Boeing Creek Park Improvements Project Critical Areas Report

Prepared for:
City of Shoreline Public Works
17544 Midvale Ave. N
Shoreline, WA 98133

Prepared by:
Otak, Inc.
10230 NE Points Drive
Suite 400
Kirkland, WA 98033

Otak Project No. 30206

December 14, 2007

Table of Contents

Boeing Creek Park Improvements Project
Critical Areas Report

Section 1—Introduction

This Critical Areas report has been prepared for the Boeing Creek Park Improvements project in the City of Shoreline, King County, Washington. As part of these improvements, the City of Shoreline proposes to: 1) increase the storage capacity of an existing stormwater facility (Boeing Creek Park Stormwater Facility), 2) construct a footbridge spanning Boeing Creek, and 3) repair and/or restore the trail system in Boeing Creek Park.

The Boeing Creek Park Stormwater Facility (stormwater facility) will be excavated to increase the storage volume in order to accommodate for increased peak flows from a proposed pump station located approximately one mile upstream of the stormwater facility. The extra volume will allow the stormwater to be held and discharged into Boeing Creek at a rate equal to existing discharges.

A Pedestrian Suspension Bridge (bridge) over Boeing Creek will be constructed in order to provide a safer stream crossing for pedestrians and to reduce erosion to the creek's streambed caused by current foot traffic.

The Trails in Boeing Creek Park (trails) that are failing due to sloughing and erosion will be restored and stabilized using steps and pin logs. Some unofficial trails in the park will be closed and revegetated with native species. Also, crushed surfacing will be added to the trail around the stormwater facility and the trail leading to the proposed bridge to improve accessibility to the public.

This Critical Areas report addresses three identified Critical Areas (Geological Hazard Areas, Fish and Wildlife Habitat Conservation Area (FWHCA), and Stream Areas), defined under the Shoreline Municipal Code (SMC 20.80), that occur in or near the project area where construction work is proposed. The proposed bridge and trail system have Geological Hazard Areas, FWHCA, and a Stream Area associated with its location. The Stormwater Facility has only a Geological Hazard Area associated with its location. No other Critical Areas are associated with the proposed project.

1.1 Project Location

The Boeing Creek Park Improvements project site is located in Boeing Creek Park, in the City of Shoreline, King County, Washington (Figure 1). This area lies in Section 12, Range 3 East, and Township 26 North, coordinates 47°45'13"N 122°21'49"W. The site is located near the intersection of 3rd Avenue NW and North 175th Street. Adjacent property uses include low density residential development, the campus of Shoreline Community College, and Shoreview Park.

The Boeing Creek Park site itself is currently used primarily for recreation. There are a number of trails for walking, jogging and hiking in the wooded aspect of the park. The site also has a stormwater detention and conveyance facility, buried stormwater and sewer pipes, and open channels that have been modified to ameliorate the influence of peak discharges on the stream perimeter. The portion of the site proposed for the bridge and trail modifications is primarily forested and the ravine slopes are occupied by understory shrubs. Much of the stormwater facility area is covered with meadow and open grassland.

1.2 Proposed Action

The project is designed to provide additional flood storage capacity in the stormwater facility, as well as enhance pedestrian safety and protect Boeing Creek by installing a pedestrian suspension bridge over an area where there is an informal stream crossing that is currently eroding due to foot traffic.

The stormwater facility expansion involves grading out an existing stormwater detention facility to increase its storage capacity. In addition, a series of rock weirs and pool elements are proposed to be installed in the centerline of the stormwater facility and the bottom of the facility will be planted with vegetation to filter the water and improve water quality before entering Boeing Creek. A pedestrian pathway will be installed around the perimeter of the facility. Native tree, shrub, and herbaceous plant species will be installed as well. See Appendix B for design details associated with the stormwater facility expansion element of the proposed project.

The park improvements for the project involve construction of a 175-foot long suspension pedestrian bridge across Boeing Creek. The design is intended to provide safe pedestrian passage across Boeing Creek, and to protect Boeing Creek from further bank erosion and disturbance associated with the existing, informal foot crossing. Additionally, numerous existing informal trails will be decommissioned and restored with native vegetation installation. Work on these improvements will occur above the Ordinary High Water Mark (OHWM) for Boeing Creek, and no fill of waters of the U.S. will occur as a result.

