IV. ENVIRONMENTAL IMPACT ANALYSIS
H. HYDROLOGY & WATER QUALITY

INTRODUCTION

This section of the Draft Environmental Impact Report (DEIR) evaluates potential impacts of the proposed Big Wave Wellness Center and Office Park project ("proposed project") with regard to hydrology of water bodies. Pillar Point Marsh and the neighboring Denniston Creek are the main surface water bodies near the project site. The Half Moon Bay Terrace serves as the primary aquifer for the Moss Beach, Princeton, and El Granada area, in which the project is located. All three of these water bodies have been designated by the State Water Resources Control Board (State Board) as having beneficial uses.[1] Both quantity and quality of flows from the project site to these water features should be consistent with these beneficial uses.

In addition, this section addresses the potential impacts of the proposed project related to water quality during construction and longer-term operational phases of the proposed project. The following discussion presents the findings and conclusions of Schaaf & Wheeler, the EIR hydrologists, including (but not limited to) data from the following (refer to Appendix H of this DEIR):

- *Hydrologic Analysis of the Big Wave Project*, prepared by Schaaf & Wheeler, May 15, 2009.

METHODOLOGY

The hydrologic, drainage, and water quality assessments of the proposed project are based upon:

- prior hydrologic analyses in the immediate area;
- site observations; and
- the preliminary site and drainage plans prepared by the project engineers MacLeod and Associates for the applicant.

General hydrologic information was collected from the National Weather Service database and published reports. General information on soils in the area of the project site was obtained from the United States Department of Agriculture (USDA) Soil Conservation Service (presently, Natural Resources Conservation Service, or NRCS) Soil Survey of San Mateo County.[2] Specific information on geologic

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[1] *San Francisco Bay Regional Water Quality Control Board, 2007, San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan), January 2007, 278 p.*

[2] *Wagner, R.J. and Nelson, R.E., 1954, Soil Survey of San Mateo Area: U.S. Department of Agriculture, Soil Conservation Service, 111 p. + maps.*

and soils conditions at the project site was drawn from the Balance Hydrologics, Inc. study[3] prepared for the County in 2002.

ENVIRONMENTAL SETTING

The project site is located on Airport Street, northwest of the Princeton/Pillar Point Harbor area in an unincorporated area of San Mateo County, and is accessible via State Route 1 (SR 1), located less than 0.5 miles to the east, and Airport Street. The site can be directly accessed from the surrounding streets, including: Cypress Avenue, Marine Boulevard; Capistrano Road, Prospect Way; and California and Cornell Avenues, located to the west, east and south of the site, respectively. The site is currently used for agricultural purposes.

Surrounding areas include the Half Moon Bay Airport (east), the El Granada Mobile Home Park (north), the Pillar Point Headlands and Pillar Point Marsh (west), and the Princeton/Pillar Point Harbor industrial/commercial area (south). The Fitzgerald Marine Reserve, bracketed by Maverick's Surf break (south) and Montara Beach (north), is located approximately 0.25 miles to the west. Additionally, Moss Beach is about 2 miles northwest of the project area, and El Granada, about 1 mile east across SR 1.

A shallow drainage swale owned by the County of San Mateo separates the two parcels that comprise the project site. The northern parcel is larger at approximately 14.25 acres, while the southern parcel comprises approximately 5.28 acres.

Topography

The project site comprises approximately 19.4 acres of relatively flat topography that is currently without urban development and in vegetable crop production. A natural drainage swale (intermittent stream) is at a low point between the two parcels and leads to the Pillar Point Marsh. Both portions of the site have a relatively steep topography change at their western edges, which approach the marsh. Steeper topographic changes also exist along the northern edge of the southern parcel and the southern edge of the northern parcel, where the parcels respectively border the drainage swale. Elevations of the northern parcel range from 11.5 to 27.7 feet National Geodetic Vertical Datum (NGVD),[4] while elevations of the southern parcel range from 8.9 to 18.3 feet NGVD.

Climate

The area encompassing the project site is located in the Mediterranean-type climate zone typical of central California. This zone is characterized by cool, wet winters and warm, dry summers, with over 80

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[3] *Woyshner, M., Hedlund, C., and Hecht, B., 2002, San Mateo County Mid-Coast Aquifers: Literature and Date Review, Prepared for San Mateo County, Board of Supervisors, Balance Hydrologics, Inc., April 2002, 76 p.*

[4] *The topographic elevations are based on Site Topography by MacLeod & Associates dated October 14, 2005 and are benchmarked to the San Mateo County Datum. San Mateo County Datum is identical to the National Geodetic Vertical Datum of 1929 (NGVD 29).*

percent of all precipitation falling between the months of November and March (refer to Table IV.H-1). Moisture-rich air moves in from the ocean during the winter and drops from 20 inches to 50 inches of rain, increasing with altitude. The coastal areas of San Mateo County, including the project site, experience frequent fogs, which help moderate temperatures. At Half Moon Bay, average daily temperatures vary less than 10 degrees between the winter and summer months.[5]

Table IV.H-1
Mean Monthly Rainfall and Evapotranspirative Demand (in inches) – Project Vicinity

Month	Mean Monthly Precipitation[1]	Mean Monthly Reference Evaporation[2]	Water Surplus or Deficit	Potential Runoff or Recharge[3]
October	1.66	2.96	-1.30	–
November	3.19	1.64	1.55	1.55
December	4.39	1.30	3.09	3.09
January	5.41	1.36	4.05	4.05
February	4.40	1.93	2.47	2.47
March	3.81	3.26	0.55	0.55
April	1.96	4.70	-2.74	–
May	0.74	4.87	-4.13	–
June	0.29	5.32	-5.03	–
July	0.11	5.03	-4.92	–
August	0.19	4.84	-4.65	–
September	0.40	3.60	-2.66	–
Annual Total	**26.40**	**40.81**	–	**11.71**

Notes:
1 *Precipitation data for Half Moon Bay Airport based on a 63-year period, 1939-2001 (Todd Engineers, 2003, Ibid.).*
2 *Mean monthly reference evapotranspiration (ETo) is based on data from the California Irrigation Management Information System (CIMIS) (Coastside County Water District, 2005, Urban Water Management Plan.).*
3 *Dry soil recharge early in the wet season must satisfy the soil moisture deficit before rainfall reaches the water table.*

There are two sources of long-term meteorological data near the project site. One is a weather station at the Half Moon Bay Airport approximately 0.5 miles from the project site. The other is the Half Moon Bay weather station (NCDC Station #043714) located approximately 3.7 miles southeast of the project site. Mean annual rainfall was 26.40 inches,[6] in terms of water year, for the period of record from 1939 to 2002 (64 complete years) at the airport station. Periods of abundant rainfall and prolonged droughts are both frequent in the historical record with a minimum annual rainfall during this period of 13.0 inches and a maximum of 52.6 inches. The recent record shows that the past decade has generally consisted of above-average rainfall conditions, with very wet years in years 1993, 1995, 1996, 1998, and 1999. This wet period was preceded by prolonged dry conditions in the late 1980's and early 1990's, with six consecutive years of below-average rainfall.

5 *Wagner, Richard J. and Ralph E. Nelson, 1961. Soil Survey of the San Mateo Area, U.S.D.A. Soil Conservation Service, 111+ p.*

6 *Todd Engineers, 2003, Lower Pilarcitos Creek Groundwater Basin Study, 66+ p.*

As Table IV.H-1 indicates, most of the area's precipitation is recorded during the months of November through March. Virtually all of the precipitation occurs as rainfall, although fog can account for a small percentage. The annual average evapotranspiration for the project area, as measured at the airport weather station, is estimated to be 40.81 inches, of which about 40 percent (17.15 inches) occurs during the non-irrigation season of October through April. Evaporation and evapotranspiration rates then rise in response to warmer weather, and soil moisture storage is typically depleted by mid- to late May. Growth of non-riparian native vegetation then slows or stops completely and landscape managers, where employed, commence irrigation, which is generally maintained into October.

For the developed areas of Moss Beach, El Granada, and Princeton, annual runoff is estimated to be 40 percent of annual precipitation.[7] Water that does not flow to the ocean serves to recharge groundwater, supply agricultural and municipal water via diversions and wells, and support water needs of vegetation and biota throughout the watersheds, including Pillar Point Marsh. As Table IV.H-1 indicates, the precipitation available after evapotranspiration to runoff or recharge groundwater from pervious surfaces is on average 11.71 inches a year, or about 44 percent of annual precipitation.

Geology and Soils

Geology

The project area is situated on a structural block west of the San Andreas and Pilarcitos faults.[8] The Half Moon Bay Terrace Formation underlies the Half Moon Bay Airport, as well as the agricultural fields to the east and west of SR 1 (Cabrillo Highway in this stretch). This formation consists of unconsolidated deposits of sand silt and clay and serves as the principal water-bearing zone in the Moss Beach and El Granada area.

Pillar Point Marsh is underlain by younger, fine-grained, organic-rich basin deposits and fine-grained alluvial deposits[9] that have been carried by flood waters from Denniston Creek, the airport, and neighboring uplands.

Geotechnical borings and water wells near the marsh reveal that the flood flows and alluvial sediments from Denniston Creek have periodically been transported to the marsh area. The existing channel

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[7] *Hecht et. Al., 1988, Hydrogeologic and Water-Quality Constraints at the Mid-Coastside Golf Course, Moss Beach, San Mateo County.*

Knot, J.M., 1973, Effects of Urbanization on Sedimentation and Floodflows in Colma Creek Basin, California.

[8] *Brady/LSA, 2002, Fitzgerald Marine Reserve Master Plan. Part Two: Environmental Setting. May 2002.*

Woyshner, M., Hedlund, C., and Hecht, B., 2002, Ibid.

[9] *Brabb, E.E., Pampeyan, E.H., 1972, Preliminary geologic map of San Mateo County, California: USGS Miscellaneous Field Studies Map MF-328.*

alignment of lower Denniston Creek, set by highway and other road construction, and the development of Princeton's industrial zone, however, limit surface connections between the creek and marsh.[10]

The main geological feature near the project area is the San Gregorio Fault (SGF).[11] The fault line essentially cuts northwest to southeast through the middle of Pillar Point Marsh and crosses the northwestern edge of the northern parcel within the project site. As described below, the SGF plays an important role in the marsh hydrology, mainly because it displaces and deforms the Half Moon Bay Terrace.[12] East of the fault, the terrace is laterally continuous for several miles. The western wave-cut platform of the terrace is present at about sea level at Moss Beach to the north, but may be as much as 60 feet below sea level near Pillar Point Marsh. Remnants of an uplifted marine terrace are present immediately west of the fault, forming the upland areas to the west of the marsh and south to Pillar Point.

Soils

The USDA NRCS has mapped soils[13] at the site as Denison Clay Loam (refer to Figure IV.H-1), subcategorized as either "nearly level" or "nearly level, imperfectly drained." The two subcategories found on site – Denison Clay Loam, nearly level (DcA) and Denison Clay Loam, nearly level, imperfectly drained (DdA) – include similar soils with the imperfectly drained implying an occasionally high water table. The high water table can reduce rates of surface water infiltration, either from stormwater runoff or irrigation.

Figure IV.H-1 displays NRCS soil data with the U.S. Geological Survey (USGS) Quadrangle Sheet in the background. A rough outline of the project boundaries and the watershed of the Pillar Point Marsh at its confluence with the harbor are also shown for clarification. The Quad Sheet supports the delineation of a high water table at some portions of the project site since the site is located in or at least near the Pillar Point Marsh. Using the NRCS Web Soil Survey,[14] percentages of each soil type on the project site were estimated. The northern parcel contains 96.7 percent DcA and 3.3 percent DdA, with the DdA portions at

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[10] *Brady/LSA, 2002, Ibid.*

[11] *Stoffer, P.W., 2005, Chapter 8 The San Andreas and San Gregorio Fault Systems in San Mateo County: In The San Andreas Fault in the San Francisco Bay Area, California: A Geology Fieldtrip Guidebook to Selected Stops on Public Lands, USGS, Open-File Report 2005-1127, 21 p.*

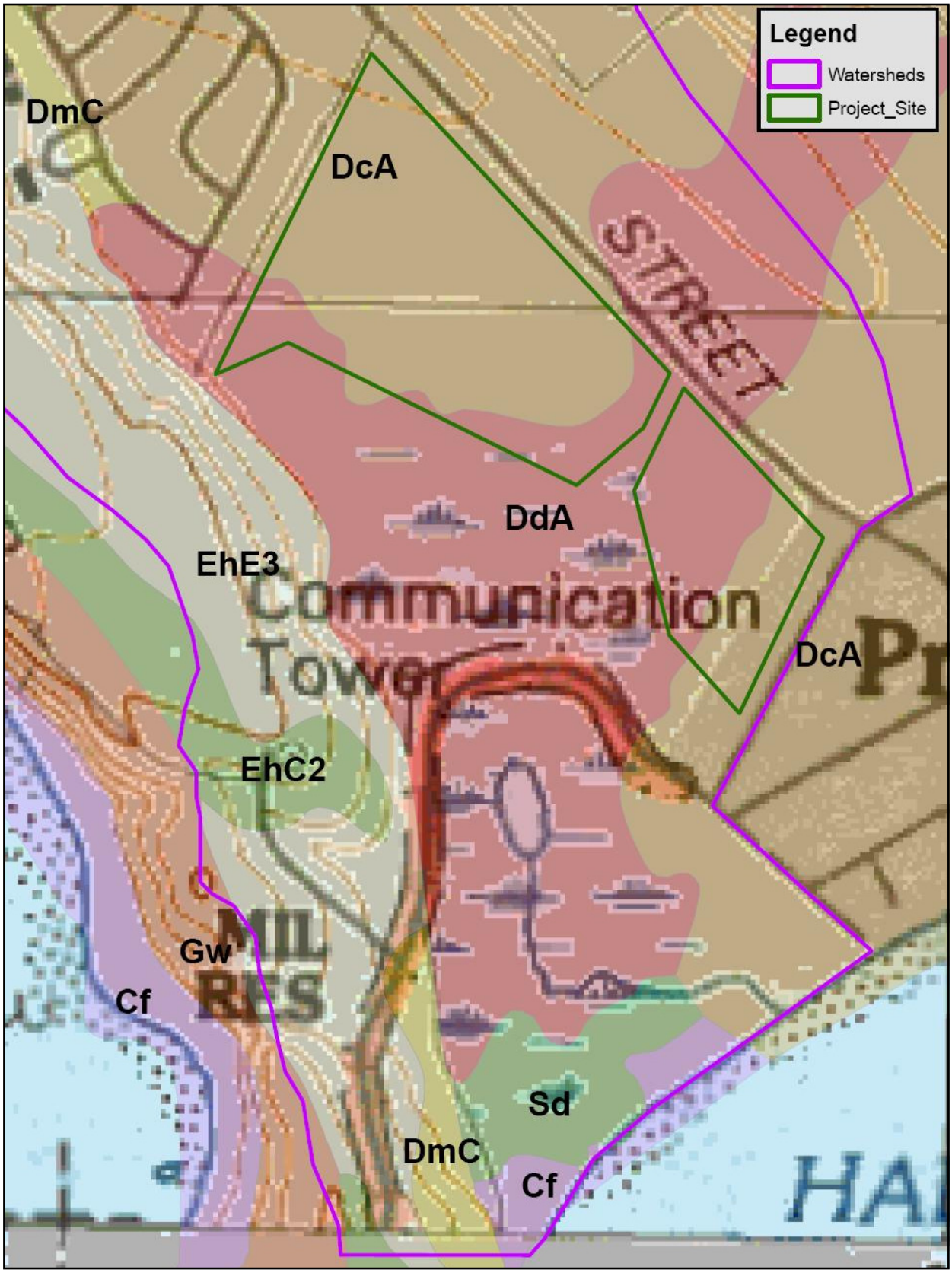
Koehler, R.D., Simpson, G.D., Witter, R., Hemphill-Haley, E., and Lettis, W.R., 2002, Paleoseismic investigation of the northern San Gregorio Fault at Pillar Point Marsh near Half Moon Bay, California, U.S.G.S., National Earthquake Hazards Research Program (NEHRP) External Grant Award No. 02HQPA0001, 6 p.

[12] *LaJoie, K.R., 1986, Coastal Tectonics: In Active Tectonics, Washington, D.C.: National Academy Press.*

LaJoie, K.R., Weber, G.E., Mathieson, S., and Wallace, J., 1979, Quarternary Tectonics of Coastal Santa Cruz and San Mateo Counties, California, as Indicated by Deformed Marine Terraces and Alluvial Deposits, Field Trip Guidebook to Coastal Tectonics and Coastal Geologic Hazards in Santa Cruz and San Mateo Counties, California.

[13] *Wagner, Richard J. and Ralph E. Nelson, 1961, Ibid.*

[14] *United States Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey, accessed at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm.*



Source: U.S. Department of Agriculture, Natural Resources Conservation Service, 2006, Soil Survey (SSURGO) database for San Mateo Area, California, ca637, December 14, 2006.
USGS, 1993, Montara Mountain, CA, 7.5' Quadrangle Sheet.

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Figure IV.H-1
Soils Map, Big Wave Project Vicinity

the low-lying southwest corner and eastern edges near the drainage swale. The southern parcel contains predominantly DdA soils at 75.9 percent; DcA soils comprise 24.1 percent of the site on the eastern edge of the site. Figure IV.H-1 verifies these percentages.

Denison Clay Loam soils of both subcategories onsite have the following characteristics (refer to Table IV.H-2) that strongly influence local hydrology:

- moderately deep or deep;
- nearly level or gently sloping;
- clay loam on the soil surface and throughout the profile;
- moderately slow to slow permeability (Hydrologic Group C);
- very high water-holding capacity; and
- low infiltration.

Although the small slopes of these soils lead to slow runoff, these soils have been classified in Hydrologic Group C (moderate runoff) because of their slow permeability. The DdA soils, furthermore, tend to have a high water table, reducing the available subsurface storage. Particularly during large storm events, these soils can have high runoff volumes. With moderate slopes, however, the erosion potential of these soils is none to slight.

Table IV.H-2
Recharge and Water-holding Properties of the Primary Surficial Soil Types at the Project Site

Map Symbol	Soil Description	Depth[1]	Hydrologic Group[2]	USCS Group[3]	Erosion Hazard	Permeability (in/hr)	Comments
DcA	Denison clay loam, nearly level – formed under grass vegetation from granitic alluvium – black and medium acidic or slightly acidic soil – extremely hard subsoil when dry	>80"	C	ML or CL	None	0.6 - 2.0	moderately slow permeability very slow runoff well drained
DdA	Denison clay loam, nearly level, imperfectly drained – same as above with: – occasionally high water table, causing problems with the disposal of water	>80"	C	SM	None	0.6 - 2.0	moderately slow permeability very slow runoff imperfectly drained

Notes:
[1] Depth to restrictive feature – i.e., bedrock or other impermeable layer limiting root penetration. Limit of soil survey is 80 ".
[2] There are four hydrologic soils groups that indicate infiltration of water when soils are thoroughly wet and receive precipitation from long-duration storms. Soil group "C" indicates a slow infiltration rate.

