4.3 HYDROLOGY AND WATER QUALITY

The *FORA Reuse Plan Final Environmental Impact Report* (FORA FEIR) identified on a program level less than significant environmental impacts from increased site runoff; water quality degradation from a proposed golf course, construction activities, and potential hazardous materials spills; and changes in the amount and quality of groundwater recharge. The FORA FEIR also identified a potentially significant environmental impact for hydrology as related to water quality from urban runoff.

Site specific details and project-level information for the EGSP were not known and not analyzed at the time of the FORA FEIR. New information for the currently proposed EGSP include the development of a project site plan, project grading and drainage plans, changes in land use, and the preparation of a site-specific hydrological report for the EGSP project.

This section provides additional analysis of potential impacts not previously analyzed in the FORA FEIR. Balance Hydrologics, Inc. prepared a *Preliminary Hydrology Report for the East Garrison Project, Monterey County, California* (October 2003) and Byron Buck & Associates prepared a *Water Supply Assessment and Written Verification of Supply, East Garrison Specific Plan Development* (June 2004) for the proposed project which are summarized in this section. Both of these reports are included in their entirety in Appendix C of this DSEIR.

4.3.1 Environmental Setting

HYDROLOGICAL CONDITIONS

The EGSP site is situated atop a prominent bluff along the southern border of the Salinas River Valley. The terrain slopes gently to the east and is characterized by steeper slopes at the western end of the project site with a maximum elevation of 245 feet. Gentler slopes are located at the eastern end of the site with a minimum elevation of 115 feet. Just to the north and east of the property boundary is a steep bluff that descends approximately 75 feet to the floodplain of the Salinas River.

The project site lies within two watersheds that extend beyond the limits of the property. The portions of these watersheds that lie outside of the project boundary (roughly 40 percent of the total watershed area) consist primarily of open space and the proposed Monterey Bay Youth Camp that will be developed with low-intensity uses. Land cover within the open space areas consists primarily of oak woodlands. The existing impervious surfaces on the project site—buildings, parking lots, roadways, etc.—cover approximately 16 percent of the project area and have substantially altered the hydrological setting (e.g., watersheds) that existed before since Fort Ord was originally developed.

Climate

The climatological characteristics of the site reflect the general Mediterranean climate of central coastal regions of California. This climate regime is characterized by cool, wet winters and warm, dry summers with occasional periods of fog. Table 4.3-1 presents climate data from the Salinas River Basin gage (located 4 miles to the northeast of the project site), which illustrates the general seasonal trends at the EGSP site.

Rainfall

The project site is situated in the lowermost reaches of the Salinas Valley, which trends to the northwest, and is located only 5 miles east of Monterey Bay. Rainfall at the site is lower than much of the region, as a whole, due to the relatively low elevation and the lack of coastal ranges, reducing the potential for orographic (mountain-induced) precipitation. Based on rainfall mapping prepared by the County of Monterey, the mean annual rainfall at the EGSP site is estimated to be 13.8 inches. This contrasts with the mean annual rainfall of 21 inches in nearby Pebble Beach and 22 inches in Watsonville, which are at the same or lower elevations but are backed by the Santa Lucia and Santa Cruz ranges respectively. Although the average rainfall is quite low, the site still experiences a wide range in annual precipitation that occurs in drought years and wet years. The minimum annual rainfall on a water year basis at the project site was 6 inches in 1924. This contrasts with the maximum annual rainfall of 33.5 inches in 1998.

Table 4.3-1: Historical Precipitation Monterey County, California From the National Weather Service Salinas River Basin Rain Gage

Month	Precipitation (inches)
January	2.91
February	2.43
March	2.09
April	1.02
May	0.38
June	0.09
July	0.03
August	0.04
September	0.18
October	0.55
November	1.37
December	2.46
Mean Annual	**13.55**

Note:
These values are presented to illustrate the relative monthly distribution of total rainfall. Monthly and yearly values at the East Garrison site, located 4 miles to the southwest, will differ slightly from these values since the mean annual precipitation at the Salinas gage is approximately 0.2 inches higher than East Garrison. Values for precipitation are from the record for the period from January 1905 to May 2003 with several months missing data.

Source: Balance Hydrologics, Inc., October 2003.

Temperature

Annual temperature patterns are typical of coastal areas of the state, and are notably tempered by sea breezes and coastal fog extending up the valley from Monterey Bay. Nonetheless, evaporation rates are quite high in summer, yielding a total annual evapotranspiration of 46 inches, over three times the mean annual rainfall (CIMIS, 2003). In fact, evaporation rates exceed rainfall in all but the wettest winter months.

Soils

The characteristics of the surficial soils underlying the EGSP area are fundamental in understanding the project site’s hydrology. The site is essentially entirely underlain by the Oceano Loamy Sand (OaD), which is characterized as a sandy soil with high rates of infiltration. This soil is classified in the Unified Soil Classification System (USCS) hydrologic soil group A with a tabulated permeability between 6 and 20 inches/hour,[1] a very high rate. The available water capacity for Oceano Loamy

[1] The USCS hydrologic soil groups divide all soil types into categories on the basis of potential to produce runoff. There are four categories, A through D. Type A soils have the lowest runoff potential and typically have high infiltration rates. Type D soils have the highest runoff potential and typically have low infiltration rates and/or are shallow.

Sand O is 0.05 to 0.08 inches/per inch of soil with a total 5.20-inch profile.[2] The high permeability of these soils accounts for the lack of well-developed stream networks in much of the northern portions of FFO and plays a significant role in recharge to the local and regional ground-water systems.

A small portion of the site, less than one percent of the watershed's area along the bluff at the eastern site boundary, is underlain by soils classified as dissected Xerorthents (Xd). This soil is described as occurring between the surface and 60 inches deep and having varying properties and was not considered in the hydrologic analysis, since no significant development is anticipated in areas with this soil. The soil survey did not distinguish areas smaller than about 20 to 40 acres, so that wetlands, alluvium, or swale fills smaller than 10 to 20 acres were not mapped.

REGIONAL HYDROLOGIC SETTING

As described previously, the project site is located directly adjacent to the floodplain of the Salinas River, approximately 8 river miles from its mouth at Monterey Bay. The Salinas River has one of the largest watersheds in central coastal California. The size of the Salinas River watershed area upstream of FFO is over 4,000 square miles.

Although regulated by a number of large dams in its headwaters, the river is still subject to very large seasonal and annual variations in total and peak discharge. The United States Geological Survey (USGS) operates a gaging station at Spreckels, roughly 5 miles upstream from the project site. This gage often records no flow during the summer months, while exceptionally wet winter periods can see very significant peak discharge values. The peak flow of record at this gage was approximately 95,000 cubic feet per second (cfs) on March 15, 1995.

Several beneficial uses have been identified for the Salinas River in the Central Coast Regional Water Quality Control Board's (CCRWQCB's) *Central Coast Basin Plan* (1994), and are summarized in Table 4.3-3.

