# H. Hydrology and Water Quality

## Environmental Setting

### Climate

The Humboldt Bay region has two distinct seasons. The fall and winter season is mild but wet; spring and summer are cool and dry. Temperatures are affected by the close proximity to the Pacific Ocean and are generally moderate. The average temperature in Eureka is between 48 and 50 degrees Fahrenheit (F) in winter and between 55 and 57 degrees F in summer. Eighty-five percent of the precipitation occurs during a 7-month period from October to April. Average annual precipitation ranges from 39 inches at Eureka to over 50 inches per year at the highest elevations in the watershed. The amount of precipitation varies significantly from year to year. A climactic cycle with periodicity of 8 to 10 years is evident from long-term rainfall records. Two periods of significant and prolonged droughts occurred between 1975 to 1995; only five or 6 years over this period had precipitation equal to or exceeding mean annual precipitation for the correlative period of record. Precipitation in the Humboldt Bay watershed arises from rain, snow, and fog-drip (fog condensing on vegetation). Snow occurs on the ridge tops occasionally during cold winter storms and rarely over the entire watershed. In the dry season the climate is moderated by summer fog that reduces solar radiation and creates an ideal habitat for a temperate rainforest.

### Regional Hydrology

The Eureka area is south of the Klamath Mountains and at the north end of the Coast Range physiographic province. Rugged mountains, scarred by numerous landslides, and stream valleys with steep, narrow canyons characterize the inland topography. Local relief, from ravine bottom to ridge top, is more than 1,000 feet. Along the coast, however, the stream valleys are broad, and elevated flat or gently rolling terraces characterize the topography.

The project site is located within the Eureka Plain Hydrological Unit, which drains an area of approximately 220 square miles to Humboldt Bay. The majority of the watershed is steep and heavily forested. Land uses in the watershed are dominated by timber harvesting and agricultural uses, with the majority of the population in the watershed basin living in the cities of Eureka and Arcata (County of Humboldt, 2002). Although the region surrounding Humboldt Bay has undergone substantial urbanization, it is considered to be among the least affected estuarine complexes of the California Coast (City of Eureka, 1994).

#### *Humboldt Bay*

Resembling an hour-glass in configuration, Humboldt Bay is long relative to width, 14 miles in length and ranges in width from 0.5 to 4.5 miles. Humboldt Bay has a surface area of 16,000 acres (23.4 square miles) characterized by tidal flats, channels and freshwater and salt marshes. The

bay is separated from the Pacific Ocean by a sand spit, separated approximately in the center by a shipping channel and rock jetties. Three sub-bays comprise the Humboldt Bay system:

### North (or Arcata Bay)

North Bay is bounded on the south by the multi-span Highway 255 bridge that joins Eureka and the communities and beaches of the North Spit. Mad River Slough is a long arm of North Bay. This is one of the largest sub-bays. Encompassing the entire northerly end, it is a wide, shallow bay 4.5 miles wide and 4.1 miles long, covering 9,400 acres. Tributaries include Mad River Slough, McDaniel's Slough (Jane's Creek), Butcher's Slough (Jolly Giant Creek), Gannon Slough (Campbell, Fickle Hill, Grotzman and Beith Creek), Jacoby Creek, Ryan, Washington and Eureka Slough.

### Central Bay (Entrance Bay)

Central Bay is 2.2 miles long and 1.5 miles in width. Central Bay connects the North and South Bays and exchanges tidal waters through the bay inlet to the ocean. Commercial shipping is restricted to the dredged channel and docks along this section of the bay. The shoreline surrounding Entrance Bay is occupied by port facilities engaged in shipping, commercial fishing, associated commercial services and other industrial activities around the bay. Elk River is the primary tributary. City of Eureka storm drain outfalls are found along the City's waterfront.

### South Bay

South Bay is located south of the South Jetty. This shallow sub-bay is 4.1 miles long and 2.5 miles wide, covering 4400 acres. The Humboldt Bay National Wildlife Refuge is located entirely within the South Bay. Commercial and recreational docks, marinas, shipyard and a fish processing plant are located in the South Bay. Salmon Creek is the primary tributary.

From north to south, the four major streams in the Humboldt Bay watershed are Jacoby Creek (draining 17 square miles), Freshwater Creek (draining 31 square miles), Elk River (draining 29 square miles), and Salmon Creek (draining 17 square miles). Jacoby and Freshwater Creeks drain into Arcata Bay to the north, Elk River into Entrance Bay (just south of Eureka), and Salmon Creek into South Bay. Smaller streams flow primarily into the North Bay. Numerous sloughs exist around the bay which is part of the historic tidal bay ecosystem. Jacoby and Freshwater Creeks and their corresponding sloughs are tidal from 1 to 2 miles inland from their mouths, and their flood plains along the tidal reaches are uniformly level marshland and mud or tidal flats, which are only a few feet above water during high tide. The Mad River slough, an abandoned mouth of the Mad River, extends inland for about 3 miles.

Freshwater discharge into the bay represents very little of the daily tidal exchange and probably has only a localized effect with 85% of the water draining to either North Bay, or to Entrance Bay/North Bay channel from the Elk River. About 12% falls as precipitation directly on the bay and the remainder is runoff into South Bay. Salinity transects done following heavy rainfall have shown most freshwater runoff from North Bay streams to be discharging to the center of the bay via the inner reach from North Bay. Elk River runoff was quickly mixed with Bay water near Elk

River. Only minor depressions in salinity could be found in transects done in South Bay and at the location where South Bay meets Entrance Bay.

Humboldt Bay tides are called mixed tides because there is a major low, a minor high, a minor low, and a major high tide (not necessarily in this order) within each approximate 25 hour period. Greatest current velocities occur during changes from major high to major low or vice versa

The circulation of Humboldt Bay water is almost entirely tidally driven. South Bay's water exchange rate amounts to 60% of its Mean High Water (MHW) volume, and North Bay's rate of exchange averages 44% of its MHW volume. Measurements have shown that 75% of the water entering and exiting North Bay passes through the Samoa Channel. Complete water exchange estimates vary, but 14 tidal cycles, or about 7.5 days, seems likely.

These large volume exchange rates result in high-velocity tidal currents. The following data were obtained from Boyd, et al., 1992 and were reported as unpublished data, but seem supportable based upon the experience of mariners on the bay. Because 75% of the water entering North Bay does so through the Samoa Channel, it seems likely the currents there approach 3 knots.

North Bay channel.....3.0kts
Entrance to South Bay.....2.0kts
Entrance Channel.....3.3kts
Eureka Inner Reach.....1.0kts

Stream flow in Humboldt Bay tributaries are the highest from November through March and the largest floods in the watershed tend to occur during December and January. During the summer and fall, flow varies little and is relatively low. Rain may come late in some years, or persist longer. In 1958, very little rain fell in November and December, while three significant floods had already occurred by the end of the year in 1964. The magnitude, timing, and number of floods varies considerably from year to year and is not directly related to total annual rainfall, but is more closely tied to the intensity of individual storms. For example, an unusually large flood occurred in Jacoby Creek in 1955, though the total rainfall for the year was average.

### Water Quality

Humboldt Bay is listed on the Clean Water Act (CWA) Section 303(d) List of Water Quality Limited Segments for Dioxins and PCBs (Polychlorinated Biphenyls) (USEPA, 2006). PCBs are found in electrical transformers manufactured before 1978 and are regulated as a hazardous waste. Dioxins are formed as unwanted by-products in a variety of industrial and combustion processes, as well as household fires. Dioxins and PCBs have no immediate effect on health, even at the highest levels found in foods; the potential risks to health come from long-term exposure to high levels. They have been shown to cause a wide range of effects, including cancer and damage to the immune and reproductive systems in certain animals.

