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STAFF REPORT: REGULAR CALENDAR

Application No:	**1-14-0160**
Applicant:	**Mark Sloper**
Location:	1591 Buhne Drive, King Salmon, California
Project Description:	Demolish an existing 1,100-square-foot one-story single family residence and construct a new 1,197-square-foot, two-story, single family residence, with a patio and landscaping.
Staff Recommendation:	Approval with Conditions

SUMMARY OF STAFF RECOMMENDATION

Commission staff recommends **approval** of coastal development application 1-14-0160 subject to the attached recommended special conditions.

The project entails the demolition of an existing 1,100-square-foot residence and construction of a new 1,197-square-foot, two bedroom, two-story, 26-foot-tall single family residence on Buhne Street in the King Salmon area of Humboldt County (**Exhibits 1-3**).

The subject site is located within a densely developed neighborhood, inland of a County road. The King Salmon subdivision, located on the shores of Humboldt Bay a few miles south of Eureka directly across from the bay entrance channel, consists of former tidelands that were partially filled during the mid-1900s and later subdivided into approximately 200 small lots. The community originally was envisioned as a fishing enclave for summer or vacation cabins. The tidelands were filled in a manner that created interior tidal channels within the subdivision, and

most of the lots within the subdivision adjoin tidal and shoreline areas of the channel, although the subject lot does not.

The major coastal act issue raised by this application is whether the proposed development would be constructed in a manner that would protect it from flood hazards consistent with Sections 30253 of the Coastal Act. Coastal Act Section 30253 requires that development minimize risks to life and property in areas of high flood hazard. In other regions of the California Coast, some Local Coastal Programs (LCPs) such as the San Mateo County and Newport Beach LCPs further restrict or prohibit development in flood hazard areas. In this case, however, the development is located on historic tidelands within the Commission's retained jurisdiction and the Coastal Act is the standard of review. Therefore, the subject development is not subject to additional LCP requirements more restrictive or numerically specific than the requirement of Section 30253 that new development minimize risks to life and property in areas of high flood hazard.

Staff recommends Special Condition No. 1 to minimize flood hazard risks. This condition requires final plans and construction to conform to the proposed hazard mitigation measures including but not limited to: (1) locating the habitable portions of the structure on the second floor at an elevation above the maximum flood elevation and above a ground floor garage, half bathroom, and laundry; (2) constructing first floor walls composed of both reinforced concrete blocks in some areas and break-away walls in other areas to accommodate flood waters without collapsing the structure; and (3) elevating and attaching to the concrete masonry portions of the first floor walls all mechanical and utility installations and cabinets for the storage of hazardous materials (e.g. paints and solvents).

Staff believes that the project, if conditioned as recommended below, includes all feasible mitigation measures necessary to find the project consistent with the Coastal Act's policies requiring minimization of flood hazards risks and the protection of visual resources, nearby environmentally sensitive habitat areas, water quality, and public access.

Commission staff recommends **approval** of coastal development permit application 1-14-0160, as conditioned. The motion to adopt the staff recommendation is found on page 4.

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APPENDICES

EXHIBITS

I. MOTION AND RESOLUTION

The staff recommends that the Commission adopt the following resolution:

Motion:

*I move that the Commission **approve** Coastal Development Permit 1-14-0160 pursuant to the staff recommendation.*

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

Resolution:

The Commission hereby approves a coastal development permit for the proposed development and adopts the findings set forth below on grounds that the development as conditioned will be in conformity with the policies of Chapter 3 of the Coastal Act. Approval of the permit complies with the California Environmental Quality Act because either 1) feasible mitigation measures and/or alternatives have been incorporated to substantially lessen any significant adverse effects of the development on the environment, or 2) there are no further feasible mitigation measures or alternatives that would substantially lessen any significant adverse impacts of the development on the environment.

II. STANDARD CONDITIONS

This permit is granted subject to the following standard conditions:

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

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

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

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

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

III. SPECIAL CONDITIONS

This permit is granted subject to the following special conditions:

1. **Final House Plans.** PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the applicant shall submit for review and written approval of the Executive Director, full-size scaled Final House plans in substantial compliance with those submitted to the Commission on April 22, 2015.

   A. The residential design, including the first floor elevations, shall be consistent with draft plans submitted to the Commission on April 22, 2105.

   B. The plans shall incorporate the following proposed hazard mitigation measures:

      (1) Installation of the first floor on a slab-at-grade foundation;

      (2) Installation of the finished floor elevation of the second story at least10.8 feet (3.25m) above the ground elevation of the parcel and at an elevation at least 19.8 feet (6.05m) NAVD 88 which is 1.24 feet (0.38meters) above the estimated combined 100-year sea level rise and wave uprush scenario);

      (3) All hazardous materials (e.g., paint, solvents) shall be stored in cabinets attached to the first floor concrete masonry walls at as high an elevation as feasible;

      (4) All mechanical and utility installations shall be attached to the first floor concrete masonry walls at as high an elevation as feasible;

      (5) The first floor walls shall be a combination of Engineered Concrete Masonry Unit (CMU) walls engineered to withstand the force of flood waters and engineered 'breakaway walls' designed substantially similar to those described in the "FEMA Technical Bulletin Number 9: Design and Construction Guidance for Breakaway Walls, dated August 2008"; and

      (6) Wall flood vents substantially similar to the SMART VENT design submitted to the Commission on April 22, 2105 shall be installed within the CMU portions of the first floor walls.

   C. The permittee shall undertake development in accordance with the approved final plan. Any proposed changes to the approved final plan shall be reported to the Executive Director. No changes to the approved final plan shall occur without a Commission approved amendment to this coastal development permit, unless the Executive Director determines that no amendment is legally required.

2. **Restrictions on Use of Lower Floor.** Use of the lower (ground) floor of the residence shall be limited to garage space, storage space, laundry facilities, a half bathroom, hallways and unfinished space as proposed. No use of the lower floor for other purposes shall occur without an amendment to CDP 1-14-0160 from the Commission.

3. **Minimization of Geologic Hazards.**

   A. All recommendations of the engineering geologic soils report titled "Engineering Geologic Soils Report, Proposed New (Replacement) Residence, 1591 Buhne Drive, King Salmon, Humboldt County, California, Assessor's Parcel number 305-083-002," prepared by David N. Lindberg, CEG 1895 and dated April 11, 2014 shall be adhered to including recommendations for site preparation, structural fills, compaction standards, seismic design parameters, foundation design, pavement subgrade preparation, drainage, and all other recommendations. **PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT**, the applicant shall submit, for the Executive Director's review and approval, evidence that an appropriate licensed professional has reviewed and approved all final design, construction, grading, and drainage plans and certified that each of those final plans is consistent with all of the recommendations specified in the above-referenced geologic hazard report.

   B. The permittee shall undertake development in accordance with the approved final plans. Any proposed changes to the approved final plans shall be reported to the Executive Director. No changes to the approved final plans shall occur without a Commission amendment to this coastal development permit, unless the Executive Director determines that no amendment is legally required.

4. **Assumption of Risk.** By acceptance of this permit, the applicant acknowledges and agrees: (a) that the site may be subject to hazards from earthquakes, liquefaction, erosion, flooding, extreme high tides, storm surges, and tsunami wave run up; (b) to assume the risks to the applicant and the property that is the subject of this permit of injury and damage from such hazards in connection with this permitted development; (c) to unconditionally waive any claim of damage or liability against the Commission, its officers, agents, and employees for injury or damage from such hazards; and (d) to indemnify and hold harmless the Commission, its officers, agents and employees with respect to the Commission's approval of the project against any and all liability, claims, demands, damages, costs (including costs and fees incurred in defense of such claims), expenses, and amounts paid in settlement arising from any injury or damage due to such hazards.

5. **Future Development Restriction.** This permit is only for the development described in coastal development permit (CDP) 1-14-0160. Pursuant to Title 14 California Code of Regulations (CCR) Section 13250(b)(6), the exemptions otherwise provided in Public Resources Code (PRC) Section 30610(a) shall not apply to the development governed by the CDP 1-14-0160. Accordingly, any future improvements to this structure authorized by this permit shall require an amendment to CDP 1-14-0160 from the Commission or shall require an additional CDP from the Commission or from the applicable local government according to a certified Land Use Plan or Local Coastal Plan. In addition thereto, an amendment to CDP 1-14-0160 from the Commission, or an additional CDP from the Commission shall be

required for any repair or maintenance identified as requiring a permit in PRC Section 30610(d) and Title 14 CCR Sections 13252(a)-(b).

6. **Deed Restriction.** PRIOR TO ISSUANCE OF THIS COASTAL DEVELOPMENT PERMIT, the applicant shall submit to the Executive Director for review and written approval documentation demonstrating that the landowner has executed and recorded a deed restriction, in a form and content acceptable to the Executive Director: (1) indicating that, pursuant to this permit, the California Coastal Commission has authorized development on the subject property, subject to terms and conditions that restrict the use and enjoyment of that property (hereinafter referred to as the "Standard and Special Conditions"); and (2) imposing all Standard and Special Conditions of this permit as covenants, conditions and restrictions on the use and enjoyment of the Property. The deed restriction shall include a legal description of the applicant's entire parcel or parcels. The deed restriction shall also indicate that, in the event of an extinguishment or termination of the deed restriction for any reason, the terms and conditions of this permit shall continue to restrict the use and enjoyment of the subject property so long as either this permit or the development it authorizes, or any part, modification, or amendment thereof, remains in existence on or with respect to the subject property.

7. **Final Runoff Treatment Plan**
   A. PRIOR TO ISSUANCE OF THIS COASTAL DEVELOPMENT PERMIT, the Applicant shall submit a run-off treatment plan to the Executive Director for review and approval.
      (i) The runoff control plan shall demonstrate that:
         (a) Runoff from the project shall not increase sedimentation into coastal waters; and
         (b) Runoff from building roofs and decking, driveways, and other impervious surfaces on the site shall be collected and conveyed into vegetated areas to avoid sedimentation either on or off the site, and provide for bio-filtration treatment of pollutants entrained in runoff.
      (ii) The plan shall include, at a minimum, the following components:
         (a) A narrative report describing all permanent runoff control measures to be installed;
         (b) A site plan showing finished grades (at 1-foot contour intervals) and the location of all permanent runoff control measures, including, but not limited to roof downspouts and drainage lines to convey runoff from the impervious surfaces, and the vegetated areas where biofiltration to remove pollutants from the runoff will occur;
         (c) A schedule for installation and removal of the runoff control measures; and
         (d) A biofiltration area planting plan showing the vegetation to be planted for the biofiltration areas indicating the species to be planted, the number of plant specimens to be planted, and the specific locations where the plant specimens will be planted.
   B. The Applicant shall undertake development in accordance with the approved final plan. Any proposed changes to the approved final plan shall be reported to the Executive Director. No changes to the approved final plan shall occur without a Commission amendment to this coastal development permit unless the Executive Director determines

that legally no amendment is required.

8. **Final Debris Disposal Plan.** PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the applicant shall submit, for the review and written approval of the Executive Director, a final plan for the disposal of all demolition and excess construction-related debris, excess sediments, vegetative spoils, and any other debris and waste expected to be generated by the authorized work.

   A. The plan shall demonstrate that all demolition and excess construction related debris, excess sediments, vegetative spoils, and any other debris and waste expected to be generated by the authorized work shall be disposed of at an authorized disposal site(s) capable of receiving such materials.

   B. The plan shall include, at a minimum, the following: Identification of all debris disposal sites that will be used and evidence that the debris disposal locations are legally authorized to accept the debris.

   C. The permitee shall undertake development in accordance with the approved final debris disposal plan. Any proposed changes to the approved final plan shall be reported to the Executive Director. No changes to the approved final plan shall occur without a Commission amendment to this coastal development permit, unless the Executive Director determines that no amendment is legally required.

9. **Construction Responsibilities.** The permittee shall comply with the following construction-related requirements:

   A. No construction materials, debris, or waste shall be placed or stored where it may be subject to entering coastal waters or environmentally sensitive areas;

   B. Any and all debris resulting from construction activities shall be removed from the project site and disposed of in accordance with the approved debris disposal plan required by Special Condition No. 6;

   C. During the course of the project work, all trash shall be properly contained, removed from the work site on a regular basis, and properly disposed of to avoid contamination of habitat during demolition and construction activities.

   D. All on-site stockpiles of construction debris and soil or other earthen materials shall be covered and contained whenever there is a potential for rain to prevent polluted water runoff from this site.

10. **Landscaping Restrictions.** The permittee shall comply with the following landscaping-related restrictions:

   A. Only native and/or non-invasive plant species shall be planted as part of the project landscaping... No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Invasive Plant Council, or as may be identified from time to time by the State of California, shall be employed or allowed to naturalize or persist on the site (see http://www.cal-ipc.org/paf/). No plant species listed as a “noxious

weed" by the governments of the State of California or the United States shall be planted within the property (see http://www.cdfa.ca.gov/plant/ipc/encycloweedia/encycloweedia_hp.htm, http://www.invasivespeciesinfo.gov/plants/main.shtml, and http://plants.usda.gov/java/noxious); and

B. Rodenticides containing any anticoagulant compounds, including, but not limited to, Bromadiolon, or Diphacinone shall not be used.

11. Lighting Limitation. All exterior lighting attached to the authorized structure shall be low-wattage and downcast shielded such that no glare will be directed beyond the bounds of the property or into nearby coastal waters or dune habitat.