[3] *The Unified Soil Classification System (USCS) groups soils according to their grain size distribution, liquid limit, and plasticity index. ML indicates a fine-grained, inorganic silty soil with a low compressibility. CL indicates a fine-grained, inorganic clayey soil with a low compressibility. SM is a coarse-grained,, sandy soil with significant amounts of silt.*
Source: USDA, NRCS, Web Soil Survey: http://websoilsurvey.nrcs.usda.gov.

Surface Water

Overview of Surface Water Features

The primary surface water features near the project are the intermittent drainage swale between the two project parcels, the Pillar Point Marsh, and Denniston Creek. These features are generally described as follows with respect to the project site (refer to Figure IV.H-2):

- The swale is primarily fed by upstream drainage from the Half Moon Bay Airport and drains into Pillar Point Marsh.
- Pillar Point Marsh is a tidally influenced estuary (i.e., salt marsh) located within a cove of Half Moon Bay on the Pacific Ocean, bounded by Pillar Point Harbor to the south, Stanford Avenue to the southeast, Airport Street to the east, the old Granada Sanitary District access road to the north, the SGF fault scarp on the west, and the Pillar Point Military Reservation to the southwest.
- Denniston Creek feeds into Half Moon Bay from the north, but does not include the project area in its drainage area (watershed).

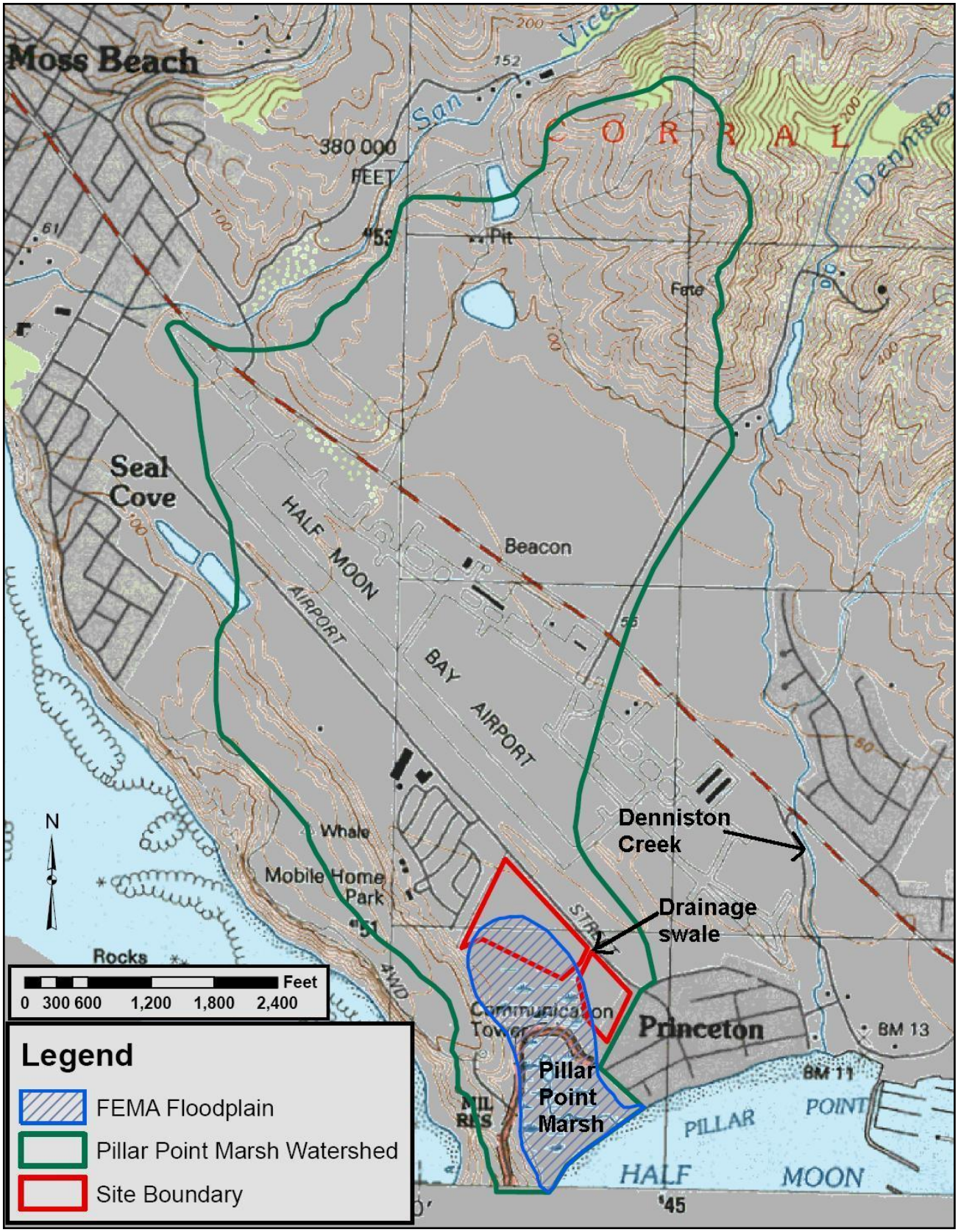
Pillar Point Marsh lies near the mouth of Denniston Creek, but is not directly connected by surface flow. Although Denniston Creek's recharge can affect water levels in the marsh, Denniston Creek is not discussed further since any impacts in the project area will not affect the creek directly.

Pillar Point Marsh

There is no distinct surface water feature, such as a creek or river that feeds surface water into Pillar Point Marsh. Although the marsh does have some surface drainage and is generally considered a surface water resource, it may be more appropriately described as a groundwater-fed lowland area (generally below 10 feet mean sea level [msl]), the lowest portion of which is subject to tidal inflows during high tides. Pillar Point Marsh eventually outlets to the Pillar Point Harbor, which in turn outlets to the Pacific Ocean. The marsh currently is reported to comprise about 41 acres (23.5 acres of freshwater marsh and 17.5 acres of salt marsh),[15] although at one point it was reported to comprise about 66 acres total.[16] The drainage area of Pillar Point Marsh is about 790 acres. Figure IV.H-3 represents the official boundary of the Pillar Point Marsh as presented in the County's Local Coastal Program documentation (1998). The maps for the Fitzgerald Marine Reserve, which acquired the marsh in 1997, indicate slightly different boundaries, as shown in Figure IV.H-4. Both maps indicate that the drainage swale between the two project site

[15] *Brady/LSA, 2002, Ibid.*

[16] *Flint, Philip S., 1977, Environmental Study of the Pillar Point Marsh: Part I. Baseline Data. February 1977.*



Source: USGS, 1993, Ibid. Kleinfelder, 2004, South Midcoast Aquifer Study, Hydrologic Sub-Areas, Plate 12, accessed on Apr. 4, 2007, http://www.co.sanmateo.ca.us/smc/department/home/0,,5557771_5558929_105063439,00.html, March 2004.

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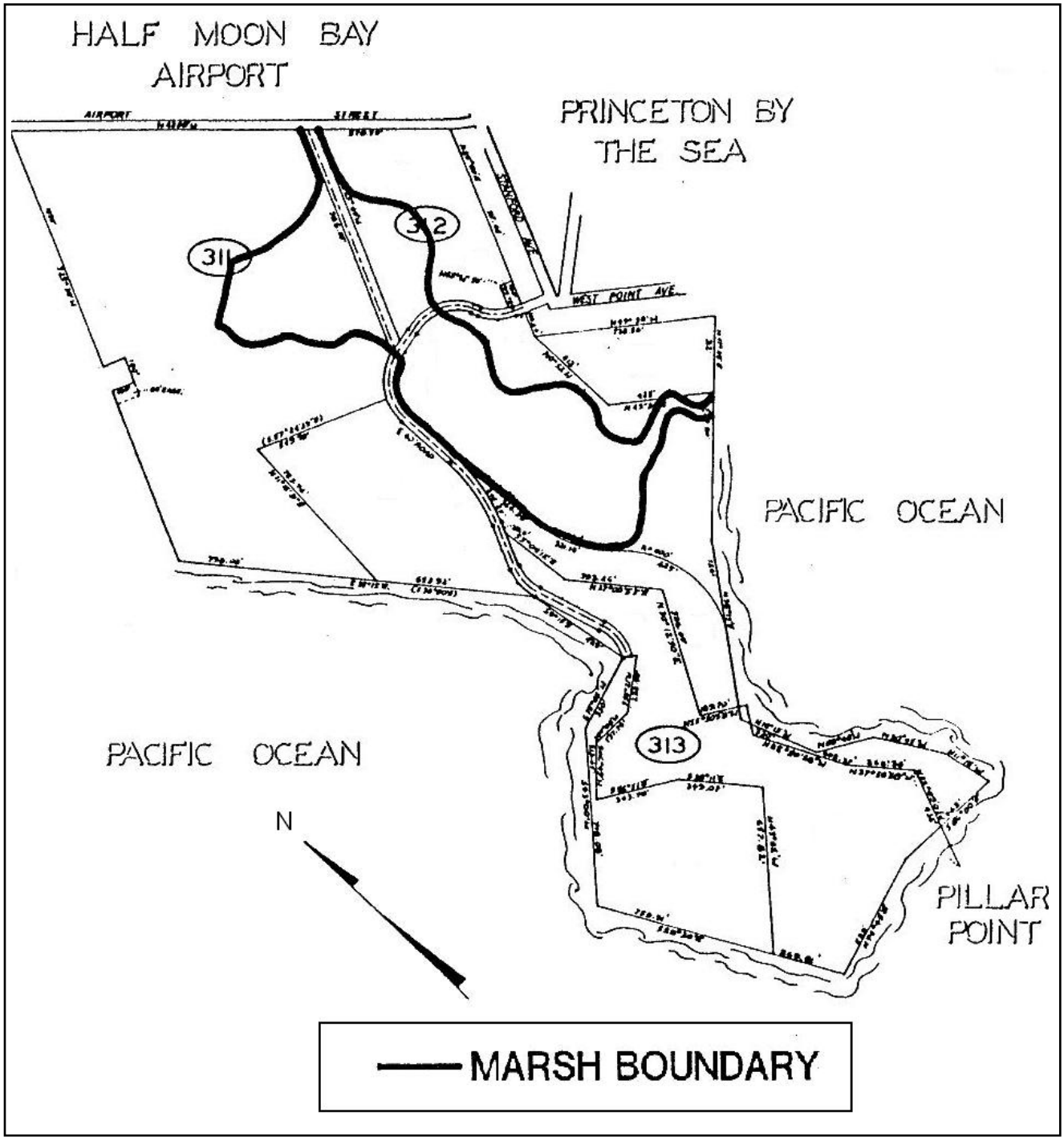
Figure IV.H-2
Project Vicinity Surface Water Features



Source: Adapted from Map 7.1 from Environmental Services Agency, 1998,
Planning and Building Division, San Mateo County, Local Coastal Program Policies, June 1998,
accessed on April 2, 2007 at http://www.co.sanmateo.ca.us/planning/pdf/lcp_1098.pdf

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Figure IV.H-3
Pillar Point Marsh Boundary,
Local Coastal Program

Source: Brady/LSA, 2002, Fitzgerald Marine Reserve Master Plan. Part Two: Environmental Setting. May 2002.

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Figure IV.H-4
Pillar Point Marsh Boundary,
Fitzgerald Marine Reserve

parcels is considered part of the marsh, although the project parcels themselves are considered to be outside and just on the northeastern edge of the marsh.

The geomorphology of Pillar Point Marsh is strongly influenced by the SGF, which is described in the geology subsection above. Surface water runoff and groundwater flow are both controlled and constrained by the SGF and its resulting offset. The marsh is currently separated into two distinct components by West Point Avenue, a brackish/saltwater marsh and beach to the southwest and a freshwater marsh-willow riparian zone to the northeast. The salt marsh portion occupies the area between the beach and the access road to the Pillar Point Military Reservation. The freshwater component of the marsh is northeast of the road, separated from the saltwater marsh by culverts under the road. The shape of the freshwater marsh components may be characterized by two lobes or arms, one that follows the trace of the SGF to the north and one that is dominated by the westerly drainage channel created during the airport construction. Historically, the marsh may not have had two such distinct components. Both natural and anthropogenic actions can affect the extent and nature of the marsh.

Natural, hydrologic conditions of the marsh can vary seasonally and throughout cycles of drought and abundant rainfall. The hydrologic status, or relative "wetness" of the marsh at any given time, will depend on the following factors:

- tidal inflow to the salt marsh;
- the annual amount of rainfall, runoff, and recharge to the supplying aquifer;
- the groundwater storage capacity of the upslope area supplying freshwater to the marsh;
- the percent of groundwater stored at any given time;
- the rate of subsurface flow through the aquifers to the marsh;
- the rate of subsurface outflow; and
- the rate of evapotranspiration.

As for artificial changes, historical land practices on the Half Moon Bay Terrace have greatly altered the surface hydrology, sedimentation, and vegetation patterns in the Pillar Point Marsh.[17] For instance, the marsh was reportedly dammed in the early 1900s by farmers trying to protect farmland from saltwater and to allow for an access road, and in the late 1920s, the U.S. Air Force improved the access road to become West Point Avenue.[18]

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[17] *The following paragraphs detailing the historical setting of Pillar Point Marsh are excerpted from Section F. Hydrology of the Brady/LSA, 2002, Ibid.*

[18] *Brady/LSA, 2002, Ibid.*

Available mapping of the marsh area indicates the marsh's hydrology has been periodically altered since the marsh was first noted in maps in the 1800s. The earliest known appearance of the marsh on maps[19] reveals that areas without standing or brackish water were used for cultivating grain. At that time, the marsh was crossed by agricultural roads. The earliest available photographs[20] from 1928 to 1931 show agricultural uses predominating. An access road to Pillar Point from Princeton-by-the-Sea existed in approximately the same location as the current paved road. Several agricultural ponds, including the San Vicente Reservoir and two ponds along the SGF scarp are also visible.

Subsequent aerial coverage indicates that by 1943[21] construction of Half Moon Bay Airport had commenced and an extensive surface drainage network, consisting of excavated ditches, had been developed to drain the runways, fields, and other airport facilities. In this drainage system, numerous small feeder ditches drain into a main collector ditch, which flows through a culvert, discharging at Airport Boulevard into the upper marsh. The grading of the runway and ditch network significantly altered surface drainage at the time. The ditch network continues to function today, serving as the primary source of surface flow and sediment to the marsh.

The 1943 aerial photographs also show that the dirt road bisecting the two portions of the marsh was a well-traveled route to the top of Pillar Point. Princeton-by-the-Sea to the south had been subdivided, but was still in agricultural production. The freshwater marsh also appears to be expanding into the area east of the Pillar Point access road, evidenced by a reduction in cultivated area and apparent spread of native vegetation, such as scrub and emergent marsh. The Pillar Point Harbor breakwater had not yet been constructed, and the salt marsh outlet was closed by a barrier dune created by wave action, leaving two distinct brackish open water areas.

By 1956, most of the upper marsh appears to have been reclaimed as agricultural land, with isolated willow stands. Princeton-by-the-Sea was still undeveloped, though the street layout remained. It should also be noted that the Pillar Point bluff and eastern slopes, as in earlier photographs, continued to be grazed and exhibited no coastal scrub characteristics. Between 1959 and 1967, the Pillar Point Harbor breakwater was constructed by the U.S. Army Corps of Engineers (USACE), enclosing Pillar Point Harbor and substantially reducing wave and tidal action at the mouth of the salt marsh. In 1968, the U.S. Air Force established the Pillar Point Missile Tracking Station, during which time the Pillar Point access road assumed essentially its current dimensions, drainage features, and alignment.

The 1972 aerial photographs show new structures on several lots next to the salt marsh. Also, the El Granada mobile home park and El Granada Sanitary District's Wastewater Treatment Plant abutting the freshwater marsh had been built. Stands of willow had begun to fill in between the mobile home park and

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[19] *U.S. Coast and Geodetic Survey, 1966.*

[20] *California Department of Transportation, 1928-1931, Aerial Photo, From University of California, Santa Cruz.*

[21] *Archaeological Consulting and Research Services, Inc., 1975, An Archaeological Assessment of the Proposed Fitzgerald Marine Reserve Additions, Prepared for the County of San Mateo Parks and Recreation Division, November 1975.*

the Pillar Point access road, and also built was the spur road off the access road, which now serves as the Harbor District's coastal access parking lot. Aerial photographs from 1977 show several structures on the barrier beach at the salt marsh outlet, implying a level of beach front stability previously unknown.

Aerial photographs reveal that the January 1982 storm events actively aggraded the delta at the mouth of Denniston Creek, with a plume of sediment discharging into Pillar Point Harbor. This sediment event appears to have overwhelmed the upstream Denniston Reservoir and resulted in the discharge to the harbor. Aerial photos from July of 1983 shows that even at high tide the barrier beach remained enlarged due to the previous year's sediment discharge event and the reduced littoral action at the mouth of the marsh. The extent of the freshwater emergent marsh consequently appears to expand upstream of the Pillar Point access road. The widening barrier bar and continuing delta formation at the mouth of Denniston Creek are still apparent in 1993 aerial photographs. The dune at the marsh outlet thus appears to be well vegetated, implying stability and an absence of wave action at higher elevations on the beach.

Surface Water Drainage

There are currently no distinct drainage channels on the project site; stormwater runoff from the project site drains directly into Pillar Point Marsh. Portions of the site drain to the onsite drainage swale, which is probably best described as a shallow, intermittent stream. Any drainage to groundwater percolates into the Half Moon Bay Terrace.

Other surface water drainage into the drainage swale comes primarily from the Half Moon Bay Airport via an approximately 4-foot diameter, concrete pipe culvert (see the top picture in Figure IV.H-5), which travels from the southerly edge of the airport to the southwest beneath an agricultural field to outlet on the eastside of Airport Street. At Airport Street, the airport drainage travels through two 44-inch diameter, concrete pipe culverts (see the bottom picture in Figure IV.H-5) under the road into the drainage swale.

Any effects of the surface water drainage and groundwater recharge, both of which affect the hydrology of Pillar Point Marsh, need to put the effects into the context of the entire Pillar Point Marsh watershed. Figure IV.H-2 depicts the estimated watershed boundaries for Pillar Point Marsh, based on the USGS Quad Sheet topography for the area and other studies,[22] and indicates the 790-acre drainage area of Pillar Point Marsh. As detailed above, surface water ponding and drainage in the Pillar Point Marsh has already historically been altered by three primary man-made features, each of which has had substantial impacts on both the biology and function of the marsh complex:

- the access road to Pillar Point;
- the construction of the Half Moon Bay Airport; and

[22] *USGS, 1993, Ibid.*
Kleinfelder, 2004, South Midcoast Aquifer Study, Hydrologic Sub-Areas, Plate 12, accessed on Apr. 4, 2007, http://www.co.sanmateo.ca.us/smc/department/home/0,,5557771_5558929_105063439,00.html, March 2004.

Surface water drainage culverts up stream of site.

Surface water drainage culverts on site.

Source: Schaaf & Wheeler, 2009.

- the USACE Breakwater at Pillar Point Harbor.

The most conspicuous feature is the access road, separating saltwater from freshwater marsh. The road both constrains tidal inflow to the freshwater wetlands, and, perhaps more importantly, traps sediment, gradually causing aggradation of the freshwater habitats to the east. The other two features are less conspicuous in their effects. The airport serves as the primary source of stormwater runoff and sediment to the upper freshwater marsh. The breakwater limits wave action on the saltwater marsh barrier dunes.