## *Groundwater*

The California Department of Water Resources (DWR) defines state groundwater basins based on geologic and hydrogeologic conditions. According to the DWR, the project site is located within the Eureka Plain Groundwater Basin (see Figure IV.H-1). The Eureka Plain Groundwater Basin has a surface area of 37,400 acres (58 square miles) and is bounded by the Little Salmon Fault to the south, Humboldt Bay and Arcata Bay to the west and northwest, and by Wildcat series deposits to the east (Strand, 1962). (The Wildcat series is a group of five formations ranging in age from Miocene to Pleistocene consisting of sandstone, marine siltstone, and claystone (Evenson, 1959)). The northeast basin boundary, shared with the Mad River Basin, is the northwest trending Freshwater Fault (Clark, 1990). It's unclear if the basin is hydrologically contiguous with the Mad River Basin. Humboldt Bay separates the primary basin deposits from dune sand deposits to the west. The faulted southern and northern basin boundaries may extend to the near surface and form hydrologic barriers in portions of dune sand deposits. Annual precipitation in the basin ranges from 39- to 47-inches, increasing to the southeast.

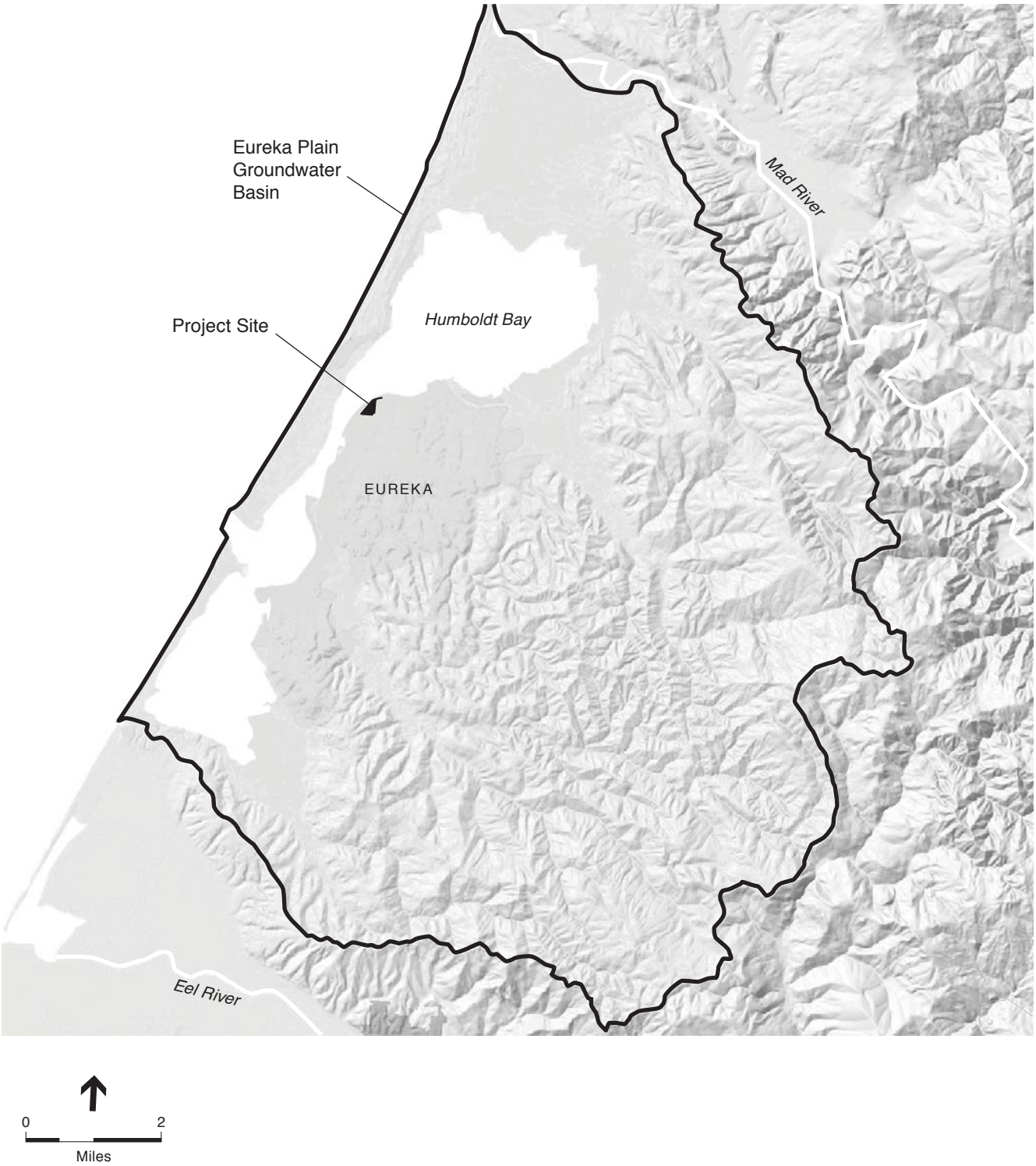
The basin is composed of Quaternary alluvium and deposits of the Hookton Formation underlain by non-marine Wildcat series deposits. Surface exposures of the Carlotta Formation are also observed north of Elk River. The Carlotta Formation forms the uppermost formation of the Wildcat series (Evenson, 1959).

### Water-Bearing Formations

The primary water-bearing formations in the basin include the Pliocene Hookton Formation and, to a lesser extent, Holocene dune sand west of Humboldt Bay and alluvial deposits southeast of Arcata Bay and along the Elk River.

**Pleistocene Hookton Formation.** The Hookton Formation underlies the alluvium in the river floodplains and is exposed surficially over approximately 70 percent of the basin. The formation consists of yellow to yellow-brown loosely consolidated clay, silt, sand, and gravel, interfingered with blue-gray marine clay and silt. Thickness of the formation ranges up to 100 feet (BOR, 1960). The formation is primarily fluvial in origin. In the Salmon Creek-Elk River Area, confined aquifers of the Hookton Formation yield up 800 gpm from wells about 400 feet deep (DWR, 1965). Sanding of wells is a problem.

**Holocene Dune Sand.** Beach and dune sand deposits occur in an almost continuous strip along the coast. The dune sand is more than 100 feet thick and attains a maximum width of three-fourths of a mile along the North Spit between the entrance to Arcata Bay and the mouth of the Mad River. The dune sand is loose, subangular to subrounded, fairly well sorted, fine to coarse grained, and gray or brownish gray in color (Evenson, 1959). The dune is developed as a source of water supply for shallow wells or well points that are driven into the sand far enough to penetrate the lens of freshwater overlying seawater. Recharge to the dune sand is almost wholly from local precipitation (Fuller, 1975).




SOURCE: California Watershed Portal

Marina Center Mixed-Use Development Project . 205513

**Figure IV.H-1**
Eureka Plain Groundwater Basin

**Holocene Alluvium.** The Holocene alluvium consists of clay, sand, and gravel underlying alluvial plains of fluvial origin. In the Salmon Creek-Elk River Area alluvium yields only very small quantities of water to wells. Alluvium in the Jacoby Creek-Freshwater Creek Area may be up to 50 feet thick and yields small quantities of water to wells.

#### Restrictive Structures

The Little Salmon Fault is likely a hydrologic barrier to the south.

#### Recharge Areas

Recharge to the alluvium is from direct precipitation and seepage from Freshwater Creek, Elk River and the Eel River. Some groundwater also moves laterally from adjacent formations and also moves upward due to differences in hydraulic head between the alluvium and underlying formations.

#### Groundwater Level Trends

Groundwater occurs in unconfined portions of the alluvium at depths less than 10 feet. Groundwater level trends have not been evaluated.

