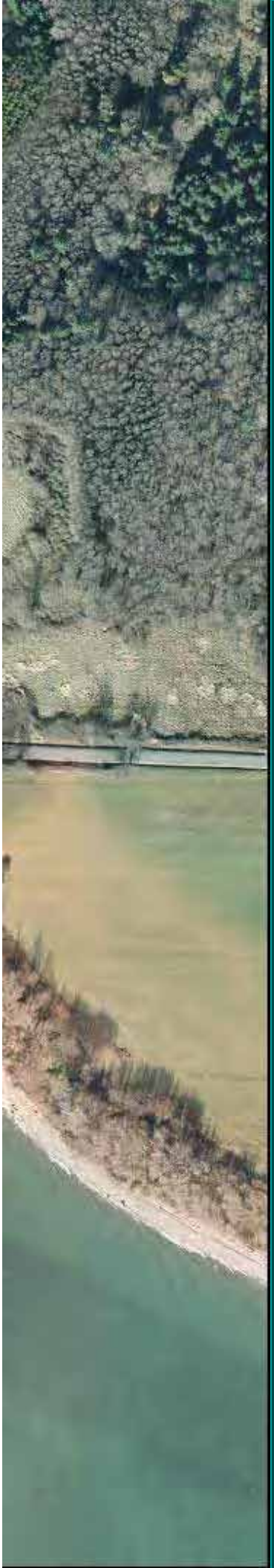

Wetland Determination and Delineation
Gateway Pacific Terminal Property
Whatcom County, WA

Submitted to:

Pacific International Terminals
1131 SW Klickitat Way
Seattle, Washington 98134

Submitted by:

AMEC Earth & Environmental, Inc.
11335 N.E. 122nd Way, Suite 100
Kirkland, Washington 98034

February 22, 2008

February 21, 2008

Randel Perry, Project Manager
Regulatory Branch
U.S. Army Corps of Engineers – Seattle District
P.O. Box 3755
Seattle, Washington 98124

Subject: **Request for jurisdictional determination and boundary confirmation of potential wetland areas located at the Gateway Pacific Terminal Property, Whatcom County, Washington.**

Dear Mr. Perry:

AMEC Earth & Environmental, Inc. is pleased to submit this report describing our wetland determination and delineation on the approximately 1,100 acre undeveloped parcel in Whatcom County, WA on behalf of Pacific International Terminals, Inc (PIT).

We request your attention for a jurisdictional determination and confirmation of delineated wetland boundaries. This request for jurisdictional determination and boundary concurrence is one of a series of actions that are a part of the baseline environmental studies and surveys necessary to complete permitting for the proposed project. In addition to the wetland study presented here, a number of previous wetland reconnaissance studies have been conducted on the property, beginning in 1991.

The property is slated to be developed by PIT into a marine cargo shipping facility known as the Gateway Pacific Terminal (GPT). The design is being finalized but will include a marine wharf, an access trestle connecting the wharf to the shore, upland cargo storage buildings, rail loop track, internal facility roads, parking area for employees, equipment storage, and administrative areas.

At this time we are submitting this report of wetland conditions explicitly for a jurisdictional determination and boundary confirmation from the USACE and will coordinate with the other agencies at an appropriate time in the future.

We look forward to scheduling a time at your convenience when we may discuss this and other information together in detail.

Sincerely,

Kristie Dunkin, Ph.D., PMP
Senior Scientists
AMEC Earth & Environmental, Inc.

Attachments

cc: Skip Sahlin, Pacific International Terminals

AMEC Earth & Environmental, Inc.
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034
(425) 820-4669 Phone
(425) 821-3914 Facsimile
www.amec.com

February 20, 2008

Regulatory Branch
Seattle District Corps of Engineers
P.O. Box 3755
Seattle, Washington 98124-3755

Attention: Mr. Randel Perry, Project Manager

Subject: Request for Jurisdictional Determination, Agent Authorization

Dear Mr. Perry:

This letter authorizes Kristie Duncan, AMEC Earth and Environmental, to act on the behalf of Pacific International Terminals (PIT) to modify and negotiate, in consultation with PIT, with the Department of the Army on a jurisdictional determination and boundary confirmation of potential wetland areas located on the Gateway Pacific Terminal Property, Whatcom County, Washington.

Sincerely,

Skip Sahlin

Pacific International Terminals

cc: Kristie Duncan

AMEC Earth & Environmental, Inc.
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034
(425) 820-4669 Phone
(425) 821-3914 Facsimile
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WETLAND DETERMINATION AND DELINEATION
GATEWAY PACIFIC TERMINAL PROPERTY
WHATCOM COUNTY, WASHINGTON

Submitted to:

Pacific International Terminals
1131 SW Klickitat Way
Seattle, Washington 98134

Submitted by:

AMEC Earth & Environmental, Inc.
11335 N.E. 122nd Way, Suite 100
Kirkland, Washington 98034

February 18, 2008

AMEC Project No. 5-91M-15338-0

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Appendix E Wetland Rating Forms

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LIST OF ACRONYMS

AMEC	AMEC Earth & Environmental, Inc.
County	Whatcom County
Ecology	Washington Department of Ecology
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
GPT	Gateway Pacific Terminal
HCA	Habitat Conservation Area
HGM	Hydrogeomorphic Classification
I-5	Interstate 5
OBL	Obligate
OHW	Ordinary High Water
PIT	Pacific International Terminal
NRCS	Natural Resource Conservation Service
UGA	Urban Growth Area
UPL	Upland
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WDFW	Washington State Department of Fish and Wildlife

1. INTRODUCTION

1.1 Purpose of this Report

AMEC Earth & Environmental, Inc. (AMEC) has conducted a wetland determination and delineation at the request of Pacific International Terminals, Inc. (PIT) on 1,092 acres of heavy-impact industrial zoned land in the vicinity of Cherry Point in Whatcom County, Washington. This comprehensive evaluation of wetland vegetation, hydrologic conditions, and soils was conducted over two 3-week periods of intensive field effort and several additional visits to the area. This report summarizes the findings of the field effort; provides field data to support the delineated wetland boundaries; characterizes wetland areas and waters of the U.S.; and assesses the value and functions of the delineated wetlands. A 22 by 34 inch map of the study area showing wetland boundaries and other study area details is included as Appendix A. The information in this report is provided to support jurisdictional determination under the Clean Water Act and boundary concurrence from the U.S. Army Corps of Engineers (USACE).

Pacific International Terminals is proposing to develop a deep-sea cargo shipping facility on a portion of the study area. The project is known as Gateway Pacific Terminal (GPT or Project). Gateway Pacific Terminal would service transoceanic ships entering the Strait of Georgia through the Strait of Juan de Fuca. Of the 1,092-acre study area evaluated in this effort, approximately 120 acres would be used for terminal storage facilities and 120 acres would be used for a railroad track to accommodate trains transporting commodities. The Project site has been identified by Whatcom County and the State of Washington for this purpose because of its proximity to the shipping lanes, the depth of the water near to the shore, close proximity to an existing railway, and nearness of Interstate 5 (I-5) for terrestrial shipment of cargo and the heavy impact industrial zoning.

1.2 Project History

In 1997, PIT received a Shoreline Substantial Development Permit from Whatcom County, Washington, to construct the GPT. A consortium including Washington State Department of Ecology (Ecology), Washington Department of Fish and Wildlife (WDFW), and a coalition of five environmental groups appealed the permit to the State Shoreline Hearings Board on the basis that potential environmental impacts from the project were not satisfactorily addressed or mitigated. The appeal led to a Settlement Agreement (SA) among all the parties in the consortium executed in 1999 (Shoreline Substantial Development Permit SHS 92-0020 and SHB Appeals 97-22 and 97-23).