IV. FINDINGS AND DECLARATIONS

The Commission hereby finds and declares as follows:

A. PROJECT DESCRIPTION

The applicant proposes to demolish an existing approximately 1,100-square-foot dilapidated one-story single-family residence built in the 1950s and construct an approximately 1,200-square-foot, 26-foot-high, two-story, two-bedroom, single family residence. The development includes the installation of a patio and landscaping improvements. Project plans are attached as **Exhibit No. 4**.

The existing residence would be demolished by a licensed contractor using heavy equipment (back hoe and dump truck) that would be staged on site. Debris would be trucked offsite for disposal at a local waste disposal site located outside of the coastal zone. All hazardous material (e.g., asbestos or lead-based paint) would be handled and disposed of appropriately.

The design of the house incorporates certain measures to reduce flood hazard risks. The habitable portions of the structure would be located on the second floor which is positioned at an elevation above the estimated maximum flood elevation during the life of the structure taking into account sea level rise. The first floor would be limited to a garage, storage area, laundry and half-bathroom. The first floor walls would be constructed of a combination of reinforced concrete blocks that can withstand flood flows and breakaway walls designed to literally break away during a flood to allow flood waters to pass through the lower floor of the structure. Flood louvers would be included in the concrete block walls to aid in the discharge of flood waters from within the structure. Finally, all mechanical and utility installations as well as cabinets housing hazardous materials would be attached to the walls and elevated above the floor.

B. ENVIRONMENTAL SETTING

The project site is located on an approximately 4,027-square-foot residential lot on the east side of Buhne Drive at 1591 Buhne Drive (APN 305-083-02) in the King Salmon area of Humboldt County, just south of Eureka (**Exhibit No. 2**). The subdivision of King Salmon is located on the shores of Humboldt Bay, south of Eureka, directly across from the Humboldt Bay entrance channel (**Exhibit No. 2**). Much of King Salmon consists of former tidelands that were partially filled during the mid-1900s and later divided, mostly into 25-foot-wide lots that were originally

used for resort cabins. The tidelands were filled in a manner that left interior tidal channels within the subdivision. Most of the lots within the subdivision adjoin tidal and shoreline areas of the channel, although the subject lot does not. The area is protected from wave action from the bay by a rock jetty and dune area to the west that also supports public access and use.

Most of the lots in King Salmon are planned and zoned for either Residential Single Family (RS) or Commercial Recreation (CR) uses under the Humboldt County LCP. The subject lot is planned and zoned for single-family residential uses. Most of the lots in the surrounding area have been developed with single-family homes of varying sizes and heights that display a variety of architectural styles.

The main roads serving the King Salmon community are King Salmon Avenue and Buhne Drive, which flanks the northwest and western sides of the subdivision, and separates the developed area from a dune area that borders the waters of Humboldt Bay. The dune and bay shoreline area is accessible to the public, and there is ample public parking along Buhne Drive. The subject property is located directly across the road (on the inland side) from the dune area and public shoreline area (**Exhibit No. 3**).

C. OTHER AGENCY APPROVALS

The proposed project does not require any other agency approvals except for a building permit from Humboldt County.

D. STANDARD OF REVIEW

The proposed project is located in the Commission's retained jurisdiction. Humboldt County has a certified local coastal program (LCP), but the site is within an area shown on State Lands Commission maps over which the state retains a public trust interest. Therefore, the standard of review that the Commission must apply to the project is the Chapter 3 policies of the Coastal Act.

E. LOCATING AND PLANNING NEW DEVELOPMENT

Section 30250(a) of the coastal Act states that new development shall be located within or near existing developed areas able to accommodate it or in other areas with adequate public services and where it will not have significant adverse effects, either individually or cumulatively, on coastal resources. The intent of this policy is to channel development toward more urbanized areas where services are provided and potential impacts to resources are minimized.

The subject property is located in the King Salmon subdivision, which is a densely developed community that is planned and zoned for single family residential use and some commercial development. The community contains over one hundred developed residences and commercial businesses. Approximately 85 percent of the lots on Buhne Drive, where the subject lot is located, are developed with residential structures.

The subject property is served by community water and sewer systems provided by the Humboldt Community Services District. Thus, there are adequate services to accommodate the proposed new two-bedroom residence. Although the subject site is located in a flood hazard area, as discussed in Finding IV-F, below, the development has been conditioned to minimize flood

hazards consistent with the requirements of Section 30253 of the Coastal Act. Furthermore, as discussed in the below findings, the project has been conditioned to protect visual resources, nearby environmentally sensitive habitat areas, and water quality.

Therefore, the Commission finds that as conditioned, the proposed development is consistent with Coastal Act Section 30250(a), in that it is located in a developed area, has adequate water and sewer capability to accommodate it, and will not cause significant adverse effects, either individually or cumulatively, to coastal resources.

F. FLOOD HAZARDS

Section 30253 states, in applicable part:

> *New development shall do all of the following:*
>
> *(a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard…*

The risk of flooding is a significant natural hazard affecting development of the subject property. The entire King Salmon subdivision lies within the FEMA-mapped 100-year flood zone and is subject to flooding from extreme high tides and tsunamis. The elevation at the site is approximately 8.5-9.5 feet (2.6-2.9 meters) above mean sea level and development in this subdivision is common as vacant lots and older homes are redeveloped. The Commission has approved several residential developments within this subdivision just in the past few years (see CDP 1-11-043 (Needham), CDP 1-12-010 (Kinori), CDP 1-13-004 (Frink), and CDP 1-13-005 (Frink).

Coastal Act Section 30253 requires that development minimize risks to life and property in areas of high flood hazard. In other regions of the California Coast, some Local Coastal Programs (LCPs) such as the San Mateo County and Newport Beach LCPs further restrict or prohibit development in flood hazard areas. In this case, however, the development is located on historic tidelands within the Commission's retained jurisdiction and the Coastal Act is the standard of review. Therefore, the subject development is not subject to additional LCP requirements more restrictive or numerically specific than the requirement of Section 30253 that new development minimize risks to life and property in areas of high flood hazard.

Extreme high tide events in conjunction with future sea-level rise will increase the vulnerability of the subject site and the entire King Salmon community. According to the State's 2010 sea-level rise interim guidance document, sea level is projected to rise 5 to 8 inches by 2030, 10 to 17 inches by 2050, 17 to 32 inches by 2070, and 31 to 69 inches by 2100. The ranges in the projections of sea level rise are based on a range of modeling results. For dates after 2050, the ranges of sea level rise also are based on low, medium, and high future greenhouse gas emission scenarios. The State Coastal Conservancy and the State Lands Commission have adopted the use of 55 inches (140 cm) of sea level rise for 2100 which is consistent with the average of the models of sea level rise for 2100 based on a high future greenhouse gas emission scenario.

Throughout the first half of the 21st-century, sea-level rise alone is not expected to cause significant flooding, inundation, or erosion, but rather the highest probability and most damaging

events likely will take place when increasingly elevated sea-level occurs simultaneously with high tides and large waves (e.g., during El Niños). Between 2050 and 2100, the effects of sea level rise alone (flooding and inundation) and the combined effects of sea-level rise and large waves (e.g., damage to coastal structures, cliff erosion, beach loss) are projected to have much greater impacts.

The most recent National Academy of Science (NAS) report issued in 2012 takes into account estimates of vertical land movement resulting from tectonic activity and land subsidence along the west coast of the United States and projects somewhat lesser amounts of sea level rise than the State's 2010 sea level rise interim guidance document in areas of California north of Cape Mendocino. In 2013, following the 2012 NAS report, the Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT) published updated state sea level rise guidance and recommendations that reflect the updated science provided in the NAS report. The 2013 guidance states that the differences in sea-level rise projections north and south of Cape Mendocino are due mainly to vertical land movement. North of Cape Mendocino, geologic forces are causing much of the land to uplift, resulting in a lower rise in sea level, relative to the land, than has been observed farther south.[1] This uplift is evidenced by a tide gauge location 65 miles north of Crescent City, which has recorded an annual drop in sea level of -0.21 feet per year. However, the 2013 report indicates that there are variations within areas north of the Cape Mendocino. A tide gauge located on the North Spit of Humboldt Bay has recorded an average sea level rise of since 1977 of 1.55 feet per year. This result is larger than the global average and suggests significant subsidence in the gauge location. In addition, according to a 2012 Humboldt Bay area sea level rise data synthesis report prepared for the Humboldt Bay Initiative, the North Spit of Humboldt Bay actually appears to be subsiding, while other locations around the bay appear to be rising, and little is known about the rate of uplift or subsidence in different locations in and around Humboldt Bay. The report recommends that additional studies be done to determine how the rate of sea level rise varies with respect to different locations around Humboldt Bay.

In 2015, Northern Hyrdology and Engineering prepared a study for the State Coastal Conservancy and Coastal Ecosystems Institute of Northern California entitled, "Humboldt Bay: Sea Level Rise, Hydrodynamic Modeling, and Inundation Vulnerability Mapping." The study includes projections for relative sea level rise in Humboldt Bay for the year 2100 that takes into account the combined effects of regional eustatic sea level rise and vertical land motion (tectonic uplift and subsidence). The projections of relative sea level rise for Humboldt Bay range from 2 feet (0.6 meters) to 5.25 feet (1.6 meters).

The primary way to minimize flooding risks from tidal waters is to site proposed structures above maximum flood elevations. The maximum flood risk that would affect the proposed development at the site would occur under a combined event of projected maximum relative sea level rise over the life of the structure, high tide, a 100-year storm surge, and a 100 year wave event. To evaluate this risk, the applicant submitted a wave uprush and sea level rise study for his property at 1591 Buhne Drive, King Salmon, California. The study assumes the proposed

[1] As updated, the sea level rise projections are as follows: North of Cape Mendocino, -1.56 to 9 inches by 2030, -1.2 to 19 inches by 2050, and 3.6 to 56 inches by 2100; South of Cape Mendocino, 1.56 to 12 inches by 2030, 5 to 24 inches by 2050, and 17 to 66 inches by 2100.

residence would have an economic life of 100 years. The study provided a wave uprush analysis and evaluation of maximum flood levels associated with a combined event of projected relative sea level rise over the next 100 years until 2115, a 100-year wave event and a 100-year storm surge all occurring at high tide.

According to the Humboldt Bay Sea Level Rise Vulnerability Assessment Digital Elevation Model (DEM; PWA 2014), the subject parcel ranges in elevation between approximately 8.5 and 9.5 feet (2.6 and 2.9 meters) elevation relative to NAVD-88 vertical datum and is located approximately 1.9 miles southeast of the North Spit tide gage where both tidal water levels and vertical land motion rates have been assessed. The wave uprush and relative sea level rise study analysis was based on published values from the North Spit gage site without interpolation. To address the 100-year sea level rise projections needed for the analysis, the study applied the range of relative sea level rise rate projections for the year 2100 included in the Northern Hydrology and Engineering Study referenced above and extended both the eustatic sea level rise rate and vertical land motion rate established at the North Spit Gage for an additional 15 years. To determine the maximum flood elevation that would affect the structure, the study used the projection for relative sea level rise at the top of the range. To establish the high tide scenario, historic water level observations at the North Spit Gage were assessed and the highest astronomical tide was incorporated into the analysis. The 100-year storm surge data was provided by the National Weather Service, and was based on the maximum observed storm surge and maximum observed wind speed for the period of record dating back to 1886.

Wave uprush is the maximum vertical extent of wave runup on a structure above the design still water level. To establish the design still water levels upon which to model the 100-year wave event, the study superimposed the highest observed astronomical tidal water level with the highest observed storm surge and both the maximum and minimum 100-year mean relative sea level rise estimates based on observations and predictions for the North Spit gage. The study then assessed maximum fetch lengths within Humboldt Bay upon which the wind could potentially interact to generate the largest wind-waves at King Salmon. The study assumed that for the purpose of assessing wave uprush, that the design storm and sea level rise scenario most likely to affect the subject property would result from storm generated wind waves with a southwesterly wind direction and associated fetch component operating within the confines of South Humboldt Bay.

While the northwestern shoreline of King Salmon is somewhat influenced by ocean waves propagating through the Bay's entrance channel, these ocean generated waves are substantially attenuated by the relatively narrow bay entrance and associated shoreline armoring in conjunction with extensive shoals that range between approximately -9.8 to -16.4 feet (-3 to -5 meters) NAVD 88 throughout most of Entrance Bay. Additionally, existing rock groins at King Salmon Beach [approximately 11.5 feet (3.5 meters) NAVD 88], a small dune field [ranging from 14.8 to 19.7 feet (4.5 to 6 meters NAVD 88)], and a concrete sea wall [approximately 13.1 feet (4 meters) NAVD 88] provide substantial protection from deep water wave propagation and associated shoreline impacts under current conditions. Considering the range of design still water levels incorporated into the analysis, any additional inundation considered for the subject property associated with wave uprush was assumed to be driven by locally generated wind-

waves interacting with a shallow, inundated landscape under 100-year sea levels and maximum storm surge.

Following guidance provided by the U.S. Army Corps of Engineers Shore Protection Manual Volume I (USACE 1984), maximum observed wind speeds were converted to wind stress and incorporated with fetch lengths and water depths derived from the Humboldt Bay DEM to generate maximum wave height and period estimates for King Salmon. For this analysis, it was assumed that maximum observed wind speeds aligned with maximum fetch lengths. Wave uprush for the subject parcel was then calculated according to Holmes (2001), assuming that a non-breaking wave interacting with the vertical walls of the proposed development in conjunction with the maximum design still water level would generate the maximum 100-year inundation level.

Incorporating uprush of 3.1 feet (0.94meters) with the maximum design still water level (4.73m), produces a maximum inundation level of 18.6 feet (5.67meters) NAVD 88 at the subject parcel. Therefore, the finished floor elevation is estimated to be 19.8 feet (6.05meters) NAVD 88, which is 1.25 feet (0.38meters) above the estimated combined 100-year sea level rise and wave uprush scenario.