#### Groundwater Budget (Type B)

Estimates of groundwater extraction are based on a survey conducted by the California Department of Water Resources in 1996. The survey included land use and sources of water. Estimates of groundwater extraction for agricultural and municipal/industrial uses are 4,800 and 1,300 acre-feet respectively. Deep percolation from applied water is estimated to be 1,700 acre-feet.

#### Groundwater Quality

**Characterization.** Groundwater in the basin is characterized as calcium magnesium type water. Total dissolved solids (TDS) range from 97- to 460- mg/L, averaging 177 mg/L (DWR unpublished data).

**Impairments.** Groundwater impairments include localized high boron, iron, manganese, and phosphorus.

### *Tsunami Hazards*

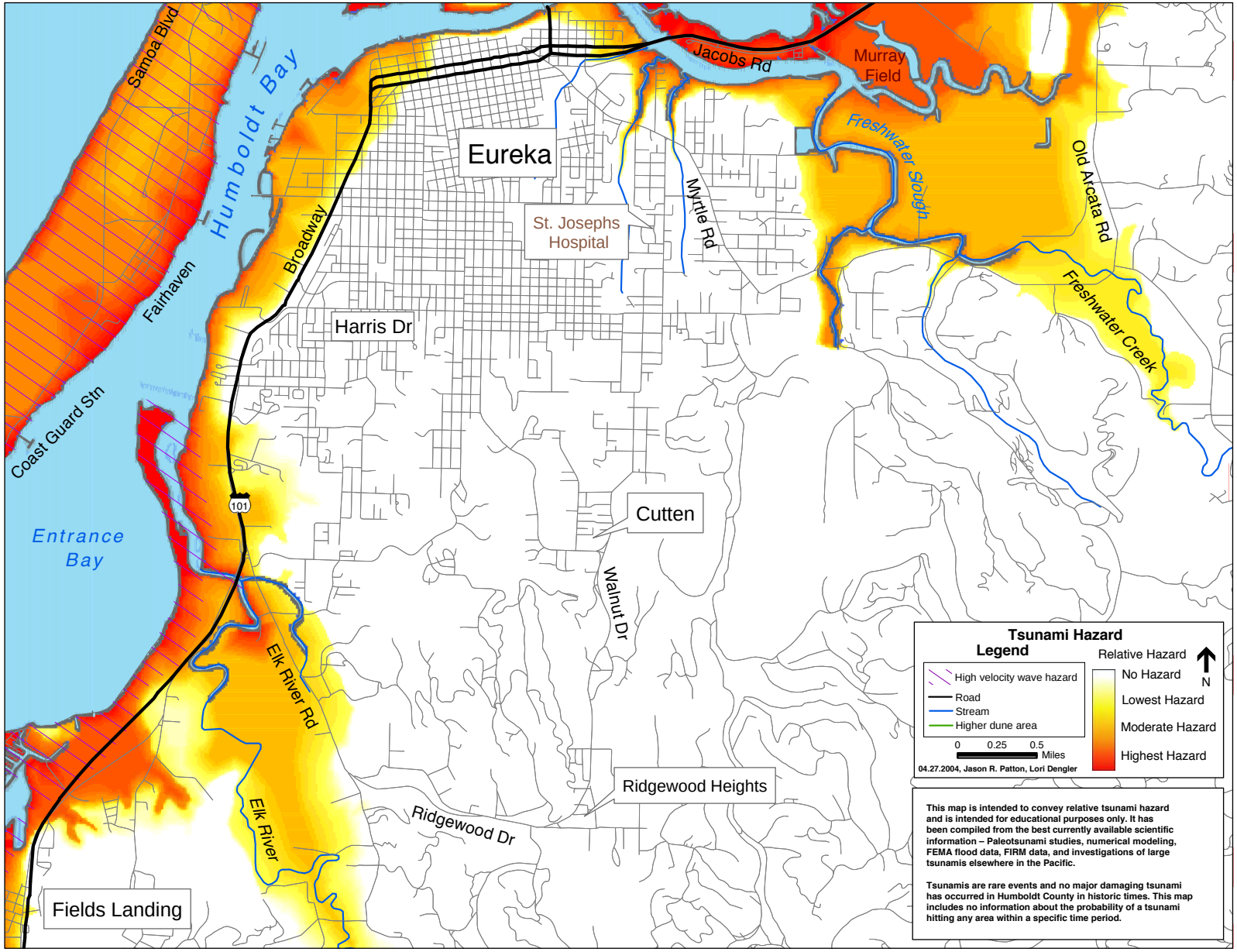
Low-lying coastal areas may be susceptible to inundation or flooding due to tsunami events. A tsunami is one or a series of large sea waves caused by earthquakes, submarine earthquakes, volcanic eruptions, landslides, or other large-scale disturbances on the sea floor. Tsunami waves are distinguishable from storm-generated waves because they are not caused by surface perturbations (wind), but rather are caused by movement on the sea floor that disrupts the entire water column. Areas that are highly susceptible to tsunami inundation tend to be located in coastal areas such as tidal flats, marshlands, and former bay margins that have been artificially filled but are still at or near sea level.

Due to the known seismic activity along the Cascadia subduction zone on California's northern coastline, there is a possibility that a large magnitude earthquake (M8.5+) could cause a significant tsunami to occur over the next 300 to 800 years (the inferred repeat time for such magnitude earthquakes on the subduction zone). The size of potential tsunami waves would correlate to the length of the rupture along the subduction zone, and the degree of secondary submarine landsliding. Tidal fluctuations in the north coast region may also affect the extent of tsunami inundation. Inundation risk would be greater at higher tides than at lower tides.

It is expected that the impact of a tsunami on Humboldt Bay would primarily occur along the north and south spits, and the King Salmon and Fields Landing areas, which are located directly across from the opening to Humboldt Bay. Humboldt State University faculty and graduate students have conducted a number of studies on the impacts to Humboldt Bay resulting from tsunami inundation. These studies indicate that the largest tsunamis occurring on the Northern California Coastline in recent history did not entirely inundate the north spit. According to the study, a subduction zone earthquake in January 1700 resulted in a tsunami that affected Humboldt Bay. The 1700 tsunami produced waves that were documented in Japan. Mapping of dune sequences suggests that the tsunami waves in 1700 might have over-topped the southern end of Humboldt Bay's north spit (including the Coast Guard base, Fairhaven, and parts of Samoa), but did not over-top the high forested dunes north of Samoa (Lanphere Dunes, etc.).

The two most recent tsunamis of any observable height recorded off the coast of California occurred in 1964 and 1992, respectively. In 1964, a magnitude 9.2 earthquake in the Gulf of Alaska resulted in a tsunami wave with a recorded maximum height of 12 feet on the inside of the north spit, and lower wave heights occurring along the Eureka waterfront area (CGS, 1995). On April 25, 1992, a series of strong earthquakes occurred near Cape Mendocino. The main shock was magnitude 7.1 and was followed by strong aftershocks with magnitudes of 6.6 and 6.7. The magnitude 7.1 main shock resulted in land-level changes near Cape Mendocino that generated a small tsunami that was recorded by tide gauges from Oregon to Southern California. (Bernard, E. N., et al. Tsunami inundation model study of Eureka and Crescent City, California and the Cape Mendocino Tsunami, NOAA Technical Memo ERL-PMEL 1993.) There was no flooding of the project site during either the 1964 or 1992 tsunami events.

