4.0 Physical Characteristics of the Site

4.1 Geology/physiography

Former Fort Ord is located within the California Coast Ranges Section of the Pacific Border physiographic province. The Coast Ranges are characterized by a linear system of nearly parallel ranges. They are generally geosynclinal in structure, with subsequent folding and faulting in late Pliocene.

From the west, Monterey Bay is bordered by outcrops of Pleistocene and Recent coastal beach and dune deposits which are in turn bordered by Pleistocene stabilized dunes inland. The stabilized dunes cover roughly one-half the area of Former Fort Ord. The Aromas sandstone occasionally outcrops within the stabilized dunes area, as well as underlies the stabilized dunes. The Aromas sandstone is underlain by the Paso Robles Formation. Alluvial deposits occur on Toro Creek and sporadically throughout the area. See Figure 4-1, Surficial Geology and Fault Lines of Fort Ord.

The Paso Robles Formation and the Aromas sandstone have high potential erosion hazard. The Paso Robles and Aromas are even more susceptible to induced erosion under disturbed conditions. The Paso Robles is also prone to piping or internal, subsurface erosion tunnels open to the surface, and to landslides, as evidenced by both recent and geomorphically identifiable past landslides.

There are several inferred or concealed earthquake faults which either cross or are adjacent to Former Fort Ord. None show activity in the last 10,000 years, but the potential cannot be ruled out. The San Andreas fault, which has been historically active within the past 200 years, is within 25 miles of Former Fort Ord. The potential of earthquake damage from ground movement is moderate to very high, with the highest potential in the coastal dune zone. High to very high liquefaction potential exists on recent alluvial sediment along Toro Creek, and may exist in other small, localized areas. Landslide potential is present in the Aromas and Paso Robles formations as described above, and the shoreline dune cliffs.

The topography of Former Fort Ord is dome like; the center of the installation has the greatest elevation, while the boundaries are low-lying areas. The most notable

4.2 Soils

Soils which formed on the Aromas formation and on the Paso Robles formation are highly susceptible to water erosion (see Figure 4-2). They are sandy, and drought-affected. Soils formed on the Aromas and the stabilized dunes have very high permeability.

In unvegetated areas, or areas under development, sand blows from the exposed soil surface. Wind erosion at a rate of up to 310 tons per acre per year continues until the source areas are stabilized and revegetated (U.S. Army Corps of Engineers, Sacramento District, 1993).

4.3 Hydrology

4.3.1 Ground Water

As stated in the Fort Ord Disposal and Reuse Final EIS:

For purposes of discussion, geologic conditions on Fort Ord can be divided into three general areas (Figure 4-3). Each area has distinct geologic and hydrologic characteristics.

The northwest part of Fort Ord (Area 1 in Figure 4-3) overlies a small part of the Salinas Valley groundwater basin, which contains several aquifers separated by aquicludes. Area 1 is covered with dune sand deposits that are largely unsaturated. The depth of the water table is typically about 100 feet. An extensive clay layer, known as the Salinas Valley Aquiclude, underlies the dune sand deposits in the Main Garrison area. Beneath the aquiclude is the 180-foot aquifer, which is the shallowest aquifer with substantial pumpage. The aquiclude is absent along a strip near the coast and in an area extending south from East Garrison. In these areas, recharge from the surface can percolate down to the 180-foot aquifer. Beneath the 180-foot aquifer are two deeper aquifer zones referred to as the 400-foot and 900-foot aquifers.

Historically, most pumpage for Fort Ord and Marina was from the 180-foot aquifer. Seawater began intruding into this aquifer as a result of the pumping, and early wells were replaced with wells that were deeper or farther inland. By the early 1980's, seawater had intruded about 2.5 miles into the 180-foot aquifer and 1.2 miles into the 400-foot aquifer in the vicinity of Marina. Around that time, Fort Ord drilled new wells into the 180-foot and 400-foot aquifers near East Garrison and Marina drilled three wells into the 900-foot aquifer.

