3.3 WATER RESOURCES

3.3.1 SURFACE WATER

WILFRED SITE

Watershed

The Wilfred site is located in the Laguna de Santa Rosa watershed, within the Santa Rosa Plain Sub-basin of the Santa Rosa Valley Groundwater Basin (City of Rohnert Park, 2005). The Laguna de Santa Rosa is the Russian River's largest tributary and one of the larger freshwater wetlands in northern California (Sonoma Land Trust and Laguna de Santa Rosa Foundation, 2003) (**Figure 3.3-1**).

At the south end of the Wilfred site, the Laguna de Santa Rosa is a broad, shallow, excavated channel more than 300 feet wide and less than 40 feet deep. According to a recent Biological Assessment, the Laguna de Santa Rosa is seasonally eutrophic (Entrix, 2004). A Total Maximum Daily Load (TMDL) for ammonia and dissolved oxygen (DO) was proposed in 1995 (Morris, 1995), and was established by the Regional Water Quality Control Board (RWQCB) and United States Environmental Protection Agency (USEPA) (for total nitrogen and ammonia) in 2004 (Santa Rosa, 2004e). However, the nutrient-rich bottom deposits in the Laguna de Santa Rosa continue to decrease DO (Entrix, 2004).

The Wilfred site is divided by the Bellevue-Wilfred Channel, which is a manmade flood control channel. The Bellevue-Wilfred Channel drains into the Laguna de Santa Rosa immediately south of the site (The Huffman-Broadway Group, Inc., 2006). The Sonoma County Water Agency (SCWA), the principal water agency of the region, manages this channel (KOMEX, 2007a), **Appendix G**.

The Wilfred site contains several depressions that retain standing water in the winter and spring. These depressions are concentrated in the western portion of the site, near the Bellevue-Wilfred Channel. The Bellevue-Wilfred Channel contains gently flowing water year-round (The Huffman-Broadway Group, Inc., 2006).

Floodplain

Federal Executive Order 11988 addresses floodplain management. The order requires the evaluation of actions taken in a floodplain. Specifically, the order states that agencies shall first determine whether the proposed action will occur in a floodplain. Second, if an agency proposes to allow an action to be located in a floodplain, "the agency shall consider alternatives to avoid adverse effects and incompatible development in the floodplains." Finally, if the only practicable

Figure 3.3-1, Laguna de Santa Rosa Watershed Map alternative action requires siting in a floodplain, the agency shall "minimize potential harm to or within the floodplain."

The Federal Emergency Management Agency (FEMA) designates flood zones based on the chance of flooding in any given year. Flood Zone A has a one-percent annual chance of flooding, for which no Base Flood Elevations (BFEs) have been determined. A BFE is the computed elevation to which a 100-year flood is expected to rise. Flood Zone A is commonly referred to as the 100-year floodplain. Flood Zone X has a 0.2 percent annual chance of flooding; a one percent chance of flooding with an average depth of less than one foot or with a drainage area of less than one square mile; or is protected by levees from a one percent annual chance of flooding. Flood Zone X is outside of areas with a one-percent or 0.2-percent annual chance of flooding and is commonly referred to as the 500-year floodplain, although some shallow flooding could occur during a 100-year flood.

Based on the Flood Insurance Rate Maps (FIRM) prepared by the FEMA, the northeast corner Wilfred site is located outside of the 100-year flood zone. Most of the balance of the site is located within the 100-year flood zone. The approximate flood zone designations for the Wilfred site are depicted on the FEMA Flood Zone Map, **Figure 3.3-2**. Surface water emanating from the site generally flows into ditches tributary to the Bellevue-Wilfred Channel. From there, the water flows to the Laguna de Santa Rosa and then to the Russian River. Runoff from the Wilfred site was assessed in a technical report, "*Site Grading and Storm Drainage* (Robert A. Karn & Associates, Inc., 2007). This report discusses the existing on-site drainage and is included as **Appendix C**.