Available tsunami inundation modeling for the Humboldt Bay region is based on a scenario 8.4 magnitude earthquake occurring on the 240 km-long southern Cascadia subduction zone, as well as world-wide historical tsunami observations. Bernard et al. (1994) based their inundation modeling on a 33-foot (10 meter) incident wave (i.e., the size of the wave that strikes the coastline) and determined that local inundation would reach approximately 10 feet (3 m). Current elevations at the project site are in the 8 to 12-foot range. The inundation estimates derived by Bernard et al. (1994), as well as the results of other studies, were compiled by the Humboldt Earthquake Education Center (2004) into a series of unpublished (yet publicly available) "Humboldt County Tsunami Hazard Maps." These maps use a four-color scheme to depict four hazard categories ranging from "No Hazard" to "Highest" hazard. The project site is shown primarily in the "Moderate" hazard zone on these maps see Figure IV.H-2. But given the paucity of data on the probabilities associated with a rupture of the Subduction Zone, any estimates




SOURCE: Redwood Coast Tsunami Work Group, April 27, 2004



**Figure IV.H-2**
Humboldt Bay Tsunami Hazard

concerning the timing or magnitude of an 8.4 magnitude earthquake on the Cascadia subduction zone and the resulting inundation levels would be speculative. (For example, there is little information on whether the Subduction Zone might rupture in pieces, or all at once. If the Subduction Zone were to rupture all at once, inundation of the project site would be more likely. On the other hand, if the Subduction Zone ruptures in pieces, the risk of inundation would be greatly reduced.)

### *Sea-Level Rise*

Another coastal process that could affect the level of flood hazard or tsunami risk is a rise in sea level resulting from global climate change. Global warming may result in sea-level rise through two main processes: thermal expansion of sea water and melting of land ice. The total computed rise of sea level based on thermal expansion and melting is predicted in California to result in a sea-level rise from 2.4 to 12.6 inches by 2035-2064 and 3.9 to 28.3 inches by 2070-2100 (2006). These numbers represent ranges because there is no scientific consensus about the amount of sea level rise that can be attributed to global warming.

## Site Hydrology

The site was used as a railroad switching, maintenance, and freight yard since the late 1800s. A survey map of the City of Eureka dated 1888 (U.S. Surveys) indicates that the entire railroad property was an undeveloped tidal marsh except for one main railroad track that traversed north to south along the present northwestern site boundary. A small railroad depot and railroad spur were present at the current location of A Street and Waterfront Drive. A large tidal channel (Clark Slough) drained the southwest area of the site. Smaller tidal channel tributaries extended onto the site.

Between the late 1800s and early 1900s, the tidal marsh in the eastern area of the site gradually was filled to allow construction of railroad maintenance buildings. By December 1946, a large part of the site that was previously a tidal marsh had been diked off with a soil berm and by July 1947, the previously diked area, including the southeast corner of the site, had been filled completely.

A commenter on the Notice of Preparation raised the issue of the Public Trust Doctrine during the scoping process. The Public Trust Doctrine is a common law right and obligation held by governments to protect the public interests in navigable waterways, their beds, banks, and certain uses. The extent of sovereign and public-trust lands within the Balloon Track site is not immediately clear. However, to the extent that there are any physical changes to the environment resulting from this project that involve potential public trust lands or resources, those physical changes are addressed herein and in other chapters of this EIR concerning the resource or trust interest at issue (e.g., Biological Resources, Cultural Resources).

Clark Slough remains and is affected by tidal action. The historic channel has been modified to flow between steep rip-rapped banks and vertical walls. Soils in the Clark Slough channel are flooded continually. Changes in water levels is due to tidal influence from Humboldt Bay and

municipal stormwater discharge systems upgradient of the site. The extent of tidal flow with each cycle appears to be controlled by a tidegate at the channel outfall on the north side of Waterfront Drive. Soils composed of fill material within approximately 150 feet of the Clark Slough channel are flooded during extreme rainfall events where stormwater flooding coincide with high tide cycles, creating a backwater flow from the channel margins and over-bank flooding. Depressions within this flood zone remain ponded for a continuous period from January to early April. A drainage swale at the southern property boundary discharges to Clark Slough.

Depressional areas and drainage ditches created by past industrial activities throughout the site are ponded for a continuous period from about January to early April. The border of these areas are also saturated during the same period.

### *Groundwater*

Groundwater flow in the project site vicinity is characterized by two distinct groundwater bearing units. These two units include three stratographic layers: a perched zone aquifer (which is a unit of soils or rock with sufficient permeability to conduct water), an aquitard (which is a confining bed of soils or rock that prevents or retards the flow of water to another water bearing unit), and a tidally influenced lower aquifer.

The uppermost aquifer layer, identified as the “A” zone, consists of fill material and is not tidally influenced. The second layer is densely compacted estuarine clay bay mud material, a fine-grained material that acts as an aquitard between the first and third layers. The third layer is coarse-grained material that contains the “B” zone aquifer. The “B” zone aquifer is tidally influenced by Humboldt Bay.

Groundwater level in the shallow sandy fill “A” zone is seasonally influenced and ranges from 0 (dry) to approximately 5 to 6 feet below ground surface (bgs). Groundwater flow direction in this layer is highly variable having been calculated at times toward the south, west, and east. Groundwater levels in the lower coarse-grained sandy “B” zone have typically ranged from 5 to 12 feet bgs with a flow direction generally towards Humboldt Bay (northwesterly).

### *Flooding*

The Flood Insurance Rate Map (FIRM Map # 060060 20005 C, updated 06-17-1986) produced by the Federal Emergency Management Agency (FEMA) show that a narrow portion of the northwestern edge of the parcel, between Waterfront Drive and the existing railroad tracks, is located within “Zone A1 (EL 6).” Zone A1 (EL 6) is an area of 100-year flood where the base flood elevation is known to be 6 feet. The remainder of the site is located in Zone “C” which are areas of minimal flooding.

### *Existing Drainage Infrastructure*

Stormwater runoff from the project site generally occurs in heavy storm events as sheet and/or concentrated flow. For the majority of the project site, there is no existing drainage infrastructure. The topography of the site is relatively flat with the exception of low areas in the southeast corner

and along Clark Slough, and ditches along the east and northeast perimeter. These ditches are former drainage ditches, which have not been maintained but still collect and channel, at least locally, surface water runoff. Clark Slough drains to Humboldt Bay and originates as part of the subsurface storm drain system that collects water from commercial and industrial facilities south of the site.

Drainage toward the west is limited by the elevated berm of the former railroad track; this berm acts as a drainage divide along the southwestern portion of the site. The poorly maintained ditch along the northwest perimeter of the former railroad yard collects surface water from a strip along the northern portion of the site and adjacent properties and drains to Clark Slough via a culvert. Drainage from most of the former operational area is toward the ditches on the eastern and southern portions of the site. These ditches, in turn, drain toward the low area in the southeast corner, which tends to collect and hold surface water runoff. The eastern drainage ditch also receives runoff from properties along Broadway. During stormwater events, runoff from Industrial Parts and Hydraulics at 400 Broadway enters the eastern ditch through a 12-inch pipe; runoff from the Nilsen Feed Company, located at 502 Broadway, enters the eastern drainage ditch through a 2-inch polyvinyl chloride (PVC) roof drain; and, runoff from the Nilsen yard enters the drainage ditch near the southwest corner of the Nilsen Property.

The existing site conditions of relatively low grades, the presence of vegetation, and coarse-grained soil cause runoff from the site to be generated slowly, after long periods of relatively intense rainfall (e.g., winter storms of substantial intensity or duration). Most of the rainfall at the site is likely to infiltrate the subsurface through the coarse-grained surficial soils or to temporarily pond and later evaporate.

Some sheet flow enters municipal drainage facilities. The City of Eureka storm drainage system consists of gutter flow by gravity that is discharged at 17 points along Humboldt Bay and sloughs surrounding the city. The drainage along U.S. 101, which includes Broadway, and the Fourth Street and Fifth Street couplet, is maintained by the California Department of Transportation (Caltrans), while elsewhere it falls under the jurisdiction of the City Public Works Department.

