APPENDIX H

BIOLOGICAL EVALUATION

BIOLOGICAL EVALUATION

for Sensitive Fish and Wildlife Species at the Greenbridge Redevelopment Master Plan in King County, Washington

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November 2003

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Biological Evaluation
Section 7, Endangered Species Act

Applicant: King County Housing Authority

1. PROJECT DESCRIPTION

The King County Housing Authority (KCHA) is proposing to redevelop the 93.5-acre Park Lake Homes Community, which presently provides 569 units of public housing and community services. The U.S. Department of Housing and Urban Development's HOPE VI program is funding this project, which provides a federal nexus and triggers the need for this Biological Evaluation to further compliance with the Endangered Species Act (ESA). The proposed project would result in a "mixed-income, pedestrian-oriented community containing housing, parks and open space, community services and facilities, and new infrastructure" [KCHA and King County Department of Development and Environmental Services (DDES) 2003]. The Greenbridge project applies "built green" and low impact design principles and is a "demonstration project" pursuant to King County's Demonstration Ordinance No. 14662. The objectives of the demonstration ordinance relevant to this evaluation are to: encourage innovative approaches to land development, design and stormwater management; reduce development impacts; improve habitat and water quality; reduce impervious surface; and employ eco-friendly building techniques. A Draft Environmental Impact Statement (EIS) has been prepared for the project (KCHA and DDES 2003) pursuant to the Washington State Environmental policy Act (SEPA) and the National Environmental Policy Act (NEPA). Much of the following evaluation has been excerpted with modifications from the EIS, but has not been specifically cited as such.

The Proposed Master Plan includes demolition of most or all existing buildings on-site and demolition, abandonment or replacement of existing infrastructure including streets, water lines, sanitary sewers, storm drainage and other utilities (electrical power, telephone, and cable service). The Proposed Master Plan would result in redevelopment of all existing residential units on the site. A range of 900 to 1,100 (maximum) residential housing units is proposed. In addition to housing, the Proposed Master Plan contains 80,000 to 100,000 ft^2 of community-oriented uses. Such uses may include: a branch library, renovated community center, youth and family facilities, Head Start and child care facility, sheriff's office, food bank, career development center, meeting/gathering space, and neighborhood-scale retail uses to meet the everyday needs of residents. The Proposed Master Plan also provides approximately 19.3 acres of landscaping, lawn, and open space including a community park, neighborhood parks and pocket parks. The Proposed Master Plan has been designed to preserve as many of the existing trees as feasible and provide additional landscaping.

The Proposed Master Plan involves replacement of all existing utilities on-site, including storm drainage. An integrated storm drainage plan would provide drainage and conveyance based on the amount of impervious coverage (roofs, parking areas, walkways) within each block area. The storm drainage plan incorporates "built green" and "low impact development" concepts to enhance stormwater control and reduce development-related impacts, while still meeting the intent of the *King County Surface Water*

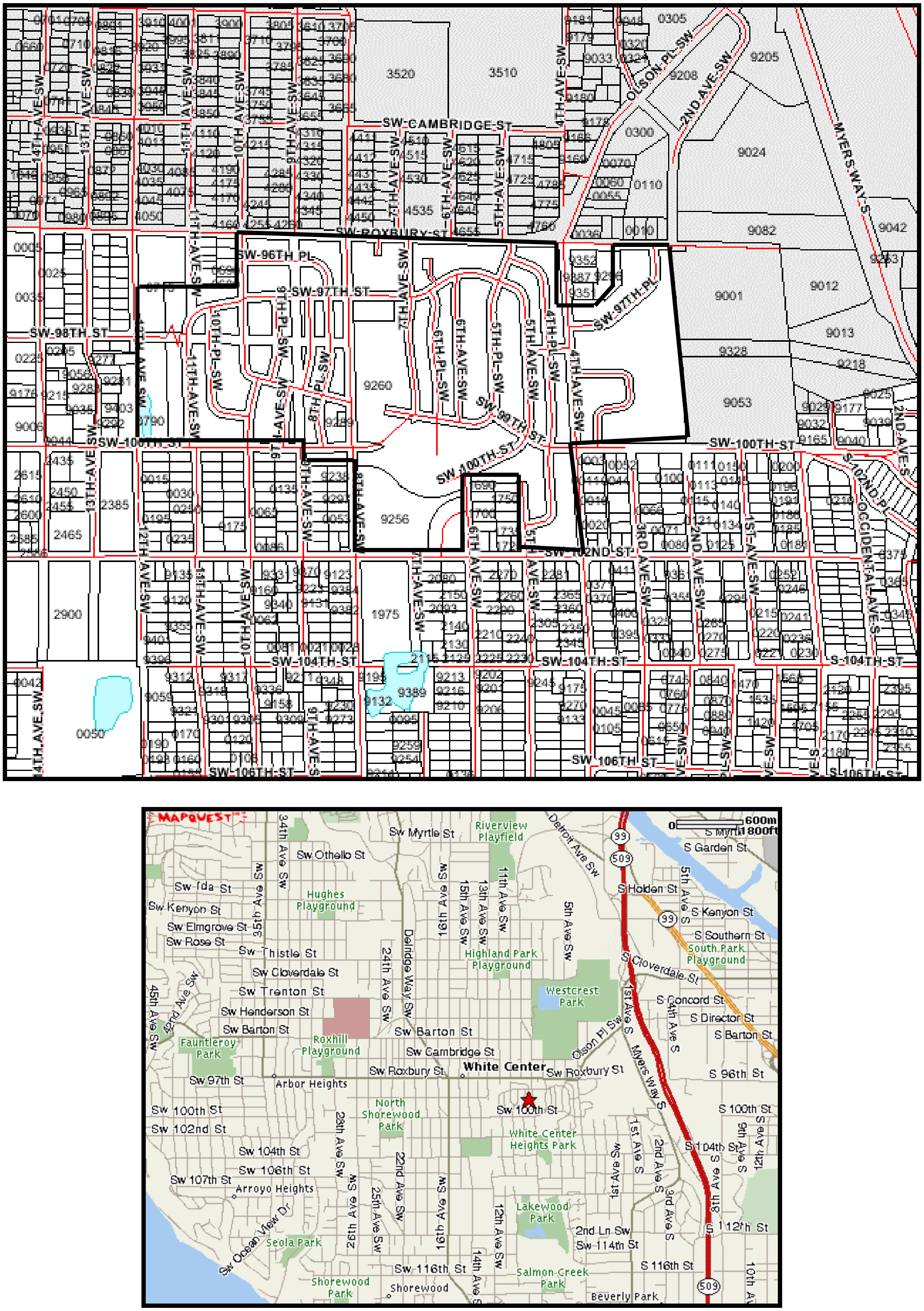

Figure 1. Maps of the project area [from King County iMAP (top) and MapQuest (bottom)].

Design Manual (King County 1998). The proposed system would include biofiltration swales integrated with street rights-of-way, a large east-west biofiltration swale/linear park extending along SW 100th Street from 7th Avenue SW to 4th Avenue SW, a water quality wetpond located along the west boundary of the site, two stormwater detention and water quality ponds along near the easterly boundary of the site, and a water quality vault located in the vicinity of the community facilities. Currently, all stormwater runoff is routed directly into the stormwater system without treatment or detention.

Stormwater runoff from an 11-acre on-site area in the Salmon Creek basin would be diverted to the North Fork of Hamm Creek. This would increase the on-site area in the Hamm Creek basin from approximately 43 to 54 acres, or from approximately three percent to four percent of the overall Hamm Creek basin. This would reduce the on-site portion of the Salmon Creek basin from approximately 47 to 36 acres, or from approximately four percent to three percent of the entire Salmon Creek basin. Stormwater control facilities, if needed, would be sized so that developed peak flows and durations will be equal to or less than existing conditions.

It is anticipated that the Greenbridge project would be developed in three phases commencing in 2004 with completion by 2012.

Conservation Measures

Best Management Practices

Construction

The following mitigation measures would be implemented during construction of the Proposed Master Plan to satisfy requirements of a Storm Water Pollution Prevention (SWPP) plan as required by the NPDES permit:

1. A temporary erosion and sedimentation control (TESC) plan, which may include a combination of interceptor swales, straw bale barriers, silt fences, and straw mulch for temporary protection of exposed soils and receiving surface water bodies.
2. Temporary stormwater ponds, if needed for construction of the proposed diversion of stormwater runoff from an on-site area in the Salmon Creek basin to the North Fork Hamm Creek basin as described above.
3. A spill prevention plan would be adopted to reduce any accident-related water quality impacts.

A TESC plan will be developed that includes measures to control erosion and sediment during construction. The erosion control system will include redundancies or backup protection such that no single element of the system is relied upon to completely control erosion and sedimentation. The system will be regularly monitored and maintained. Qualified personnel will perform the monitoring. Provisions for modifications to the erosion control system, based on monitoring observations, will be included in the TESC plan. The TESC plan will incorporate the following basic planning principles:

1. Schedule the grading and construction to minimize soil exposure.
2. Retain existing vegetation whenever feasible.

3. Vegetate and mulch denuded areas in a timely manner.
4. Direct runoff away from denuded areas.
5. Minimize length and steepness of slopes.
6. Keep runoff velocities low.
7. Prepare drainageways and outlets to handle concentrated or increased runoff.
8. Trap sediment on site.
9. Inspect and maintain control measures frequently.