Subsequently, PIT commenced implementation of the SA conditions. These actions included baseline environmental studies and surveys; conceptual and order-of-magnitude designs; financial studies; and contractual arrangements. Also taken were actions to acquire the additional permits required for the project.

Prior to the wetland determination and delineation reported here, wetlands and other aquatic habitats onsite and in the vicinity were previously evaluated. In summary, between the period of 1991 and 2001, the following studies were conducted:

- *Cherry Point Wetland Analysis* conducted by Parametrix, Inc., 1991, prepared for Environmental and Energy Services Company;
- *Jurisdictional Wetland Determination for Cherry Point Project* conducted by Shapiro and Associates, 1992, prepared for Pacific International Terminals;
- *Wetland Report of Gateway Pacific Terminal,* conducted by Aqua-Terr Systems, Inc., 1995, prepared for Gateway Pacific Terminal; and
- Miscellaneous site reconnaissance visits from 1999 through 2001 conducted by Mr. Jim Wiggins.

The early reconnaissance and delineation efforts identified substantial areas of wetland within the study area. A letter of concurrence was issued by the USACE in December 1992 for the wetland boundaries delineated earlier that year, which expired in 1995. Efforts conducted in 1995 and additional reconnaissance investigation conducted in 1999, 2001, and 2005 indicated that many wetland boundary locations and wetland conditions have changed from those reported in earlier studies.

1.3 Agency Coordination

PIT engaged the USACE soon after execution of the SA and permit applications were filed. PIT continued to work and cooperate with USACE regarding project permits. Specifically regarding the wetland component of the GPT project, PIT met with USACE on numerous occasions to discuss jurisdictional determination. PIT has remained in communication with USACE to clarify USACE position regarding their NEPA process, as well as the effect of the US Supreme Count's 2007 decision and the subsequence USACE/EPA Rapanos Guidance Document. Additionally, Mr. Matt Bennett and Mr. Randal Perry of the Seattle District USACE met with AMEC biologists on site to review portions of the study area. A field, that was plowed and seeded in April 2006, was examined for wetland conditions during that site review.

PIT also worked with USACE on other aspects of project. Those issues included agency coordination, project schedule, wetland jurisdictional determinations, and cultural and geotechnical issues.

1.4 Wetland Regulatory Environment

The USEPA and the USACE regulate wetlands and other water of the U.S., including wetlands, under the Clean Water Act. The 2006 Rapanos Supreme Court decision held that EPA and USACE maintain jurisdiction over traditional navigable waters (TNW), wetlands adjacent to or abutting TNW, non-navigable tributaries of TNW that are relatively permanent (RPW), and wetlands that abut such tributaries. For those wetlands associated with non-navigable tributaries that are not relatively permanent, the agencies will assert jurisdiction where they are found to have a significant nexus to a TNW.

The Washington State Department of Ecology provides regulation of wetlands under Section 401 of the Clean Water Act and under the State's Growth Management Act. Wetlands are regulated by Whatcom County under the County's Critical Areas Ordinance.

Wetlands are defined by the County and state and federal agencies as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions" (Federal Register 1982, Federal Register 1985, the State Shoreline Management Act [RCW 90.58], and the State Growth Management Act [RCW 36.70A]). Under normal circumstances, wetlands support this type of vegetation.

1.5 Study Area Description

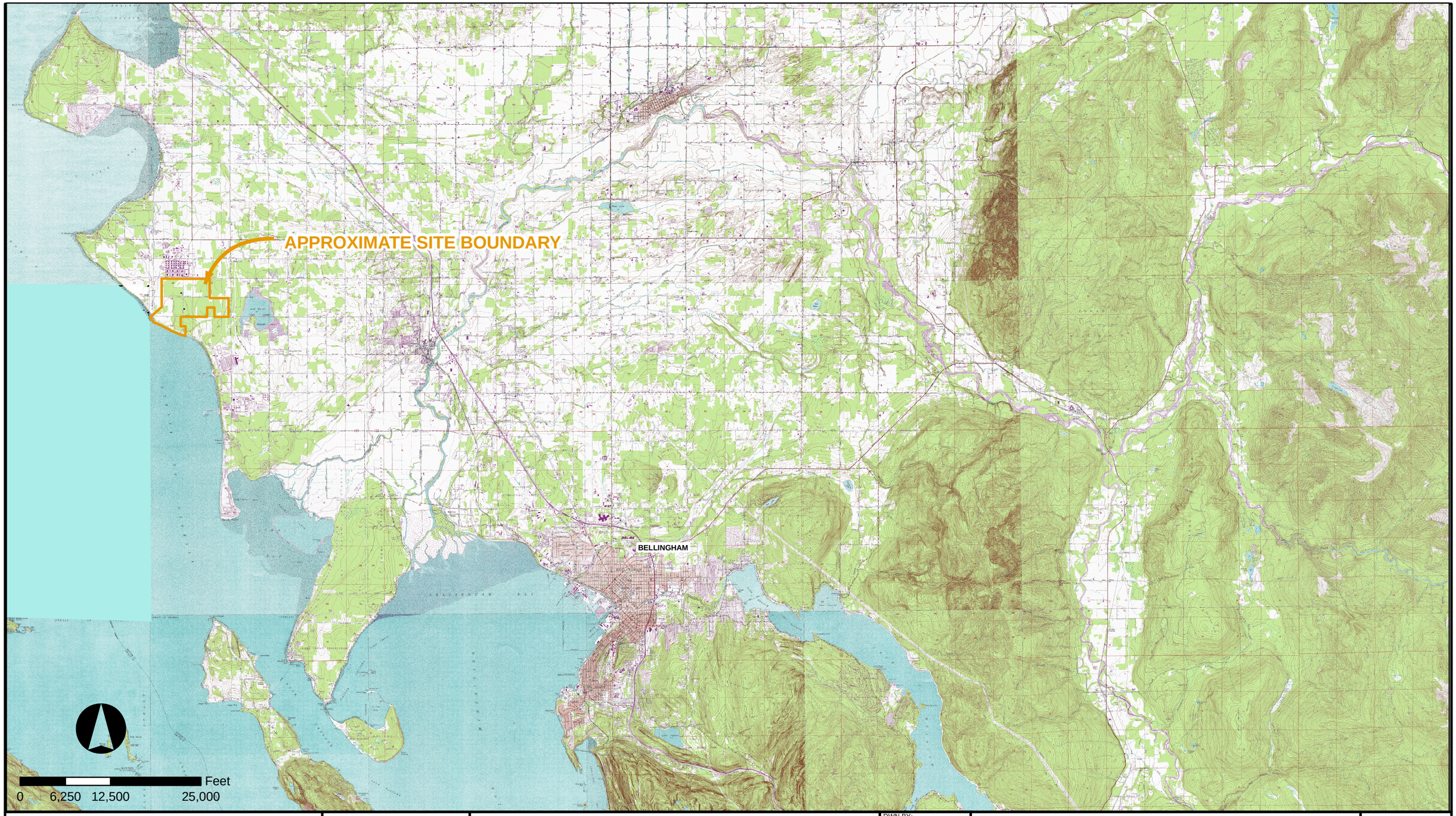
The study area is located 18 miles northwest of Bellingham and 10 miles west of Ferndale (Figure 1). The study area is considerably larger than the proposed GPT development area and includes all the lands owned by PIT in the vicinity.

The study area covers portions of Sections 17, 18, and 19 of Township 39 North, Range 1 East, all in unincorporated Whatcom County. The study area is accessible from I-5 via Highway 548 (Grandview Road) west, and left on Kickerville Road.

Roughly rectangular in shape, the study area is bounded by roads and industrial operations to the north, east, and south, and by the Strait of Georgia to the southwest:

- BP's Cherry Point refinery property is adjacent to the north and west;
- 70 acres owned by BP lie to the northwest;
- Kickerville Road, populated by private residences on approximately 5 acre plats, lies to the east;
- pastures and a small industrial area lie to the south; and
- DNR lands lie to the southeast and northeast (Figure 2).

