

3.3 WATER RESOURCES

This section describes the surface water and groundwater conditions on and proximate to the project site. Information in this section was gathered from the following sources:

- Sensitive area map folio¹ and wetlands inventory² by King County.
- Preliminary Drainage report for Park Lake Homes Redevelopment.³
- Habitat-limiting Factors and Reconnaissance report for the Green/Duwamish and Central Puget Sound Watersheds (WRIA 9).⁴
- Preliminary Engineering Geologic and Geotechnical Engineering Services report for Park Lake Homes Redevelopment.⁵
- Duwamish Basin Groundwater Pathways Conceptual Model Report for the Duwamish Industrial Area Hydrogeologic Pathways Project.⁶
- Occurrence and Quality of Ground Water in Southwestern King County, Washington.⁷
- Well records on file with the Washington State Department of Ecology.⁸
- King County Drainage Complaints

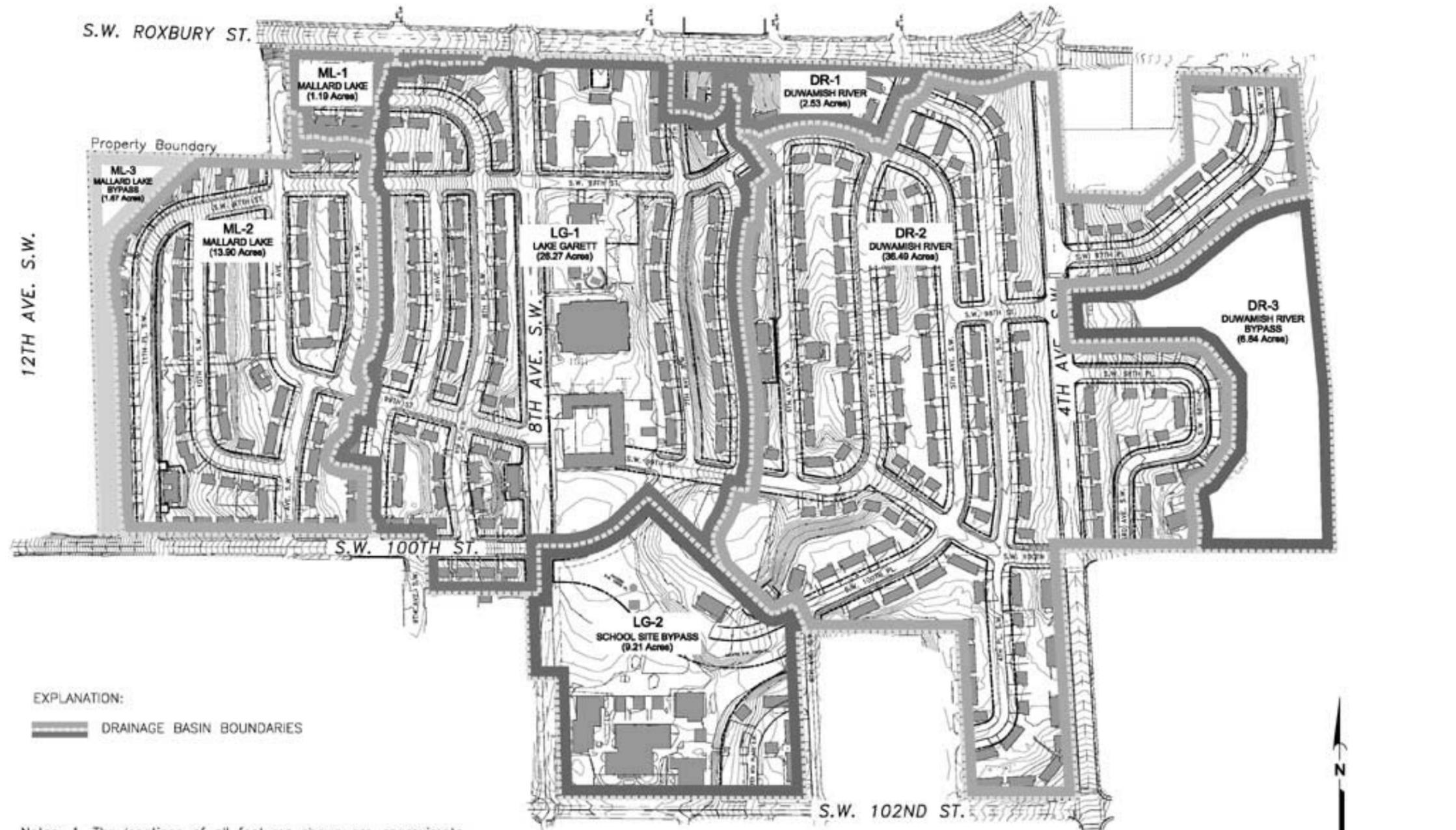
3.3.1 Affected Environment

Surface Water

No existing surface water bodies are located on the project site. Because the site was developed in the early 1940s, runoff from roadways and parking areas is routed directly into the stormwater system. No retention, detention or water quality treatment facilities are associated with the existing development. The surrounding area has been developed to urban densities since the time that Park Lake Homes was first developed. While there are installed storm drains located within streets (see *Section 3.14. Public Services and Utilities* of this Draft EIS), issues related to site drainage proximate to residences have been identified (e.g., standing water adjacent to foundation walls, damp crawl spaces, etc.).⁹

As shown by **Figure 3.3-1**, portions of the project site are located within three drainage basins. Each basin eventually discharges to Puget Sound via stormwater conveyance facilities and through natural drainages. See the specific discussions below for a more complete discussion. Two of the drainage basins, located in the western half of the site, are within the Salmon Creek basin, which then flows into the Central Puget Sound basin. These two drainage basins are referred to as Lake Garrett and Mallard Lake sub-basins. The largest drainage basin