Figures 2 and 3 represent the project site map and Critical Areas map for the proposed project. Definitions of Critical Areas, per the City of Shoreline Municipal Code (SMC), are presented in Section 2 below.

Section 2—Methods

2.1 Review of Existing Information

Several existing documents and databases were reviewed to gain specific background information on Critical Areas for the Boeing Creek Park Improvements site. These include the Shoreline Municipal Code, aerial photographs, a geotechnical report from Landau and Associates (2007), the King County Critical Areas database, information from Washington Department of Fish and Wildlife (DFW) and Washington Department of Natural Resources (DNR), and survey maps of the site.

2.2 Geological Hazards Determination Methodology

The Shoreline Municipal Code (SMC) defines geologic hazard areas as follows:

> *Geologic hazard areas are those lands that are affected by natural processes that make them susceptible to geologic events, such as landslides, seismic activity and severe erosion, especially bluff and ravine areas and steep slopes.*

Our geological hazards evaluation included a review of existing documentation that included King County Critical Area map coverage, and a geotechnical report written by Landau and Associates (2007). A site evaluation of the project area was conducted on June 27, 2007 by an Otak, Inc. (Otak) geomorphologist. The purpose of the site visit was to identify areas of potential geological hazards and assess the character and nature of the site topography.

In the field, we measured the gradient of the valley walls with hand-held clinometers, and the slope lengths with a measuring tape and a laser range finder. We documented the characteristics of the soils in the vicinity of the proposed bridge crossing by describing stratigraphy of deposits exposed in free faces in the stream valley. Signs of historic slope movement such as hummocky topography and pistol butt trees were documented during these field visits, as was evidence of groundwater seeps at the base of the valley walls.

2.3 Fish and Wildlife Habitat Conservation Area and Stream Assessment Method

Fish and Wildlife Habitat Conservation Areas (FWHCA) are defined by the Shoreline Municipal Code (SMC) based on best available science, input from Washington Department of Fish and Wildlife, Washington Department of Ecology, and other agencies, and any of the following criteria:

- The presence of species proposed or listed by the Federal government or the State of Washington as endangered, threatened, critical, or priority; or

- The presence of heron rookeries or raptor nesting trees; or
- Streams and wetlands and their associated buffers that provide significant habitat for fish and wildlife.

Additionally, the City of Shoreline considers streams to be defined as Critical Areas, based upon the presence of anadromous fish species and the flow regime. The SMC defines Stream Critical Areas as follows:

> *Streams are those areas where surface waters produce a defined channel or bed, not including irrigation ditches, canals, storm or surface water runoff devices or other entirely artificial watercourses, unless they are used by salmonids or are used to convey streams naturally occurring prior to construction.*

Boeing Creek, in the vicinity of the proposed project area, would be considered a Type II stream based upon its flow regime and potential to provide fish habitat, per SMC 20.80.480.

The project site vicinity contains both a riparian corridor/buffer and Boeing Creek, which meet the criteria for classification FWHCA and Streams under SMC. However, the FWHCA and Stream Critical Areas are found only in the vicinity of the proposed bridge construction and habitat restoration associated with the trail restoration element of the project (Figure 3).

Functions of FWHCAs and Streams may be defined as functions and values of a critical area or buffer that are highly beneficial to the maintenance of the aquatic system and surrounding environment. Habitat values and function for Boeing Creek were assessed using a methodology and approach derived from the U.S. Environmental Protection Agency's (EPA) Habitat Assessment methodology in their Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers (Barbour, et al., 1999). Ten habitat parameters, described below, were assessed semi-quantitatively and qualitatively for individual parameter scores and for an overall habitat score. Habitat parameter scores ranged from 0 to 20, with 20 denoting the most suitable habitats and 0 the least. Qualitative habitat values ranged from poor to optimal. The stream habitat assessment was conducted on September 21, 2007 by an Otak biologist and fluvial geomorphologist.

Epifaunal Substrate/Available Cover

This parameter refers to the presence of substrate that is favorable for epifaunal colonization and fish cover. A mix of elements such as snags, submerged logs, undercut banks, cobble, and stable habitat in general comprises a high quality habitat element for fish and other aquatic species.

Embeddedness

This parameter refers to the percentage of fine sediment that makes up the stream substrate. Fines are defined as sediment particulates such as silts and clays with a grain size less than 0.85 mm. In general, the higher percentage of embededness, the poorer the stream is for that habitat parameter.