Table 4.3-2: Existing Beneficial Uses of Receiving Waters in the Vicinity of the EGSP Site

	Salinas River Downstream of Spreckels Gage	Salinas River Refuge Lagoon (South)	Salinas River Lagoon (North)
Municipal and Domestic Supply (MUN)	**E**	—	—
Agricultural Supply (AGR)	**E**	—	—
Industrial Process Supply (PRO)	—	—	—
Industrial Service Supply (IND)	—	—	—
Groundwater Recharge (GWR)	—	—	—
Contact Water Recreation (REC-1)	—	**E**	**E**
Non-contact Water Recreation (REC-2)	**E**	**E**	**E**
Wildlife Habitat (WILD)	**E**	**E**	**E**
Cold Freshwater Habitat (COLD)	**E**	**E**	**E**
Warm Freshwater Habitat (WARM)	**E**	**E**	**E**
Migration of Aquatic Organisms (MAGR)	**E**	**E**	**E**

[2] Available water capacity is the held-water available for use by most plants.

Table 4.3-1 (Cont.): Historical Precipitation Monterey County, California

	Salinas River Downstream of Spreckels Gage	Salinas River Refuge Lagoon (South)	Salinas River Lagoon (North)
Fish Spawning (SPWN)	—	—	**E**
Preservation of Biological Habitats of Special Significance (BIOL)	—	**E**	**E**
Rare, Threatened, or Endangered Species (RARE)	—	**E**	**E**
Estruarine Habitat (EST)	—	—	**E**
Freshwater Replenishment (FRESH)	**E**	—	
Navigation (NAV)	—	—	—
Hydropower Generation (POW)	—	—	—
Ocean, Commercial and Sport Fishing (COMM)	**E**	**E**	**E**
Aquaculture (AQUA)	—	—	—
Inland Saline Water Habitat (SAL)	—	—	—
Shellfish Harvesting (SHELL)	—	**E**	**E**

Note:
"E" indicates existing beneficial uses. Information taken from the San Francisco Bay Basin (Region 3) Water Quality Control Plan (RWQCB, 1994).
Source: Balance Hydrologics, Inc., October 2003.

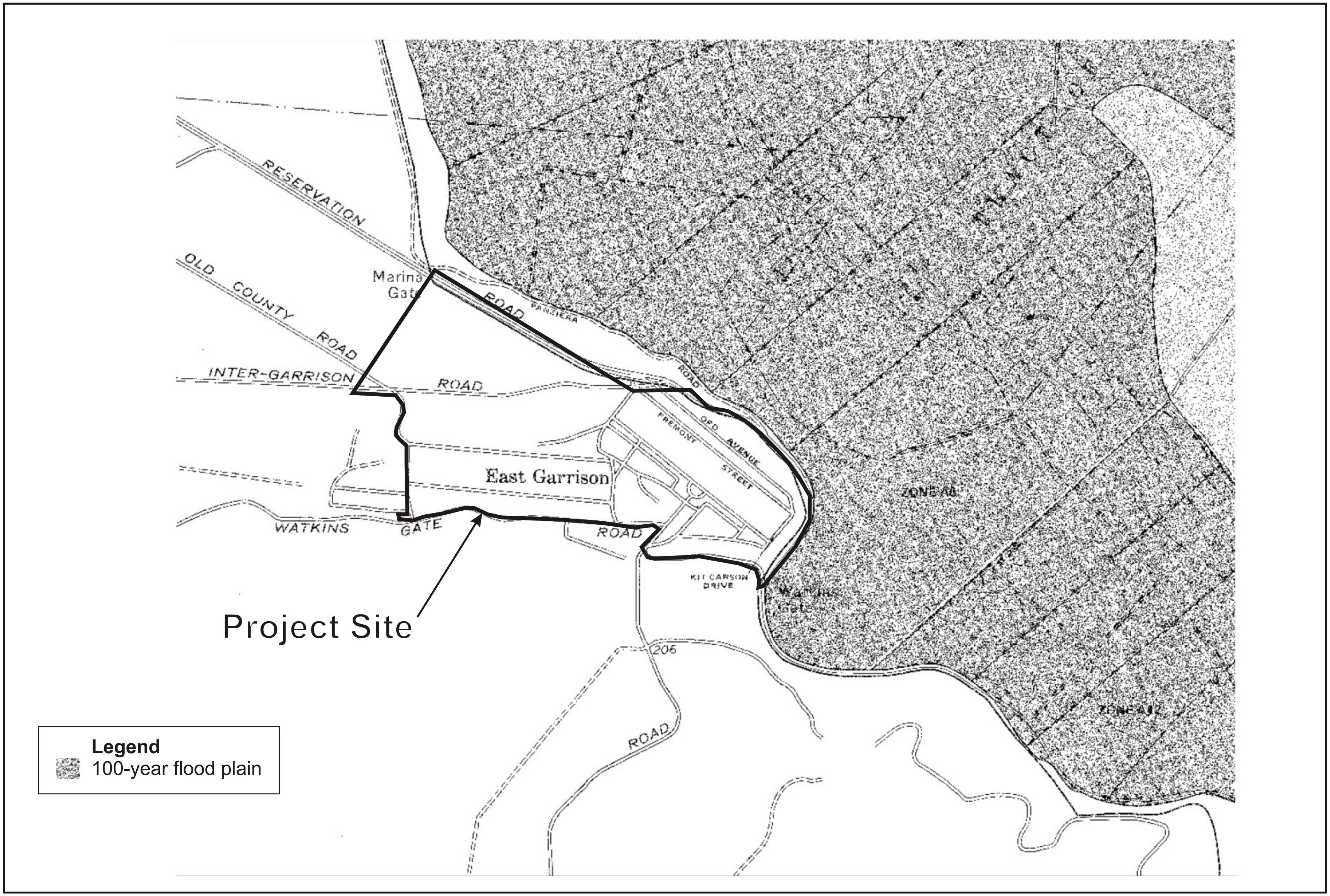
Flood Plain Mapping

The EGSP project site is not in a special flood hazard area (SFHA) as mapped by the Federal Emergency Management Agency (FEMA). The entire site is mapped in Zone C, defined as those areas subject to minimal or no flooding. Exhibit 4.3-1 illustrates the latest FEMA mapping taken from the currently effective *Flood Insurance Rate Map panel 060195 0130 D for Unincorporated Areas of Monterey County* (January 30, 1984). The mapping depicts that the 100-year floodwater surface elevations for the Salinas River will not exceed 37 feet near the property boundary, which is well below the lowest elevation at the site.

Drainage Patterns

The uplands located in the northern portions of FFO, especially those characterized by the Oceano Loamy soils, represent large areas of stabilized dunes built up over time by sands blown in from the ocean shore and/or the mouths of the various rivers draining into Monterey Bay. The high permeability of these soils has worked to preclude the formation of drainage networks of surface streams through the rapid rate of percolation in the soils.

In fact, many areas in the vicinity of the EGSP site have no discernable watersheds in the traditional sense, with the limited amounts of surface runoff gathering at natural low points in the topography where it infiltrates and, to a much lesser extent, evaporates. Surface drainage pathways are often



Source: Balance Hydrologics, Inc., October 2003.

Michael Brandman Associates

NORTH

1,710 855 0 1,710
SCALE IN FEET

Exhibit 4.3-1
FEMA Floodplain Boundaries Map

distinct only near the edge of the upland area where steeper gradients and headward erosion have created limited swale/channel systems. Both runoff gathering low points and limited swale/channel system drainage types are found at the project site, which encompasses portions of two watersheds that will be referred to as the northern and southern watersheds.

- **The northern watershed** is typical of an enclosed drainage that does not have a surface release to the Salinas River. This watershed covers an area of approximately 75 acres, consisting primarily of open space with only a few paved roads. Roughly 45 acres of this watershed currently lie within the project site. The low-point for this watershed is located just to the west of the project near the proposed intersection of Inter-Garrison Road and Reservation Road at an elevation of 169 feet.