Surface Water Quality

The Laguna de Santa Rosa is currently on the list of Clean Water Act 303(d) impaired waterbodies. Nutrient loading in runoff; elevated water temperature; levels of nitrogen (N) and phosphorous (K); erosion; sedimentation; and lowered dissolved oxygen affect the Laguna de Santa Rosa's water (State Water Board, 2003). In 1995, the RWQCB waste reduction strategy was to reduce total N in the Laguna to levels that inhibit rapid algal growth. Concentrations of 3.7 milligrams per liter (mg/l) with an annual loading of 116,000 pounds per year of total N from all sources was thought to be the allowable load (equivalent to the modern "Total Maximum Daily Load" at that time) (Morris, 1995). Since 1995, the City of Santa Rosa has been studying and analyzing the impacts of regional wastewater discharges into the Laguna. These studies include the *Santa Rosa Sub-regional Wastewater Reclamation Project EIR* (Santa Rosa, 1997), the *Incremental Recycled Water Program Draft EIR* (Santa Rosa, 2003), and the *Santa Rosa Subregional Water Reclamation System, Incremental Recycled Water Program, Addendum to Program Environmental Impact Report* (Santa Rosa, 2004e).

Figure 3.3-2, Wilfred and Stony Point site Floodplain Map

Furthermore, the RWQCB has placed limitations on the discharge of treated wastewater into the Laguna de Santa Rosa by the Santa Rosa Sub-regional Wastewater Treatment Plant (WWTP) based upon flows in the Russian River. It is anticipated that similar limitations would be placed on discharge from this project.

The established TMDLs for total nitrogen and ammonia for the Laguna de Santa Rosa are 265,700 lbs per year and 35,100 lbs per year, respectively (Santa Rosa, 2004e). According to a letter from USEPA Region 9 to the SWQCB, the USEPA standard in surface water is 1 mg/L total N (USEPA, 2003). Based upon the data, the Laguna de Santa Rosa exceeds the USEPA standard of 1 mg/L for total nitrogen.

The 303(d) list for the Laguna de Santa Rosa was also recently updated to include impairments for excessive phosphorous. The RWQCB is currently in the process of developing a TMDL for the Laguna de Santa Rosa.

The history of water quality impacts to the Laguna de Santa Rosa was summarized in 1995 (Morris, 1995), and more recently in the Russian River Fisheries Restoration Plan (California Department of Fish and Game [CDFG], 2002). In past years, nutrients in the Laguna de Santa Rosa came from several sources including lawns, landscapes, vineyards, dairy farms and the Santa Rosa Sub-regional Wastewater Treatment Plant.

More than 50 water quality monitoring stations exist in the Russian River system including the Mark West Creek and Laguna de Santa Rosa subsystem. These stations are operated by the City of Santa Rosa, California Department of Fish and Game, California Division of Water Resources, Mendocino County Water Agency, North Coast RWQCB, Sonoma County Water Agency (SCWA), and United States Geological Survey. The stations have amassed data on temperature, dissolved oxygen, pH, and specific conductivity. The SCWA has been compiling this data (Entrix, 2004).

The current State Water Resources Control Board (the State Water Board) Water Quality Order No. 2000-02 for the City of Santa Rosa’s Laguna Sub-regional Wastewater Treatment Plant prohibits discharge of tertiary treated “Title 22” reclaimed water from May 14 to September 30 each year. In addition, discharges of advance treated wastewater (tertiary treated, Title 22 reclaimed water) are not generally allowed until the Russian River flow reaches 1000 cfs measured at the Hacienda Bridge (State Water Board, 2000).

The beneficial uses of the Laguna de Santa Rosa may be affected by changes in the quality of surface water it conveys. HydroScience, Inc. has compiled baseline data for the Bellevue-Wilfred

Channel on the site, which reflects on the quality of the Laguna de Santa Rosa just downstream from the site (HydroScience, 2008) (**Appendix D**).

STONY POINT SITE

Watershed

Like the Wilfred site, the Stony Point site is located in the Laguna de Santa Rosa watershed, within the Santa Rosa Plain Sub-basin of the Santa Rosa Valley Groundwater Basin (City of Rohnert Park, 2005). Like the Wilfred site, the Stony Point site is divided by the Bellevue-Wilfred Channel. The Stony Point site contains several depressions that retain standing water in the winter and spring, and that are most concentrated in the western portion of the site, near the Bellevue-Wilfred Channel (The Huffman-Broadway Group, Inc., 2006).

