Lake to Sound Trail – Segment B

Final Stream Discipline Report

Prepared for:

King County

Facilities Management Division
201 South Jackson, Seventh Floor
Seattle, WA 98104

May 2011

Prepared by:

Parametrix

411 108th Avenue NE, Suite 1800
Bellevue, WA 98004
425.458.6200

Table of Contents

1 Introduction 1-1
1.1 Project Overview 1-1
1.2 Project Features 1-5
1.3 Project Area and Setting 1-5
1.4 Project Purpose and Need 1-6
2 Methodology 2-1
2.1 Methods of Analysis 2-1
2.2 Studies and Coordination 2-1
2.2.1 Review of Existing Information 2-1
2.2.2 Field Investigation 2-1
2.2.3 Regulations 2-2
3 Affected Environment 3-1
3.1 Study Area 3-1
3.2 Miller and Walker Creek Basins 3-1
3.3 Miller Creek Mainstem 3-1
3.3.1 Stream Type 3-3
3.3.2 Basin Summary 3-5
3.3.3 Fish Habitat 3-6
3.3.4 Water Quality Conditions 3-6
3.3.5 Biological Conditions 3-9
3.4 Stream 0371G (Tributary to Miller Creek) 3-10
3.4.1 Stream Type 3-10
3.4.2 Basin Summary 3-10
3.4.3 Fish Habitat 3-10
3.4.4 Water Quality Conditions 3-10
3.4.5 Biological Conditions 3-11
3.5 Walker Creek 3-13
3.5.1 Stream Type 3-13
3.5.2 Basin Summary 3-13
3.5.3 Fish Habitat Conditions 3-14

3.5.4 Biological Conditions 3-15
3.6 Unnamed Tributary to Walker Creek 3-17
3.7 Special Status Species 3-18
4 Environmental Consequences 4-1
4.1 Construction Effects 4-1
4.1.1 Permanent Effects 4-1
4.1.2 Temporary Effects 4-1
4.2 Operational Effects 4-21
5 Mitigation 5-1
5.1 Avoidance and Minimization Measures 5-1
5.2 Restoration of Temporary Effects 5-1
5.3 Compensatory Mitigation 5-1
6 References 6-1

List of Tables

Table 4-1. Existing Roadway PGIS Collected and Discharged 4-21

List of Figures

Figure 1-1. Vicinity Map 1-3
Figure 3-1. Project Area Streams 3-3
Figure 3-2. Miller Creek, Stream 0371G, and Associated Wetlands with the Project Area . 3-7
Figure 3-3. Stream 0371G and Associated Wetlands within the Project Area 3-11
Figure 3-4. Walker Creek and Associated Wetlands within the Project Area 3-15
Figure 4-1. Stream Buffer Impacts 4-3
Figure 4-2. Stream Buffer Impacts 4-5
Figure 4-3. Stream Buffer Impacts 4-7
Figure 4-4. Stream Buffer Impacts 4-9
Figure 4-5. Stream Buffer Impacts 4-11
Figure 4-6. Stream Buffer Impacts 4-13
Figure 4-7. Stream Buffer Impacts 4-15
Figure 4-8. Stream Buffer Impacts 4-17
Figure 4-9. Stream Buffer Impacts 4-19

List of Appendices

A Site Photographs

Acronyms and Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
BMP	best management practice
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
DO	dissolved oxygen
DPS	distinct population segment
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
FHWA	Federal Highway Administration
HPA	Hydraulic Project Approval
LWD	large woody debris
OHWM	ordinary high water mark
NEPA	National Environmental Policy Act
PGIS	pollution generating impervious surface
PHS	Priority Habitats and Species
Port	Port of Seattle
RM	river mile
SF	square feet
SPCC	spill prevention control and countermeasures
SR	State Route
SWD	small woody debris
TESC	temporary erosion and sediment control
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

1 INTRODUCTION

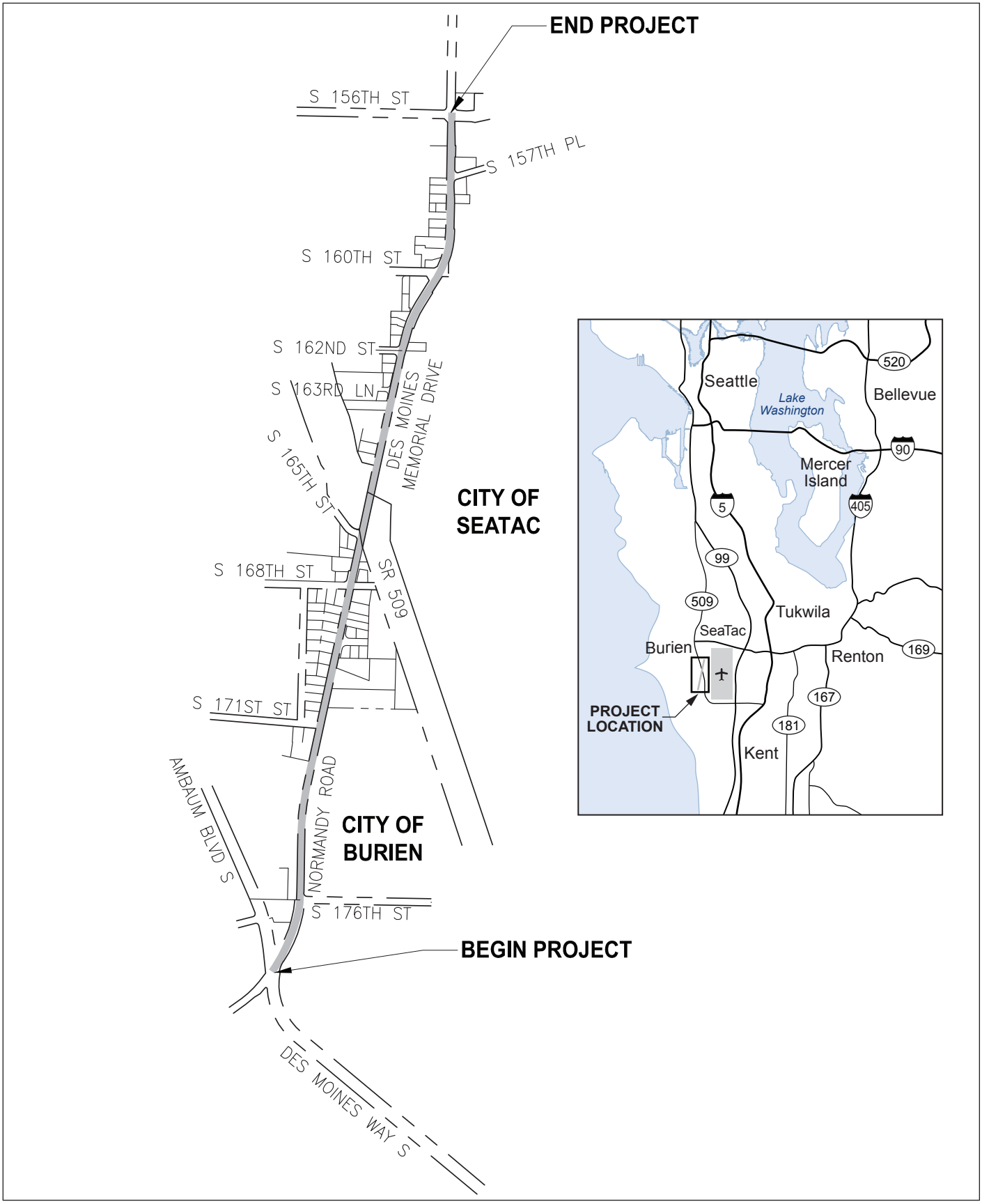
This Discipline Report is intended to provide information in support of the Washington State Department of Transportation (WSDOT) Environmental Classification Summary form for the National Environmental Policy Act (NEPA) Documented Categorical Exclusion process, assist project planning, and facilitate permitting. This report describes fish and aquatic resources in the area of a proposed 1.5-mile non-motorized trail, which includes three fish-bearing streams. This report also evaluates potential project impacts to streams and aquatic resources, which would be minor, consisting of some small amount of riparian buffer clearing and some changes in discharge location for existing road-related runoff. The report also documents avoidance and minimization measures and presents mitigation for these impacts, in the form of riparian planting within an adjacent basin.

1.1 Project Overview

King County, together with the cities of Burien and SeaTac (Cities), the WSDOT, and the Federal Highway Administration (FHWA), is proposing to develop a 1.5-mile segment of what would ultimately be the 16-mile Lake to Sound Trail. Segment B extends along the east side of Des Moines Memorial Drive from Ambaum Boulevard South, north to South 156th Street (Figure 1-1).

Segment B, as well as the longer Lake to Sound Trail, is part of a Regional Trail System that provides a non-motorized alternative transportation and recreation corridor for multiple trail users, including bicyclists, pedestrians, skaters, and others. A goal of the Lake to Sound Trail is to provide non-motorized transportation facilities to economically disadvantaged communities in southwest King County that have been historically underserved by such facilities.

Once complete, Segment B would be part of a larger planned system connecting employment and residential centers in South King County with regional trails in Seattle and the greater Regional Trail System network. Segment B would connect at the north to the recently completed Westside Trail to North SeaTac Park and to existing bike lanes running east-west on South 156th Street. This network includes connections to the Duwamish Trail to the north and the Seahurst Park Trail and Burien Town Square to the west. To the east, this project would connect with a multi-use trail and on-street bike lanes along South 154th Street, built by the Port of Seattle (Port) in 2006 in conjunction with the third runway project.



Parametrix 554-1521-084/B(2T300B) 1/11 (B)

N

NOT TO SCALE

Figure 1-1
Vicinity Map

Lake to Sound Trail — Segment B

1.2 Project Features

The typical design of the Segment B trail includes 10 to 12 feet of porous asphalt pavement bounded by 2-foot-wide shoulders and 1-foot-wide clear zones on either side, in accordance with American Association of State Highway and Transportation Officials' (AASHTO) guidelines. The project includes:

- Construction of a 10- to 12-foot-wide porous asphalt pavement with soft-surface (gravel) shoulders;
- Fill import and excavation for general grading, pavement sections, and retaining walls;
- Separation of the trail from the adjacent road with a planter strip, which could include replacement elm trees, where practical, and other landscaping;
- Relocation of above-ground utilities to either the east side of the trail, the planter strip, or underground;
- Drainage elements related to the trail (including the use of pervious pavement) and conveyance of existing stormwater from the adjacent road across the trail;
- Retaining walls in some places to reduce the cut-and-fill areas needed for the trail;
- A short boardwalk section through an area in which the trail cannot avoid the adjacent Walker Creek wetland complex;
- Channelization and consolidation of driveways where multiple driveways exist for a given property to reduce the potential for conflicts between trail users and vehicles; and
- Other access and traffic control features (bollards, striping, signage, etc.).

1.3 Project Area and Setting

The Segment B project area is a linear corridor mostly within the existing right-of-way for Des Moines Memorial Drive. Segment B is located in Sections 20, 29, and 32, Township 23 North, Range 4 East, W.M. North of State Route (SR) 509, the trail would be within in the City of SeaTac; south of SR 509, it would be in the City of Burien.

Des Moines Memorial Drive is a historic living memorial and tribute to those who died in World War I. In 1921, elm trees were planted along the east side of the roadway to create a "living road of remembrance." Over time, disease, development, and road and utility improvements have threatened the trees. Of the originally planted trees, eight remain in the project area. These resources are discussed in detail in the *Lake to Sound Trail – Potential Effects on Memorial Elms Technical Memorandum* (Parametrix 2011a).

North of SR 509, most of the adjacent property to the east is owned by the Port. The Port's property is undeveloped and includes wetland mitigation constructed in conjunction with the third runway project. The undeveloped property, while fenced, provides a natural park-like setting along this otherwise urban corridor. Several small private properties (a small warehouse and a gas station/convenience store) also about the trail alignment in the north end.

South of SR 509, more than a dozen single-family residential properties are immediately east of the trail alignment. Farther south, a vacant property owned by the City of Burien and a mini-warehousing facility are east of the trail.

To the west of Segment B, on the other side of Des Moines Memorial Drive, relatively dense residential development occurs throughout the corridor. The residential development consists primarily of single family homes, but also includes multi-family dwellings such as apartments and condominiums.

1.4 Project Purpose and Need

The purpose of the Lake to Sound Trail – Segment B project is to design and construct a non-motorized transportation corridor and multi-use recreational trail along the east side of Des Moines Memorial Drive from Ambaum Boulevard South to South 156th Street, in the cities of Burien and SeaTac.

