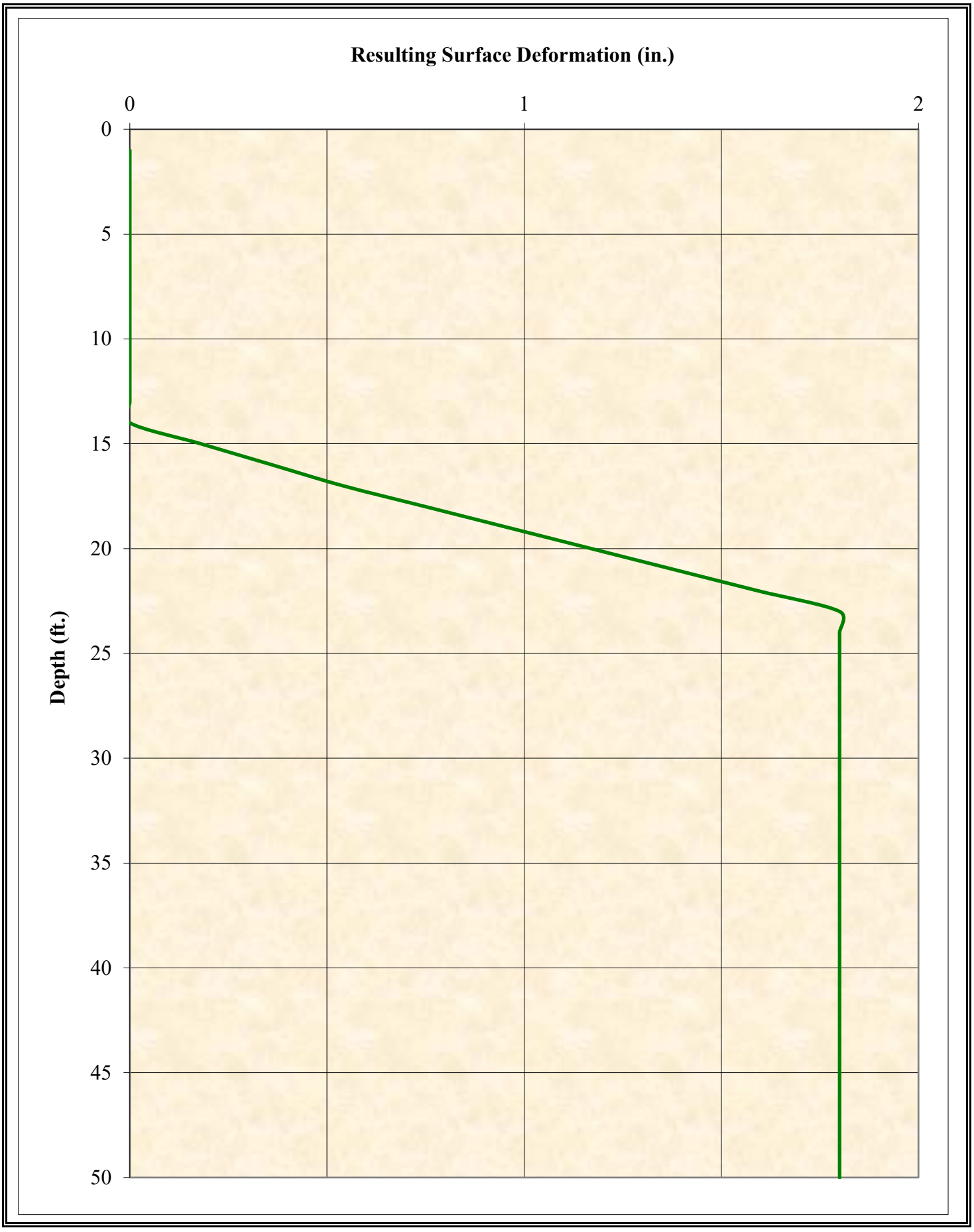
Depth (ft.)


