Derby Creek Restoration

Design Plan

April 2011

King County

Department of Natural Resources and Parks
Parks and Recreation Division
201 South Jackson Street, Suite 700
Seattle, Washington 98104-3855

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Prepared by

Tina Miller,
Senior Ecologist
and Restoration Coordinator
KC (DNRP) – Parks Resource Program

Keith Kurko
Strategic Advisor
Seattle Public Utilities
700 5th Ave., Suite 4900
PO Box 340-18
Seattle, WA 98124-4018

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1.0 Project Description

Derby Creek has been observed flowing in several locations after being directed through a culvert across 148th Avenue NE. in the past 15 years. Seattle Public Utilities (SPU) and the King County Department of Natural Resources and Parks (Parks) propose to restore 400 feet of Derby Creek and enhance habitat to 25,000 square feet of wetland adjacent to Derby Creek in King County, Washington.

1.1 Project Location

The project will occur on two parcels in unincorporated King County. Both are located north of NE 145th Street, west of 148th Avenue NE, east of the Sammamish River and south of the Tolt Pipeline (refer to attached map). King County Parks owns the western parcel; and Seattle Public Utilities (SPU) owns the eastern parcel. Seven baseball fields occupy a majority of the King County Parks parcel and that site is managed by the Northshore Athletic Fields Corporation. The Tolt Pipeline Trail and utility corridor is the north boundary. The remaining area of the western parcel and the area of the eastern parcel are relatively undeveloped. The site is generally flat and the undeveloped areas consist of one wetland complex and two stream channels. Derby Creek was recently named by the City of Woodinville. The dominant vegetation in the wetland and stream area is reedcanary grass. The western parcel's tax identification number is 1526059070, and the eastern parcel's tax identification number is 1526059055. They are both located in the SE ¼ of Section 15, T26N, R5E. The two parcels total approximately 32.5 acres in area.

1.2 Responsible Parties

Tina Miller, Senior Ecologist and Restoration Coordinator
King County Department of Natural Resources and Parks
201 South Jackson Street, Suite 700
Seattle, WA 98104
(206) 296-2990

Keith Kurko, Strategic Advisor
Seattle Public Utilities
700 5th Ave., Suite 4900
PO Box 340-18
Seattle, WA 98124-4018

2.0 Description of the Overall Project

This restoration project would relocate and restore approximately 400 feet of the channel and reconnect it with its historic downstream channel which flows into the Sammamish River. The stream will be realigned, dredged, cleaned of reedcanary grass, and contoured to maximize flow through the area. Meanders will be incorporated wherever possible and practical. Native woody vegetation will be planted along the new channel to increase shading by increasing the diversity and height of streamside vegetation. Native vegetation will also be planted in the wetland to improve aquatic habitat and to increase shade.

Excavated channel material will be used to create raised hummocks. Because these raised hummocks will be drier, they will then support and be planted with woody vegetation, such as western red cedar, Sitka spruce, ninebark, twinberry, red-osier dogwood. In the surrounding wetlands willows and cottonwoods will be started through the reed canarygrass. The woody vegetation will greatly improve the structure and diversity of the wetland habitat. The significantly increased shade will protect and further cool the water in Derby Creek. In turn, this cool water input to the Sammamish River will improve cool water conditions for migrating ESA-threatened Chinook salmon.

The goal of this project is to:

- provide a source of cool water for salmon habitat in the Sammamish River by improving Derby Creek;
- restore Derby Creek and its associated wetland on this King County Parks and SPU site; and
- provide interpretive signs for education regarding salmon and restoration efforts at both the trail and the Northshore Athletic fields.

The stream restoration project will grade a 400 foot long stream channel for Derby Creek. This will involve excavating approximately 195 cubic yards of material and depositing it on site in a series of hummocks approximately 1 to 2 feet above the existing grade. Some of the excavated material will be placed in DeltaLoc bags and used to stabilize the bends of the stream is a few areas. This will be used instead of rock for bank protection. Several pieces of large woody debris (LWD) will be used to promote stream and wetland habitat structure and functions will be installed. . The LWD will be located and positioned in order to accelerate the formation of habitat features, such as pools, backwaters, and to provide cover.