The multi-use Lake to Sound Trail – Segment B would provide non-motorized access to recreation and employment centers, and complete a link in the Regional Trail System network. The trail is intended to safely accommodate a variety of users such as bicyclists, pedestrians, runners, wheelchair users, and skaters. Trail design standards will safely accommodate different ages and skill levels among those users.

The Lake to Sound Trail – Segment B would:

- Serve local and regional non-motorized transportation needs ;
- Provide access to the trail for local communities.
- Help satisfy the regional need for recreational trails and provide safe recreational opportunities to a wide variety of trail users.
- Provide a critical link in the regional trails system.
- Provide economic and health benefits to communities along the trail.

2 METHODOLOGY

2.1 Methods of Analysis

This study is based on a review of existing information and field investigations. The goal of these efforts is to document existing information to reflect current site conditions and to collect new information to assess potential impacts. Potential impacts on fish and aquatic resources were calculated by overlaying the proposed design onto the project base maps showing wetland, stream and buffer locations. Affected areas were determined as the area of overlap of the two sets. In some areas, multiple impact types (e.g., stream buffer and wetland buffer) were present in a single location. In this document, all stream and riparian buffer impacts are reported, although for purposes of compensatory mitigation, overlapping impacts were assigned based on the following hierarchy: wetland, stream (below ordinary high water mark [OHWM]), wetland buffer, and stream buffer impacts.

2.2 Studies and Coordination

2.2.1 Review of Existing Information

Prior to conducting fieldwork, Parametrix reviewed maps and materials that assessed basin conditions, local habitat conditions, and fish use and distribution including, but not limited to:

- Miller and Walker Creek Basin Plan (King County 2006);
- Priority Habitats and Species Report (Washington State Department of Fish and Wildlife [WDFW] 2010a);
- Washington State Department of Natural Resources (WDNR). Natural Heritage Program CAD Layer;
- Salmonscape database (WDFW 2010b);
- A catalog of Washington streams and salmon utilization. Volume 1, Puget Sound Region. (Williams et al. 1975);
- Water Resource Inventory Area (WRIA) 9 (Green/Duwamish River) Limiting Factors Analysis (WSCC 2000).

2.2.2 Field Investigation

The information on streams and aquatic habitat presented within this report is based primarily on the results of site investigations, conducted by project biologists. In the case of the Miller Creek and Stream 0371G, field investigations were limited to visual inspection of aquatic features from adjacent parcels, because right-of-entry was not obtained for Port property and private properties. In these cases, descriptions of visually observed habitat features were supplemented with available published information on these resources (see Section 2.2.1 above for data sources).

In other cases, where right-of-entry was obtained (such as Walker Creek), instream habitat surveys characterized the project area streams within and immediately adjacent to the project right-of-way. The stream investigation involved measurements and/or qualitative descriptions of instream habitat features,

riparian vegetation, streambank stability, substrate composition, and fish passage obstructions within the study area (where right-of-entry allowed access). Field investigations within the Segment B project area occurred on two separate dates: October 29 and December 21, 2010. Selected site photographs are presented in Appendix A.

In addition, coordination occurred with the authors of the Lake to Sound Trail – Segment B Wetland Discipline Report (Parametrix 2011b), who also collected available information on ecological resources and performed field studies. The Wetland Discipline Report also discusses compensatory mitigation for some stream buffer/wetland buffer impacts.

2.2.3 Regulations

Streams in the City of Burien (north of SR 509) are regulated under BMC 19.40.3400 and 19.40.370 (the Burien Zoning Code). Streams in the City of SeaTac (south of SR 509) are regulated under SMC 15.30.340 and 15.10.620. Development of the trail will require land use permits from the Cities.

Streams, wetlands, and other sensitive resources in the project vicinity are also subject to federal and state regulations. The information in this report is intended to facilitate project planning and to support acquisition of a Hydraulic Project Approval (HPA) from the WDFW, a Clean Water Act (CWA) Section 404 permit from the U.S. Army Corps of Engineers (Corps), and a CWA Section 401 Water Quality Certification from the Washington State Department of Ecology (Ecology).

3 AFFECTED ENVIRONMENT

This section describes overall site conditions as well as the specific condition of the streams and buffers within the study area. Wetlands are discussed in the Lake to Sound Trail – Segment B Wetland Discipline Report (Parametrix 2011b).

3.1 Study Area

The study area for the Lake to Sound Trail –Segment B stream field investigation is defined as the area within 100 feet of the trail corridor, along the east side of Des Moines Memorial Drive from 156th Street South to South Ambaum Boulevard South, excluding adjacent property owned by the Port (Figure 3-1). The Segment B project area occurs in the vicinity of Walker Creek, Miller Creek, an unnamed tributary to Walker Creek, and a tributary to Miller Creek, Stream 09.071G (identified as Water D by the Port). All four streams are located within the Duwamish River Watershed, within the Duwamish/Green WRIA 9.

The primary land use in the areas surrounding the project is urban residential and Sea-Tac airport. Many of the properties within the project area have houses and outbuildings with associated driveways, lawns, and ornamental plantings. Some properties associated with the airport have chain-link fencing surrounding them.

The following sections describe the aquatic habitat and species within the study area. Included are an overview of general site characteristics and descriptions of individual streams and aquatic habitats, as well as fish distribution and habitat in each stream.

3.2 Miller and Walker Creek Basins

The Miller and Walker Creek basins contain a population base of about 30,000 people and land use is dominated by residential neighborhoods, which accounts for about 88 percent of the land area in the basins. Overall, development in the basin has reduced forest cover, filled wetlands, and increased impervious surface area, which has increased to a basin average of 22 percent (King County 2006). Resulting increases in peak flows are substantial, with the 1-year storm streamflow of 95 cubic feet per second (cfs), as compared to 6 cfs in pre-developed conditions (King County 2006).

King County (2006) identified several habitat factors limiting aquatic resources in the basins, which include lack of buffer areas, lack of large woody debris (LWD) and pool habitat, high stream flows and erosion that have damaged the stream bed, and stream corridor alterations (e.g., channel realignments and culverts). In addition, water quality is also an issue in Miller Creek, in which past analyses have indicated elevated levels of metals, including copper and zinc, and fecal coliform.

3.3 Miller Creek Mainstem

As noted in Section 2.2, field investigations for this stream were limited to visual inspection of aquatic features from adjacent parcels, due to limited right-of-entry. The descriptions of visually observed habitat features were supplemented with available published information on these resources (see Section 2.2.1 above for data sources).

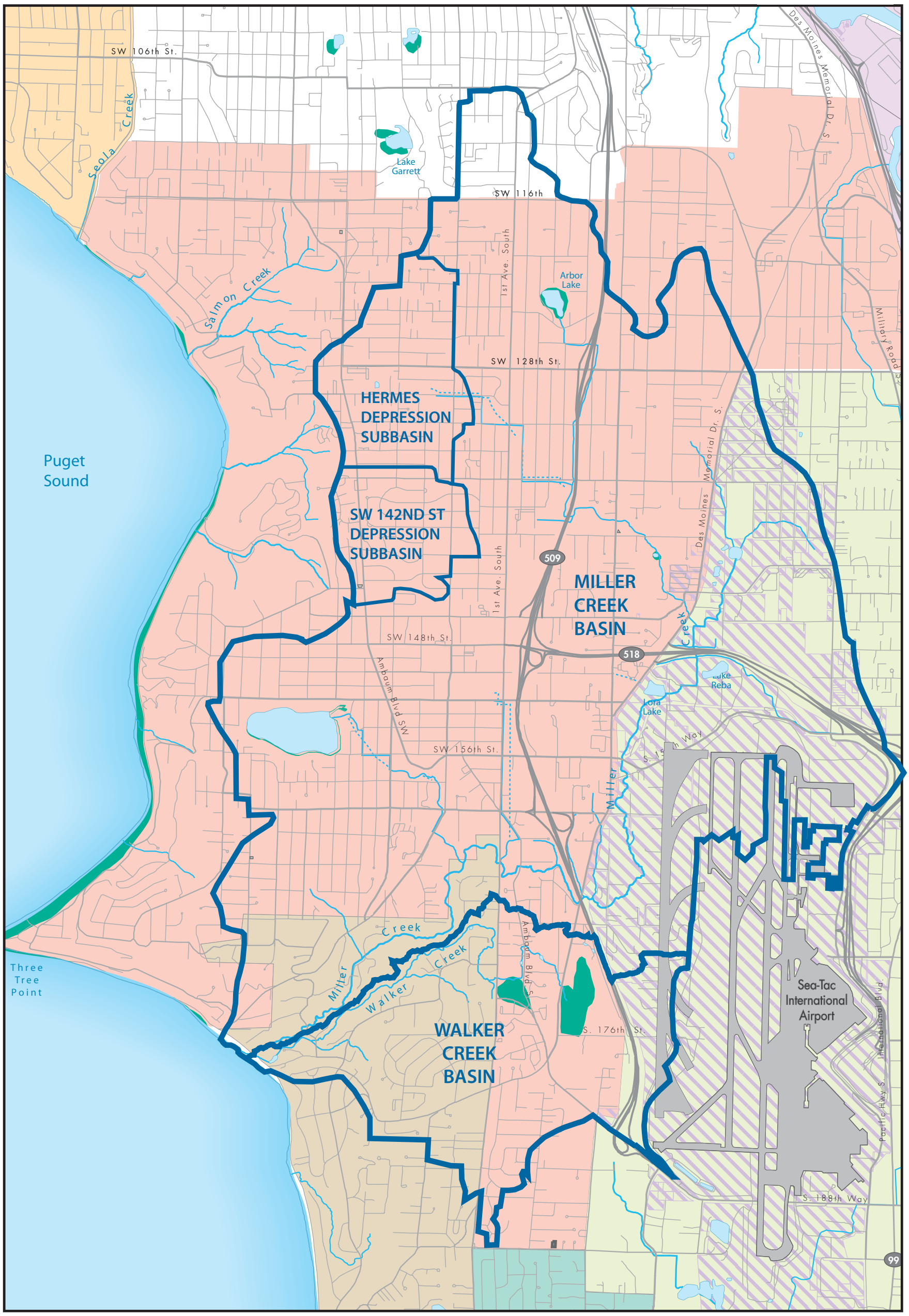


Figure 3-1
Miller and Walker Basins

- Burien
- Normandy Park
- Seattle
- SeaTac
- Tukwila
- Des Moines
- King County (unincorporated)
- Port of Seattle Property
- Basin Boundary
- Subbasin Boundary
- Streams & Waterline
- Freeways & Arterials
- Local Roads
- Railroads
- Pipes
- SAO Wetlands
- Other Significant Man-made Features

N

0 1/4 1/2 3/4 1 Mile

Compiled April, 1994, updated June 2010

1006_1502_MillerWalker2_HLineAnnex.ai LPRE,WG, LPRE, SK, BH, MD

Base Map Notes:
All updates register to USGS PLS.
Shoreline is USGS Mean High Water.

Data Sources:
Miller Creek Basin & Streams: Port of Seattle, 1/08
Other Stream Sources: King County "WTRCRS", 1/08
Roads: King County "TRANS_NETWORK", 1/08
Wetlands: From Environmental Division, 1994.

King County
Department of Natural Resources and Parks
Water and Land Resources Division

3.3.1 Stream Type

The project alignment crosses Miller Creek at about River Mile (RM) 2.0. According to the WDNR stream typing system, Miller Creek is a perennial fish-bearing stream (Type F). Within the project area, the stream is located within the local jurisdiction of the City of SeaTac, which classifies the stream as a Type 2 (fish-bearing) stream with a regulated buffer of 100 feet (SeaTac Municipal Code 15.30.340 and 15.10.620).

3.3.2 Basin Summary

The Miller Creek basin is located in southwest King County and drains approximately eight square miles of predominantly urban area, mostly within the cities of Burien and SeaTac (see Figure 3-1). Basin boundaries consist of Sea-Tac Airport to the east, the City of Normandy Park to the south, the plateau edge above Seahurst to the west, and the hill line north of Arbor Lake to the north. A complex system of at least 15 locally named and unnamed tributaries form the Miller Creek basin. The tributaries of the upper basin originate on a rolling till plateau with glacial outwash sediment partially filling broad swales from which small lakes, bogs, and depressions feed these tributaries. Several of these lakes form the headwaters of two of the tributary streams, while other tributaries receive flow from stormwater runoff and groundwater seeps located on the west side of Sea-Tac Airport.