Velocity/Depth Regime

This habitat parameter refers to the number of Velocity/Depth regimes present in a particular system. There are a total of four regimes: slow/deep, slow/shallow, fast/deep, and fast/shallow. High habitat value for this parameter would include all four regimes, and habitat value decreases as a stream system includes fewer regimes.

Sediment Deposition

This parameter refers to sediment mobilized by the stream depositing on the stream substrate or as islands and point bars. In general, increased sediment deposition—particularly deposition of fines—is associated with a decreased habitat value with regard to this parameter.

Channel Flow Status

This habitat parameter refers to the degree to which channel substrate is covered by flowing water, or conversely, the degree to which channel substrate is exposed. The greater the degree to which channel substrate is exposed, the poorer the condition of this parameter is. Channel flow status may be strongly influenced by seasonality of flow, particularly in areas such as the Puget Sound lowlands where summer precipitation events are rather infrequent and generally of a relatively small magnitude.

Channel Alteration

This habitat parameter is a metric for the degree of anthropogenic alteration to the stream channel, generally as a result of dredging or bank armoring. As channel alteration increases in a stream system, habitat value for this parameter is decreased.

Frequency of Riffles

This habitat parameter represents a frequency of riffle habitat units based on the ratio of the distance between riffles to width of the stream. More frequent riffles (a smaller riffle distance:stream width ratio) represent a better habitat value for this parameter, with a ratio of 7:1 or less representing optimal habitat conditions.

Bank Stability

This habitat parameter represents the degree to which the stream banks maintain a stable condition and the amount of erosion apparent in the system. The greater the amount of erosion scarring, bank scour, and evidence of bank failure, the more degraded the habitat is with regard to this parameter.

Vegetative Protection

This habitat parameter is a metric for the amount of native vegetation that covers the stream bank surfaces and immediate riparian zone. A greater percentage of vegetative cover coupled with little disruption to the vegetative community due to mowing or grazing results in an increased habitat value for this parameter.

Riparian Vegetative Zone Width

This habitat parameter measures the width of the vegetative community in the riparian zone. Human activities within the riparian zone, including parking lots, lawns, clear-cuts, crops, roads, etc., are also included in the assessment of this parameter. Wider riparian zones, coupled with minimal human disturbances, result in increased habitat values for this parameter. Generally, riparian vegetative corridors greater than 18 meters are considered optimal for this parameter.

Section 3—Findings

3.1 Project Area Setting

The project site is located in Boeing Creek Park, with the Stormwater Facility expansion element proposed in the existing Stormwater Facility, and the Park Improvements elements (the suspension pedestrian bridge and trail restoration) proposed along the south Boeing Creek tributary.

3.2 Topography and Geomorphology

Northwest King County is dominated by elongated, smoothly rounded oval-shaped hills called drumlins that were deposited roughly 16,000 years ago during the Vashon glaciation. They are largely composed of compacted sandy glacial drift and gravelly till. The long axis of these hills trends in the north-south direction, parallel to the advance and retreat of the glaciers which originated from Vancouver, B.C. Streams that flow between these hills (in a north-south direction) tend to be low gradient streams that do not cause intensive erosion or sediment supply problems, while those that flow in transverse directions (east-west) incise directly into the hills, liberating sandy gravel that is transported to downstream reservoirs.

Boeing Creek is the natural low point in the topography for the entire watershed, so it is the lowest elevation among all of the surrounding properties. Upland portions of the area could be described as flat or rolling (generally less than 15 percent slopes), while the portion of the area that will be most directly affected by the proposed work are best described as hilly (slopes of more than 15 percent and less than 30 percent or a vertical rise of ten feet over a horizontal distance of 33 to 66 feet) and steep-sloped (greater than 30 percent or a vertical rise of ten feet over a horizontal distance of less than 33 feet). The steepest slope on the property is roughly 65 percent; however this slope length is only approximately 15 feet. The south tributary of Boeing Creek (the pedestrian bridge site) flows through a steeply incised valley that is roughly 55 feet deep and 130 feet wide in the vicinity of the bridge crossing. The southern valley wall rises another 130 feet in elevation above the proposed bridge crossing to create a maximum relief of roughly 185 feet at this location. The valley walls on both sides have gradients of roughly 41 percent. The stream channel in the bed of the southern tributary is dry upstream of the proposed bridge crossing during the summer months, and conveys minimal discharges of 1-2 cfs in the reaches immediately downstream from the crossing. The channel has an average bankfull channel width of roughly seven feet and average gradient of roughly five percent.