Resulting Surface Deformation (in.)
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Depth (ft.)
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Project No. 15043-B
January 19, 2021

Kevin and Ingrid Donahue
2153 Waverley Street
Palo Alto, California 94301

SUBJECT: **ADDENDUM TO GEOTECHNICAL INVESTIGATION**
Proposed Single Family Residence
49 Shearwater Lane, Watsonville, California
APN 052-291-12

REFERENCES: See Attached

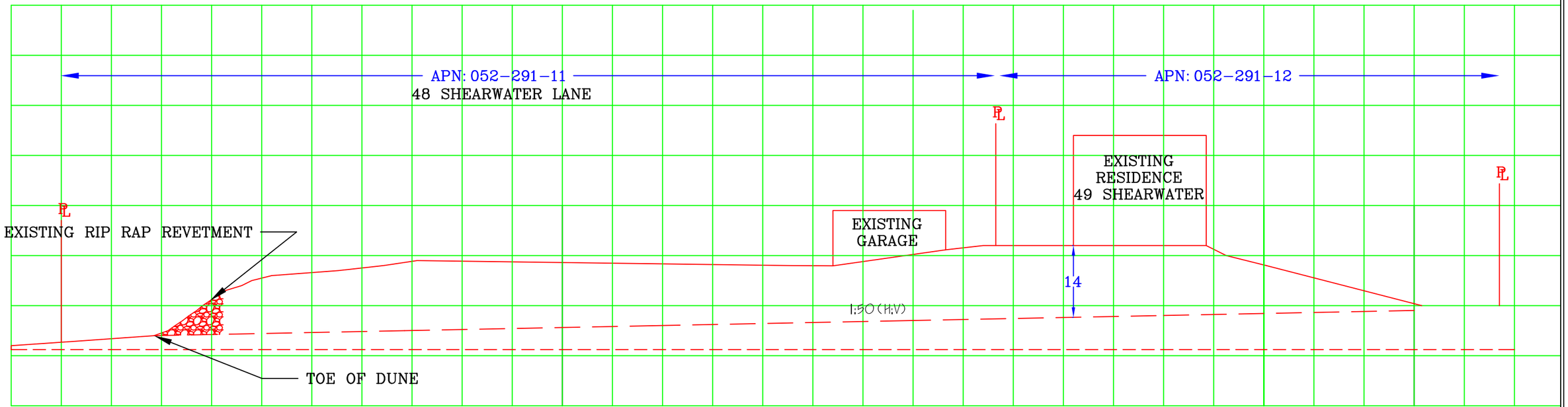
Dear Mr. and Mrs. Donahue:

It is our understanding that you would like to consider the use of a foundation composed of deep foundations in lieu of the mat slab foundation system that was recommended in the Geotechnical Investigation (Reference 3). The need for a deep foundation system is based on FEMA's mapping of the Pajaro Dunes development. Based on FEMA's mapping the property is located in a FEMA VE Zone and is located on the Primary Frontal Dune. FEMA is requiring the foundations for new development or development that meets FEMA's definition of substantial improvement in this area to account for potential dune face removal. To determine the extent of the dune face removal at the site, we have prepared a dune face removal profile for this parcel based on FEMA's Guidance for Flood Risk Analysis and Mapping - Coastal Erosion (Reference 2). The extent of the dune face removal is modeled by projecting a 1:50 line through the dune, extending from the toe of the dune through the backside of the dune. The eroded profile is shown on our cross section of the site in **Figure 1**, attached. Based on the profile we have measured a maximum of 14 feet of dune face removal at the site.

In addition to the anticipated dune removal, the foundation design for the site must also account for the potential for liquefaction to occur during a seismic event. Other considerations for construction of the deep foundations include loose, caving sands, groundwater and environmental impact of the foundation system on the site.