¹ King County, 1990a
² King County, 1990b
³ Goldsmith, 2003
⁴ King County, 2000
⁵ GeoEngineers, 2003
⁶ Booth & Herman, 1998
⁷ Woodward, et al, 1995
⁸ Washington Dept. of Ecology, 2002
⁹ King County, 2001



EXPLANATION:

==== DRAINAGE BASIN BOUNDARIES

- Notes: 1. The locations of all features shown are approximate.
 2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing entitled "KING COUNTY HOUSING AUTHORITY, VIC. SW ROXBURY & 8TH AVE SW" by Bush, Roed & Hitchings, Inc, dated Nov. 2002 and CAD file "BASINS" provided by Hugh G. Goldsmith and Associates April 29, 2003.

Source: GeoEngineers, Inc.



Figure 3.3-1

Drainage Basin Map

is the Duwamish River Basin and lies within the eastern portion of the site. Subdivision of the Duwamish Basin on the project site is described further below. The divide between the Duwamish River basin and the Salmon Creek basin is generally located along 6th Place Southwest and 6th Avenue Southwest.

Duwamish River Basin

The largest drainage basin on-site is the east basin, referred to as the Duwamish River Basin. This drainage basin extends from S.W. Roxbury on the north to S.W. 100th and S.W. 102nd on the south and from approximately 6th Avenue SW on the west to the east boundary of the development. The Duwamish River basin comprises approximately 46 acres (52 percent of the total site area) and consists of three sub-basins – DR-1, DR-2 and DR-3, which all drain to the Duwamish River. DR-1 (2.5 ac.) drains north to SW Roxbury Street and is conveyed in a storm drain that is located in SW Roxbury Street. DR-2 is the largest sub-basin (36.5 ac.). Stormwater runoff from this sub-basin is conveyed in storm drains in an east and northeasterly direction to outfalls that discharge into swales located in sub-basin DR-3 (6.8 ac.) near the easterly portion of the Greenbridge development. Runoff from DR-2 and DR-3 flows overland to a 36-inch pipe that carries runoff to Myers Way, roughly one-quarter mile east of the east boundary of the project site. Approximately 20.3 of the basin's 46 acres are covered by impervious surfaces.