Operation

Several design elements of the Proposed Master Plan are intended to mitigate potential operational impacts. These items, listed below, will be further discussed in conjunction with a description of impacts in a following section.

1. Built green and low impact design concepts to enhance stormwater control and reduce development-related impacts, including:
   - Biofiltration swales integrated within street rights-of-way in the Duwamish River basin and diverted portions of the Lake Garrett sub-basin,
   - Biofiltration swale/linear park along SW 100th Street,
   - Reduced road widths and slightly less impervious surface area than the Design Alternative Master Plan.
2. Two stormwater detention ponds near the eastern site boundary.
3. A water quality vault in the vicinity of the proposed community facilities.
4. A water quality vault in the northeastern portion of the redevelopment.
5. A water quality wetpond along the western site boundary.
6. A new storm drain conveyance system would be constructed and a storm drainage plan would be prepared to outline the proposed methods to control and treat stormwater (both quantity and quality).

All stormwater control facilities would be sized so that selected peak flows and durations are equal to or less than the existing conditions. For the Proposed Master Plan, additional analysis may be needed for the final design of the stormwater and water quality ponds and to develop design criteria for installation of the vault in the central (Lake Garrett) basin. It may be necessary to line stormwater ponds located in close proximity to erosion, steep slope and/or landslide hazard areas.

Timing Restrictions

No in-water work is proposed to occur, so a specific fish-protective timing restriction would not be required by the Washington Department of Fish and Wildlife (WDFW), National Marine Fisheries Service, or U.S. Fish and Wildlife Service (USFWS) for this project.

The nearest known bald eagle (*Haliaeetus leucocephalus*) nest is greater than 1.0 mile away (WDFW 2003); accordingly, a bald eagle breeding restriction is not necessary. The nearest likely foraging areas are also more than 1 mile away. Accordingly, a winter foraging timing restriction is also not necessary.

King County may impose timing restrictions on construction related to major grading and other earth-moving activities.

Action Area

"Action area" is defined as "all areas to be affected directly or indirectly by the proposed action and not merely the immediate area involved in the action." Based on the analysis below, the potential disturbance effects of this project on chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), and, conceivably, bull trout (*Salvelinus confluentus*) could only be realized in stormwater runoff receiving waterbodies that contain listed fish. These waterbodies are the North Fork of Hamm Creek, Duwamish River, and Puget Sound. Lake Garrett and its tributaries would regularly receive stormwater runoff from on-site and Salmon Creek might receive such runoff during infrequent overflow events, but these waterbodies do not contain listed fish. No other areas would be affected directly or indirectly.

According to the USFWS, loud construction activities can affect foraging or nesting bald eagles up to 1.0 mile away. Thus, the action area for bald eagles would be within a maximum 1.0-mile radius of the proposed construction activity.

2. LOCATION

The proposed project is a 93.5-acre site in the White Center area of unincorporated King County just south of the Seattle city limits. The site is bounded by SW Roxbury Street to the north, 12th Avenue SW to the west, SW 102nd Street to the south, and 2nd Avenue to the east (see Figure 1). The properties comprising the project area are located in Section 6, Township 23 North, Range 4 East.

3. LISTED SPECIES

A county-wide species list dated 2 October 2003 was obtained from USFWS. The species included on that list are wintering, communal night roosting, and nesting bald eagles (proposed delisted); Canada lynx (threatened); gray wolf (threatened); grizzly bear (threatened); marbled murrelets (threatened); northern spotted owl (threatened); bull trout (threatened); and two plant species. A list of potential anadromous species from the National Marine Fisheries Service website was consulted. The relevant species included on that list are chinook salmon (threatened) and coho salmon (candidate).

The county-wide USFWS list directs species list requesters to obtain site-specific information from the Washington Department of Fish and Wildlife (WDFW) and/or Washington Department of Natural Resources. WDFW data was obtained on 19 September 2003. According to WDFW, chinook and coho salmon and bull trout are the only federally listed or candidate fish species using the Duwamish River or Puget Sound in the vicinity of the proposed project; no listed species use is shown for the other waterbodies that receive project area stormwater drainage. No bald eagle nests are noted within 1 mile of the project site (WDFW 2003), but low level or limited bald eagle foraging possibly occurs along the Duwamish River. Based on habitat descriptions for the two listed plant species (marsh sandwort and golden paintbrush) in

Hitchcock and Cronquist (1976) and Pojar and MacKinnon (1994), and surveys conducted by Raedeke Associates, Inc., adequate habitat conditions do not exist on or adjacent to the project site and none of these species was observed (KCHA and DDES 2003).

4. DESCRIPTION OF PROJECT AREA

The federal government originally authorized construction of Park Lake Homes in the early 1940s to provide temporary homes for defense workers and their families during World War II. Park Lake Homes today consists of 569 units of public housing in 329 buildings on the 93.5-acre site. All units are rental housing consisting of one-story structures that each contains one or two residential dwelling units. The Park Lake Homes campus also contains nine other buildings that contain non-residential uses (approx. 40,000 ft^2). They include a community facility, maintenance facilities, storage buildings, and former housing units that have been converted for community uses.

Greg Johnston, Senior Fisheries Biologist, and Amy Myers, Wetland/Wildlife Biologist, conducted a site visit on 5 February 2003. The following description of existing conditions is based upon observations from the site visit and material derived from, or prepared by others in support of, the Greenbridge Draft EIS. An aerial photograph of the site and photos of the potentially affected waterbodies are included in Appendix B.

Only an isolated section of an intermittent, non-fish bearing (King County Class 3) stream may be present on the project site, near the extreme southeast border. The project site does not adjoin any lakes or Puget Sound. As such, no fish habitat is present on-site, nor are any fish. The site occupies headwater areas of the Salmon Creek and Hamm Creek (Duwamish River) drainages.

The project site is divided among three drainage basins: east (Duwamish River), central (Lake Garrett), and west (Mallard Lake). While the entire site is technically located within the Duwamish-Green basin (WRIA 9), the central and west basins are included within the Salmon Creek basin, which drains directly into Puget Sound to the west without ever entering the Duwamish River (Figure 2). The east basin contributes flow to the North Fork of Hamm Creek, which drains directly into the Duwamish River to the east within the river's zone of tidal influence. The Duwamish, in turn, discharges a short distance to the north into Elliott Bay at Seattle. All basins ultimately discharge to Puget Sound.

The only known potential stream section on-site, if confirmed, would be a short section of Class 3 stream in the Hamm Creek drainage identified by King County DDES staff during a site visit in 2001. By definition, King County Class 3 streams are intermittent (seasonal) and are not used by salmonid fish. The Class 3 stream channel section is reportedly located at the extreme eastern end of the site on the south side near the head of the modest ravine. It is reportedly fed by urban stormwater runoff discharge of sufficient flow to define a channel for a limited distance, but it may again lose its definition before its flow enters an existing piped system farther downslope.