The average low-flow channel width will be 5-feet with side slopes having no greater than a 2:1 slope. The stream channel will be approximately 15 feet in width. The size of the channel is based on previous work completed by Hollywood Hill – Phase 3 Culvert Replacement projects prepared by KC Water and Land Resources (WLRD), and KC Department of Transportation Road Services Division (KC Roads). These reports provided KCRTS modeling for a peak flow and FHWA culvert analysis. The culvert is designed to carry a peak flow of 46.2 cfs.

During the December 2010 winter storm, Derby Creek filled in with approximately 2 feet of sediment from above the box culvert across 148th Ave. N.E., across parcel 1526059056, and

filled in most of the existing Derby Creek channel, where is was directed into the Tolt Pipeline ditch (Stream 2). Since the 2010 storm, Derby Creek is flowing in a delta as wide as the SPU property. King County Roads is planning to remove sediment from the channel, both upstream of 148th Ave. N.E culvert and within the right-of-way downstream in summer 2011. This project will be constructed at the same time. In addition, the parcel between the right of way and the beginning of the SPU property will be dredged to remove this sediment and get the elevation of the stream at a consistent level.

The project site is dominated by a reed canarygrass (*Phalaris arundinacea*) wetland community. The goal of the project is to establish shrub and tree species that provide greater habitat functions. In order to restore riparian structure and functions in a rapid and cost-effective manner, the site will be revegetated using a managed succession strategy. The site installation phase will use an Integrated Pest Management (IPM) approach to control and eradicate the reed canarygrass. IPM treatments will include mowing and spraying with an aquatic glyphosate (Aqua Master) herbicide application.

Cuttings of native willows and cottonwoods will be harvested during plant senescence and planted throughout the 25,000 square foot area on 2 to 3 foot centers. Coniferous trees and other wetland species will be installed on the topographic hummocks. Species will include western red cedar, Sitka spruce, red-osier dogwood, nine bark, and twinberry. Site maintenance and monitoring will be performed throughout the project.

2.1 Wetland Assessment

A wetland assessment and delineation was completed by Talasaea Consultants in 2009 in the project area. In addition a wetland delineation was completed in 1994 by King County Water and Land Resources. The project area consists of approximately 1.5 acres of this identified wetland. The wetland is a depressional and riverine flow through wetland receiving hydrology from occasional stream overbank flooding, slope seeps, overland flows, and from a high groundwater table. It is characterized as a palustrine emergent temporarily flooded wetland. The dominant plant species is reed canarygrass. The wetlands were rated as a Category II wetland using the Washington State Wetland Rating System for Western Washington (Hruby, 2008). Details regarding the wetlands are presented in Talasaea Consultants (2009) Critical Areas Report and Conceptual Restoration Plan.

3.0 Existing Conditions

3.1 Historic Information

The property historically was logged, cleared, and converted to agriculture. The baseball fields which cover a majority of the property were constructed in 1978, and have been managed by the Northshore Athletic Fields Corporation (NAFCO) since that time. The remaining portion of the site supports a wetland system and Derby Creek, Tributary 08-0090. Historical this creek has been is several locations, from along the backside of the baseball fields (in the 1980's) to along the Tolt Pipeline during 1991 – 1994, and from 2006 to 2010 after construction of a new box culvert across 148th Avenue NE and the winter floods of 2006. In December 2010, the stream has been rerouted again due to filling in of the channel to a wide braided delta across the SPU property. The purpose of this project is to provide a restored stream channel for Derby Creek.