Floodplain

A discussion of floodplain regulations and federal policy appears in the Wilfred site portion of **Section 3.3.1**, above. Most of the Stony Point site is located within the 100-year floodplain. The approximate flood zone designations for the Stony Point site are depicted on the FEMA Flood Zone Map, **Figure 3.3-2**. Surface water emanating from the site generally flows into tributary ditches of the Bellevue-Wilfred Channel. From there, the water flows to the Laguna de Santa Rosa and then to the Russian River.

Runoff from the Stony Point site was assessed in a technical report, *Site Grading and Storm Drainage* (Robert A. Karn & Associates, Inc., 2007). This report discusses the existing drainage on the Stony Point site and is included in **Appendix C**.

Surface Water Quality

Like the Wilfred site, the Stony Point site, located along a tributary to the Laguna de Santa Rosa. The Laguna de Santa Rosa is currently on the list of Clean Water Act 303(d) impaired waterbodies. For a discussion on surface water quality in the Laguna de Santa Rosa, see the discussion of surface water quality for the Wilfred site, above. HydroScience, Inc. has compiled baseline data for the Bellevue-Wilfred Channel on the site, to help evaluate the quality of the Laguna de Santa Rosa downstream from the site (HydroScience, 2008) (**Appendix D**).

LAKEVILLE SITE

Watershed

Located at the lower end of the Petaluma River Valley, the principal water body adjacent to the Lakeville site is San Pablo Bay with its fringing saltmarsh and diked agricultural wetlands. At least four unnamed ditches and several intermittent streams and ephemeral gulches convey runoff from the hills at the south end of the Sonoma Mountains into San Pablo Bay, agricultural wetlands, and marshes between the mouth of the Petaluma River and Tubbs Island near Midshipment Point.

The 322-acre site contains about an acre of intermittent watercourse and ponds, which convey water to the relatively flat agricultural land bordering Lakeville Highway. More than 20 acres of marsh occur on the site.

Floodplain

A discussion of floodplain regulations and federal policy appears in the Wilfred site portion of **Section 3.3.1**, above. Most of the lower end of the Lakeville site lies within the 100-year floodplain (**Figure 3.3-3**).

Surface Water Quality

Water quality in the ditches and agricultural wetlands that are fed from the intermittent and ephemeral streams that drain from the hills at the southern end of the Sonoma Mountains is probably poor due to the long history of grazing and farming on the property. Grazing and farming introduce modest quantities of fecal matter and urine into the soil, which is often washed into intermittent watercourses.

3.3.2 GROUNDWATER

WILFRED SITE

Groundwater Basins

According to the California Department of Water Resources (DWR), the Wilfred site lies within the Santa Rosa Plain groundwater sub-basin (Basin No. 1-55 [formerly Basin No. 2-18] of the North Coast Hydrologic Region (DWR, 2004). The Santa Rosa Valley is part of a structural depression of the North Coast Ranges (DWR, 2004; **Figure 3.3-4**). The sub-basin contains one main water-bearing unit known as the Wilson Grove Formation (formerly known as the Merced Formation) and several smaller units including the Glen Ellen Formation, Sonoma volcanics, “Basin deposits” and “Alluvial fan deposits” (KOMEX, 2007a; **Appendix G**).

Groundwater-bearing zones (i.e. aquifers) in the vicinity of the site are not laterally continuous due to the presence of faults and isolated lenses of clay, sand and gravel. Alluvial deposits of clay, sand and gravel blanket most of the Santa Rosa Valley. Older water-bearing alluvium, up to 100 feet thick, is Late Pleistocene in age and is overlain with younger alluvium 30 to 100 feet thick. The deposits are not perennially saturated, have low permeability, and are either slightly confined or unconfined (DWR, 2003).

Figure 3.3-3, Lakeville site Floodplain Map

Figure 3.3-4, Regional Groundwater Basins

Numerous wells have been identified within the vicinity of the Wilfred site, including several municipal wells. Within a 1.5-mile radius of the site, 193 shallower wells (up to 200 feet deep) and 61 deeper wells (over 200 feet deep) were identified. These wells are shown in Figures 10 and 11 of the Groundwater Study prepared for the Wilfred and Stony Point sites (**Appendix G**). There are three wells located on the Wilfred site, HydroScience Well #7, KOMEX Well #38 and KOMEX Well #58 (KOMEX, 2007a; HydroScience, 2006). Well #7 is a small diameter well with a pump to fill cattle watering troughs. Well #38 is a deep irrigation well with a depth of 1,028 feet. Well #58 is a shallow domestic well installed in 1979 with a depth of 120 feet (KOMEX, 2007a). Information on location of these wells is presented in **Section 3.9**.