Many of the tributaries that drain into the lower reach of the Duwamish River have become inaccessible and inhospitable for salmonids as the result of aggressive development. Hamm Creek, which receives runoff from the project site, is one of the tributaries to the Duwamish River.

Salmon Creek Basin

Approximately 43 acres of the western half of the site is located within the Salmon Creek basin which flows into the Central Puget Sound basin. The Salmon Creek basin covers an area of approximately 2.3 square miles. There have been no recent observations of anadromous salmonids in Salmon Creek. Streamflow data for Salmon Creek (near its outfall to Puget Sound) during water years 1992, 1993 and 1994 indicate that the average flow is approximately 3.8 cubic feet per second (cfs) during the summer and about 4.3 cfs during the winter.¹⁰ The Salmon Creek Basin is divided into two drainage basins within the project site.

The central drainage basin (Lake Garrett) comprises approximately 26.3 acres. Drainage from this basin contributes to the Salmon Creek Basin. This drainage basin extends from S.W. Roxbury on the north to roughly S.W. 100th on the south and from approximately 9th Avenue SW on the west to 6th Avenue SW on the east. Drainage from this basin is conveyed south within 8th Avenue SW and off-site through the White Center Park to Lake Garrett (located approximately 3,000 feet south of the site) and Salmon Creek. Stormwater drainage within Lake Garrett is retained/detained and then pumped in a closed-pipe system to Puget Sound. Overflow from the piped conveyance flows within the Salmon Creek channel to Puget Sound.

The west drainage basin (Mallard Lake) comprises 16.8 acres. Like the central basin, drainage from this basin also contributes to the Salmon Creek Basin. This drainage basin extends from S.W. Roxbury on the north to S.W. 100th on the south and from the west property line on the

¹⁰ King County, 1999

west to 9th Avenue SW on the east. Drainage from this basin is conveyed west and off-site to the White Center Bog, immediately west of the southwest corner of the Park Lake Homes site. Drainage flows from White Center Bog to Mallard Lake (approx. 1,500 feet southwest of the site) and subsequently converges with drainage from the central drainage basin at Lake Garrett. Approximately 21.5 of the basin's 43 acres are covered by impervious surfaces.