Cherry Point, a small promontory of land south of Point Whitehorn, forms the southwest corner of the study area. Roads, pipelines, power line corridors, railroads, and other heavy industrial utilities further define the study area. Gulf Road (formerly Powder Plant Road) and a BNSF railway line run north-south in the eastern portion of the site, and Lonseth Road bisects the study area east-west. A BPA transmission-line corridor runs north-south through the eastern study area. An area measuring approximately 28 acres between Henry Road and Lonseth Road, west of the BNSF railway line is under separate ownership and was excluded from the study area (called the "exclusion area" for this report).



CLIENT: GATEWAY PACIFIC TERMINALS

AMEC Earth & Environmental
7376 SW Durham Road
Portland, OR, U.S.A. 97224

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CHK'D BY: MG
DATUM: NAD83
PROJECTION: WA SP North, Ft.
SCALE: 1 inch equals 12,500 fee

PROJECT: WETLAND DELINEATION

TITLE: VICINITY MAP

DATE: FEBRUARY 2008
PROJECT NO.: 5-91M-15338-0
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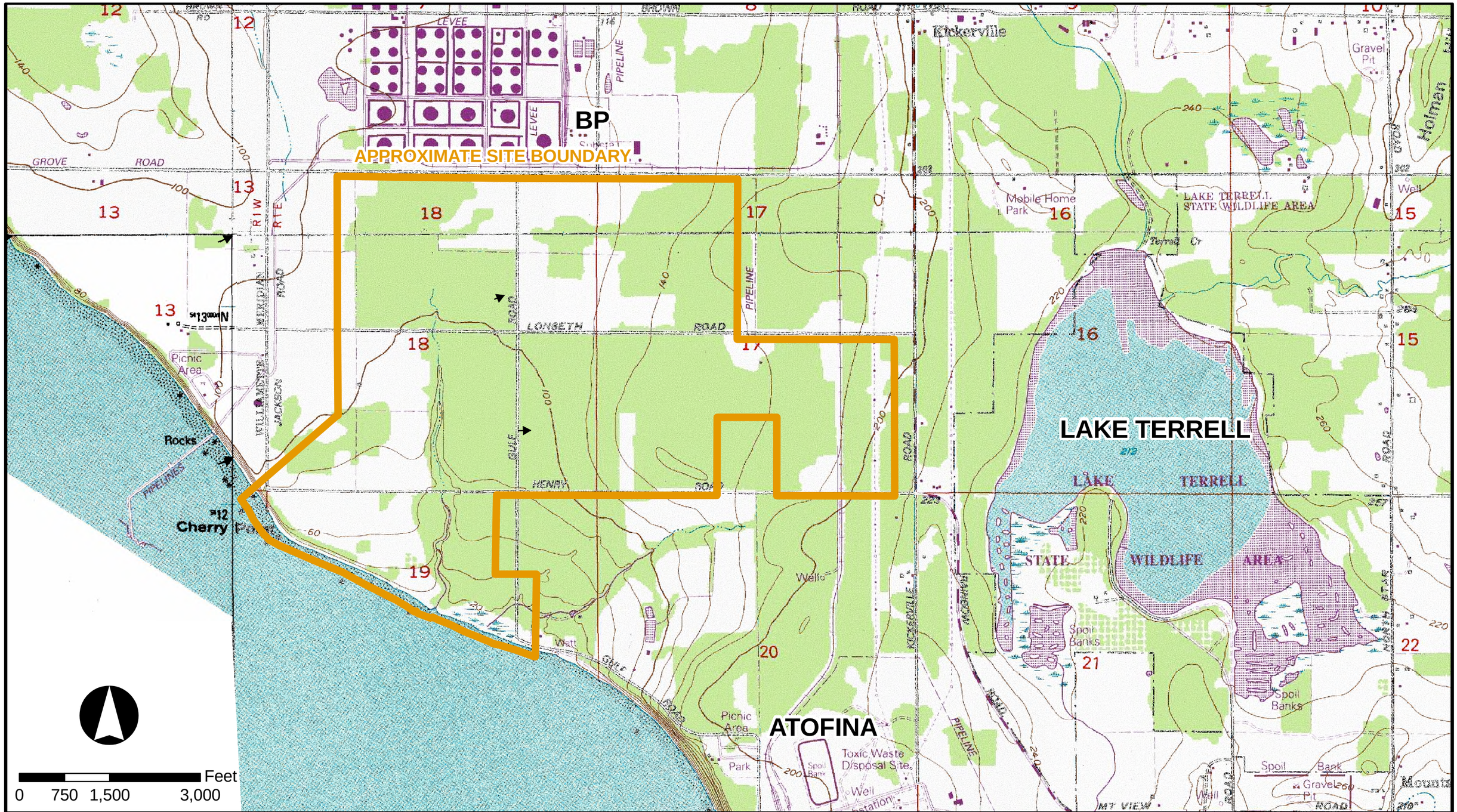

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			DATUM: NAD83	TITLE: MAP SHOWING LOCATION OF STUDY AREA	REV. NO.: 1	
		AMEC Earth & Environmental 7376 SW Durham Road Portland, OR, U.S.A. 97224	PROJECTION: WA SP North, Ft.		FIGURE NO.: FIGURE 2	
			SCALE: 1 inch equals 1,500 feet			

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The study area is situated within the Urban Growth Area (UGA) of unincorporated Whatcom County (UGA-9), and is zoned for heavy industrial/port growth (Whatcom County, 2006).

2. METHODS

The following section provides information on the methods used during field surveys, data collection, and analysis regarding vegetation, soils, hydrology, and precipitation patterns, and methods used to classify and rate wetlands and other waters of the U.S.

2.1 Site Investigation

Comprehensive site investigations were used to identify and delineate the wetlands reported herein. The results of previous field investigations conducted from 1991 to 2005 were used as reference to expedite the present effort. The field effort occurred in two, three-week field surveys: May 30 through June 16, 2006 and from January 22 through February 7, 2007. Several follow-up visits were made throughout 2007 and early 2008.