# Environmental Analysis

## Significance Criteria

For the purposes of this EIR, implementation of the proposed project would have a significant effect on hydrological resources if, based on Appendix G of the CEQA Guidelines, it would:

1. Violate any water quality standards or waste discharge requirements;

2. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);

3. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion of siltation on- or off-site;

4. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;

5. Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

6. Otherwise substantially degrade water quality;

7. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;

8. Place within a 100-year flood hazard area structures which would impede or redirect flood flows;

9. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or

10. Be subject to inundation by seiche, tsunami, or mudflow.

## Regulatory Framework

The following standards and regulations govern hydrological resources and are used to measure impacts.

### *Clean Water Act (CWA)*

The CWA was enacted in Congress in 1972 and amended several times since inception. It is the primary federal law regulating water quality in the U.S. and forms the basis for several state and local laws throughout the country. Its objective is to reduce or eliminate water pollution in the nation's rivers, streams, lakes, and coastal waters. The CWA prescribes the basic federal laws for regulating discharges of pollutants and sets minimum water quality standards for all surface waters in the U.S. At the federal level, the CWA is administered by the U.S. Environmental Protection Agency (US EPA). At the state and regional levels, the CWA is administered and enforced by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs).

#### 303(d) List of Impaired Waterbodies

Section 303(d) of the federal CWA requires states to identify waterbodies that do not meet water quality standards and are not supporting their beneficial uses. Each state must submit an updated list, called the 303(d) List of Impaired Waterbodies, to the US EPA by April of each even numbered year. In addition to identifying the waterbodies that are not supporting beneficial uses, the List also identifies the pollutant or stressor causing impairment and establishes a schedule for

developing a control plan to address the impairment. The Humboldt Bay is listed on the Section 303(d) List due to PCBs (US EPA, 2003).

Placement of a waterbody on the 303(d) List acts as the trigger for developing a pollution control plan, called a Total Maximum Daily Load (TMDL), for each waterbody and associated pollutant/stressor on the list. The TMDL serves as the means to attain and maintain water quality standards for the impaired waterbody. During each 303(d) listing cycle, priorities are set for the waterbodies on the list and a schedule is established for completing the TMDLs. The Humboldt Bay has been given a low priority for TMDL development, and thus a TMDL has not yet been prepared (US EPA, 2003).

#### Stormwater Permitting for Construction Activity

The CWA effectively prohibits discharges of stormwater from construction projects unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. The SWRCB is the permitting authority in California and has adopted a statewide General Permit for Stormwater Discharges Associated with Construction Activity (General Construction Permit) that encompasses one or more acres of soil disturbance.

The NPDES stormwater program requires operators of both large and small construction sites to obtain authorization to discharge stormwater under an NPDES construction permit. Construction activity resulting in a land disturbance of 1 acre or more, or less than 1 acre but part of a larger common plan of development or sale, must obtain a General Construction Permit. Construction activity includes clearing, grading, excavation, and soil stockpiling as well as reconstruction of existing facilities. In general, the NPDES stormwater permitting requirements for construction activities require that the landowner and/or contractor develop and implement a Storm Water Pollution Prevention Plan (SWPPP) and submit required notices. The SWPPP must specify best management practices (BMPs) that will prevent construction pollutants from contacting stormwater, with the intent of keeping products of erosion from moving offsite into receiving waters. The SWPPP must include measures for erosion and sediment controls, methods for construction waste handling and disposal, and post-construction erosion and sediment control requirements. The SWPPP also addresses the elimination or reduction of non-stormwater discharges to receiving waters and inspection procedures for BMPs.

### *Porter-Cologne Water Quality Control Act*

The Porter-Cologne Water Quality Control Act is the primary statute covering the quality of waters in California. The Act sets out water quality provisions and procedures for issuing discharge requirements regulating the discharge of waste within any region that could affect the quality of state waters. It established and is administered by the SWRCB and the nine RWQCBs. The North Coast RWQCB is the relevant board reviewing actions that may affect Humboldt Bay.

### *North Coast Basin Plan*

The North Coast RWQCB is required to develop, adopt, and implement a Water Quality Control Plan (Basin Plan) for the North Coast region. The Basin Plan is the master policy document that

contains descriptions of water quality regulation in the North Coast region. The Basin Plan identifies beneficial uses of surface waters and groundwater within its region to assist decision makers in maintaining the continued beneficial uses of these waters (RWQCB, 2008).

#### Beneficial Uses of Surface Water

For the Humboldt Bay, the assigned beneficial uses of the surface waters are:

1. Municipal and Domestic Supply
2. Agricultural Supply
3. Industrial Service Supply
4. Freshwater Replenishment
5. Navigation
6. Water Contact Recreation
7. Non-Contact Water Recreation
8. Commercial and Sport Fishing
9. Cold Freshwater Habitat
10. Wildlife Habitat
11. Rare, Threatened, or Endangered Species
12. Marine Habitat
13. Migration of Aquatic Organisms
14. Spawning, Reproduction, and/or Early Development
15. Shellfish Harvesting
16. Estuarine Habitat
17. Aquaculture
18. Native American Culture

#### Beneficial Uses of Groundwater

Existing and potential beneficial uses of groundwater throughout the North Coast Region are as follows:

1. Municipal and Domestic Water Supply
2. Industrial Water Supply
3. Industrial Process Water Supply
4. Agricultural Water Supply
5. Freshwater Replenishment to Surface Waters

### *Municipal Stormwater Discharge Regulations*

Discharge of stormwater from municipal storm drain systems in California is subject to regulation by section 402(p) of the CWA, which establishes a framework for regulating non-point source (NPS) stormwater discharges under the NPDES. The City of Eureka has not yet been issued a NPDES Discharge of Storm Water from a Small Municipal Separate Storm Sewer System (Small MS4 General Permit) from the SWRCB. The Small MS4 General Permit requires dischargers to develop and implement a Storm Water Management Plan (SWMP) to reduce the discharge of stormwater pollutants to the maximum extent possible. The City has submitted a SWMP to the SWRCB (Knight, 2005). Following SWRCB approval of the SWMP, stormwater discharge in the City will be subject to Small MS4 General Permit regulations. The City of Eureka stormwater drainage policies also require new development that would increase storm drainage runoff in a 10-year storm event more than 1 cubic foot per second (cfs) to provide retention/siltation basins to limit new runoff to pre-project flows.

### *City of Eureka Construction Site Erosion Control Ordinance*

The purpose and intent of City's Construction Site Erosion Control Ordinance is to protect and enhance the water quality of watercourses, water bodies and wetlands pursuant to and consistent with the Federal Clean Water Act (33 U.S.C. §1251 et seq.) and the Porter Cologne Water Quality Control Act (California Water Code Section 13000 et seq.) by minimizing, to the maximum extent practicable, the discharge of sediment into the storm drainage system as a result of construction-related activities.

### *General Plan and Local Coastal Program*

The City of Eureka's adopted General Plan and adopted Local Coastal Program together formalize a long-term vision for the physical evolution of Eureka and they outline the policies, standards, and programs that guide day-to-day decisions concerning Eureka's development in the coastal zone. The Policy Consistency Analysis, found in Section IV.I, *Land Use and Planning*, provides an evaluation of the Marina Center project's conformity with the policies of the adopted General Plan and Land Use Plan portion of the adopted Local Coastal Program.

### *Coastal Zoning Regulations*

The Coastal Zoning regulations, which implement the policies of the Land Use Plan portion of the adopted Local Coastal Program, are codified in Chapter 156 of the Eureka Municipal Code (EMC), and are also referenced as Article 29, Part 1, Section 10-5.29 et. seq. of the zoning regulations of the City for the coastal zone.

### *Zoning Regulations*

The Zoning Regulations of the City of Eureka are found in Chapter 155 of the EMC and are adopted pursuant to the City Charter to protect the public health, safety, peace, comfort, convenience, prosperity, and general welfare.