Both surface runoff from upstream of the marsh and rising groundwater levels contribute to surface water in the marsh. Fluctuations in the extent and duration of ponding occur through the year and over longer periods of wet and dry cycles. In effect, aggradation changes the mean elevation of the ground surface. Changes of habitat type reflect the long history of fluctuating water levels and sediment generating disturbance, especially in the freshwater portions subject to flooding and sedimentation.

In the upper watershed and on the unpaved areas of the Half Moon Bay Terrace, effective runoff of seasonal precipitation occurs after soils have become saturated. Based on local soil types, this typically occurs after the first 10 inches of rainfall has been absorbed by dry vegetation and soil surfaces. In paved areas, with roofs, gutters, and ditches, both the volume and velocity of rainfall runoff is increased. Drainage ditches hasten the flow of freshwater off the surface of the Half Moon Bay Terrace and through Pillar Point Marsh. As a result, groundwater recharge is decreased. Particularly if there is further development in the El Granada/Princeton area and along Airport Street, the trend may be towards less recharge area for the marsh.

Other Surface Water Bodies

There are no existing ponds or other surface water bodies on the project site. Extensive research and discussion with regulatory agencies has been conducted to clarify the extent of wetlands on and near the site. Results of this research and discussions are provided in Section IV.D (Biological Resources) of this DEIR. For this section of the DEIR, it is sufficient to note that high groundwater onsite is likely, especially near the edges of the project parcels that border the marsh and swale.

Flooding

Under Executive Order 11988, the Federal Emergency Management Agency (FEMA) is responsible for management of floodplain areas defined as lowland and relatively flat areas adjoining inland and coastal waters subject to a one-percent chance of flooding in any given year (a 100-year flood). FEMA requires that local governments covered by federal flood insurance pass and enforce a floodplain management ordinance specifying minimum requirements for any construction within the 100-year floodplain.

Flood hazards in the project vicinity and generally along the northern California coast may be generated by swell waves from offshore storms, by wind waves from land-falling storms, or tsunamis – sea waves

generated from oceanic earthquakes, submarine landslides, and volcanic eruptions.[23] The degree of hazard depends on the water-surface elevation of the astronomical tide that coincides with the wave or tsunami. Historical information on tsunamis in the project area is discussed in detail in the following subsection.

The federal Flood Insurance Study (FIS) for the project area does not discuss flooding specifically at Pillar Point Marsh or its vicinity, except at Miramar Beach, which is approximately 2 miles southeast of the site. Flooding related to Denniston Creek, however, is discussed in the FIS. The flooding for Denniston Creek is local to the creek and is not noted as directly affecting areas close to the project site. The floodplain depicted in the Flood Insurance Rate Map (FIRM) for the project area (i.e., Pillar Point Marsh) is not discussed or explained in the FIS; given that the floodplain is listed as an approximate zone, it is likely based on a previous floodplain map from 1977. Figure IV.H-6 shows the portion of the effective FIRM that includes the project area, with the project parcel boundaries superimposed. The FIS does note that the most severe storms to hit the California coast up until the time of the study were in 1978 and 1983, when high water levels were accompanied by large storm waves.

In January 1978, some of the better protected beaches were damaged, with jetties and breakwater barriers being overtopped and even undermined. The winter of 1983 brought a series of high tides, storm surges, and storm waves and caused considerable damage along the northern California coast. In addition, tsunami-related flooding, discussed below, has historically caused damage in the project area.

Both parcels of the project site appear to be located within a 100-year flood hazard area as mapped on the effective FIRM. Significant portions of the project site, as shown on the 1984 FEMA flood mapping,[24] are shown in a Zone A flood area. Since Zone A is an approximate flood zone with no base flood elevations (BFEs) determined, no BFEs are shown on the FIRM. However, in 2001, a Letter of Map Revision Based on Fill (LOMR-F) was granted by FEMA for properties adjacent to this floodzone, list the BFE as 8.5 feet (NGVD).[25] Furthermore, in a 2005 Letter of Map Amendment (LOMA), FEMA removed the project parcels from the floodplain.[26] This LOMA and its back-up information indicate that the limits of the FEMA floodplain are on the southside of the West Point Avenue access road.

Based on the surveyed site topography, no portion of the site is at 8.5 feet or lower. The lowest part of the site is near 10 feet. Figure IV.H-6 presents three floodplain boundaries: the one shown in the FEMA

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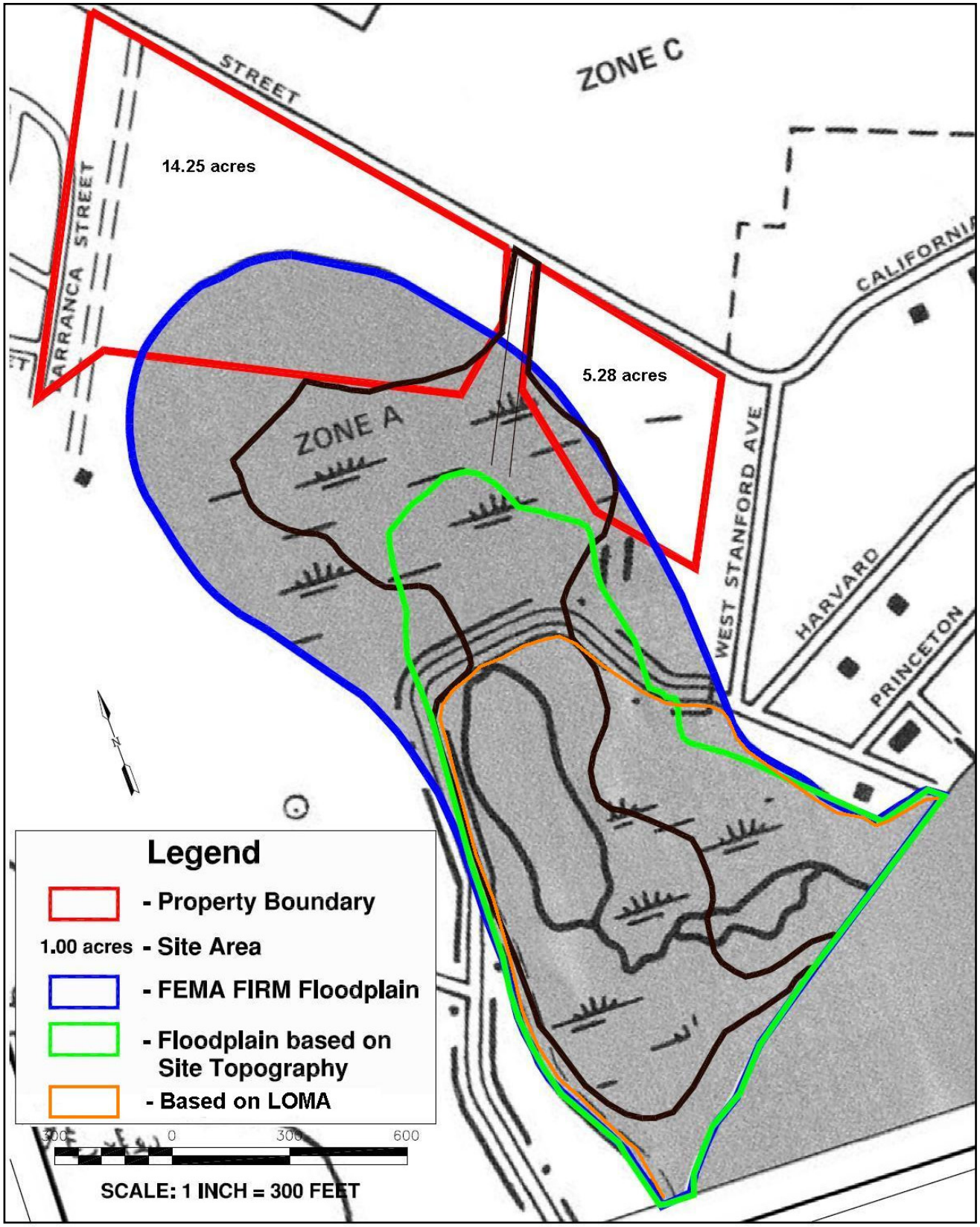
[23] *FEMA, 1986, Flood Insurance Study, San Mateo County, California, Unincorporated Areas, August 5, 1986.*

[24] *Federal Emergency Management Agency (FEMA), National Flood Insurance Program (NFIP), 1984, Flood Insurance Rate Map (FIRM), San Mateo County, California (Unincorporated Areas), Panel 060311 0113B, July 5, 1984.*

[25] *FEMA, 2001, Letter of Map Revision Based on Fill Determination Document (Removal), Case No. 01-09-276A, February 1, 2001.*

[26] *FEMA, 2005, Letter of Map Amendment Determination Document (Removal), Case No. 06-09-0050A, November 1, 2005.*



Source: Background: Federal Emergency Management Agency (FEMA), National Flood Insurance Program (NFIP), 1984, Flood Insurance Rate Map (FIRM), San Mateo County, California (Unincorporated Areas), Panel 060311 0113B, July 5, 1984.

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Figure IV.H-6
Floodplain in the Project Vicinity

FIRM, one based on available site topography, and one based on the previous LOMR-F and LOMA documents. The latter two boundaries show the project clearly outside of the (8.5-foot) floodplain.

Although the project is no longer within a FEMA-designated floodplain, another potential flooding source could affect the project parcels – the Denniston Reservoir. The Denniston Reservoir, a pooled section of Denniston Creek due to a small dam, sits approximately 4,800 feet north-northeast of the project site at the southern edge of the Montara Mountain foothills (refer to Figure IV.H-2). The California Office of Emergency Services (OES) prepares Dam Inundation Maps showing areas which would be inundated if regulated dams fail. The dam is apparently not large enough to be regulated by the California Department of Water Resources, Division of Safety of Dams (DOSD), although exact dimensions of the reservoir are not readily available.[27] Since the dam is not regulated by the DOSD, a Dam Inundation Map is not available for this dam. Inundation Maps for other dams in the project vicinity do not show the project site as being in an area inundated by waters of a failed dam.[28]

Tsunamis

Tsunamis, often commonly and somewhat incorrectly referred to as "tidal waves", are water waves of any size generated by a sudden vertical displacement of a water surface. Tsunamis do not have to be large, but can cause coastal flooding if large enough. Therefore, the FIS discusses general aspects of tsunamis in the project area and refers to engineering calculations that were performed to evaluate the coastal flood hazard along the Pacific Ocean in San Mateo County. The results of these calculations have been incorporated into the FIRMs. It is noted in the FIS that tsunamis cause some of the most destructive natural waves, although specific tsunami events and their effects are not discussed or analyzed further.[29]

Other sources indicate that for the West Coast of the U.S., in general, and the project vicinity, in particular, tsunami events are relatively rare. Most tsunamis are small, with a high percentage of "false alarms" reported, particularly since tsunamis can be confused with other phenomena, such as storm-generated waves or seiches.[30] For the 52 reported *local* tsunami events (i.e., generally not earthquake-induced and effecting only small areas) known from 1806 to 1992, only one tsunami event is reported within 10 miles of the project vicinity, at Half Moon Bay or Princeton-by-the-Sea. There are, however, among the 63 *non-local* tsunamis or *teletsunamis* (i.e., earthquake-induced) reported, three recorded with effects near the project site and several events noted in San Francisco, the San Francisco Bay, Santa Cruz, and Monterey. Most fatalities due to earthquake-induced tsunamis occur within 250 miles of the epicenter of the earthquake. Therefore, earthquakes centered as far south as Los Angeles, as far north as

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[27] *TRC Essex, 2006, DRAFT Denniston Reservoir Restoration Project Draft Initial Findings Report, Prepared for the Coastside County Water District, December 2006.*

[28] *See http://www.abag.ca.gov/bayarea/eqmaps/damfailure/dfpickc.html, last accessed on May 7, 2009.*

[29] *FEMA, 1986, Ibid.*

[30] *Lander, James F., Lockridge, Patricia A., and Michael J. Kozuch, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1993, Tsunamis Affecting the West Coast of the United States 1806-1992, NGDC Key to Geophysical Records Documentation No. 29, December 1993, 254 p.*

Humboldt County, or as far out as 250 miles into the Pacific Ocean could be estimated to cause fatalities near the project.[31]

A validity scale has been established by the National Oceanic and Atmospheric Administration (NOAA) to gauge the veracity and severity of reported tsunamis, since reports of tsunamis and their effects can be more or less accurate. This scale varies from "0" for invalid reports to "4" for valid reports that conclusively indicate a tsunami event. The reported tsunamis near the project site include the following, with their validity rating indicated in parenthesis:

- September 1859 - local tsunami reported to lower water levels in Half Moon Bay (2);
- April 1946 - teletsunami induced by 7.8-magnitude earthquake in the Aleutian Islands (4);
- May 1960 - teletsunami induced by 8.6-magnitude earthquake in Chile and (4); and
- March 1964 - teletsunami induced by 8.4-magnitude earthquake in Prince William Sound (4).

The 1859 Half Moon Bay tsunami is disputed, and the effects were minor if any. The 1946 teletsunami, on the other hand, was observed all along the U.S. West Coast and reportedly flooded homes and stranded boats near Princeton-by-the-Sea, with a maximum height of about 10 feet at Half Moon Bay. A shed near Half Moon Bay was destroyed and boats floated 0.25 miles inland. The 1960 teletsunami also caused damage all along the California coast, including damaging a dozen boats near Princeton-by-the-Sea. The 1964 teletsunami caused massive damage along the West Coast, including sinking one boat and damaging four others near the Pillar Point jetties, as well as forcing nearby residents to evacuate from low-lying areas.[32]

With the Association of Bay Area Governments (ABAG), San Mateo County has developed a *Tsunami Evacuation Planning Map for San Francisco & San Mateo County*. Figure IV.H-7 provides a tsunami evacuation map for the project vicinity prepared with information from the ABAG map.[33] The ABAG tsunami website also indicates that the tsunami evacuation map is based on:

"modeling of potential earthquake sources and hypothetical extreme undersea, near-shore landslide sources. Maximum run-up to a specific contour was determined to be the reasonable measure to delineate the tsunami evacuation area. The contour used [from a previous study] *was…42 feet."*[34]

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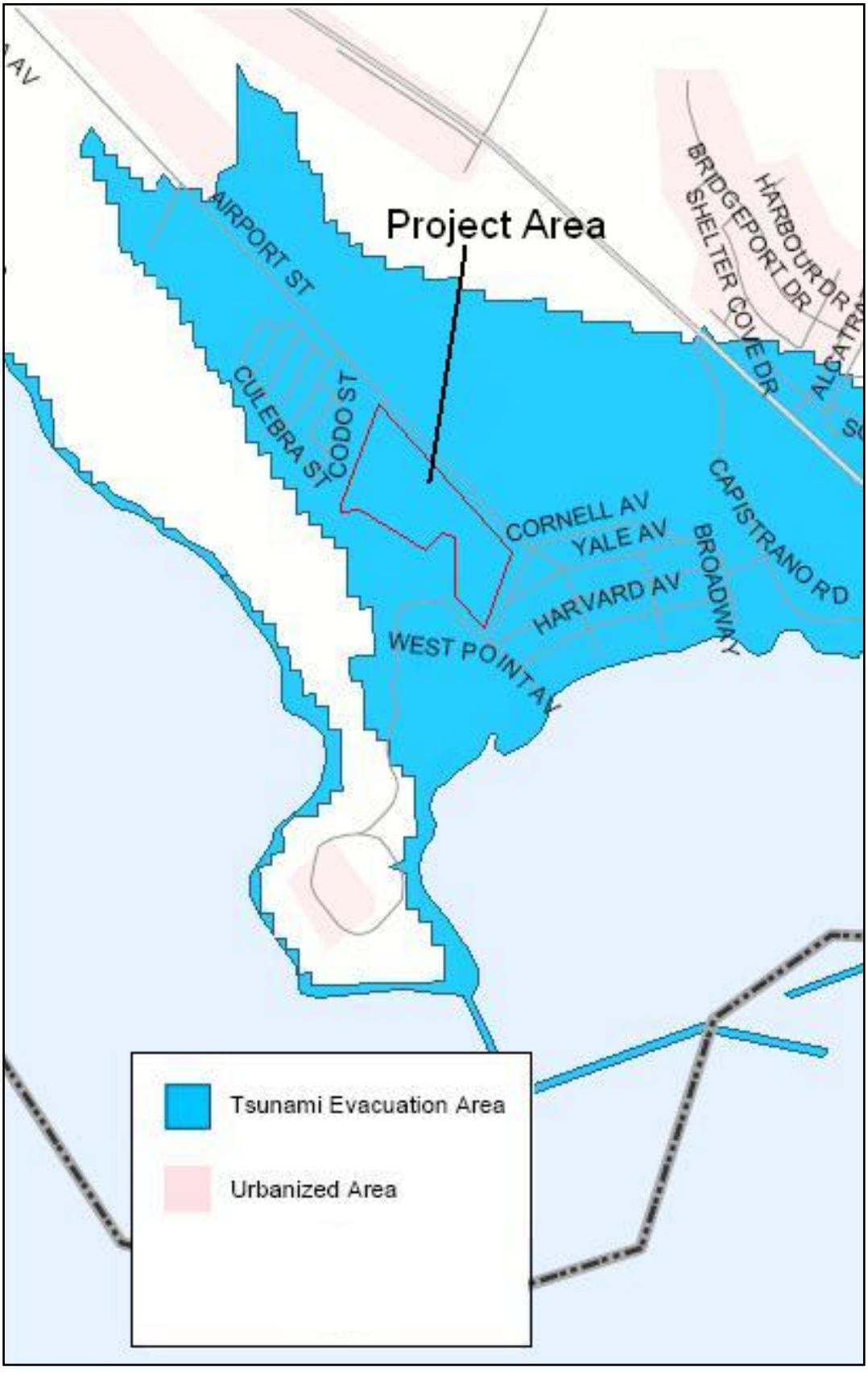
[31] *Ibid.*

[32] *Ibid.*

[33] *See http://www.abag.ca.gov/ last accessed on May 6, 2009*

[34] *See http://www.abag.ca.gov/bayarea/eqmaps/tsunami/tsunami.html last accessed on May 6, 2009.*
Titov, V.V and Synolakis, C.E., 1998, Numerical Modeling of Tidal Wave Runup, Journal of Waterways, Port, Coastal and Ocean Engineering, Vol. 124, No. 4, July/August 1998, 15 p.



Source: Association of Bay Area Governments (ABAG), San Mateo County 2009.

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Figure IV.H-7
Tsunami Evacuation Map
in the Project Vicinity

The figure clearly shows the entire project vicinity and much of the surrounding area within the tsunami evacuation area (i.e., below the 42 foot contour). Along with the reported historical information on tsunamis in the project area, this evacuation map indicates that any development in this area would need to take into account the effects of tsunami action on structures and people.

Surface Water Quality

Limited surface water quality data are available for Pillar Point Marsh, the main surface water body of concern, beyond periodic salinity and specific conductance measurements in the saltwater marsh.[35]

The available data indicate that the three primary potential sources of degraded water quality in the Pillar Point Marsh are:

- sediment transported from the airport drainage ditch network, roadside ditches, and grading and development in the Princeton-by-the-Sea area;
- urban runoff from the airport and Princeton-by-the-Sea; and
- agricultural chemicals used by local growers on the Half Moon Bay Terrace.