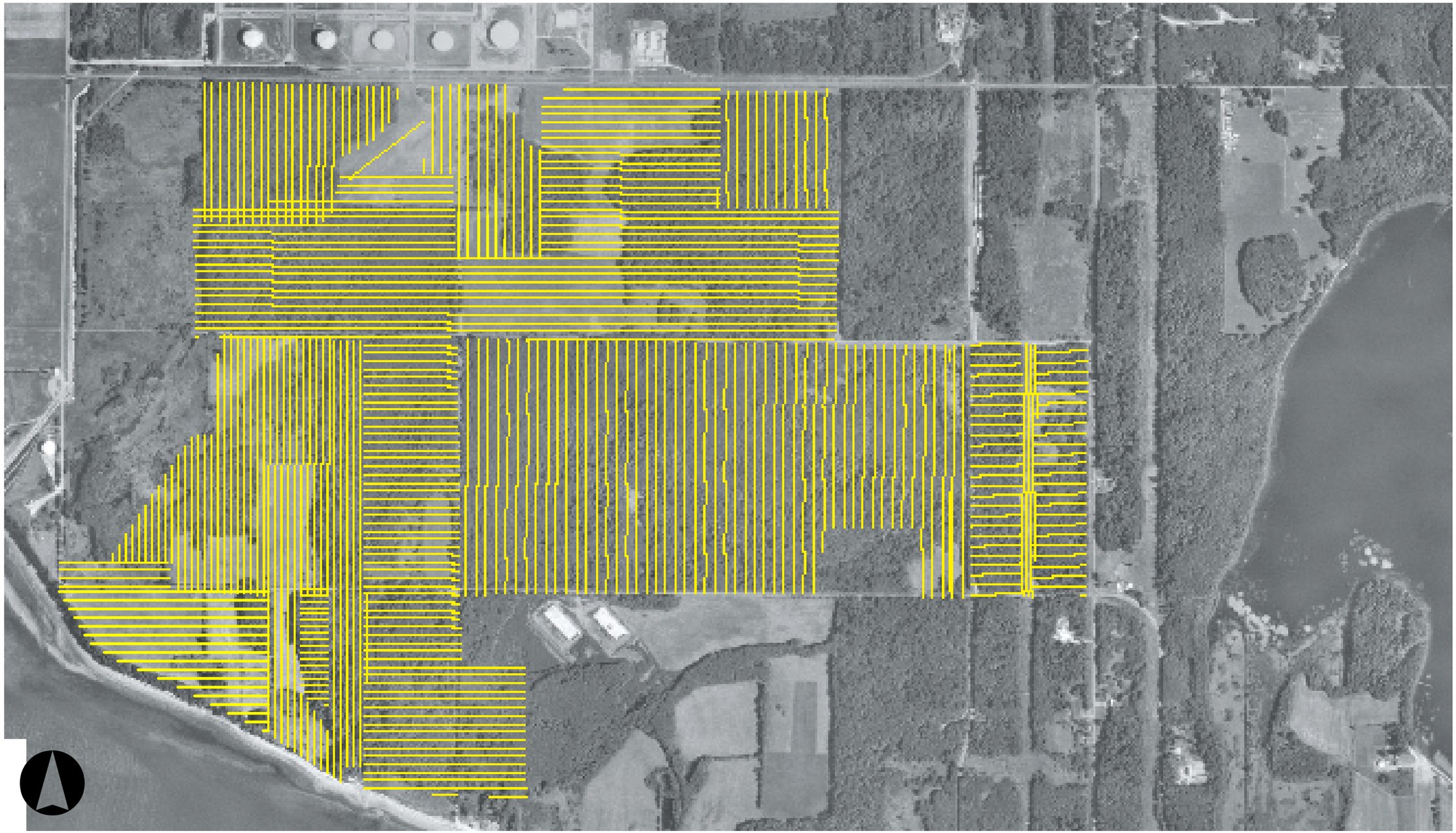
To verify that the study area was thoroughly investigated, roughly parallel transects approximately 25-feet apart and perpendicular to a pre-established baseline were established. Transects were walked to examine vegetation, soil, and hydrologic conditions. During the June 2006 field investigation, transect locations were documented by descriptions in field notebooks. During the January-February 2007 field investigation, transect locations were again documented in field notebooks and the starting and ending points marked on roadside vegetation with flagging to be surveyed. Unfortunately, before the transect flags could be surveyed, they were mowed by Whatcom County brush-control maintenance crews. Figure 3 shows the approximate location of transects based on field notes.

2.1.1 Wetland Determination and Delineation

Potential wetland areas were evaluated in the field using the methods outlined in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997). According to these manuals, hydrophytic (wetland) vegetation, hydric (wetland) soils, and wetland hydrology must be present for a significant duration during the growing season for an area to be considered a wetland.

Data used to evaluate these parameters were collected from plots representative of typical conditions in each wetland. Additional data collected in areas adjacent to wetlands documented upland conditions. Appendix B provides plant species information including scientific names. Wetland data sheets documenting field conditions are included as Appendix C.

Wetland and upland data plots were coded to include the field team's designation (e.g. A, B, or Z), the nearest wetland boundary name (L##), and a sequential number in upland and wetland areas with U## for upland data plots and W## for wetlands data plots. Sample plot locations were those areas most representative of the plant community and having a hydrologic regime typical of the area.



CLIENT:
GATEWAY PACIFIC TERMINALS

AMEC Earth & Environmental
7376 SW Durham Road
Portland, OR, U.S.A. 97224

DWN BY: PM
CHK'D BY: MG
DATUM: -
PROJECTION: -
SCALE: -

PROJECT:
WETLAND DELINEATION

TITLE:
APPROXIMATE TRANSECT LOCATION

DATE: FEBRUARY 2008
PROJECT NO.: 5-91M-15338-0
REV. NO.: -
FIGURE NO.: FIGURE 3

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Once an area was determined to meet the definition of a wetland, the boundary of the area was delineated. Wetland boundaries were marked with consecutively numbered survey flagging. Wetlands names were assigned by consecutively numbering wetland assessment units.

Boundaries and data plot locations were professionally surveyed using conventional survey and high-resolution GPS methods during the period from September 2006 through early June 2007.

2.1.2 Vegetation

Wetlands are defined by having a hydrophytic plant community (wetland vegetation). The probability of a plant species occurring in a wetland within a geographic area has been estimated, and an indicator status had been assigned based on that probability. Accordingly, plants are identified as having one of the following wetland indicator status: obligate (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), or upland (UPL; Table 1). Plant species with an indicator status of OBL, FACW, or FAC are considered adapted for life in saturated or anaerobic soil conditions (Reed, Jr. 1988; Reed, Jr., et al. 1993). By definition, if greater than 50 percent of the dominant plant species in a community have wetland indictor status of OBL, FACW, or FAC (but not FAC-), then the plant community is hydrophytic.

Table 1. Definitions of Indicator Status

Indicator Symbol	Definition
OBL	Obligate. Species that almost always occur in wetlands (estimated probability >99%) under natural conditions.
FACW	Facultative wetland. Species that usually occur in wetlands (estimated probability 67% to 99%), but occasionally are found in uplands.
FAC	Facultative. Species that are equally likely to occur in wetlands or uplands (estimated probability 34 to 66%).
FACU	Facultative upland. Species that usually occur in uplands (estimated probability 67% to 99%), but occasionally are found in wetlands.
UPL	Upland. Species that almost always occur in uplands under normal conditions (estimated probability >99%).
NL	Not listed. Species was not included in evaluation and does not have an indicator status. More often occurs with plant species that would be categorized as UPL if they had been included in the evaluation.
NI	No indicator. Species for which insufficient information was available to determine an indicator status.

Sources: Reed, Jr. 1988; Reed, Jr., et al. 1993

Vegetation data at each sample plot, trees within a 20-foot radius, shrubs within a 15-foot radius, and non-woody herbaceous plants—including forbs, grasses, sedges and rushes within a 5-foot radius of plot center—were identified and recorded on wetland field data forms. The dominant plant species for each stratum were defined as those that provide 20 percent or more areal leaf cover.

Scientific nomenclature of plant species follows that of the PLANTS database (NRCS 2007b) and Hitchcock and Cronquist (1976). Common plant names are given in the following text. The scientific nomenclature for all plants recorded on the site is presented in Appendix B.

2.1.3 Hydric Soils Definition and Field Examination

Hydric soils are defined as soils formed under saturated, flooding, or ponding conditions for a duration during the growing season long enough to develop anaerobic conditions in the upper part of the soil (Environmental Laboratory 1987). Hydric soils exhibit certain characteristics that can be observed in the field such as high organic contents, accumulation of sulfidic material, greenish or bluish-gray color (gley formation), and development of redoximorphic (redox) features including redox accumulations, redox depletions, and a depleted soil matrix.

Soils were examined by digging a pit down to a depth of generally at least 18 inches. Soil samples were then examined for hydric indicators. Organic content was estimated visually and texturally. Sulfidic material was determined by the presence of sulfide gases (rotten-egg odor), and soil colors were evaluated against a Munsell® soil color chart (GretagMacbeth LLC 2004).