In order to found the structure below the anticipated depth of dune removal and the zone of liquefiable soils and also account for the construction constraints, we recommend that the proposed new residence be founded on a foundation system composed of displacement piles or helical piles. Helical pile installation consists of screwing the helical pile into the subsurface soils and usually does not require excavating. Displacement pile construction consists of advancing augers which displace the soils as they are advanced increasing the density of the surrounding soil and limiting the spoils generated. Grout is pumped in the excavation as the auger is removed preventing caving of the soils. Installation of these foundation systems do not require casing of foundation excavations nor do they create a large amount of spoils to be off hauled.

We are providing the design criteria for displacement and helical piles below.



SCALE: 1"=20'

BASE MAP TAKEN FROM TOPOGRAPHIC MAPS PREPARED BY HANAGAN LAND SURVEYING, INC. AND MICHAEL GOODHUE

ROCK SOLID ENGINEERING, INC.

CROSS SECTION

49 SHEARWATER LANE
WATSONVILLE, CALIFORNIA

FIGURE
1

1. **Concrete Displacement Piles**

a. It is our recommendation that the proposed concrete displacement piles have a **minimum embedment depth of 35 feet below lowest adjacent grade**. This depth is a depth sufficient penetrate the liquefiable soils and embed the pile into the dense sand stratum underlying the site.

b. The minimum recommended shaft diameter is **18 inches**.

c. The estimated allowable downward and pullout capacities for 18 inch and 24 inch diameter, augured, cast-in-place, concrete piles are presented in **Figures 2.1** and **2.2** for the proposed construction. These were computed assuming a minimum embedment depth of 35 feet. These capacities include a reduction based on the down drag forces anticipated should liquefaction occur during a seismic event and neglect soil in the upper 14 feet of the site. These capacities do not include the weight of the shaft.

d. The recommended capacities apply to a single shaft, as this is the anticipated configuration. If multiple piles are used, group efficiencies should be evaluated on the basis of actual structural configurations in order to assess possible reductions in capacity due to group influences.

e. The design of the piles shall assume a loss of soil support over 14 feet of the length of the pile to account for potential dune erosion at the surface of the site.