The estimated current groundwater usage in the Santa Rosa Plain groundwater basin is between 33,900 and 38,600 acre-feet per year (afy) (approximately 18,400 afy from municipal and industrial uses, 14,000-18,000 from agricultural uses, and 1,500-2,200 from rural domestic uses). Detailed calculations can be found in **Appendix G**. Historically, the City of Rohnert Park has been the largest single user of groundwater in the area, pumping from 850 to 4,600 afy from 2000 to 2005 (other regional groundwater users are described in detail in **Appendix G**). The City extracts groundwater from up to 42 wells located in the Santa Rosa Valley Groundwater Basin and inside city limits. Most City wells are constructed to depths of 600 feet or less. A few wells extend to depths of about 800 feet. Three wells extend to greater depths of up to 1,500 feet. Four water producing zones in the aquifer system have been identified: (1) shallow (0 to 200 feet deep), (2) intermediate (200-600 feet deep), (3) deep (600-800 feet deep), and (4) lower (depths greater than 800 feet) (City of Rohnert Park, 2005, **Appendix H**).

Pumpage from Rohnert Park's well field has been associated with a lowering of the groundwater surface beneath both the City and the proposed Wilfred site. Court action against the City of Rohnert Park has resulted in a negotiated settlement requiring the City to cut back groundwater usage from 4.2 to 2.3 mgd (4,705 to 2,580 afy) before additional growth could take place on yet-to-be-annexed County land. Groundwater cutbacks by the City have primarily been dependent upon the quantity of water supplied by the SCWA, which has limited contracted water allocations throughout the region due to delays in its expansion project caused by litigation and regulatory constraints. Nonetheless, in 2004 the City adopted a resolution capping future groundwater pumping at a rate of 2.3 mgd (2,580 afy), further affirming the negotiated settlement. Since then the City has significantly decreased its groundwater usage (1.36 mgd in 2004, 0.76 mgd in 2005, and 0.30 mgd in 2006 (through September 30th)). By 2010 the City plans to use groundwater as a backup/emergency source only after expected substantial additional water resources are obtained from SCWA (KOMEX, 2007a; **Appendix G**).

At any given time, local groundwater elevations appear to be strongly influenced by pumping of the City of Rohnert Park's well field due to an apparent horizontal continuity between groundwater bearing zones in the area. Shallow groundwater levels had dropped up to 50-feet as a result of the regional drought conditions of the 1980's coupled with excessive groundwater withdrawals (i.e. overdraft). However, by the mid-1990's groundwater levels rose gradually (KOMEX, 2007a; **Appendix G**). More recently, when City of Rohnert Park groundwater pumpage was reduced in 2003, groundwater levels exhibited additional recovery (City of Rohnert Park, 2005).

Several Sonoma County groundwater use studies have been conducted in the latter part of the last decade, including the relatively recent 2003-2004 Sonoma County Grand Jury Study, 2004 Todd Engineers Study, and the 2005 City of Rohnert Park Water Supply Assessment (WSA; City of Rohnert Park, 2005, **Appendix H**). A joint U.S. Geological Survey (USGS) / SCWA 5-year cooperative study of the Santa Rosa Valley groundwater basin commenced in October 2005. All of these studies have been summarized in the groundwater studies for this EIS (KOMEX, 2007a), which appear in **Appendix G**.

The 2003-2004 Sonoma County Grand Jury study found that the volume of groundwater being extracted in Sonoma County is not monitored and is not definitively known; that there was a need for Cities and the County to consider future sustainability of groundwater within the County; that there is currently no regional governing board to monitor and coordinate Countywide water issues; that the County does not have a groundwater management plan; and that the County's General Plan Update to the year 2020 includes a "Water Resources Element," designed to assure the County's water resources are sustained and protected. The study recommended that the County and each of the cities adopt a sustainable water element as part of their General Plan, together with a comprehensive groundwater management plan (KOMEX, 2007a; **Appendix G**).