2.1.4 Wetland Hydrology Definition and Examination

Wetland hydrology is described in areas inundated and/or saturated to the surface for a consecutive number of days for more than 12.5 percent of the growing season, provided the soil and vegetation parameters are met. Areas inundated or saturated to the surface for less than 5 percent of the growing season are non-wetlands.

The presence of wetland hydrologic indicators was determined for each wetland and documented on data sheets. Primary indicators of wetland hydrology include soil saturation, inundation, and evidence of previous water inundation or saturation. (i.e., watermarks drift lines, sediment deposits, and wetland drainage patterns). Secondary indicators include oxidized root channels and water-stained leaves.

During the 3-week field effort in June 2006, primary indicators of wetland hydrology were present for most wetland areas over the first two weeks. However, due to lack of precipitation, primary indicators were mainly absent by the third week. During the field effort in January and February 2007, identified wetlands had primary indicators of wetland hydrology. Also during the 2007 effort, some areas determined to be uplands due to a lack of hydric soils and/or hydrophytic vegetation, displayed primary indicators of wetland hydrology because of heavy recent precipitation and surface water accumulation.

2.2 Evaluation of the Growing Season

The growing season is defined as “the portion of the year when soil temperatures at 19.7 inches below the soil surface are higher than biological zero (41 °F)” (Ecology 1997). The growing season can be approximated as the number of frost-free days from the last date in spring when air temperature drops to 28°F, to the first date in fall when it drops to 28°F. The beginning and

ending dates for growing season in the study area were estimated based on the median dates (50 percent probability) for the first and last 28°F days, based on long-term temperature data (NRCS 2006d).

The start and end dates for the growing season in the study area are March 24 to November 5, in any year, for a total of 227 days. Thus by definition, areas with wetland hydrologic conditions present for 28 consecutive days during the growing season are considered wetlands, and areas with 11 consecutive days of wetland hydrologic conditions might be defined as wetlands, depending on soil and plant community conditions. While the duration of wetlands hydrologic conditions was not measured in the field, the range of duration was noted and visually applied in field efforts.

2.3 Evaluation of Precipitation Patterns

Precipitation is generally considered normal when it falls between the 30th and 70th percentiles of the 50-year average monthly precipitation totals (Sprecher and Warne 2000). Precipitation patterns at the weather station in Blaine, Washington (2 miles north of the study area, 50 feet above sea level) were evaluated by comparing monthly precipitation data for the 2005–2006 water year and the early portion of the 2006–2007 water year to the monthly precipitation average from 1948 through 2006.

The vegetation and hydrologic condition observed in June 2006 was shaped primarily by the 2005–2006 water year, while the vegetation and hydrologic condition recorded in January/February 2007 was shaped by the 2006–2007 water year. An evaluation of normal conditions, in terms of monthly precipitation, was evaluated from October 2005 through March 2007.

To more accurately describe precipitation trends, the USACE developed a method to evaluate normal conditions by using a 30-day rolling total (Sprecher and Warne 2000). By analyzing daily precipitation values, the data are not “reset” on a monthly basis. Rather, the 30-day rolling total is generated by summing the rainfall daily over the past 30 days. By overlaying a plot of daily precipitation for the rain year in question with the rolling total for the 30-year average precipitation, it is possible to conduct a more thorough analysis of precipitation data. This method is especially useful when precipitation is not within the range of normal for a given month or year. Rolling totals were evaluated from January 2006 through January 1, 2007.

2.4 Wetland Classifications

2.4.1 Cowardin Classification

The Cowardin system was designed to apply a hierarchical classification system to wetlands with respect to their position in the landscape, habitat/vegetative form, hydrologic modifier and water quality modifiers (Cowardin et al. 1979). Five systems are defined as the highest level of the classification hierarchy—Marine, Estuarine, Riverine, Lacustrine, and Palustrine.

Wetlands in the study area are typically included in the Palustrine system, with three vegetative forms; Palustrine Emergent (PEM), dominated by emergent herbaceous angiosperms; Palustrine Scrub-Shrub (PSS), dominated by shrubs or small trees; and Forested (PFO), dominated by large trees.

2.4.2 Hydrogeomorphic Classification

Hydrogeomorphic (HGM) classification for wetlands clarifies the relationship between hydrology and geomorphology for a wetland system. The classification system is based on the wetlands' geomorphic setting, water source, and hydrodynamic patterns. These three aspects are responsible for maintaining many of the functional aspects of wetland ecosystems (Brinson 1993). Overall, six HGM classes are recognized: Depressional, Riverine, Lake-fringe, Slope, Flats, and Freshwater Tidal.

2.5 Wetland Ratings

Wetlands were rated using *The Washington State Wetlands Rating System for Western Washington* (Hruby 2004, revised), which evaluates wetlands based on rarity, sensitivity, and wetland function. The method uses the wetland's HGM classification to guide the evaluation. Wetlands are categorized as Category I, II, III, or IV, based on the results of the evaluation. Category I wetlands are characterized as highly functional, sensitive and rare, while Category IV wetlands are low functioning, disturbed, and relatively common in some settings.

Wetlands were rated to develop and apply standards for protecting and managing wetlands. Wetland rating will be used to assign wetland buffers and may be used to determine compensation ratios if wetlands are disturbed during the proposed development. Wetland Assessment Units used for Wetland Ratings were determined as directed in the *Washington State Wetland Rating System for Western Washington* (Hruby, revised 2004). Wetland Assessment Areas used in determining the ratings were mapped as shown in Appendix D and completed wetland rating forms are included as Appendix E.

2.6 Other Waters of the U.S.

2.6.1 Streams

Streams are defined as flowing, permanent, or intermittent aquatic systems having a bed and bank. The location of the ordinary high water on stream systems was determined in the field, marked with flagging, and professionally surveyed.

Stream classification follows the guidance of WAC 222-16-030, under the cooperation of WDFW, Ecology, and in consultation with tribal nations. Additionally, Whatcom County regulates streams as Habitat Conservation Areas (HCAs). The County provides guidance in classifying streams in the form of GIS maps. These maps were evaluated to assess classification of streams in the study area. Streams were classified according to the criteria briefly outlined in Tables 2 and 3.

Table 2. State of Washington Steam Types and Descriptions

Type	Description
Type I	All water areas of the state including reservoirs and associated shorelands and lands underlying them, waters designated Shorelines of the State specified as shorelines of statewide significance (90.58.030), shorelines of streams where the mean annual slow is 20 cfs or less, and shorelines on lakes less than 20 acres.
Type II	Streams with a defined channel 20 feet or greater in width between ordinary high water marks, and a gradient less than 4 percent, used by substantial numbers of anadromous or resident game fish for spawning, migration or rearing or; contain off channel habitat for salmonids or; connected to a stream bearing salmonids, and accessible during some period of the year, and the off-channel water must be accessible to juvenile salmonids through a drainage with less than a 5% gradient.
Type III	Streams with a moderate to slight fish, wildlife, and human use. They are natural waters that are periodically inundated and provide significant numbers of anadromous or resident game fish with habitat for spawning, rearing, or migration. This includes a defined channel of 2 feet or greater in width between the ordinary high-water marks, and a gradient of 16 percent or less. These parameters do not apply if the waters have confirmed, long term, naturally occurring water quality parameters incapable of supporting anadromous or resident game fish.
Type IV	Perennial or intermittent natural waters that are less than 2 feet in width between ordinary high-water marks.
Type V	Streams with or without well-defined channels, areas of perennial or intermittent seepage, ponds, natural sinks, and drainageways having short periods of spring or storm runoff.

Source: WAC 222-16-030

Table 3. Whatcom County Stream Types and Descriptions

Type	Description
HCA 1a	Shorelines of the state as defined by WAC 173-18-310 and designated in the Whatcom County Shoreline Master Programs (WCC Title 23).
HCA 1b	Other fish bearing streams that do not meet the definition of shorelines of the state but have known or potential use by anadromous or resident fish species.
HCA 1c	Non-fish bearing streams are those streams that have no known or potential use by anadromous or resident fish.