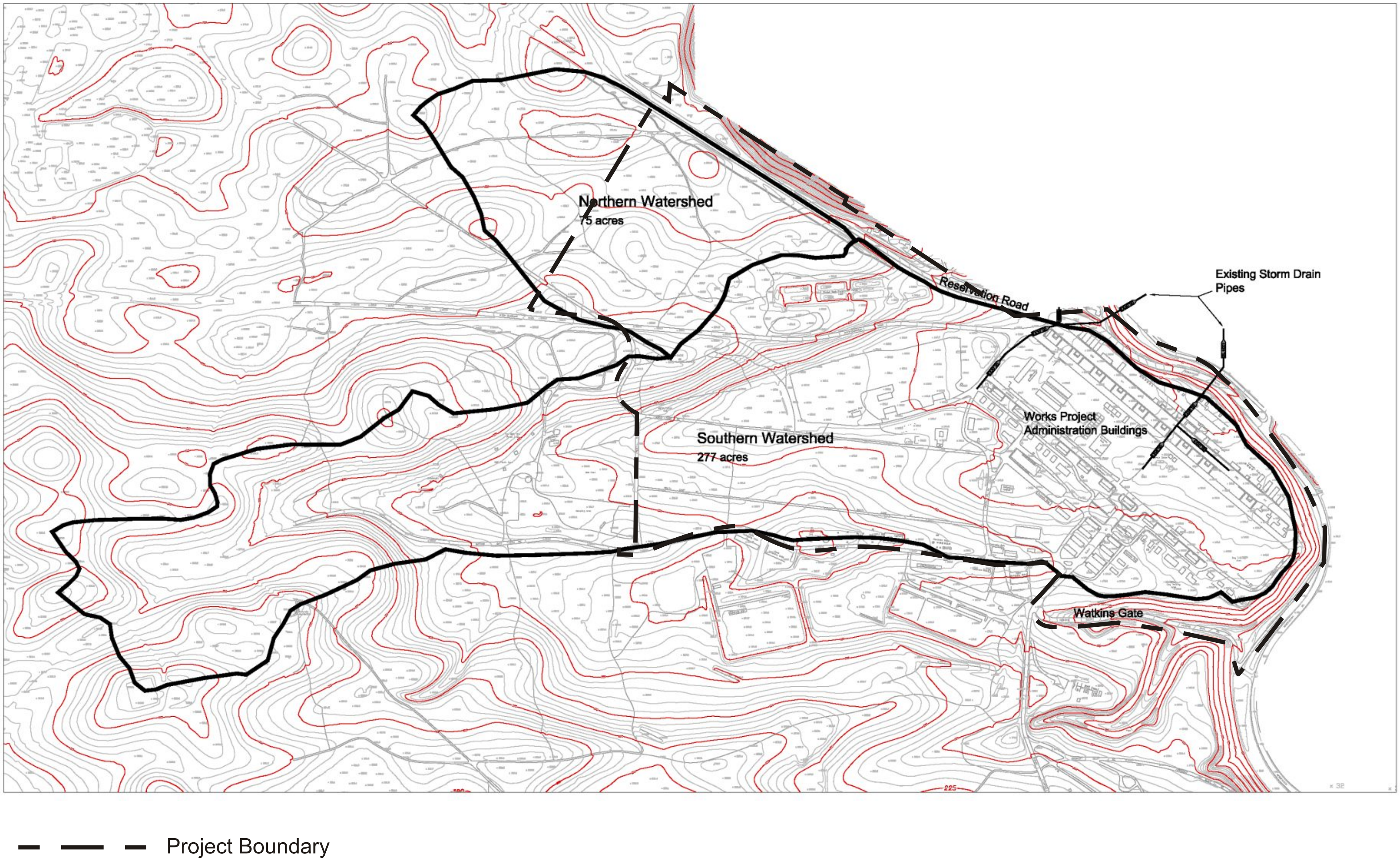
- **The southern watershed** is much larger, with an area of roughly 277 acres of which 177 acres lie within the project site. This watershed has a defined drainage swale that receives runoff from the hills to the west and is characterized by a relatively large amount of existing impervious surfaces associated with the former military uses at East Garrison. As indicated previously, there are a number of existing structures, foundations, and extensive areas of pavement that cover approximately 16 percent of the watershed.

The more developed eastern portions of the site (southern watershed) are served by a drainage system that collects storm water runoff from the site and conveys it down the bluff and across Reservation Road in a 30-inch and a 24-inch storm drain line as shown in Exhibit 4.3-2.[3] There is no significant existing infrastructure for storm water detention, infiltration, or enhancement of water quality in the eastern portion of the site. More specifically, the two storm drain lines discharge into a ditch that borders the intensely farmed Salinas River floodplain below Reservation Road. This ditch carries the runoff from the project site and any storm water flows or excess irrigation water from the agricultural fields to an impoundment area where storm water is stored. It is then pumped to the Salinas River in a 12-inch pipe.

Groundwater

The project site lies above the regionally significant Salinas Valley Groundwater Basin (i.e., Salinas Valley Aquifer system) that is a critical source of water for much of the surrounding area. This groundwater basin aquifer underlies the Salinas Valley from San Ardo to the coast of Monterey Bay and is divided into four hydrologically linked subareas. These areas are the Pressure, East Side, Forebay and Upper Valley areas. The basin consists of what has been historically thought of as three main aquifers, an upper aquifer known as the upper or 180-foot aquifer, a middle or 400-foot aquifer and a deeper aquifer, known as the deep or 900-foot aquifer. While originally thought to be geologically confined in the Marina area, meaning there was no ready physical connection between the aquifers allowing flow between them, recent stratigraphic analysis has indicated that these aquifers are connected hydraulically, with water from the upper layers recharging the lower layers. Additionally, the deep aquifer is in reality a series of aquifers, not all of which are hydraulically connected. As discussed in Section 4.2, Geology and Soils, of this DSEIR, none of the borings conducted as part of the project-related geotechnical studies (as deep as 180 feet) encountered groundwater.

[3] Some storm drain infrastructure exists as far west as West Camp Road, but field inspections show that the catch basins have not been maintained for some time. Therefore, modeling and analysis of the existing hydrologic conditions assume that runoff from the areas west of Chapel Hill Road would be dominated by overland and swale flow.



Source: Balance Hydrologics, Inc., October 2003.

Michael Brandman Associates

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SCALE IN FEET

Exhibit 4.3-2
Existing Land Use and Watershed Boundaries Map

WATER QUALITY

Existing Regulatory Framework

Surface water quality is regulated to protect aquatic life and human health according to the provisions of the Federal Clean Water Act (and associated federal regulations) and the California Porter-Cologne Water Quality Control Act, referred to respectively as the Federal and State Acts. The State Act established the nine Regional Water Quality Control Boards (Regional Boards) and the State Water Resources Control Board (State Board). In California, the discharge permitting provisions of the Federal Act have been delegated by U.S. EPA to the State and Regional Boards.

As indicated previously, the project is located within the jurisdiction of the Central Coast Regional Water Quality Control Board CCRWQCB. The CCRWQCB, which has a Water Quality Control Plan for basins within its jurisdiction (Central Coast Basin Plan) that identifies beneficial uses of surface waters, establishes numeric and narrative objectives for protection of beneficial uses, and sets forth policies to guide the implementation of programs to attain the objectives.