The applicant has incorporated certain design components into the proposed residence to minimize risks of flooding from the combined effects of sea level rise, high tides, storm surge, and extreme wave effects. As noted above, the ground elevation of the parcel is estimated to vary between 8.5 and 9.8 feet (2.6 and 3.0 meters) above mean sea level (NAVD 88 datum). Taking into consideration leveling associated with foundation construction, the base elevation of the subject parcel was assumed by the wave uprush study to be 9.2 feet (2.8 meters) above mean sea level (NAVD 88 datum). Thus, the base elevation is approximately 9.4 feet (2.9 meters) below the maximum flood level of 18.6 feet (5.67 meters).

To minimize flood risks to the residents of the house and to minimize damage to property, the proposed two-story house is designed in a manner that locates the habitable portions of the structure on the second floor at an elevation above the maximum flood elevation. The ground floor would only contain a garage, storage areas, a laundry, and a half-bathroom. According to the design specifications of the proposed development, the finished floor elevation will be 10’8” above grade (3.35 meters) above the ground elevation of the parcel. The finished floor elevation of the habitable floor will be approximately 1.25 feet (0.38 meters) above the highest predicted inundation levels considered in the 100-year Wave Uprush and Sea Level Rise Study (PWA 2015). A second design component incorporated into the residence to minimize flood risks is the proposed use of first floor walls composed of both reinforced concrete blocks in some areas and breakaway walls in others. These walls will extend from the finished garage slab elevation (+8.2 ft.) up to the bottom of the framing for the first floor of living space (+19 ft.). The reinforced concrete block portions of the first floor walls are designed to withstand the hydrodynamic force of tidal surge and waves without collapsing. The breakaway-wall portions of the first floor walls are intended to collapse under wave loads. The combination of the two wall types is designed to allow waves and water moving at high velocity to pass through the structure without causing collapse, displacement, or other structural damage to the elevated building or the supporting foundations system. To further reduce the pressure that rising flood waters can exert on the first

floor walls, a third design component to minimize flood risks has been incorporated into the project. The proposed concrete block walls will be equipped with automatic Smartvent flood louvers to return flood waters that enter the home to the outside of the structure. The Smartvent flood louvers quickly equalize the pressure and minimize damage. Finally, to minimize the chances that hazardous materials enter the water during high tide storm and flooding events, the applicant is proposing elevated storage cabinets within the first floor to contain storage for all paints and cleaners, as well as all mechanical and utility installations. Similarly, the applicant proposes that all mechanical and utility installations such as electrical panels, on-demand hot water heaters, and force air furnaces be attached to the first floor walls.

In designing the project to minimize flooding hazards associated with sea level rise, the applicant has considered a projected range of sea level rise that would affect the site over the economic life of the project based on the best available science. As the elevations of the low-lying parcel make the entire project site vulnerable to inundation as sea level rises, siting the development on higher ground is not a feasible alternative to minimize flood hazards. The only feasible alternative to minimize flooding hazards is to elevate the habitable portions of the structure above the projected maximum flood level as proposed by the applicant. As discussed above, the applicant has incorporated certain flood hazard design mitigation measures to further minimize flood hazards. As discussed below, with certain conditions to maximize the effectives of the proposed flood hazard mitigation measures, the flood risks associated with sea level rise over design life of the structure will be minimized as required by Section 30253.

As discussed above, the applicant proposes to site all habitable portions of the proposed residence on the upper floor of the proposed residence to minimize risks to residents in the event of a flood. Residents would be less likely to be occupying the non-habitable spaces in the event of a sudden flood and would therefore be less at risk of immediate danger. In addition, in the aftermath of a flood, residents may be able to continue to shelter in the upper floor even if the lower floor becomes unusable. The uses of the lower floor would be limited to a garage, laundry room, hallways, unfinished space, and half bathroom. A space used as a garage is clearly not a habitable use. The other proposed uses of the lower floor can also be considered to be non-habitable uses. Zoning ordinances often exclude these kinds of uses under definitions of habitable spaces or rooms. For example, Section 313-153 of Humboldt County's certified coastal zoning code defines "habitable room" as follows:

> *Any room in a main or accessory building except a bathroom, water closet, hall storage space, utility room, foyer, communicating hall, pantry, laundry, or unfinished attic, basement or cellar.*

The Commission finds that limiting the use of the lower floor to the proposed specific uses and confining habitable spaces to the upper floor would minimize risks to personal safety during flood events. However, portions of the lower floor, including the large garage space, storage areas, and the undefined space between the stairway and the laundry and half bathroom would be feasible to physically convert to a bedroom, living room, or other habitable rooms.

To ensure that future residents of the new house do not convert the lower floor spaces designed for these purposes to bedrooms, dens, or other habitable spaces that would create greater safety

risks or risks of greater property damage, the Commission attaches Special Condition No. 2. The special condition limits use of the lower floor to the proposed uses unless the owner obtains a permit amendment from the Commission to allow other uses. To ensure that the proposed flood hazard mitigations are incorporated into the final design of the house, Special Condition No. 1 requires that final construction plans for the house that incorporate these flood hazard mitigation measures be submitted for the review and approval of the Executive Director prior to issuance of the permit.

The Commission also notes that Section 30610(a) of the Coastal Act exempts certain improvements to existing single-family residential structures from coastal development permit requirements. Pursuant to this exemption, once a house has been constructed, certain improvements that the applicant might propose in the future are normally exempt from the need for a permit or permit amendment. Depending on the specific improvements proposed, building additions and remodeling of the residence could increase flood hazard risks. Section 30610(a) requires the Commission to specify by regulation those classes of development which involve a risk of adverse environmental effects and require that a permit be obtained for such improvements. Pursuant to Section 30610(a) of the Coastal Act, the Commission adopted Section 13250 of Title 14 of the California Code of Regulations (CCR). Section 13250(b)(6) specifically authorizes the Commission to require a permit for improvements to existing single-family residences that could involve a risk of adverse environmental effect by indicating in the development permit issued for the original structure that any future improvements would require a development permit. As noted above, improvements to the lower floor of the approved residence that involve adding habitable uses could increase the danger of harm to residents and property damage from flooding in a manner inconsistent with the requirements of Section 30253 of the Coastal Act that risks of flood hazard of development be minimized. Therefore, pursuant to Section 13250 (b)(6) of Title 14 of the CCR, the Commission attaches Special Condition No. 5 which requires that all future development on the subject parcel that might otherwise be exempt from CDP requirements requires an amendment or new CDP. This condition will allow future development to be reviewed by the Commission to ensure that future improvements of the structure will not increase flood hazard risks. Special Condition No. 6 also requires that the applicants record and execute a deed restriction approved by the Executive Director against the property that imposes the special conditions of this permit as covenants, conditions, and restrictions on the use and enjoyment of the property. Special Condition No. 6 will also help assure that future owners are aware of these CDP requirements applicable to all future development.

In addition to the risk of flood hazards associated with extreme high tides and future sea level rise, the subject property, along with many others around Humboldt Bay, is shown on emergency planning maps published in 2009 by the California Emergency Management Agency, California Geologic Survey, and University of Southern California as being within the zone of potential inundation by a tsunami. If the region were to suffer a major earthquake along the Cascadia Subduction Zone, a local tsunami could hit the Humboldt Bay shoreline within minutes. The primary way to ensure that the proposed development would be safe from tsunami wave run-up would be to require that the habitable living spaces be positioned only above tsunami inundation levels. The applicant is proposing to locate an attached garage as the first-story with the habitable living space on the second story, at least 1.25 feet (0.38 meters) above the highest predicted

inundation levels, which will help reduce the severity of flooding impacts to the residence from smaller tsunamis.

However, it is not feasible to design a structure in this location that would position all of the habitable living space above maximum tsunami inundation levels, which are believed to be at least 30 feet above mean sea level (the maximum height of the proposed structure is proposed to be 35 feet). The proposed house is designed as a two story structure with one floor of habitable space above a garage floor. Even though the structure is two stories, the area of the house is a very modest 1,197 square feet. Constructing a building where the floor area is at least 30 feet above mean sea level would be inconsistent with zoning code restrictions, which limit maximum building heights in the RS district to 35 feet. In addition, positioning the habitable living space above the 30-foot-high tsunami wave run-up elevation would require the construction of an approximately 50-60 foot tall structure, the equivalent of a five story building. Further, construction of a new structure at a design elevation high enough to minimize the hazard of tsunami wave run-up from all potential tsunamis would be glaringly out of character with the surrounding area, where most existing structures are below 30 feet in height. Given the zoning standards requiring five-foot wide side yard setbacks, the structure can only be 15 feet wide. A 15-foot-wide, 50-60-foot tall structure would be greatly out of character with the other development in the area.

Aside from construction mitigation measures, the National Weather Service, in combination with other agencies, has developed a community tsunami readiness program. A tsunami siren has been installed, there is a clearly marked tsunami evacuation route and a sheltering location has been established on higher ground on the adjoining PG&E power plant site. Evacuation drills have also been conducted.

Therefore, the Commission finds that there are no further feasible mitigation measures available to minimize the flood risk from tsunami wave run-up at the site.

The Commission further finds that if the applicant and future landowners receive notification of the flood risks associated with the property, then the applicant and future landowners of the property can decide whether to implement development on the site despite the risks. Therefore, the Commission attaches Special Condition Nos. 4 and 6. Special Condition No. 4 requires the landowner to assume the risks of flooding hazards to the property and to waive any claim of liability on the part of the Commission. Given that the applicant has chosen to implement the project despite flooding risks, the applicant must assume the risks. In this way, the applicant is notified that the Commission is not liable for damage as a result of approving the permit for development. The condition also requires the applicant to indemnify the Commission in the event that third parties bring an action against the Commission as a result of the failure of the development to withstand hazards. To ensure that all future owners of the property are aware of the flood hazard present at the site, the Commission's immunity from liability and the indemnity afforded the Commission.

To ensure that all future owners of the property are aware of the flood hazard present at the site, the Commission's immunity from liability, and the indemnity afforded the Commission, Special

Condition No. 6 requires recordation of a deed restriction that imposes the special conditions of the permit as covenants, conditions, and restrictions on the use of the property.

As discussed above, the project as conditioned will not eliminate all risk to life and property from flood hazards. However, all feasible mitigation measures necessary to minimize the flood risks have been incorporated into the project as conditioned. Therefore, the Commission finds that the proposed project, as conditioned, will minimize risk to life and property from hazards, consistent with Section 30253 of the Coastal Act.

G. GEOLOGIC HAZARDS

Coastal Act Section 30253 states in applicable part:

> *New development shall do all of the following:*
>
> *(1) Minimize risks to life and property in areas of high geologic…hazard.*

Coastal Act Section 30253 requires in applicable part that new development minimize risks to life and property in areas of high geologic hazard and neither creates nor contribute significantly to erosion or geologic instability.

The project site is located several hundred feet southeast of the current shoreline of the Humboldt Bay. The generally flat property has no slopes with gradients greater than ten percent. The site is situated at an elevation of approximately 13 feet above mean sea level on a former sand bar and salt marsh that was reclaimed for residential development.

An engineering geologic soils investigation of the site was performed by David Lindberg, CEG 1895, who prepared a report dated April 11, 2014. The engineering geologic soils report indicates that the project site is underlain by a uniform profile of fine sand with occasional shelly interbeds. The natural topsoil consists of loose, low plasticity, granular soil composed primarily of soft sandy silt. The engineering geologic soils report evaluated potential geologic hazards that might affect the site and the geotechnical report indicates the primary geologic hazard affecting the site is the potential for liquefaction. As the subject site is relatively flat, the site is not subject to bluff retreat or landsliding. The report states that "given the proximity of significant active faults (the Litlle Salmon fault to the southwest, the Mad River fault zone to the north, and the Cascadia subduction zone offshore to the west) as well as other active faults within and offshore of northern California, it is highly likely that the project site will experience strong ground shaking during the economic life span of the proposed development." Although the site is within a seismically active region, the project site is not located within an Alquist-Priolo Earthquake fault zone and based on the distance between the project site and nearest fault trace, the potential for surface fault rupture to occur within the boundaries of the property is low.

Liquefaction is the loss of soil strength, resulting in fluid mobility through the soil. Liquefaction typically occurs during earthquakes when uniformly-sized, loose, saturated sands or silts that are subjected to repeated shaking in areas where the groundwater is less than 50 feet below grade surface. A liquefaction event could lead to dynamic settlement of the soils underlying the buildings.

The engineering geologic soils report concludes that the project site may be suitable for the proposed residential use. The report includes a number of recommendations to reduce the potential consequences of the liquefaction hazard. The recommendations address site grading, soil compaction, structural fills, foundation design, seismic design criteria, pavement design, landscaping, and site drainage. The recommendations are found in Section 6 of the report. The principal recommendations concern foundation design. The report recommends that the structure be supported by a mat slab or stiffened slab-on-grade with continuous concrete perimeter footings in combination with isolated interior spread footings. The report further recommends that the stiffened concrete floor slab-on-grade or mat slab have a minimum thickness as specified by an engineer, and should be underlain by at least seven inches of compacted select fill. The foundation is recommended to be embedded a minimum of 12 inches into suitably dense undisturbed native bearing soils. The base of the footings are recommended to extend a minimum of approximately 18 inches below the existing grade. The minimum width of the footings is recommended to be 18 inches, and the minimum thickness is recommended to be eight inches.