3. RESULTS

3.1 History of the Study Area

Archaeological studies indicate that portions of the study area have been used by a group of Salish Indians, known by the post-reservation name of Lummi, for at least 3,000 years (Grabert 1982). The Salish Indians at Cherry Point were noted for reef-netting and other fishing practices. According to homestead records, the earliest account of Euroamerican occupation of Cherry Point was documented in the 1870s (Jeffcott 1949). Between 1902 and 1934, European settlers used a portion of the study area as a camp for fishermen tending off-shore fish traps (Markham 1993). Two sites with potential archaeological significance are within the study area.

Beginning in the late 1800s, the site was logged and homesteaded for farming by European settlers. Several abandoned orchards and farmsteads remain throughout the study area (Grabert 1988). Farming included crops such as rye, potatoes, hay, dairy and chicken farms, and scattered woodlots for firewood and logging. Farming activities continued through the mid-1940s, when large portions of land in the vicinity of the study area were acquired for industrial use. The present condition of the study area, with open fields and wooded areas, appears to have been stable for at least the last 50 years.

The recent land use of the study area has included pastures, hay farming, and wood production. In general, the study area is a mix of forest, pastures, hayfields, and abandoned fields. The forested areas of the study area were logged as recently as 1999 for pulp and firewood. The pastures and hayfields still in use are occasionally tilled and reseeded.

3.2 Topography and Geology

The terrain throughout the study area is characterized as generally flat to gently rolling slopes. Elevations range from sea level to 210 feet. The highest portion of the study area occurs nearest the eastern property boundary, with site elevation gradually decreasing to the west and to the south. Moderate slopes and steep bluffs border the westernmost stretch of shoreline. A steep ravine lies in the south central portion of the study area.

The retreat of the Vashon-Stade glacier approximately 13,000 y BP left the study area at least partially submerged below sea level. Over time, waves reworked and re-deposited the upper geologic layers. Eventually the land rebounded from glacial compaction, while sea level dropped. The ice deposited glacial debris, gravel, sand, and rock, forming depositional units up to several hundreds of feet thick.

3.3 Soil Characteristics

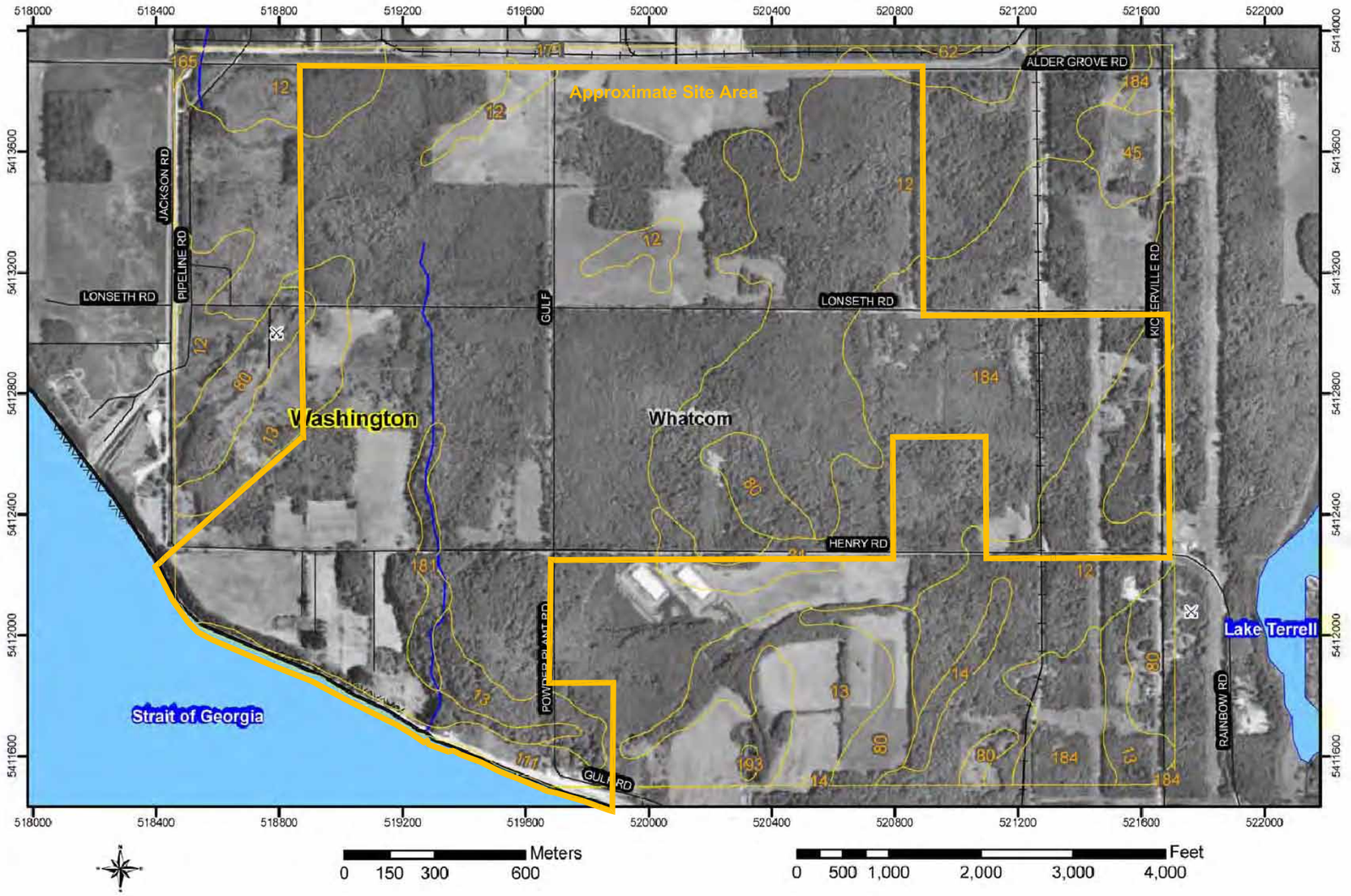
The NRCS mapped five unique soil series in the Study Area (Figures 4a and 4b), including Birchbay silt loam (0 to 3 percent slopes and 3 to 8 percent slopes), Clipper silt loam, Kickerville silt loam, Neptune very gravelly sandy loam, Whatcom silt loam, and Whitehorn silt loam (Table 4).

Table 4. Soils in the Study Area

Soil Series	Slope	Drainage Class	Parent Material	Landscape Position
Birchbay silt loam	0 to 3	Moderately well drained	Volcanic ash, loess, glaciofluvial deposits and glaciomarine drift	Glaciomarine drift plains
Birchbay silt loam	3 to 8	Moderately well drained	Volcanic ash, loess, glaciofluvial deposits and glaciomarine drift	Glaciomarine drift plains
Birchbay silt loam	8 to 15	Moderately well drained	Volcanic ash, loess, glaciofluvial deposits and glaciomarine drift	Terraces and plains
Edmonds-Woodlyn loam	0 to 2	Poorly drained	Volcanic ash, loess, and glacial outwash	Outwash terraces and outwash plains
Hale silt loam (hydric)	0 to 2	Poorly drained	Volcanic ash, loess, and glacial outwash	Outwash terraces
Kickerville silt loam	3 to 8	Well drained	Volcanic ash, loess, and glacial outwash	Outwash terraces
Neptune very gravelly sandy loam	0 to 3	Excessively drained	Coastal beach deposits	Marine ridges, spits, and terraces
Whatcom silt loam	30 to 60	Moderately well drained	Volcanic ash, loess, and glaciomarine drift	Glaciomarine drift plains
Whitehorn silt loam (hydric)	0 to 2	Poorly drained	Volcanic ash, loess, glaciofluvial deposits, and glaciomarine drift	Glaciomarine drift plains