---

## Project Impacts

**Impact H-1:Would the Marina Center project violate any water quality standards or waste discharge requirements?**

Stormwater runoff from the site either during construction or during post-construction operations could result in pollutants entering the stormwater system and ultimately Humboldt Bay. The stormwater discharges associated with the project would be regulated by the SWRCB under the NPDES permit program. The required Storm Water Pollution Prevention Plan (SWPPP) would specify Best Management Practices (BMPs) to prevent construction pollutants from contacting stormwater, with the intent of keeping products of erosion from moving off-site into receiving waters. The SWPPP (see also additional requirements in Mitigation Measure H-3a) would also include measures for erosion and sediment control, methods for construction waste handling and disposal, and post-construction erosion and sediment control strategies. Project-specific measures for complying with these requirements would be included in the SWPPP. With all of these

measures in place and by operating under the NPDES stormwater program, the project would avoid any violations of water quality standards or waste discharge requirements.

### Mitigation

See recommended Mitigation Measures H-3a and H-3b.

### Finding of Significance

The recommended mitigation measures would avoid or minimize the potential for the Marina Center project to violate water quality standards or waste discharge requirements, reducing the impact to a ***less-than-significant*** level.

---

**Impact H-2: Would the Marina Center project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?**

Water supplies for the proposed project would not be derived from groundwater wells and thus would not deplete groundwater supplies underlying the project site. In addition, due to the proximity of the project site to Humboldt Bay, the increase in impervious surface area resulting from the proposed project would not have a significant impact on groundwater recharge.

### Mitigation

None recommended.

### Finding of Significance

The potential of the Marina Center project to substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level would be a ***less-than-significant impact***.

---

**Impact H-3: Would the Marina Center project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion of siltation on- or off-site?**

Earthwork would occur on the majority of the project site and is expected to include the stripping of the surface vegetation, removal of loose fill materials, and the placement of imported engineered soils on the project site. Existing gravel and vegetative cover, which acts to stabilize the soil, would be removed from the project site as part of the remediation process, potentially resulting in construction-related erosion. During construction, potential pollutant sources may include petroleum or heavy metal impacted sediments, and construction materials (asphalt,

concrete, solvents, sealants, paints, adhesives, cleaners, etc.) that may be left exposed to rainfall and/or stormwater runoff. Potential pollutant sources associated with construction activities are typically managed through the implementation of the following types of BMPs during construction: erosion and sediment control, non-stormwater management, and waste management and materials pollution control. Recommended mitigation includes requiring that erosion control BMPs be incorporated into the project grading plan and submitted with the project site plan for approval by the City of Eureka Building Department prior to the issuance of a Building Permit.

As part of the project, the Clark Slough would have the riprap removed from the drainage channel and replaced with gentle banks. The SWPPP and implementation of best management practices would be implemented for any work done in the vicinity of the slough to control erosion and to mitigate the increase in the rate of surface runoff.

### Mitigation

**Mitigation Measure H-3a:** In addition to the required SWPPP, the following BMPs shall be implemented to protect water quality.

1. *Erosion/Sediment Control*. During the construction phase, prior to site grading, combinations of silt fencing, straw wattles, and/or straw bale sediment transport barriers shall be constructed at specific site locations with the intent of containing all site runoff on the project site. This barrier shall be maintained during the rainy season and until completion of construction and shall prevent transport of pollutants, such as excessive sediment, away from the construction area. The barrier shall be constructed so that concentrated surface water flows during heavy rains cannot penetrate it without being dissipated in flow energy, and without the water being filtered through the sediment transport barriers.

2. *Scheduling*. The north coast's dry season is typically between April 15 and October 15. Proper timing of grading and construction during the dry season would minimize soil and construction material exposure during the rainy season. Following October 15, areas of disturbed or fill soils more than 6 inches in depth and greater than 100 square feet (10-foot-by-10-foot area) shall be specifically protected from erosion by 1) shaping the ground surface so that concentrated surface flows do not encounter or cross them, or 2) providing localized straw wattles, straw bales and/or silt fencing. During the rainy season, construction materials and equipment shall be stored under cover or in secondary containment areas.

3. *Protection of Water Courses and Drainage Inlets*. Site drainage under existing conditions is toward the bay. General guidelines for water course and drainage inlet protection during the rainy season shall include providing downgradient sediment traps or other BMPs that allow soil particles to settle out before flows are released to receiving waters, storm drains, streets, or adjacent property. Drainage inlet protection BMPs, if required, shall be installed in a manner that does not cause additional erosion or flooding of a roadway.

4. *Soil Stockpiles*. Should it be necessary to stockpile excess soil on-site, the soil shall be placed within a sediment-protected area that is not likely to result in off-site sedimentation. If likely to be subjected to rain or high winds, stockpiles shall be covered with plastic sheeting (Visqueen®, for example) at least 6- to 10-mils thick. Plastic sheeting shall be well-anchored to resist high winds. If stockpiles are to be

present through the rainy season, they shall be surrounded with silt or straw bale fencing about 5 feet from the toe of the pile.

5. *Dust Control*. All construction areas shall be treated and maintained as necessary to minimize the generation of dust that may blow off-site. The most common method of dust control during construction activities is through periodic application of water. However, the application of water for dust control purposes shall be managed to ensure there is no off-site runoff.

6. *Material Delivery, Storage and Use*. Materials used during construction, where appropriate, shall be delivered and stored in appropriate containers and in designated areas, to prevent the discharge of pollutants to nearby watercourses or storm drain systems. During the rainy season, materials shall be stored in covered areas. Chemicals, paints or bagged materials shall not be stored directly on the ground, but instead shall placed on a pallet or in a secondary containment system. Materials shall be used according to the manufacturer's instructions and all materials shall be disposed of properly. Any spills shall be cleaned up immediately and an ample supply of spill clean-up materials shall be kept on-site during construction activities. There shall be no fueling or equipment washing activities conducted on-site.

7. *Monitoring*. During construction, all erosion and pollution control measures shall be periodically inspected throughout the duration of the project by a qualified professional to ensure that the control measures are properly implemented. If the erosion and pollution control measures are not functioning properly, the owner shall immediately make appropriate modifications to ensure that water quality is protected.

**Mitigation Measure H-3b:** Prior to any clearing, grading, excavating or fill within 50 feet from the edge of a delineated wetland, stream, or stream channel or disturbing more than 2,500 square feet, the applicant shall obtain an Erosion Control Permit (ECP) from the City of Eureka. The ECP shall require specific erosion/sediment control devices, which shall be maintained in proper working condition for as long as work is being conducted on the property or for as long as an active permit of any nature is issued for the project. Erosion/sediment control devices required by the ECP may include, but are not limited to, silt fences, straw bales, retention ponds, mulch, sod, rip-rap, vegetation barriers, hydro-seeding, erosion blankets and any other measures that would adequately prevent soil from being eroded and transported onto adjoining property. The ECP shall always require a stabilized construction site access for any sites where sediment can be tracked onto public roads by construction vehicles. The responsibility of the property owner and its agents shall be joint and severable with the entity performing the work for the maintenance of all erosion control devices. The erosion control devices shall be maintained in a condition so as to prevent soil erosion on the property and transport of sediment off the property.

### Finding of Significance

The recommended mitigation measures would avoid or minimize the potential for the Marina Center project to substantially alter the existing drainage pattern of the site or area in a manner that would result in substantial erosion of siltation on- or off-site, reducing the impact to a ***less-than-significant*** level.