3.3 Soils

Soils in the vicinity of the proposed bridge crossing consist of poorly-graded fine to medium sand with various amounts of gravel, overlain with very gravelly sand in the flat regions that are set back from the incised valley. Clay and silt particles are reported to be less than five percent of the total soil volume, making these soils pure sands on the USDA classification

chart. These can be classified as type C (ii) (granular soils including gravel, sand and loamy sand) under WAC 296-155-66401. These soils are highly permeable and nearly 200 feet thick in some locations. According to the geotechnical report (Landau Associates, 2007) test pits and hand auger borings reached depths of roughly six feet without encountering the soil water surface. This sandy layer is underlain by a relatively impermeable clay unit. The relationship between these two layers creates groundwater seeps low in the valley wall in the south Boeing Creek tributary downstream from the proposed bridge crossing. The lower layers of the Esperance Sand were saturated in the stream valley bottom at elevations of approximately 250 feet during the month of July.

3.4 Hydrology

The annual average precipitation in the project area is roughly 36 inches. There are watercourses, including perennial intermittent streams and springs located on the Boeing Creek Park site. Flow within the Park appears to occur perennially throughout the stream network in all but the upstream end of the south tributary. Flow occurs throughout the entire channel on a seasonal basis from late fall through early spring, while the upstream end of the south Boeing Creek tributary appears to be dry during the summer. Iron oxide stained bed sediment is present in the south tributary of Boeing Creek, downstream from the proposed site of the bridge. This staining is most likely a natural phenomenon that is associated with acidic or iron rich soils. Three to four inch deep puddles of standing water are present on the floodplain of the southern tributary during the summer months. These exist immediately downstream from groundwater seeps and stormwater outfalls. The project site contains two watercourses that are upstream from the 100 year floodplain of Boeing Creek, and a riparian wetland is present downstream of the confluence of the north and south tributaries, but off site from the project.

3.5 Vegetation

Boeing Creek Park Improvements Site

Upland vegetation on the slope above the Boeing Creek Park site in the vicinity of the proposed bridge is a mixture of relatively mature coniferous and deciduous forest, often occurring along fairly steep slopes. Table 1 lists the plant species observed in the upland slopes above the creek. Photos of the vegetated slopes associated with the project area are included in Appendix A.

Table 1. List of Plant Species Observed in the Boeing Creek Park Site		
Stratum	Scientific Name	Common Name
Tree	*Acer macrophyllum*	Big leaf maple
	Alnus rubra	Red alder
	Pinus monticola	Western white pine
	Pseudotsuga menziesii	Douglas fir
	Thuja plicata	Western red cedar
	Tsuga heterophylla	Western hemlock
Shrub	*Acer circinatum*	Vine maple
	Corylus cornuta	Beaked hazelnut
	Gaultheria shallon	Salal
	Mahonia nervosa	Dull Oregon grape
	Oemleria cerasiformis	Indian plum
	Oplopanax horridus	Devil's club
	Rubus spectabilis	Salmonberry
	Salix sitchensis	Sitka willow
	Sambucus racemosa	Red elderberry
	Vaccinium parvifolium	Red huckleberry
Vine	*Rubus armeniacus*	Himalayan blackberry
	Rubus ursinus	Trailing blackberry
Herb	*Agrostis capillaris*	Colonial bentgrass
	Athyrium filix-femina	Lady fern
	Dicentra formosa	Pacific bleeding heart
	Equisetum arvense	Field horsetail
	Geranium robertianum	Herb-Robert
	Maianthemum dilatatum	False lily of the valley
	Phalaris arundinacea	Reed canarygrass
	Polystichum munitum	Sword fern

The mixed coniferous/deciduous has three strata (tree, shrub, and herbaceous) and is dominated by native species, representing a relatively undisturbed habitat. The tree layer includes western hemlock (*Tsuga heterophylla*), Douglas fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*), Western white pine (*Pinus monticola*), big leaf maple (*Acer macrophyllum*), and red alder (*Alnus rubra*). Many of the trees are very large; some of the Douglas fir appear

to be greater than 60 inches in diameter at breast height (dbh). The shrub layer contains vine maple (*Acer circinatum*), Indian plum (*Oemleria cerasiformis*), salmonberry (*Rubus spectabilis*), dull Oregon grape (*Mahonia nervosa*), red elderberry (*Sambucus racemosa*), and red huckleberry (*Vaccinium parvifolium*). The herbaceous layer consists of sword fern (*Polystichum munitum*), herb-Robert (*Geranium robertianum*), lady fern (*Athyrium filix-femina*), bleeding heart (*Dicentra formosa*), and trailing blackberry (*Rubus ursinus*).