The 2004 Todd Engineers Study was conducted as part of the Environmental Impact Report (EIR) for a proposed development project located in Canon Manor West, an unincorporated area of Sonoma County located adjacent to the City of Rohnert Park. The Todd Engineers study includes an analysis of groundwater level trends in the area, finding that increased groundwater pumping by Rohnert Park in the 1970s and 1980s was a major factor in local groundwater level decline. The study also notes that Rohnert Park pumpage stabilized after 1985 and that groundwater levels have also stabilized. Todd Engineers carried out a water balance analysis for their study area (which includes the Wilfred and Stony Point sites). The study was based on water years 1986-87 through 2000-01. During this time period, the study found a small but positive change in groundwater storage, which was considered "consistent with the observed groundwater level trends that have leveled off and even increased slightly since 1987…" In evaluating the long-term effects of the Canon Manor West project on groundwater levels, a major factor and area of uncertainty was determining future pumping by the City of Rohnert Park. The study notes that should the City decrease its reliance on groundwater pumping, in line with the

City's General Plan (see **Appendix G** and **Section 4.9**), then this would compensate entirely for not only the water demand of the Canon Manor West project, but also for all other future increased groundwater demands predicted by Todd Engineers (including the proposed Graton Rancheria casino/hotel resort). The converse was that if Rohnert Park did not decrease its pumping from current levels, then the predicted future groundwater demands could lead to another period of groundwater level decline.

Rohnert Park's WSA was published in January 2005 (City of Rohnert Park, 2005; **Appendix H**). The WSA was prepared in compliance with California Senate Bill 610 (SB 610) to assist the City in making decisions related to land use and water supply through the year 2025. The report provides background on the City's water supply, together with a detailed study of groundwater conditions in the upper Laguna de Santa Rosa watershed (similar to the area studied in the 2004 Todd Engineers study). For the purposes of the WSA, the subsurface was divided into a shallow zone (ground level to 200 feet below ground surface (bgs)), an intermediate zone (200 to 600 feet bgs), a deep zone (600 to 800 feet bgs) and a lower zone (deeper than 800 feet bgs). After study of hydrographs for wells in the area, the following conclusions were made:

- Most shallow zone wells located on the periphery of the City's well field were interpreted to exhibit relatively stable long-term groundwater levels, with little response to changes in (City) pumping or climatic conditions.
- Intermediate zone wells were interpreted to exhibit changes in groundwater elevations in response to changes in the City's pumping. Most of the City's wells extract water from the intermediate zone. In central Rohnert Park wells, Spring groundwater elevations were generally stable from 1977 to 1981, declined from 1982 to 1990 when City pumping increased, and were stable to slightly increasing from 1990 to 1997 when total pumping was relatively stable. Groundwater levels remained stable until 2003, and then showed a marked recovery as pumping was reduced.

The WSA states that the groundwater level rises (in intermediate zone wells) since 1990 indicate that the groundwater level declines of the 1980's were not the result of overdraft conditions. Furthermore, the WSA states there is no indication of generally declining groundwater levels elsewhere in the sub-basin; that is, there is no indication of overdraft on a sub-basin scale. The WSA discusses water budgets for the area, including a review of previous recharge estimates made by PES and Todd Engineers (see **Appendix G**). The WSA concludes that PES's estimate of annual average recharge (1.6 million gallons per day (mgd)) pertains to a limited geographic area that does not include the areas of highest recharge to the northeast of Rohnert Park. The WSA also presents calculations that derive a recharge estimate of 7.4 mgd from data previously reported by Todd Engineers.

The WSA provides an analysis of future groundwater supply sufficiency, noting that the City has recently shifted its primary source of water supply from groundwater to water supplied by SCWA. The report estimates projected future pumping in the study area through 2025, and notes that the projected total of 7,350 afy (6.6 mgd) is less than the total pumping in the 1990 to 1997 time period of 8,700 afy (7.8 mgd) during which groundwater elevations were stable or rising slightly. The conclusion reached by the WSA is that projected groundwater pumping through 2025 falls in the range of historically sustainable pumping and would not result in overdraft conditions in the study area.