**Impact H-4: Would the Marina Center project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?**

Currently, stormwater runoff from the project site generally occurs as sheet and/or concentrated flow that travels overland to drainage ditches that in turn direct the runoff off-site. The proposed project would result in the conversion of nearly 29 acres of the approximately 43-acre site into impervious surfaces and would result in an increase in peak discharge from the project site. Post-project runoff would be conveyed to the formal subterranean storm drain system. The resulting increase in runoff from the project site during post-development conditions is not expected to exceed the capacity of the existing storm drain system, largely due to the proximity of the site to Humboldt Bay where the stormwater would discharge. Therefore, the project is not expected to result in flooding on- or off-site. However, an on-site conveyance system would need to be designed and constructed to adequately convey stormwater from the site. The following mitigation measure would ensure that on-site conveyance systems are designed and constructed to adequately address stormwater collection and conveyance.

### Mitigation

> **Mitigation Measure H-4a:** The project applicant shall prepare a drainage plan indicating the specifics of the project drainage system. The drainage plan shall demonstrate that the culverts are adequately sized and configured to address peak runoff and protect against a 10-year storm event. The drainage plan shall ensure that any increase in stormwater drainage runoff in a 10-year storm event remains below 1 cfs. Alternatively, if the 1 cfs threshold cannot be maintained in a projected 10-year storm event, the drainage plan shall provide a retention/siltation basin that limits stormwater runoff to pre-project flows. The plan shall be submitted to and approved by the City of Eureka, and recommendations from the City shall be adopted by the project applicant prior to issuance of a building permit.

### Finding of Significance

The recommended mitigation measure would avoid or minimize the potential for the Marina Center project to substantially alter the existing drainage pattern of the site or area or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site, reducing the impact to a ***less-than-significant*** level.

---

**Impact H-5: Would the Marina Center project create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?**

Non-point source (NPS) pollutants are washed by rainwater from rooftops, landscape areas, and streets and parking areas into the drainage network. Without proper mitigation, development of the project site could increase the levels of NPS urban pollutants and litter entering Humboldt Bay. An increase in NPS pollutants could adversely affect the beneficial uses of the bay.

Pollutant concentrations in site stormwater runoff are dependent on a number of factors, including 1) land use conditions, 2) site drainage conditions, 3) intensity and duration of rainfall, 4) the climatic conditions preceding the rainfall event, and 5) implementation of water quality BMPs. Due to the variability of urban runoff characteristics, it is difficult to estimate pollutant loads for NPS pollutants. However, pollutants from the proposed project would be consistent with commercial areas, light industrial uses, landscape areas, and parking lots. Increases in the levels of oil and grease, petroleum hydrocarbons, metals, and possibly nutrients in site runoff are likely. The possible pollutants associated with these developed areas include:

1. Roof and Building Materials—Heavy Metals, Synthetic Compounds
2. Parking Areas—Sediment, Oil and Grease, Debris, Heavy Metals
3. Driveway—Sediment, Oil and Grease, Debris, Heavy Metals
4. Walkways—Sediment, Debris
5. Landscaping—Pesticides, Nutrients

### Mitigation

**Mitigation Measure H-5a:** The applicant shall treat stormwater at drop inlets that capture runoff from roof drains, paved pedestrian areas, and parking, prior to connection to the City's storm drain system. The project applicant shall prepare and implement a permanent maintenance program for stormwater treatment facilities on the project site.

**Mitigation Measure H-5b:** The project applicant shall incorporate grassed swales (biofilters) into the project landscape plan, to the extent feasible, for runoff conveyance and filtering of pollutants. The maintenance of biofilters on the project site shall be the responsibility of the project applicant.

**Mitigation Measure H-5c:** The applicant shall ensure that only USEPA-approved herbicides and pesticides are used on the site in any area that might drain to aquatic environments.

### Finding of Significance

The recommended mitigation measures would avoid or minimize the potential for the Marina Center project to create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff, reducing the impact to a ***less-than-significant*** level.

---

### Impact H-6: Would the Marina Center project otherwise substantially degrade water quality?

Implementation of stormwater quality controls and BMPs would reduce project-related impacts on water quality to less than significant levels.

### Mitigation

See Mitigation Measures H-3a, H-3b, H-4a, and H-5a through H-5c.

### Finding of Significance

The recommended mitigation measures would avoid or minimize the potential for the Marina Center project to otherwise substantially degrade water quality, reducing the impact to a ***less–than-significant*** level.

---

**Impact H-7: Would the Marina Center project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?**

With implementation of recommended Mitigation Measure H-10b, high density residential units and visitor-serving structural developments would not be located on the ground floor, and thus proposed residential units would be outside of the 100-year flood zone.

### Mitigation

See Mitigation Measure H-10b.

### Finding of Significance

The recommended mitigation measure would avoid the potential for the Marina Center project to place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, reducing the impact to a ***less-than-significant*** level.

---

**Impact H-8: Would the Marina Center project place within a 100-year flood hazard area structures which would impede or redirect flood flows?**

The Flood Insurance Rate Map (FIRM Map # 060060 20005 C, updated 06-17-1986) produced by the Federal Emergency Management Agency (FEMA) shows that a narrow portion of the northwestern edge of the parcel, between Waterfront Drive and the existing railroad tracks, is located within “Zone A1 (EL 6)” (1986). Zone A1 (EL 6) is an area of 100-year flood where the base flood elevation is known to be 6 feet. The remainder of the site is located in Zone “C,” indicating areas of minimal flooding.

The **Zone A1** area consists of a narrow portion of the site between the railroad tracks and the shoreline where there are no structures proposed. Thus, the project would not place any structures within the 100-year flood hazard area that might impede or redirect flood flows.

### Mitigation

None recommended.

### Finding of Significance

The potential for the Marina Center project to place within a 100-year flood hazard area structures that would impede or redirect flood flows would be a ***less-than-significant impact***.

---

**Impact H-9: Would the Marina Center project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?**

The project site is not located downslope of a dam or levee, and therefore the project would not expose people or structures to flooding as a result of dam or levee failure. As discussed above, no structures would be placed within the 100-year flood hazard area, and so there would be no additional risk of loss, injury, or death involving flooding from other sources.

### Mitigation

None recommended.

### Finding of Significance

The potential for the Marina Center project to expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam would be a ***less-than-significant impact***.

---

**Impact H-10: Would the Marina Center project result in inundation of seiche, tsunami, or mudflow?**

Tsunami hazards in Humboldt County that could result from a major earthquake on the Cascadia Subduction Zone were evaluated by the CGS in 1995 (see Figure IV.F-1). According to the study, the shoreline of Eureka, including the project site, could potentially be inundated by a tsunami. The level of tsunami inundation depends on a variety of factors, including the size and period of tsunami waves, the tidal stage at the time of the event, and land-level changes that may raise or lower the site by several feet. The dynamics of tsunami effects inside the bay are not well understood, but presumably the extent of flooding along the Humboldt bayshore will be a function of the degree of overtopping of the north spit. A tsunami hazard evaluation of Humboldt County was completed by Humboldt State University, which mapped the project site as having a “moderate” risk of inundation in the event of a large tsunami (see Figure IV.H-2). The shape and underwater topography of Humboldt Bay and the protection provided by the Samoa Peninsula significantly reduce tsunami hazards in Eureka and at the project site specifically. Given the infrequency of tsunami events, the elevation of the proposed project (10 to 12 feet above MSL),

and other natural barriers protecting Humboldt Bay (e.g., the north spit is likely to block all but the largest tsunami waves at the project site), the tsunami risk to people and property is relatively low. Still, tsunami inundation could potentially damage proposed structures or threaten site occupants in the unlikely event that one of sufficient magnitude occurs. For example, waves of the magnitude that occurred along the coastal regions in Sumatra in 2004 would over-top most of the spit and result in significant flooding along the Humboldt bayshore. The following mitigation measures would substantially reduce the risks of tsunami hazards of sufficient magnitude to over-top the north spit and result in inundation of the Eureka shoreline.

The proposed project is not located in an area that would be susceptible to mudflows.