To ensure that the proposed residential structures are developed consistent with the foundation and other recommendations of the engineering geologic soils report to mitigate potential geologic hazards affecting the site, the Commission attaches Special Condition No. 3, which requires that the final construction plans for the development adhere to the design recommendations specified in the geotechnical report. In addition, the condition requires the applicant submit evidence that an appropriate licensed professional has reviewed and approved all final design, construction, grading, and drainage plans and certified that each of those final plans is consistent with all of the recommendations specified in the above-referenced geologic report.

Special Condition No. 4 requires the landowner to assume the risks of extraordinary erosion and geologic hazards of the property and waive any claim of liability on the part of the Commission. Given that the applicants have chosen to implement the project despite these risks, the applicants must assume the risks. In this way, the applicants are notified that the Commission is not liable for damage as a result of approving the permit for development. The condition also requires the applicants to indemnify the Commission in the event that third parties bring an action against the Commission as a result of the failure of the development to withstand hazards.

The Commission thus finds that the proposed development, as conditioned, is consistent with Section 30253 of the Coastal Act as the development as conditioned will minimize risks to life and property of geologic hazards. Only as conditioned is the proposed development consistent with Section 30253 of the Coastal Act.

H. VISUAL RESOURCES

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

The project site is located in a densely developed neighborhood. No public views of Humboldt Bay or the shoreline are afforded through the property, which is a developed lot located along the inland side of Buhne Drive and bordered on its other three sides by other residential development and Cod Street. Expansive and unobstructed public views of Humboldt Bay and coastal dunes are available for motorists and pedestrians from Buhne Drive adjacent to and seaward of the subject site. In addition, public parking is available along Buhne Drive for access to the dunes and shoreline and viewing the Bay. Thus, the proposed development will not have a significant adverse impact on views to or along the shoreline as seen from publicly-accessible vantage points.

As the site is relatively flat and does not require significant grading that would change the basic topography of the site, the proposed project minimizes the alteration of natural landforms.

As the proposed new structure would be visible from Buhne Drive, the Commission must consider whether the proposed development would be compatible with the character of the surrounding area. The character of the King Salmon area is largely defined by its bay-shore setting and predominantly single-family residential and commercial composition. The community consists of a diversity of architectural styles and sizes of structures ranging from small, old cabins and manufactured homes to larger two- and even a few three-story homes. The proposed two-story structure would be a maximum of 26 feet tall and would be of similar size, scale, and architectural style to some of the other newer development in this neighborhood of diverse structures. Thus, the proposed design of the residence will be visually compatible with the residential and commercial character of the surrounding area.

Although the development pattern is very compact in the King Salmon area, the overall nighttime character of the area in terms of outside illumination is largely suburban in nature, with very little exterior lighting evident. As a result, with the exception of nominally shielded street lighting along Buhne Drive and security lighting within the parking areas of commercial properties in the community, King Salmon has less glare from external nighttime lighting than many communities of similar size and density. Accordingly, to protect the character of the area as well as prevent the cumulative impacts of glare to the visual resources of the area, the Commission attaches Special Condition No. 11, which requires that all exterior lighting associated with the proposed development be low-wattage and downcast shielded such that no glare is directed beyond the bounds of the property or into nearby coastal waters or environmentally sensitive dune habitat.

In summary, the proposed project as conditioned is consistent with Section 30251, as the development will not adversely affect views to or along the coast, result in major landform alteration, or be incompatible with the character of the surrounding area.

I. Water Quality Protection

Section 30230 of the Coastal Act states, in applicable part, as follows:

> *Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will*

maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

Section 30231 of the Coastal Act states as follows:

The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.

Stormwater runoff from the development that is not absorbed into the ground ultimately drains to Humboldt Bay. Stormwater runoff from residential development can adversely affect the biological productivity of coastal waters by degrading water quality. Recognizing this potential impact, Section 30231 requires the protection of coastal waters to ensure biological productivity, and to protect public health and water quality. New development must not adversely affect these values and should help to restore them when possible. Therefore, the Commission imposes Special Condition No. **7**, which requires the Applicant to submit a final runoff treatment plan to ensure that flows from the proposed residence will be directed to vegetated areas on the parcel. This requirement will help protect water quality by providing for the biofiltration of roof, driveway, and patio runoff.

In addition, the Commission attaches Special Condition No. 9 to require that the project implement various construction-related measures to protect adjacent marine waters including such measures as placing and storing construction materials and debris where it will not enter the tidal channel, containing and properly disposing of debris, and covering stockpiles of construction materials prior to storms. Furthermore, Special Condition No. 8 requires the submittal for the review and approval of the Executive Director a final debris disposal plan demonstrating all demolition and construction debris will be disposed of at an authorized disposal facility to prevent discharge of such material into Humboldt Bay or other coastal waters.

Thus, as conditioned, the Commission finds that the proposed project will maintain the biological productivity and quality of coastal waters appropriate to maintain optimum populations of marine organisms, and protect human health as mandated by the requirements of Sections 30230 and 30231 of the Coastal Act.

J. ENVIRONMENTALLY SENSITIVE HABITAT AREAS

Section 30240(b) of the Coastal Act requires that environmentally sensitive habitat areas (ESHAs) be protected against any significant disruption of habitat values potentially resulting from adjacent development. Section 30240(b) of the Coastal Act states, in applicable part, the following:

Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which

would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

The subject property, which is currently developed, does not contain any known environmentally sensitive habitat. However, the site is located across Buhne Drive from coastal dune habitat adjacent to Humboldt Bay. Coastal dune habitats in the North Coast region in general often support populations of rare, threatened, and endangered plant species, including beach layia (*Layia carnosa*), Humboldt Bay wallflower (*Erysimum menziesii* ssp. *eurekense*), pink sand verbena (*Abronia umbellata* var. *breviflora*), dark-eyed gilia (*Gilia millefoliata*), and other rare species. Both the Commission and the County in past permitting actions for projects in the region have considered these rare plant habitat areas to be ESHA under the Coastal Act and certified LCP. Additionally, the Commission has considered coastal dune habitat in and of itself in the absence of rare species to be ESHA, since the habitat in general is both rare and especially valuable because of its special nature and role in an ecosystem and could be easily disturbed or degraded by human activities and developments.

The Commission finds that the coastal dunes located across the street from the proposed development do constitute ESHA, and the ESHA could be adversely affected if nonnative, invasive plant species were introduced in landscaping at the subject site. If any of the proposed landscaping were to include introduced invasive exotic plant species, the weedy landscaping plants could colonize (e.g., via wind or wildlife dispersal) the nearby dune ESHA over time and displace native dune vegetation, thereby disrupting the functions and values of the dune ESHA. The Commission attaches Special Condition No. 10 to ensure that only native and/or non-invasive plant species are planted on the subject property. As conditioned, the proposed project will ensure that the ESHA near the site is not significantly degraded by any future landscaping that would contain invasive exotic species.

In addition, the Commission notes that certain rodenticides, particularly those utilizing blood anticoagulant compounds such as brodifacoum, bromadiolone and diphacinone, have been found to pose significant primary and secondary risks to non-target wildlife present in urban and urban/wildland interface areas. As these target species are preyed upon by raptors or other environmentally sensitive predators and scavengers, the pest control compounds can bio-accumulate in the animals that have consumed the rodents to concentrations toxic to the ingesting non-target species. To avoid this potential cumulative impact to environmentally sensitive wildlife species, Special Condition No. 10 also contains a prohibition on the use of such anticoagulant-based rodenticides.

With the mitigation measures discussed above, which are designed to minimize any potential impacts to the adjacent ESHA, the project as conditioned will not significantly degrade adjacent ESHA and will be compatible with the continuance of the habitat area. Therefore, the Commission finds that the project as conditioned is consistent with Section 30240(b) of the Coastal Act.

K. PUBLIC ACCESS

Section 30210 of the Coastal Act requires that maximum public access shall be provided consistent with public safety needs and the need to protect natural resource areas from overuse.

Section 30212 of the Coastal Act requires that access from the nearest public roadway to the shoreline be provided in new development projects, except where it is inconsistent with public safety, military security, or protection of fragile coastal resources, or where adequate access exists nearby. Section 30211of the Coastal Act requires that development not interfere with the public's right to access gained by use or legislative authorization. Section 30214 of the Coastal Act provides that the public access policies of the Coastal Act shall be implemented in a manner that takes into account the capacity of the site and the fragility of natural resources in the area. In applying Sections 30210, 30211, 30212, and 30214, the Commission is also limited by the need to show that any denial of a permit application based on these sections or any decision to grant a permit subject to special conditions requiring public access is necessary to avoid or offset a project's adverse impact on existing or potential access.

The proposed project will not adversely affect public access. The project site does not front directly on Humboldt Bay as it is separated from the shoreline by Buhne Drive. In addition, the subject parcel does not front on any of the interior tidal channels within the interior of the King Salmon subdivision. As noted previously, the entire bay front of the King Salmon subdivision along the west side of Buhne Drive is open and available for public access use. In addition, public parking is available along Buhne Drive for access to the dunes and shoreline. Therefore, the Commission finds that the proposed project does not have any significant adverse effect on public access, and the project as proposed without new public access is consistent with the public access policies of Coastal Act cited above.

L. CALIFORNIA ENVIRONMENTAL QUALITY ACT

Section 13906 of the Commission's administrative regulations requires Coastal Commission approval of a coastal development permit application to be supported by findings showing that the application, as modified by any conditions of approval, is consistent with any applicable requirements of the California Environmental Quality Act (CEQA). Section 21080.5(d) (2)(A) of CEQA prohibits a proposed development from being approved if there are feasible alternatives or feasible mitigation measures available, which would significantly lessen any significant effect that the activity may have on the environment.

The Coastal Commission's review and analysis of CDP applications has been certified by the Secretary of Resources as being the functional equivalent of environmental review under CEQA. As a responsible agency, the Commission conducted its analysis of the potential impacts of the proposed development that the Commission is authorized by the Coastal Act to review. The Commission has reviewed the relevant coastal resource issues associated with the proposed project and has identified appropriate and necessary conditions to assure protection of coastal resources consistent with the requirements of the Coastal Act. The staff report discusses the relevant coastal resource issues with the proposed development. All public comments received to date have been addressed in the staff report, including staff's oral presentation and the findings adopted by the Commission. The Commission incorporates its findings on Coastal Act consistency at this point as if set forth in full. As conditioned, there are no additional feasible alternatives or feasible mitigation measures available, beyond those required, which would substantially lessen any significant adverse environmental effect that approval of the proposed project, as modified, would have on the environment. Therefore, the Commission finds that the

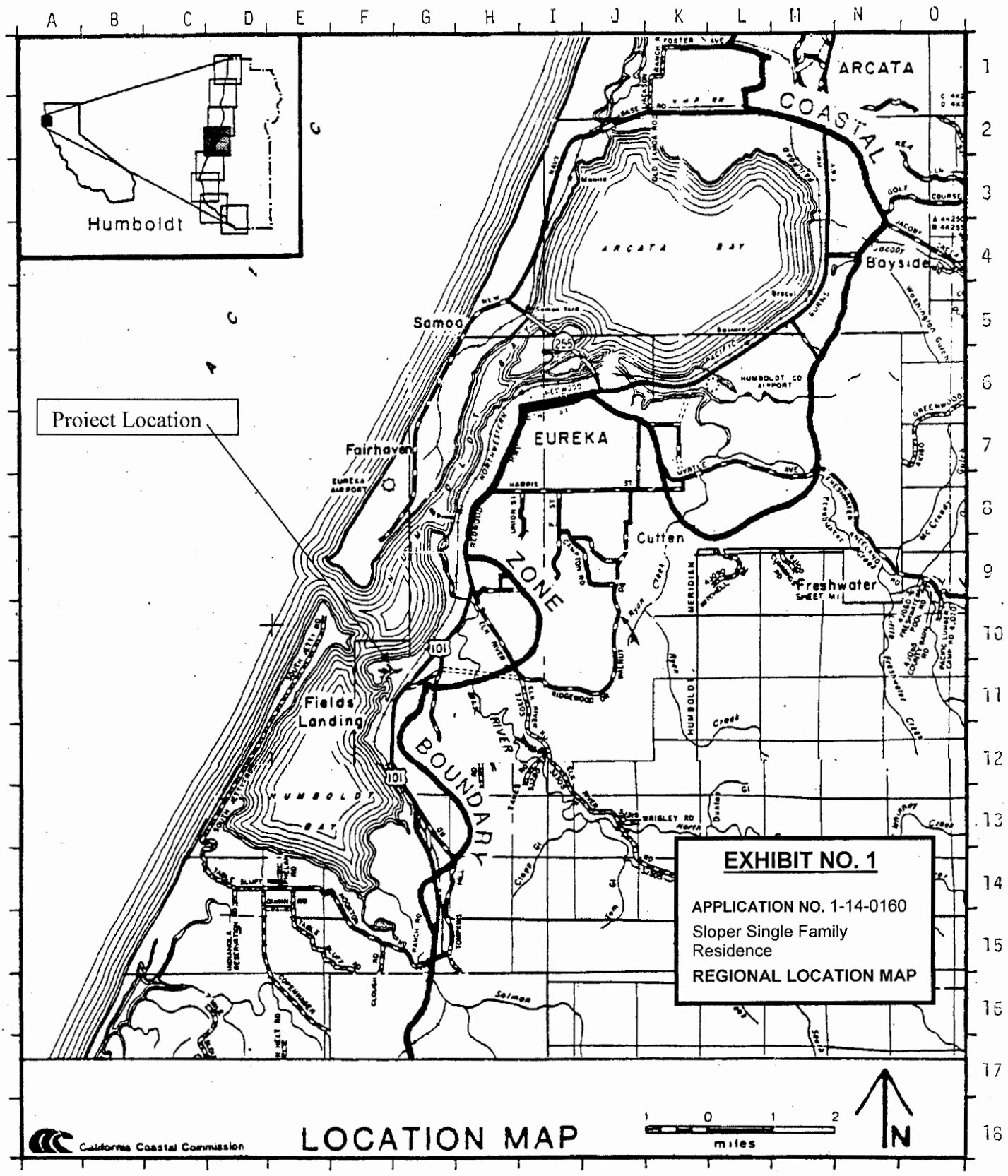
proposed repair and maintenance project can be found to be consistent with the Coastal Act and CEQA Section 21080.5(d)(2)(A).