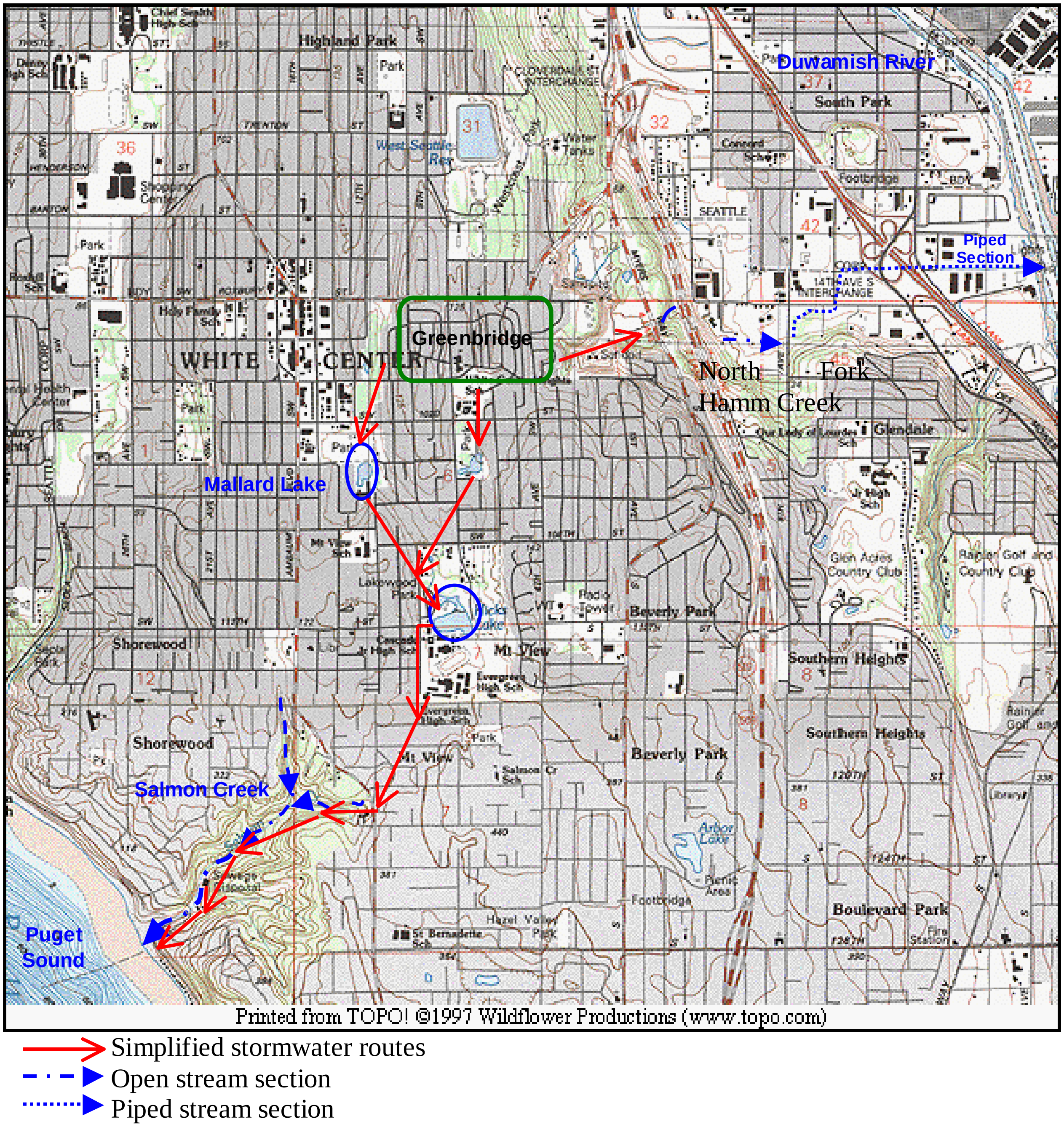

Figure 2. Drainage pathways for water originating on the Greenbridge site.

Baseline Conditions

Duwamish River

The Duwamish River is 93 miles long and is identified as Water Resource Inventory Area (WRIA) 9, having a drainage area of 566 square miles in King and Pierce Counties. The river headwaters in the Cascade Mountains about 30 miles northeast of Mount Rainier and flows into Puget Sound at Elliott Bay in Seattle. The Green/Duwamish estuary has been largely eliminated over time with the growth of the City of Seattle and associated filling and other waterfront development activities. The lower Duwamish River is a highly industrial area with few natural habitat features. Water quality has deteriorated as a result of urbanization (Kerwin and Nelson 2000).

North Fork of Hamm Creek

The North Fork of Hamm Creek (WRIA 09-0002) receives runoff from the eastern drainage basin of the project site and carries it to the Duwamish River (see Figure 2). The majority of the stream is in a pipe under roads, an old gravel quarry, and heavily industrialized areas. However, two open sections, totaling approximately 1,560 linear feet, were located and assessed. Hamm Creek enters the tidally influenced, lower portion of the river near River Mile 5 (Kerwin and Nelson 2000). Proceeding upstream from the Duwamish River, the first open section is a section of the North Fork just downstream (east) of the embankment of State Highway 509, continuing east to 8th Avenue South. The stream flows in a straight ditch underneath a recently cleared power line corridor located behind a number of heavy industries. Riparian vegetation is dominated by bittersweet nightshade, Himalayan blackberry, and reed canarygrass. Wetland fringe areas also contain soft rush. The substrate appeared during the February 5, 2003 site visit to consist primarily of small gravel with some sand. The stream flows in a culvert under 8th Avenue South and then drops slightly into an open collection area, where it combines with flows from ditches and storm drains, including the flow from a tributary called the Mid Fork, joining on the east side of 8th Avenue South. The combined flow enters a large corrugated metal pipe.

Proceeding upstream, a second open section of stream is located between State Highway 509 and Myers Way. The stream exits a metal pipe part way down the road embankment on the east side of Myers Way and disperses into a steeply-sloped field of boulders, presumably placed during road construction. Near the bottom of the slope, a concrete dam-like structure directs the water into a central hole at its base (the structure does not form an impoundment). The stream then flows into a large pool, possibly constructed to trap sediment, and then into a more natural channel. Just upstream of State Highway 509 is a "U"-shaped concrete flume with baffles, possibly designed to collect sediment and/or reduce flow velocities. At the end of the "U," stream flow plunges approximately 20 feet vertically into a shaft topped by a trash rack and is then piped underneath the highway. Though the upstream boulder field is barren, the lower half of this stream section is flanked by a wide buffer vegetated with bigleaf maple, red alder, western hemlock, western red cedar, Sitka spruce, hazelnut, rose, osoberry, and sword fern. A few patches of slough sedge, soft rush, and buttercup are also present at the stream edge. Students at Evergreen High School planted many of the native plants close to the stream, particularly the conifer species. The substrate in the natural stream section is a well-graded mix of gravels and the low banks appear stable. The upstream pool and the concrete flume have sediment and fine sand substrates. A few pieces of downed wood are also present in the natural portion of this stream section.

Stream flows in all forks of Hamm Creek have exhibited evidence of water quality degradation typical of streams in urbanized settings during storm events. Metals such as zinc, copper, and lead have been measured at high concentrations during these storm events. In addition to the high metal concentrations, high concentrations of total suspended solids and total petroleum hydrocarbons (TPH) have been measured at sampling locations throughout the streams with only minor exceptions (King County 1994; King County 1995). Elevated pH with values up to 8.72, sampled during base flow conditions, have been attributed to runoff from a cement kiln dust pile located in the vicinity of South 96th Street and 10th Avenue South (King County 1994).

Fish passage into the Middle and North Forks is partially obstructed by a perched culvert outfall into the Duwamish River. However, since the outfall is located within a reach of the river that is subject to tidal influence, adult and juvenile salmonids can enter the system when the tide reaches an elevation of approximately +6.5 feet or higher (Kerwin and Nelson 2000). The lower, piped section of this stream may also inhibit salmonid migration. While the gradient is relatively flat, the lack of suitable holding areas and darkness may inhibit some upstream salmonid migration.

Salmon Creek (WRIA #09-0362)

Salmon Creek flows into Puget Sound near SW 125th Street out of a system of steeply sided, somewhat unstable ravines. The creek and its tributaries have cut deeply into the local, glacial sediments, resulting in steep and inherently unstable sideslopes. Both slow and rapid earth movements occur on the sideslopes and streambanks. The lowermost section of the creek, downstream of Shorewood Drive SW, has been lined with rock and is channelized (King County 1987). A sewage treatment plant lies just upstream of Shorewood Drive SW on the south side of the stream.

The stream has been piped in the northern and central portions of the basin, which include the project area, collecting flows from upstream of Lake Garrett (see Figure 2). Storm runoff water from the project site flows through various ponds, wetlands, and piped sections by two separate pathways to reach Lake Garrett. No listed or candidate fish are believed to inhabit these drainage pathways located in the upper watershed. Storm runoff surface flows originating from on-site are normally kept entirely separate from the flows in Salmon Creek, since they flow into Lake Garrett, and water from Lake Garrett is normally pumped to an outfall at Puget Sound which is distinct from the mouth of Salmon Creek. However, in response to high flow events exceeding a certain threshold, some stormwater overflows from this storm drainage system are reportedly discharged to the creek (Barber, pers. comm., 11 February 2003).

Resident cutthroat trout are reported to use the creek at least up to river mile (RM) 0.8, but there are no documented present-day salmon runs up the stream (Schneider, pers. comm., 20 February 2003). An absolute block to upstream fish migration occurs near the stream's mouth, where there is a 4-foot-high waterfall with no pool (King County 1987). This plunge at the mouth is apparently the result of shoreline armoring (bulkhead construction) - the stream is now reported to plunge over the top of the bulkhead with little or no pool below, resulting in a complete barrier to upstream migration (Schneider, pers. comm., 20 February 2003). While the name of the mainstem creek suggests that anadromous salmonids may have been historically present, there have been no recent observations of any species of anadromous salmonids in this system (Kerwin and Nelson 2000). The only recorded observations are from a spot spawning ground survey conducted on 27 December 1956. As reported in Kerwin and Nelson (2000), 128 chum salmon adults were observed in unnamed tributary 09-0365, and 95 chum salmon adults were observed in unnamed tributary 09-0366. If chum salmon used the creek historically, it is possible and likely that coho did as well.

Of the salmonid fish species being evaluated under the ESA or for EFH, only coho salmon have any reasonable prospects of using the available freshwater habitat in Salmon Creek directly, presuming the existing migration barrier at the mouth were to be corrected. The others (chinook salmon, bull trout, and pink salmon) are not expected to be found in the freshwater habitats of Salmon Creek, but use the waters of Puget Sound into which Salmon Creek flows.

Puget Sound

Puget Sound habitat has been impacted by a variety of human activities which have modified the shoreline condition and function, and have impacted water quality. Shoreline development and clearing has reduced the amount of woody materials lining the shore, and artificial shoreline armoring has reduced substrate material supply, affecting the composition of many beach areas. As mentioned for the Duwamish, many estuary areas, important for the rearing of juvenile fish during their period of transition to sea water, have been filled for industrial or other development, or diked and drained for agricultural uses. The Nisqually delta and estuary, located approximately 50 miles to the south in Pierce County, is among the least impacted in Puget Sound, though some of it has a history of agricultural use.

Juveniles of all the species of anadromous fish mentioned in this report are expected to occupy nearshore marine environments in the project vicinity to some degree. Near the project area, sand lance spawning areas have been mapped along the nearshore of Puget Sound north of the mouth of Salmon Creek and surf smelt spawning areas have been mapped along the nearshore to the south (WDFW 2003). These two species serve as prey for adult salmonid fishes, including chinook salmon.