Fecal contamination is also a continual problem in Pillar Point Harbor, just downstream of the marsh. A research study headed by the San Mateo County Resource Conservation District (RCD) and funded by the State Board is currently investigating the sources of the fecal contamination.[36] The initial work has included a literature review and experimental circulation study to provide information on how pollution travels in the harbor.

As discussed in the Fitzgerald Marine Reserve Master Plan, visual impressions[37] of the sediment transported from the airport drainage system and Airport Street imply that a substantial proportion of the sediment delivered to the Pillar Point Marsh originates in the disked airport fields, the periodically cleared ditches, and roadside drainage ditches. During and after rainfall events, it is possible at the culvert above the saltwater marsh to differentiate, by eye and specific conductance measurements, between turbid waters flowing from the airport ditch and the relatively sediment-free surface runoff from the vegetated hillsides and terrace to the north.

Urban runoff and non-point sources of pollution related to the airport and local automobiles likely contribute hydrocarbons and heavy metals to the marsh, but these are not specifically documented. The potential for fuel spills and related industrial chemicals exist, although as of 1998, the San Francisco Bay

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[35] *Flint, 1977, Ibid.*

[36] *San Mateo County Resource Conservation District, 2008, Identification of Sources of Fecal Pollution Impacting Pillar Point Harbor: Literature Review, May 2008.*

[37] *Brady/LSA, 2002, Ibid.*

Regional Water Quality Control Board (RWQCB) staff did not have any record of known occurrences that had adversely impacted the marsh.[38]

Agricultural chemicals known to be used[39] by local farm operations on the Half Moon Bay Terrace include: Meta Systox, Vapam, Terra Clor 75 percent WP, Lorsban, Diazanon, Di-methoate, Guthion, and Lannate. Fertilizers used are 15-15-15, 12-12-12, urea, ammonium nitrate, and calcium nitrate. Transport of diazanon and other pesticides increases the likelihood of water quality degradation of the marsh and related groundwater. Furthermore, residues of these chemicals, as well as more toxic and persistent ones, may remain in the soil and be transported to the marsh due to their physical and chemical attachment to eroded sediment. No definitive water and sediment quality studies of the marsh have been conducted or are readily available to assess whether these substances are present or have caused problems.

Ground Water

Hydrogeologic Setting

The Half Moon Bay Terrace is the principal water-bearing formation in the El Granada/Moss Beach area. Figure IV.H-8 presents the main aquifers in the project area along with the geological information of each aquifer. The subbasin of the Half Moon Bay Terrace in the project vicinity is often referred to as the airport aquifer[40] because the Half Moon Bay Airport occupies a large portion of the basin. This aquifer is described as having an aerial extent of 5.12 square miles, although the exact boundaries of the airport aquifer vary by study. Neighboring subbasins include the Montara/Moss Beach and El Granada aquifers. The Regional Board's Basin Plan[41] describes the Half Moon Bay Terrace as having an aerial extent of 25 square miles, a depth from the surface of 15-20 feet, a storage capacity of 10,300 acre-feet, and a perennial yield 2,200 acre-feet.[42] Groundwater levels in the airport aquifer have remained essentially constant since the 1950s with no apparent long-term changes in water level or groundwater storage, although groundwater extraction by the local water utilities has increased from about 250 acre-feet per year (AFY) to a maximum of near 430 AFY and about 340 AFY during the 1987-1992 drought.[43] An agricultural well is located in the northern portion of the project site. Information is limited to reports by others for projects in the vicinity of the project site, including prior documents cited in these reports.

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[38] *Napolitano, M., 1998, Personal Communication, RWQCB, January 22, 1998.*

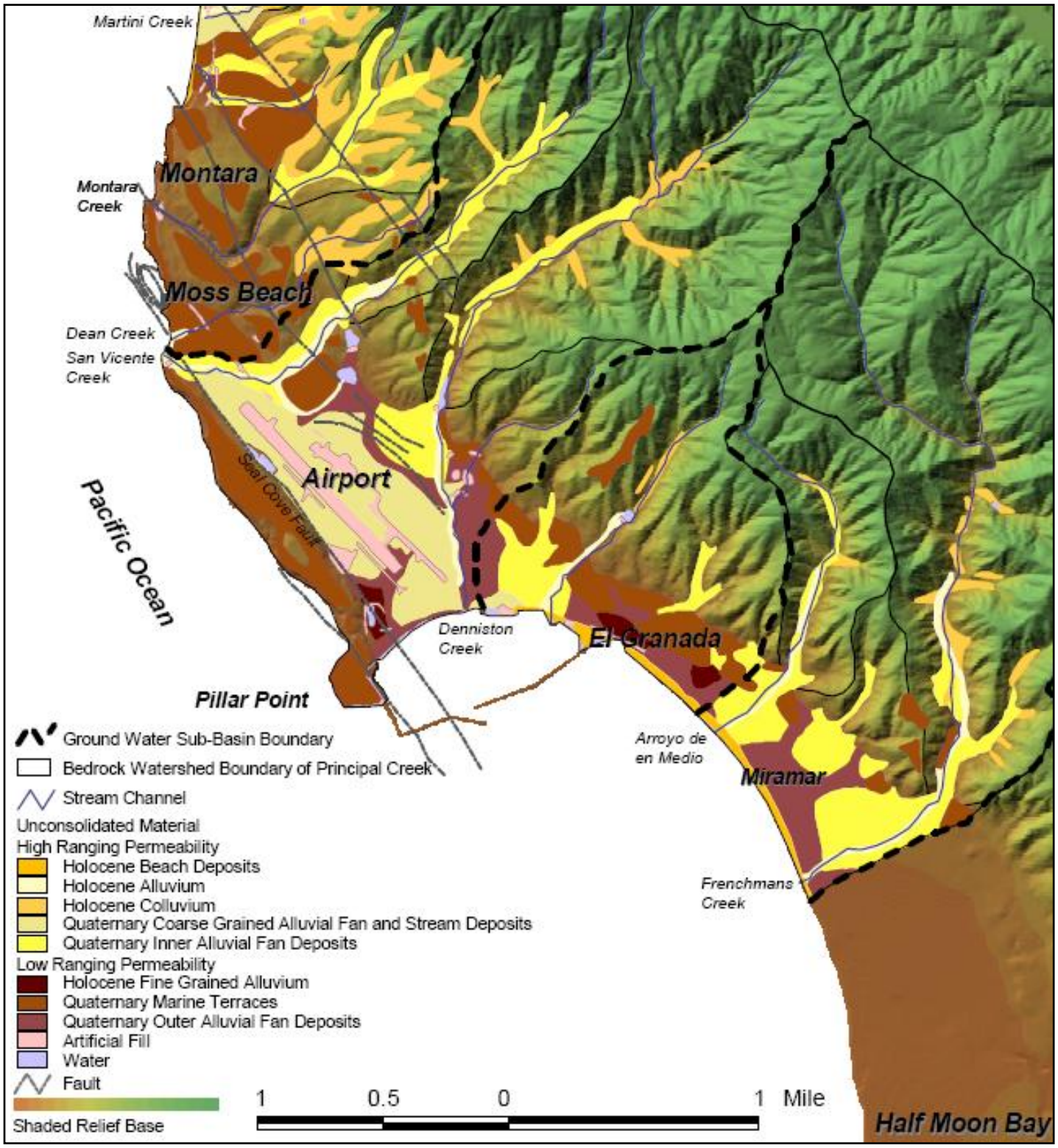
[39] *Teter, J.S., 1996, Watershed Sanitary Survey, Denniston and San Vicente Watersheds, For Coastside County Water District.*

[40] *Woyshner, M., Hedlund, C., and Hecht, B., 2002, Ibid.*

[41] *Regional Board, 2007, Basin Plan, Ibid.*

[42] *Geoconsultants, Inc., 1991, Annual Report 1990-1991, Groundwater Resources, Half Moon Bay, California, Prepared for the City of Half Moon Bay.*

[43] *Woyshner, M., Hedlund, C., and Hecht, B., 2002, Ibid.*



Source: Image adapted from Figure 1 of Woyshner, M., Hedlund, C., and Hecht, B., 2002, San Mateo County Mid-Coast Aquifers: Literature and Date Review, Prepared for San Mateo County, Board of Supervisors, Balance Hydrologics, Inc., April 2002, 76 p.

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Figure IV.H-8
Groundwater Subbasins and Geology in the Project Vicinity

In the Half Moon Bay/Pillar Point Marsh Ground Water Basin Study,[44] sixteen existing wells are identified in the Pillar Point area. Over 90 wells exist in the El Granada area. These have been the subject of several hydrogeological investigations to assess the safe yield of the airport aquifer and to evaluate the role of groundwater withdrawals and water table drawdown effects on the Pillar Point Marsh.

Since at least 1974, water levels have been measured in the marsh area and regional pumping has been monitored.[45] Professor Philip Flint of San José State University conducted probably the most intensive investigations[46] of Pillar Point Marsh and its seasonal surface and groundwater hydrologic conditions relative to municipal water supply production in the airport aquifer. Subsequent groundwater investigations confirm Dr. Flint's assessment that, despite periodic lowering of the groundwater by pumpage, rainfall runoff and recharge on the terrace and from Denniston Creek provide sufficient water to reverse drawdown effects, and, most probably, inhibit seawater intrusion into the groundwater basin. In addition, these locally conducted groundwater studies agree that the overall groundwater gradient in the terrace indicates a condition of groundwater discharge into the marsh area.

The flow of groundwater to the marsh is the primary reason the freshwater wetland habitats exist. Where this groundwater emerges at the surface, at approximately 10 to 15 feet msl, the freshwater wetland and riparian species can be found. Below this elevation, from approximately 5 to 10 feet msl, salt marsh habitat and tidally influenced brackish water predominates, except during rainy season flushing.[47]

Water level records from monitoring wells located in the terrace formation near Pillar Point Marsh indicate average seasonal water level fluctuations of 4 to 10 feet during average rainfall years. Water level declines of 14 to 29 feet have been recorded during dry and critically dry years in a monitoring well just west of the airport. Most important, however, is the quick response of several local monitoring wells to abundant periods of rainfall.[48] Overall, water levels in the airport aquifer recover seasonally, except

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[44] *Luhdorff & Scalmanini Consulting Engineers and Earth Sciences Associates, 1987, Half Moon Bay/Pillar Point Marsh Ground-Water Basin Study: Phase I.*

Luhdorff & Scalmanini Consulting Engineers and Earth Sciences Associates, 1991, Half Moon Bay/Pillar Point Marsh Ground-Water Basin Study: Phase II.

Luhdorff & Scalmanini Consulting Engineers and Earth Sciences Associates, 1992, Half Moon Bay/Pillar Point Marsh Ground-Water Basin Study: Phase III.

[45] *Lowney-Kaldveer Associates, 1974, Groundwater Investigation, Denniston Creek Vicinity, San Mateo County, California, for Coastside County Water District.*

Woyshner, M., Hedlund, C., and Hecht, B., 2002, Ibid.

[46] *Flint, P.S., 1977, Ibid.*

Flint, P.S., 1978, Environmental Monitoring Study of the Pillar Pt. Marsh: Part II Progress Report, Prepared for the Coastside County Water District, March 1978.

[47] *Brady/LSA, 2002, Ibid.*

[48] *Luhdorff & Scalmanini Consulting Engineers and Earth Science Associates, 1987, Ibid.*

Luhdorff & Scalmanini Consulting Engineers and Earth Science Associates, 1991, Ibid.

Luhdorff & Scalmanini Consulting Engineers and Earth Science Associates, 1992, Ibid.

during periods of extended drought. As in many coastal basins, groundwater levels appear to be dictated by the elevation of the outflow point of the marsh, which is at or above mean sea level.

Groundwater Quality

Groundwater quality data for the project area is relatively more abundant than surface water quality,[49] due to the use of groundwater for water supply. Groundwater quality is generally considered good, with the exception of elevated levels of iron and manganese. Groundwater in this area, as it is generally in California, is reported to be relatively hard,[50] but hardness is not necessarily a health problem and not regulated as a contaminant.

At least one study[51] also reports high nitrate levels in the aquifer, which requires pumped groundwater used for domestic supply to be blended with surface water of lower nitrate concentration. Possible sources of nitrate and nitrogen include fertilizer use for agriculture in the region and the airport restaurant's septic leach field.

Because the groundwater basin interfaces with the ocean in Half Moon Bay, the potential for seawater intrusion has long been a source of concern. Chloride concentrations in the area's groundwater, however, do not appear to indicate the existence of seawater intrusion into the groundwater basin at past or current levels of groundwater production.[52]

In contrast with the effects of sediment on surface water quality, there are no distinctive concerns with sediment on groundwater quality. Although pesticides and other organics may pose a hazard to the surface water in the marsh, they are not indicated as a concern for the groundwater of the Half Moon Bay Terrace.

Although not currently listed for other contaminants, there is a potential that the groundwater near and underlying the project site is contaminated with 1,2,3-trichloropropane (TCP), a chemical found in historical soil fumigants and which can cause eye and skin irritation to those exposed to it by air. TCP is potentially thought to cause liver and kidney problems and be carcinogenic, as well. The Montara Water and Sanitary District, who manages groundwater wells at the airport found levels of TCP in 2002 that exceeded advisory levels. Currently, the chemical is unregulated by a maximum contaminant level, although the United States Environmental Protection Agency (USEPA) has an advisory limit of 2 parts

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[49] *Flint, P.S., 1977, Ibid.*

[50] *Hardness refers to the presence of divalent cations – magnesium, calcium, etc. – that can cause scale build-up in plumbing fixtures and reduce the efficiency of cleaning detergents.*

[51] *Woyshner, M., Parke, J., Hecht, B., and Porras, G., 2005, Drilling and Testing of Montara Water and Sanitary District's Well 2004-4, APN 036-180-030, San Mateo County, California, Well Completion Report, Prepared for Montara Water and Sanitary District, Prepared by Balance Hydrologics, Inc., July 2005.*

[52] *Woyshner, M., Hedlund, C., and Hecht, B., 2002, Ibid.*

per million (ppm) for adults and 0.6 ppm for children.[53] The California Department of Public Health (CDPH) has an advisory level of 0.005 parts per billion (ppb).[54]

REGULATORY SETTING

There are several federal, state, and local laws, policies, and regulations that apply to hydrology and water quality on the project site. Applicable federal laws regulating development that may have effects on hydrology include the following:

- The National Flood Insurance Program (NFIP) of FEMA, established by Title 44, Code of Federal Regulations (CFR) and administered through FEMA;
- The USACE; and
- Various provisions of the Clean Water Act (CWA), including the National Pollutant Discharge Elimination System (NPDES), which is administered at a federal level through the USEPA. A USEPA regional office (Region IX) is located in San Francisco and delegates authority for waste discharge permitting under the CWA to the State Board.

The main state agencies with jurisdiction over the project site are the following:

- The State Board and the RWQCBs are divisions of the California Environmental Protection Agency (CEPA). These state agencies, as mentioned in §13160 of the Porter-Cologne Water Quality Control Act, serve as the lead agencies for the USEPA to implement aspects of the CWA through regional Basin Plans and administer the USEPA's NPDES program.[55]
- The California Department of Fish and Game (CDFG); and
- The California Coastal Commission (CCC), established by the California Coastal Act of 1976.

Several local agencies, including the County of San Mateo, the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP), the San Mateo County Environmental Health Department, and the County Agricultural Commissioner, also have jurisdiction over development on the project site.

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[53] *USEPA, 2008, Emerging Contaminant – 1,2,3-Trichloropropane (TCP), Fact Sheet, April 2008.*

[54] *CDPH, Drinking Water Program, 2007, Drinking Water Notification Levels and Response Levels – An Overview, December 2007, accessed on April 27, 2009 at http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Notificationlevels/NotificationLevels.pdf.*

[55] *State Water Resources Control Board, Porter-Cologne Water Quality Control Act, 2009, California Water Code, Division 7. Water Quality, Effective January 1, 2009.*

Federal

National Flood Insurance Program

FEMA publishes FIRMs that identify special flood hazards. The FIRM containing the project site is part of the unincorporated San Mateo County FIRM series and became effective July 5, 1984. The FIRM established a Zone A Special Flood Hazard Area (SFHA) comprising Pillar Point Marsh. A Zone A floodplain has a 1 percent annual chance of flooding and is approximately delineated; because detailed analyses are not performed for such areas, no flood depths or base elevations are established or shown on the FIRMs for this zone. As currently shown on the FIRM, portions of the project site are within the A Zone. However, as noted above, FEMA removed the project parcels from the floodplain in a 2005 Letter of Map Amendment (LOMA).

U.S. Army Corps of Engineers

The USACE has jurisdiction and permitting authority under Section 10 of the Rivers and Harbors Act of 1899 over the Nation's waterways and their associated wetlands. The USACE also has authority under Section 404 of the CWA to protect the quality of the Nation's waters. The USACE regulates potential impacts on wetlands, threatened or endangered species, other valuable fish and wildlife resources, and cultural resources found in wetland areas.

Both dredging and filling of waters under the USACE protection are activities regulated by the USACE. The Section 404 permit program for discharge of fill or dredged materials into waters of the U.S. may be applicable to the project. The general criteria for such discharges is to have "no net loss" of wetlands due to project impacts, basically requiring compensatory mitigation.

Clean Water Act

Provisions of the federal CWA relevant to hydrology and water quality are generally implemented in California via statewide agencies, as discussed in the next subsection. As a summary of federal regulations under the CWA:

- Section 319 of the CWA addresses programs to manage non-point sources of pollution to the navigable waters of a state, via the NPDES permits;
- Section 401 addresses water quality in waters of the U.S., including wetlands;
- Section 402 addresses the discharge of pollutants from point sources into U.S. surface waters; and
- Section 404 establishes a program to regulate the discharge of dredged or fill material into waters of the U.S., and is implemented by the USACE as described above.

State

California Department of Fish and Game

The CDFG has jurisdictional authority over wetland resources associated with rivers, streams, and lakes under California Fish and Game Code Section 1600 to 1607. The CDFG has authority to regulate development and other work that will substantially divert, obstruct or change the natural flow of a river, stream or lake; substantially change the bed, channel or bank of a river, stream, or lake; or use material from a streambed. Typical activities regulated by the CDFG include re-channeling and diverting streams, stabilizing banks, implementing flood control projects, river and stream crossings, diverting water, damming streams, gravel mining, and logging operations.

The CDFG should be contacted if any portion of the project would interfere with a water course under the CDFG's jurisdiction. Alterations to the wetlands on-site are planned, and these alterations may require a permit from the CDFG. Once such a permit is acquired and permit conditions are met, the project should be in compliance with the CDFG regulations protecting wetlands and surface waters in California.

California Coastal Commission (CCC)

The California Coastal Act created the CCC, an independent, quasi-judicial state agency which regulates development along California's coastline. In addition to preserving the coastline, the CCC also is charged with wetland preservation. Regional regulation is implemented by Local Coastal Programs (LCPs), which are prepared by the cities and counties located within the coastal zone. Prior to beginning construction, development within the "Coastal Zone" also requires a Coastal Development Permit.