The uppermost reaches of Miller Creek (above approximately RM 4.1), extend north of SR 518. The Hermes depression subbasin (see Figure 3-1), in the northwestern part of the basin, is artificially drained and piped to a tributary to Arbor Lake. This portion of the watershed drains a gently rolling plateau between the Duwamish/Green River valley and Puget Sound. Although the watershed is generally highly developed, several small bogs, depressions, and wetland lakes remain in the upper basin; this area formerly had a more extensive network of headwater wetlands that buffered the stream from winter storms and provided recharge during summer dry periods (C. May 1996).

In reaches downstream of 1st Avenue South (RM 1.8), Miller Creek flows through a well-incised ravine and cuts through glacial material before entering Puget Sound via a small estuary. The outlet stream from Burien Lake enters the ravine reach at RM 1.2. A sewage treatment plant operates alongside Miller Creek at approximately RM 1.0. Walker Creek, an anadromous fish-bearing stream that originates in wetlands west of Sea-Tac Airport and SR 509, enters Miller Creek approximately 300 feet upstream of its mouth and estuary. A waterfall, which drops over a hardpan lip at about RM 3.1 (upstream of the project area), has been described as a complete barrier to upstream migrations of anadromous fish (Williams et al. 1975, Ames 1970).

The Washington Department of Fisheries reported that Miller Creek had undergone extensive alteration and "total deterioration" due to heavy residential and commercial growth in the drainage in the early 1970s (Williams et al. 1975). Stream conditions necessary to adequately support spawning and rearing of salmonids "were virtually nonexistent" upstream of 1st Avenue South (RM 1.8) due to excessive amounts of sand and silts that comprised 70 to 100 percent of the bottom substrate (Ames 1970). More recent characterizations by King County (2006) indicate that the high level of urbanization in the Miller Creek basin has degraded water quality, increased the volume and rate of storm flows, promoted erosion and mass wasting, and destroyed riparian habitat and vegetation. These factors had greatly reduced the habitat quality of streams, which in turn affect fish populations. Additionally, road crossings present seasonal barriers to salmon migration, numerous

invasive plant species are present, and wetlands in the basin have been filled, reduced in size, or disconnected from the stream system (King County 2006).

Miller Creek stream surveys have been conducted by Trout Unlimited (1993; 2003), Luchessa (1995), Parametrix (1999), and Hillman et al. (1999). Surveys all agreed on Miller Creek's deteriorated habitat, particularly in the upper basin above RM 1.9. Factors contributing to loss of instream habitat include degradation of water quality by pollutants, sediment deposition, eutrophication of lakes and wetlands, and filling of wetlands; loss of protective streamside vegetation; and loss of instream gravels, large organic debris, natural meanders, pools, and other diversity features. In addition, high water temperatures in Miller Creek during the summer constitute a water quality concern, as do high fecal coliform counts, low dissolved oxygen (DO) levels, and residues of lawn and garden chemicals, especially in the upper reaches (Parametrix 1999). The lower basin has benefited from instream habitat restoration conducted by Trout Unlimited.

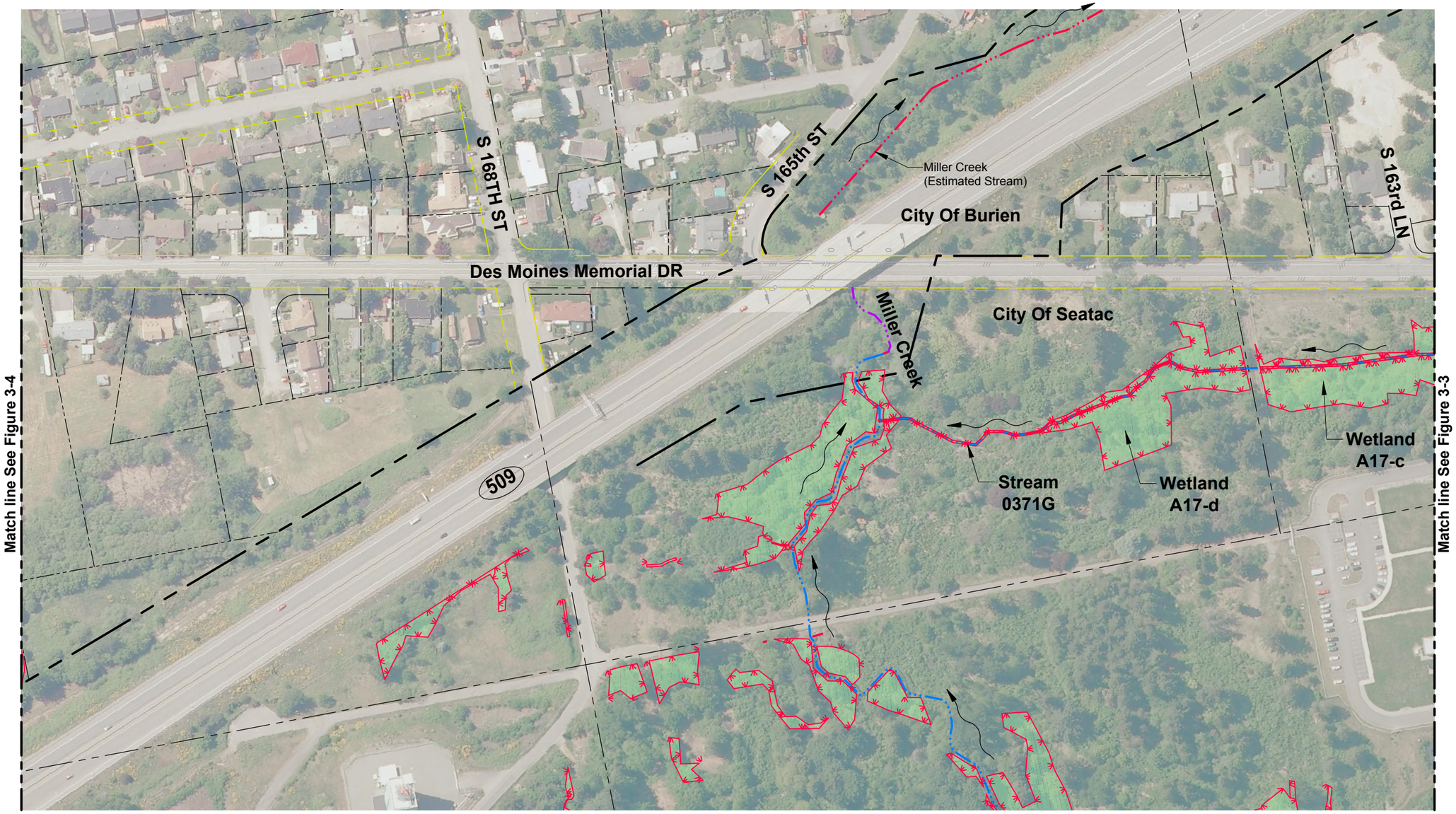
3.3.3 Fish Habitat

Miller Creek crosses the project corridor under Des Moines Memorial Drive (Figure 3-2) at about RM 2.0. Dual culverts convey Miller Creek under the roadway; a 6-foot diameter round corrugated metal culvert (toward the right bank), and a 5.2-foot-high by 6-foot-wide corrugated culvert (toward the left bank). Three plunge pools, formed by the presence of notched concrete sandbags, are located just upstream of the culverts (see Photograph 1 of Appendix A). The pools are about 15 to 20 feet wide and are about 1 to 2 feet deep. The vertical drop at the weirs is about 1 to 1.5 feet. This drop may represent a partial fish passage barrier, at least to juvenile salmonids, although both adult and juvenile salmonids have been observed upstream of the weirs.

King County (2006) characterized the adjacent to the trail corridor as low-gradient, medium floodplain channel with a moderate sinuosity of 1.2 and an average gradient of one percent. The channel is predominantly unconfined except where bank armoring, culverts, or dredging have occurred. Aquatic habitat consists of alternating slow water pools and fast water riffles. The channel substrate consists of moderate amounts of gravel and gravel embedded with high amounts of sands and silts. Substrate in the vicinity of the trail corridor is a combination of placed rip-rap, cobble, and gravel, with medium embededness. The pools have some overhanging shrubs, although observed LWD appeared to be scarce (see Photograph 1 of Appendix A). Based on the habitat conditions, this reach offers fair to good holding or rearing habitat for salmonids.

3.3.4 Water Quality Conditions

Miller Creek is on the 2008 Ecology 303(d) list for exceeding the dissolved oxygen and fecal coliform criteria (Ecology 2011). However, the nearest water quality sample site was about 0.4 mile downstream of the project site.



Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F3-1-STREAM

N

0 200

SCALE IN FEET

Legend:

- Stream
- Estimated Stream
- USGS Stream
- Wetland Boundary (Delineated)
- Wetland Boundary (Estimated)
- Flow Arrow

Figure 3-2
Miller Creek, Stream 0371G, and Associated Wetlands within the Project Area

Lake to Sound Trail – Segment B

3.3.5 Biological Conditions

Fish Presence

WDFW (2010) fish distribution data indicate that coho salmon (*Onchorynchus kisutch)* are potentially present in the project area within Miller Creek, while chum salmon (*O. keta*) have been documented in the lower reaches (RM 0 to 0.5) of the stream. Washington Trout (2003) has documented cutthroat trout (*O. clarkii*) and coho salmon within the project reach, as well as upstream and downstream. Cutthroat trout redds have also been documented in Miller Creek upstream of the project. No Chinook salmon (*O. tshawytscha*), pink salmon (*O. gorbuscha*), bull trout (*Salvelinus confluentus*), or steelhead (*O. mykiss*) have been documented (WDFW 2010b; WSCC 2000). There is a single known report from the 1980s of a single sockeye salmon (*O. nerka*) adult observed in the lower reach (Parametrix 1999). Only coho salmon and cutthroat trout were found rearing below the falls, at RM 3.1 (Parametrix 1999), with chum salmon (*O. keta*) spawning in lower Miller Creek (Hillman et al. 1999).

Warmwater and resident fish species documented in Miller Creek include threespine stickleback (*Gasterosteus aculeatus*), pumpkinseed sunfish (*Lepomis gibbosus*), black crappie (*Pomoxis nigromaculatus*), and cutthroat trout (*O. clarki*) above the falls at RM 3.1 (Parametrix 1999; Washington Trout 2003). Warmwater fish species are associated with Lora Lake and Lake Reba, and the lower-velocity, fine substrate reaches of upper Miller Creek.

Stream Buffer Conditions

Stream buffers in the Miller Creek subbasin range from degraded areas (limited buffer widths composed of shrub and non-native species) located in road rights-of-way to higher-functioning forested riparian habitat in the lower reaches where the stream flows through a steep ravine.

Immediately adjacent to the proposed trail on the upstream (east) side of Des Moines Memorial Drive, the outer (southerly) 35 feet of Miller Creek riparian buffer is composed of maintained (mowed) grass and herbaceous species, including the 15-foot-wide area between the roadway and the Port security fence, extending to about 20 feet past the fence (see Photograph 2 of Appendix A). This area does not provide many of the functions of a healthy riparian area, including LWD recruitment, stream temperature regulation, bank stability, or leaf litter recruitment. Riparian functions provided include only limited water quality functions.

Within the study area, the riparian buffers on the east and west side of the stream are better functioning, with a shrub component and some overstory species. Here, riparian cover consists of abundant deciduous tree and shrub cover and invasive blackberries (King County 2006). Maturing deciduous trees (red alder [*Alnus rubra*], black cottonwood [*Populus balsamifera ssp. trichocarpa*], and big leaf maple [*Acer macrophyllum*]) and a few conifers (Douglas-fir [*Pseudotsuga menziesii*]) are scattered throughout the riparian zone, which extends more than 100 feet from the stream. Invasive species, such as Himalayan blackberry (*Rubus armeniacus*) and reed canarygrass (*Phalaris arundinacea*), are relatively common. Although the riparian corridor is not fully functioning, it does provide functions that support aquatic species, including LWD recruitment, overhead cover, bank stability, leaf litter recruitment, and water quality maintenance.

3.4 Stream 0371G (Tributary to Miller Creek)

As noted in Section 2.2, field investigations for this stream were limited to visual inspection of aquatic features from adjacent parcels, due to limited right-of-entry. The descriptions of visually observed habitat features were supplemented with available published information on these resources (see Section 2.2.1 above for data sources).