3.2 Existing Streams

Stream Channel 1, the ditch along the Tolt Pipeline until December 2010 was containing Derby Creek, Tributary 08.0090. This stream channel is still receiving flow from Derby Creek but after it has dispersed through the reed canarygrass wetland. This water course which contains a portion of Derby Creek's flow enters the area through a box culvert across 148th Avenue NE, and then continues north into the Tolt Pipeline right-of-way ditch. (See Photographs). The water flows through approximately 1300 feet of ditch and then discharges into the Sammamish River through a large-diameter corrugated metal pipe. Only during periods of high flows in the Sammamish River is there the potential for fish access into the system. Recently in December 2010 and January 2011, Derby Creek experienced a major flooding event, where sediment has been deposited in the channel along 148th Ave. NE, through the box culvert and downstream of the box culvert. This has resulted in a large amount of sediment being deposited throughout the first 100 feet of the project area and the stream being relocated partial to the area where the proposed channel is to be constructed.

The second stream course is the remnant former Derby Creek channel which also flows into the Sammamish River. The former Derby Creek channel originated at the project's eastern property boundary. This former stream channel is currently abandoned in this location. It starts to carry flow from the wetland when it borders the northern boundary of the baseball fields. This former Derby Creek channel also discharges to the Sammamish River through a large-diameter corrugated metal pipe. Both channels terminate at the Sammamish River through hanging culverts that are not fish passable, except perhaps during extremely high flows.

The Sammamish River is located directly west of the subject properties. The Sammamish River is classified as a Type 2 aquatic area, inventoried as a "Shorelines of the State". The project area is over 350 feet from the Sammamish River.

3.3 Existing Vegetation

The project site includes 1.5 acres of wetland habitat. The wetland area is dominated by a monotypic community of reed canarygrass (See Photographs). One clump of Sitka willow is found in the project area, as well as one patch of knotweed. In addition, Policeman's helmet was indentified in the area during the summer of 2010. The Policeman's helmet was pulled in August 2010.

3.4 Existing Hydrology

The wetlands on the project site historically were converted to agricultural uses, probably for hay production and/or livestock grazing. Derby Creek was channelized and dredged as part of these historical farming practices. Under the hydrogeomorphic classification system (Hruby et al., 1999), the onsite wetlands would be classified as riverine impounding wetlands. Wetland hydrology is driven by overbank flooding, slope seeps, overland flows from properties to the east, direct precipitation, and a high groundwater table. Under the Cowardin system (Cowardin, 1979), the wetland hydrology would be classified as seasonally flooded. Direct observations indicate that saturated conditions are present for extended periods during the most of the growing season (February to August). The wetland has been observed to be wet in the summer with ground water playing a significant roll in the summer hydrology.

3.5 Existing Soils

The NRCS maps onsite soils as Earlmont silt loam and Tukwila muck. Direct observations of site conditions validate this assessment. Soils consist of silty loam and silty clay loam, and stratified peat overlain by a 4– to 6-inch thick mat of reed canarygrass sod and undecomposed thatch (Snyder et al. 1973).

3.6 Existing Fauna

A query of the Washington State Department of Natural Resources Natural Heritage Program Western Washington Geographic Information System database reported no records of rare plants or high-quality ecosystems in the project vicinity. Chinook (Federally Threatened), coho (Federal Species of Concern), sockeye salmon, bull trout (Federally Threatened), and winter steelhead trout (Federally Threatened) are all known to be in the Sammamish River, which is west of the property and where Derby Creek drains. Cutthroat trout are known to use Derby Creek.

4.0 Mitigation Goals, Objectives, and Performance Standards

4.1 Goals

The goal of this project is to:

- provide a source of cool water for salmon habitat in the Sammamish River by improving Derby Creek;
- restore Derby Creek and its associated wetland on this King County Parks and SPU site; and
- provide interpretive signs for education regarding salmon and restoration efforts at both the trail and the Northshore Athletic fields.

4.2 Objectives and Performance Standards

Objective 1: Construct a restored Derby Creek channel with stream processes established.

Performance Standard: Derby Creek is flowing in the designed stream channel. Fish are observed using the creek by Year 3.