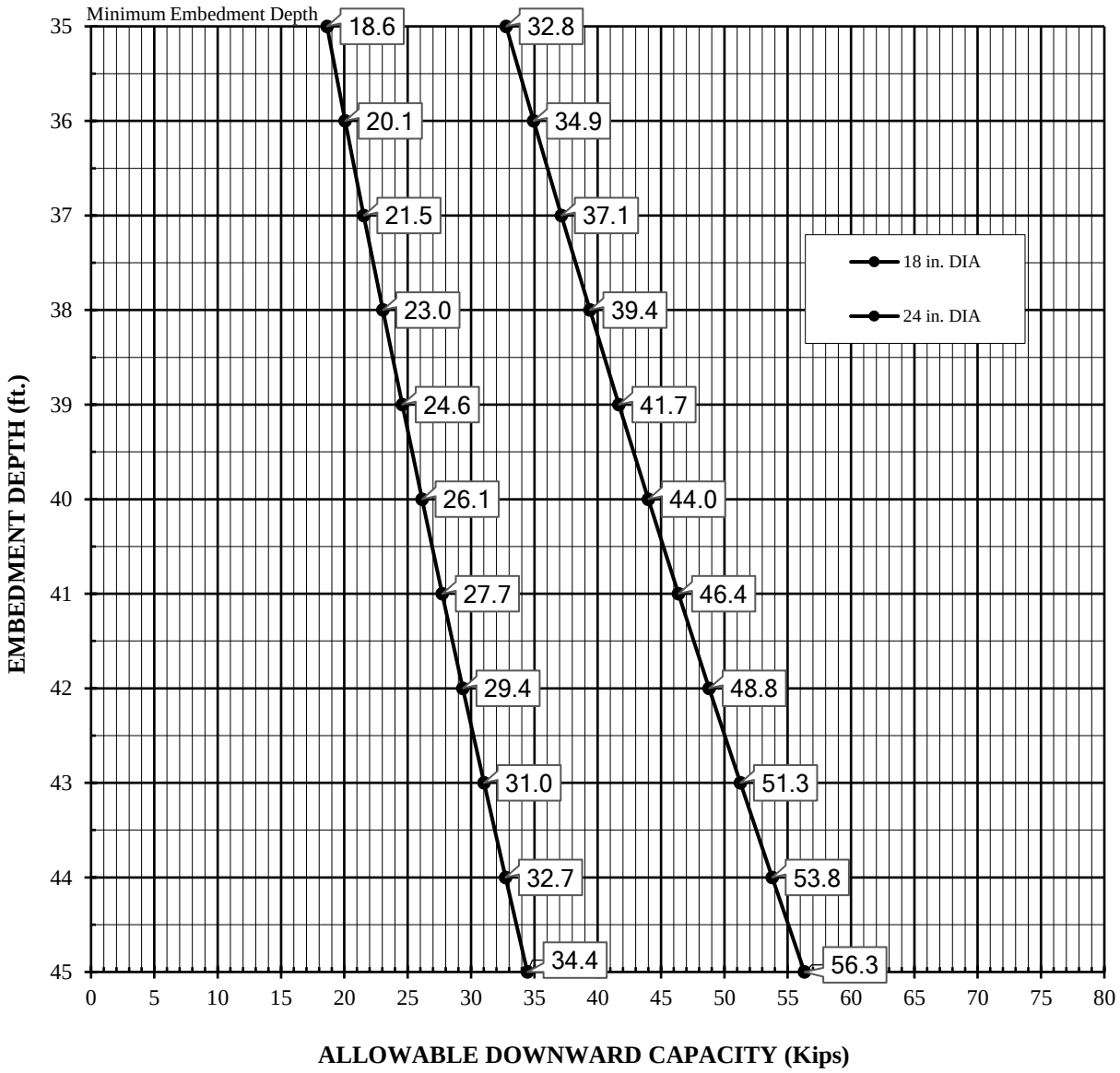
f. Active pressures of **35 psf/ft**, should be applied, from the upper 24 inches of soil against the shaft, acting on a plane which is 1½ times the shaft diameter may be assumed for design purposes.

g. Passive pressures of **400 psf/ft**, acting over a plane 1½ times the shaft diameter, may be assumed for design purposes. Neglect passive pressure in the upper 14 feet of soil.