3.4.1 Stream Type

According to the WDNR stream typing system, Stream 0371G is a (Type F) seasonal fish-bearing stream. Within the project area, the stream is located within the local jurisdiction of the City of SeaTac and is classified as a Type 2 stream with a regulated buffer of 100 feet (SeaTac Municipal Code 15.30.340 and 15.10.620).

3.4.2 Basin Summary

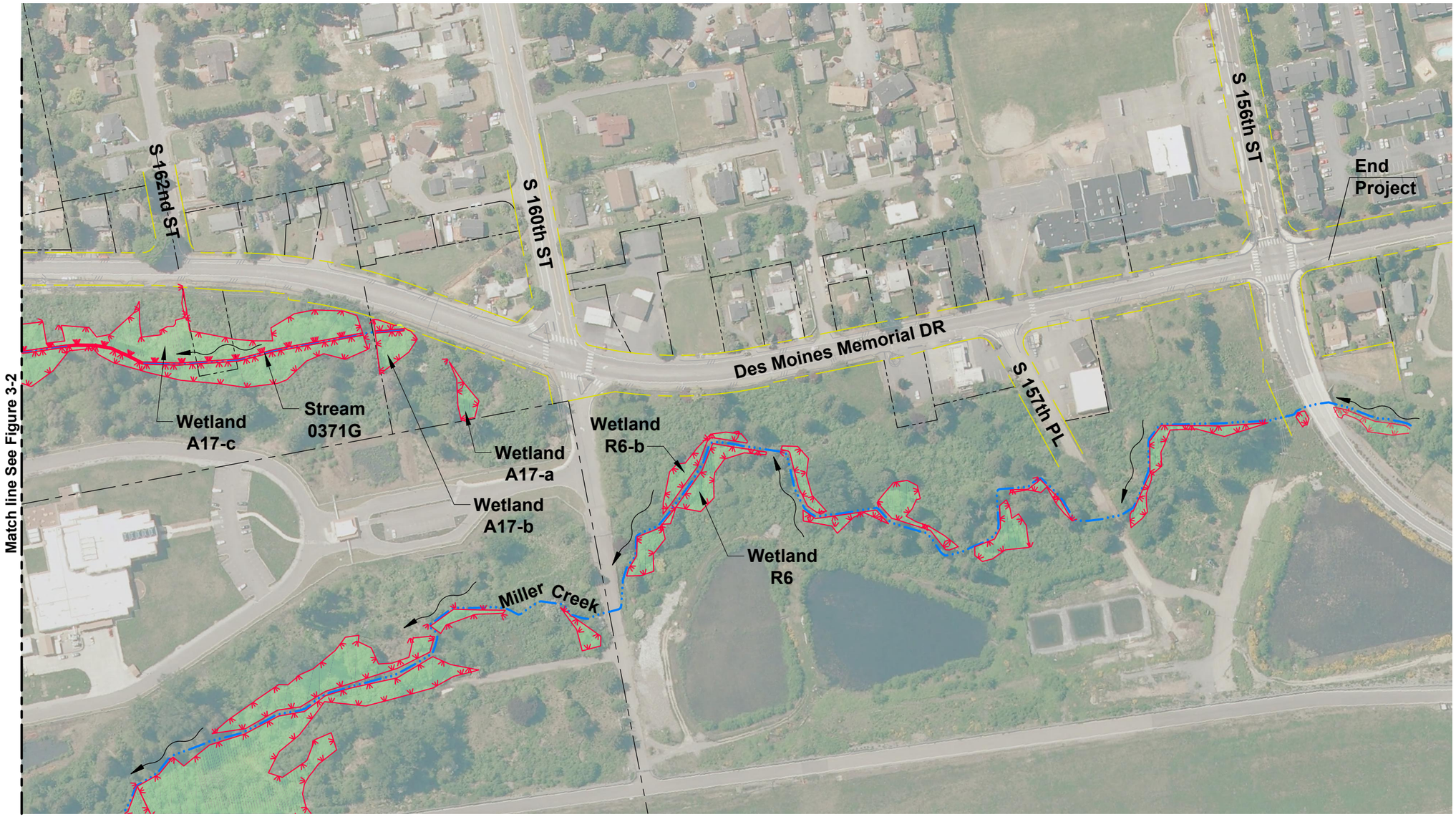
The tributary is about 2,000 feet long and originates in the vicinity of South 160th Street (see Figure 3-1). The tributary flows southeast from its origin, crossing under Des Moines Memorial Drive in a culvert, then turning south and paralleling Des Moines Memorial Drive before draining into Miller Creek on the right bank (see Figures 3-1 through 3-3). The seasonal stream receives substantial volumes of stormwater input, and is located within Wetlands A-17b, c, d (Figures 3-3) (Parametrix 2010a). Overall, the basin has a high level of channel and flow alteration.

3.4.3 Fish Habitat

Substrate within Stream 0371G is composed primarily of fine sediments. The stream channel is relatively narrow (1 to 3 feet wide) and entrenched (see Photograph 3 of Appendix A), except in the vicinity of the wetland, where the OHWM is much wider (10 to 15 feet) and the channel is ill-defined through the wetland. Channel morphology is uniform, with few to no riffles or pools. There is vegetation growing in the majority of the active stream channel, with some overhanging herbaceous and shrub vegetation present. Large Woody debris is scarce in this reach. Based on the habitat conditions including poor water quality, poor habitat heterogeneity, and dominance of fine sediments, this reach offers relatively poor fish habitat, with the exception of the lower 200 feet of stream, which provides some moderate to low quality holding or rearing habitat for salmonids.

3.4.4 Water Quality Conditions

Stream 0371G has no listed exceedances on the 2008 Ecology 303(d) list (Ecology 2011). King County indicates that the stream had cold water (9.5 C), indicating some degree of groundwater discharge.



Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F3-1-STREAM

N

0 200

SCALE IN FEET

Legend:

- Stream
- Estimated Stream
- USGS Stream
- Wetland Boundary (Delineated)
- Wetland Boundary (Estimated)
- Flow Arrow

Figure 3-3
Stream 0371G and Associated Wetlands within the Project Area

Lake to Sound Trail – Segment B

3.4.5 Biological Conditions

Fish Presence

Fish use in this tributary is likely limited by the habitat conditions listed above. A single juvenile cutthroat trout, 95mm in length, was captured about 200 feet upstream of the confluence with Miller Creek, during electrofishing surveys in 2003 (Washington Trout 2003).) This indicates that at least some juvenile salmonids utilize Stream 0371G for off-channel rearing habitat. King County (2006) noted anecdotal information of historically observed salmon farther upstream in the tributary, prior to filling of headwater wetlands. However, the seasonal nature of the streamflow, relatively small channel size, and degraded upstream habitat conditions likely limits its use by salmonids, which is probably limited to a few cutthroat trout.

Stream Buffer Conditions

Stream buffers along Stream 0371G range from degraded areas (limited buffer widths composed of herbaceous, shrub, and non-native species) upstream of Des Moines Memorial Drive to higher functioning forested and scrub-shrub riparian habitat in the reach downstream Des Moines Memorial Drive.

Downstream of Des Moines Memorial Drive, the buffer varies in width from about 50 to 125 feet on each side of the stream. On the south side, the inner riparian zone consists of maturing deciduous trees (alder, cottonwood, and big leaf maple) and a few conifers (Douglas-fir) scattered throughout the riparian zone, while the outer portion of the buffer (adjacent to the roadway) consists of narrow disturbed strips of upland grasses and forbs and invasive blackberries (King County 2006). In about 2005, the Port conducted compensatory mitigation plantings consisting of shrub and tree species between the stream and the roadway. This tributary is fringed by 2.8 acres of palustrine forested/scrub-shrub/emergent wetlands including Wetlands A17b, A17c, and A17d (Parametrix 2001a).

Under existing conditions, the riparian corridor is not fully functioning, but it does provide functions that support aquatic species, including some level of small woody debris (SWD) or LWD recruitment, overhead stream cover, bank stability, leaf litter recruitment, and water quality maintenance.

3.5 Walker Creek

Habitat information on Walker Creek was based on reconnaissance of the stream within the project area to characterize stream features within and immediately adjacent to the project right-of-way.

3.5.1 Stream Type

According to the WDNR stream typing system, Walker Creek is a (Type F) perennial fish-bearing stream. Within the project area, the stream occurs in the local jurisdiction of the City of Burien, which classifies the stream as Type 2, with a regulated buffer of 100 feet (Burien Municipal Code 19.40).

3.5.2 Basin Summary

Walker Creek drains an approximately 2.5-square-mile subbasin of the Miller Creek watershed (see Figure 3-1 and 3-4). The creek originates upstream of SR 509, in a small wetland, but receives much of its flow volume from Wetland WS-1, a large (>20 acres) wetland located between Des Moines Memorial

Drive and SR 509 (Figures 3-4). Downstream of Des Moines Memorial Drive the stream flows through both residential and commercial development before its confluence with Miller Creek approximately 300 feet upstream from Puget Sound. Upstream from the confluence, Walker Creek has a diversion pipe that draws water into a small pond impounded by a control weir. Much of the riparian areas adjacent to the stream, particularly in the downstream reaches, have been eliminated or altered by adjacent development.

Walker Creek parallels Miller Creek for roughly one-half its length and they share similar effects from urbanization. KCSWM (1987) reports several problems in the Miller/Walker Creek watershed created by urbanization; these include excessive runoff from streets, parking lots, and commercial areas that has increased the volume and rate of storm flows. These increased flows have led to mass-wasting and stream erosion, flooding, and loss of habitat. Runoff from this development has also reduced water quality and impaired fish usage.