Objective 2: Establish 25,000 square feet of native woody plant species. Install 3,000 woody plants, including 8 native shrub and tree species to increase overall plant richness. These will include 4 tree and 4 shrub species. Willows (*Salix sitchensis, S. hookeriana and S. scouleriana)* and black cottonwood (*Populus trichocarpa)* will be planted throughout the wetland. The coniferous and deciduous shrubs plant species will be located on the topographic hummocks. These species will include Sitka spruce (*Picea sitchensis)*, Western red cedar (*Thuja plicata*), red alder (*Alnus rubra)*, twinberry (*Lonicera involucrate)*, red-osier dogwood (*Cornus sericea*), and ninebark (*Physocarpus capitatus)*.

Performance Standards: Plant community success will be evaluated based on observations of woody native species including both planted and volunteer trees and shrubs, as follows:

Year 1: Survivorship of planted species will be 80%

Year 3: Aerial cover will be $\geq$ 50%

Performance Standard: Plant community richness by year 3 will equal $\geq$ 8 species.

Objective 3: Establish large woody debris by monitoring year 3.

Performance Standard: There will be a minimum of 5 logs with root wads present in the project area at Year 3

Objective 4: Provide a source of cool water to the downstream portion of Derby Creek.

Performance Standard: During the month of August determine that the water temperature leaving the site is cooler than the water entering the project area, or below 70 degrees.

Objective 5: Provide interpretive signs for education.

Performance Standard: At year 3 the interpretive signs are present.

5.0 Construction Sequence

5.1 Site Preparation

The project site consists of 25,000 square feet of palustrine-emergent wetland that is dominated by reed canarygrass with Derby Creek spread through the SPU property before flowing into the ditch line along the Tolt Pipeline.

Staging

Project construction will be timed to occur at the same time as KC Roads project to remove sediment form the upstream channel. Prior to the commencement of construction, the clearing and construction limits will be marked with survey flagging. A defined staging area will be established at the northeast corner of the site, along 148th Avenue Northeast. Organic woody debris will be sited here prior to installation. KC DOT will be electroshocking and any fish found through the project area will be removed. A pipe will be connected to the downstream end of KC DOT's diversion pipe and will direct all of the Derby Creek flow into the Tolt-Pipeline ditch during construction of the new channel.

Erosion and Sediment Control

Silt fences, straw bales, plastic sheeting, and other best management practices will be used as necessary during construction to mitigate erosion impacts. BMPs used during construction will be in accordance with the current edition of the Stormwater Management Manual for Western Washington (Washington State Department of Ecology, 2005).

Wetland Enhancement

The project site is dominated by a monotypic reed canarygrass community that has prevented the establishment of shrub and tree species that provide greater habitat functions. Currently, reed canarygrass outcompetes and excludes desirable native plants throughout much of the Pacific Northwest lowland wetlands. It provides little feeding and nesting habitat for wildlife and can severely alter surface hydrology. In highly infested areas, reed canarygrass can exist for hundreds of acres in monospecific stands, lowering native biodiversity.

Reed canarygrass can form dense, persistent, monotypic stands in wetlands, moist meadows, and riparian areas. These stands exclude and displace desirable native plants and animals. Areas invaded by reed canarygrass may be of little use to wildlife (Hoffman and Kearns, 1997; The Nature Conservancy, 2002).

A mixed management strategy may prove most successful for control of reed canarygrass. Weed eaters will be used to mow the project site of reed canarygrass in July 2011 immediately before construction of the stream channel. After construction of the stream channel and when the reed canarygrass regrowth is about 5 inches tall, backpack sprayers will be used to spray the project areas of the site with Rodeo® in a 2 percent solution. All sprayed areas will be above the ordinary high-water mark of Derby Creek.

5.2 Stream Project Installation

Project installation will begin in August 2011. Channel construction will take one week and be timed together with KCDOT sediment removal project immediately upstream.

Grading of Stream Channel

The channel will be excavated approximately one to two foot below existing grade, and the excavated material from the channel will be used to create topographic hummocks (See Grading Plan Sheet). Some of this material will be used to fill DeltaLoc bags that will be used to reinforce the bends in the stream channel, similar to using large rock but the DeltaLoc product allows vegetation to be established through it. Channel construction will occur starting at the upstream end. Before construction begins the downstream entrance will be sealed by straw bales and erosion control fabric.