The southwest part of Fort Ord (Area 2 in Figure 4-3) overlies the Seaside groundwater basin. This basin is structurally complex and divided into several subbasins by faults and folds in the underlying Monterey Shale formation. Fort Ord overlies most of the northern part of the basin and supplies a substantial amount of total recharge to the basin. Except at one shallow well near the shoreline, seawater intrusion has not affected wells in this basin. The existing amount of pumpage appears to be close to the safe yield of the basin.

The eastern part of Fort Ord (Area 3 in Figure 4-3) is hilly and lacks the surficial dune deposits that cover Areas 1 and 2. Because of relatively low infiltration rates and subsurface permeability, this area is not promising for groundwater development and probably does not contribute substantial amounts of groundwater inflow to the western part of Fort Ord.

On Figure 4-3, note areas of known groundwater contamination on Fort Ord - labeled A, B, and C.

U.S. Army Corps of Engineers, Sacramento District, Fort Ord Disposal and Reuse Environmental Impact Statement, Final, June 1993, Sacramento, CA.

4.4 Weather

The sea keeps the temperature of the Monterey Peninsula moderate at all seasons. The days are never extremely hot nor extremely cold. The nights are always cool. The average temperature varies less than ten degrees the year round, ranging usually from about 53 degrees to 70 degrees. Rainfall is heaviest from November to February and averages 17 inches a year. Throughout the spring and summer fog drifts in from the Pacific to cool the coastal area.

4.5 Species and Habitats

The information provided for Former Fort Ord has been compiled from the Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California, April, 1997.

Wildlife and plant species and habitats addressed in the 1997 Habitat Management Plan (HMP) are the same as those included in the 1994.

Since publication of the 1994 Habitat Management Plan (HMP), the legal status of several species has changed. On February 28, 1996, the Department of the Interior published in the Federal Register (FR) the Department of the Interior Endangered and Threatened Species, Plant and Animal Taxa; Proposed Rule (61 FR 7596 February 28, 1996). Under the rule, the Category 1 and 2 classifications for federal

HMP species occurring in coastal strand and dune scrub are *Smith's blue butterfly, sand gilia, Monterey spineflower, robust spineflower, black legless lizard, and coast wallflower. Yadon's piperia may occur in these habitats.*

Additional information may be found in the Environmental Impact Statement, Fort Ord Disposal And Reuse, June 1993, Sacramento District, and the Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California, April, 1997.