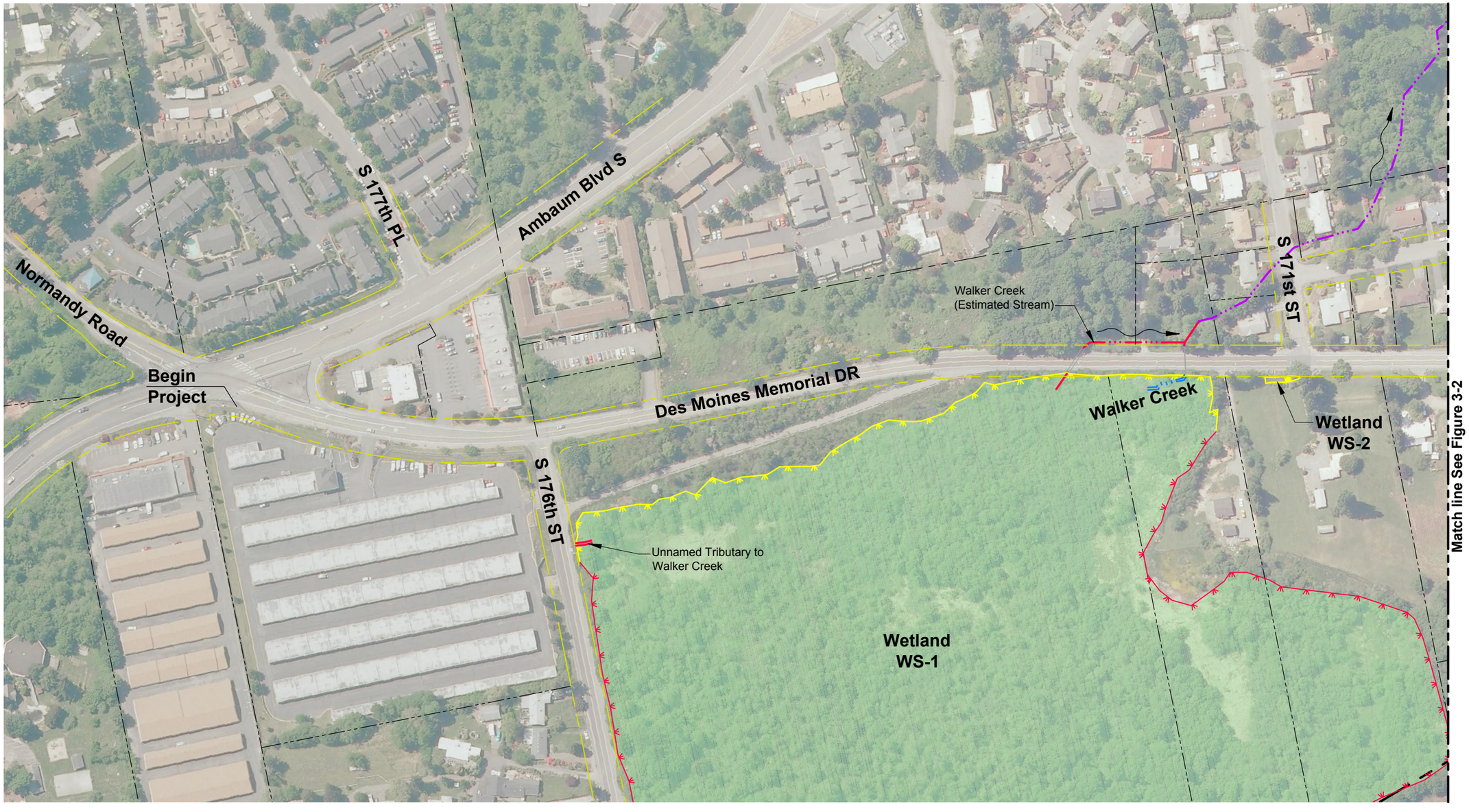
3.5.3 Fish Habitat Conditions

Immediately upstream (east) of the study area, Walker Creek flows through WS-1, a large open-water wetland. Much of the stream is ill-defined in the wetland, with multiple braided channels and open-water ponded areas. Water from Walker Creek crosses beneath Des Moines Memorial Drive in two culverts. The majority of the flow is conveyed to the northernmost culvert, an 18-inch-diameter round concrete pipe within a 4- to 5-foot-wide low-flow channel paralleling the roadway. Channel substrate is composed exclusively of muck and silt, to a depth of several feet. Water depths within the channel were 0.5 to 1.0 foot during the site visit, and channel morphology was uniform, with no observed riffles or pools within the channelized portion of the stream. The culvert inlet is submerged, and has a 10-foot-wide by 20-foot-long pool (see Photograph 4 of Appendix A). The maximum pool depth was about 2.5 feet, although substantial deposition of fine materials has occurred. A beaver exclusion system has been installed at both the inlet and outlet of the pipe. At the inlet, the exclusion system is composed of a 2-foot-diameter cylinder of fencing material that extends from the inlet upstream to a distance of about 10 feet. Leaves and other organic material were partially blocking the cage, but were not acting as a complete dam. The culvert outlet also was screened, with a box of 6-foot-square fencing placed around the pipe.

The stream/wetland complex also delivers flows to Walker Creek through a second culvert, located about 220 feet to the south of the first crossing. Here, some unchannelized water from the wetland crosses under the road in a round or oval concrete culvert, approximately 3 feet in diameter. There is a headwall at the inlet, and the pipe outlet is submerged and appears to be partially buried. Only a small amount of streamflow was observed at this crossing during the site visit.

The flow from this culvert, combined with backwater from the northern culvert, has formed a second channel on the west side of Des Moines Memorial Drive, which joins the mainstem of Walker Creek at the outlet of the northern culvert.

Based on the amount of available off-channel habitat and the presence of overhead cover, the reaches of Walker Creek within the study area would present good rearing habitat for salmonids, especially coho salmon. However, no potential spawning habitat is present within the low-gradient, wetland-dominated system.



Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F3-1-STREAM

N

0 200

SCALE IN FEET

Legend:

- Stream
- Estimated Stream
- USGS Stream
- Wetland Boundary (Delineated)
- Wetland Boundary (Estimated)
- Flow Arrow

Figure 3-4
Walker Creek, Unnamed Tributary to Walker Creek and Associated Wetlands within the Project Area

Lake to Sound Trail – Segment B

3.5.4 Biological Conditions

Fish Presence

Coho salmon occur in the lower reaches of Walker Creek (WDFW 2010), and although the absolute upstream limit of coho use has not been documented, a single coho salmon was found 20 feet downstream of SR 509 (Washington Trout 2003). Hillman et al. (1999) conducted spawning surveys in Walker Creek from October 1998 to March 1999, and tallied 66 coho redds in the lower 2.3 miles (the project is at about RM 2.0). They also found seven chum redds up to RM 1.35. Neither of these surveys, nor existing fish distribution information, indicate Chinook salmon, pink salmon, sockeye salmon, steelhead, or bull trout presence in Walker Creek.

Stream Buffer Conditions

Within this reach, overhanging vegetation is prevalent and vegetation also is actively growing within the low-flow channels. Vegetation along the shoulder of Des Moines Memorial Drive includes tall fescue (*Schedonorus phoenix)*, colonial bentgrass (*Agrostis capillaris*), narrowleaf plantain (*Plantago lanceolata*), red alder, sow thistle (*Sonchus asper*), and giant horsetail (*Equisetum telmateia*). Vegetation in the forested buffer includes red alder, big leaf maple, western swordfern (*Polystichum munitum*), apple (*Malus sp.*), Indian plum (*Oemleria cerasiformis*), English holly (*Ilex aquifolium*), beaked hazelnut (*Corylus cornuta*), Himalayan blackberry, and some non-native ornamental trees.

Under existing conditions, the riparian corridor and associated wetland are relatively high functioning, providing many of the functions that support aquatic species, including some level of SWD or LWD recruitment, overhead stream cover, bank stability, leaf litter recruitment, and water quality maintenance. The vegetation along the road shoulder also provides some of these functions, albeit at a reduced level.

3.6 Unnamed Tributary to Walker Creek

A small unnamed tributary to Walker Creek abuts the southern end of the project area (see Figure 3-4). This stream, which has no name or number, is not listed nor discussed in any available reference documents and no information exists about habitat conditions or fish use (William et al. 1975; WSCC 2000; King County 2006; WDFW 2011). According to the WDNR stream typing system, the stream is a (Type Np) perennial non fish-bearing stream. Within the project area, the stream occurs in the local jurisdiction of the City of Burien, which classifies the stream as Type 3, with a regulated buffer of 50 feet (Burien Municipal Code 19.40).

Based on a field reconnaissance, the headwaters of the stream appear to begin at a culvert outlet, on the north side of South 176th Street. No open-channel was observed upstream of this point, and based on surrounding land uses, it is assumed that the hydrology source for the stream is a combination of groundwater and stormwater. The channel downstream of the culvert is approximately 4 feet wide and 0.5 to 1 foot deep. It appears as if gravel and small angular cobbles have been added to the stream to enhance habitat. The channel is relatively linear, with uniform stream morphology consisting of run/glide habitat. The portion of the stream with a defined bed and bank for approximately 150 feet downstream (north) of the culvert outlet. At this point, the channel becomes ill-defined, with the hydrology appearing to generally sheet flow out of the wetland located to the northeast. Through the wetland, shallow water flows through reed canarygrass, shrubs,

and other vegetation. No gravel or other hard substrate is present through the wetland. Based on the lack of a defined channel, the dispersed and shallow flow path, the thick vegetation, and the lack of ponding in the wetland, it is highly unlikely the upstream defined portion of the channel supports salmonids. Riparian conditions are relatively good, with a deciduous forest overstory and shrub understory, although the streambanks are vegetated primarily with herbaceous species.

3.7 Special Status Species

There are no known fish species within the project area that are listed as threatened or endangered under the Endangered Species Act (ESA). Although ESA-listed salmonid populations, specifically the Puget Sound evolutionarily significant unit of Chinook salmon, the Puget Sound steelhead distinct population segment (DPS), and the Coastal–Puget Sound DPS of bull trout, are present within Puget Sound and WRIA 9, these species are not known to be present within any of the streams affected by the project, and the aquatic habitat within the study area is not sufficient to support the life history requirements of these species. Likewise, no species that are candidates for listing under ESA are present in the study area; however, the Puget Sound/Strait of Georgia population of coho salmon is listed as a species of concern by the National Oceanic and Atmospheric Administration (NOAA) Fisheries, and is present in the study area.

Priority fish species include all state endangered, threatened, sensitive, and candidate species, and species of recreational, commercial, or tribal importance that are considered vulnerable. No fish species with state candidate status occur in the study area. No state sensitive, threatened, or endangered fish species occur in the study area. Other fish species that are designated as priority species (WDFW 2010a) may occur within the study area. These are chum, sockeye, and kokanee salmon and rainbow and coastal cutthroat trout.

4 ENVIRONMENTAL CONSEQUENCES

4.1 Construction Effects

This section describes the extent and type of temporary and permanent effects to streams and aquatic resources that could occur as a result of construction activities associated with the proposed project.

4.1.1 Permanent Effects

The project does not include construction activities below the OHWM of any stream; therefore, the project would not result in any stream fill nor would alterations to fish passage structures be required. Permanent effects to stream buffers occur where the proposed trail alignment encroaches into currently vegetated areas adjacent to the stream. As previously discussed, there is significant overlap between stream buffers and wetland buffers. The total riparian buffer permanent impact is 17,623 square feet (Figures 4-1 through 4-9), although 14,844 square feet of this impact is also in wetlands and wetland buffers. Further details on these impacts are provided in Parametrix (2011b). Permanent riparian buffer impacts occur along Miller Creek, Stream 0371G, Walker Creek, and the Unnamed Tributary to Walker Creek, although the only area where permanent stream buffer impacts do not occur in conjunction with wetland/wetland buffer impacts is at the Miller Creek crossing of Des Moines Memorial Drive (Figure 4-5). In almost all cases, the quality of the riparian buffer that would be permanently displaced is low. For the Miller Creek and its tributary, the impacted riparian areas consist almost exclusively of maintained (mowed) grass. In the case of Walker Creek, the impacted buffer areas have more of a shrub component, and some scattered trees, but existing buffer functions are still degraded. Because of the extremely limited existing functions that the riparian buffer currently provides (mostly limited to minor water quality filtration and infiltration), the permanent loss of the relatively narrow linear buffer area is not expected to have a substantial effect on stream habitat or fish resources in any of the project area streams.

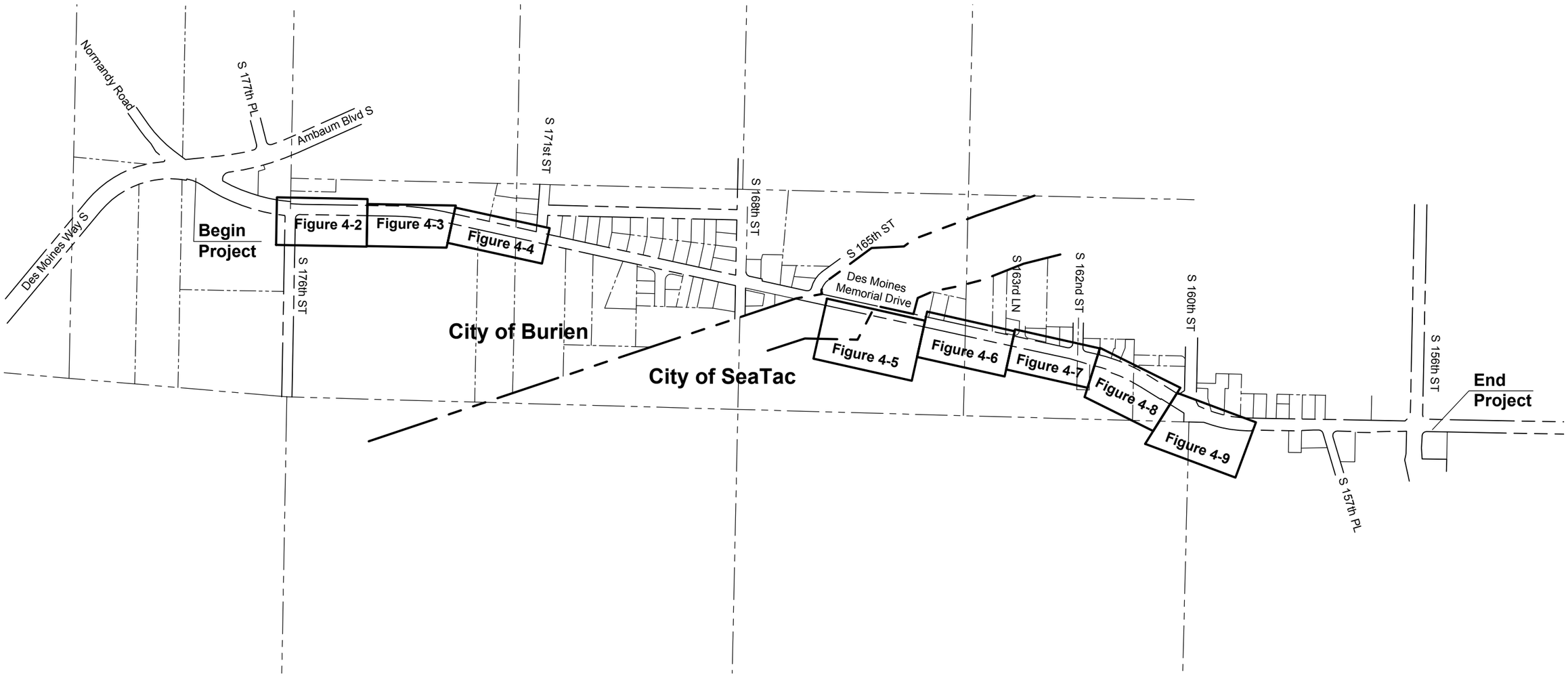
4.1.2 Temporary Effects

The project does not include construction activities below the OHWM of any stream; therefore, the project would not result in any stream fill nor would alterations to fish passage structures be required. Temporary impacts to stream buffers would occur from minor clearing and grading to construct the project, as well as from the potential for erosion, sedimentation, and noise disturbance during construction. As previously discussed, there is significant overlap between stream buffers and wetland buffers. The total riparian buffer temporary impact is 3,848 square feet (Figures 4-1 through 4-9), although 2,889 square feet of this impact is also in wetlands and wetland buffers. Further details on these impacts are provided in Parametrix (2011b). Temporary riparian buffer impacts occur along Miller Creek, Stream 0371G, Walker Creek, and the Unnamed Tributary to Walker Creek, although the only area where permanent stream buffer impacts do not occur in conjunction with wetland/wetland buffer impacts is at the Miller Creek crossing of Des Moines Memorial Drive (Figure 4-5). Because the portions of the affected buffer are degraded (as discussed above) and these riparian areas would be replanted once construction is complete, temporary clearing is not expected to have a substantial effect on stream habitat or fish resources in any of the project area streams.