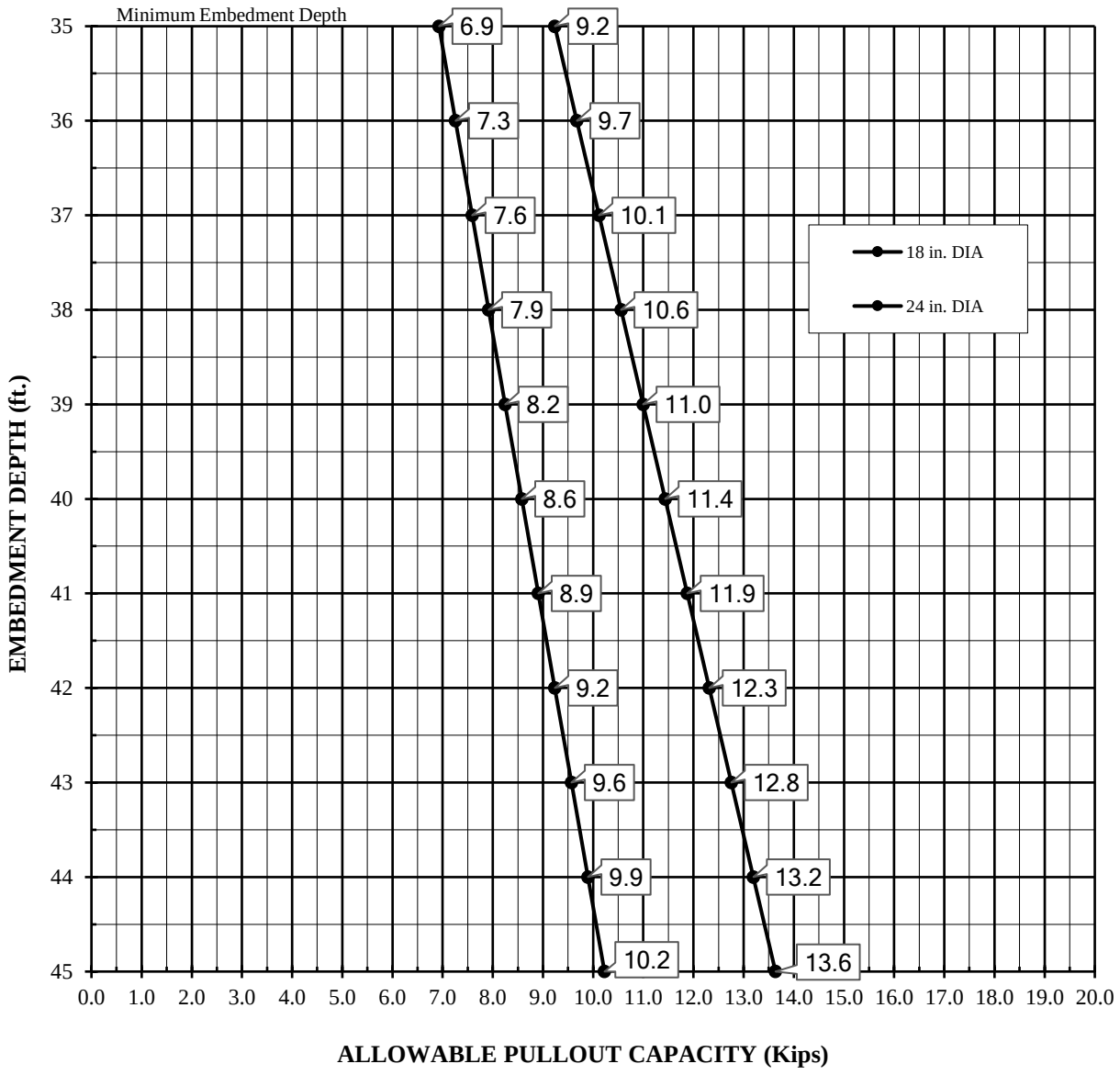
h. Piles should be spaced no closer than 2.5 diameters, center to center, with a minimum 3.0 diameters preferred.

i. The project is located near the Pacific Ocean. The possibility of salt water intrusion is high. According to the American Concrete Institute (ACI) salt water **is considered exposure Class S1.** Concrete that will be in contact with soil should be designed in accordance with the recommendations presented in the current ACI 318 Code.

j. All shaft construction must be observed and approved by the Geotechnical Consultant. Any piles constructed without the full knowledge and continuous observation of Rock Solid Engineering, Inc. will render the recommendations of this report invalid.



ROCK SOLID ENGINEERING, INC.	**DOWNWARD CAPACITY for AUGURED CAST-IN-PLACE CONCRETE PIERS**	FIGURE 2.1



ROCK SOLID ENGINEERING, INC.	**PULLOUT CAPACITY for AUGURED CAST-IN-PLACE CONCRETE PIERS**	FIGURE 2.2

k. The piles should contain steel reinforcement as determined by the Project Structural Engineer in accordance with applicable CBC or ACI Standards.