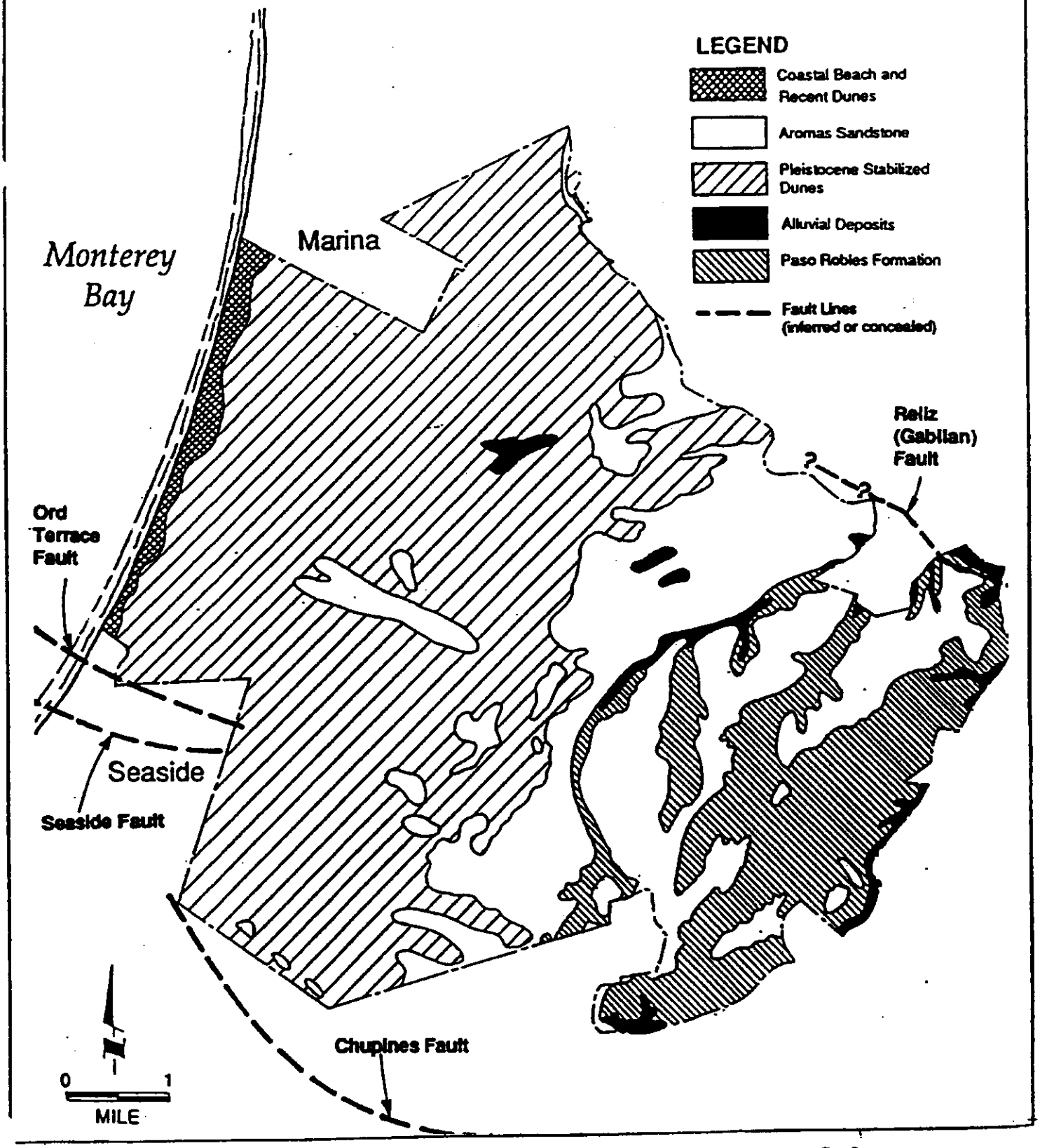


Figure 4-1: Surficial Geology and Fault Lines of Former Fort Ord