Construction occurring directly adjacent to project area streams could increase turbidity and total suspended solids. These effects would be avoided or minimized through the development and implementation of

temporary erosion and sediment control (TESC) and spill prevention control and countermeasures (SPCC) plans. Details on the TESC and SPCC plans, and other best management practices (BMPs) are discussed in Section 6 of this report.

No inwater work would occur within any of the project area streams. However, drilling or pile driving during installation of pin piles may occur adjacent to the OHWM of Walker Creek. It is possible that this activity may transmit some minor amount of noise and vibration from the upland area the water column in those reaches of Walker Creek adjacent to the proposed boardwalk. However, the pin piles are relatively small (9 inches in diameter), and would be installed in areas with softer soils. Also, the load-bearing ability of the boardwalk is only for non-motorized standards, meaning that individual pile installation times would be relatively short (minutes or tens of minutes). Because of these factors, effects to fish from pin pile installation would be insubstantial, at most consisting of minor and temporary behavioral changes. Noise and vibration levels from upland pile driving do not produce sufficient inwater energy to approach or exceed the sound thresholds for fish injury or death.



Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F4-1-STRE-BUFR-IMP

N

0 600

SCALE IN FEET

Figure 4-1
Stream Buffer Impacts

Lake to Sound Trail – Segment B

Des Moines Memorial DR

106+00

107+00

108+00

109+00

110+00

1+00

2+00

3+00

4+00

5+00

6+00

7+00

S 176th ST

CG

Proposed Trail on
Existing Gravel Path

Match line See Figure 4-3

242 sf Buffer
Temporary

96 sf Buffer
Permanent

2+70

47 sf Buffer
Permanent

50' Buffer

Wetland
WS-1

Unnamed Tributary to
Walker Creek

Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F4-2-STRE-BUFR-IMP

N

0 40

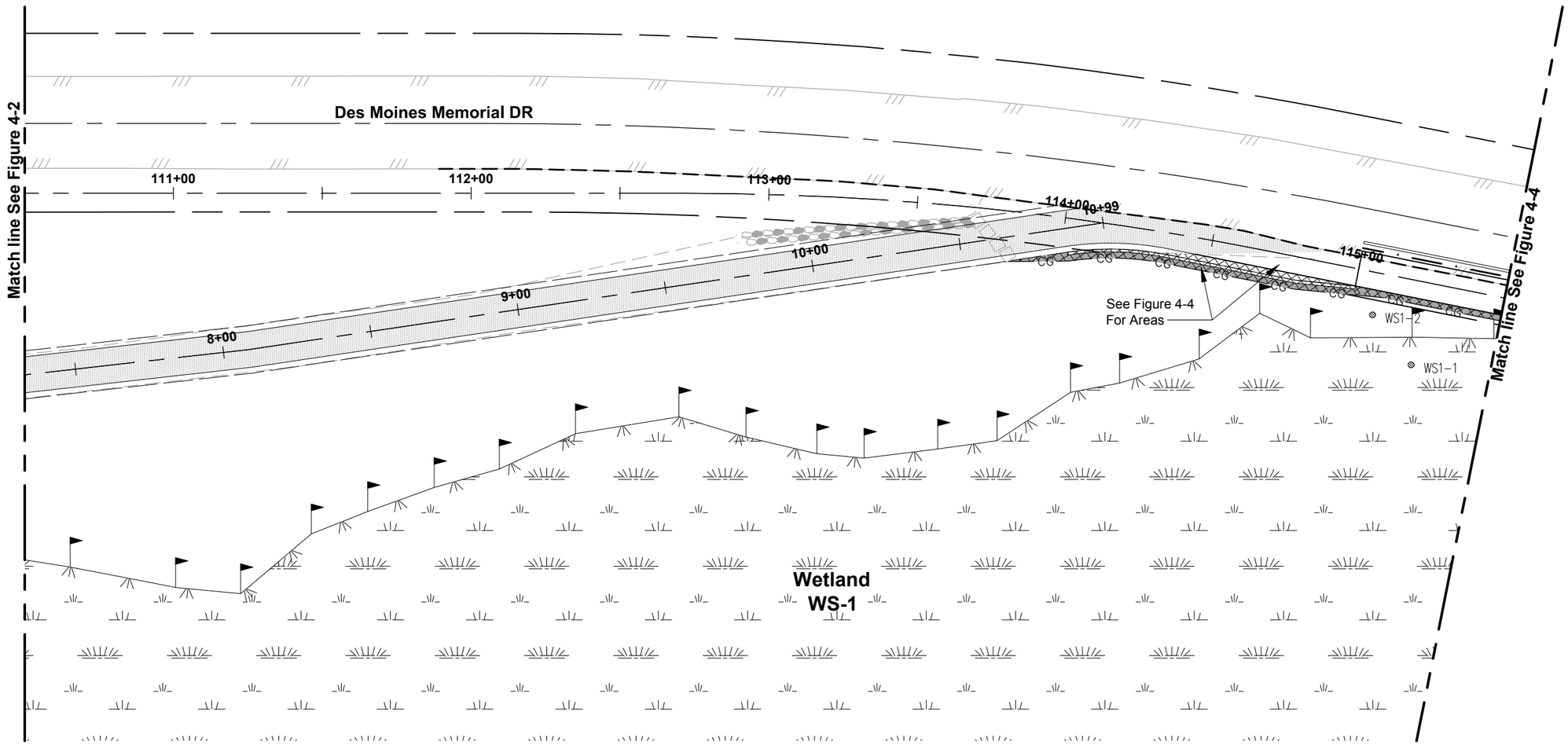
SCALE IN FEET

Legend:

- Stream Buffer
- Wetland Boundary
- Stream
- Fill Line
- Cut Line
- Clear and Grubbing
- Right of Way Line
- Property Line
- Existing Asphalt
- Proposed Trail
- Stream Buffer Permanent Impact
- Stream Buffer Temporary Impact
- Stream Buffer and Wetland/Wetland Buffer Permanent Impact
- Stream Buffer and Wetland/Wetland Buffer Temporary Impact

Figure 4-2
Stream Buffer Impacts

Lake to Sound Trail – Segment B



Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F4-2-STRE-BUFR-IMP

N

0 40

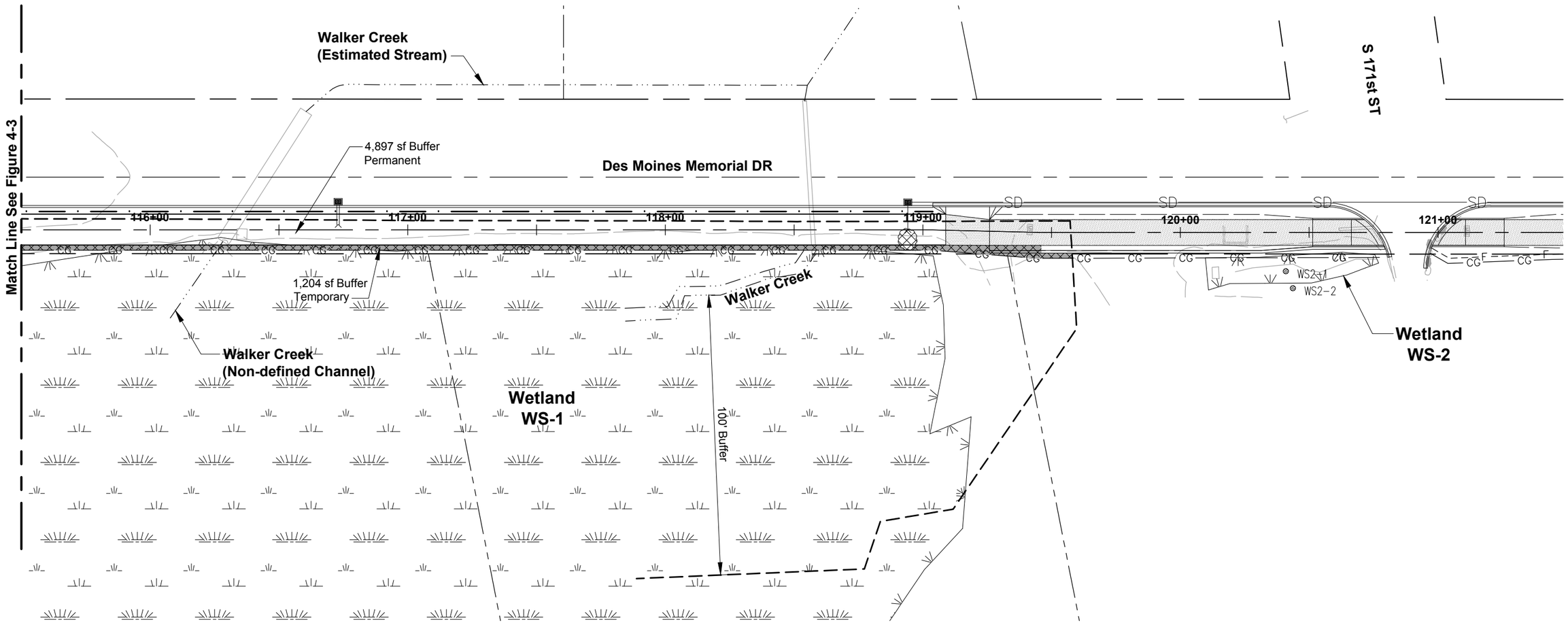
SCALE IN FEET

Legend:

- Stream Buffer
- Wetland Boundary
- Stream
- Fill Line
- Cut Line
- Clear and Grubbing
- Right of Way Line
- Property Line
- Existing Asphalt
- Proposed Trail
- Stream Buffer Permanent Impact
- Stream Buffer Temporary Impact
- Stream Buffer and Wetland/Wetland Buffer Permanent Impact
- Stream Buffer and Wetland/Wetland Buffer Temporary Impact

Figure 4-3
Stream Buffer Impacts

Lake to Sound Trail – Segment B



Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F4-2-STRE-BUFR-IMP

N

0 40

SCALE IN FEET

Legend:

- Stream Buffer
- Wetland Boundary
- Stream
- Fill Line
- Cut Line
- Clear and Grubbing
- Right of Way Line
- Property Line
- Existing Asphalt
- Proposed Trail
- Stream Buffer Permanent Impact
- Stream Buffer Temporary Impact
- Stream Buffer and Wetland/Wetland Buffer Permanent Impact
- Stream Buffer and Wetland/Wetland Buffer Temporary Impact