SOIL SURVEY OF WHATCOM COUNTY AREA, WASHINGTON

GPT Soil Survey



USDA Natural Resources Conservation Service

Web Soil Survey 1.1
National Cooperative Soil Survey

2/28/2007
Page 1 of 3

MAP LEGEND

- Soil Map Units
- Cities
- Detailed Counties
- Detailed States
- Interstate Highways
- Roads
- Rails
- Water
- Hydrography
- Oceans
- Escarpment, bedrock
- Escarpment, non-bedrock
- Gulley
- Levee
- Slope
- **Approximate Site Area**
- Blowout
- Borrow Pit
- Clay Spot
- Depression, closed
- Eroded Spot
- Gravel Pit
- Gravelly Spot
- Gulley
- Lava Flow
- Landfill
- Marsh or Swamp
- Miscellaneous Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Slide or Slip
- Sinkhole
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Perennial Water
- Wet Spot

MAP INFORMATION

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov

Coordinate System: UTM Zone 10

Soil Survey Area: Whatcom County Area, Washington
Spatial Version of Data: 1

Map comprised of aerial images photographed on these dates:
7/21/1998

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

CLIENT: GATEWAY PACIFIC TERMINALS

AMEC Earth & Environmental
11335 NE 122ND WAY, SUITE 100
KIRKLAND, WA USA 98034-6918

DWN BY:	LM/PM
CHK'D BY:	MG
DATUM:	
PROJECTION:	
SCALE:	AS SHOWN

PROJECT: WETLAND DELINEATION

TITLE: SOIL SURVEY OF WHATCOM COUNTY, WA
SOIL MAP

DATE:	FEBRUARY 2008
PROJECT NO:	5-91M-15338-0
REV. NO.:	2
FIGURE No.	FIGURE 4a

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Map Unit Legend Summary

Whatcom County Area, Washington

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Birchbay silt loam, 0 to 3 percent slopes	463.5	23.2
13	Birchbay silt loam, 3 to 8 percent slopes	130.3	6.5
14	Birchbay silt loam, 8 to 15 percent slopes	12.7	0.6
31	Clipper silt loam, drained, 0 to 2 percent slopes	19.1	1.0
45	Edmonds-Woodlyn loams, 0 to 2 percent slopes	19.5	1.0
62	Hale silt loam, drained, 0 to 2 percent slopes	1.1	0.1
80	Kickerville silt loam, 3 to 8 percent slopes	89.4	4.5
111	Neptune very gravelly sandy loam, 0 to 3 percent slopes	19.4	1.0
165	Tromp loam, 0 to 2 percent slopes	1.6	0.1
171	Urban land	0.1	0.0
181	Whatcom silt loam, 30 to 60 percent slopes	15.0	0.7
184	Whitehorn silt loam, 0 to 2 percent slopes	1,140.2	57.0
193	Water	1.3	0.1

CLIENT: GATEWAY PACIFIC TERMINALS

DWN BY: LM/PM
CHK'D BY: MG
DATUM:
PROJECTION:
SCALE:

PROJECT: WETLAND DELINEATION

DATE: FEBRUARY 2008
PROJECT NO: 5-91M-15338-0
REV. NO.: 1
FIGURE No. FIGURE 4b

TITLE: SOIL SURVEY OF WHATCOM COUNTY, WA
SOIL MAP TABLE

AMEC Earth & Environmental
11335 NE 122ND WAY, SUITE 100
KIRKLAND, WA USA 98034-6918

K:\AMEC US OFFICES\KIRKLAND\15338-0\DWG\Figure_04_Soils.DWG – 4b table – Feb. 22, 2008 11:44am – patrick.mccarthy

2007). More than half of the study area is mapped as Whitehorn silt loam, and nearly one-third of the study area is mapped as a Birchbay silt loam (see Figure 4a and 4b).

Birchbay silt loam (0 to 3 percent slopes and 3 to 8 percent slopes) – This soil generally has moderate to very rapid permeability in the sandy surface layer, and slow in the loamy lower part. In general, the soil is moderately well drained. The native vegetation consists primarily of conifers and shrubs. The surface layers are dark brown silt loam to a depth of 12 inches, increasing in yellow and becoming more gravelly to 24 inches. Below 24 inches, soil is dark yellowish brown, and becomes increasingly rocky.

Kickerville silt loam (3 to 8 percent slopes) – This soil has formed along some of the shallow slopes, covering approximately 5 percent of the study area. The permeability of the soil is moderate in the upper part, while the substratum is well drained. In general, the available water-holding capacity is high, with little runoff and would be good at groundwater recharge. The native vegetation includes primarily conifers and shrubs. The soil profile includes a dark brown, silt loam surface layer to 9 inches deep. Below the surface layer, the soil is dark, yellowish brown, with a gravelly loam texture.

Neptune very gravelly sandy loam (0 to 3 percent slopes) – This soil type is found along the marine shoreline. The marine shoreline consists of approximately 1 percent of the study area, and is characterized by very deep, well-drained soil with coastal beach deposits and marine shell debris. The surface layer is black and very gravelly, the 17 inches below the surface layer a very dark brown color. Below 17 inches, soil is variegated and very gravelly, with some areas of cementing in the substratum.

Whatcom silt loam (30 to 60 percent slopes) – This moderately well-drained soil is found on steep slopes. Permeability is moderate in the upper part of the soil and slow in the lower part, with a relatively high available water capacity. The native vegetation may include conifers and shrubs. The surface layer is a dark brown silt loam to a depth of 5 inches. Below the surface, the soil is a yellowish-to-olive brown, mottled loam. This soil occurs predominantly along the cliffs adjacent to Stream 1.

Whitehorn silt loam (0 to 2 percent slopes) – Whitehorn silt loam is listed as hydric and is mapped over 60 percent of the study area. The permeability of the soil is low. Due to the high water table generally associated with the soil, rooting depth is limited. Native vegetation includes trees and shrubs, with red alder the dominant woodland species. The surface layer is typically very dark brown loam to a depth of 10 inches. Below 10 inches, the subsoil is generally a slightly lighter brown/grayish brown, mottled loam and very fine sandy loam.

3.4 Vegetation of the Study Area

The current wetland and upland plant communities in the study area are a result of historical land use, soil characteristics, and geomorphic and hydrologic conditions. Vegetation in pastures that are occasionally seeded and hayed annually consists of thick grasses including red fescue, bentgrass, sweet vernalgrass, velvetgrass, and plantain. In less extensively managed pastures,

dominant grass species include red fescue, foxtail, Canadian thistle, bentgrass, quackgrass, and orchardgrass1.

Vegetation in forested areas is predominantly red alder along with black cottonwood (deciduous forest) and with relatively small extents of western red cedar and Douglas-fir (coniferous forest). Understory species include vine maple, common snowberry, salmonberry, English holly, clustered rose, bracken fern, and red elderberry. Appendix B provides a summary of all plant species (common and scientific names) identified in the study area.

3.5 Hydrologic Conditions during the Field Efforts

As described previously, the field investigation was conducted during two concentrated field efforts: one in June 2006 and the second in January and February 2007. The hydrologic conditions are discussed in the following for each event.

3.5.1 2006 Field Investigation

Precipitation from the period of October 2005 through February 2007 fluctuated between times of relatively normal precipitation and deviations from normal (Figure 5). During the 2005–2006 water year (October through April), precipitation exceeded normal at the beginning of October 2005 through the middle of November, and at the end of January 2006 through the beginning of February 2006. Precipitation was slightly below normal in August 2005, at the end of September 2005, during the beginning of December 2005, the month of March 2006, and the end of May 2006.