Implementation of the EGSP would result in disturbing an area exceeding an acre. The project is, therefore, subject to National Pollutant Discharge Elimination System (NPDES) permit requirements, as described in further detail later in Section 4.3.2. NPDES permit conformance requires that the project applicant file a Notice of Intent (NOI) to comply with the terms of the General Permit to Discharge Storm Water Associated with Construction Activity and submit a SWPPP to the CCRWQCB. A SWPPP contains a listing and implementation plan for the storm water BMPs that would be implemented during construction of the project to minimize erosion and sedimentation as well as during permanent post-construction operations.

Moreover, urban storm water runoff discharging into the ocean from the project site may locally impair coastal water quality. Because Monterey Bay is designated as a national marine sanctuary, resource protection is assigned a higher priority than research, education programs, and visitor use. The Marine Protection, Research, and Sanctuaries Act of 1972 requires a management plan to protect the sanctuary's resources.

Surface Water Quality

Surface water quality of drainage channels within the project area varies throughout the year. During the first strong rains of the season, ditches and storm drainage systems draining the developed areas of the EGSP site receive the highest concentration of urban pollutants, such as trash, nutrients, oils, grease, heavy metals, pesticide residues, and coliform bacteria. In general, surface waters in the project area are hard and high in total dissolved solids. Winter storms contribute to erosion and gullying in some undeveloped areas. Surface erosion can cause high concentrations of suspended sediment loading causing increased siltation, turbidity, and accompanying high total dissolved solids.

The site does not contain any significant water quality enhancements (i.e., storm water BMPs). Most of the potential pollutants found in the northern watershed are removed through natural conveyance. Flows that are conveyed overland through undeveloped open space (i.e., oak woodlands) and other natural low points in topography on the project site afford some infiltration and biofiltration of runoff and, thus, removal of potential pollutants. A drawback to flows that are conveyed overland is that they tend to create erosion problems, thereby increasing suspended solids in the runoff.

Pollutants found in more urban runoff, such as that associated with the southern watershed, can be classified by the type of land use activity that generates the pollutants. General classifications include Agricultural, Landscape, Transportation, Construction, and Disposal. Typical sources of these pollutants include agricultural practices of fertilizer and pesticide application, outdoor washing activities and generation of soaps that flow into storm drains and surface waters, deposition of contaminants released into the atmosphere (either direct deposition or washed from the atmosphere during rain events), soils that become exposed during construction activities, pollutants from automobiles, and improper disposal or contaminant spills.

The most common characteristics and categories of storm water pollutants are described below. Many of these pollutants are found in urban runoff and would likely be generated by the construction and operation of the proposed project. Runoff pollutants are washed into storm drains and are then conveyed to receiving waters downstream. Receiving waters can assimilate a limited quantity of various constituent elements without becoming “polluted.” However, concentrations of constituent elements beyond certain thresholds are considered pollutants.

Common Characteristics of Surface Runoff

Standard parameters, which can assess the quality of storm water, provide a method of measuring impairment. A background of these typical characteristics assists in understanding water quality requirements. The quantity of a material in the environment and its characteristics determine the availability as a pollutant in surface runoff. In an urbanized area, the quantity of certain pollutants in the environment is a function of the intensity of land use. For instance, a high density of automobile traffic makes a variety of potential pollutants (such as lead and hydrocarbons) more available. The availability of a material, such as a fertilizer, is a function of the quantity and the manner in which it is applied. Applying fertilizer in quantities that exceed plant needs leaves the excess nutrients available for loss to surface or groundwater.

The physical properties and chemical constituents of water have served traditionally as the primary measures for monitoring and evaluating water quality. Evaluating the condition of water via a water quality standard means evaluating its physical, chemical, or biological characteristics. Water quality parameters for storm water comprise a long list and are classified in many ways. In many cases, the concentration of an urban pollutant, rather than the annual load of that pollutant, is needed to assess a water quality problem. Some of the physical, chemical, or biological characteristics by which the quality of surface runoff is measure are outlined below.

Dissolved Oxygen (DO) Dissolved oxygen (DO) in the water has a pronounced effect on the aquatic organisms and the chemical reactions that occur. It is one of the most important biological water quality characteristics in the aquatic environment. The DO concentration of a water body is determined by the solubility of oxygen, which is inversely related to water temperature, pressure, and biological activity. DO is a transient property that can fluctuate rapidly in time and space. DO represents the status of the water system at a particular point and time of sampling. The decomposition of organic debris in water is a slow process and the resulting changes in oxygen status respond slowly also. The oxygen demand is an indication of the pollutant load and includes measurements of biochemical oxygen demand or chemical oxygen demand.

Biochemical Oxygen Demand (BOD)

The biochemical oxygen demand (BOD) is an index of the oxygen-demanding properties of the biodegradable material in the water. Samples are taken from the field and incubated in the laboratory at 20°C, after which the residual dissolved oxygen is measured. The BOD value commonly referenced is the standard five-day values. This value is useful in assessing stream pollution loads and for comparison purposes.

Chemical Oxygen Demand (COD)

The chemical oxygen demand (COD) is a measure of the pollutant loading in terms of complete chemical oxidation using strong oxidizing agents. It can be determined quickly because it does not rely on bacteriological actions as with BOD. COD does not necessarily provide a good index of oxygen demanding properties in natural waters.

Total Dissolved Solids (TDS)

TDS concentration is determined by evaporation of a filtered sample to obtain residue whose weight is divided by the sample volume. The TDS of natural waters varies widely. There are several reasons why TDS is an important indicator of water quality. Dissolved solids affect the ionic bonding strength related to other pollutants such as metals in the water. TDS are also a major determinant of aquatic habitat. TDS affects saturation concentration of dissolved oxygen and influences the ability of a water body to assimilate wastes. Eutrophication rates depend on total dissolved solids.

pH

The pH of water is the negative log, base 10, of the hydrogen ion (H^+) activity. A pH of 7 is neutral; a pH greater than 7 indicates alkaline water; a pH less than 7 represents acidic water. In natural water, carbon dioxide reactions are some of the most important in establishing pH. The pH at any one time is an indication of the balance of chemical equilibrium in water and affects the availability of certain chemicals or nutrients in water for uptake by plants. The pH of water directly affects fish and other aquatic life and generally toxic limits are pH values less than 4.8 and greater than 9.2.

Alkalinity

Alkalinity is the opposite of acidity, representing the capacity of water to neutralize acid. Alkalinity is also linked to pH and is caused by the presence of carbonate, bicarbonate, and hydroxide, which are formed when carbon dioxide is dissolved. A high alkalinity is associated with a high pH and excessive solids. Most streams have alkalinities less than 200 milligrams per liter (mg/l) and ranges of alkalinity of 100-200 mg/l seem to support well-diversified aquatic life.

Specific Conductance

The specific conductivity of water, or its ability to conduct an electric current, is related to the total dissolved ionic solids. Long-term monitoring of project waters can indicate a relationship between specific conductivity and TDS. The measurement of conductance is quick and inexpensive and can be used to approximate TDS. Specific conductivities in excess of 2000 μohms/cm indicate a TDS level too high for most freshwater fish.

Turbidity

The clarity of water is an important indicator of water quality that relates to the alkalinity of photosynthetic light to penetrate. Turbidity is an indicator of the property of water that causes light to become scattered or absorbed. Suspended clays and other organic particles cause turbidity. It can be used as an indicator of certain water quality constituents such as predicting the sediment concentrations.