The San Mateo LCP, which has been certified by the CCC, defines wetlands as areas "where the water table is at, near, or above the land surface long enough to bring about the formation of hydric soils, or to support the growth of plants which are normally found to grow in water or wet ground."[56]

There is another policy in the LCP in §2.33 that discusses any project that does or will draw from the Mid-Coast water supply via groundwater wells. This policy requires that "any water system that… proposes to draw [ground]water from wells in the aquifer serving Pillar Point Marsh agree to participate in and assist in funding of the hydrologic study of Pillar Point Marsh required by Policy 7.20 and to accept the restrictions from that study" as a condition of development. Relevant to hydrology and groundwater, Policy 7.20 requires the County to first define safe yield from the aquifer feeding the marsh as the amount of water that can be removed without adverse impacts on marsh health and then to restrict groundwater extraction in the aquifer to a safe yield as determined by a hydrologic study participated in by the two public water systems in the area. Water system capacity permitted and the number of building permits allowed in any calendar year shall be limited if necessary by the findings of the study.

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[56] *Environmental Services Agency, Planning and Building Division, San Mateo County, Local Coastal Program Policies, June 1998, accessed on April 2, 2007 at http://www.co.sanmateo.ca.us/planning/pdf/lcp_1098.pdf*

State Water Resources Control Board and Regional Water Quality Control Boards

The project area lies within the jurisdiction of the San Francisco Bay RWQCB, which is Region 2 of the State Board. The State Board and the nine RWQCBs have the authority in California to protect and enhance water quality, both as the lead agencies in implementing the Section 319 nonpoint source NPDES program of the federal CWA, and from the state's primary water-pollution control legislation, the Porter-Cologne Water Quality Control Act.[57] The State Board and RWQCB also guide and regulate water quality in streams and aquifers of the San Francisco Bay Area through the following policies and actions:

- California Ocean Plan;
- Antidegradation Policy;
- Policy Regarding Water Reclamation;
- Bay's and Estuaries Policy;
- Thermal Plan;
- Basin Plan;
- Administration of the NPDES permit program for storm water and construction site runoff (CWA Sections 319 and 402); and
- CWA Section 401 water quality certification where development results in fill of jurisdictional wetlands or waters of the U.S. under Section 404 of the CWA.

California Ocean Plan

The State Board developed a Water Quality Control Plan for ocean waters of California (the "California Ocean Plan") in 1976, with several subsequent revisions.[58] The California Ocean Plan addresses discharge by point sources and non-point sources to California's ocean waters, but not to enclosed bays or estuaries. Ocean waters, as defined in the California Ocean Plan, are "territorial marine waters of the State [of California] as defined by California law to the extent these waters are outside of enclosed bays, estuaries, and coastal lagoons." As Figure IV.H-9 indicates, the Pillar Point Harbor area is considered an enclosed harbor and by that reason not subject to the California Ocean Plan.

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[57] *State Board, 2009, Ibid.*

[58] *State Board, 2006, California Ocean Plan, Water Quality Control Plan, Ocean Waters of California, February 2006, 57 pp.*

State Board, 2009 (in review), Water Quality Control Plan, Ocean Waters of California, 62 pp.

However, another provision of the California Ocean Plan is to protect Areas of Special Biological Significance (ASBS) by preventing discharges to these areas or to areas that would affect maintenance of natural water quality conditions in these areas. Parts of the Fitzgerald Marine Reserve and nearby areas on the Pacific Ocean coast are considered ASBS. Therefore, if the project discharges, either via stormwater or wastewater, were thought to impair the natural water quality of the protected areas, the State Board could use the California Ocean Plan to restrict discharges from the project.

Antidegradation Policy

The Statement of Policy with Respect to Maintaining High Quality of Waters in California, known as the Antidegradation Policy, adopted in 1968 and codified as Resolution No. 68-16 of the State Board, requires the continued maintenance of existing high quality waters and provides conditions under which a change in water quality is allowable. A change must:

- Be consistent with maximum benefit to the people of California;
- Not unreasonably affect present and anticipated potential beneficial uses of water; and
- Not result in water quality less than that prescribed in water quality control plans (i.e., Basin Plans) or policies.

This policy is periodically reviewed, with the latest review near the end of 2008.[59]

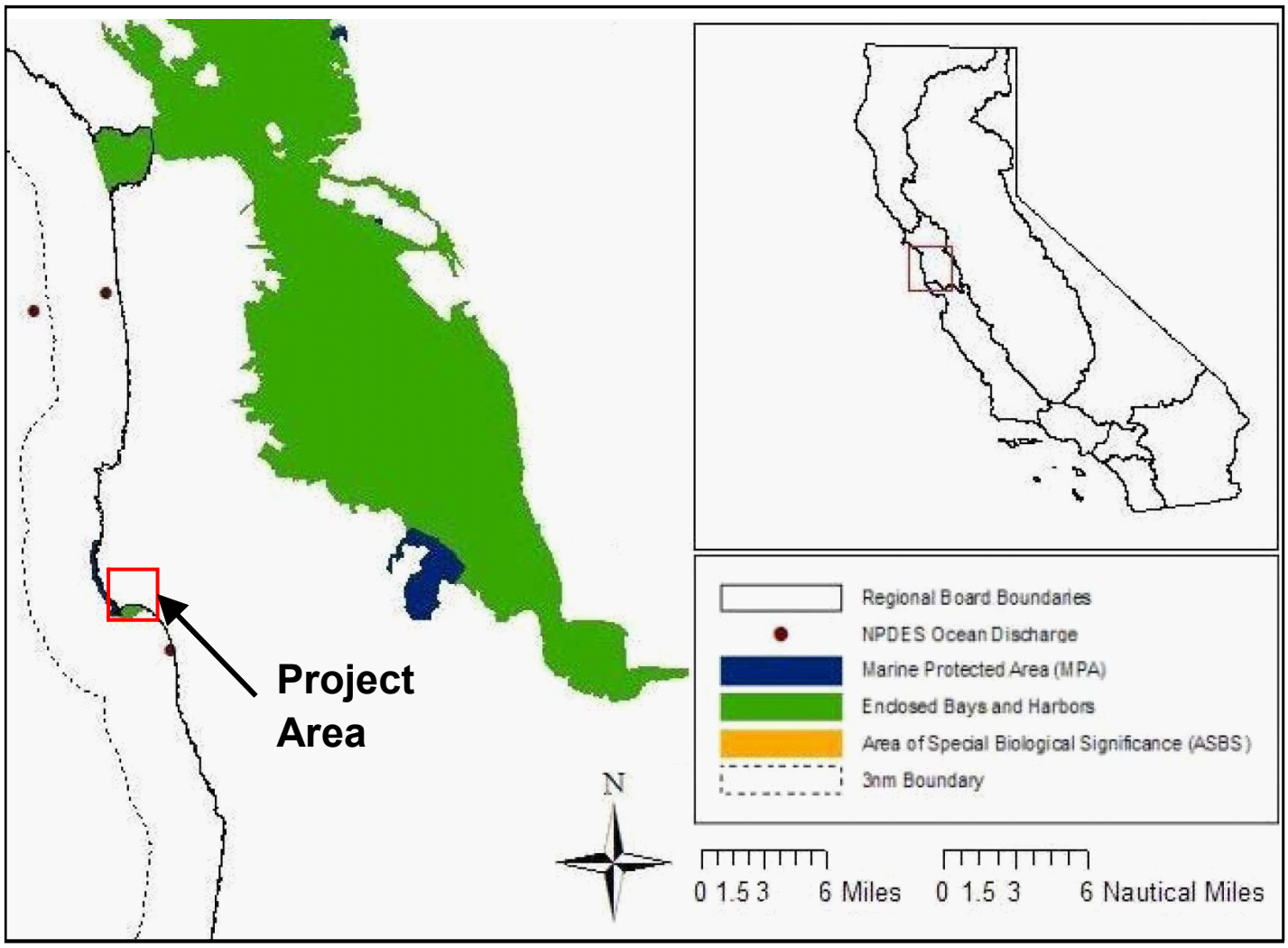
Water Reclamation Policy

The State Board's Resolution No. 77-1 requires the State Board and RWQCBs to encourage water recycling projects in water-short areas of California to (a) put wastewaters that would otherwise be discharged to marine or brackish receiving waters to beneficial use, (b) supplement the use of fresh water supplies and (c) allow the use of treated wastewater to create, restore, and enhance marshlands, as long as beneficial uses are still protected.

Bays and Estuaries Policy

The State Board's Resolution Nos. 74-43 and 95-84 adopted and amended, respectively, the Water Quality Control Policy for the Enclosed Bays and Estuaries of California (Bays and Estuaries Policy). This policy provides water quality principles and guidelines for the prevention of water quality degradation and the protection of beneficial uses of the regulated waters. In general, this Policy applies to municipal wastewater discharges and industrial waste discharges. There is one provision in Section C.5

[59] *State Board, 2008, Notice of Staff Workshop, Periodic Review of the "Statement of Policy with Respect to Maintaining High-Quality of Waters in California" (Anti-Degradation Policy) State Water Resources Control Board Resolution No. 68-16, October 16, 2008.*



Source: State Board, 2009 (in review), Water Quality Control Plan, Ocean Waters of California, 62 pp.

NORTH

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Figure IV.H-9
California Ocean Plan Map
near Big Wave Project

that requires in all of California's enclosed bays and estuaries that "[n]onpoint sources of pollutants shall be controlled to the maximum practicable extent," a provision which parallels the NPDES permitting requirements as described below. In addition, any (non-stormwater) wastewater discharges from the project would be regulated under Waste Discharge Requirements (WDR) for the project's wastewater treatment system. Essentially, then, this policy is enforced through other regulations of the State Board and RWQCB and will, therefore, not be discussed further.

Thermal Plan

The State Board's Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California[60] ("Thermal Plan") was adopted in 1972 and amended in 1975. This policy specifies water quality objectives, effluent quality limits, and discharge prohibitions related to elevated temperature waste discharges to interstate waters, enclosed bays, and estuaries. Any liquid waste discharged at a temperature higher than the natural temperature of receiving water, unless from irrigation runoff, is subject to the provisions of this policy. New discharges to receiving waters protected under this policy are specifically limited to temperature levels that assure protection of beneficial uses, with a maximum temperature of the discharge not allowed to exceed the natural temperature of the receiving waters by more than 20°F. The State Board enforces provisions of the Thermal Plan via the Waste Discharge Requirements for any related discharge. The project's wastewater treatment plant will have Waste Discharge Requirements, which should include requirements to meet the objectives of the Thermal Plan.

San Francisco Bay Water Quality Control Plan ('Basin Plan')

The San Francisco Bay RWQCB regulates water quality in the Bay area in accordance with its Water Quality Control Plan or 'Basin Plan'.[61] The Basin Plan presents the beneficial uses, which the RWQCB has specifically designated for local aquifers, streams, marshes, rivers, and the Bay, as well as the water quality objectives and criteria that must be met to protect these uses. Table IV.H-3 presents the existing and potential beneficial uses for Pillar Point Marsh, Denniston Creek, and the Half Moon Bay Terrace. Beneficial uses of Pillar Point Marsh include estuarine habitat, contact and non-contact aquatic recreation, saltwater habitat and wildlife habitat. These uses also apply to tributaries upstream of the marsh to the extent that flows in the tributaries could logically support the same uses. The Half Moon Bay Terrace has existing beneficial uses as a municipal and domestic water supply and agricultural water supply; the aquifer also has potential beneficial uses for industrial process and service water supply.

Pollution due to urban development, principally sediment and pollutants typically found in urban runoff (e.g., petroleum products, heavy metals, pesticides, and fertilizers) from the project site could potentially

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[60] *State Board, undated, Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California, 9 pp.*

[61] *Regional Board, 2007, Basin Plan, Ibid.*

degrade water quality for sensitive aquatic and terrestrial wildlife species in these downstream receiving waters and in the tidal wetlands of Pillar Point Marsh.

Through the State Board, California has also identified waters that are polluted and need further attention to support their beneficial uses. These water bodies are listed under the CWA Section 303(d) list. The identified water bodies are "impaired," meaning not meeting one or more of the water quality standards established by the State. Once the water body or segment is listed, the State is required to establish a Total Maximum Daily Load (TMDL), which is the quantity of the pollutant that can be safely assimilated into the water body without violating water quality standards.

In 2002, the State Board placed the Pacific Ocean at Pillar Point Beach on the 303(d) list as being water quality impaired for specific constituents; the list was approved by USEPA in July 2003. The 2006 303(d) list (approved by the USEPA in June 2007) continues to list this area has being impaired. The Pacific Ocean at Pillar Point Beach, presumably the coastal area of Pillar Point Marsh, is listed as being impaired by coliform bacteria (having a high coliform count) due to nonpoint sources for 1.1 miles. The Pacific Ocean at Pillar Point is also listed as being impaired by mercury from unknown sources along 0.62 miles.

Table IV.H-3
Existing and Potential Beneficial Uses of Receiving Waters in the Vicinity of the Project Site

Use	Pillar Point Marsh	Denniston Creek	Half Moon Bay Terrace
Agricultural Supply (AGR[1])		E[2]	E
Cold Freshwater Habitat (COLD)		E	
Estuarine Habitat (EST)	E		
Industrial Service Water Supply (IND)			P
Migration of Aquatic Organisms (MIGR)		E	
Municipal and Domestic Supply (MUN)		E	E
Industrial Process Water Supply (PROC)			P
Preservation of Rare, Threatened, or Endangered Species (RARE)		E	
Contact Water Recreation (REC-1)	E	E	
Non-contact Water Recreation (REC-2)	E	E	
Salt water habitat (SALT)	E		
Fish Spawning (SPWN)		E	
Warm Freshwater Habitat (WARM)		E	
Wildlife Habitat (WILD)	E	E	

Notes:
[1] Abbreviations are those used in the Basin Plan to refer to beneficial uses.
[2] "E" denotes existing beneficial uses: "P" denotes potential beneficial uses.
Source: San Francisco Bay RWQCB, 2007, Basin Plan, Ibid.

The shoreline area of Pillar Point Marsh is regularly posted for water quality exceedances of total coliform, E. coli, and enterococcus based on testing by the County Environmental Health Department. The San Mateo County RCD has been leading a study called "Identification of Sources of Fecal Pollution Impacting Pillar Point Harbor" to identify, as the name indicates, the sources of the (fecal) contaminants in an effort to reduce or eliminate the water quality concerns.[62] The latest information on this study indicates that a harbor circulation study has been performed to understand how the water flows through the harbor.[63]

The Pacific Ocean at the nearby Fitzgerald Marine Reserve is listed as being impaired by coliform bacteria for 0.46 miles. All of these locations listed as being impaired have TMDLs slated to be completed by 2019.

Section 402 NPDES Permit for Non-Point Source Discharges

The 1987 amendments to the CWA [Section 402(p)] provided for USEPA regulation of several new categories of nonpoint pollution sources within the existing NPDES. In Phase I, NPDES permits were issued for urban runoff discharges from municipalities of over 100,000 people, from plants in industries recognized by the USEPA as being likely sources of storm water pollutants, and from construction activities which disturb more than 5 acres. Phase II implementation, effective March 10, 2003, extended NPDES urban runoff discharge permitting to cities of 50,000 to 100,000 people, and to construction sites which disturb between 1 and 5 acres.

The USEPA has delegated management of California's NPDES Municipal Stormwater Permit program to the State Board and the nine RWQCB offices. In both Phase I and Phase II, urbanized counties and cities that implemented a comprehensive storm water management plan for urban runoff management meeting RWQCB standards could apply to the respective Board for a joint city-county NPDES Municipal Stormwater Permit. Upon acceptance, the authority to regulate storm runoff discharges from municipal storm drain systems was transferred to the permit holders, allowing them to more effectively integrate the storm-water control program with other nonpoint source control programs. The NPDES enforcement for the project area is performed by a consortium of local agencies, as described further under "Local Regulations" below.

NPDES General Permit for Construction Activity Discharges of Storm Water

Since the proposed project would disturb more than 1 acre of land, the project applicant would be required to submit a Notice of Intent (NOI) to the State Board and apply for coverage under the NPDES Construction General Permit. Administration of these permits has not been delegated to cities, counties,

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[62] *San Mateo County Resource Conservation District, 2007, Identification of Sources of Fecal Pollution Impacting Pillar Point Harbor, Project Description, October 2007, 10 pp.*

[63] *San Mateo County Harbor District, 2008, Board of Harbor Commissioners Meeting Minutes, September 17, 2008, 6 pp.*

or RWQCBs, but remains with the State Board. Enforcement of permit conditions, however, is the responsibility of San Francisco Bay RWQCB staff, assisted by local municipal or County staff. San Mateo County requires the project applicant to prepare a Storm Water Pollution Prevention Plan (SWPPP) and submit it for review to the County and San Francisco Bay RWQCB prior to commencing construction. Once grading begins, the SWPPP must be kept onsite and updated as needed while construction progresses. The SWPPP details the site-specific best management practices (BMPs) to control erosion and sedimentation and maintain water quality during the construction phase. The SWPPP also contains a summary of the structural and non-structural BMPs to be implemented during the post-construction period, pursuant to the non-point source practices and procedures encouraged by the County, SMCWPPP, and the San Francisco Bay RWQCB.

California Department of Public Health

The CDPH regulates the recycling of wastewater under Title 22, Division 4 of the California Code of Regulations. These regulations are generally intended to protect the public from fecal and toxic contaminants found in wastewater. When applied to recycled wastewater, which is often applied as landscape irrigation in California, the Title 22 regulations also serve to protect the quality of receiving waters. Title 22 requires filtration and disinfection of influent wastewater, and rigorous sampling and laboratory testing of the treated wastewaters. The CDPH Title 22 regulations can be implemented via State or San Francisco Bay RWQCB Waste Discharge Requirements of a permitted treatment and recycling plant.

Pharmaceuticals and Personal Care Products (PPCPs)

Pharmaceuticals and personal care products (PPCPs) comprise a diverse set of chemicals increasingly found in treated wastewater as advances in analytical chemistry methods allow detection of pollutants in progressively smaller concentrations. Compounds commonly detected in wastewater effluent or receiving waters downstream of wastewater treatment plants include: cholesterol, estrogens (e.g., coprostanol), insect repellents (e.g., DEET), caffeine, triclosan, analgesics (e.g., salicylic acid, ibuprofen, acetaminophen), antibiotics (e.g., amoxicillin, erythromycin), tranquilizers, synthetic fragrances, and soaps and surfactants. PPCPs are introduced into the wastewater system through a variety of pathways, including: excretion following human use; expired and unused products flushed down sinks or toilets; and release of unabsorbed externally-applied products during washing or bathing.

PPCPs are an emerging issue, and the potential effects of many of these biologically active chemicals on humans and aquatic ecosystems are poorly understood due to the number of potential constituents involved (the compounds and their breakdown products and/or metabolites), the low concentrations, the lack of information on additive and synergistic effects of mixtures of PPCPs, effects of sub-therapeutic doses or continual long-term exposure to low concentrations, and the environmental fate and degradation characteristics. Concentrations of PPCPs in wastewater, surface water, and ground water are typically very low, which limits the potential for human exposure. For humans, the primary routes of exposure to PPCPs include consumption of potable water or fish that contain PPCPs and their derivatives. While

extensive mammalian and human toxicity data are available for pharmaceuticals subject to the drug development and approval process, the amount of monitoring data available on the prevalence and concentrations of other PPCPs in the environment and the resulting risks to humans and wildlife is currently very limited. Some types of PPCPs are referred to as endocrine disrupting compounds (EDCs) because they can mimic natural endocrine hormones of animals. Most evidence for adverse effects of EDCs on animals focuses on resident aquatic organisms (fish, invertebrates) immediately downstream of urbanized areas, livestock production facilities or direct wastewater discharges into receiving waters.