APPENDIX A

SUBSTANTIVE FILE DOCUMENTS

Application File for Coastal Development Permit No. 1-14-0160

Humboldt County Local Coastal Program



County of Humboldt

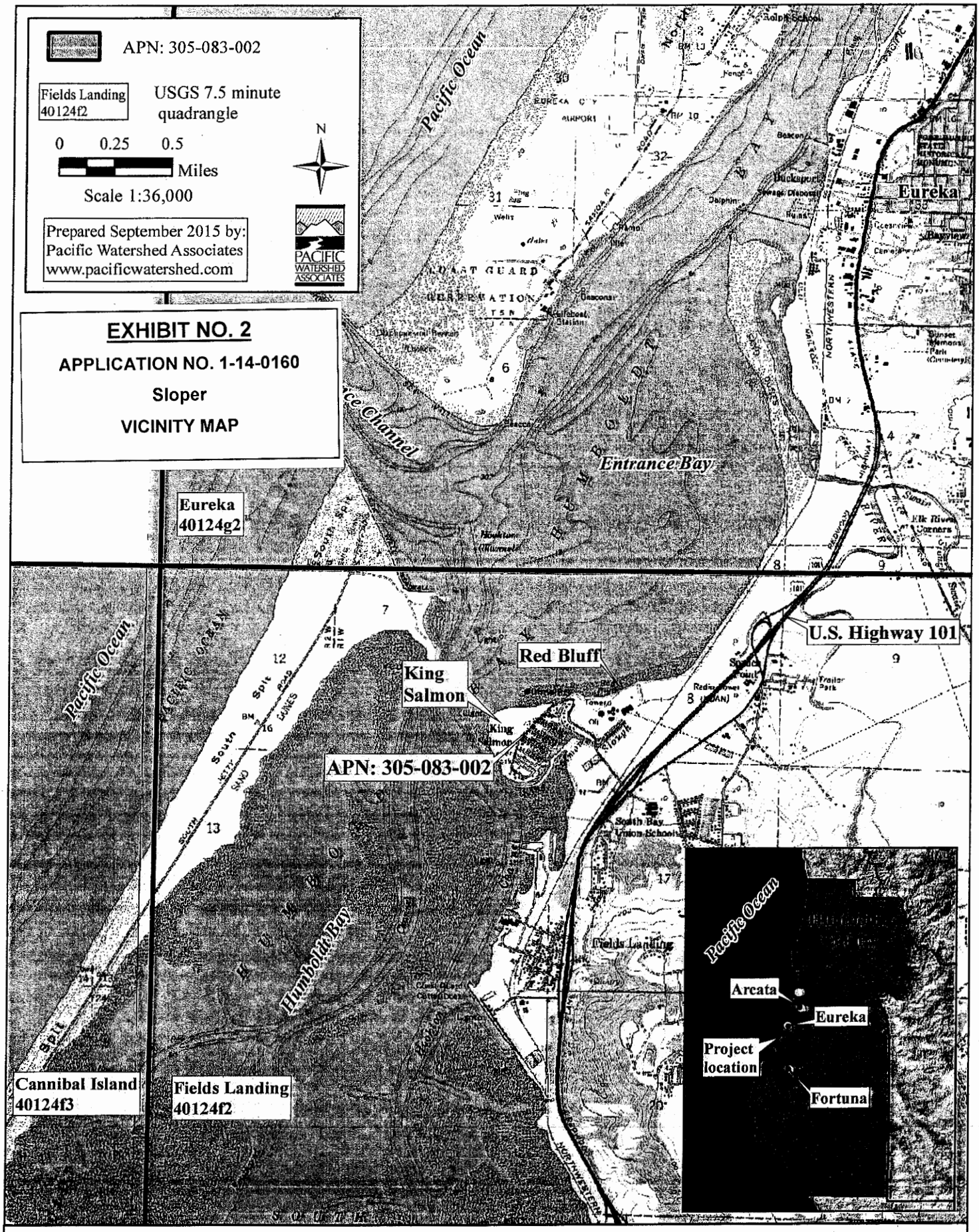


Figure 1. General location map for Sloper, 1591 Buhne Drive, A.P. No.: 305-083-002, King Salmon, Humboldt County, California.

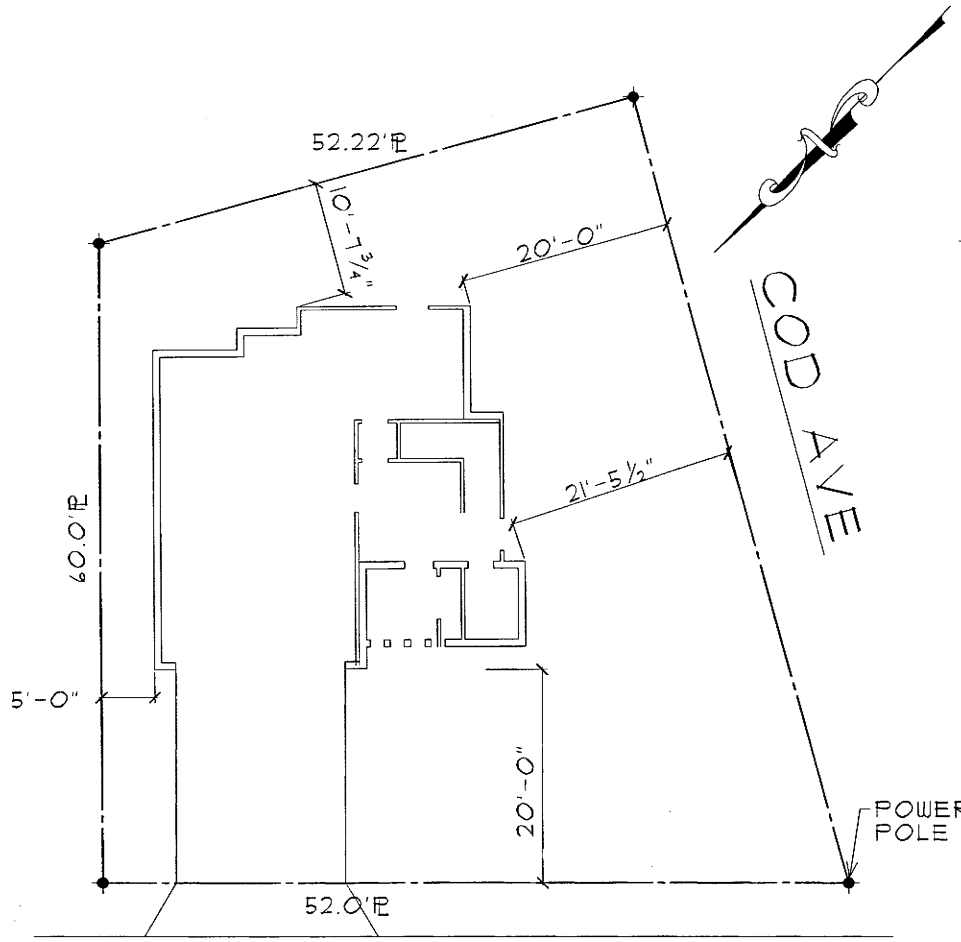
P:\GIS\5063 Sloper 2015\5063 Sloper 2015 location map.mxd

EXHIBIT NO. 3

APPLICATION NO. 1-14-0160

Sloper

AERIAL PHOTO



PLOT PLAN

SCALE: 1"=20'-0"

AP# 305-083-002
ADDRESS:1591 BUHNE DR
OWNER: MARK SLOPER
BUILDER: SAME
PHONE# 498-4303

NO TREES TO BE REMOVED
PUBLIC WATER AND SEWER
NO EASEMENTS
NO CREEKS W/IN 50'
DRAINAGE →
SURVEY MONUMENTS ✦

ROOF DRAINS SHALL BE DIRECTED AWAY FROM FOUNDATIONS BY SOLID PIPES.

A MINIMUM POSITIVE DRAINAGE OF 2% IS TO BE ESTABLISHED AWAY FROM FOUNDATIONS FOR A MINIMUM HORIZONTAL DISTANCE OF 4', WITH THE REMAINDER OF THE GRADING A MINIMUM OF 1%.

FRONT SETBACKS 24' FROM BACK OF SIDEWALK MINIMUM, UNLESS OTHERWISE DESIGNATED.

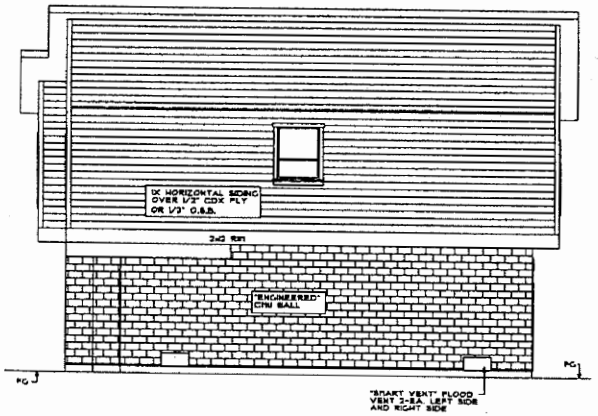
REAR YARD SETBACKS 10' MINIMUM.
SIDE YARD SETBACKS 5' MINIMUM.

EXHIBIT NO. 4
APPLICATION NO. 1-14-0160
Sloper
PROJECT SITE PLANS
1 OF 5

FRONT ELEVATION

SCALE:1/4"=1'-0"

2 of 5.

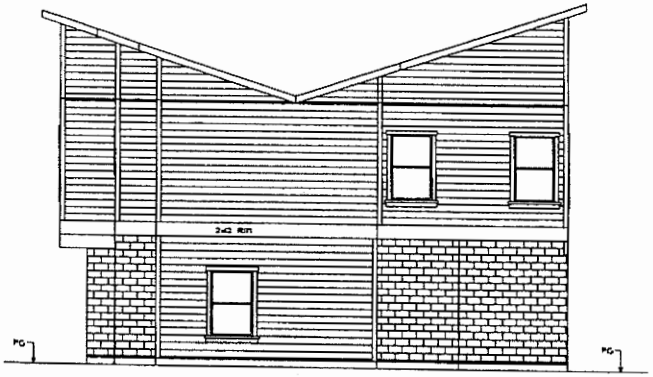


LEFT SIDE ELEVATION

SCALE: 1/4"=1'-0"

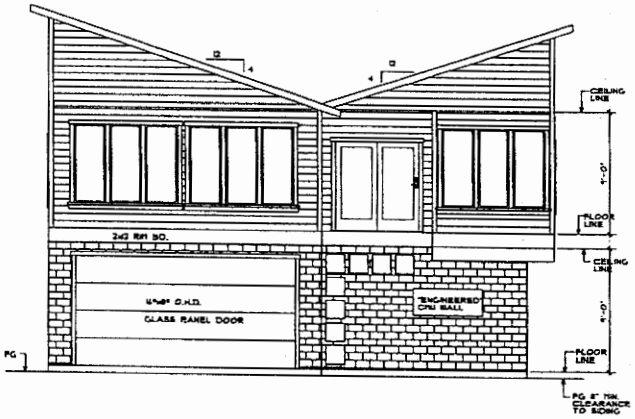
RIGHT SIDE ELEVATION

SCALE: 1/4"=1'-0"



BACK ELEVATION

SCALE: 1/4"=1'-0"



FRONT ELEVATION

SCALE: 1/4"=1'-0"

C:\drawings\MARK SLOPER\SL-HB.asc

Monday, April 20, 2015

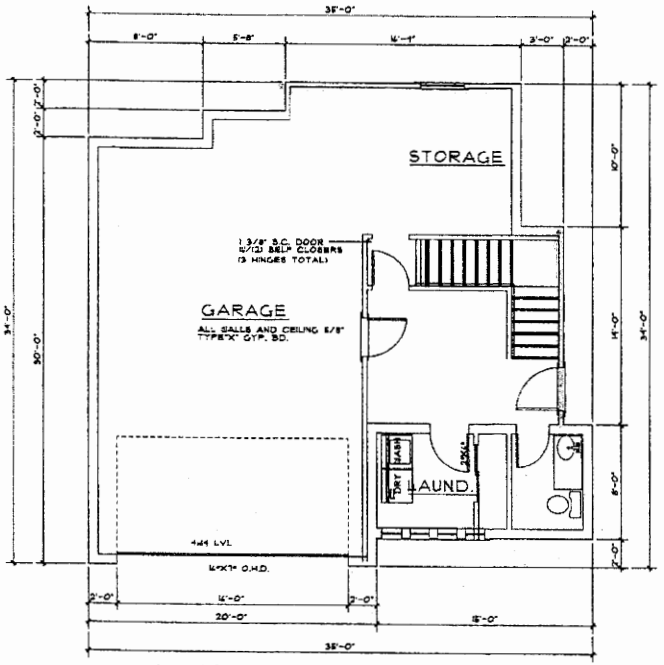
OWNER: MARK SLOPER
BUILDER: MARK SLOPER
AP#305-083-002 ;ADDRESS: 1591 BUHNE DR.
PHONE #