Indicators of Baseline Conditions

1. Water Quality: The lower Duwamish River is a highly industrial area with few natural habitat features. Water quality has also suffered (Kerwin and Nelson 2000). Stream flows in all forks of Hamm Creek have exhibited evidence of water quality degradation typical of streams in urbanized settings during storm events. Metals such as zinc, copper, and lead have been measured at high concentrations during these storm events. In addition to the high metal concentrations, high concentrations of total suspended solids and total petroleum hydrocarbons (TPH) have been measured at sampling locations throughout the streams with only minor exceptions (King County 1994; King County 1995). Elevated pH with values up to 8.72, sampled during base flow conditions, have been attributed to runoff from a cement kiln dust pile located in the vicinity of South 96th Street and 10th Avenue South (King County

Table 1. Checklist for Documenting Environmental Baseline and Effects of Proposed Action(s) on Relevant Indicators. (completed at scale of WRIA 9, Duwamish/Green River basin with action area effects noted where different)

PATHWAYS	ENVIRONMENTAL BASELINE			EFFECTS OF THE ACTION(S)		
INDICATORS	Properly [1] Functioning	At Risk[1]	Not Prop.[1] Functioning	Restore [2]	Maintain [3]	Degrade [4]
Water Quality						
Temperature		X			X	
Sediment/Turbidity			X	improve in action area	X	
Chem. Contam./Nut.			X	improve in action area	X	
Habitat Access						
Physical Barriers			X		X	
Habitat Elements						
Substrate		X			X	
Large Woody Debris			X		X	
Pool Frequency			X		X	
Pool Quality			X		X	
Off-Channel Habitat			X		X	
Refugia			X		X	
Channel Cond. & Dyn.						
Width/Depth Ratio		X			X	
Streambank Cond.		X			X	
Floodplain Connectivity			X		X	
Flow/Hydrology						
Peak/ Base Flows			X	improve in action area	X	
Drainage Network			X		X	
Watershed Conditions						
Road Dens. & Loc.			X		X	
Disturbance History			X		X	
Riparian Reserves			X		X	

[1] These three categories of function ("properly functioning," "at risk," and "not properly functioning") are defined for each indicator in the "Matrix of Pathways and Indicators"

[2] For the purposes of this checklist, "restore" means to change the function of an "at risk" indicator to "properly functioning," or to change the function of a "not properly functioning" indicator to "at risk" or "properly functioning" (i.e., it does not apply to "properly functioning" indicators).

[3] For the purposes of this checklist, "maintain" means that the function of an indicator does not change (i.e., it applies to all indicators regardless of functional level).

[4] For the purposes of this checklist, "degrade" means to change the function of an indicator for the worse (i.e., it applies to all indicators regardless of functional level). In some cases, a "not properly functioning" indicator may be further worsened, and this should be noted.

1994). Puget Sound habitat has been impacted by a variety of human activities which have modified the shoreline condition and function, and have impacted water quality.

2. Habitat Access: The North Fork of Hamm Creek (WRIA 09-0002) receives runoff from the eastern drainage basin of the project site and carries it to the Duwamish River. The majority of the stream is in a pipe under roads, an old gravel quarry, and heavily industrialized areas. Fish passage into the Middle and North Forks is partially obstructed by a perched culvert outfall into the Duwamish River. However, since the outfall is located within a reach of the river that is subject to tidal influence, adult and juvenile salmonids can enter the system when the tide reaches an elevation of approximately +6.5 feet or higher (Kerwin and Nelson 2000). The lower, piped section of this stream may also inhibit salmonid migration. While the gradient is relatively flat, the lack of suitable holding areas and darkness may inhibit some upstream salmonid migration. The culverted crossing under SR 509 includes an approximately 20-foot vertical plunge into a shaft on the upstream (west) side, which is impassable to upstream fish migration. Maps posted by the I.A.M.A.P.A.L. Foundation (I'm a Pal) at the Lost Fork, Marra Farm restoration site indicate that salmon have been observed up to, but not above, State Highway 509.

   An absolute block to upstream fish migration occurs near the mouth of Salmon Creek, where there is a 4-foot-high waterfall with no pool (King County 1987). This plunge at the mouth is apparently the result of shoreline armoring - the stream is now reported to plunge over the top of a bulkhead with little or no pool below, resulting in a complete barrier to upstream migration (Schneider, pers. comm., 20 February 2003).

3. Habitat Elements: Streambed substrate within the action area was observed to consist primarily of sand and small-to-medium-sized gravel. Where gravelly, sand and fine substrate materials were found to be substantially filling in the interstitial spaces. This gravel was considered to be marginally suitable, at some locations, for the spawning of salmonid fish. Human activities in the basin have likely increased the proportion of fine sediments in the stream substrate, and have thus likely diminished its usefulness and function as a spawning medium for salmonid fish.

   Woody debris materials along the North Fork of Hamm Creek are largely absent due to the extensively modified and piped condition of the channel, though implementation of various habitat enhancement and restoration projects elsewhere within the Hamm Creek basin have replenished and restored stocks of woody materials to some degree. Situated, as it is, within a fairly steep-sided and deep, wooded ravine, in-stream woody materials are more prevalent along Salmon Creek. However, the size and number of such large woody debris items have likely decreased considerably there, too, compared to the pristine, old growth condition. Pool frequency and quality are diminished due to the extensive channel and basin changes noted, and cover within the remaining pools is likewise diminished due to the reduced amount of woody materials. Off-channel habitat which formerly would have occurred along lower Hamm Creek on the Duwamish flood plain and in its estuary have since been almost entirely eliminated due to intense industrial development in that area. Adequate habitat refugia have not been identified in the Hamm or Salmon Creek basins since no relatively large areas of undisturbed habitat are present. Development in these basins has been broadly distributed and pervasive.

4. Channel Condition and Dynamics: The width/depth dimensions of the Hamm and Salmon Creek channels within the defined action area appear to have been significantly altered due to channelization and flow effects associated with the fairly intense urbanization of their basins. The channels are fairly stable throughout most of the action area considering the increased flows that the creeks experience due to the past and ongoing development that is occurring in their basins, but they are experiencing significant bank erosion in certain areas, particularly within the somewhat naturally unstable Salmon Creek ravine. These areas of bank erosion are a detriment to habitat functioning and may be slightly improved due to improved stormwater management associated with the project.

5. Flow/hydrology: Changes in basin hydrology, including increases in peak flows, have clearly accompanied the extensive development that has occurred throughout both the Hamm and Salmon Creek basins. Drainage network density has increased significantly due to the extensive network of roads which have been built in the basin.

6. Watershed Conditions: In summary, the Hamm and Salmon Creek basins have experienced a high degree of disturbance as they have been changed from their original, old-growth forest character to their present state which includes numerous roads, and significant areas of residential and commercial development. Though present, riparian reserve areas are fragmented and disconnected, and areas large enough to be considered refugia are generally not present.

5. SPECIES INFORMATION AND PROJECT VICINITY USE

Site-specific information about each species is presented below. General life history information related to temperature, diet, and migration is contained in the Federal Register listings (U.S. Federal Register, 24 March 1999; U.S. Federal Register, 25 July 1995; U.S. Federal Register, 1 November 1999; U.S. Federal Register, 12 July 1995) and summarized below. Listed fish species use of each stormwater-receiving waterbody is shown in Table 2.

Table 2. Aquatic Species Use of Project Vicinity Waterbodies

Common Name ***Scientific Name*** **Special status***	**Project Vicinity Waterbodies**				
	Duwamish River	**Lake Garrett and Tributaries**	**North Fork Hamm Creek**	**Salmon Creek**	**Puget Sound Nearshore**
Chinook salmon *Oncorhynchus tshawytscha*	✓[1, 2]		✓[6]		✓
Coho salmon *Oncorhynchus kisutch*	✓[1, 2]		✓[5, 6]	✓ (presumed historic)	✓
Bull trout *Salvelinus confluentus*	✓[1, 3, 4]				✓

Sources: [1] WDFW 2003, [2] WDF et al. 1993, [3] WDFW 1998, [4] USFWS 2003, [5] Phil Schneider, [6] John Beal

Chinook Salmon

Chinook salmon are found along the Pacific Coast from the Ventura River in southern California to Point Hope, Alaska (Wydoski and Whitney 1979). In Washington, chinook salmon spawn in streams in the Columbia River, Puget Sound, and coastal drainages (Wydoski and Whitney 1979).

Naturally spawning females guard redds for up to three weeks before dying; males attempt to fertilize other redds before dying (U.S. Federal Register, 9 March 1998). Chinook salmon eggs hatch after 90 to 150 days, depending on water temperature (Wydoski and Whitney 1979). Juvenile summer/fall chinook in the Duwamish basin typically rear in the river for several months during the January through July period before migrating to sea. Out migration occurs primarily during the months of April, May, and June. Juvenile fall (ocean-type) chinook salmon use estuaries extensively to feed before starting their long-distance oceanic migrations, exhibiting longer residence times in estuaries than do other anadromous salmonids (Healey 1982).

Project Vicinity Use

The following overview (Table 3) of the habitat requirements for chinook salmon have been derived primarily from *Habitat Requirements of Anadromous Salmonids* (Reiser and Bjornn 1979), and *Habitat Suitability Index Models and Instream Flow Suitability Curves: Chinook Salmon* (Raleigh et al. 1986).

Table 3. Chinook Habitat Requirements.