### Mitigation

**Mitigation Measure H-10a:** The project applicant shall prepare and submit a tsunami Evacuation and Response Plan for the City's approval prior to issuance of a building permit for construction. The Evacuation and Response Plan shall include, at a minimum, a tsunami warning or alarm system integrated into the building designs, specific routes for egress in the event of a tsunami warning (including vertical routes of egress and safe haven as appropriate), identified locations of safe haven, educational materials for residents and business owners, and a list of emergency response agencies, contact numbers, and other methods of communication in the event of a tsunami warning.

**Mitigation Measure H-10b:** Habitable space in building structures shall be prohibited on the first floor, and must be elevated by such means as posts, piles, piers, or shear walls parallel to the expected direction of flow of floodwaters from a tsunami. Building structures shall be designed to resist the effects of coastal floodwaters due to tsunamis. For the purposes of calculating allowable stresses for the building materials (i.e., load factors in the case of ultimate strength or limit design), the same standards used for wind and earthquake loads combined with gravity loads shall be used (e.g., treat loads and stresses due to tsunamis in the same fashion as for earthquake loadings). Main building structures shall be adequately anchored with deep piles and piers and connected to the elevating substructure system to resist lateral, uplift, and downward forces. For any wood construction proposed for the project, toenailing shall not be allowed. Shallow foundation types shall not be permitted unless the natural supporting soils are protected on all sides against scour by a protection structure, preferably a bulkhead. Shallow foundations may be permitted beyond 300 feet from the shoreline, provided they are founded on natural soil and at least 2 feet below the anticipated depth of scour, and provided not more than 3 feet of scour is expected at the structure. Project design plans shall be approved by a licensed architect or structural engineer with expertise in building in areas subject to coastal flooding to ensure that proposed structures are designed and built to withstand coastal flooding.

**Mitigation Measure H-10c:** Landscaping and streetscaping shall be designed to reduce the potential for large objects to mobilize in a tsunami event and affect structures below the 30-foot elevation.

### Finding of Significance

The recommended mitigation measures would avoid or minimize the potential for the Marina Center project to result in adverse impacts due to inundation of seiche, tsunami, or mudflow, reducing the impact to a ***less-than-significant*** level.

---

## Cumulative Impacts

**Impact H-11: Would the Marina Center project, together with other developments in the immediate vicinity, contribute to potential adverse cumulative impacts on hydrology and water quality?**

Implementation of the proposed project, combined with other reasonably foreseeable future projects in the vicinity, would not result in adverse cumulative effects on hydrology and water quality. Adherence and implementation of mitigation measures contained in this EIR would reduce the above-mentioned project-related impacts on hydrology and water quality to less-than-significant levels. The City of Eureka will require anticipated future development to implement similar water quality BMPs for construction and post-development conditions. Consequently, cumulative hydrologic impacts associated with the proposed project, together with other existing and foreseeable development in the surrounding area, would be considered less than significant.

### Mitigation

See recommended Mitigation Measures H-3a, H-3b, H-4a, H-5a through H-5c, and H-10a through H-10c.

### Finding of Significance

The recommended mitigation measures would reduce the potential impacts of the Marina Center project on hydrology and water quality to ***less-than-significant*** levels, and the project would not make a cumulatively considerable contribution to cumulative hydrology and water quality impacts.

---

# References – Hydrology and Water Quality

Bernard, E. N., et al., *Tsunami inundation model study of Eureka and Crescent City, California and the Cape Mendocino Tsunami*, NOAA Technical Memo ERL-PMEL, 1993.

California Climate Change Center, *Projecting Future Sea Level*, http://www.energy.ca.gov/2005publications/CEC-500-2005-202/CEC-500-2005-202-SF.PDF, March 2006.

California Department of Water Resources (DWR), *California's Groundwater Bulletin 118, Eureka Plain Groundwater Basin*, 2003 Update, 2003.

California Department of Water Resources, *North Coastal Hydrographic Area. Volume 1: Southern Portion. Bulletin 142-1*, 1965.

California Department of Water Resources, Northern District, *Sea Water Intrusion and Ground Water Monitoring Programs in the Eureka Area*, 1973.

California Department of Water Resources, *California's Ground Water, Bulletin 118*, 1975.

California Geological Survey (CGS) (formerly the California Division of Mines and Geology), *Special Publication 115, Planning Scenario for a Great Earthquake on the Cascadia Subduction Zone, Humboldt and Del Norte Counties, California*, January 1995.

City of Eureka, *City of Eureka General Plan*, adopted February 1997, amended through April 2008.

City of Eureka, *Eureka Redevelopment Final Program EIR*, prepared by Environmental Science Associates (ESA), January 10, 2005.

City of Eureka. General Plan Background Report, prepared by J. Laurence Mintier & Associates, Arnold Herskovic, Dowling Associates, Oscar Lawson & Associates, Angus McDonald and Associates, Brown-Buntin Associates, Inc., January 1994.

City of Eureka, Eureka Municipal Code, adopted May 1966, amended through April 2008.

Clark, Samuel H. Jr., *Map Showing Geologic Structures of the Northern California Continental Margin*, United States Geological Survey, 1990.

County of Humboldt, *Natural Resources and Hazards Report*, 2002.

Evenson, R.E. *Geology and Groundwater Features of Eureka Area, Humboldt County, California*. USGS Water Supply Paper 1470, 1959.

Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map (FIRM), City of Eureka, California, Humboldt County, Panel 5 of 10*, June 17, 1986.

Fuller, R.H. *Water Quality in the Mad River Basin, Humboldt and Trinity Counties, California*. USGS Water Resources Investigations 44-75, 1975.

Geist, Jill K., for the North Coast Regional Water Quality Control Board and the Department of Health Services-Preharvest Shellfish Sanitation Unit, *Final Comment Report Humboldt Bay and Watershed Fecal Coliform Study*, February 2003

Humboldt Bay Watershed Advisory Committee and The Natural Resources Services Division of Redwood Community Action Agency, Prepared for: California Department of Fish & Game and the California Coastal Conservancy, *Humboldt Bay Watershed Salmon and Steelhead Conservation Plan*, March 2005

Humboldt Earthquake Education Center, *Tsunami Hazards for Humboldt County*, Humboldt State University, 2004.

Knight, Mike. Public Works Director, City of Eureka Public Works Department, personal communication, November 28, 2005.

North Coast Regional Water Quality Control Board (RWQCB), Basin Plan, http://www.swrcb.ca.gov/northcoast/water_issues/programs/basin_plan/, accessed September 3, 2008.

North Coast Hydrologic Region, *California's Groundwater. Eureka Plain Groundwater Basin Bulletin 118*, Last update 2/27/04

Resources Agency, California. ACP 1 Humboldt Bay. Sensitive sites: www.dfg.ca.gov/ospr/response/acp/marine/2005ACPs/2005SFACPs/VolII/005_9813_ACP 1.HumboldtBay3.pdf.

Strand, R.G. *Geologic Map of California*, [Redding Sheet]. Scale 1:250,000. California Division of Mines and Geology, 1962.

Todd, D.K. *Groundwater Reconnaissance of the Humboldt Bay Area* (For Humboldt Bay Municipal Water District, Eureka, CA.), Consulting Engineers, Inc., 1992.

United States Bureau of Reclamation (BOR), *Natural Resources of Northwestern California*. Report Appendix – Plans of Water Development, January, 1960.

United States Environmental Protection Agency (US EPA), *2002 CWA Section 303(d) List of Water Quality Limited Segments, North Coast RWQCB*, approved July 2003.

United States Department of the Interior, prepared in cooperation with the California Department of Water Resources, Robert Edward Evenson, *Geology and Ground-Water Features of the Eureka Area, Humboldt County, California*, Geological Survey Water-Supply Paper 1470, 1959.