2. Helical Screw Piles

a. We recommend that the proposed helical screw piles be **embedded such that the lowest helical plate has a minimum embedment of 35 feet below grade**. Actual depths **may vary** and will be determined in the field based on the available data and monitoring of the installation torque.

b. The design of the helical screw piles shall assume a loss of soil support over 14 feet of the length of the pile to account for potential dune erosion and/or loss of soil strength during a seismic event. The loss of soil support may occur across any length of the pile from the surface to 32 feet below lowest adjacent grade.

c. The estimated allowable bearing/pullout capacities for 6 inch, 8 inch, 10 inch, 12 inch, and 14 inch diameter, helical plates are presented in **Figure 3** for the proposed structure. These values were computed assuming a minimum embedment depth of 35 feet.

d. If multi-plate anchors are proposed, the total allowable bearing/pull-out capacity of each anchor is calculated by summing the capacity of each helical plate on the anchor. These capacities do not include the weight of the shaft.

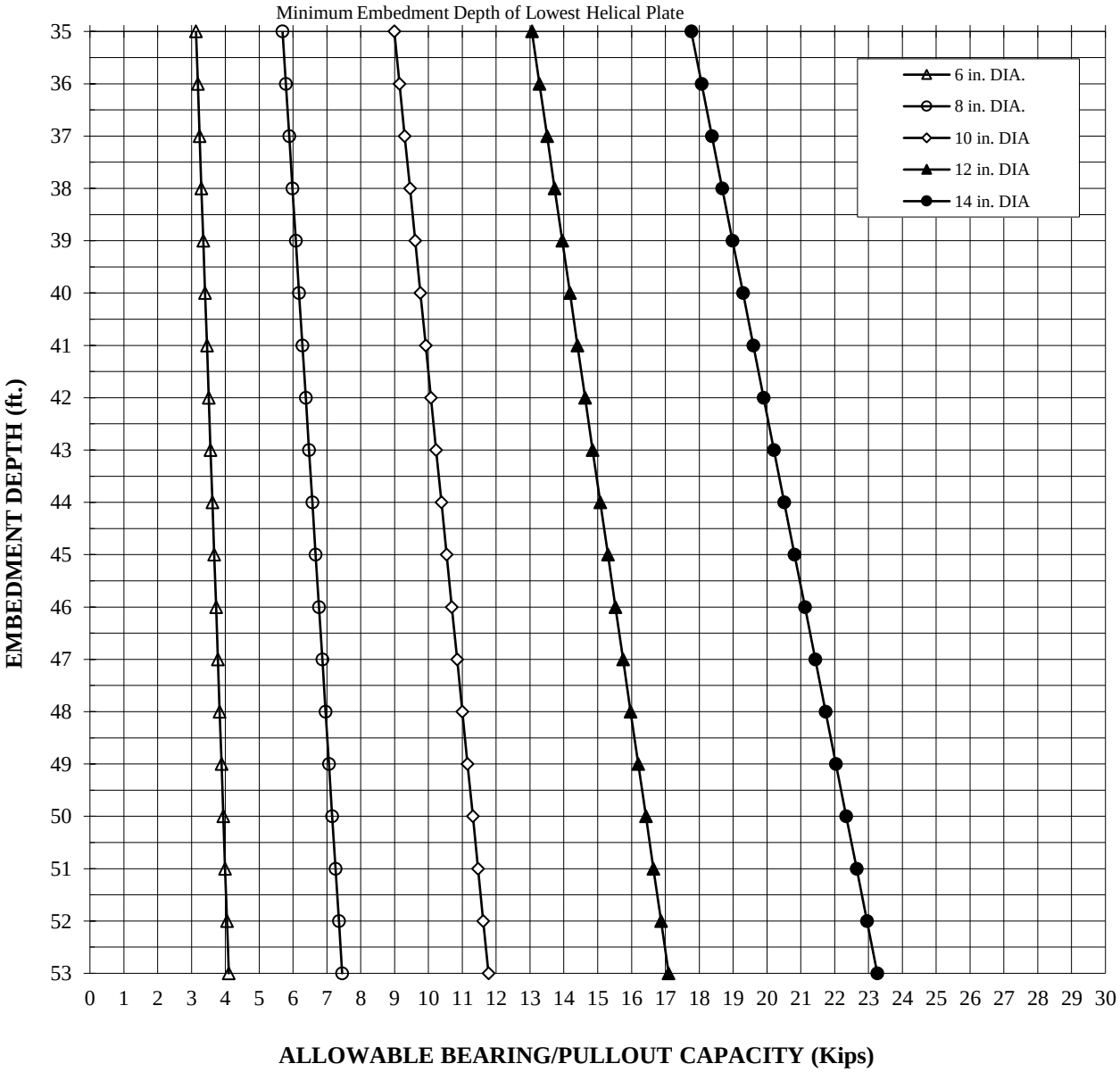
e. Lateral support may be mobilized by helical piles drilled at an incline. The lateral support piers shall also be embedded beyond the liquefiable layers and should be located within the property lines.