At present, there are no federal regulations specific to pharmaceuticals in drinking or natural waters and concentrations of PPCPs, and EDCs in wastewater are typically not monitored. The most applicable state regulation is the RWQCB's Basin Plan narrative water quality objective for toxicity, which states that all waters should be free of substances that produce detrimental effects in living organisms.

Local

In terms of local regulations, since the project site is within unincorporated San Mateo County, the project is generally subject only to County regulations. The County has a Development Review Center that acts as a "one-stop" permitting center for projects in the County's jurisdiction. The center has project submittals reviewed by Building Inspection, Current Planning, and Public Works representatives. The Department of Public Works is specifically responsible for review of project submittals for compliance with the County's Stormwater Management Plan and with the Watershed Protection Maintenance Standards. Along with the Planning Department, the Public Works Department also reviews projects for compliance with the NPDES Provision C.3, as described below. Most of the County's stormwater regulations are codified under Chapter 4, Section 100 of the San Mateo County Code,[64] which includes provisions from the County's Ordinance 3633, adopted in 1995.

NPDES Municipal Stormwater Permit

A major function of Ordinance 3633 and Section 4.100 of the County Code is to require projects to comply with the County's NPDES permit. Each incorporated city and town in San Mateo County joined with the County of San Mateo to form the SMCWPPP in applying for a regional NPDES permit.[65] The SMCWPPP, previously referred to as San Mateo Countywide Stormwater Pollution Prevention Program (STOPPP), was established as part of the regional NPDES permit to apply for and administer the permit for the County and its cities and towns. The SMCWPPP received its first 5-year Phase I NPDES Municipal Stormwater Permits in 1995. The San Francisco Bay RWQCB adopted the second NPDES permit on July 21, 1999; it was subsequently amended with Provision C.3 (New Development and Redevelopment Component) on February 19, 2003, at which time a Stormwater Management Plan was also required to be implemented. Currently, Provision C.3 requires stormwater controls during the

[64] *Accessible at http://municipalcodes.lexisnexis.com/codes/sanmateo/.*

[65] *Regional Board, 2007, Order No. R2-2007-0027, NPDES Permit No. CAS0029921.*

construction and operation stages of proposed development. In addition, due to project size and type, the project would also be required to construct permanent on-site stormwater treatment systems and maintain these systems in perpetuity. On July 21, 2004, the RWQCB adopted the third permit. On May 12, 2005, the SMCWPPP submitted to the RWQCB its Hydromodification Management Plan (HMP) as required under the 2004 permit. On March 14, 2007, the RWQCB amended the 2004 permit to include key provisions of the submitted HMP. The goal of an HMP is to manage increased peak runoff flows and volumes (hydromodification) to avoid erosion of stream channels and degradation of water quality both on and off the project site.

SMCWPPP has issued guidelines based on the regional NPDES permit for integrated pest management, and general and construction-specific BMPs to minimize sedimentation and discharge of pollutants into stormwater runoff within the SMCWPPP's area. Construction BMPs are discussed below.

Sediment and Erosion Control (Construction BMPs)

Relevant to water quality, best management practices (BMPs) for sediment and erosion control will need to be employed during project construction to meet local sediment and erosion control policies. These BMPs will need to meet the County's Watershed Protection Maintenance Standards, generally set out in the Ordinance 3633. Under this ordinance, the County may establish controls on the volume and rate of storm water runoff from new developments and redevelopments as may be appropriate to minimize the discharge and transport of pollutants.[66]

Other Relevant Local Entities/Policies

The San Mateo County Environmental Health Department and the County Agricultural Commissioner are locally responsible for maintaining public health and safety relative to water quality, pesticide applications, and other potential environmental hazards.

The site is currently not served with potable water via a public water system, nor is the site within the district boundaries of a domestic water supplier,[67] which would require annexation via Local Agency Formation Commission (LAFCO) if the project was to receive back-up services. The applicant is proposing to connect to Coastside County Water District (CCWD) for the purchase of domestic water for emergency back-up and fire flow. Just over a third of the CCWD's available water supply is from local groundwater wells, located near Denniston and Pilarcitos Creeks.[68] However, the CCWD's 2007 Annual Water Quality Report[69] indicates that only 4 percent of the CCWD's water supply was from groundwater

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[66] *San Mateo County, San Mateo County Code, Chapter 4.100 Storm Water Management and Discharge Control, accessed at http://www.ordlink.com/codes/sanmateo/index.htm on April 27, 2009.*

[67] *CCWD, http://www.coastsidewater.org/water-district-map.html, Accessed on April 27, 2009.*

[68] *CCWD, Ibid.*

[69] *CCWD, 2008, 2007 Annual Water Quality Report: Consumer Confidence Report, July 2008, 4 pp.*

in 2007, and a separate report indicates 6 percent production from groundwater for 2006.[70] Since groundwater is the identified water supply source for the project, potential influence of the CCWD's operations on the project's wells and, vice versa, effects of the project's groundwater operations on CCWD's groundwater supply are of concern.

One other relevant policy document that affects development on the project site is the Fitzgerald Marine Reserve Master Plan. Since the project site is within and contributes drainage to the Pillar Point Marsh, the project would be subject to any County implementation of the Fitzgerald Marine Reserve Master Plan. Policy 6 of the Master Plan's Natural Resource Management Program (Section C) involves implementation of water quality improvements in Pillar Point Marsh. Specifically, the County is identified as coordinating with surrounding landowners to develop and implement BMPs and enforce non-point source water quality regulations to improve water quality upstream areas that drain to Denniston Creek and the marsh.[71] These duties are performed under the county-wide NPDES permit enforcement described above.

On April 8th, 2008, San Mateo County Board of Supervisors passed a resolution to transfer specific vector control operations and responsibilities to San Mateo County Mosquito Abatement District. San Mateo County Mosquito Abatement District Board of Trustees reviewed and approved the transfer of services resolution during the board meeting on April 9th, 2008. San Mateo County Mosquito Abatement District Board of Trustees also approved a name change to San Mateo County Mosquito and Vector Control District. The San Mateo County Mosquito and Vector Control Districts mission is: "To safeguard the health and comfort of the citizens of San Mateo County through a planned program to monitor and reduce mosquitoes and other vectors." Various goals include: Prevent the emergence of biting adult mosquitoes by applying control to the larval stage; Monitor adult mosquito populations to uncover new sites of larval development and assess the effectiveness of control; Monitor the distribution of vector-borne diseases and prevent the occurrence of these diseases among district residents; Evaluate new pesticides and methods of control for mosquitoes; and Increase public awareness of District services with an active educational program.

No other local entities or regulations are known to affect the project development with respect to hydrology and water quality concerns.

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[70] *CCWD, 2007, Water Supply Evaluation Report, Calender Year 2006, November 2007, 51 pp.*

[71] *Brady/LSA, 2002, Ibid.*

ENVIRONMENTAL IMPACTS

Thresholds of Significance

Based on Appendix G to the CEQA Guidelines, the proposed project would have a significant hydrology and water quality environmental impact if it would:

a) violate any water quality standards or waste discharge requirements.

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

c) 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 or siltation on- or offsite.

d) 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 offsite.

e) create or contribute runoff water which would exceed the capacity of stormwater drainage systems or provide substantial additional sources of polluted runoff.

f) otherwise substantially degrade water quality.

g) 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.

h) place within a 100-year flood hazard area structures which would impede or redirect flood flows.

i) 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.

j) expose people or structures to inundation by seiche, tsunami, or mudflow.

Proposed Project

The 19.4-acre project site currently consists of two undeveloped parcels (northern and southern parcels), which are mostly in agricultural production. The two parcels are split by the County-owned, shallow drainage swale that collects intermittent drainage from the Half Moon Bay Airport and the parcels and outlets to the Pillar Point Marsh. Several aspects of the proposed project may impact hydrology and water quality of receiving waters, including the following:

- Grading and drainage system;
- Water supply (from groundwater);
- Groundwater recharge system;
- Stormwater (non-point source) pollutant discharge;
- Wastewater (point source) pollutant discharge; and
- Development in or near flood-prone areas;

The evaluation of the project relies on the latest submitted vesting tentative map plans, which are generally split between plans for the Office Park property development (within the 14.25-acre northern parcel) and those for the Wellness Center property development (within the 5.28-acre southern parcel).[72] These plans indicate extensive use of Low Impact Design (LID) and Best Management Practices (BMPs) to minimize the project's impact on the environment.

Grading and Drainage System

The existing site parcels drain either into the drainage swale between the parcels or to the Pillar Point marsh. Previous studies of the project site have indicated that the agricultural furrows onsite generally run perpendicular to the topographic contours,[73] thus in line with the natural drainage of the parcels. The project grading plans (refer to Figures III-25 and III-26) indicate some alteration of existing topography, including reshaping of some low contours outside the main areas of development, as well as placement of structures, parking lots, and walkways that can alter local drainage patterns.

The current project design focuses construction of new impervious and pervious areas on the relatively flat areas of the site. Figures III-25 and III-26 show that the majority of grading would occur as fill at the edges of the developed areas. Figure III-25 indicates 21,875 cubic yards (cy) of cut and 15,780 cy of fill are necessary for the Office Park property, mostly for building pads and parking lots. Since some of the net cut from the Office Park property will be transferred as fill to the Wellness Center property, only 4,105 cy of imported fill is projected to be needed. Figure III-26 indicates 870 cy of cut for landscaping rain gardens and 11,070 cy of fill for building pads, the perimeter fire trail, and parking lot within the Wellness Center property.

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[72] *Big Wave Project, 2009, Facilities Plan: Draft #2, January 2009, provided by applicant.*

MacLeod & Associates, 2009, Preliminary Grading/Drainage & Utility Plan With Permanent Storm Drainage Controls, Big Wave Office Park, Drawing No. 1584-00, April 07, 2009, provided by applicant.

MacLeod & Associates, 2009, Preliminary Grading/Drainage & Utility Plan With Permanent Storm Drainage Controls, Big Wave Wellness Center, Drawing No. 1608-00, April 07, 2009, provided by applicant.

[73] *Schaaf & Wheeler, 2007, Memorandum, Subject: Review of Wetland Hydrology Indicators for Big Wave Jurisdictional Delineation Including Site Visit Commentary, September 2007.*

Newly created impervious area would cover a moderate (13 to 22 percent) part of the entire project site. Also, the proposed project includes various elements to minimize surface water runoff, including the use of porous pavements for parking lots and walkways and draining roof leaders to infiltrating rain gardens.

The Office Park and Wellness Center properties will continue to drain to separate locations. Both properties would include storm drainage systems that collect water from the parking lots and rooftops and terminate in landscaped areas to allow for infiltration. Several outfalls are shown on Figures III-25 and III-26. The Wellness Center property has four outfalls along its western edge, all of which enter graded low areas that then drain towards Pillar Point Marsh. The Office Park property has three outfalls, two of which are anticipated to lead to localized depressions on site. The other outfall leads to a depressed rainwater garden at the southern edge of the parcel.

Except for the buildings, all new pavements (parking lots, walking paths, basketball court/game area) are proposed to be made of permeable materials and are not considered to increase the imperviousness of the site. The parking lot includes 6 inches of concrete, underlain by 12 inches of open graded baserock, which then sits on clayey silt soils. Both the concrete and baserock have permeabilities of 3 inches per hour, with the underlying soil having a permeability of ½ inch to 1 inch per hour.

As proposed, onsite infiltration drain fields (or drain fields) will be used, with the Wellness Center property drain fields located on the inside edge of the fire trail that runs along the outside of the developed area and the Office Park property drain fields located just around Building B and next to Buildings A and C on their respective sides facing Building B. All of these proposed drain fields are located upstream of the wetland areas and the Pillar Point Marsh.

Water Supply

The proposed domestic (potable) water supply for the project would be obtained through the production of treated groundwater from an onsite, existing groundwater well. An emergency back-up and fire flow connection would also be constructed to connect to the potable water facilities of the CCWD, who obtains some of their supply from local water wells drawing from the Half Moon Bay Terrace.[74] Refer to Section IV.L.1 (Water) for a detailed discussion of the water supply aspects of the proposed project.

For this section analysis use of groundwater for the project is relevant. Both of the proposed potable water sources draw groundwater from the Half Moon Bay Terrace, although the CCWD has other, surface water sources, as well.

Total potable water demands will be kept to a minimum by using recycled water for flushing toilets and irrigating landscaped areas. Total potable water demands have been estimated by the applicant as 10,000 gallons per day (gpd) during normal rainfall years and 5,000 gpd for drought years. During drought

[74] *Coastside County Water District, 2006, Water Supply Evaluation Report, Prepared for the CCWD Board of Directors, Prepared by the CCWD Staff*

years, the proposed project would decrease agricultural irrigation to minimize water usage. The project also includes provisions to use well water to supplement irrigation water, if needed, although no estimate of these demands has been provided.

The project water supply will be supplemented by recycled wastewater, as discussed below. Much of this recycled water will be used to irrigate the project landscaping, as part of the project's groundwater recharge system.

Groundwater Recharge System

The proposed groundwater recharge system is designed to infiltrate an average of 12,000 gpd of stormwater and 20,000 gpd of recycled wastewater. Key stormwater infiltration components of the system are the planned permeable concrete parking lots and walkways and rainwater gardens. Recycled wastewater will recharge groundwater through drip irrigation for the landscaping and three infiltration drain fields. Final design of the drain fields would be based on certified percolation tests.

The groundwater recharge system will double as a stormwater control system, with plans to capture and treat 80 percent of the surface water runoff. To maximize the ability to recharge groundwater from recycled water, onsite stormwater runoff needs to be minimized. Minimizing stormwater runoff also helps meet stormwater runoff water quality criteria.

Stormwater Pollutant Discharge

The proposed project has been designed to incorporate the County's overall approach and practices (i.e., BMPs) for stormwater management.[75] The project plans and literature indicate various measures to manage pollutant discharges via stormwater runoff. Non-point source pollution is generally handled via stormwater BMPs, including Site Design BMPs, Source Control BMPs, and Treatment Control BMPs.

The Site Design BMPs employed in the development of the project include the following:

- Separating different quality stormwaters (parking lot runoff vs. roof water runoff) into different retention systems;
- Minimizing impervious surfaces;
- Minimizing impacts of parking lots (through design);
- Disconnecting roof leaders from impervious surfaces;
- Including microdetention in landscaping to slow runoff and infiltrate more stormwater;

[75] *WSP Environment and Energy, 2008, Draft (90%) Basis of Design Report, Riparian & Waters/Wetlands Ecosystem Restoration for Big Wave Wellness Center and Office Park, August 2008, provided by applicant.*

- Protecting wetland areas;
- Maximizing stormwater infiltration; and
- Minimizing changes in the runoff hydrograph.

In addition, at least one Source Control BMP is planned – regular maintenance of the storm drain system and developed site. Various Treatment Control BMPs are also planned, and will perform several important functions, including enhancing the water quality, dissipating energy, and storage and infiltration of stormwater runoff. The specific Treatment Control BMPs planned for the project include the following:

- Porous pavement and underground detention for the parking lots and walkways;
- Grit removal and oil/water separators for captured parking lot runoff;
- Landscaped swales and rain gardens; and
- Infiltration basins.

All of these BMPs are referenced in some form on the SMCWPPP "NPDES Permit Impervious Surface Data Collection Worksheet," and specified in the SMCWPPP C.3 Stormwater Handbook, used in the County's review of project's compliance with the County's NPDES permit.[76]

Critical to proper stormdrain system and BMP function is the ongoing operation and maintenance of the stormdrain system and BMPs. Operation of the project landscaping is proposed to minimize excess irrigation to prevent runoff. The maintenance plan for the proposed stormwater system includes the following:

- Daily trash pickup in the parking lots;
- Monthly inspection of all components;
- Bi-monthly vacuuming of permeable concrete in parking lots by trained operators;
- Bi-annual catch basin cleaning;
- Training of select Wellness Center residents to perform maintenance;
- Annual weeding and debris removal from the landscaped areas; and

[76] *SMCWPPP, 2005, SMCWPPP C.3 Stormwater Handbook, May 2005, 232 p.*

- Annual replanting of rain gardens and restored wetlands with native wetland plants.

Wastewater Pollutant Discharge

Other than stormwater runoff, the proposed project could contribute pollutants to the environment via discharge of wastewater, which generally can have various contaminants when untreated, including human bodily waste, detergents, abrasives, and other household chemicals. Even recycled wastewater can contain relatively high levels of certain contaminants, including salts. The project includes the development of an onsite membrane bioreactor (MBR) wastewater treatment plant (MBR plant) for treatment and recycling of wastewater produced onsite. The project is anticipated to generate approximately 26,000 gpd of domestic wastewater. The wastewater influent to the MBR plant will include both black wastewater from toilets and grey wastewater from other fixtures. The MBR plant will be used to treat and recycle 16,000 gpd of the wastewater for reuse in toilets onsite, with the remainder of the treated wastewater applied as landscape/agricultural irrigation and infiltrated via three drain fields. For these uses, the MBR plant will need and is planned to meet Title 22 Standards for tertiary treated wastewater and reuse.

The specific wastewater treatment criteria are summarized in Section III (Project Description) and in Table III-9 and are referenced against current Title 22 standards. The proposed MBR plant discharge is planned to have levels of biochemical oxygen demand, total nitrogen, total suspended solids, turbidity, and fecal coliform at or below the standards.

During wet periods (i.e., the winter), when groundwater levels are higher and reduce the allowable infiltration of the onsite soils, the MBR plant wastewater effluent will be discharged to a sanitary sewer system. A manhole is proposed to be constructed with the MBR plant to allow connection of the onsite wastewater collection system to the Granada Sanitary District's existing wastewater treatment plant, a regional wastewater treatment facility in the City of Half Moon Bay. This treatment facility has received San Francisco Bay RWQCB Order No. R2-2007-0003[77] as the current regulating Waste Discharge Requirements (WDR) permit. The WDR currently allows disposal of treated wastewater from this facility into the Pacific Ocean.

Development In/Near Flood-prone Areas

Since the 2005 FEMA LOMA[78] has removed the project parcels from the FEMA-designated floodplain and the project development is limited to these two parcels, no project development will occur in a FEMA-designated floodplain. The FEMA (100-year) floodplain is currently limited to the southside of West Point Avenue, which generally splits Pillar Point Marsh downstream of the project site.

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[77] *RWQCB, 2007, Waste Discharge Requirements For the Sewer Authority Mid-Coastside, City of Half Moon Bay, Montara Water and Sanitary District, and Granada Sanitary District Discharge to the Pacific Ocean Via Discharge Point 001.*

[78] *FEMA, 2005, Ibid.*

It is possible, given the nearby marsh that high groundwater could cause local flooding onsite, especially during heavy rain events. Inundation due to a dam failure, or from effects of a tsunami or seiche are also possible on the project site, as discussed above. Other than onsite stormwater storage, the current project plans do not indicate any particular measures planned to mitigate for onsite flooding from these or other sources.