Parameter	**Metric Units**	**English Units**
Upstream Migration of Adults		
Temperature Range	10.6-19 ^{o}C	51-67 ^{o}F
Minimum Depth	0.24 meters	9.5 inches
Maximum Velocity	2.44 meters/sec	8.0 feet/sec
Spawning and Incubation		
Temperature Range spawning incubation	 5.6-13.9^{o}C 5.0-14.4^{o}C	 42-57^{o}F 41-58^{o}F
Minimum Depth	0.24 meters	9.5 inches
Velocity Range	30 - 91 cm/sec	1-3 feet/sec
Substrate (Gravel) Size Range	1.3 - 10.2 cm	0.5 - 4 inches
Minimum Dissolved Oxygen	5 mg/l	
Average Redd Area	5.1 square meters	55 square feet

<u>Duwamish River</u>: Near the project area, both of the chinook salmon stocks inhabiting the Duwamish River basin can be identified as summer/fall stocks, spawning from September through October. These stocks are the Duwamish/Green stock, with spawning throughout the basin and hatchery production at Soos Creek, and the Newaukum Creek stock, made up of fish which spawn in lower Newaukum Creek. Both of these stocks are considered to be healthy (WDF et al. 1993).

Hamm and Salmon Creeks: With respect to both Hamm and Salmon Creeks, the habitat criteria for chinook salmon are generally not met and chinook are expected to make relatively little use of them. Inadequacy of flow, particularly during the period of spawning migration, and a lack of suitable spawning materials represent the criteria most problematic for chinook use of these two creeks. Simply put, these creeks are too small to be extensively and consistently used by chinook for spawning. In addition, a formidable barrier to upstream migration, mentioned previously, exists at the mouth of Salmon Creek. However, given the large numbers of chinook juveniles migrating downstream along the Duwamish River past the mouth of Hamm Creek each spring as a result of Soos Creek hatchery operations, it is likely that at least a few of these juveniles enter the lower sections of the creek for refuge and short-term rearing. As mentioned previously, both adult and juvenile salmonids can enter the mouth of Hamm Creek from the Duwamish when the tide reaches an elevation of approximately +6.5 feet or higher (Kerwin and Nelson 2000). Elevated summer temperatures, however, may negatively impact rearing.

Any chinook use of the North Fork of Hamm Creek would extend only as far upstream as the SR 509 crossing at a maximum, nearly a half-mile downstream of the project site. In spite of these limitations, John Beal, with the I.A.M.A.P.A.L. Foundation, indicated that he has videos of adult chinook salmon using the North Fork of Hamm Creek (Beal, pers. comm., 20 February 2003).

Puget Sound: Juveniles of chinook salmon are expected to occupy nearshore marine environments in the project vicinity to some degree. However, any effects of on-site activities at this location would be minimal and difficult to detect or quantify.

Coho Salmon

Coho salmon are found along the Pacific Coast from Monterey Bay in central California to Point Hope, Alaska (Wydoski and Whitney 1979). In Washington, coho salmon spawn in streams in the Columbia River, Puget Sound, and coastal drainages (Wydoski and Whitney 1979). Adults spawn in late fall and early winter. Coho salmon eggs hatch after 45 to 60 days, depending on water temperature (Wydoski and Whitney 1979).

Coho juveniles typically rear in fresh water for one year (Groot and Margolis 1991). While in fresh water, juveniles utilize virtually all accessible reaches of their natal stream systems for rearing, including lakes, seasonally wetted areas, off-channel ponds, sloughs, swamps, and their tributaries (Pollard et al. 1997; Bryant et al. 1996; Hartman and Brown 1987; Cederholm and Scarlett 1981; Skeesick 1970). Some physical characteristics of habitat typically selected by coho fry and parr include depths greater than 8 centimeters, low current velocity, and availability of cover (Fransen et al. 1993; Fausch 1993; Shirvell 1990; Bugert et al. 1991). Juvenile coho typically begin migrating to sea as smolts during their second spring, with peak downstream migration typically occurring from April through mid-May.

Project Vicinity Use

The following overview (Table 4) of the habitat requirements for coho salmon have been derived primarily from *Habitat Requirements of Anadromous Salmonids* (Reiser and Bjornn 1979), and *Habitat Suitability Index Models and Instream Flow Suitability Curves: Coho Salmon* (McMahon 1983).

Table 4. Coho Habitat Requirements.

Parameter	Metric Units	English Units
Upstream Migration of Adults		
Temperature Range	7.2-15.6 °C	45-60 °F
Minimum Depth	0.18 meters	7 inches
Maximum Velocity	2.44 meters/sec	8.0 feet/sec
Spawning and Incubation		
Temperature Range spawning incubation	 4.4-9.4 °C 4.4-13.3 °C	 40-49 °F 40-56 °F
Minimum Depth	0.18 meters	7 inches
Velocity Range	30-91 cm/sec	1-3 feet/sec
Substrate (Gravel) Size Range	1.3-10.2 cm	0.5-4 inches
Minimum Dissolved Oxygen	5 mg/l	
Average Redd Area	2.8 square meters	30 square feet

Duwamish River: Near the project area, two stocks of coho salmon inhabit the Duwamish River basin. These are the Green River/Soos Creek stock, a healthy stock spawning throughout the basin from late October through mid-December, and the Newaukum Creek stock, a depressed stock spawning in the Newaukum Creek basin from late October through mid-January (WDF et al. 1993). WDFW (2003) also notes coho salmon use of the Duwamish River.

Hamm and Salmon Creeks: Both Hamm and Salmon Creeks are of adequate size for use by coho salmon. The lower stream sections of Hamm Creek are accessible to fish entering from the Duwamish River at moderately high tides (Kerwin and Nelson 2000). However, usage of Salmon Creek by coho is entirely precluded due to a man-made migration barrier situated at the streams mouth (King County 1987; Schneider, pers. comm., 20 February 2003).

No fish were observed along an open section of the North Fork of Hamm Creek upstream of 8th Avenue South during a February 2003 site visit, past the expected spawning period for coho. However, an employee of Security Construction Services reported last seeing adult salmon (likely coho) migrating upstream in 2001 and previous years. According to the employee, salmon are stranded on the road and in the paved storage yard during floods. Maps posted by the I.A.M.A.P.A.L. Foundation (I'm a Pal) at the North Fork, Marra Farm restoration site indicate that salmon have been observed up to State Highway 509. Phil Schneider of King County, formerly with WDFW, indicated that he had captured juvenile coho in the North Fork under the power lines extending up to SR 509 (Schneider, pers. comm., 20 February 2003), and John Beal, with the I.A.M.A.P.A.L. Foundation, indicated that he has videos of adult coho salmon using the North Fork (Beal, pers. comm., 20 February 2003). Both Salmon and Hamm Creeks would potentially provide functional habitat for rearing juvenile and spawning adult coho salmon. However, potential coho salmon use of Salmon Creek is presently completely blocked by a migration barrier at its mouth and Hamm Creek has been impacted by intense industrial and residential development throughout its basin. As for most small, lowland streams, low summer flows and associated elevated temperatures may restrict rearing capacities for coho juveniles (Williams et al. 1975). While the name of the mainstem of Salmon Creek suggests that anadromous salmonids may have been historically present, there have been no recent observations of any species of anadromous salmonids in this system (Kerwin and Nelson 2000). The only recorded observations are from a spot spawning ground survey conducted on 27 December 1956. As reported in Kerwin and Nelson (2000), 128 chum salmon adults were observed in unnamed tributary 09-0365, and 95 chum salmon adults were observed in unnamed tributary 09-0366. If chum salmon used the creek historically, it is possible and likely that coho did as well. As previously mentioned, there is an absolute block to upstream fish migration near the stream's mouth.

Puget Sound: Juveniles of coho salmon are expected to occupy nearshore marine environments in the project vicinity to some degree, but, as for chinook salmon, any effects of on-site activities at this location would be minimal and difficult to detect or quantify.

Bull Trout

Several thorough reviews of bull trout literature were surveyed in preparation for this species description. Rather than repeat their work here, the following is a summary of the salient points from those reviews cited collectively, with information from other sources cited separately. The collective citation for the bulk of this description follows: Brown (1992), Rieman and McIntyre (1993), and Sanborn et al. (1998).

The historical range of bull trout extended from the McCloud River in California to the Yukon River in Alaska, west of the Continental Divide within the contiguous United States except in tributaries of the Saskatchewan River, but east of the Continental Divide in the Saskatchewan and Mackenzie River systems in Canada. In Washington, bull trout occur within the Columbia River system, in most rivers of Puget Sound, and in coastal rivers from Grays Harbor north (U.S. Federal Register, 1 November 1999).

Several life history forms of bull trout occur, and all may be present within the same population. Fish exhibiting the resident life history strategy are non-migratory, spending their entire lives within their spawning stream. Migratory life history strategies include fluvial, adfluvial, and anadromous. Migratory bull trout reside as adults and subadults in larger rivers (fluvial), lakes or reservoirs (adfluvial), or marine waters (anadromous), and spawn and rear as juveniles in headwater tributaries. Anadromous forms are common in Puget Sound drainages from the Snohomish River north (Kraemer in prep.).