Figure 4-4
Stream Buffer Impacts

Lake to Sound Trail – Segment B

Des Moines Memorial DR

138+00 139+00 140+00 141+00 142+00 143+00

2732 sf Buffer Permanent

464 sf Buffer Temporary

495 sf Buffer Temporary

47 sf Buffer Permanent

Miller Creek

City Of Burien

City Of Seatac

100' Buffer

100' Buffer

100' Buffer

Wetland A17-d

Stream 0371G

Match line See Figure 4-6

Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F4-2-STRE-BUFR-IMP

N

0 40

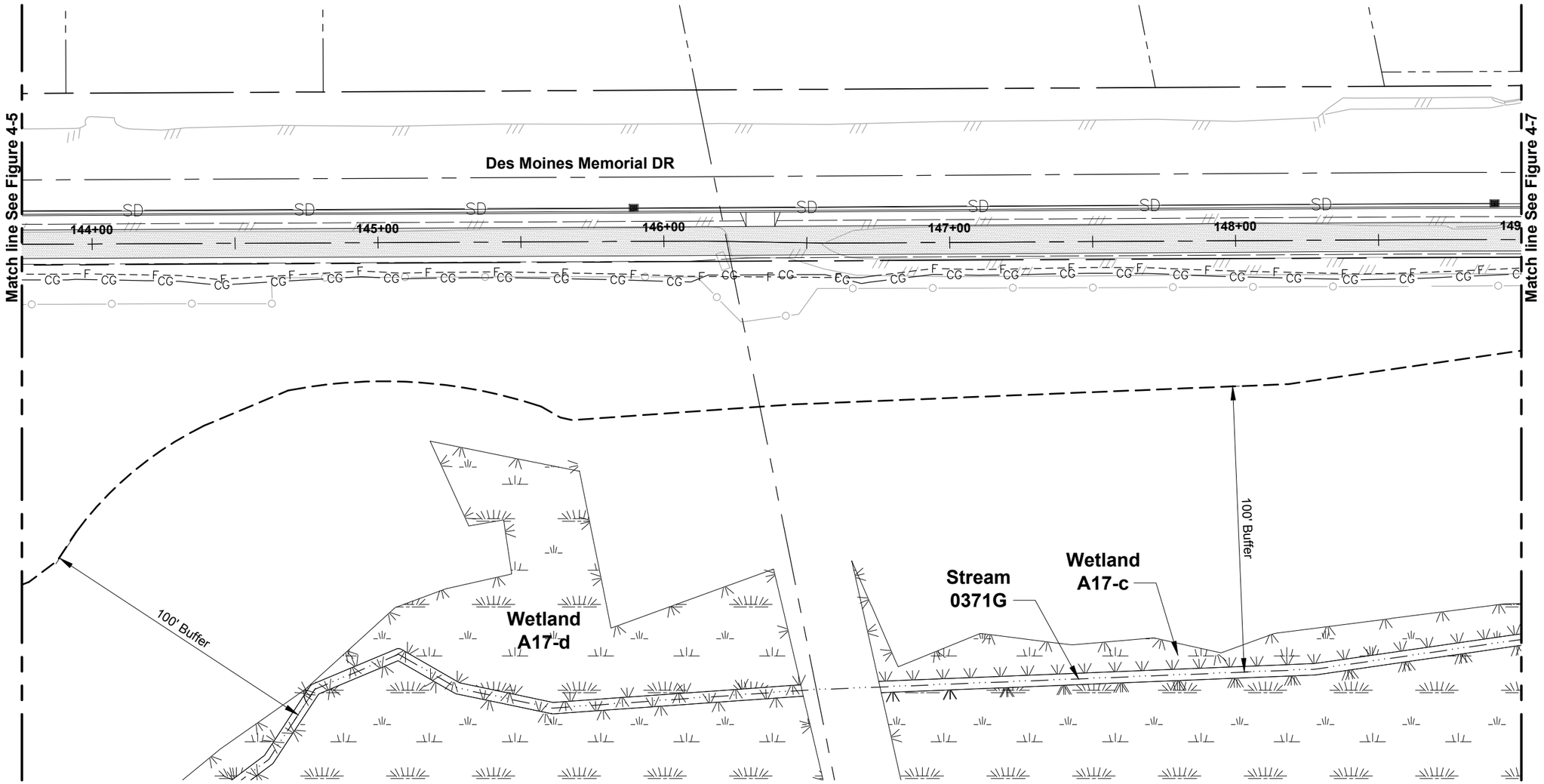
SCALE IN FEET

Legend:

- Stream Buffer
- Wetland Boundary
- Stream
- Fill Line
- Cut Line
- Clear and Grubbing
- Right of Way Line
- Property Line
- Existing Asphalt
- Proposed Trail
- Stream Buffer Permanent Impact
- Stream Buffer Temporary Impact
- Stream Buffer and Wetland/Wetland Buffer Permanent Impact
- Stream Buffer and Wetland/Wetland Buffer Temporary Impact

Figure 4-5
Stream Buffer Impacts

Lake to Sound Trail – Segment B



Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F4-2-STRE-BUFR-IMP

N

0 40

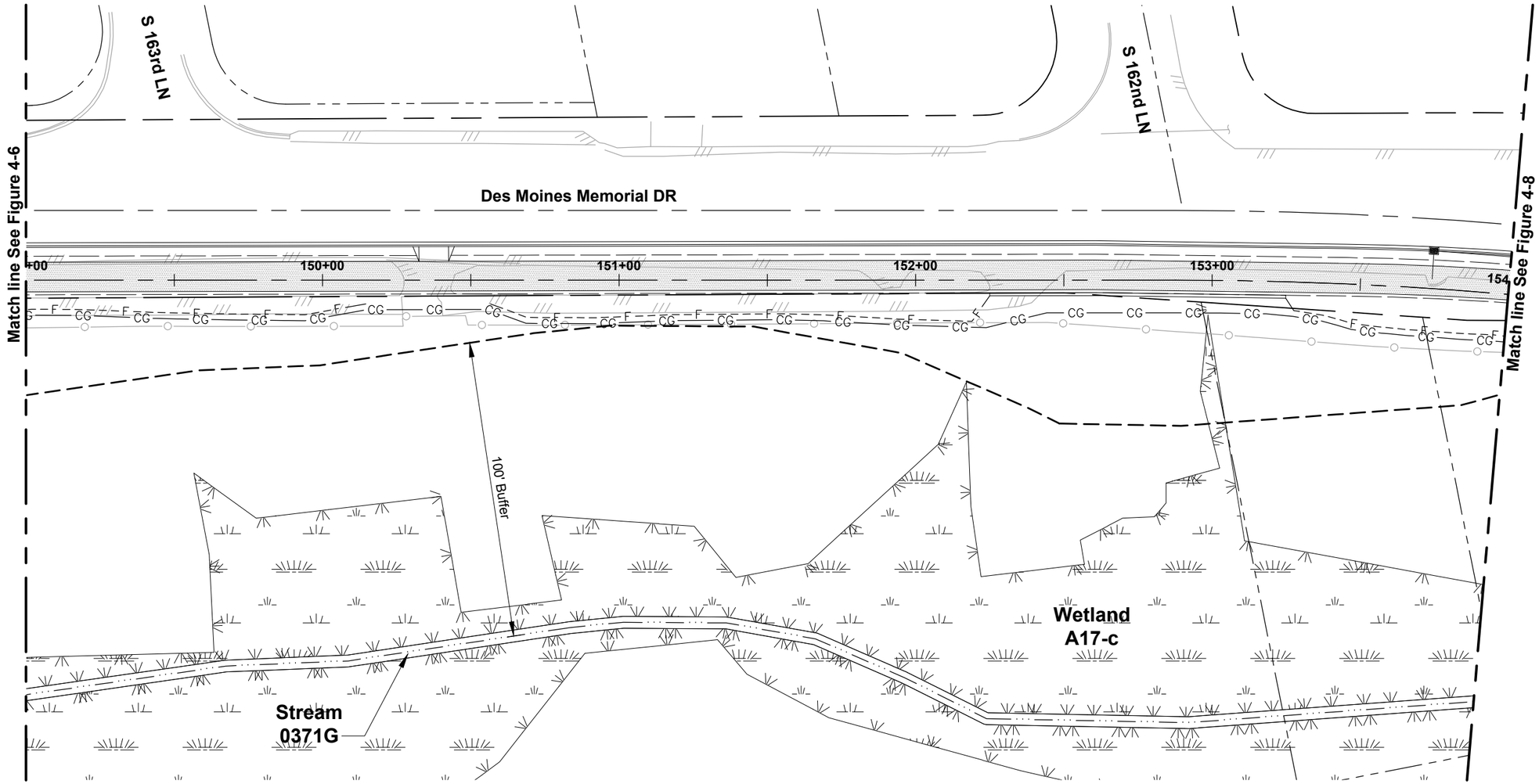
SCALE IN FEET

Legend:

- Stream Buffer
- Wetland Boundary
- Stream
- Fill Line
- Cut Line
- Clear and Grubbing
- Right of Way Line
- Property Line
- Existing Asphalt
- Proposed Trail
- Stream Buffer Permanent Impact
- Stream Buffer Temporary Impact
- Stream Buffer and Wetland/Wetland Buffer Permanent Impact
- Stream Buffer and Wetland/Wetland Buffer Temporary Impact

Figure 4-6
Stream Buffer Impacts

Lake to Sound Trail – Segment B



Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F4-2-STRE-BUFR-IMP

N

0 40

SCALE IN FEET

Legend:

- Stream Buffer
- Wetland Boundary
- Stream
- Fill Line
- Cut Line
- Clear and Grubbing
- Right of Way Line
- Property Line
- Existing Asphalt
- Proposed Trail
- Stream Buffer Permanent Impact
- Stream Buffer Temporary Impact
- Stream Buffer and Wetland/Wetland Buffer Permanent Impact
- Stream Buffer and Wetland/Wetland Buffer Temporary Impact

Figure 4-7
Stream Buffer Impacts

Lake to Sound Trail – Segment B

Des Moines Memorial DR

Match Line See Figure 4-7

Match Line See Figure 4-9

155+00

156+00

157+00

158+00

159

3,804 sf Buffer
Permanent

1,443 sf Buffer
Temporary

100' Buffer

100' Buffer

Wetland
A17-c

Wetland
A17-b

Wetland
A17-a

Stream
0371G

Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F4-2-STRE-BUFR-IMP

N

0 40

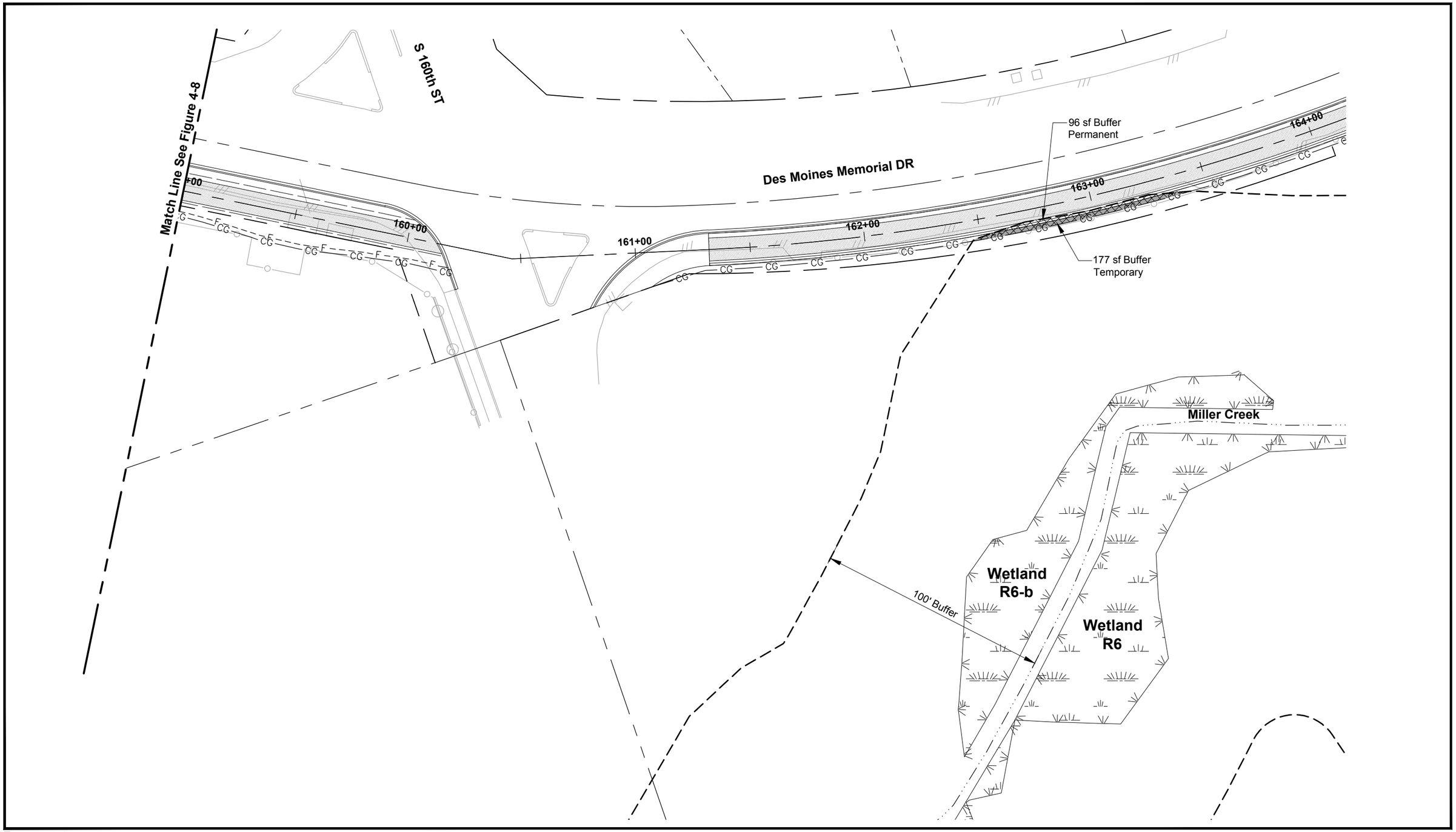
SCALE IN FEET

Legend:

- Stream Buffer
- Wetland Boundary
- Stream
- Fill Line
- Cut Line
- Clear and Grubbing
- Right of Way Line
- Property Line
- Existing Asphalt
- Proposed Trail
- Stream Buffer Permanent Impact
- Stream Buffer Temporary Impact
- Stream Buffer and Wetland/Wetland Buffer Permanent Impact
- Stream Buffer and Wetland/Wetland Buffer Temporary Impact

Figure 4-8
Stream Buffer Impacts

Lake to Sound Trail – Segment B



Parametrix DATE: April 29, 2011 FILE: BL1521084PBT2T2F4-2-STRE-BUFR-IMP

N

0 40

SCALE IN FEET

Legend:

- Stream Buffer
- Wetland Boundary
- Stream
- Fill Line
- Cut Line
- Clear and Grubbing
- Right of Way Line
- Property Line
- Existing Asphalt
- Proposed Trail
- Stream Buffer Permanent Impact
- Stream Buffer Temporary Impact
- Stream Buffer and Wetland/Wetland Buffer Permanent Impact
- Stream Buffer and Wetland/Wetland Buffer Temporary Impact

Figure 4-9
Stream Buffer Impacts

Lake to Sound Trail – Segment B

4.2 Operational Effects

The primary potential for operational effects would be from stormwater discharges, which can negatively impact stream flows and/or water quality. The proposed project would not add any pollution generating impervious surface (PGIS) to the Miller or Walker Creek subbasins. The non-motorized trail project would result in a total of 2.5 acres of additional trail surface, of which 0.2 acre would be impervious surface associated with the new boardwalk trail along Walker Creek and its associated wetlands. The remaining 2.3 acres of trail surface would be composed of pervious pavement and gravel shoulders, which allows precipitation to infiltrate through the pavement and into the soils below. Even if the infiltration efficiency of the pervious pavement decreases over time, the permeable gravel shoulder at the outer edge of the trail, combined with the adjacent wetland and riparian buffer will infiltrate the vast majority of the runoff from this surface. No changes in water quality of the project area streams would result, because heavy metals, polycyclic aromatic hydrocarbons (PAHs), and other contaminants commonly associated with roadway runoff would not be generated on the pedestrian and bike trail. No changes in flow regime, including the peak flows and base flows of Miller Creek, Stream 0371G, Walker Creek, and the Unnamed Tributary to Walker Creek are expected because all stormwater generated on the trails surface would be infiltrated through the pervious pavement (2.3 acres), or sheet flow from the boardwalk (0.2 acres) into the wetland buffer. This would effectively disperse the flow into a vegetated area with ample capacity for the interception, infiltration, or holding of the additional runoff from this small area.

Stormwater from some areas of the existing PGIS on Des Moines Memorial Drive would require collection and discharge. No stormwater treatment currently exists for the roadway, and existing runoff sheetflows into adjacent wetlands and streams, including Miller Creek, Stream 0371G, and Walker Creek. Because of the new trail and associated curb, runoff from the roadway adjacent to the trail would be collected (but not treated) and discharged into the project area streams. Table 4-1 lists the amount of existing impervious surface generating stormwater that would be collected from each subbasin. This runoff would be discharged in a series of new and existing discharge locations. All new discharge locations would be located above OHWM and include energy dissipation features to eliminate streambank erosion or sedimentation. Since no additional PGIS is associated with the project, no water quality effects would occur. Because no inter-basin transfers of stormwater would occur (all stormwater would remain in the basin it originated in), and because the stormwater would be dispersed in several locations along each waterbody, no measurable changes in stream baseflows or peakflows are expected to occur from the concentration of stormwater from these small areas of impervious surface.

Table 4-1. Existing Roadway PGIS Collected and Discharged

Stream Name	Existing Roadway PGIS (acres)	Number of Existing Outfalls Utilized	Number of New Outfalls Constructed
Miller Creek	1.66	5	0
Stream 0371G	2.84	3	1
Walker Creek	1.60	0	3

5 MITIGATION

The Lake to Sound Trail—Segment B project would avoid and minimize impacts to streams by proceeding in accordance with the mitigation sequencing requirements established by NEPA, the CWA, and other aquatic area protections programs. According to NEPA (40 CFR paragraphs 1508.20), the definition of mitigation is as follows:

1. Avoiding the impact all together by not taking a certain action or parts of an action.
2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
5. Compensating for the impact by replacing or providing substitute resources or environments.

5.1 Avoidance and Minimization Measures

Consistent with the above sequencing requirements, a high priority was placed on avoiding and minimizing stream and stream buffer impacts. The streams in the study area have been avoided to the greatest feasible extent and no permanent filling of streams is anticipated. King County would apply the following strategies to minimize stream and buffer impacts during the design, permitting, and construction phases:

- Use retaining walls to narrow the trail footprint in the vicinity of the streams.
- Use a boardwalk to minimize fill impacts to streams, wetlands, and buffers.
- Limit earthwork near streams to the dry season to reduce the potential for sediment runoff.
- Use appropriate BMPs to reduce the risk of erosion and reduce or minimize the chance of sediments entering project waterbodies (e.g., mulching, matting, and netting; filter fabric fencing; sediment traps).
- Prepare and implement a TESC plan for clearing or removing vegetation, grading, ditching, filling, excavating, and conducting embankment compaction to minimize and control pollution and erosion from all vegetation or ground-disturbing activities.

5.2 Restoration of Temporary Effects

All temporarily affected areas would be restored to pre-construction conditions or better through re-planting or reseeding.

5.3 Compensatory Mitigation

In cooperation with resource agencies, King County would develop plans for habitat improvements or restoration to mitigate the effects of the project. Specific mitigation plans would be included in permit applications for construction of the project. The mitigation plans would focus on providing riparian buffer and wetland buffer mitigation that would provide equal or greater functions than were impacted. The mitigation site would be planted at a ratio of at least 1:1 (mitigation area to impact area) to offset project

impacts. Since the riparian buffer and wetland buffer impacts have substantial overlap (84 percent of the permanent riparian buffer impacts are also wetland/wetland buffer impacts), further details on the overall mitigation plan are provided in the Lake to Sound Trail – Segment B Wetland Discipline Report (Parametrix 2011b). However, the riparian buffer component of the overall mitigation would consist of planting native trees and shrubs within the regulated riparian buffer of a fish-bearing stream. On-site mitigation is preferred, but would likely require cooperation with adjacent landowners because the project right-of-way is highly confined, and would be largely occupied by the proposed project. Mitigation may occur on Miller or Walker Creeks, upstream or downstream of the project, or at a similar subbasin in the same geographic area. Riparian mitigation would consist of planting, or underplanting, in an area where existing riparian conditions are degraded. This type of mitigation would offset the project's impacts on stream resources by maintaining or enhancing those riparian functions that support water quality and fish habitat. The riparian functions that would benefit from mitigation include LWD recruitment, stream temperature regulation, bank stability, or leaf litter recruitment, and water quality functions. All temporarily disturbed areas would be fully revegetated and would support a level of riparian function that is the same, or greater, than under existing conditions.

6 REFERENCES

Ames, J. 1970. Miller Creek: Present status and potential for salmon production. Washington Department of Fisheries, report to file. Olympia, Washington.

Ecology (Washington State Department of Ecology). 2011. Water Quality Assessment and 303(d) Listings. Available at: < http://www.ecy.wa.gov/programs/wq/303d/2008/index.html>. Accessed on January 14, 2011.

Hillman, T.W., J.R. Stevenson, and D.J. Snyder. 1999. Assessment of spawning and habitat in three Puget Sound streams, Washington. Report to Airport Communities Coalition. BioAnalysts, Inc. 33 pages.

King County. 2006. Miller and Walker Creek Basin Plan. King County Department of Natural Resources and Parks.

KCSWM (King County Surface Water Management). 1987. Basin reconnaissance program summary. Reconnaissance Report No. 12, Miller Creek basin. Natural Resources and Parks Division and Surface Water Management Division, King County, Washington.

Luchessa, S. 1995. Stream survey report for Miller Creek. Seattle, Shapiro and Associates, Inc. Appendix F. In: Natural resource mitigation plan for the proposed Master Plan Update improvements at Seattle-Tacoma International Airport.

May, C. 1996. Assessment of cumulative effects of urbanization on small streams in the Puget Sound lowland ecoregion. Dissertation, University of Washington, Seattle, Washington.

Parametrix. 1999. Draft natural resource mitigation plan for Seattle-Tacoma International Airport Master Plan Update improvements. Prepared for the Port of Seattle by Parametrix, Inc., Kirkland, Washington.

Parametrix. 2001. Natural resource mitigation plan. Seattle-Tacoma International Airport, Master Plan Update. Prepared for Port of Seattle.

Parametrix. 2011a. Lake to Sound Trail – Segment B: Final Lake to Sound Trail – Potential Effects on Memorial Elms Technical Memorandum. Bellevue, Washington.

Parametrix. 2011b. Lake to Sound Trail – Segment B: Final Wetland Discipline Report. Bellevue, Washington.

Trout Unlimited. 1993. 1993 Trout Unlimited Miller Creek stream survey results. Reported as Appendix A in Lucchessa, S. 1995. Sea-Tac Airport Master Plan Update Final EIS. Stream Survey Report for Miller Creek. Shapiro and Associates, Seattle, Washington.

Washington Trout. 2003. Water Type Survey Results South King County May/June, 2003. Database and photos available at <http://www.washingtontrout.org/kcpuget/index.shtml>.

WDFW (Washington Department of Fish and Wildlife). 2010a. Priority Habitats and Species Report for the Lake to Sound Trail – Segment B project vicinity. Olympia, Washington.

WDFW. 2010b. Salmonscape database. Available at: <http://wdfw.wa.gov/mapping/salmonscape/index.html>. Accessed on December 14, 2010.

Williams et al. 1975. A catalog of Washington streams and salmon utilization. Volume 1, Puget Sound Region. Washington Department of Fisheries. Olympia, Washington.

WSCC (Washington State Conservation Commission). 2000. Habitat Limiting Factors and Reconnaissance Assessment Report: Green/Duwamish and Central Puget Sound Watersheds (Water Resource Inventory Area 9 and Vashon Island), Olympia, Washington. December 2000.

APPENDIX A

Site Photographs

Photograph 1. View of Miller Creek, just upstream (east) from crossing of Des Moines Memorial Drive South. Note notched weir and pool, one of three such structures within this reach. (Photograph from Washington Trout, 2003)

Photograph 2. View of Miller Creek stream buffer that will be impacted by project (along east side of Des Moines Memorial Drive South). Note degraded condition of stream buffer, which consists primarily of maintained grasses.

Photograph 3. View of Stream 09-0371G, about 100 feet upstream from confluence with Miller Creek. Note narrow channel width and presence of invasive herbaceous vegetation. (Photograph from Washington Trout, 2003)

Photograph 4. View of Walker Creek, at inlet to northern culvert under Des Moines Memorial Drive. Note pooled area at inlet presence of beaver deceiver.