Nitrogen (N)

Sources of nitrogen in storm water result from the additions of organic matter to water bodies or chemical additions. Ammonia and nitrate are important nutrients for the growth of algae and other plants. Excessive nitrogen can lead to eutrophication since nitrification consumes dissolved oxygen in the water. Nitrogen occurs in many forms. Organic Nitrogen breaks down into ammonia, which eventually becomes oxidized to nitrate-nitrogen, a form available for plants. High concentrations of nitrate-nitrogen (N/N) in water can stimulate growth in algae and other aquatic plants, but if phosphorus (P) is present, only about 0.30 mg/l of nitrate-nitrogen is needed for algal blooms. Some fish life can be negatively affected when nitrate-nitrogen exceeds 4.2 mg/l. There are a number of ways to measure the various forms of aquatic nitrogen. Typical measurements of nitrogen include Kjeldahl nitrogen (organic nitrogen plus ammonia); ammonia; nitrite plus nitrate; nitrite; and nitrogen in plants. The principal water quality criteria for nitrogen focus on nitrate and ammonia.

Phosphorus (P)

Phosphorus is an important component of organic matter. In many water bodies, phosphorus is the limiting nutrient that prevents additional biological activity from occurring. The origin of this constituent in urban storm water discharge is generally from fertilizers and other industrial products. Orthophosphate is soluble and is considered the only biological available form of phosphorus. Since phosphorus strongly associates with solid particles and is a significant part of organic material, sediments influence concentration in water and are an important component of the phosphorus cycle in streams. The primary methods of measurement include detecting orthophosphate and total phosphorus.

Common Categories of Storm Water Pollutants

Sediment

Sediment is made up of tiny soil particles that are washed or blown into surface waters. It is typically the major pollutant by volume in surface water. Suspended soil particles can cause the water to look cloudy or turbid. The fine sediment particles also act as a vehicle to transport other pollutants including nutrients, trace metals, and hydrocarbons. Construction sites are the largest source of sediment for urban areas under development. Another major source of sediment is stream bank erosion, which may be accelerated by increases in peak rates and volumes of runoff due to urbanization.

Nutrients

Nutrients are a major concern for surface water quality, especially phosphorous and nitrogen, which can cause algal blooms and excessive vegetative growth. Of the two, phosphorus is usually the limiting nutrient that controls the growth of algae in lakes or other non-moving water bodies. The orthophosphorous form of phosphorus is a readily available nutrient for plant growth. The ammonium form of nitrogen can also have severe effects on surface water quality. The ammonium is converted to nitrate and nitrite forms of nitrogen in a process called nitrification. This process consumes large amounts of oxygen, which can impair the dissolved oxygen levels in water. The nitrate form of nitrogen is very soluble and is found naturally at low levels in water. When nitrogen fertilizer is applied to lawns or other areas in excess of plant needs, nitrates can leach below the root zone, eventually reaching groundwater. Orthophosphate from auto emissions also contributes phosphorus in areas with heavy automobile traffic. As a general rule of thumb, nutrient export is greatest from development sites with large impervious areas. Other problems resulting from excess nutrients are: 1) surface algal scums, 2) water discolorations, 3) odors, 4) toxic releases, and 5) overgrowth of plants. Common measures for nutrients are total nitrogen, organic nitrogen, total Kjeldahl nitrogen (TKN), nitrate, ammonia, total phosphate, and total organic carbon (TOC).

Trace Metals

Trace metals are primarily of concern because of their toxic effects on aquatic life and their potential to contaminate drinking water supplies. The most common trace metals found in urban runoff are lead, zinc, and copper. Fallout from automobile emissions is also a major source of lead in urban areas. A large fraction of the trace metals in urban runoff are attached to sediment and this effectively reduces the level that is immediately available for biological uptake and subsequent bioaccumulation. Metals associated with the sediment settle out rapidly and accumulate in the soils. Also, urban runoff events typically occur over a short duration, which reduces the amount of exposure, which could be toxic to the aquatic environment. The toxicity of trace metals in runoff varies with the hardness of the receiving water. As total "hardness" of the water increases, the threshold concentration levels for adverse effects increases.

Oxygen-Demanding Substances

Aquatic life is dependent on the dissolved oxygen (DO) in water. When organic matter is consumed by microorganisms, the DO is also consumed in the process. A rainfall event can deposit large quantities of oxygen demanding substances in lakes and streams. The biochemical oxygen demand of typical urban runoff is on the same order of magnitude as the effluent from an effective secondary wastewater treatment plant. A problem from low DO can result when the rate of oxygen-demanding material exceeds the rate of replenishment. Oxygen demand is estimated by direct measure of DO and indirect measures such as biochemical oxygen demand (BOD), chemical oxygen demand (COD), oils and grease, and total organic carbon (TOC).

Bacteria

Bacteria levels in undiluted urban runoff exceed public health standards for water contact recreation almost without exception. Studies have found that total coliform counts exceeded EPA water quality criteria at almost every site examined and almost for each time it rained. The coliform bacteria that are detected may not be a health risk in themselves, but are often associated with human pathogens.

Oil and Grease Oil and grease contain a wide variety of hydrocarbons some of which could be toxic to aquatic life in low concentrations. These materials initially float on water and create the familiar rainbow-colored film. Hydrocarbons have a strong affinity for sediment and quickly become absorbed to it. The major source of hydrocarbons in urban runoff is through leakage of crankcase oil and other lubricating agents from automobiles into pervious surfaces. Hydrocarbon levels are highest in the runoff from parking lots, roads, and service stations. Residential land uses generate less hydrocarbons export, although illegal disposal of waste oil into storm waters can be a local problem.

Other Toxic Chemicals Priority pollutants are generally related to hazardous wastes or toxic chemicals and are occasionally detected in storm water. Priority pollutant scans have been conducted in previous studies of urban runoff, which evaluated the presence of over 120 toxic chemical and compounds. The scans rarely revealed toxins that exceeded the current safety criteria. The urban runoff scans were primarily conducted in suburban areas not expected to have many sources of toxic pollutants (with the possible exception of illegally disposed or applied household hazardous wastes). Measures of priority pollutants in storm water include: 1) phthalate (plasticizer compound), 2) phenols and creosols (wood preservatives), 3) pesticides and herbicides, 4) oils and greases, and 5) metals.

Groundwater Quality

Seawater Intrusion

Seawater intrusion into the Salinas Valley Groundwater Basin's upper and middle aquifers of the Pressure sub-area has been documented since the 1940s and is continuing. Recent preliminary findings regarding the deep aquifers in the FFO area indicate that pumping from the deep aquifers can affect the rate of seawater intrusion in the middle and upper aquifers as the deep aquifers' sources of recharge are these overlying aquifers. Thus, while abandonment of wells in the upper and middle aquifers for wells in the deep aquifers can restore potable supplies, they do not lessen the landward progression of seawater intrusion. Additionally, increased pumping of the deep aquifers is expected to increase the rate of seawater intrusion in the middle and upper aquifers, according to the *Deep Aquifer Investigative Study* prepared by WRIME in May 2003. Among other issues, this report analyzed the increasing flow rate of landward movement of seawater into the freshwater aquifers (groundwater flow across the coast or seawater intrusion). The report stated that as pumping in the deep aquifers increased, the landward flow of groundwater increased.