Source: U.S. Army Corps of Engineers, Sacramento District, 1993

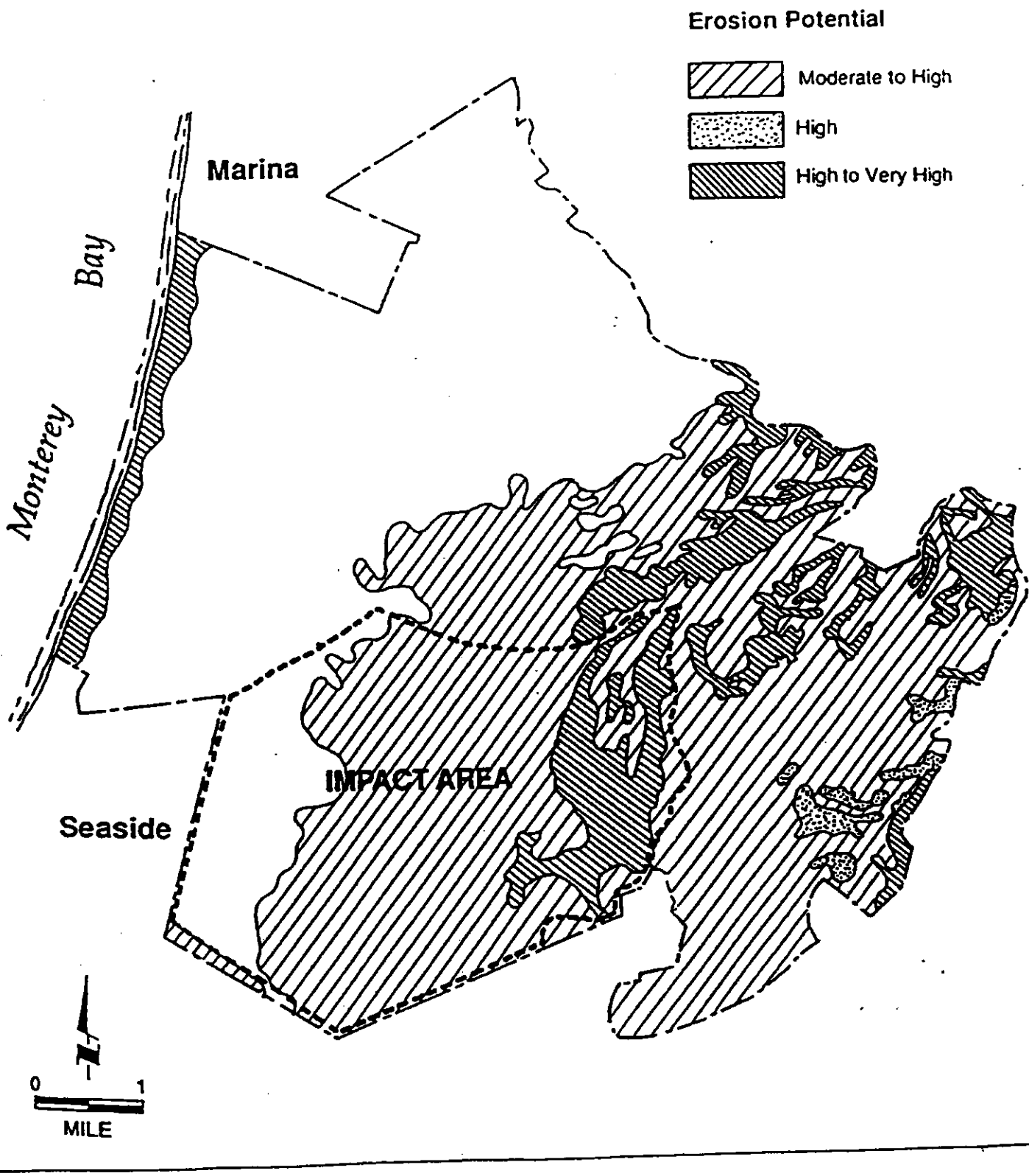