The majority of bull trout spawning occurs between late August and early November. Spawning migrations occur during the summer, but may start as early as April in some systems (Ratliff et al. 1996). In river systems of north Puget Sound, spawners typically arrive in holding areas near spawning grounds from several weeks, to up to four months before spawning (Kraemer in prep.). Characteristics of holding areas are: depth of at least one meter; cover in the form of turbulent water, undercut banks, woody debris, or overhanging vegetation; and cool temperatures, often provided by groundwater input. Spawning typically does not commence until stream temperatures drop to 8°C. In the North Puget Sound region, "the downstream limit of successful spawning is always upstream of the winter snow line (that elevation at which snow is present on the ground for much of the winter)" (WDFW 1999). Bull trout spawning habitat typically consists of gravel/cobble substrates (Kraemer in prep.). Once sexually mature, resident, fluvial, and anadromous bull trout in north Puget Sound spawn annually (Kraemer in prep.). Following spawning, adult bull trout move downstream quickly, remaining in deep pools in larger rivers, or in lakes for the winter. Spawned-out bull trout have been observed in November feeding on loose eggs in salmon spawning grounds (Kraemer in prep.).

Successful egg incubation for bull trout requires temperatures less than 5°C (WDFW 1999), with maximum survival between 2 and 4°C. Incubation usually takes from 100 to 145 days, depending on temperature. Both juvenile and adult bull trout are rarely found in streams with summer temperatures that exceed 15°C, though cold groundwater seeps can occasionally provide temperature refuges that allow bull trout to inhabit the warmer streams. Fry are closely associated with the substrate while foraging, and rely on interstitial spaces for cover. Bull trout juveniles show a preference for low-velocity habitat; fry are often found in backwater areas, stream margins, and side channels, while larger juveniles occupy pools. Juveniles disperse widely from the spawning area, and should be expected even in tributaries that do not support spawning unless access is obstructed by a passage barrier. Juveniles that adopt a migratory life history strategy usually move downstream to a mainstem river, lake, or ocean following two or three years of rearing in headwater streams. The timing of this migration varies between and within systems, and is not confined to spring. The non-spawning movements of adults are generally associated with thermal requirements, either seeking warmer water in winter (non-coastal populations) or colder water in summer.

Bull trout with an anadromous life history spend two to three years in fresh water before migrating in the spring to the estuary or nearshore marine environment (Kraemer in prep.). While in the marine environment, they feed on smaller fish such as surf smelt (*Hypomesus pretious*), Pacific herring (*Clupea harengus pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and pink (*O. gorbuscha*) and chum (*O. keta*) salmon fry, closely following the distribution of the prey fish (Kraemer in prep.). Subadults usually spend two summers in the marine environment before they mature, separated by a return to fresh water to overwinter, and immature and non-spawning adult fish migrate upstream with the spawners in late summer (Kraemer in prep.).

Project Vicinity Use

Duwamish River: According to WDFW (1998), "information on the presence, abundance, distribution, and life history of bull trout/Dolly Varden in the Green River basin is unavailable or extremely limited." One study cited by WDFW (1998) indicates that bull trout are present below Howard Hansen Dam, and WDFW maps (2003) report bull trout presence based on a submission by the USFWS. However, there is no "confirmation or quantitative measure of bull trout/Dolly Varden natural production or juvenile rearing in the Green River basin" (WDFW 1998). The USFWS included bull trout on its county-wide 2003 species list for the proposed project and WDFW (2003) data also indicated bull trout use in the Duwamish River.

North Fork of Hamm Creek: No spawning of adult bull trout in Hamm Creek has been documented or is expected. Habitat within the Hamm Creek basin is likely poorly suited for use by bull trout, even in its original, pristine condition. As described above, bull trout typically utilize very cold, mountain headwater streams as their primary habitat, which Hamm Creek is most definitely not. Though not expected, sporadic or occasional use of Hamm Creek by juvenile outmigrant anadromous bull trout for short term rearing cannot be entirely ruled out.

Salmon Creek: Bull trout rearing or spawning would not be expected to occur in Salmon Creek since, as mentioned in reference to Hamm Creek, they typically utilize very cold, mountain headwater streams as their primary habitat. Furthermore, the existing migration barrier situated at the mouth of the creek would prevent any fish from entering the creek out of Puget Sound. WDFW (2003) does not identify bull trout as using Salmon Creek.

Puget Sound: Juveniles of bull trout may occupy nearshore marine environments in the project vicinity to a limited degree. Bull trout use of the Duwamish/Green River system is apparently quite low, as stated above, and only any anadromous fish from that limited population would likely be present in the portions of Puget Sound in the project vicinity.

Bald Eagle

Bald eagles are found throughout most of North America (Johnsgard 1990; Kaufman 1996). In general, migrant bald eagles breed in Alaska, Canada and parts of northeastern United States and then winter in central and western United States (Kaufman 1996; Rodrick and Milner 1991). Resident bald eagles remain year-round in areas where the waterways do not freeze in winter, such as along the Atlantic Coast, Gulf of Mexico, Puget Sound, and Idaho and western Montana (Kaufman 1996). Wintering birds may roost communally in groups of up to 400 in areas with high concentrations of food and low disturbance levels (Rodrick and Milner 1991; Anthony et al. 1982). In Washington, for example, communal roosts are located on the Skagit, Skykomish, Columbia, and Yakima rivers. There are no known communal roosts within 1.5 miles of the site (WDFW 2003).

Bald eagles feed primarily on fish through live capture or scavenging carrion such as spawned salmon (Johnsgard 1990). Bald eagles forage opportunistically. In deep-water lacustrine environments, bald eagles feed on dead or surface-swimming fish; in shallow areas, such as coves or gravel bars, bald eagles hunt live fish from perches (Hunt et al. 1992). Other prey includes small mammals, such as rats and rabbits, and waterfowl, such as ducks and American coots (Johnsgard 1990).

Mature bald eagles are occupied with activities related to breeding for the majority of each year. Bald eagles first breed in their fourth or fifth year and are believed to establish a pair bond that lasts for life (Kaufman 1996; Johnsgard 1990). Commencement of reproductive activities ranges from October to May depending on location (Johnsgard 1990). January and February are the typical courtship and nest-building months for bald eagles in Washington (Rodrick and Milner 1991). Average clutch size is two (Kaufman 1996; Johnsgard 1990). Brooding activity steadily declines until, by early May, the chicks are able to regulate their own body temperature (Parametrix, Inc. 1993; Johnsgard 1990). Adults provide food to the young from hatching until shortly after fledging, approximately six feedings per day over 12 weeks. Juvenile bald eagles typically fledge in mid-July, but may remain in the area for another month (Rodrick and Milner 1991).

Project Vicinity Use

According to WDFW (2003), the nearest nesting bald eagle is more than one mile away. The nearest bald eagle nest is located in Seahurst Park along the Puget Sound shoreline, approximately three miles southwest of the Greenbridge site. Other bald eagle nests are located 4 and 6 miles north of the project site along the Duwamish Waterway and Elliot Bay, respectively (WDFW 2003), and in Seward Park, approximately 6 miles east of the site.

Eagles likely forage along the Puget Sound to the west and the Duwamish Waterway to the east, most likely concentrating in areas with significant use by adult salmonids or waterfowl. The USFWS (2003) has determined that wintering bald eagles may occur in the vicinity of the project site. Wintering activities typically occur from October 31 through March 31. WDFW (2003) does not show any winter concentration areas or occurrence of wintering bald eagles within several miles of the project site. Wintering bald eagles may range over the Green/Duwamish River valley and along the Puget Sound; however, there is no documentation of regular or individual use within the project vicinity (Brookshire, pers. comm., 4 March 2003).

It is possible that bald eagles could use the larger trees on the eastern and western boundaries of the site as perch trees and may hunt waterfowl in the winter when the Salmon Creek 1 wetland or others nearby are inundated; however, no eagles were observed during field visits to the project vicinity. Eagles are not likely to perch in the trees on the project site due to the highly urbanized nature of the surrounding land use, including high pedestrian activity and frequent disturbance of vehicular traffic within and surrounding the project site.

6. SPECIES IMPACTS

Salmonids

The effects of the proposed project on watershed and action area conditions are indicated in NOAA Fisheries' "Checklist for Documenting Environmental Baseline and Effects of Proposed Action(s) on Relevant Indicators" (see Table 1). As previously mentioned, only an isolated section of an intermittent, non-fish-bearing stream may be present on the project site; no development is proposed in this portion of the site. The project site does not adjoin any lakes or Puget Sound, but occupies headwater areas of the Salmon Creek and Hamm Creek (Duwamish River) drainages. As such, no fish habitat is present on-site, nor are any fish. Potential fish- or fish-habitat-related impacts would occur only in areas somewhat removed from and downslope of the site. Impacts would be based on the quantity, quality, and timing of the surface water and, to a lesser extent, the groundwater, originating from the site during construction (direct) and operation (indirect) of the Greenbridge site.

A. Direct, Construction-Related Effects on Salmonids

Construction would include excavation and filling during grading activities, construction of stormwater facilities, and the addition of impervious surfaces. Construction activities would result in excavation and removal of vegetation and disturb and compact near-surface soils. Cuts and excavations could intersect shallow perched groundwater. Short-term impacts could result in reduced run-off because water would infiltrate more quickly. However, areas of compacted soil may shed water more quickly. Dewatering activities in trenches and other excavations that encounter seeps or groundwater could result in a temporary increase in discharge to storm drainage systems and/or to surface water bodies. The potential direct impacts of these activities are described below.