DESIGN DRAFTING
Drafting Service
2803 E ST. EUREKA, CALIFORNIA (707)443-9909

Project # SL-HB
Date 4/20/2015
Drawn By JHA
Checked by JHA
Revised

Sheet No.
of Sheets

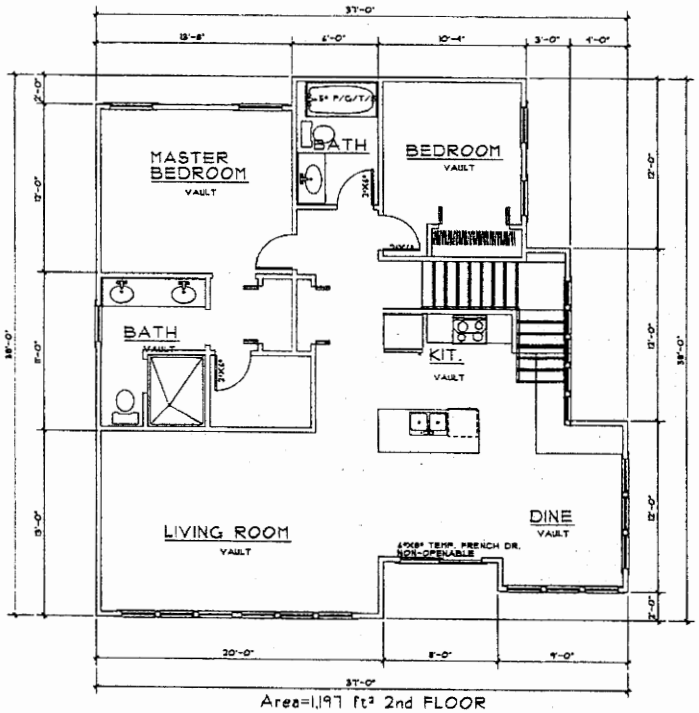
3 of 5



Area=1,039 ft² 1st FLOOR W/GARAGE

1st FLOOR PLAN

SCALE: 1/4"=1'-0"



Area=1,197 ft² 2nd FLOOR

2nd FLOOR PLAN

SCALE: 1/4"=1'-0"

GENERAL NOTES:

ALL WORK SHALL CONFORM TO 2010 C.R.C. CRC,CPC,CEC-2010 AND TITLE 24

1. DRAWING SCALE AS NOTED.
2. ALL FRAMING LUMBER D.F. #2 UNLESS NOTED.
3. ALL WOOD MEMBERS IN DIRECT CONTACT WITH CONCRETE TO BE PRESSURE TREATED D.F.
4. ALL BEDROOM WINDOWS TO BE FRAMED W/MAX. 36" TO FLOOR.
5. ATTIC ACCESS TO BE 22"X30" MIN.
6. FOUNDATION ACCESS TO BE 18"X24" MIN.
7. SMOKE DETECTORS IN ALL BEDROOMS,ADJOINING HALLWAYS AND VAULTED AREAS OVER STAIRWELL TO HAVE BATTERY BACKUP. DETECTORS TO BE HARD WIRED.
8. GFCI RECEPTACLES IN BATHROOMS, KITCHEN, GARAGES, LAUNDRY &WARD EXTERIOR
9. CONCRETE MIX TO BE 3000 PSI MIN.
10. UNDERFLOOR VENTILATION TO HAVE 1 SQ. FT. OF VENT TO EACH 150 SQ.FT. OF UNDERFLOOR AREA
11. GARAGE WALLS SHALL BE 5/8" TYP "X" GYP. BD. UP TO ROOF SHEATHING BETWEEN RESIDENCE AND GARAGE
12. ATTIC VENTILATION REQUIRED TO HAVE 1 SQ.FT. OF OPENING TO EACH 150 SQ.FT. OF ATTIC AREA
14. ALL GLAZING IN TUB ENCLOSURES TO BE TEMPERED
15. DRYER VENT TO TERMINATE OUTSIDE OF BUILDING W/ MAX. LENGTH OR MANUFACTURES SPECS
16. IN EXTERIOR WALLS AND BEARING PARTITIONS, ANY WOOD STUD MAY BE CUT OR NOTCHED TO A DEPTH NOT TO EXCEED 25 % OF ITS WIDTH. CUTTING, NOTCHING OF STUDS IN NON-BEARING WALL CAN NOT EXCEED 40 % OF STUD WIDTH.
17. A BORED HOLE CAN NOT EXCEED 40% OF THE STUD WIDTH. BORED HOLES NOT GREATER THAN 60% IN NON BEARING WALLS.
20. IN EACH ROOM THAT CONTAINS A WATER CLOSET, ONE LIGHTING FIXTURE THAT COMPLIES THE HIGHER EFFICIENCY STANDARDS SHALL BE PROVIDED I.E., 40 LUMEN PER WATT (FLUORESCENT TYPE).
21. MATERIALS USED FOR DRAINAGE AND WASTE SHALL BE ABS. MATERIALS USED FOR WATER PIPING SHALL BE COPPER, OR EQ., MATERIALS USED FOR GAS PIPING SHALL BE BLACK IRON.
22. ANCHOR OR STRAP, WATER HEATER, HVAC UNIT, OR AIR HANDLING UNIT INCLUDING DUCTS TO STRUCTURE TO RESIST EARTHQUAKE MOTION.
23. PROVIDE APPROVED NON-REMOVABLE BACKFLOW PREVENTION DEVICES ON HOSE BIBS.
24. PRESSURE TEMPERATURE RELIEF VALVES SHALL TERMINATE OUTSIDE THE BUILDING WITHIN 6" TO 24" OF THE GROUND OR TO ANOTHER APPROVED LOCATION.
25. SKYLIGHTS SHALL BE U.L.B.O. LISTED
26. ALL HEADERS SHALL BE 4X12 D.F. UNLESS OTHERWISE NOTED.
27. ALL EXTERIOR SURFACES OF THE BUILDING SHALL BE WRAPPED IN R WRAP OR SIMILAR MATERIAL
28. ALL SUBSIDING SHALL BE 1/2" CDX PLYWOOD OR O.S.B. UNLESS OTHERWISE SPECIFIED.
30. PRIMARY LIGHTING IN BATHROOMS AND KITCHEN TO BE FLORESCENT LIGHTING.
31. COMBUSTION AIR REQUIREMENTS FOR GAS BURNING APPLIANCES ARE 50 CUBIC FEET OF AREA PER 1000 BTU/H OF AGGREGATE INPUT RATING OF APPLIANCES. SEE PROP ABOVE AND BOX FROM BELOW.

---- = FEMA BLOW OUT WALLS

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Monday, April 20, 2015

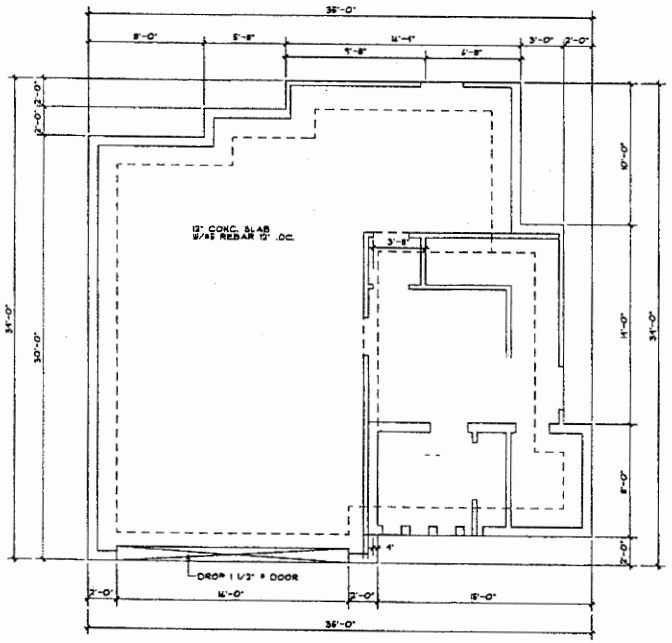
5 of 4

OWNER: MARK SLOPER
BUILDER: MARK SLOPER
AP#305-083-002 ;ADDRESS: 1591 BUHNE DR.
PHONE #

DESIGN DRAFTING
Drafting Service
(707)445-9889
2808 E. ST. EUREKA, CALIFORNIA

Project # 56-14B
Date 4/20/2015
Drawn By JMA
Checked by JMA
Revised

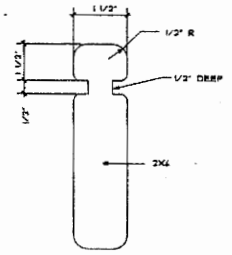
Sheet No.
___ of ___ Sheets



NOTE: 2500 PSI CONC.TYP.

FOUNDATION PLAN

SCALE: 1/4"=1'-0"



HANDRAIL DETAIL

SCALE:NONE

SLAB WILL BE POURED ON 12" OF COMPACTED BASE ROCK

S to S

OWNER: MARK SLOPER
BUILDER: MARK SLOPER
AP#305-083-002 ;ADDRESS: 1591 BUHNE DR
PHONE #

DESIGN DRAFTING
Drafting Service
3609 B ST. EUREKA, CALIFORNIA (707)443-9888

Project # 14-14B
Date 4/20/2015
Drawn By JMA
Checked by JMA
Revised

Sheet No.
___of___Sheets

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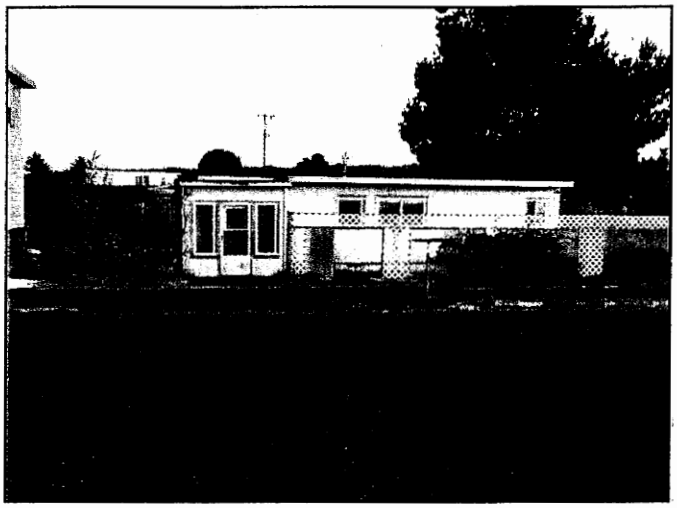
Monday, April 20, 2015

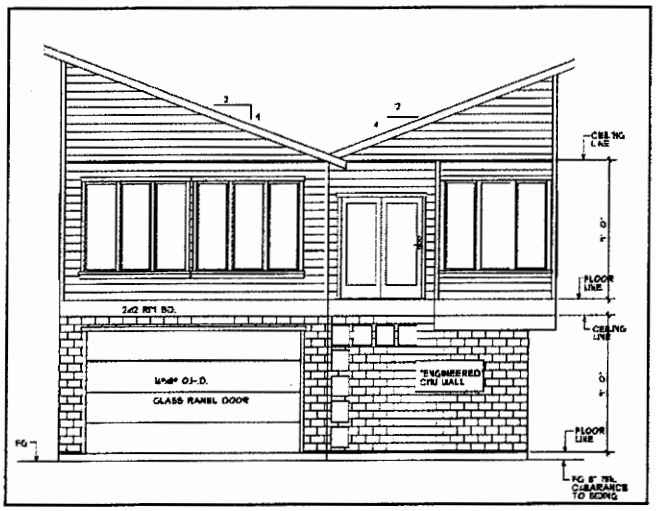
EXHIBIT NO. 5
APPLICATION NO. 1-14-0160
Sloper
WAVE UPRUSH STUDY – 1 of 12

100-year Wave Uprush and Sea Level Rise Study

1591 Buhne Drive,
King Salmon, California
(APN # 305-083-002)

PWA Report No. 15506301
September 2015





Prepared for:
Mark Sloper
801 Westgate Drive
Eureka, CA, 95503

REGISTERED PROFESSIONAL ENGINEER
L. B. JOB
C 055099
Exp. 12/16
CIVIL
STATE OF CALIFORNIA

Prepared by:
Whelan Gilkerson, Ecologist/GIS Analyst
Brad Job, P.E., Senior Engineer
Pacific Watershed Associates Inc.
PO Box 4433, Arcata, CA 95518-4433
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100-year Wave Uprush and Sea Level Rise Study

1591 Buhne Drive, King Salmon, California
(APN # 305-083-002)

Introduction

To satisfy California Coastal Commission (CCC) requirements regarding incorporating sea level rise planning and hazard analysis in the Coastal Development Permit (CDP) application process, Mr. Sloper contracted Pacific Watershed Associates (PWA) to provide a 100-year wave uprush and sea level rise study for his property at 1591 Buhne Drive, King Salmon, California (APN # 305-083-002). In a letter dated February 14, 2014, the Coastal Commission asked Mr. Sloper to "Specifically, provide a wave uprush analysis and evaluate the water levels associated with a combined event of the following: projected sea level rise, plus a 100-year wave event, plus a 100-year storm surge, all occurring at high tide." To pursue this study, PWA conducted the following research and analysis, with guidance provided by CCC staff members Leslie Ewing (Senior Coastal Engineer) and Kasey Sirkin (Coastal Program Analyst II).