A chloride concentration of 500 milligrams per liter (mg/L) is the short-term EPA Secondary Drinking Water Standard for chloride and is used as a measure of impairment of water. The line of chloride concentration of 500 mg/L water is therefore used as the basis for determining the seawater intrusion front. Seawater intrusion has forced the Marina Coast Water District (MCWD) to close its wells in the upper and middle aquifers and drill wells in the deep aquifer. The FFO's original shallower groundwater wells in the Salinas Valley Groundwater Basin were located closer to the coast. These wells progressively suffered from advancing seawater intrusion. New wells were constructed further inland in the pressure sub-area of the Salinas Valley Groundwater Basin and completed in the upper and middle aquifers.

Trichloroethylene (TCE)

In June 2002, the contaminant trichloroethylene (TCE), a cleaning solvent, was found in one of the three water supply wells at the FFO. The contamination comes from landfills near Imjin Road that were formerly used by the Army but are now closed. The Army has responded to the landfill contamination problem by installing extensive cleanup systems to remove the contamination and prevent its further migration. The Army has also been monitoring groundwater quality at the FFO for a number of years to understand the location and movement of groundwater contamination caused by the closed landfills.

The amount of TCE found in the one well was just above detection limits at 0.53 parts per billion (ppb). State and federal safe drinking water standards allow a Maximum Contaminant Level for TCE of 5.0 ppb, or approximately one full magnitude higher than detected. Detection of TCE, even at the low concentration of 0.53 ppb, was reported, as required by law, to the California Department of Health Services (DHS). No additional action was deemed necessary by the DHS because the concentration levels are well below 5.0 ppb. Both the MCWD and the Army have been regularly monitoring the wells to see whether traces of TCE continue to exist. No TCE was detected in the monitoring done in July 2003. Over the past year, fluctuations in the readings have ranged from undetected to a high of 0.81 ppb, still substantially below the health standard of 5.0 ppb.

Nitrate

The Salinas Valley Groundwater Basin is also suffering from nitrate contamination, a pollutant coming primarily from animal confinement activities (dairies, feedlots, etc.) with contribution from irrigated agriculture, sewage treatment plant effluent, and septic tanks. This contamination is a concern, particularly in upper reaches of the 180-foot aquifer. Many contaminated wells exceed the state health standard of 45 mg/L of Nitrate as NO3. Nitrate levels in the 400-foot aquifer are low due to intervening clay layers between the 180- and 400-foot aquifers. No nitrate problems are evident in any of the MCWD’s wells.

4.3.2 Project Impacts and Mitigation Measures

IMPACT ANALYSIS AND MITIGATION MEASURES

Thresholds of Significance

The proposed project is considered to have a significant impact upon hydrology and water quality if it will:

- Violate any water quality standards or water discharge requirements;
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level;
- Substantially alter the existing drainage pattern of the site or areas, including alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on-or off-site;

- 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 that will result in flooding on- or off-site, or

- Create or contribute runoff water, which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.

Methodology

Two independent hydrologic analysis methods were used to assess the storm water management needs of the site. The needs included identifying the required size and design of the storm water basins to control peak flows and managing water quality.

The first methodology, the rational method, was used to calculate the peak flow for the existing conditions 10-year storm event, which is the target post-development peak flow for the southern watershed.[4] These calculations were carried out using Monterey County Water Resources Agency (MCWRA) guidelines.

One limitation of the rational method is that it provides no information on whether routing longer duration storms through the basin would result in having post-project flows not exceed the existing condition 10-year rates. Therefore, a second approach was applied using the SCS curve number methodology to route a representative 100-year 24-hour storm through the proposed basins. Pertinent modeling parameters for this methodology are summarized in the hydrology technical report located in Appendix C of this DSEIR.

Hydrology for the project analysis was modeled using the SCS methodology in the U.S. Army Corps of Engineers HEC-1 software. For the northern watershed, the purpose of the modeling was to assess the amount of total storage volume needed to contain the anticipated 100-year 24-hour storm since there would be no surface release from the basin. For the southern watershed, the purpose was to identify appropriate basin designs (including preliminary outlet designs) that would reduce the 100-year peak discharge to or below the pre-project 10-year peak.

Peak Storm Water Flows

Impact 4.3-A	**Implementation of the EGSP will increase the impervious surface area on the project site, thereby altering the existing drainage pattern and amount of surface runoff resulting in a potential increase in peak storm water flows (i.e., 10- and 100-year storm events). (Less than Significant)**

Control of peak storm water flows is an integral element in the design of the storm water basins at the EGSP site, as described in detail below. To control these flows, the MCWRA requires that the post-project 100-year flow rate not exceed the pre-project 10-year flow rate.

To comply with the requirements of the MCWRA, implementation of the project will require replacement of the entire storm drain system on the EGSP site to accommodate the proposed development. Both the northern and southern watersheds will use a conventional gravity-flow storm drain network to collect runoff from the site and route it to new storm water basins, as shown in

[4] This peak flow amount is also an appropriate design goal for the north watershed. However, the north storm water basin, which currently exists as a local sump, will infiltrate all runoff from storms up to the magnitude of the 100-year design storm. Therefore, peak flow is not a specific design criterion for the northern watershed.

Exhibit 4.3-3. Grading associated with the project will create minor shifts in the boundaries of the two watersheds.

The area of the northern watershed, which includes a developed sub-watershed and an undeveloped sub-watershed, will increase by approximately 7 acres to a total of 84 acres. This post-project watershed will consist of roughly 53 acres of residential uses and 31 acres of undeveloped open space off-site. Runoff from the northern watershed will be captured, routed, and infiltrated (i.e., percolated in ground) into the existing sump that will serve as a storm water basin (i.e., north basin) along the western edge of the project (see Exhibit 4.3-3). Preliminary grading designs for this basin show a total available storage volume of approximately 56 acre-feet, although only a small fraction of this total would be used under implementation of the EGSP (i.e., 7 percent of available volume or 3.92-acre-feet). This volume is equivalent to a maximum ponded depth of roughly 3 feet with the assumption that the basin is dry at the beginning of the 100-year storm. Therefore, with implementation of the proposed project, the north basin will easily accommodate the 100-year 24-hour storm.

As shown on Exhibit 4.3-3, the boundaries of the post-project southern watershed, which was divided into four sub-watersheds (i.e., southwestern undeveloped watershed, southwestern developed watershed, southeastern developed watershed, and southeastern undetained watershed for the purpose of the hydrologic analysis), will also change slightly, resulting in a 4-acre decrease in area under the EGSP, for a total 273 acres. A large portion of the southern watershed (i.e., southwestern undeveloped watershed) is located outside of the EGSP site and will not be developed as part of the proposed project. Runoff from this undeveloped southwestern portion of the watershed, covering 102 acres of open space and Monterey Bay Youth Camp lands, will be collected by a headwall and pipe at the western edge of the development and will be routed through the project to one of the two proposed storm water basins.

As indicated previously, an area of approximately 1.5 acres near Reservation Road within the southeastern undetained watershed is at too low an elevation to drain into the storm water basins and constitutes a small post-project watershed that will drain directly from the site (see Exhibit 4.3-3). The amount of this runoff is considered negligible and would not exceed existing flows.