Boeing Creek Park Stormwater Facility Site

Plant species associated with the stormwater facility consisted of planted upland wildlflowers, grasses, and weedy species. The planted wildflower mix included such species as California poppy (*Eschscholzia californica*), yarrow (*Achillea millefolium*), lupine (*Lupinus sp.*) vetch (*Vicia sp.*), alfalfa (*Medicago sativa*), and clovers (*Trifolium* spp). Grasses included bentgrass (*Agrostis sp.*), fescue (*Festuca sp.*), and orchardgrass (*Dactylis glomerata*) as dominant species. Invasive weeds included Himalayan blackberry in the northeast corner of the site, reed canary grass near the overflow structure, and Scot's broom around the upper perimeter of the site. The plant community associated with the stormwater facility would be characterized as disturbed, and provides limited functional habitat value.

3.4 Geological Hazard Critical Areas

Landslide Hazard Areas

The Shoreline Municipal Code is written to include all episodic downslope movements of soil and rock in its definition for the term 'landslide'. The bridge project area at Boeing Creek includes areas that are subject to landslides as a result of a combination of the following risk factors: slopes that are steeper than 15 percent, soils that are underlain by impermeable soils (silt and clay), ground surfaces with water seepage, extensive evidence of recent historical movement, and potential instability due to stream incision and bank erosion. Land slide hazard areas are identified on either side of the south tributary of Boeing Creek in the project vicinity. Per the SMC, standard required buffer is 50 feet from all edges of the landslide, and may be reduced to a minimum of 15 feet provided that "the reduction will not increase the risk of the hazard to people or property on- or off-site" (SMC 20.80.230). The area is similar in topography and geology to areas designated as medium (20 to 75 shallow landslides/km^2) to high (>75 shallow landslides/km^2) relative shallow landslide hazard areas using the USGS open file report 06-1139 designation system (Harp et al, 2006). There is evidence of past slope movement along the ravine walls of the south tributary. Slopes downstream from the proposed bridge site have steep scarp walls at the top of the features. The stream valley contains a large amount of large woody debris from mature trees that were likely growing atop the left bank prior to bank collapse.

Erosion Hazard Areas

Erosion is the process by which soil particles are mobilized and transported by natural agents such as wind, rainsplash, frost action or surface water flow. The Shoreline Municipal Code classifies areas with slopes greater than 15 percent and which are underlain by soils that are subject to severe erosion when disturbed as "Erosion Hazard Areas". Erosion hazards areas were identified on both sides of the south tributary to Boeing Creek in the geotechnical report by Landau Associates (2007) based on previous work within the area.

Steep Slope Critical Areas

Steep Slope Critical Areas in the City of Shoreline are those with gradients that are 40 percent or steeper over an elevation change of at least 10 feet. Steep slope critical areas were identified on both sides of the south tributary to Boeing Creek in the geotechnical report by Landau Associates (2007) based on previous work within the area. The area is upstream from those mapped as unstable class 3 in the Ecology Coastal Zone Atlas, although the slope angle and substrate material are both similar.

Critical Aquifer Recharge Areas (CARA)

The Washington Administrative Code defines well head protection areas, sole source aquifers, special protection areas, and other areas that are susceptible or vulnerable to ground water contamination as areas with a critical recharging effect on aquifers used for potable water (also referred to as critical aquifer recharge areas) [WAC 365-190-080]. This area is not designated as a CARA by King County as of 2005.

Frequently Flooded Areas

Flood hazard areas are subject to periodic inundation. Flood losses are caused by development in areas prone to inundation that increase flood heights and velocities, and when inadequately anchored, damage uses in other areas. Uses that are inadequately floodproofed, elevated, or otherwise protected from flood damage also contribute to flood loss. The site is located well upstream from the delineated shoreline zone, and roughly 195 feet upstream from the furthest extent of the FEMA 100-year floodplain zone as mapped by King County in 2005.