Site Coverage

The total project would have approximately 3 acres of impervious surface area and 9.5 acres of pervious parking lots and walkways that are designed for groundwater infiltration. The remaining 9 acres would be restored wetlands and native plant landscaped areas that is also considered pervious surface. Only 10 percent of the total site coverage is impervious surface. Tables IV.H-4 and IV.H-5 provide a breakdown of the impervious and pervious surfaces associated with the proposed development within the Office Park and the Wellness Center properties, respectively.

Table IV.H-4
Office Park Property Site Coverage

Surfaces	Area (sf)
Impervious Surfaces	
Buildings A-D and Communication Building	80,000
Total Improved Impervious Surfaces	**80,000**
Pervious Surfaces	
Porous Parking Lot	243,925
Walkways	13,052
Islands/Sidewalks	18,065
Subtotal Improved Pervious Surfaces	**275,042**
Total Improved Surfaces (not including Wetlands)	**355,042**
Total Wetland Restoration (Pervious)	226,038
Total Pervious Surface	**501,080**
Total Parcel Area	**620,841**
Total Percent Pervious	**87.1%**
Percent Wetlands Restoration	**36.4%**

Notes: sf = square feet
Source: Big Wave, LLC, Facilities Plan: Draft #2, Big Wave Property, January 2009.

Table IV.H-5
Wellness Center Property Site Coverage

Surfaces	Area (sf)
Impervious Surfaces	
Buildings 1 – 7	46,999
Pool Building	3,464
Water Recycling Plant	600
Total Improved Impervious Surfaces	**51,063**
Pervious Surfaces	
Porous Parking Lot	30,721
Basketball Court, Game Space	12,601
Walkways/Multipurpose Trails	9,211
Subtotal Improved Pervious Surfaces	**52,533**
Total Improved Surfaces (not including Wetlands)	**103,596**
Total Wetlands Restoration	122,749
Total Pervious Surfaces	**175,282**
Total Parcel Area	**229,779**
Total Percent Pervious	**76%**
Percent Wetlands Restoration	**53%**

Notes: sf = square feet
Source: Big Wave, LLC, Facilities Plan: Draft #2, Big Wave Property, January 2009.

Project Impacts and Mitigation Measures

Impact HYDRO-1 Violate Water Quality Standards or Waste Discharge Requirements

Water quality standards of concern would be those applicable to the nearby drainage swale or Pillar Point Marsh, to which the project site drains. The California Ocean Plan and its protection of the Fitzgerald Marine Reserve require that discharges affecting the Reserve do not impair its water quality.

Pillar Point Harbor is listed as being impaired for fecal coliforms. The proposed development would not increase the presence of livestock or wildlife to contribute fecal coliforms, and human waste is being conveyed through an onsite sanitary sewer system and treated at an onsite MBR plant. The MBR plant would use Kubota membranes, which have been certified by the San Francisco Bay RWQCB and CDPH (in 2004) to meet the filtration requirements of Title 22 for unrestricted reuse of recycled tertiary treated wastewater. However, an April 2004 letter from the CDPH (then known as the California Department of Health Services) to the Kubota Corporation indicates that:

"The Department will continue to review all proposed projects [using the Kubota membrane technology] on a case-by-case basis to determine full compliance with all applicable treatment and reliability features

required by the Water Recycling Criteria. This will include the collective review of all treatment unit processes, operational controls . . . 'O&M' procedures, etc."[79]

Therefore, because the Kubota membranes are currently certified by the San Francisco Bay RWQCB and CDPH and the proposed development would not increase the presence of livestock or wildlife, no increase in fecal coliforms to the marsh is expected from the project.

In terms of violating WDR, the project's MBR plant will require a WDR permit from the San Francisco Bay RWQCB before any external discharge will be allowed. The MBR plant's WDR would have provisions to protect receiving waters under the State Board's Antidegradation Policy, Bays and Estuaries Policy, and Thermal Plan, and the San Francisco Bay RWQCB's Basin Plan.

The wet weather connection to the Granada Sanitary District is anticipated to be capable of treating the project's wastewater contribution and therefore, the project's wastewater contribution would be covered under the existing WDR permit for that facility and thus meet applicable water quality criteria of its treated wastewater discharge. Refer to Section IV.N, Utilities and Service Systems for additional discussion of the Granada Sanitary District wastewater system.

Additionally, although the project would increase the amount of impervious surface on the project site, the project has been designed to incorporate the County's overall approach and practices (i.e., BMPs) for stormwater management. The project has incorporated stormwater BMPs, including Site Design BMPs, Source Control BMPs, and Treatment Control BMPs as discussed above to reduce impacts associated with non-point source pollution.

With implementation of the abovementioned planned stormwater BMPs and the requirements for the WDR permit, the project is anticipated to have ***less-than-significant*** impacts in terms of violating water quality standards or waste discharge requirements and therefore no mitigation measures are required.

Impact HYDRO-2 Substantially Deplete Ground Water Supplies or Substantially Interfere with Ground Water Recharge

Development or redevelopment of any particular area has the potential to impact groundwater resources by (1) increasing water demand, if that demand is met with groundwater, and/or (2) increasing the amount of ground covered by impermeable surfaces that would thus interfere with the ability for surface water to infiltrate into subsurface soils and recharge groundwater aquifers. It should be noted that the project's Facilities Plan[80] recommends that "groundwater utilized domestically and groundwater to be used for irrigation will not exceed the designed infiltration amount for project infiltration systems."

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[79] *California Department of Health Services. 2004. Letter to Mr. Hiroyuki Takatori. Subject: Conditional Acceptance of Increased Flux for the Kubota Type 510 Membrane. April 29, 2004.*

[80] *Big Wave Project, 2009, Ibid.*

Effects of Proposed Withdrawals on Regional Aquifers[81]

One approach to evaluating the effects of the project's pumping on local and regional aquifers is to: (a) compare the projected demand and recharge with existing local demand and recharge; (b) evaluate how projected demand may affect offsite uses; then (c) consider effects during prolonged droughts. It is customary to use round numbers when conducting such evaluations.

(a) Existing recharge on this 19.4-acre site is approximately 20 AFY, based on mean annual recharge of 11.5 to 12 inches. Due to the alluvial deposits that form the groundwater basin, recharge also occurs throughout the basin. Significant areas that have low recharge include the Half Moon Bay Airport and the existing developments in the watershed. Projected recharge with project implementation is anticipated to be similar to the existing recharge, as the impervious areas of the site will be drained to pervious areas.

The project site currently has an operating well that may be used for irrigation. It is possible to estimate existing irrigation (i.e., well water) demands from some knowledge of the crop's being irrigated. Based on site visits and available aerial photography, the entire area of both parcels (i.e., 19.4 acres) is essentially being irrigated. To avoid crop water stress, rainfall and irrigation must be sufficient to meet the crop's water needs, accounting for evapotranspiration. At a minimum, the calculated annual evapotranspiration needs to be delivered via rainfall or irrigation. As detailed in Table IV.H-1, the total average evaporation for the project area is 40.81 inches versus a total average rainfall of 26.40 inches, leaving an average annual deficit of 14.41 inches or 1.2 feet. Assuming perfect efficiency of the irrigation system and a crop coefficient[82] for legumes of 1.15, the existing crops onsite would annually require about 1.4 acre-feet per acre of crops. As a comparison, typical landscape irrigation in the Bay Area is estimated to require about 2.5 AFY per acre (acre-feet per acre is equivalent to feet). For the entire project area, a range from 1.4 to 2.5 AFY per acre would equal 27 to 49 AFY or 24,000 to 44,000 gpd. If the onsite well is used to meet these demands, then 24,000 to 44,000 gpd is a rough estimate of the amount currently pumped.

The applicant has estimated the proposed water demand as 10,000 gpd or 11 AFY,[83] which is about equal to the mean annual onsite recharge. This is less water than is estimated to be currently used onsite. Some of the existing water used will recharge the aquifer, but most of it is lost to evapotranspiration. Therefore, the project demands are estimated to be less than the net demands from the existing site.

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[81] *This section relies on and summarizes a more detailed discussion in the memo attached as Appendix H.*

[82] *The crop coefficient accounts for varying water usage versus the reference crop used in estimating evapotranspiration values. Green beans have a relatively high crop coefficient of 1.15. See the Santa Clara Valley Water District's (undated) Handbook for Agricultural Water Use Efficiency.*

[83] *Project demand is evaluated separately in the Utilities section of this DEIR.*

(b) About 4 percent of the CCWD water supply is provided directly from wells in the airport aquifer,[84] and is legally limited to 130 million gallons per year (MGY), which is equivalent to 400 AFY. The average annual amount pumped, however, is about 160 AFY, and is even projected to decrease further to less than 100 AFY by 2010 due to increased reliance on other sources. Another 17 percent of the CCWD's water supply is provided from surface diversions of Denniston Creek, which is indirectly influenced by the airport aquifer. Overall, only a quarter of the CCWD's water supply is related to the local groundwater. Most of the remainder is purchased from the San Francisco Public Utilities Commission (SFPUC) and originates from the Hetch Hetchy Reservoir. The project demand of 11 AFY adds 7 percent more demand on the airport aquifer. However, total groundwater withdrawals from the site, as discussed above, are expected to decrease. Therefore, given the small increase over the CCWD's existing withdrawals and the net decrease for the site, the project's groundwater usage will not discernibly affect the ground water supply in the regional aquifer and existing ground water users who draw from it.

(c) The CCWD has prepared an Urban Water Management Plan (UWMP)[85] in 2005 that analyzes the effects of pumping during multiple consecutive years of drought. Groundwater would still supply about 300 AFY during three consecutive dry years, although the proportion from the airport aquifer is unclear. Nevertheless, the UWMP does not indicate that excessive groundwater pumping would be required during drought years. Therefore, groundwater availability during drought is not expected to limit community water-supply availability as projected. The project, during a drought, is anticipated to increase groundwater recharge through groundwater infiltration efforts.

Therefore, impacts would be ***less than significant***, and no mitigation measures are required.

Interference with Ground Water Recharge

Ground water recharge at the project site is significant as a means to: (a) contribute to the quantity and quality of groundwater for the local water supply; (b) sustain the wetland areas near the site; and (c) handle stormwater infiltration and minimize flooding. Rates of recharge approaching, equaling, or slightly exceeding those which currently prevail onsite are important for (b) and (c) and will influence (a).

The existing site, as agricultural land, contributes approximately 80 percent of its precipitation to recharge, with the remainder running off site into the Pillar Point Marsh. Urban development has the potential to greatly increase the amount of impervious surface on a site and, thus, increase the stormwater runoff and decrease the groundwater recharge.

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[84] *CCWD, 2006, Ibid.*

[85] *CCWD, 2005, 2005 Urban Water Management Plan, Prepared for CCWD Board of Directors, Prepared by Amanda Cox.*

The current site development calls for a lower impermeable surface coverage (20 percent) compared to typical subdivisions, where impermeable surface coverage is 25 to 40 percent or higher. Although the developed land will occupy a greater percentage of the site, the parking lots and sidewalks are planned to be paved with permeable concrete. Permeable concrete is considered as pervious surface because it allows stormwater to percolate through into the ground. Any stormwater that does runoff the permeable concrete is planned to be directed to rainwater gardens, designed to percolate runoff.

The only truly impermeable surfaces on the project site will be the building rooftops and stormwater from the rooftops will also runoff eventually to rainwater gardens after entering small sections of storm drainage piping. Therefore, even though the site will have some impervious cover, runoff from all impervious surfaces is planned to drain to pervious surfaces and infiltrate into the groundwater system.

Infiltration via the rain gardens can be hindered by high groundwater levels. The project site may have relatively high groundwater. The applicant has provided relatively recent, site-specific geotechnical borings[86] that indicate water levels ranging from 3 to 9 feet below the ground surface on the Wellness Center property and 5 to 7 feet below the ground surface on the Office Park property. Given the location of these borings and the existing site (surface) elevations, these water depths equate to water elevations of 4 to 12 feet for the Wellness Center property and approximately 7 to 22 feet for the Office Park property. These borings were taken in late spring, so the water levels may not represent the highest seasonal water levels onsite. Wet-weather water levels would be confirmed for the final design and installation of any infiltration components, such as the rain gardens and wastewater infiltration galleries. From a recharge perspective, even if the infiltration components are less effective than anticipated, the excess water would still eventually percolate into the same aquifer in the downstream marsh area.

Effects on recharge to the Half Moon Bay Terrace – which supports the Pillar Point Marsh and drinking water supplies in the area – are expected to be ***less than significant***, and no mitigation is required. The planned project recharge should serve as a further benefit to recharging the underlying aquifer. Further analysis of the project applicant's submitted water balance is presented in the *Hydrologic Analysis of the Big Wave Project*, prepared by Schaaf & Wheeler, May 15, 2009 provided in Appendix H of this DEIR.

Impact HYDRO-3 Substantially Alter Drainage Patterns Resulting in Increased Erosion or Siltation

The existing project site drains generally to the southwest towards the Pillar Point Marsh. The proposed project would essentially maintain the drainage discharge points onsite. Also, the nearby drainage swale would not be altered, so no stream or river would be altered as part of the proposed project. However, the proposed project would increase the amount of imperviousness onsite since the site currently has no impervious development, and the buildings are considered impervious cover. The increase in imperviousness serves to increase runoff amounts by 80 percent, as discussed later in this section. The

[86] *Bay Area Geotechnical Group, 2000, Job No. PECKJ-01-00, Boring Logs, June 2000.*
Bay Area Geotechnical Group, 2002, Job No. BIGWA-01-00, Boring Logs, May 2002.

drainage plans (refer to Figure III-25 and III-26) propose rain gardens to mitigate the peak flows from the site, although the storm drainage system is likely to handle flows from only smaller events, such as the 2-year and 10-year storms. No modeling of the storm drainage systems and infiltration systems, such as in a drainage report, has been provided with the drainage plans, so the expected effect of the storm drainage systems cannot be fully assessed at this time.

Erosion and sedimentation are typically of greatest potential concern during the project construction-phase. After a project has been built and the landscaping has been installed, erosion from residential and commercial development sites is usually minimal, particularly when they are sited on relatively flat slopes. Potential impacts from the proposed project include onsite and offsite stream channel susceptibility to "*hydromodification*," as well as localized effects of stormwater discharges to swales and drainageways. Any overland flow will go to a tidally-influenced area and not to any unlined channel subject to erosion. Therefore, hydromodification effects of the site development are anticipated to be minimal, and hydromodification regulations are not anticipated to be applicable to the project.

The existing drainage patterns on the project site, as inferred from the site topography, are dispersed overland flow. Some of the overland flow likely flows into the drainage swale between the two parcels of the project site. These drainage patterns will be somewhat altered by the proposed project. Rooftop runoff will be concentrated on the rooftops, collected into the storm drain system, and released to onsite rainwater gardens for detention and percolation. Rainfall on the pervious pavement sections of the site are intended to percolate locally. Any runoff from the pervious pavement sections will be collected into the storm drain system to percolate in the rainwater gardens, as well. The amount of overland stormwater flow will likely be reduced, as well as the overland flow to the drainage swale. Overall, the effects on erosion from such flow, therefore, is anticipated to be reduced. Also, the proposed project, as mentioned earlier, is anticipated to be exempt from mitigating for hydromodification.

The site includes soils with a low erosion potential (refer to Table IV.H-2), but the relatively steep parts of the site at the edges of the development will require attention during and after construction to avoid erosion. Erosion control plan sheets have been prepared by the applicant. However, these sheets only show short- or mid-term controls, such as fiber rolls and jute mesh at the downstream edges of the development. Clear flow paths of stormwater are not shown, and long-term erosion control measures are not described. Long-term erosion control measures are necessary, in particular for the relatively steep parts of the site at the edges of development. Indeed, these are the primary areas where construction BMPs are already being planned. A SWPPP has not yet been prepared for the project site. Measures to dissipate energy and control runoff velocities would be required to prevent discharges from eroding slopes and cause gullying and sediment transport downstream. Without a complete erosion control plan, a SWPPP, and a landscape plan showing erosion control measures, including measures that adequately control runoff velocities during larger events, the altered drainage patters could cause ***significant*** erosion impacts.

The following mitigation measure would reduce Impact HYDRO-3 to a ***less-than-significant*** level:

Mitigation Measure HYDRO-3 Alteration of Drainage Patterns Resulting in Increased Erosion or Siltation

The applicant shall prepare and submit a SWPPP for the proposed project. The applicant's SWPPP shall identify the BMPs to control erosion and sedimentation and provide for treatment of 80 to 85 percent of post-construction runoff from new impervious areas. Neighborhood- and/or lot-level treatment BMPs shall be emphasized, consistent with San Francisco Bay RWQCB and SMCWPPP guidance for NPDES Phase 2 compliance. These types of BMPs, which may also assist in reducing post-project peak flows, include infiltration basins and trenches, dry wells, rain gardens, on-contour grassy swales, media filters, biofiltration features and grassy swales. BMPs shall be designed in accordance with engineering criteria in the California Stormwater BMP Handbook or other accepted guidance and designs shall be reviewed and approved by the County prior to issuance of grading or building permits. As discussed under Mitigation Measure HYDRO-5, if lot-level BMPs are accepted by SMCWPPP as a suitable control measure, the applicant shall establish a mechanism for enforcement to assure that BMP functioning is being maintained as designed. The applicant has included a detailed maintenance schedule, which includes monthly inspection of system components, annual weeding, annual replanting, bi-annual cleaning of catch basins, bi-monthly parking lot vacuuming, and daily trash pickup in the parking lots.

Submittal of a project erosion control plan and SWPPP to San Mateo County for review shall be required as part of the Final Map application. The erosion control plan shall include components for erosion control, such as phasing of grading, limiting areas of disturbance, designation of restricted-entry zones, diversion of runoff away from disturbed areas, protective measures for sensitive areas, outlet protection, and provision for revegetation or mulching.[87] The plan shall also prescribe treatment measures to trap sediment once it has been mobilized, at a scale and density appropriate to the size and slope of the catchment. These measures typically include inlet protection, straw bale barriers, straw mulching, straw wattles, silt fencing, check dams, terracing, and siltation or sediment ponds. Other aspects of the SWPPP, especially those related to water quality, are discussed below for other mitigation measures.

Landscape plans showing the grassy swales and indicating flow paths shall also be provided.

Impact HYDRO-4 Substantially Alter Drainage Patterns Resulting in Increased Flooding

Placing fill or other structures in such a way as to block existing drainage paths could result in increased onsite or offsite flooding, particularly if there is significant offsite drainage that flows through the site. Offsite runoff from upstream of the project site is unlikely given that Airport Street is at the upstream border of the project site. Existing stormwater drainage from upstream travels through a culvert under Airport Street, and through the drainage swale between the two parcels of the project site into the Pillar

[87] *Association of Bay Area Governments (ABAG), 1995, Manual of Standards for Erosion and Sediment Control Measures, 2nd Edition, May 1995.*

Point Marsh. However, since no drainage report was provided by the applicant, it is unknown if there are substantial stormwater discharges that would travel onto the site from neighboring areas, particularly the residential development to the northwest.

Increased flooding from onsite runoff can be analyzed by looking at the effects on Pillar Point Marsh of the increased runoff. The surface area of the freshwater portion of the marsh, which is upstream of West Point Avenue, is about 23.5 acres, based on Figure IV.H-6 and other reports. Based on the estimated precipitation for a 100-year, 24-hour storm and the increase in site impermeability, runoff volume is expected to increase by 17.0 acre-inches. This would increase the marsh level by about seven-tenths (0.7) of an inch over the existing level during a 100-year storm, assuming no increased outflow due to the higher water level.