The O.W.L. Foundation (a local citizen's group) filed suit in the California Superior Court challenging adoption of the WSA in 2005. On May 31, 2006 the court issued a decision invalidating the WSA. The reason cited for this action was that the WSA's evaluation of water supply sufficiency was based on considering existing groundwater demand for a study area that encompassed only the upper Laguna de Santa Rosa Watershed, and not the entire groundwater basin or sub-basin in which the City is located. The court also found that the WSA used the DWR's definition of "critical overdraft" rather than the DWR's definition of "overdraft" when discussing the adequacy of the groundwater supply. The court specified that it was not ruling as to the sufficiency of the water supply, but only the method used to support the sufficiency determination as required by SB 610. In November 2008, the California Court of Appeals overturned the Superior Court's ruling, finding that it is appropriate for the City of Rohnert Park to rely on the WSA for the purposes of compliance with SB 610. *O.W.L. Foundation v. City of Rohnert Park*, 168 Cal.App.4th 568 (2008).

In October 2005 the USGS and SCWA initiated a planned 5-year cooperative study of the Santa Rosa Valley groundwater basin. USGS staff indicate that the work will include data compilation and conceptual model development, preparation of a numerical groundwater flow model of the basin, and reporting. Among other items, the final report will address the question of whether the basin is in overdraft. In 2006 the USGS completed a preliminary analysis of the hydrostratigraphy of the basin. In 2007 this analysis will be used to help develop a conceptual model, which in turn will be used to build the numerical model. The study is still in its preliminary stages and no findings have been made yet.

Groundwater Quality

The updated California's Groundwater - Bulletin 118 contains very little information on the quality of water of alluvial aquifers. Reporting on a 45-year-old study by Cardwell, the bulletin states, "Although the water quality is generally good for most uses, there are few wells screened adjacent to the deposits." According to the City of Rohnert Park, naturally occurring iron and manganese are found in some well water (City of Rohnert Park, 2005, **Appendix H**).

Most of Sonoma County's groundwater is of suitable quality for domestic purposes (HydroScience, 2008). DWR has described overall groundwater quality in the Santa Rosa Plain Sub-basin as "good". Few wells in the sub-basin have been found to contain constituents in concentrations higher than those recommended for drinking water (HydroScience, 2008; KOMEX, 2007a, **Appendix G**).

Though few wells in Sonoma County have been rendered non-potable by chemical constituents, many have produced water with aesthetic problems (HydroScience, 2008; KOMEX, 2007a, **Appendix G**). Chemical constituents that may pose aesthetic problems at the Wilfred site include iron; manganese; boron; and sodium. Iron and manganese are believed to have caused severe corrosion in a well (HydroScience Well #1) that is located on the Stony Point site, adjacent to the Wilfred site. Though neither iron nor manganese poses a health hazard, both can stain laundry, dishes, glassware, etc. Boron is present in the water from several local wells. Boron, while not a drinking water health hazard, may be injurious or toxic to a variety of plants. Sodium is present in high concentrations in a number of wells throughout Sonoma County, and is the dominant cation in deep wells under the western part of Rohnert Park. Sodium can be toxic to plants but is also not a health hazard (HydroScience, 2008; KOMEX, 2007a).

TDS concentrations reported by DWR in 1979 for wells in Rohnert Park ranged from 135 to 321 mg/L. These concentrations compare to the California Secondary Maximum Contaminant Level (MCL) of 500 mg/L (KOMEX, 2007a, **Appendix G**). MCLs are standards set for allowable levels of constituents in drinking water, and are required under the federal Safe Drinking Water Act of 1974 and its updates. Primary standards, developed to protect public health, are legally enforceable. Secondary standards, generally for the protection of aesthetic qualities such as taste, odor, appearance, etc., are generally non-enforceable (DWR, 2003).