Tsunami Hazards

The shoreline zone is located well downstream from the site, and the project area is not located in a Tsunami hazard area.

3.5 Fish and Wildlife Habitat Conservation Area (FWHCA) and Stream Characteristics

The reach of Boeing Creek in the vicinity of the proposed bridge is considered a Fish and Wildlife Habitat Conservation Area (FWHCA) and is categorized as a Type II stream per

SMC 20.80. The reach of Boeing Creek in the proposed bridge vicinity shows a fairly steep gradient. During the site visit, the stream flow was quite low. It is likely that this reach of stream would constitute a fish passage barrier due to gradient and flow conditions, at least during the summer and early fall months. Note that at least three barriers to fish passage occur downstream under existing conditions, and include an artificial waterfall and two dams. The bridge project reach of Boeing Creek is considered a non-fish bearing stream per Washington Department of Natural Resources, in part because of flow regime and fish passage barriers.

Stream substrate in the area of the bridge project reach is dominated by gravel and cobble, and numerous boulders are associated with the substrate near the existing foot crossing. This reach of Boeing Creek was evaluated for the following habitat values and functions.

Epifaunal Substrate/Available Cover

The reach of Boeing Creek near the proposed pedestrian bridge showed a good mix of substrate favorable for epifaunal colonization and fish refugia, and included cobble, undercut banks, and woody debris. Approximately 75 percent of the substrate appeared favorable for this parameter, and the stream reach would be rated between optimal and suboptimal in this regard.

Embeddedness

Less than 20 percent of the stream substrate is composed of fine sediment in the project reach, and the larger cobble provides a diversity of niche space for fish and aquatic invertebrates. The stream reach would be rated as optimal for this habitat parameter.

Velocity/Depth Regime

Only one of the velocity/depth regimes is present in the reach of Boeing Creek near the project area: a slow, shallow regime. Depths did not exceed 0.5 meters (i.e. categorized as 'shallow'), and flow rates were less than 0.3 meters/second (i.e. are categorized as 'slow'). Lack of flow and depth regimes contribute to habitat simplification and homogeneity, and the stream would be rated as poor for this habitat parameter.

Sediment Deposition

There appears to be moderate deposition of sediment in the reach of Boeing Creek near the project area, comprising about 60 percent of the stream substrate and consisting mostly of sand near in-stream obstructions. These conditions constitute a marginal functional category with regard to this habitat parameter.

Channel Flow Status

Flowing water was evident in less than 50 percent of the available channel during the site visit, with the exposed stream substrate consisting primarily of gravels and cobble. The exposed substrate was due to low flow conditions associated with the summer season, as well as the position of the reach in the drainage. Channel flow habitat was rated as falling into the marginal category, based on these conditions.

Channel Alteration

Some anthropogenic alteration of the channel is evident along the left (northwest) bank of Boeing Creek, occurring as old piped stormwater conveyances. No evidence of dredging was noted. These conditions constitute a sub-optimal category with regard to this habitat parameter.

Frequency of Riffles

Riffles are abundant in the project reach of Boeing Creek, occurring as channel bars and at an approximate distance of a 4:1 ratio with the stream width. These conditions constitute an optimal category with regard to this habitat parameter, but the amount of sediment in the system would decrease this category to an optimal/suboptimal rating.

Bank Stability

The left and right banks in the project reach of Boeing Creek exhibit bank stability conditions that appear highly eroded. Both banks appear unstable with numerous signs of erosion, including evidence of bank sloughing, erosion scars, and groundwater expressing as surface seeps near the toe of the valley slopes. The banks rate as poor for this habitat parameter.

Vegetative Protection

Both the left and right banks in the project reach of Boeing Creek exhibit dense vegetative coverage, comprising greater than 90% of the streambank surface and immediate riparian zone. Vegetative coverage is composed mostly of native species, with salmonberry and devils club representing the dominant shrub species along the banks. Tree species associated with the riparian habitat include western hemlock, Douglas fir, western red cedar, big leaf maple, black cottonwood, and red alder. The degree of vegetative protection in the project vicinity rates as optimal for this habitat parameter.