The excavation will occur using a small tract hoe and compact tract loader. The material will be placed in hummocks within the wetland to create areas that will support woody wetland vegetation. Approximately 195 cubic yards will be moved. Construction equipment may need to be on swamp pads to keep the disturbance to the wetland at a minimum.

Revegetation

Following the grading of the channel to create topographic hummocks the area will be covered with straw for erosion control. Revegetation will consist of installing no less than 3,000 native trees and shrubs in late fall 2011 or winter 2012. The Planting Plan is presented in Table 1. Woody plants, including 8 native shrub and tree species will be planted to increase overall plant richness. These will include 4 tree and 4 shrub species. Willows (*Salix sitchensis, S. hookeriana and S. scouleriana)* and black cottonwood (*Populus trichocarpa)* will be planted throughout the wetland. The wetland coniferous and deciduous plant species will be located on the topographic hummocks. These species will include Sitka spruce (*Picea sitchensis)*, Western red cedar (*Thuja plicata*), red alder (*Alnus rubra)*, twinberry (*Lonicera involucrate)*, red-osier dogwood (*Cornus sericea*), and ninebark (*Physocarpus capitatus)*.

Running of Equipment during Construction

A variety of equipment will be operated during construction, including dump trucks, a track-mounted excavator, a bulldozer, and a tractor. Because of the wet conditions, swamp pads may be required to keep equipment from damaging the wetland and keeping the equipment from getting stuck.

Table 1. Derby Creek Plant List

SCIENTIFIC NAME:	COMMON NAME:	QTY.:	SIZE:	LOCATION:	SPACING
Coniferous Trees:					
Picea sitchensis	Sitka Spruce	15	1 gal	hummocks	10' o.c.
Thuja plicata	W. Red Cedar	10	1 gal	hummocks	10' o.c.
	sub-total conifers	25			
Deciduous Trees:					
Alnus rubra	Red Alder	10	1 gal	hummocks	10' o.c.
Populus trichocarpa	Black Cottonwood	225	4 foot poles	wetland	10' o.c.
	sub-total deciduous	235			
Shrubs:					
Cornus sericea	Red-Osier Dogwood	200	1 gal	hummocks	3' o.c.
Lonicera involucrata	Black Twinberry	100	1 gal	hummocks	3' o.c.
Physocarpus capitatus	Pacific Ninebark	100	1 gal	hummocks	3' o.c.
Salix spp. (sitchensis, hookeriana, scouleriana	Willow	2,400	4 foot stakes	wetland	2 - 3' o.c.
	sub-total shrubs	2,800			
TOTAL:		3060			

6.0 Maintenance and Contingency Plan

6.1 Long-Term Maintenance

Maintenance will be performed during the intermediate growing season (May 16 to September 15) in order to control reed canarygrass and promote the establishment of the planted native woody plant species. Maintenance activities will cease once the planted species are satisfying the project performance standards.

6.2 Contingency Plan

In the event that the project performance standards are not being attained by each monitoring period, the permitting agencies will be notified and additional planting or construction measures will be taken.

Animal damage is expected, however if the project is being significantly damaged contingency measures will be taken. Voles (*Microtus* spp.) can girdle cottonwoods during late summer periods. In order to protect, plastic vole collars may be used on the cottonwood species. In order to protect conifers against beaver and deer browse, chicken-wire cages may be established around each of the planting mounds.

7.0 Monitoring Plan

Baseline Post-Construction Monitoring

Following the completion of construction and planting activities an as-built plan will be prepared. This drawing will include the location of all the features and photopoints. Photographs will be taken from the photopoints at Years 1, 2, and 3. A percent survival survey will be completed after Year 1. Plant species cover will be measured at Year 3.

7.0 Photographs

Photo 1 - Derby Creek in January 2009

Photo 2 – Derby Creek in January 2011

Photo 3 – Reed Canarygrass field in Summer 2009

Photo 4 – Reed Canarygrass field in Winter 2011

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