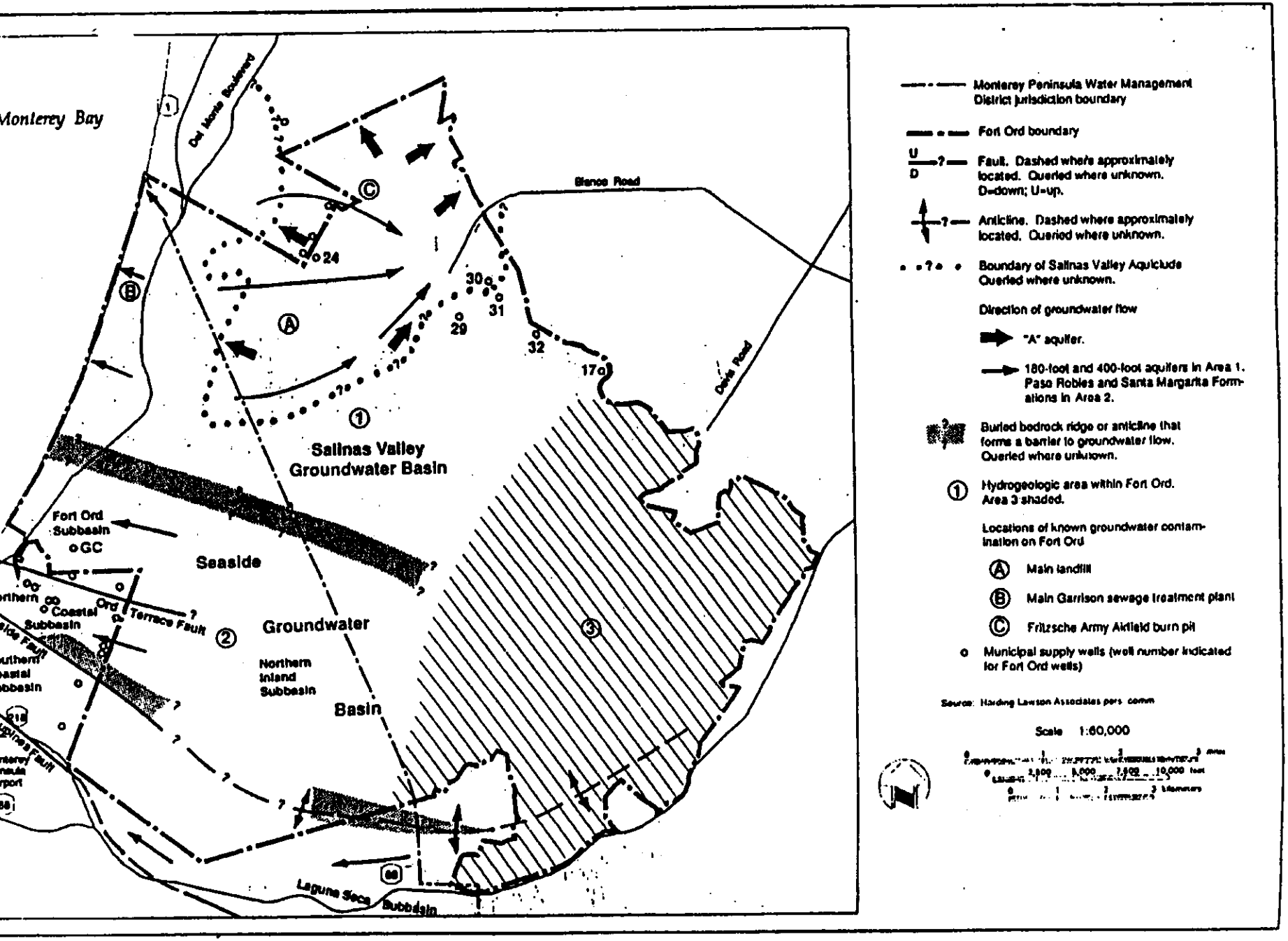
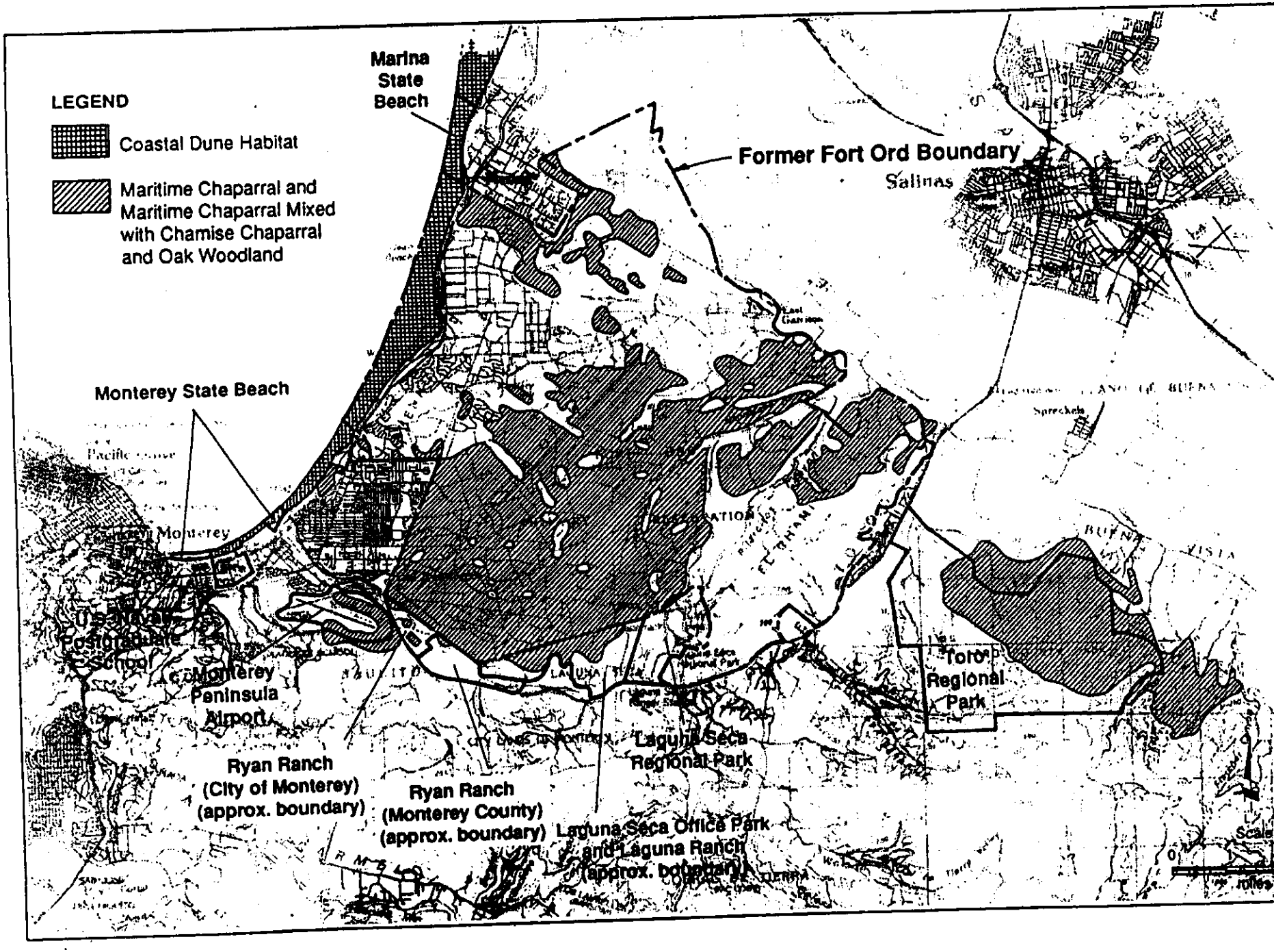