Background

King Salmon is an unincorporated community in Humboldt County situated on a peninsula created by the historic stockpiling of dredge spoils (Times Standard, 1977). King Salmon separates South Humboldt Bay from Entrance Bay (Figure 1.). With a population of approximately 160 and a median household income of $40,000, King Salmon represents an economically disadvantaged community (Census Block Group ID Number 060230107004; Disadvantaged Communities Mapping Tool). With the majority of King Salmon situated at elevations ranging between 2.3 and 3.5 m NAVD 88, the area is subject to periodic flooding when the highest astronomical tides coincide with amplified water levels associated with storm surge.

Historically, construction of the jetties and dredging of the Humboldt Bay Entrance Channel allowed high-energy waves and concentrated tidal currents to almost completely erode Red Bluff by the early 1980's (Barnhart 1992). This presented an increasing threat to the community of King Salmon and the adjacent Humboldt Bay Power Plant. This erosion was arrested through shoreline armoring, including construction of two large groins and rebuilding of the beach at King Salmon in a joint effort conducted by the Humboldt Bay Harbor, Recreation, and Conservation District and the Army Corps of Engineers (Humboldt Bay Harbor, Recreation, and Conservation District 2012). The historic erosion and subsequent coastal protection measures provides context regarding threats to coastal communities associated with shoreline erosion that can be both caused by and mitigated through coastal development and engineering in the absence of accelerated sea level rise.

Methods

Our approach to conducting this wave uprush and sea level rise study for one property in the King Salmon area was guided by input from CCC staff in conjunction with the recently adopted California Coastal Commission Sea Level Rise Policy Guidance document (California Coastal Commission 2015).

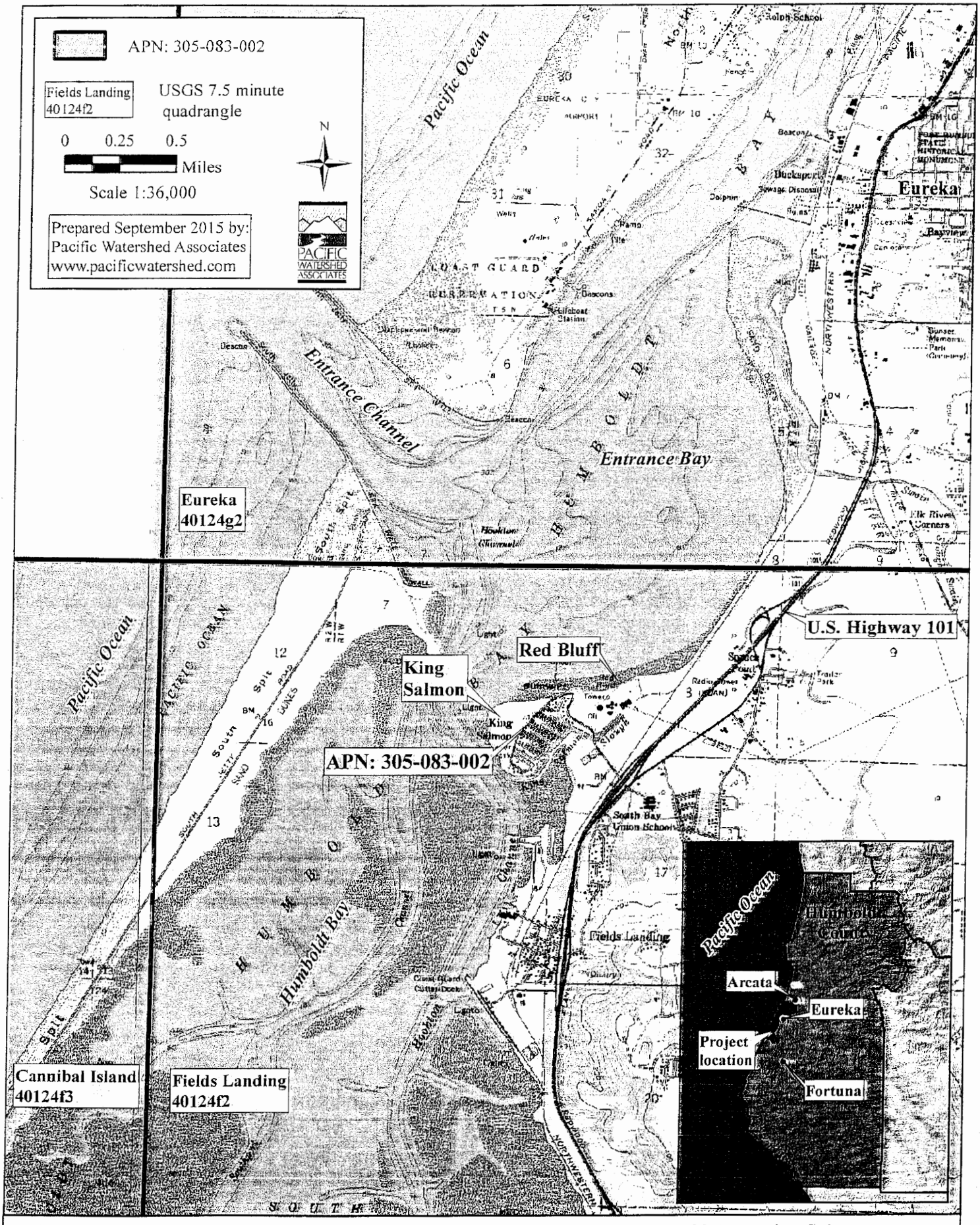

Figure 1. General location map for Sloper, 1591 Buhne Drive, A.P. No.: 305-083-002, King Salmon, Humboldt County, California.

P:\GIS\5063 Sloper 2015\5063 Sloper 2015 location map.mxd

Existing Conditions- According to the Humboldt Bay Sea Level Rise Vulnerability Assessment Digital Elevation Model (DEM; PWA 2014), Mr. Sloper's parcel (APN # 305-083-002) ranges in elevation between approximately 2.6 and 2.9 meters elevation relative to the NAVD-88 vertical datum and is located approximately 1.9 miles southeast of the North Spit tide gage. Based on the relative proximity of Mr. Sloper's parcel to the North Spit tide gage where both tidal water levels and vertical land motion rates have been assessed, we chose to base our analysis on published values from the North Spit gage site without interpolation.

Sea Level Rise Projections- For the Humboldt Bay region, where observed sea level rise is heavily influenced by the combined effects of regional eustatic sea level rise (ESLR) and vertical land motion (VLM), relative sea level rise (RSLR) rates are amongst the highest observed along the west coast of the United States (NHE 2015; Patton et al. 2014). To address the 100-year sea level rise projections required for the analysis, PWA applied a range of published RSLR projections for the year 2100 (Table 2-9; NHE 2015) that incorporated both ESLR and VLM components. RSLR projections for the year 2115 were then developed by extending the ESLR rate and VLM rate established at the North Spit Gage for an additional 15 years.

High Tide Conditions- To establish the high tide scenario, historic water level observations at the North Spit gage were assessed and the highest astronomical tide was incorporated in the analysis.

100-year Storm Surge- Troy Nicolini, Chief Meteorologist at the National Weather Service Woodley Island Station, provided data on the maximum observed storm surge and maximum observed wind speed for the period of record dating to 1886.

100-year Wave Uprush Event- Wave uprush is the maximum vertical extent of wave runup on a structure above the design still water level. To assess wave uprush, the following design parameters, assumptions and procedures were incorporated into the analysis:

To establish the design still water levels upon which to model the 100-year wave event, we superimposed the highest observed astronomical tidal water level with the highest observed storm surge and both the maximum and minimum 100-year mean relative sea level rise estimates based on observations and predictions for the North Spit gage. We then assessed maximum fetch lengths within Humboldt Bay upon which the wind could potentially interact to generate the largest wind-waves at King Salmon. PWA assumes that for the purpose of assessing wave uprush, that the design storm and sea level rise scenario most likely to affect the subject property would result from storm-generated wind waves with a southwesterly wind direction and associated fetch component operating within the confines of South Humboldt Bay.

While the northwestern shoreline of King Salmon is somewhat influenced by ocean waves propagating through the Bay's Entrance Channel, these ocean-generated waves are substantially attenuated by the relatively narrow bay entrance and associated shoreline armoring in conjunction with extensive shoals that range between approximately -3 to -5 m NAVD 88 throughout most of Entrance Bay. Additionally, existing rock groins at King Salmon Beach

(approximately 3.5 m NAVD 88), a small dune field (ranging from 4.5 to 6 m NAVD 88), and a concrete sea wall (approximately 4 m NAVD 88) provide substantial protection from deep water wave propagation and associated shoreline impacts under current conditions (Figure 2). Considering the range of design still water levels incorporated into this analysis, any additional inundation considered for the subject property associated with wave uprush was assumed to be driven by locally generated wind-waves interacting with a shallow, inundated landscape under 100-year sea levels and maximum storm surge.

Following guidance provided by the U.S. Army Corps of Engineers Shore Protection Manual Volume I (USACE 1984), maximum observed wind speeds were converted to wind stress and incorporated with fetch lengths and water depths derived from the Humboldt Bay DEM to generate maximum wave height and period estimates for King Salmon. For this analysis, it was assumed that maximum observed wind speeds aligned with maximum fetch lengths. Wave uprush for the Sloper parcel was then calculated according to Holmes (2001), assuming that a non-breaking wave interacting with the vertical walls of the proposed Sloper residence in conjunction with the maximum design still water level would generate the maximum 100-year inundation level at the proposed residence.

Results

Appendix A provides the input parameters and details the analytical steps that were performed to predict wave uprush and the associated maximum inundation levels anticipated for the proposed Sloper residence. Figure 2 presents a detailed view of King Salmon with minimum and maximum design still water level and NAVD 88 0 contours superimposed over aerial imagery. Figure 3 presents the fetch profile and minimum and maximum design still water levels considered for the uprush analysis (only the maximum design still water level was used to compute uprush).

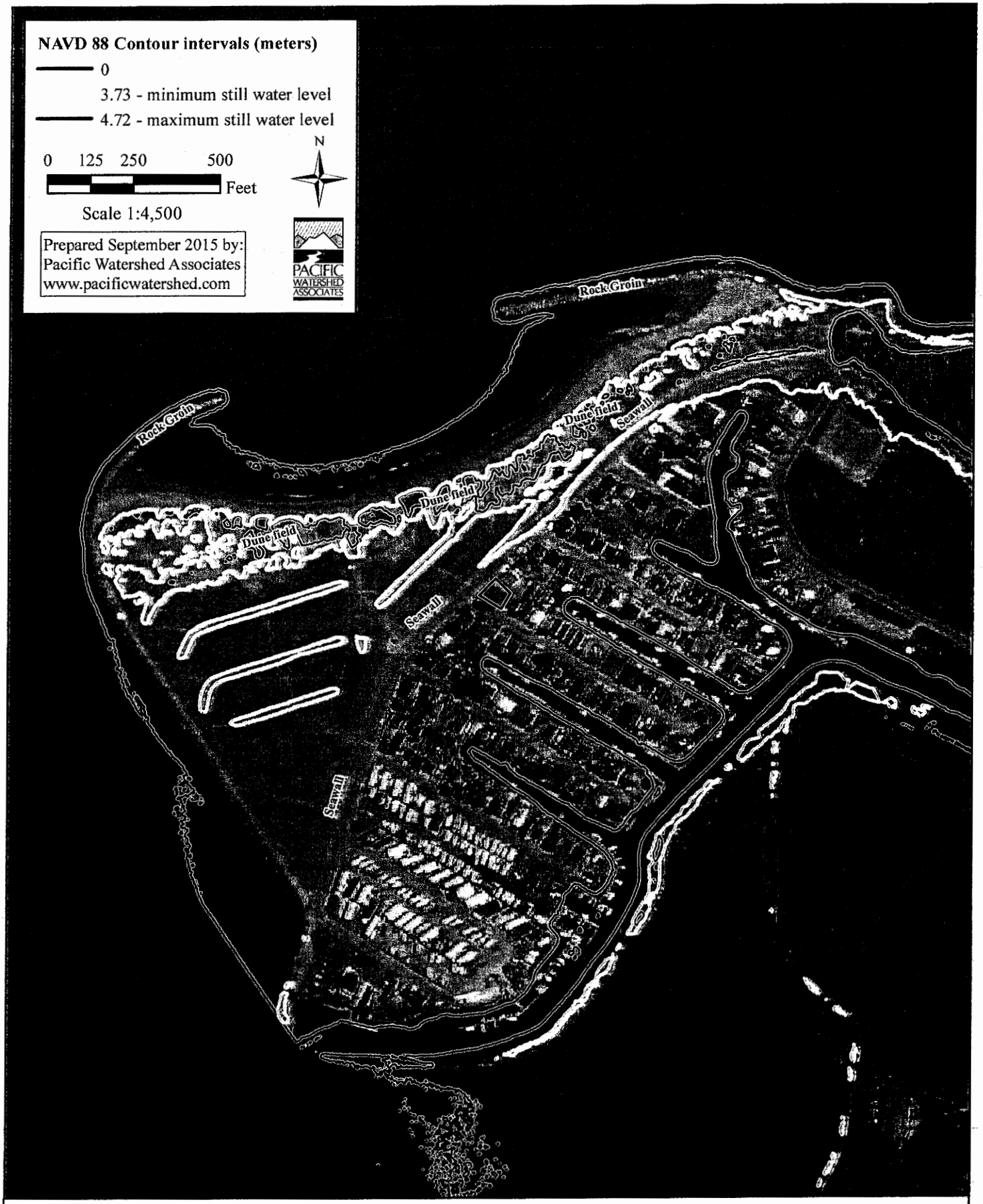

Figure 2. Site map for Sloper, A.P. No.: 305-083-002; showing the NAVD 88 0 contour in addition to projected maximum and minimum 100-year design still water inundation level contours, King Salmon, Humboldt County, California.