Riparian Vegetative Zone Width

Both the left and right banks in the project reach of Boeing Creek exhibit relatively wide vegetated riparian zones—greater than 18 meters in width. Although some human

disturbance activity is apparent (trails, debris associated with the stream banks, stream crossing), the riparian zone width would rank as optimal for this habitat parameter.

General Fish and Wildlife Conservation Area Habitat Conditions

FWHCA conditions rank at a moderate rating for the project reach of Boeing Creek, falling within the suboptimal to optimal condition category for most habitat parameters, with several parameters ranking as marginal or poor due to related issues of erosion, bank stability, and sediment deposition. General habitat conditions would be rated as suboptimal, with an average score of 12 out of 20. The stream and riparian habitat can be characterized as largely intact but subject to erosion and sedimentation, with some apparent anthropogenic disturbances evident.

4.1 Stream Ratings and Buffers

In the vicinity of the project site, Boeing Creek should be considered a Type II Stream per SMC criteria. A Type II Stream is considered a stream with either perennial or intermittent flow which provides salmonid habitat value. Although anadromous salmonids cannot access this reach of Boeing Creek, there is habitat for resident salmonids (e.g. cutthroat trout) in the project vicinity. Thus, per SMC stipulations, the reach of Boeing Creek associated with the proposed pedestrian bridge should be accorded a 115 foot buffer, measured from the OHWM of the creek.

Construction of structures within the stream buffer is prohibited under Shoreline Code; however, the proposed bridge falls under an exception, identified in SMC 20.80.480 D(4), which allows for construction of footbridges in buffer areas. Additionally, the proposed project is designed to enhance riparian and upland habitat as a result of native plant installations, and is also designed to reduce the impact of pedestrian disturbances to the habitat through decommissioning many of the existing informal trails.

4.2 Fish and Wildlife Habitat Conservation Area Rating and Buffers

Boeing Creek itself, in the vicinity of the proposed pedestrian bridge, would be considered a FWHCA per SMC 20.80. Buffer widths for FWHCA are not quantified by Shoreline Code. For the proposed pedestrian bridge project element, the FWHCA buffer may be considered to be the 115-foot riparian stream buffer associated with Boeing Creek (see 4.1 above).

4.3 Geological Hazard Critical Areas

Boeing Creek Park Improvements

Per the SMC, buffers associated with geological hazard areas will reflect the sensitivity of the hazard areas and the risks associated with development. Both Steep Slope and Landslide Hazards are associated with the proposed pedestrian bridge. Construction of structures in Landslide Hazard Areas is prohibited by the SMC, except as granted by a critical areas special use permit. Issuance of a critical areas special use permit requires an evaluation of safety and associated development risks by qualified geotechnical professionals. The evaluation is discussed below and attached to this report in Appendix C

The geotechnical firm Landau and Associates (2007) reviewed site conditions and proposed bridge designs, and concluded that subsurface conditions at the proposed bridge crossing are suitable for the proposed bridge construction provided the geotechnical recommendations contained in the geotechnical report are incorporated in the project design and construction.

Boeing Creek Stormwater Facility

Per SMC 20.80.030, modifications to the stormwater facility at Boeing Creek are exempt from the Critical Areas provisions of the City's Code, because they involve modifications of a stormwater drainage system associated with a publicly improved roadway, and do not involve the expansion of roadways or related improvements into previously unimproved rights-of-way or portions of rights-of-way (SMC 20.80.030.C). The project intends to provide additional stormwater storage for runoff generated by existing roadways.

Section 5—References

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C

Harp, E.L; Michael, J.A; and Laprade, W.T, 2006. Shallow-Landslide Hazard Map of Seattle, Washington. U.S. Geological Survey Open File Report no. 2006-1139. U.S. Department of the Interior: Reston, VA. 23p.

King County, 2004. FEMA 100 Yr floodplain. King County Digital Data [computer file]; King County GIS Center, Seattle, WA

Shoreline Municipal Code. 2007. Chapter 20.80
http://cosweb.ci.shoreline.wa.us/uploads/attachments/pds/esc/cao.pdf

Washington Administrative Code. 2007. http://apps.leg.wa.gov/WAC/default.aspx

Figures

Appendix A—Photolog

Appendix B—Design Drawings

See Drawings for Boeing Creek Park Improvements, December 2007—Submitted Separately to City of Shoreline