f. The recommended allowable bearing/pullout capacities may be higher than the design strength of the helical foundation piles or their intermediate shaft connections depending on the product chosen. These factors may effect the design capacity of the helical foundation piles and govern in the design.

g. The monitoring of installation torque during installation is required. Installation torque should not exceed the anchor rating. Installation torque has been empirically related to bearing/pull-out capacity. The minimum bearing/pull-out capacity to installation torque ratio generally recommended is between 9 and 10, subject to verification in the field.

h. Installation tolerances should be within 2% with regards to plumbness and to within 2 inches in location.

i. In general, installation procedures should be verified per the manufacturer's specifications.



ROCK SOLID ENGINEERING, INC.	**ALLOWABLE BEARING/PULLOUT CAPACITY** **for INDIVIDUAL HELICAL PLATES**	FIGURE 3

j. The project is located near the Pacific Ocean. The possibility of salt water intrusion is high. Therefore, the **helical foundation piers should be protected from corrosion as specified by the manufacturer,** taking into account the possibility of salt water intrusion.

k. **It is recommended that at least one helical screw pile be installed and tested prior to full scale production in order to verify both design loads and installation torque requirements.**

l. **All helical screw pile installation must be observed and approved by the Geotechnical Consultant. Any helical screw piles installed without the full knowledge and continuous observation by a representative of Rock Solid Engineering, Inc. will render the recommendations of this report invalid.**

The remaining portions of the Geotechnical Investigation report generally continue to apply. If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office.

Sincerely,

ROCK SOLID ENGINEERING, INC.

Signed: February 17, 2021

Dusty M. Osburn, P.E.
Senior Engineer
R.C.E. 85113

Distribution: (1) Addressee and via email
(3) Jerrod Nicholls, Fuse Architects, and via email
(1) Leonard Willis, Redwood Engineering, via email

REFERENCES

1. California Building Standards Commission, 2019, 2019 California Building Code, California Code of Regulations, Title 24, Part 2, Effective January 1, 2020.

2. FEMA, Guidance for Flood Risk Analysis and Mapping - Coastal Erosion, Guidance Document 40, Dated February 2018.

3. Hanagan Land Surveying, Inc., Topographic and Boundary Map, The Lands of Gary Smerdon & Sandra Wheatley, 48 Shearwater Lane, Watsonville, CA 95076, Santa Cruz County, A.P.N. 052-291-11, Job No. 18056, Sheet SU-1 of 1, Dated 6-6-2018.

4. Michael F. Goodhue, 49 Shearwater Lane, Topographic Map, APN 052-29-108, Sheet 1 of 1, Dated 3/15.

5. Rock Solid Engineering, Inc., Geotechnical Investigation-Design Phase, Proposed Single Family Residence, 49 Shearwater Lane, Watsonville, California 95076, APN: 052-291-12, Project No. 15043-B, Dated April 10, 2019.

6. Rock Solid Engineering, Inc., Update to Geotechnical Investigation, Proposed Single Family Residence, 49 Shearwater Lane, Watsonville, California, APN: 052-291-12, Project No. 15043-B, Dated June 18, 2020.