Groundwater

Perched Groundwater

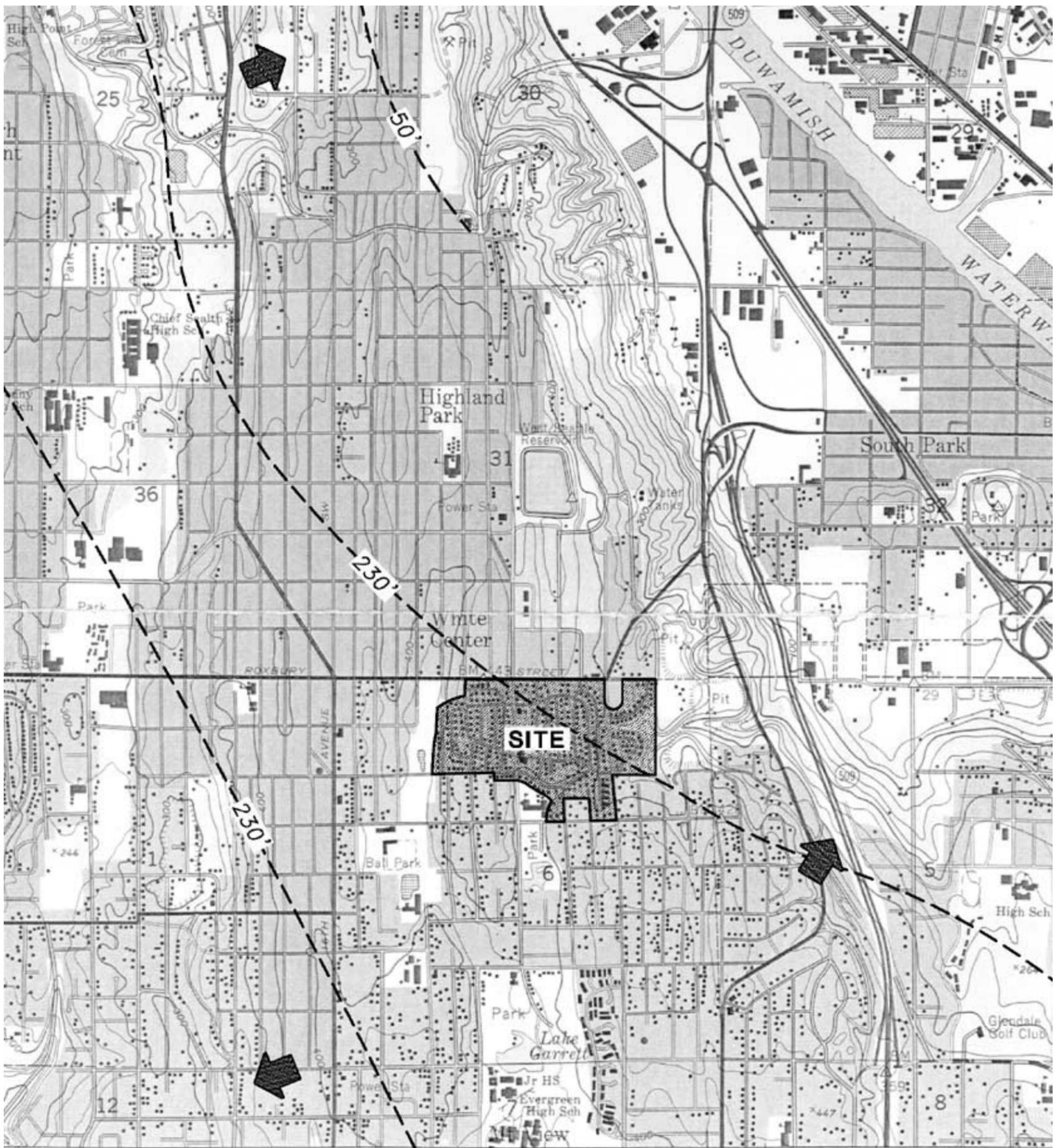
Localized zones of shallow groundwater were encountered within Vashon till and ice contact deposits in several of the exploration borings located within the central and western portions of the site. A description of the Vashon glacial deposits is presented in *Section 3.1 Earth* of this Draft EIS. These groundwater zones were typically encountered at depths of 10 to 30 feet beneath ground surface, in 2- to 5-foot thick lenses of sand or silty sand that were underlain by sediments with low permeability. Groundwater becomes perched on these low permeability sediments. Perched groundwater at the site occurs in isolated zones that are not laterally continuous, but provides limited recharge to underlying aquifers.

Regional Aquifers

Based on existing studies of the area, the shallowest regional or laterally-extensive aquifer beneath the project site occurs within the Vashon advance outwash (Qva) sediments at an approximate elevation of 230 feet. The Qva aquifer beneath the site is bounded by Puget Sound to the west, Elliott Bay to the north, and the Duwamish/Green river valley to the east. The southern extent of the Qva aquifer is beyond the King/Pierce County line. Groundwater within the Qva aquifer beneath the site is inferred to flow to the northeast, toward the Duwamish valley, as shown on **Figure 3.3-2**.