The remaining 171 acres of the post-project southern watershed includes mixed-use development at its eastern end (see Exhibit 4.3-3). There will be one basin for each of the “developed” sub-watersheds that drain into the existing storm drain lines (i.e., outfall pipes) that leave the site. An underground storm drain network will collect and route runoff from this watershed to the two storm water basins (i.e., southwest basin and southeast basin). Preliminary designs for the southwest basin are based on a broad, gently sloping grading configuration that will accommodate athletic fields as an additional multiple use. This basin will have a total available storage volume of roughly 9.5-acre-feet. The large surface area of this basin will be ideal for promoting infiltration of runoff. The outlet from this basin will be regulated by a riser or box structure with an appropriately-sized orifice to control outflow.

The design of the southeast basin will be different from the southwest basin. More specifically, it will be located adjacent to the edge of the bluff. Geotechnical investigations determined that the basin bottom should be impermeable to eliminate percolation, which could cause slope instability. This will be accomplished through appropriate lining techniques and/or use of cemented soil in the basin bottom. This basin will also include a riser or box structure with an orifice to control outflow and a new pipe that will serve as an emergency spillway to convey any overflow to the bottom of the bluff and past Reservation Road. The water-quality benefits of this basin will be primarily through the removal of sediments and sediment-borne constituents. The total storage volume available in this basin is 6.3-acre-feet.

Overall, the existing 10-year flow from the southern watershed is approximately 46 cfs. The post-project peak discharge for the 100-year event would be approximately 105 cfs without the two storm water basins to control peak outflow. The proposed storm water basins are capable of reducing the 100-year storm outflow to 38 cfs, well below the existing 10-year discharge. This value is conservative since no percolation is included for the southwestern basin. However, it is important to note that the final outflow value may increase slightly as a result of final design changes, but would always be below the existing peak flow rate of 46 cfs. Peak storage for the 100-year event is projected to be 3.8-acre-feet for the southwest basin and 5.3-acre-feet for the southeast basin. However, runoff is anticipated to leave the site for larger storm events (for example storms larger than the two-year storm), although at a lower peak rate than under existing conditions.

Mitigation Measures

4.3-A-1 No mitigation measures are necessary.

Significance After Mitigation

Less than significant.

Groundwater

Impact 4.3-B	**Implementation of the EGSP may affect or interfere with groundwater recharge, thereby depleting groundwater supplies to the underlying aquifer. (Less than Significant)**

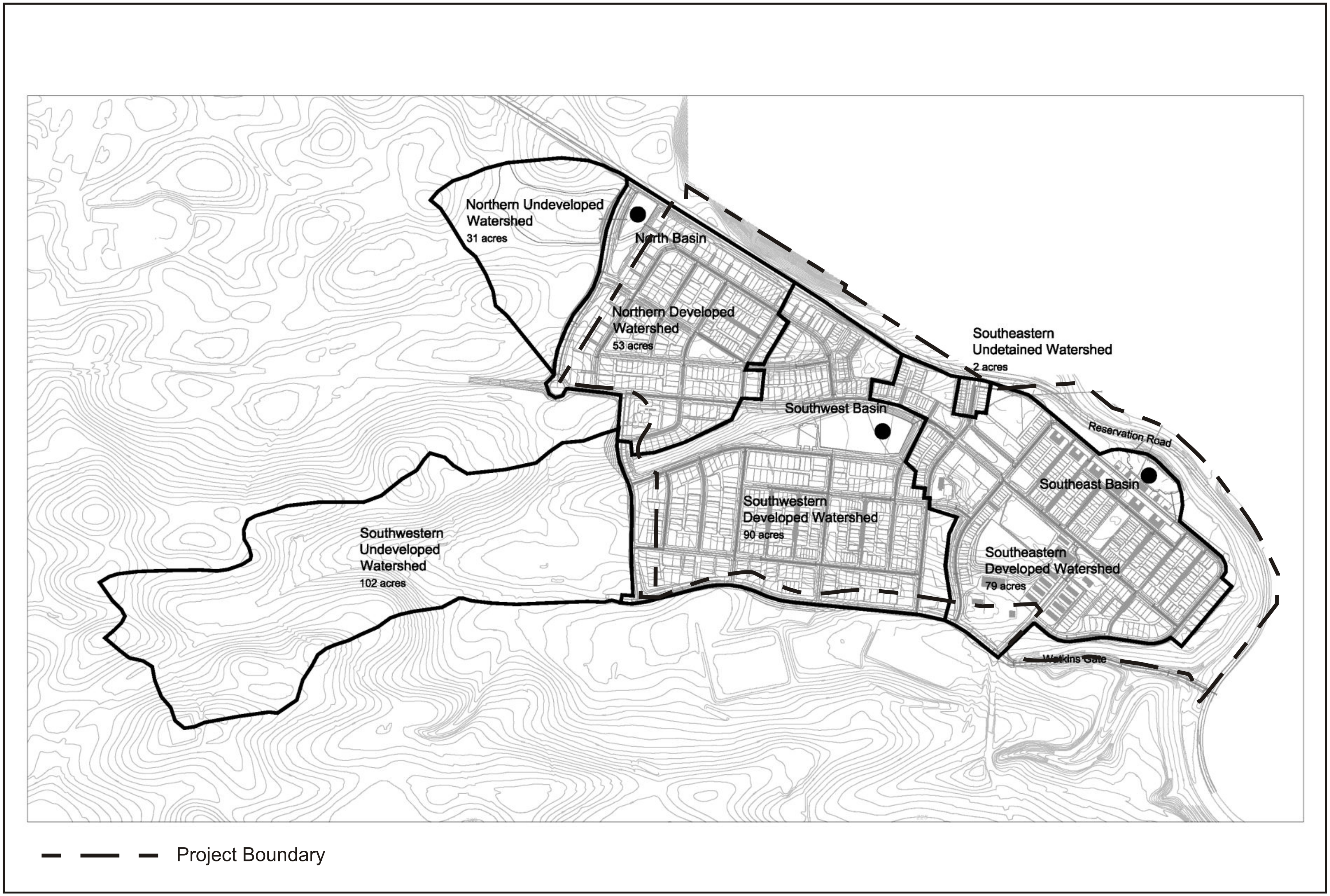
Project implementation will result in the transition of the project site to primarily urban uses. These uses will introduce impervious surfaces that may interfere with groundwater recharge. Thus, maintaining or enhancing groundwater recharge is one of the primary objectives of the storm water management strategy for the project site. Two of the proposed basins have been designed to promote the recharge of runoff from the project. More specifically, preliminary calculations show that the basins will be capable of percolating the anticipated runoff from the small to moderate-sized rainfall events that constitute the vast majority of the annual precipitation. Runoff is anticipated to leave the site for larger storm events (for example storms larger than the two-year storm). However, the effect on overall recharge from the site is expected to be greater in the post project condition due to the already large area of existing impervious surfaces, resulting in a significant amount of pre-development runoff, and the addition of the new basins.

Mitigation Measures

4.3-B-1 No mitigation measures are necessary.

Significance After Mitigation

Less than significant.



Source: Balance Hydrologics, Inc., October 2003.

Michael Brandman Associates

1,000 500 0 1,000
SCALE IN FEET

NORTH

Exhibit 4.3-3
Post-Project Drainage Areas and Basin Locations

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Short-Term Water Quality

Impact 4.3-C **Construction-related activities resulting from implementation of the EGSP may result in the degradation of surface water quality. (Less than Significant)**

Project implementation will require extensive construction and grading. During these activities, there will be the potential for surface water to carry sediment from onsite erosion and small quantities of pollutants into the storm water system and local waterways. Soil erosion may occur along project boundaries during construction in areas where temporary soil storage is required. Small quantities of pollutants have the potential for entering the storm drainage system, thereby potentially degrading water quality.