COUNTY OF SANTA CRUZ

PLANNING DEPARTMENT
701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060
(831) 454-2580 FAX: (831) 454-2131 TDD: (831) 454-2123

15 December 2021

Kevin and Ingrid Donahue <ingrid_donahue@hotmail.com>
2153 Waverly Street
Palo Alto, CA 94301

Subject: Review of the Geotechnical Investigation-Design Phase for the Proposed Single-Family Residence at 49 Shearwater Lane/APN 052-291-12 dated 10 April 2019; the Update to Geotechnical Investigation dated 18 June 2020; and the Addendum to Geotechnical Investigation dated 19 January 2021 by Rock Solid Engineering, Inc. – Project No. 15043-B

Project Site: 49 Shearwater Lane
APN 052-291-12
Application No. REV201083

Dear Applicant:

The Planning Department has accepted the project site geotechnical investigation reports. The following items shall be required:

1. All project design and construction shall comply with the recommendations of the subject reports;

2. Final plans shall reference the subject geotechnical investigation reports by titles, author, and dates. Final Plans should also include a statement that the project shall conform to the reports' recommendations; and

3. After plans are prepared that are acceptable to all reviewing agencies, please submit a completed Soils (Geotechnical) Engineer Plan Review Form to Environmental Planning. The Consultants Plan Review Form (Form PLG-300) is available on the Planning Department's web page. The author of the soils report shall sign and stamp the completed form. Please note that the plan review form must reference the final plan set by last revision date.

Electronic copies of all forms required to be completed by the Geotechnical Engineer may be found on our website: www.sccoplanning.com, under "Environmental", "Geology & Soils", and "Assistance & Forms".

After building permit issuance the soils engineer *must remain involved with the project* during construction. Please review the Notice to Permits Holders (attached).

Our acceptance of the report is limited to its technical content. Other project issues such as zoning, fire safety, septic or sewer approval, etc. may require resolution by other agencies.

Please note that this determination may be appealed within 14 calendar days of the date of service. Additional information regarding the appeals process may be found online at: http://www.sccoplanning.com/html/devrev/plnappeal_bldg.htm

If we can be of any further assistance, please contact the undersigned at:
rick.parks@santacruzcounty.us

Respectfully,

Rick Parks, GE 2603
Civil Engineer – Environmental Planning Section
County of Santa Cruz Planning Department

Cc: Environmental Planning Department, Attn: Leah MacCarter
Rock Solid Engineering, Inc. Attn: Dusty Osburn, PE
Jerrod Nichols <jerrod@fusearchitects.com>

Attachments: Notice to Permit Holders

NOTICE TO PERMIT HOLDERS WHEN A SOILS REPORT HAS BEEN PREPARED, REVIEWED AND ACCEPTED FOR THE PROJECT

After issuance of the building permit, the County requires your soils engineer to be involved during construction. Several letters or reports are required to be submitted to the County at various times during construction. They are as follows:

1. **When a project has engineered fills and / or grading**, a letter from your soils engineer must be submitted to the Environmental Planning section of the Planning Department prior to foundations being excavated. This letter must state that the grading has been completed in conformance with the recommendations of the soils report. Compaction reports or a summary thereof must be submitted.

2. **Prior to placing concrete for foundations**, a letter from the soils engineer must be submitted to the building inspector and to Environmental Planning stating that the soils engineer has observed the foundation excavation and that it meets the recommendations of the soils report.

3. **At the completion of construction,** a *Soils (Geotechnical) Engineer Final Inspection Form* from your soils engineer is required to be submitted to Environmental Planning that includes copies of all observations and the tests the soils engineer has made during construction and is stamped and signed, certifying that the project was constructed in conformance with the recommendations of the soils report.

If the *Final Inspection Form* identifies any portions of the project that were not observed by the soils engineer, you may be required to perform destructive testing in order for your permit to obtain a final inspection. The soils engineer then must complete and initial an *Exceptions Addendum Form* that certifies that the features not observed will not pose a life safety risk to occupants.