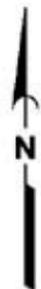
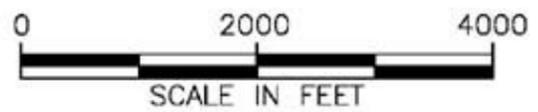
Two additional aquifers, identified as the Q(A)c and Q(B)c aquifers, are present beneath the site vicinity, below the Qva aquifer. These two aquifers are located within the older sequence of pre-Vashon glacial and interglacial sediments. The bottom of the Qva aquifer (approximate elevation of 200 feet) and top of the underlying Q(A)c aquifer are separated by approximately 200 feet of low-permeability sediments (the transitional beds). The Q(A)c aquifer is inferred to be about 50 feet thick, with an approximate basal elevation of -50 feet. The bottom of the Q(A)c aquifer is separated from the underlying Q(B)c aquifer by approximately 100 feet of low-permeability sediments. The Q(B)c aquifer is also inferred to be about 50 feet thick, with a basal elevation of about -200 feet. The Q(B)c aquifer is underlain by an additional sequence of low-permeability sediments until sedimentary bedrock is encountered at an inferred elevation of -300 feet. Bedrock beneath the site is not expected to be a significant source of groundwater because of its fine-grained, cemented nature, with generally massive intrusive rocks of even lower permeability and porosity.

A review of records on file with the Department of Ecology did not identify any drinking water wells completed in the regional aquifers (Qva, Q(A)c, Q(B)c) within a one mile radius of the site. The nearest wells extracting groundwater from the regional aquifers appear to be associated with the Highline wellfield, located approximately 1 to 4 miles south-southeast of the site.



EXPLANATION:

- 230' - - - - - INFERRED GROUNDWATER ELEVATION CONTOUR (FEET)
- ➔ INFERRED GROUNDWATER FLOW DIRECTION



References: USGS 7.5' topographic quadrangle map "Seattle South, Wash." photorevised 1973 and Booth, D.B., and Herman, L., 1998. Duwamish basin groundwater pathways conceptual model report.

Source: GeoEngineers, Inc.



Figure 3.3-2
Regional Groundwater Flow Map

Flooding

The Greenbridge development is located on an upland area several hundred feet above the Duwamish River and the Puget Sound. The developed and undeveloped portions of the site are mapped in Zone X, and are determined to be outside of areas of the 500-year flood.^{11,12} However, ponding of water is reported in the low-lying areas along the 8th Avenue S.W. corridor, during wet weather as a result of poor drainage.

Water Quality

Stormwater runoff from the eastern third of the project site is not treated before it flows into drains that eventually flow into the Duwamish Waterway. Stormwater runoff from the central portion of the site is routed via pipes to Lake Garrett. From Lake Garrett, the water is conveyed by pipes to Puget Sound. Overflows are routed into Salmon Creek channel and then to Puget Sound. Runoff from the western portion of the site is routed into White Center Pond. From White Center Pond, it flows through a channel to Mallard Lake, and then to Lake Garrett.

In addition to the documents listed under the primary heading for Water, the following additional documents were used to develop existing conditions for water quality:

- Water Quality Management Plan to Control Nonpoint Source Pollution;¹³
- Water quality data for Salmon Creek from King County, unpublished data;¹⁴ and
- The 303(d) list of impaired and threatened waterbodies.¹⁵

Surface Water Quality

The State has established water quality standards¹⁶ for surface water in Washington. Surface water quality criteria include fecal coliform organisms; dissolved oxygen; total dissolved gas; temperature; pH; turbidity; toxic, radioactive or deleterious materials; and aesthetic values. Specific concentrations or threshold values for these surface water quality criteria vary according to the classification of a specific water body. Surface water body classifications include Class AA (extraordinary), Class A (excellent), Class B (good) and Class C (fair). Ecology has prepared a list, as specified by Section 303(d) of the federal Clean Water Act (CWA), which identifies impaired surface waters that do not meet the water quality standards specified by 173-201A WAC. The last update was in 2000, based on data developed in 1998. The list of impaired waters under Section 303(d) of CWA is presently being updated using data obtained in 2002.

¹¹ Federal Emergency Management Agency, 1995, FIRM, Flood Insurance Rate Map, King County, Washington and Incorporated Areas, Panel 638 of 1725, Map Number 53033C0638, revised May 16, 1995.