Construction of the EGSP project will also require the use of gasoline and diesel powered heavy equipment, such as bulldozers, backhoes, water pumps, and air compressors. Chemicals such as gasoline, diesel fuel, lubricating oil, hydraulic oil, lubricating grease, automatic transmission fluid, paints, solvents, glues, and other substances will be utilized during construction. An accidental release of any of these substances could degrade the water quality of the surface water runoff and add additional sources of pollution into the drainage system.

As indicated previously, implementation of the proposed project would result in an area of disturbance of more than 1 acre. To assure implementation of the EGSP would not adversely affect short-term water quality, the project would comply with NPDES permit requirements. This would require the project to prepare a Storm Water Pollution Prevention Plan (SWPPP), which would incorporate Best Management Practices (BMPs) to control erosion, siltation, and contaminated runoff from construction sites. BMPs for storm water quality treatment are classified as structural and non-structural. Structural measures may include biofilters, wetlands, infiltration basins, or mechanical structures designed to remove pollutants from storm water. Non-structural measures such as street sweeping, public education, or hazardous substance recycling centers are preventive measures intended to control the source of pollutants. Typical BMPs that are included within NPDES permit requirements include:

- Use of sand bags and temporary desiltation basins during project grading and construction during the rainy season (November through April) to prevent discharge of sediment-laden runoff into storm water facilities;

- Installation of landscaping as soon as possible after completion of grading to reduce sediment transport during storms;

- Hydroseeding of graded building pads if they are not built upon before the onset of the rainy season;

- Incorporation of structural BMPs (e.g., grease traps, debris, screens, continuous deflection separators, oil/water separators, drain inlet inserts) into the project design to provide detention and filtering of contaminants in urban runoff from the developed site prior to discharge to storm water facilities; and

- Stenciling of catch basins and other publicly visible flood control facilities with the phrase, “Don’t Dump - Pollutes Our Creeks.”

Additionally, prior to construction grading, the applicant must file a Notice of Intent (NOI) to comply with the General Permit and prepare the SWPPP, which addresses the measures that will be included in the project to minimize and control construction and post-construction runoff to the "maximum extent practicable." Moreover, project grading plans will conform to the drainage and erosion standard adopted by the County of Monterey and are subject to approval of Monterey County. The SWPPP will also be reviewed by the MCWRA to ensure adequacy and appropriateness of BMPs. The following specific measures, or their equivalent, will be included in the SWPPP, which will be implemented to prevent storm water pollution and minimize potential sedimentation during construction.

- Restrict grading to dry season (April through October) or use BMPs for wet season erosion control;
- Preclude non-storm water discharges to the storm water system;
- Perform monitoring of discharges to the storm water system;
- Construction practices will include the use of stabilized construction entrances and/or wash racks, street sweeping, use of erosion control devices, including damp sweeping, straw bales and/or silt fences, and storm drain inlet protection to minimize contamination from storm water runoff;
- Provide temporary cover of disturbed surfaces to help erosion control during construction; and
- Provide permanent cover to stabilize the disturbed surfaces after construction has been completed.

Mitigation Measures

4.3-C-1 No mitigation measures are necessary.

Significance After Mitigation

Less than significant.

Long-Term Water Quality

Impact 4.3-D	**In the long-term, Implementation of the EGSP may result in aggravating existing seawater intrusion, in addition to potentially exposing persons to drinking water that has low levels of TCE, and increasing urban pollutants in surface runoff. (Less than Significant)**

Seawater Intrusion

The potable water supply at the FFO is from the Pressure Zone of the Salinas Valley Groundwater Basin. The water demands of the EGSP project as forecasted in *Marina Coast Water District's Urban Water Management Plan* (December 2001) will proportionately increase the rate of seawater intrusion and the need for the MCWD to invest to protect its water supply from this intrusion.

The MCWD and all the jurisdictions represented under the Fort Ord Reuse Authority (FORA) have recognized the need to invest in the MCWD's water supply system and the inevitable need to respond to seawater intrusion. Accordingly, the MCWD's current Capital Improvement Program includes development of new water supply wells situated away from the seawater intrusion front, with construction of a new well in fiscal year 2004 (FY-04), and the rehabilitation of two wells in FY 07-

08. A new monitoring well in the deep aquifers is also being constructed. Plans are also underway to develop a water augmentation supply for the Fort Ord Community Service Area. In FY-03 $700,000 was budgeted in planning for this augmentation. A capital fund from FORA of $19,000,000 is accumulating and will be available to support the selected project. The MCWD also anticipates a $10,000,000 capital project for additional supply development beyond 2015.

The MCWD will continue to monitor and develop better information on the rate of seawater intrusion. This information will feed back to further planning and capital programming in order to assure supply reliability is not outstripped by growing demands. This may require additional investment in the water system not already under development or planning. Provided this monitoring is continued and planning and investment proceeds to develop new supplies ahead of any potential loss of existing groundwater wells, a reliable, high quality supply can be maintained for the EGSP project as well as MCWD service area as a whole.

Trichloroethylene

In order to further reduce any potential contamination before water is distributed to housing and ancillary facilities at the FFO, water from the well which has had TCE detected is being blended with water from other wells without traces of TCE. Blending is an approved method for diluting contaminants. In this case, blending serves as an extra precautionary assurance. The detected TCE level is already very low and is well within the mandated State and Federal health standards. In addition, the MCWD has voluntarily reduced pumping of water from the affected well.

The MCWD is continuing to monitor the affected well, and all other wells, for TCE and/or any other contaminants on a regular basis. Any changes due to increased pumping rates in other parts of the aquifers from which MCWD draws its water will be monitored and appropriate actions taken. Meanwhile, the drinking water supply at the FFO remains completely safe for potable use.

Urban Pollutants

In the long-term, the proposed project will result in an increase in urban runoff. Typical pollutants found in urban runoff include oil grease, heavy metals, sediment, pesticide, residues, and fertilizers from roadways, parking lots, rooftops, and other surfaces. The CCRWQCB is currently in the process of implementing project design guidelines requiring that 85 percent of the mean annual runoff is subject to appropriate BMP measures. The EGSP project proposes a variety of BMPs to reach this goal including nonstructural and structural source control and site design measures, as described previously. Source control BMPs will likely include regular street sweeping by the Community Service District, chemical application guidelines for landscape management in public areas, public education materials, and stenciling of catch basins and inlets. Site design measures include the appropriate use of reduced street widths to minimize directly-connected impervious area.

The storm water basins will be the principal structural water-quality control measure controlling long-term water quality at the site. The primary method for water quality enhancement in the north and southwest basins will be through percolation, which is a highly effective removal mechanism for pollutants typically found in storm water runoff. This mechanism is especially effective when the basins infiltrate all, or a large portion of, the incoming runoff from smaller storms, eliminating significant off-site transport of constituents. Numerous studies have shown that the pollutants from infiltrated runoff in appropriately designed basins are sequestered in the topmost soil layers and have essentially no potential for contaminating local groundwater resources. This is especially true where appropriate pre-treatment (for example, in basin forebays) removes fine sediments that might otherwise impair the infiltration capacity of the basins.