Therefore, the proposed project could have a ***significant*** impact on flooding.

The following mitigation measure would reduce Impact HYDRO-4 to a ***less-than-significant*** level:

Mitigation Measure HYDRO-4 Alteration of Drainage Patterns Resulting in Increased Flooding

The applicant shall submit a drainage report and plans to the County that identify the drainage pathways and the extent of any offsite drainage that flows onsite. How such offsite drainage will be conveyed through the site shall also be detailed. The drainage plan shall provide designs consistent with recognized engineering criteria. The drainage plan shall be reviewed and approved by the County prior to issuance of grading or building permits.

Impact HYDRO-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

Quantity of Surface Water Runoff

A drainage report was not provided by the applicant. Table IV.H-6 summarizes the relevant parameters given by the applicant and used to estimate the existing (pre-project) and post-project stormwater discharges onsite for various size storms. Table IV.H-7 presents the results of the runoff analysis. As detailed in the *Hydrologic Analysis of the Big Wave Project*, prepared by Schaaf & Wheeler, May 15, 2009 provided in Appendix H of this DEIR, the rational method, combined with parameters from the Santa Clara County Drainage Manual (SCCDM), were used to estimate site runoff during a 2-year, 10-year, and 100-year storm event.

These estimates were based on the soil types described earlier, considering them Hydrologic Group C soils with moderately slow permeability. The high groundwater table can also lead to significant stormwater runoff, especially during large storm events. However, effects of the high groundwater table are not incorporated in the following estimates.

Table IV.H-7 indicates that the stormwater discharges increase by 80 percent for all three analyzed events. The runoff from the site enters some storm drains and then rain gardens and other retention basins. Any further runoff proceeds to Pillar Point Marsh, for which no new development or storm drainage facilities are planned or ever likely to be planned. Therefore, there are no existing or planned stormwater drainage systems whose capacities could be exceeded by the increased stormwater runoff from the site.

Table IV.H-6
Existing (Pre-) and Post-Project Discharge Parameters

Watershed	Scenario	Drainage Area (acre)	Developed Area (acre)	Impervious-ness (%)	TC (min)	2-Year Intensity (in/hr)	10-Year Intensity (in/hr)	100-Year Intensity (in/hr)
Office Park	Pre	14.3	0.0	0.0	20.47	0.96	1.61	2.51
	Post		1.8	12.9	10.83	1.32	2.22	3.45
Wellness Center	Pre	5.3	0.0	0.0	14.23	1.15	1.93	3.01
	Post		1.2	22.2	9.13	1.43	2.41	3.75
Post Total		**19.6**	**3.0**	**15.4**	NA	NA	NA	NA

Notes:
TC = Time of Concentration
in/hr = inches per hour
NA = not applicable
Source: Schaaf & Wheeler, 2009.

Table IV.H-7
Existing (Pre-) and Post-Project Peak Storm Discharges for the 2-Year, 10-Year, and 100-Year Event

Watershed	2-Year Discharge (cfs)		10-Year Discharge (cfs)		100-Year Discharge (cfs)		Average Increase (%)
	Existing	Post-Project	Existing	Post-Project	Existing	Post-Project	
Office Park	4.1	7.5	6.9	12.6	13.4	24.6	80
Wellness Center	1.8	3.0	3.1	5.1	5.9	9.9	80
Total	**5.9**	**10.5**	**9.9**	**17.7**	**19.3**	**34.3**	80

Notes:
cfs = cubic feet per second
Source: Schaaf & Wheeler, 2009.

Furthermore, the project, without any onsite mitigation, would increase the total watershed peak flows to Pillar Point Marsh by an estimated 3 percent; project site flows would go from representing 2.9 percent to 5.8 percent of the marsh watershed's peak flows. With the planned detention, the percentage increase

should be even smaller. The *Hydrologic Analysis of the Big Wave Project*, prepared by Schaaf & Wheeler, May 15, 2009 provided in Appendix H of this DEIR presents details of the estimate for the entire watershed drainage.

Overall, impacts of increasing quantities of stormwater runoff would be ***less than significant***, and no mitigation measures are required.

Quality of Surface Water Runoff

The proposed project may generate significant adverse impacts on water quality. Pollutants and chemicals associated with urban development would runoff new roadways and other transportation facilities, such as parking lots. The pollutants can then flow into the main Pillar Point Marsh or the associated drainage swale. These pollutants would include, but are not limited to, heavy metals from automobile emissions, oil, grease, trash and debris, and air pollution residue. Eventually, these urban pollutants can filter down into the groundwater table, especially where groundwater is near the surface, such as in the freshwater portion of the marsh. Such contaminated urban runoff remains relatively untreated, thus resulting in incremental long-term degradation of water quality. Increased stormwater runoff can also lead to erosion, which can then contribute sediment to receiving waters; sediment can impair water quality by carrying with it any of the pollutants mentioned above.

Short-term adverse impacts to water quality may also occur during construction of the project when areas of disturbed soils become susceptible to water erosion and downstream sedimentation. This impact is of particular concern where projects are located on previously contaminated sites. Grading and vegetation removal in proximity to drainage features, such as the drainage swale, could result in an increase in bank erosion, affecting both water quality and slope stability along the drainage feature.

Site design to reduce impervious area coverage, limited grading, fitting structures to the existing topography, and use of onsite swales and rain gardens rather than storm drain pipes to convey runoff, as proposed by the project, are favored approaches to managing urban runoff.[88,89] Current agency guidance also recommends that, where soils and geotechnical conditions allow, runoff should be infiltrated using a combination of treatment BMPs, such as grass swales and infiltration trenches, to reduce peak flows and enhance water quality. Based on the analysis herein, these types of BMPs – when installed at the lot- or neighborhood-scale, properly sized for the drainage area, and designed to comply with criteria in the California Stormwater BMP Handbook – would be well suited to local conditions.

Under existing conditions, fertilizer and pesticide compounds are the most likely pollutants of concern since the project site is currently in vegetable crop production. Given that agricultural production would be reduced following project construction, the project could potentially reduce any existing nitrate-

[88] *Bay Area Stormwater Management Agencies Association (BASMAA), 1999, Start at the source, 2nd Edition, 165 p.*

[89] *California Storm Water Quality Task Force, 2003, Ibid.*

nitrogen, ammonia-nitrogen and agriculture-related organic contributions to the surface water and ground water, a benefit to water quality.

However, there are several pollutants that the project development could contribute to the surface water, including sediment and typical urban pollutants. In contrast to other potential pollutants, sediment is typically of greatest potential concern during the construction-phase of development. After a project has been constructed and the landscaping has been installed, erosion and sedimentation from development sites is usually minimal. Potential post-project contributions of sediment to surface waters from storm drain outlets have been discussed above. Pollutants other than sediment which might typically degrade surface-water quality during project construction include petroleum products (gasoline, diesel, kerosene, oil, and grease), hydrocarbons from asphalt paving, paints, and solvents, detergents, nutrients (fertilizers), pesticides (insecticides, fungicides, herbicides, rodenticides), and litter. Once the buildings and roadways have been constructed, typical urban runoff contaminants might include all of the above constituents, as well as trace metals from pavement runoff, nutrients, and bacteria from pet wastes, and landscape maintenance debris. Since the drainage system discharges directly to Pillar Point Marsh, these pollutants could affect aquatic and wetland habitats and sensitive species, and sediment could reduce flood storage of the marsh. Without mitigation, the effects on surface water quality could be ***significant***.

Therefore, the following mitigation measure is required to reduce the effects on surface quality to a ***less-than-significant*** level:

Mitigation Measure HYDRO-5 Surface Water Runoff Quality

The applicant shall prepared and submit a comprehensive erosion control plan and SWPPP. Potential construction-phase and post-construction pollutant impacts from development can be controlled through preparation and implementation of an erosion control plan and a SWPPP consistent with recommended design criteria, in accordance with the NPDES permitting requirements enforced by SMCWPPP and the San Francisco Bay RWQCB. The erosion control plan forms a significant portion of the construction-phase controls required in a SWPPP, which also details the construction-phase housekeeping measures for control of contaminants other than sediment, as well as the treatment measures and BMPs to be implemented for control of pollutants once the project has been constructed. The SWPPP also sets forth the BMP monitoring and maintenance schedule and identifies the responsible entities during the construction and post-construction phases.

The applicant's SWPPP shall identify the BMPs that will be used to reduce post-construction peak flows to existing levels in all onsite drainages where construction will occur. Neighborhood- and/or lot-level BMPs to promote infiltration of storm runoff shall be emphasized, consistent with San Francisco Bay RWQCB and SMCWPPP guidance for NPDES Phase 2 permit compliance. These types of BMPs, which may also enhance water quality, include infiltration basins and trenches, dry wells, rain gardens, on-contour grassy swales, media filters, and biofiltration features. BMPs shall be designed in accordance with engineering criteria in the California Stormwater BMP Handbook or other accepted guidance and designs shall be reviewed and approved by the County prior to issuance of grading or building permits.

The applicant shall prepare a clearly defined operations and maintenance plan for water quality and quality control measures. The design and maintenance documents shall include measures to limit vector concerns, especially with respect to control of mosquitoes. The applicant shall identify the responsible parties and provide adequate funding to operate and maintain stormwater improvements (through a HOA, Geological Hazard Abatement District, CSD, CFD or similar organization). If lot-level BMPs are accepted by the County as a suitable control measure, the applicant shall establish a mechanism for enforcement to assure that BMP functioning is being maintained as designed. The applicant shall also establish financial assurances, as deemed appropriate by the Community Development Director, enabling the County to maintain the stormwater improvements should the HOA or other entity disband or cease to perform its maintenance responsibilities.

The SWPPP must also include post-construction water quality BMPs that control pollutant levels to pre-development levels, or to the maximum extent practicable (MEP). To confirm that structural BMPs (e.g., biofiltration features, wet ponds, vegetated swales, constructed wetlands, or media filters) will function as intended, design must be consistent with engineering criteria, as set forth in guidance such as the recently revised California Storm Water BMP Handbook for New and Redevelopment.[90] These types of structural BMPs are intended to supplement other storm water management program measures, such as street sweeping and litter control, outreach regarding appropriate fertilizer and pesticide use practices, and managed disposal of hazardous wastes.

The main post-construction water quality enhancement measure indicated by the applicant report is the use of rain gardens (constructed wetlands) to control pollutants. Locations and designs of the stormwater infiltration system should be provided to the County as part of the grading plans during Final Map review.

Many of the distributed BMPs that could prove useful to address control of post-project peak flows at the lot- and/or neighborhood level could reasonably be linked with measures to enhance water quality, thereby providing compliance with the NPDES Phase 2 permit requirements as well. For example, downspouts could direct roof runoff to biofiltration features, with percolated stormwater conveyed through subdrains to small infiltration basins or dry wells.

Impact HYDRO-6 Otherwise Substantially Degrade Groundwater Quality

The proposed project could potentially degrade groundwater quality due to contractor activities during construction, residents' and workers' activities following occupation of the constructed facilities, and contamination of unused wells.

Constituent pollutants from the first two sources are the same as described above for surface waters, and the regulatory framework and mitigation measures proposed to minimize impacts are also identical. No further mitigation would be required.

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[90] *California Storm Water Quality Task Force, 2003, California Storm Water Best Management Practices Handbooks, 3 volumes.*

The project applicant has indicated that an existing well, permitted for potable water use although currently used only for agricultural purposes, is onsite and planned for continued use during project operation. If any other wells do exist, are not used, and are not properly destroyed, the unused wells could pose a potentially significant impact to ground water quality as pollutants entering the well would be rapidly conveyed to the subsurface aquifer. This would be a ***significant*** impact on ground water quality.

The following mitigation measure is required to reduce the impacts to groundwater quality to a ***less-than-significant*** level:

Mitigation Measure HYDRO-6 Groundwater Quality

The applicant shall abandon all unused wells on the project site consistent with San Mateo County Department of Environmental Health standards and the standards described in the State of California Department of Water Resources Well Standards (Bulletins 74-81 and 74-90).

Any onsite wells left in service should meet CDPH criteria for well protection. The applicant shall prepare, if required by the CDPH or County Department of Health Services, a Drinking Water Source Assessment and Protection (DWSAP) application to identify and protect against potential well contaminants.

Impact HYDRO-7 Place Housing Within a 100-year Flood Hazard Area or Place Within 100-Year Flood Hazard Area Structures that would Impede or Redirect Flood Flows

As discussed previously, a 2005 LOMA removed the project parcels from the FEMA-designated 100-year flood hazard area (floodplain) in the project area.[91] Since the project is limited to development on these parcels, the project, therefore, would not be placing housing with a 100-year Flood Hazard Area. Given the existing LOMA, project development should have no impacts in terms of placing housing within a 100-year flood hazard area and no mitigation measures are required.

Furthermore, since the project parcels are not within a FEMA-designated 100-year floodplain, any development on these parcels should not impede or redirect flood flows. Hence, project development would have ***no impacts*** in terms of impeding or redirecting 100-year flood flows and no mitigation measures are required.

[91] *FEMA, 2005, Ibid.*

Impact HYDRO-8 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 could potentially expose people and structures to a significant risk of loss, injury or death involving flooding as a result of the failure of a dam. Failure of the Denniston Reservoir dam on Denniston Creek could potentially affect the project area. The CCWD operates the dam and reservoir as part of their water supply. As mentioned before, the dam is not large enough to be regulated by the DOSD, and exact dimensions of the reservoir are not readily available.[92] A State Board application by the CCWD does allow for water rights to 5,580 acre-feet (243 million cubic feet) of stored water per year at a Denniston Creek reservoir.[93] Without more information on the dam or reservoir dimensions, however, actual storage in the reservoir cannot be calculated. It can be assumed since the dam is not subject to the DOSD that the storage and, thus, failure impacts are relatively small. Based on available information, the following can be said:

- The dam is about 5,800 feet from the mouth of Denniston Creek.
- The main channel of Denniston Creek is about 2,300 feet from the project site at its closet point.
- The project area is not within the Denniston Creek watershed.
- A small ridge generally separates the Pillar Point Marsh watershed, which includes the project area, from the Denniston Creek watershed to the east.
- No other potential flood sources, including levees, are known that would affect the project area.

For these reasons, the project is assumed to have a ***less-than-significant*** impact in terms of exposing people or structures to flooding as a result of dam or levee failure; therefore, no mitigation measures are required.

Impact HYDRO-9 Expose People or Structures to Inundation by Seiche, Tsunami, or Mudflow

There are hydrologic risks associated with seismic activity near large bodies of water, which can cause a tsunami, a seiche, or flow of mud and other debris from hillsides.

A tsunami is a series of waves created when a body of water, such as an ocean, is rapidly displaced on a massive scale. Earthquakes, mass movements above or below water, volcanic eruptions, and other underwater explosions, landslides, and large meteoric impacts all have the potential to generate a tsunami or teletsunami. As described earlier, ABAG has created tsunami maps for the Bay Area. The map

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[92] *TRC Essex, 2006, DRAFT Denniston Reservoir Restoration Project Draft Initial Findings Report, Prepared for the Coastside County Water District, December 2006.*

[93] *State Board, 1969, Decision 1341, June 1969.*

showing the project vicinity indicates that the project would place residential and commercial structures within a mapped tsunami area, understandable given its proximity to the Pacific Ocean. This could represent a ***potentially significant*** impact.

The resonant oscillation of water (a standing wave) in an enclosed or partially enclosed water body is a seiche, which can raise flood levels of a water body.[94] The Pillar Point Harbor near the project site is mostly enclosed by engineered and constructed jetties. While these jetties tend to protect the harbor from the day-to-day effects of currents and tides, they could lead to seiche effects, especially if a tsunami were to affect the harbor. There are no other lakes or other enclosed bodies of water in the general vicinity of the project that would produce seiche events and affect the project site. The proximity of the project to the partially enclosed Pillar Point Harbor and the potential for tsunami events could expose people to inundation by seiche, which represents a ***potentially significant*** impact. The mitigations for such an occurrence would coincide with mitigations for tsunami events.

Landslides and mudflows tend to occur in steeply sloped areas. A USGS map of landslide potential for San Mateo County lists the project vicinity as a "flat land" area with a low potential for landslides,[95] and a USGS map of debris-flow source areas does not include the project vicinity in an area predicted to be a principal debris source area.[96] The USGS Quad Sheet confirms the flat terrain.[97] Therefore, given the relative flatness of the area and the mapping results, the potential for impacts from mudflow are considered ***less than significant*** within the project area and site.

The following mitigation measure is required to reduce impacts from exposure to tsunami and seiche to ***less-than-significant*** levels:

Mitigation Measure HYDRO-9 Exposure to Tsunami and Seiche

In areas subject to tsunami and seiche effects, implementing agencies shall, where appropriate, ensure that the project incorporates features designed to minimize damage from a tsunami or seiche. Structures should either be placed at elevations above those likely to be adversely affected during a tsunami or seiche event or be designed to allow swift water to flow around, through, or underneath without causing collapse. Other features to be considered in designing projects within areas subject to tsunami or seiche may include using structures as buffer zones, providing front-line defenses, and securing foundations of expendable structures so as not to add to debris in the flowing waters.

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[94] *Lander, James F., Lockridge, Patricia A., and Michael J. Kozuch, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1993, Ibid.*

[95] *Wentworth, C., S. Graham, R.J. Pike, G. Buekelman, D. Ramsey and Barron, A., 1997, Summary of distribution of slides and earth flows in San Mateo County, California, USGS Open-File Report 97-745C, 10 p and 11 sheets.*

[96] *Ellen, S.D., et al., 1997, Map Showing Principal Debris-Flow Source Areas in San Mateo County, California, USGS, Open File 97-745 E.*

[97] *USGS, 1993, Ibid.*

CUMULATIVE IMPACTS

This section analyzes potential cumulative hydrologic and water quality impacts that could occur from the combination of the proposed project with other reasonably foreseeable projects in the near vicinity (refer to Table III-1). CEQA's concept of a cumulative impact is a change in the environment that results from adding the effects of the project to those effects of cumulative projects in the project vicinity. A cumulative impact related to hydrology would be an impact caused by the project that, when added to impacts of related past, present, and probably future projects, would rise to the level of significance.

The Half Moon Bay Airport, in particular, is an entity with considerable influence on the water quality and sedimentation rate of Pillar Point Marsh. Activities on the airport property, as well as on other neighboring parcels, directly affect the marsh. The airport is required to maintain an NPDES permit, a Stormwater Pollution Prevention Plan, and a Hazardous Material Management Plan, as required by the San Francisco Bay RWQCB and the County Department of Environmental Health.

The list of projects considered in the cumulative analysis is shown in Section III.B (Related Projects) of this DEIR. The other projects listed in the cumulative analysis would also be subject to local, State and federal regulations regulating water quality and flood control. By complying with those regulations, through incorporation of BMPs to prevent increases in peak flows and treat post-construction runoff, cumulative hydrologic and water quality impacts would be ***less than significant***.

LEVEL OF SIGNIFICANCE AFTER MITIGATION

Impacts on hydrology and water quality with implementation of mitigation would be ***less than significant***.