¹² Federal Emergency Management Agency, 1995, FIRM, Flood Insurance Rate Map, King County, Washington and Incorporated Areas, Panel 640 of 1725, Map Number 53033C0640, revised May 16, 1995.

¹³ Hashim, Green and Phillips, 2003.

¹⁴ King County, 2003.

¹⁵ Ecology, 2002.

¹⁶ Chapter 90.48 of the Revised Code of Washington (90.48 RCW) (Water Pollution Control Act), Chapter 173-201A of the Washington Administrative Code (173-201A WAC) (Water Quality Standards for Surface Waters of the State of Washington)

Duwamish River Basin

The Duwamish River and Hamm Creek are classified as Class B and Class A surface waters, respectively, according to 173-201A WAC. Water bodies that are not specifically listed in 173-201A WAC are classified according to the class of the receiving water.

Within a 2-mile radius of the project site, six sites along the Duwamish River are identified in the Department of Ecology's 303(d) list of impaired and threatened waterbodies. Listed water quality parameters include arsenic, cadmium, zinc, PCBs (polychlorinated biphenyls), DO (dissolved oxygen), pH and fecal coliform.

As previously discussed, Hamm Creek receives a portion of its flow from site runoff, which flows into the Duwamish River and then to Puget Sound. Hamm Creek has been subjected to water quality degradation typical of streams in urban environments. These impacts include high concentrations of metals, total suspended solids and total petroleum hydrocarbons. Despite these indications of water quality degradation, Hamm Creek is not included in Ecology's 303(d) list of impaired and threatened waterbodies.

Salmon Creek Basin

Puget Sound (west of the project site, at the outfall of Salmon Creek) is classified as Marine Class AA surface waters according to 173-201A WAC. Since this water body is not specifically listed in 173-201A WAC, it is classified according to the class of the receiving water. Hence, Salmon Creek and its tributary waters are also considered Class AA surface water.

The presence of domestic rubbish throughout the stream channel and the high percentage of impervious surfaces within the basin have adversely impacted the water quality of Salmon Creek.⁵ Three water quality samples obtained from the mainstem of Salmon Creek during storm events in 1992 and 1993 indicate fecal coliform concentrations ranging from 390 to 2,500 colony forming units per 100 milliliters (CFU/100 ml). These concentrations are greater than the allowable levels specified in 173-201A WAC for a Class AA surface water (not to exceed a geometric mean of 50 colonies per 100mL and have not more than 10 percent of the results used for the geometric mean exceeding 100 colonies per 100mL). Despite these elevated concentrations of fecal coliform, Salmon Creek is not included in Ecology's 303(d) list of impaired and threatened waterbodies.

Groundwater Quality

Like surface waters, the State has established water quality standards for groundwater.¹⁷ A 1995 study of groundwater in southwestern King County concluded that there were no significant chemical differences in water quality among the Quaternary aquifers (this includes the Qva, Q[A]c and Q[B]c aquifers). Based on water quality data from 223 wells in southwestern King County, this study also concluded that there is no widespread degradation of groundwater quality.

A comparison of water quality data from this 1995 study for the Qva, Q(A)c and Q(B)c aquifers with groundwater quality standards established by 173-200 WAC indicates that all of the

¹⁷ 90.48 RCW and 90.54 RCW (Water Resources Act of 1971), 173-200 WAC (Water Quality Standards for Ground Waters of the State of Washington)

samples met the criteria for total dissolved solids, nitrate, heavy metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium silver and zinc), and organic compounds (including benzene, bromoform, carbon tetrachloride, chloroform, ethylbenzene, methylene chloride, toluene, trichloroethylene and vinyl chloride). Fecal coliform concentrations exceeded the established criterion in less than one percent of the samples. Iron and manganese were the only parameters that exceeded the established criteria at a significant frequency (greater than 10 percent of the samples).