Figure 4-2: Water and Coastal Erosion Potential at Former Fort Ord
Source: U.S. Army Corps of Engineers, Sacramento District, 1993


Monterey Bay
Del Monte Boulevard
Blanco Road
Davis Road
24
30
31
29
32
17
Salinas Valley
Groundwater Basin
Fort Ord
Subbasin
GC
Seaside
Coastal
Subbasin
Terrace Fault
Groundwater
Basin
Northern
Inland
Subbasin
Laguna Seca Subbasin
Monterey Peninsula Water Management District jurisdiction boundary
Fort Ord boundary
Fault. Dashed where approximately located. Queried where unknown. D=down; U=up.
Anticline. Dashed where approximately located. Queried where unknown.
Boundary of Salinas Valley Aquiclude Queried where unknown.
Direction of groundwater flow
"A" aquifer.
180-foot and 400-foot aquifers in Area 1. Paso Robles and Santa Margarita Formations in Area 2.
Buried bedrock ridge or anticline that forms a barrier to groundwater flow. Queried where unknown.
Hydrogeologic area within Fort Ord. Area 3 shaded.
Locations of known groundwater contamination on Fort Ord
Main landfill
Main Garrison sewage treatment plant
Fritzsche Army Airfield burn pit
Municipal supply wells (well number indicated for Fort Ord wells)
Source: Harding Lawson Associates pers. comm.
Scale 1:60,000


LEGEND
Coastal Dune Habitat
Maritime Chaparral and Maritime Chaparral Mixed with Chamise Chaparral and Oak Woodland
Marina State Beach
Former Fort Ord Boundary
Salinas
Monterey State Beach
Monterey
Pacific Ocean
U.S. Naval Postgraduate School
Monterey Peninsula Airport
Ryan Ranch (City of Monterey) (approx. boundary)
Ryan Ranch (Monterey County) (approx. boundary)
Laguna Seca Regional Park
Laguna Seca Office Park and Laguna Ranch (approx. boundary)
Toro Regional Park
Scale
0
miles