STONY POINT SITE

The Stony Point site occurs within the Santa Rosa Plain groundwater sub-basin, on a site that partially overlaps the Wilfred site. Like the Wilfred site, numerous wells have been identified within the vicinity of the Stony Point site, including several municipal wells. Four wells have been identified on the Stony Point site. One well (HydroScience Well #7) is active; occurs on the portion of the Stony Point site that overlaps the Wilfred site; and is discussed for Wilfred site: Groundwater Basins, above. A second well (HydroScience Well #1) is currently active. Like Well #7, Well #1 supplies water to cattle watering troughs. Well #1 also supplies barnyard wash water. Two wells are abandoned and sealed (HydroScience, 2008). Like the Wilfred site, existing pumpage on the Stony Point site appears to be of low volume.

For further discussion on groundwater basins and groundwater quality, see the previous discussion of groundwater basins and groundwater quality for the Wilfred site.

LAKEVILLE SITE

Groundwater Basins

The Petaluma Valley Groundwater Basin No. 2-1, which is part of the larger San Francisco Bay Hydrologic Region (DWR, 2004), underlies the Lakeville site (**Figure 3.3-4**). The site is at the lower end of the Petaluma Valley at the base of the Sonoma Mountains, in a structural depression in the Coast Ranges.

The Petaluma Valley is underlain by a basement complex consisting primarily of marine metamorphic and igneous rocks belonging to the Mesozoic Franciscan Assemblage. In southern Petaluma Valley, the Pliocene Petaluma formation overlays the Mesozoic Franciscan Assemblage. The Pliocene Petaluma formation consists of claystone with some sands and gravels of marine and continental origins. Overlaying these formations are Quarternary and Recent estuarine sediments (locally called Bay Mud) and alluvial deposits.

The principal aquifers in the basin occur in the Quarternary to Recent deposits and the Petaluma formation (KOMEX, 2007b). The water-bearing portion of Quarternary to Recent deposits may be less than 100 to more than 200 feet thick (DWR, 2004). According to DWR (2004), the Merced Formation is also an important water-bearing formation in the Petaluma Valley. The Merced Formation is between 300 and 2,000 feet thick. Of lesser importance as a groundwater source is Pliocene-age volcanic tuff (DWR, 2004; KOMEX, 2007b).

In the shallow alluvial deposits near the valley margins, groundwater is unconfined, or occurs under water-table conditions. In deeper parts of the groundwater basin, groundwater is confined or semiconfined (KOMEX, 2007b).

Fifty-seven wells were identified within one-quarter mile of the Lakeville site. These wells are shown on Figure 5 of the Groundwater Study prepared for the Lakeville site (**Appendix G**). None of the wells are utilized for municipal use. Current status of the wells was not known. Two wells are located on the Lakeville site. North #1 is located on the east side of the Lakeville site and has a depth of 413 feet. North #2 is located on the west side of the Lakeville site and has a depth of 650 feet (KOMEX, 2007b).

The Petaluma Valley groundwater basin has been subject to intensive development for domestic use (mostly in rural areas), and moderate development for stock watering, municipal, irrigation, and industrial use. The latest accurate estimate of groundwater pumping in the basin is 7,800 afy in 1980. Current rough estimates of groundwater usage are very similar to the 1980 estimate (7,700 afy). Detailed calculations can be found in **Appendix G**.

Groundwater Quality

The quality of groundwater of the water-bearing formations in the Petaluma Valley Groundwater Basin varies from place to place because of the nature of the sedimentary layers (DWR, 2004). Within most areas of the groundwater basin, groundwater quality is generally suitable for most purposes (KOMEX, 2007b). Locally elevated levels of certain chemicals restrict groundwater use in some areas and for some applications. Such chemicals include chloride, sodium, boron, nitrate, iron, and manganese (KOMEX, 2007b).

Water quality decreases south of Petaluma where seawater intrusion becomes a factor (DWR, 2004). At the southern end of the Petaluma Valley, and perhaps under the Lakeville site, a zone of poor quality groundwater has been identified at depths from approximately 150 to 700 feet. Seawater intrusion is the primary source of elevated chloride and sodium in the southern end of the Petaluma Valley (KOMEX, 2007b). In some areas of the Petaluma Valley, nitrate contamination is of concern (DWR, 2004). Nitrate concentrations, in the area northwest of Petaluma, are as high as three times the maximum allowed for drinking water (KOMEX, 2007b). Incidence of Methyl Tertiary Butyl Ether (MTBE) contamination is increasing in the basin (DWR, 2004).