1. Water Quality (sediment or other construction-related contaminants): Construction-related water quality impacts to fish and fish habitat would be related to the amount and type of earth exposed during construction, the effectiveness of temporary erosion and sedimentation control measures, and the extent and effectiveness of flow control measures from temporary ponds. These would affect the amount, quality, and timing of potentially silt-laden water reaching downstream areas of fish habitat.

   Construction activities could cause a significant increase in erosion potential and could impair the quality of off-site surface water bodies such as the Duwamish River and Puget Sound. Preparation and implementation of a SWPP plan is required to meet National Pollutant Discharge Elimination System (NPDES) permitting administered by the Washington State Department of Ecology. The plan would primarily consist of a temporary erosion and sedimentation plan (as required by King County), which may include temporary stormwater control facilities. Other impacts to surface water quality could occur from a spill of fuels or other fluids used for construction equipment. The SWPP plan would also include a spill response plan to address accidental releases.

   Existing storm runoff surface flows originating on-site are normally kept separate from flows in Salmon Creek. Currently, storm runoff flows into Lake Garrett, and water from Lake Garrett is pumped to an outfall draining directly to Puget Sound, which is near but distinct from the mouth of Salmon Creek. During high flow events and/or equipment failure, some stormwater overflows from this storm drainage system are reportedly discharged to the creek (Barber, pers. comm., 11 February 2003). Flows from the portions of the site draining to the Duwamish River would, however, flow through fish-bearing portions of the North Fork of Hamm Creek en route.

   The North Fork of Hamm Creek would be more vulnerable to construction-related impacts than Salmon Creek since flows from on-site do not normally enter Salmon Creek but do enter the North Fork of Hamm Creek. In addition, a number of ponds and wetlands occur downstream of the project site in the Salmon Creek basin. These ponds and wetlands serve to improve water quality and attenuate flow fluctuations before runoff from on-site can reach fish habitat in Puget Sound. No such off-site ponds or wetlands occur along the drainage route leading to the North Fork of Hamm Creek, which is documented as supporting salmonid fish in its lower reaches.

   The proposed project would divert the flow from an approximately 11-acre on-site area away from the Lake Garrett sub-basin (Salmon Creek basin) and into the North Fork of Hamm Creek (Duwamish basin). This diversion would represent an approximately one percent increase in the size of the overall Hamm Creek basin. The proposed diversion from the Lake Garrett basin to the Duwamish River basin would not occur until Phase 2 (approximately 2005 or 2006) is constructed. Therefore, installing flow controls on the water quality vault proposed in the Lake Garrett basin could accommodate temporary increases in run-off. Alternatively, temporary stormwater ponds could be constructed or limits could be placed on the percentage of the Lake Garrett basin developed prior to completing the diversion during Phase 2. It is likely that at least one of the stormwater facilities in the Duwamish River basin would be completed during Phase 1.

The Proposed Master Plan calls for stripping and exposing approximately 40 percent of the project site, making it potentially vulnerable to erosion and resultant downstream water quality impacts. However, the Proposed Master Plan would implement effective temporary sedimentation and erosion control and temporary flow control BMPs during the construction process. As a result, downstream construction-related impacts to fish and/or fish habitat are expected to be difficult to detect or quantify, and are discountable.

2. Habitat Alteration (changes in refuge, foraging, and migration conditions): As no work would be conducted in or adjacent to streams, the potential for direct physical habitat alterations is unlikely. Stormwater runoff would be carefully controlled during construction in accordance with a TESC plan such that potential atypically high runoff flows during construction would not occur and could therefore not damage streambanks or beds.

3. Direct Mortality: The potential to kill bull trout, chinook salmon, or coho salmon exists, though at an extremely low level, to the extent that they would be present in the action area during construction. However, as no work would be conducted in or adjacent to streams, the potential for mortality would be related to a lethal water quality problem during construction. Because of the project's implementation of a TESC plan and an SWPP plan, such a problem is highly unlikely and discountable.

B. Indirect, Operationally-Related Effects on Salmonids

1. General Stormwater Runoff: Though proposed project implementation activities would not occur in or adjacent to actively used or potential fish habitat, such habitat occurring farther downstream could still be indirectly affected through changes in water quality and/or quantity resulting from on-site activities. Potential impacts to water quality could occur from discharge of stormwater onto erosion hazard areas, steep slopes or landslide hazard areas. Overflow from stormwater facilities could also result in erosion if not managed properly. Infiltration from stormwater facilities located near steep slopes or landslide hazard areas could result in seeps emerging on or near potentially sensitive slopes.

   In general, an increase in impervious surface area would result in an increased amount of surface water runoff and a decrease in groundwater recharge. Under the Proposed Master Plan, redevelopment would be based on hydrologic analysis for flow control and water quality facilities that allow for a reduction in effective impervious area based on low impact development BMPs. Accordingly, the Proposed Master Plan includes the design and construction of stormwater quality facilities (e.g., wetponds, water quality vaults, etc.) that would be sized to accommodate post-development flows anticipated from each sub-basin. In some cases, clean run-off (e.g., from roofs) would be maintained and routed separately from run-off water needing treatment (e.g., from roadways) to reduce the size of stormwater control facilities, allowing for efficient site planning and design of stormwater control infratructure. The Proposed Master Plan would also incorporate roadside biofiltration swales to achieve water quality treatment and some flow control. Some infiltration would likely result from the use of these biofiltration swales, however detention ponds were sized using the conservative assumption of no infiltration. This would not only augment shallow groundwater flow (interflow), but would also assist with the filtering and treatment of the roadway run-off water. In general, runoff would be treated and would be cleaner than under existing conditions. This would contribute to improved water quality in downstream receiving waters.

Following water quality treatment and flow attenuation due to detention, storm runoff from on-site in the North Fork Hamm Creek drainage may either be discharged to near the head of a small on-site ravine, as it is presently, or it may be piped directly to an existing piped drainage system. As described previously, the head of the small ravine may contain a short, Class 3 stream section and a Class 3 wetland. No development is proposed in this area. If the existing stormwater discharge location to the ravine sideslope is maintained, it could result in some continued erosion, but presumably less than would occur under existing conditions since the Proposed Master Plan would attenuate storm runoff flow fluctuations by providing detention. If piped directly to the existing piped drainage system, some potential erosion may be avoided and the Class 3 stream section and Class 3 wetland area, if present in the upper ravine area, would be bypassed. Some stormwater from off-site to the south also enters the ravine, which may be sufficient to maintain the stream section and wetland area, if present. The Proposed Master Plan would significantly improve water quality and attenuate runoff flow fluctuations compared with existing site conditions.

2. Flow Diversion Between Basins: As described previously, development under the Proposed Master Plan would divert storm runoff flows from an 11-acre area of the site away from the Salmon Creek basin and into the North Fork Hamm Creek basin. Stormwater control facilities, if needed, would be sized so that developed peak flows and durations will be equal to or less than existing conditions.

   Despite the contrived and piped condition of the North Fork of Hamm Creek and its alignment, the stream is reportedly used by several species of salmonid fish. Surface flows from the portions of the project site that are nominally in the Salmon Creek basin do not normally reach Salmon Creek since they are, instead, bypassed to Puget Sound. However, runoff from portions of the project site in the Hamm Creek basin flow through sections of the North Fork of Hamm Creek that are used by fish. Therefore, runoff water draining to Hamm Creek from the project site could more directly affect fish before reaching Puget Sound.

   The proposal to divert on-site flows to the North Fork Hamm Creek basin from the Salmon Creek basin would increase non-peak flow rates in the North Fork of Hamm Creek and has the potential to affect salmonid fish and their habitat unless effective safeguards and controls are implemented. The reroute could potentially increase the frequency or extent of flooding along the North Fork of Hamm Creek. However, the proposed diversion of flows is not expected to result in adverse impacts to fish or fish habitat downstream of the project site for the following reasons:

   A. The increase in drainage area to the overall Hamm Creek basin would be relatively minor, an increase of approximately one percent.

B. No flow controls on runoff originating on-site are presently in place. The Proposed Master Plan incorporates flow controls which would prevent any increases in the duration of flows higher than half of the existing two-year flow as calculated at the site boundary. Flows below half of the two-year rate are generally considered to be relatively non-erosive. Changes in flow would be further attenuated proceeding downstream along the stream channel away from the site as flow from an increasing proportion of the overall basin is assimilated.

C. No water quality treatment for runoff originating on-site is presently provided. The Proposed Master Plan would provide a network of biofiltration swales and opportunities for interflow and infiltration on-site. Interflow, which is shallow, often short-distance groundwater flow, would improve water quality. Through the provision of these water quality protection and improvement measures, it is anticipated that the quality of the water reaching downstream stream sections from the site would be of adequate quality for beneficial use by salmonid fish.

D. As stated above, a proposed diversion of flow out of the Salmon Creek basin would increase non-peak flow rates in the North Fork of Hamm Creek. Given that the North Fork of Hamm Creek is a relatively small creek amongst those used by adult salmon, such a minor increase in non-peak flow rates during periods of upstream adult migration may be of benefit in facilitating such upstream fish passage.

Bald Eagle

The site of the proposed project is more than 1.0 mile from the nearest bald eagle nesting site. Bald eagle habitat would not be destroyed by the project, nor would prey abundance be reduced. Populations of wildlife species preyed on by bald eagles, such as waterfowl, would not be affected.