P:\GIS\5063 Sloper 2015\5063 Sloper 2015 site map.mxd

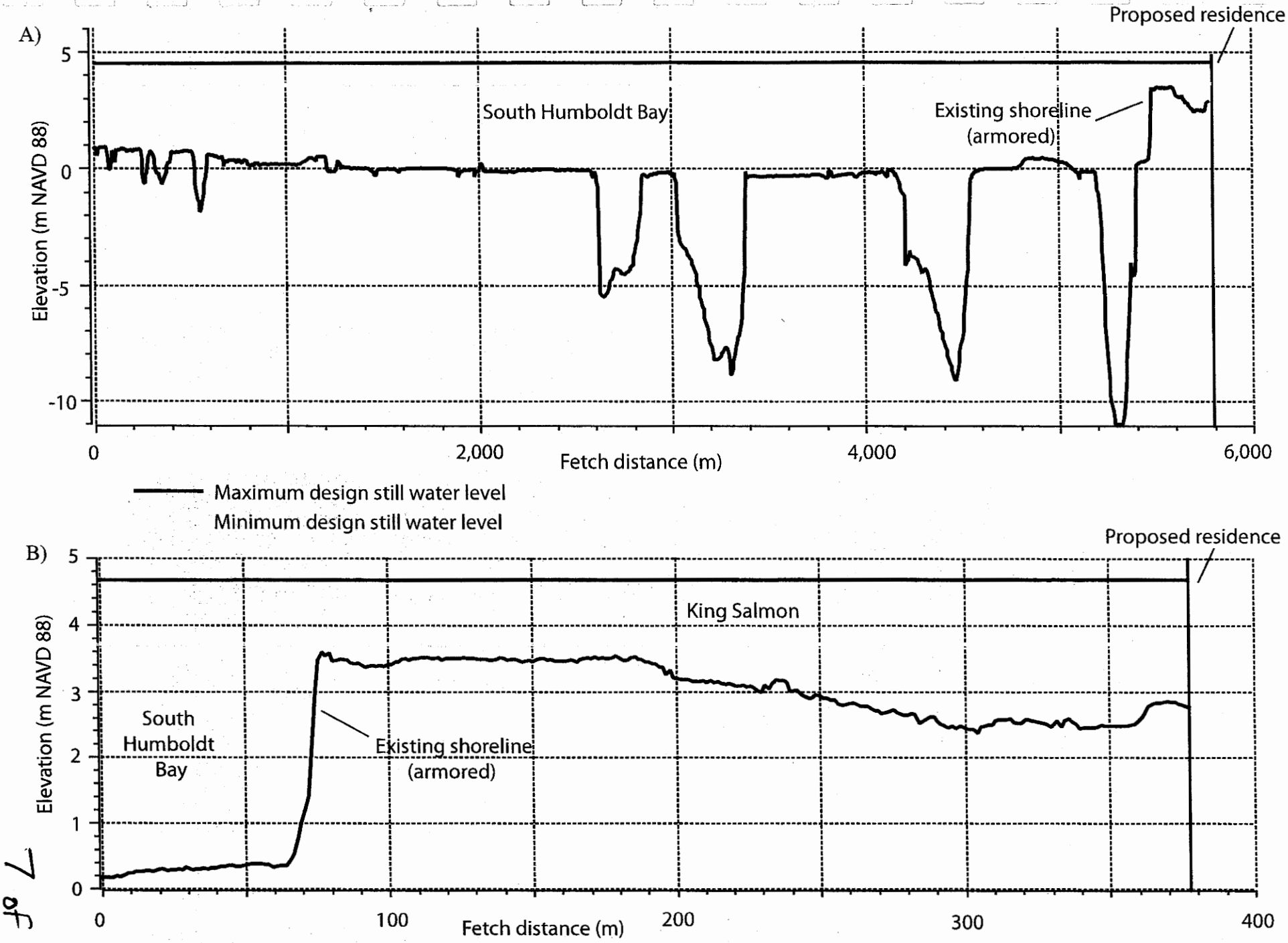

Figure 3. Fetch profile used to estimate wave uprush for the proposed Sloper residence (APN No.: 305-083-002); King Salmon, Humboldt County, California. Plot A presents the full fetch profile including open water areas of South Humboldt Bay. Plot B presents the fetch profile in detail for King Salmon.

Incorporating uprush (0.94 m) with the maximum design still water level (4.73m), produces a maximum inundation level of **5.67m NAVD 88** at the Sloper residence. According to the design specifications of Mr. Sloper's proposed residence, the finished floor elevation will be 10' 8" above grade or 3.25 m above the ground elevation of his parcel, which was estimated to vary between 2.6 and 3.0 m NAVD 88 according to the Humboldt Bay DEM. Taking into consideration leveling associated with foundation construction, we assume the base elevation of the parcel to be 2.8 m NAVD 88. Therefore, the finished floor elevation is estimated to be 6.05 m NAVD 88, which is 0.38 m above the estimated combined 100-year sea level rise and wave-uprush scenario.

Discussion

There is a high degree of uncertainty inherent in projecting future inundation associated with the combined effects of 100 years of sea level rise and extreme storm events. To begin with, the range of uncertainty regarding regional eustatic sea level rise projections for the year 2100 is on the order of one meter (NHE 2015). Additionally, predicting the future wave environment is complicated by a number of factors including uncertainty about future sea level, storm magnitude and frequency, sediment supply and shoreline management actions (California Coastal Commission 2015). Currently, there is no single approved or accepted method of projecting future wave conditions including uprush (California Coastal Commission 2015; Riggs Engineering 2013). Even under existing conditions there is substantial uncertainty with respect to modeling wave behavior in inundated, developed areas, where the presence of buildings, retaining walls and other infrastructure result in wave diffraction, refraction, and reflection that would likely attenuate potential wave uprush on any given structure within King Salmon. Further, by using the existing Humboldt Bay DEM which is based on bare-earth Lidar data for intertidal and terrestrial areas as the basis for predicting wave uprush, we neglect the effects that buildings would have on wave attenuation because they have been synthetically removed from the DEM.

Based on the results of our study, it appears likely that the community of King Salmon will face increased risk of flooding, both in terms of frequency and magnitude, well before the effects of wave uprush further exacerbate inundation levels. King Salmon generally decreases in elevation moving eastward towards the canal system adjacent to the majority of the residential parcels comprising the community (Figures 2 and 3). This suggests that flooding from elevated water levels would inundate much of the community from the east before water levels become high enough to allow the propagation of significant wave energy from the south or west. While the sea walls currently protecting King Salmon from wave exposure could be further built up to protect the community from the effects of future wave exposure (and likely will be over the next 100 years), it may be more difficult to address the overall effects of increasing inundation given the extremely low elevation of the King Salmon peninsula.

Mr. Sloper's proposed residence incorporates a number of design elements that will substantially reduce the risk of damage associated with flooding and wave uprush throughout the design life of the structure. The finished floor elevation will remain approximately 0.38m above the highest predicted inundation levels considered in this study for the next 100 years. Additionally, the

lower level (garage) of the proposed residence that may be subjected to inundation will be constructed of reinforced concrete masonry units and designed according to Federal Emergency Management Agency (FEMA) standards for elevated coastal buildings (http://www.fema.gov/pdf/fima/job15.pdf).

Limitations

PWA makes no warranty either expressed or implied, regarding the proposed structure's capacity to survive the forces associated with any and all storm events or inundation conditions. The results of this study were limited to the assessment of future inundation levels and do not include any analysis regarding structural design considerations with respect to the lateral forces potentially imposed by wind and/or waves on the proposed structure. Additionally, the potential direct and indirect effects of earthquakes and tsunamis were not considered in this study.

Citations

Barnhart, Roger A. 1992. The Ecology of Humboldt Bay, California: an Estuarine Profile. Washington, D.C.: U.S. Dept. of the Interior, Print.

California Coastal Commission. 2015. Sea Level Rise Policy Guidance: Interpretive Guidelines for Addressing Sea Level Rise in Local Coastal Programs and Coastal Development Permits. Adopted August 12, 2015.

Disadvantaged Communities Mapping Tool. Available at: https://gis.water.ca.gov/app/dacs/

Federal Emergency Management Agency. 1999. Technical Bulletin 9/99. Design & Construction Guidance for Breakaway Walls Below Elevated Coastal Buildings. Available at: http://www.fema.gov/pdf/fima/job15.pdf

Holmes, P. 2001. Coastal Infrastructure Design, Construction, and Maintenance. Chapter 10, Coastal and Offshore Structures.

Municipal Service Review. 2012. Humboldt Bay Harbor, Recreation, and Conservation District. Prepared for Updating the Sphere of Influence Report.

North Spit tide gage datums. Available at: (http://tidesandcurrents.noaa.gov/datums.html?units=1&epoch=0&id=9418767&name=North+Spit&state=CA)

Northern Hydrology and Engineering. 2015. Humboldt Bay: Sea Level Rise, Hydrodynamic Modeling, and Inundation Vulnerability Mapping. Prepared for the State Coastal Conservancy and Coastal Ecosystems Institute of Northern California.

Pacific Watershed Associates (PWA). 2014. Humboldt Bay Sea Level Rise Vulnerability

Assessment: DEM Development Report, Final Draft. Prepared for Northern Hydrology & Engineering. PWA, McKinleyville, CA. PWA Report No. 14100351, February 2014.

Patton, J. R., T. B. Williams, J. K. Anderson, R. Burgette, and T. Leroy. 2014. Tectonic land level changes and their contribution to sea-level rise, Humboldt Bay region, Northern California: 2014 status update. Prepared for U.S. Fish and Wildlife Service Coastal Program. Cascadia GeoSciences, McKinleyville, CA.

Riggs Engineering. 2013. Technical Brief - Wave Uprush Analysis. 129 South Street, Gananoque.

USACE. 1984. Shore Protection Manual Volume 1. Coastal Engineering Research Center. Department of the Army. Waterways Experiment Station, Corps of Engineers, 3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199

Troy Nicolini, Meteorologist, National Weather Service. Personal Communication, August 28, 2015.

The Times Standard, Eureka, California. Sunday, November 13, 1977. Local Dredging Activity.

Appendix A

Table 1. Water level and wind speed input parameters used to develop 100-year sea level rise and wave uprush projections.

Input parameter	Value	Source
RSLR	0.68 -1.68 m (2100)	NHE 2015*
Highest astronomical tide	2.597 m NAVD 88, (12/31/1986)	North Spit tide gage, NOAA
100-year storm surge	0.451 m, (12/31/2005)	North Spit tide gage, NOAA
100-year maximum wind speed	69 knots (12/31/2005)	NWS Eureka, Woodley Island station
Maximum design still water level	4.73 m NAVD 88	
Minimum design still water level	3.73 m NAVD 88	

* Values derived from Table 2-9 (NHE 2015) for the year 2100 and projected to year 2115.

Wave Uprush Calculations

Maximum wind speed = U_f = **69 knots** = 35.5 m/s
Assuming t = 55 seconds, $U_{t=3600\,s} = \frac{U_{t=55}}{\left(\frac{U_{t=55}}{U_{t=3600}}\right)} = \frac{35.5}{1.25}$ **=28.4 m/s** = 1 hour wind speed

Wind stress = $U_A = 0.71\ (U_t)^{1.23}$ =0.71 $(28.4)^{1.23}$ **43.5 m/s**

Fetch length, maximum wave height and wave period:
Segment 1 (open water)
Fetch length = 5,474m ~5.5 km
Depth ~4.5 m
Wind stress = 43.5 m/s

From Figure 3-29 (USACE)
Segment 1: H = 1.25 m, T = 3.5 sec

Segment 2 (inundated land)
Fetch length = 298 m ~ 300 m
Depth ~1.5 m
Wind stress = 43.5 m/s
Segment 2: H = 0.375 m T = 1.4 sec

The incoming open water waves would be induced to break along the shoreline where the vertical step and height associated with the armored shoreline is approximately 1.2 m below the

maximum design still water level. A component of the incoming wave energy would be reflected due to the abrupt change in depth along the armored shoreline while the remaining wave energy would continue to propagate shoreward through the flooded area and lead to uprush above the maximum design still water level of 4.73 m NAVD 88. For this analysis, it is assumed that the wave period remains unchanged as the wave transitions into depth limited conditions associated with inundated areas. It is also assumed that there are no other buildings or obstructions on the land surface leading to the Sloper residence. The maximum stable wave height at the seaward end of fetch segment 2 is then calculated as:

$H_m = 0.78*d = 0.78 * 1.2 \text{ m} =$ **0.94 m**

As the depth of the inundated area seaward of the Sloper residence gradually increases moving landward from the existing shoreline (Figure 3), it is assumed that wave-uprush predictions for the Sloper residence would be based on a non-breaking wave surging up the vertical walls of the structure (Holmes, 2001). Since the fetch length corresponding to the inundated area seaward of the Sloper residence is short and the maximum depth remains approximately 2 meters or less relative to the maximum design still water level, we assume that the maximum stable wave height throughout the inundated portion of the fetch profile does not exceed 0.94 m. Under this assumption, wave uprush at the Sloper residence is calculated according to the following equation:

$$R/_H = (\pi/_{2\theta})^{1/2}$$

Where R is the vertical uprush above the design still water level and H is the maximum wave height. In the case of a vertical wall, $\Theta = \pi/2$ and R = H, therefore, **R = 0.94 m**.