As stated in Section 1, because the project site is greater than 1.0 mile from an active bald eagle nest, the project would have no effect on bald eagle breeding, and timing or equipment restrictions are not necessary during the bald eagle breeding period. Bald eagles may have been observed in the vicinity on occasion. Except for potential perching habitat on the slopes along the western portion of the site, the site lacks suitable foraging or nesting habitat (mature trees along fish-bearing waters or areas of waterfowl use). The proposed project would occur more than one mile from likely primary foraging areas (e.g., fish-bearing waters of Puget Sound or potentially along the Duwamish River); accordingly, no additional timing restrictions are necessary to protect any foraging bald eagles. Thus, the proposed project would have no effect on breeding bald eagles and may affect, not likely to adversely affect, foraging bald eagles.

7. CRITICAL HABITAT

Chinook Salmon

Critical habitat designated for Puget Sound chinook salmon (U.S. Federal Register, 16 February 2000) was withdrawn as of 30 April 2002 as part of a settlement between NMFS and the National Association of Home Builders. Habitat issues related to direct and indirect species impacts covered by the take prohibition (U.S. Federal Register, 24 March 1999) have been discussed in Section 6 above.

Coho Salmon

Critical habitat has not been proposed for coho salmon.

Bull Trout

Critical habitat has not been proposed for bull trout.

Bald Eagle

Critical habitat has not been proposed or designated for the bald eagle.

8. ESSENTIAL FISH HABITAT

A 1996 amendment to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires the identification of habitat utilized by certain federally managed fishery species. The purpose of an Essential Fish Habitat (EFH) assessment is to identify potential adverse effects to the habitat of designated EFH species within the action area. The proposed project described in this document falls within the jurisdiction of the Pacific Coast Salmon Fishery Management Plan. Under this plan, EFH is described as all streams, lakes, ponds, and wetlands that currently support or have historically supported chinook, coho, or pink salmon (*O. gorbuscha*), downstream of natural impassable barriers. Species with EFH occurring in the project vicinity are shown below in Table 5.

Table 5. Species with Designated EFH Found in the Green/Duwamish Basin.

Species	Life History Stages	EFH
Coho salmon	Eggs, alevins, juveniles, adults	All freshwater in action area accessible to salmon
Chinook salmon	Eggs, alevins, juveniles, adults	All freshwater in action area accessible to salmon
Pink salmon	Eggs, alevins, fry, adults	All freshwater in action area accessible to salmon

Discussions regarding essential fish habitat (EFH) related to Pacific salmon present in the Duwamish/Green River basin are indirectly included in this Biological Evaluation (BE). The information below identifies where these discussions are located within the BE and concludes with a determination of effect. In accordance with comments from federal lead agencies such as the U.S. Army Corps of Engineers and prior concurrence letters from NOAA Fisheries, this discussion should be considered sufficient to make this determination.

Description of the Project / Proposed Activity: The project description and location are described within the first two sections of the BE. This description gives a thorough explanation of the construction plan and relevant activities. Pacific salmon species of interest related to EFH in the project vicinity are chinook, coho salmon, and pink salmon.

Potential Adverse Effects of the Proposed Project: The following is a description of Pacific salmon EFH as per the federal Fisheries Management Plan (FMP). EFH for the Pacific coast salmon fishery means those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. To achieve that level of production, EFH includes all those streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon in Washington, Oregon, Idaho and California. Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (i.e. natural waterfalls in existence for several hundred years).

Potential impacts to Pacific salmon chinook and coho EFH, as described in the BE in Section 6, include indirect impacts due to potential changes in the quantity and quality of stormwater runoff originating on-site and eventually contributing to stream flows. It is concluded, since the stormwater runoff originating from the development which presently occupies the site is neither detained nor treated, that application of the required, state-of-the-art water quality and quantity controls will result in a significant improvement over existing conditions. Though not specifically addressed elsewhere in the BE, these improvements would apply to pink salmon EFH in the Duwamish/Green River basin as well.

EFH Conservation Measures: Mitigation measures which have been incorporated into the Proposed Master Plan in order to reduce the collective impact include BMPs to improve and protect water quality and provide quantity controls as prescribed by and modeled after the Built-Green design procedures and scoring protocol. Related specifically to storm runoff water, these include a roadside biofiltration BMP, and flow controls to meet design criteria. The mitigation measures provided will result in material improvements to water quality and quantity control parameters, to the benefit of EFH downstream of the site in the lower Duwamish basin and Puget Sound.

Conclusion: All of the proposed project's potential impacts on chinook, coho and pink salmon EFH are considered collectively. Although construction could potentially adversely affect water quality and thereby the EFH described above temporarily, the implementation of the proposed project and included conservation measures would result in a net beneficial impact within a short period of time, certainly within the first year following implementation as water quality biofiltration swales become fully vegetated. Thus, the collective impact of the proposed project may affect, but is not likely to adversely effect, Pacific chinook, coho, and pink salmon EFH.

9. CUMULATIVE IMPACTS

Cumulative impacts were assessed through the review of the project proposal, a site visit, and previous studies. The Salmon Creek and Hamm Creek basins are already highly developed with little land remaining for additional development. If and when land in these basins is redeveloped, it will be subject to more stringent and effective water quality and quantity control measures, such as those included in the current KCSWDM. Significant improvements in water quality and runoff flow regime characteristics would be anticipated as such re-development occurs. Due primarily to topographic constraints, it is not anticipated that flow from substantial additional areas would be diverted between drainage basins in the project vicinity.

10. DETERMINATION OF EFFECT

The proposed project may affect, but is not likely to adversely affect, Puget Sound chinook salmon and the bald eagle, and is not likely to jeopardize Puget Sound-Strait of Georgia coho salmon. The proposed project may affect, but is not likely to adversely affect, Coastal-Puget Sound bull trout.

The collective impact of the proposed project may affect, but is not likely to adversely effect, Pacific chinook, coho, and pink salmon EFH.

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Appendix A

PROJECT PLANS

architecture | interior design | landscape architecture | planning & urban design

NORTH

0 50 100 200 500

HOPE VI
KING COUNTY HOUSING AUTHORITY

NAKANO ASSOCIATES

GOLDSMITH & ASSOCIATES

kpff Consulting Engineers

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DRAWING ISSUES: 5/30/03

PROJECT: GREENBRIDGE - HOPE VI MASTER PLAN

CLIENT: KING COUNTY HOUSING AUTHORITY

SHEET TITLE: MASTER SITE PLAN

PROJECT NO: 2002070.00

SCALE: 1"=100'-0"

SHEET NO: MP-1

Appendix B

SITE PHOTOS

2000 aerial photograph of project site (King County iMap).

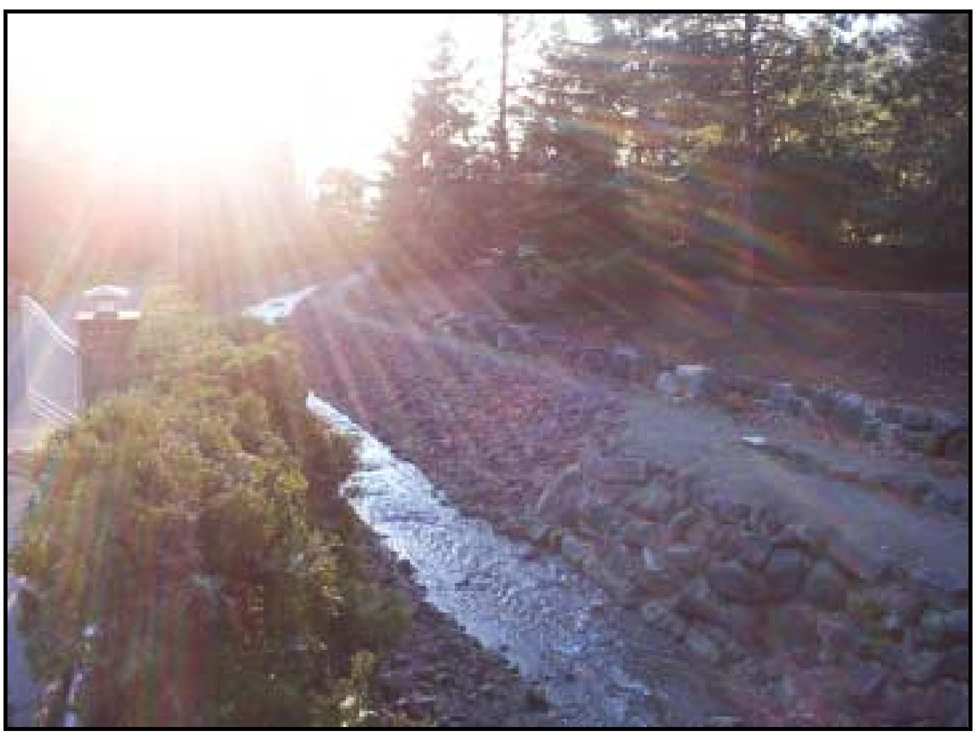
View of North Fork Hamm Creek, upstream end of culvert on the east side of 8th Avenue South.

View of Hamm Creek facing downstream towards 8th Avenue South.

View of North Fork Hamm Creek between State Highway 509 and Myers Way. The stream plunges 20 feet upon entering the trash rack.

View of Mallard Lake.

View of flooded Lake Garrett, 5 February 2003. The pump station is outside of the photo to the right.



View of Salmon Creek, facing downstream near Puget Sound. Note channelization and armoring of banks.