The June 2006 field investigation followed a period of over 20 days of below-normal precipitation that presaged a below-normal rainfall for the upcoming summer months. During the investigation, primary indicators of wetland hydrologic conditions (inundation and saturation) were present in most areas, declining rapidly over the first two weeks and almost completely absent by the final week. Summer conditions, characterized by full plant leaf-out and absence of wetland hydrologic indicators, were present by the end of the 2006 field investigation.

3.5.2 2007 Field Investigation

The January 2007 field investigation effort followed the month of December where precipitation was at the low end of normal, and by the beginning of January, just above normal. Thirty-day average rolling totals show that precipitation on average was decreasing in frequency throughout the end of November and beginning of December (Figure 6). As the rain year continued, precipitation levels were average in February and substantially above average in March. The 2006–2007 rain year was also characterized by more snow than usual (data not shown).

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1 Scientific names are given in Appendix B

During the 2007 field effort, inundation around 3 to 6 inches was present across more than 50 percent of areas determined to be wetlands, with the depths up to 12 to 18 inches at the deepest locations. The remaining portions of the wetlands had soil saturated to the surface, or slight ponding.

Many upland areas also had saturated soils and areas of slight ponding subsequent to recent precipitation. These areas were distinguished from wetlands by an absence of hydric soil and wetland plants. Additional verifications of boundaries for some suspect areas were made during field visits in April and June 2006 when high water levels had receded.

Figure 5. Summary of Precipitation from October 2005 through December 2006

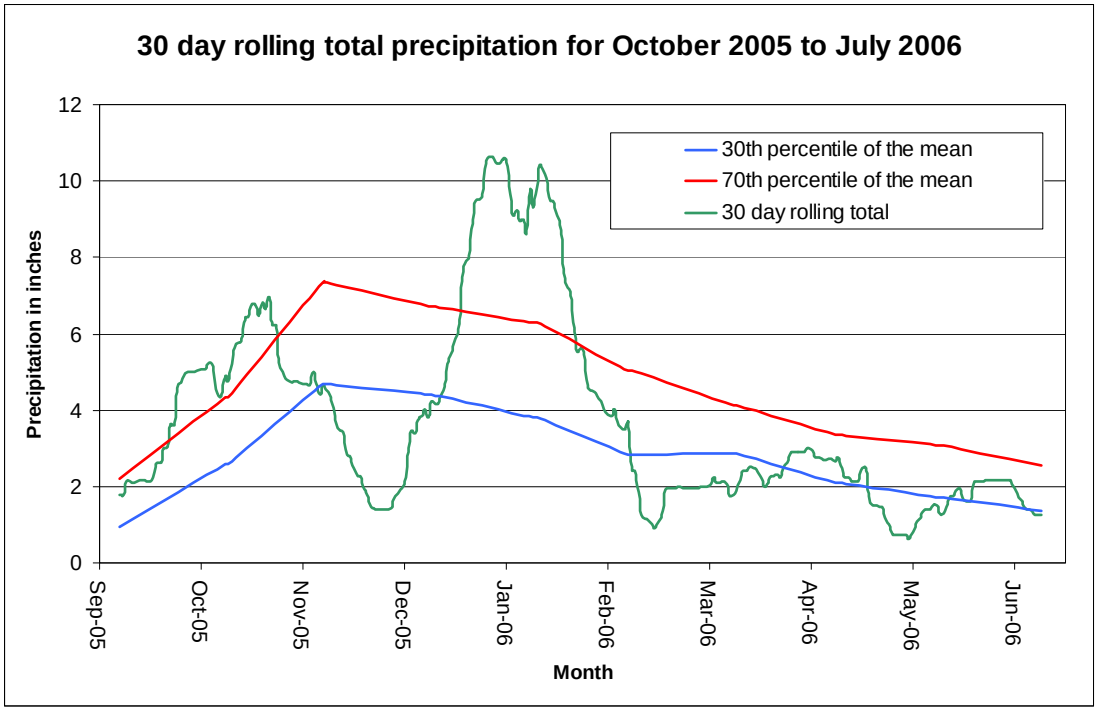
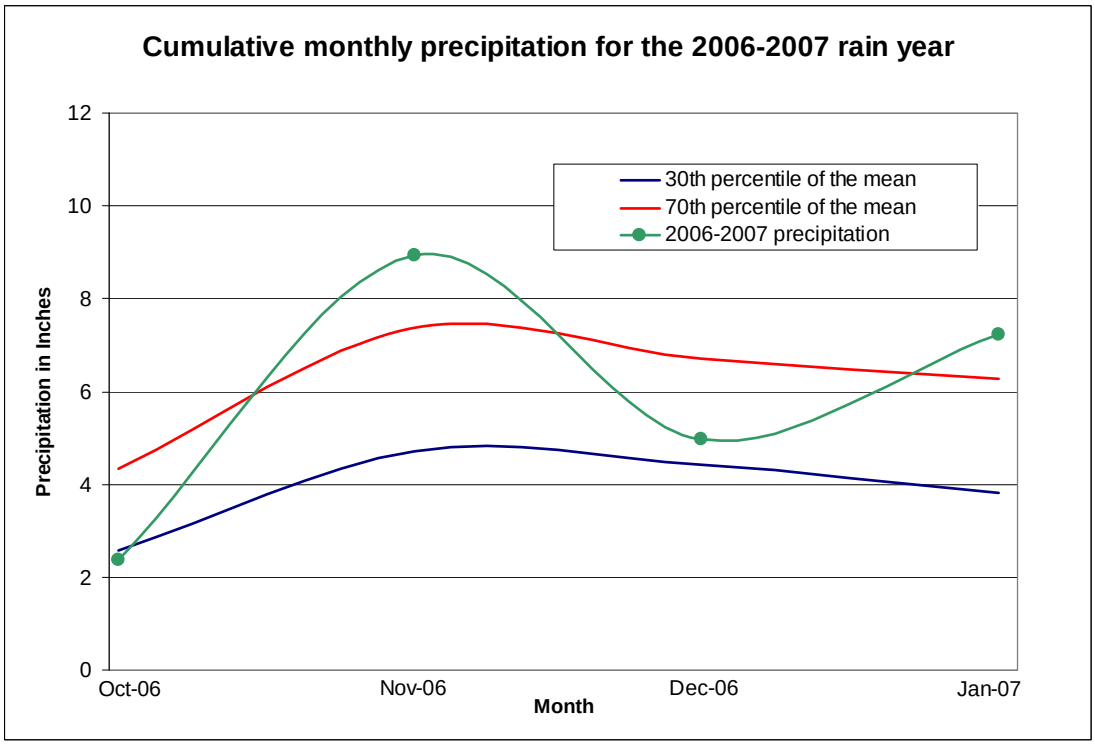


Figure 6. Summary of Precipitation from January 2006 through April 2007



3.6 Regional Hydrology

3.6.1 Watershed Characteristics

The greater part of the site is contained within a single sub-basin that drains to a first-order stream (Stream 1) located in the western portion of the site. Stream 1 drains approximately 800 acres, approximately 90 percent of which is contained within the study area. Two other sub-basins are present within the site, which drain water to the northwest and to the southwest to a second unnamed stream (Stream 2) that flows from the eastern portion of the site.

3.6.2 Strait of Georgia and the Marine Shoreline

The marine shoreline that abuts the study area at the Strait of Georgia has a wide cobble beach, with an Ordinary High Water (OHW) line characterized by driftwood, decomposing kelp masses, and eelgrass that have washed ashore.

At the shoreline and east of Stream 1 lies a tidally influenced coastal lagoon characterized by emergent and salt marsh vegetation. The lagoon appears to receive seasonal surface flow from the upward slopes and overflow from Stream 1 and Stream 2 during periods of heavy rainfall.

3.7 Streams and Drainages

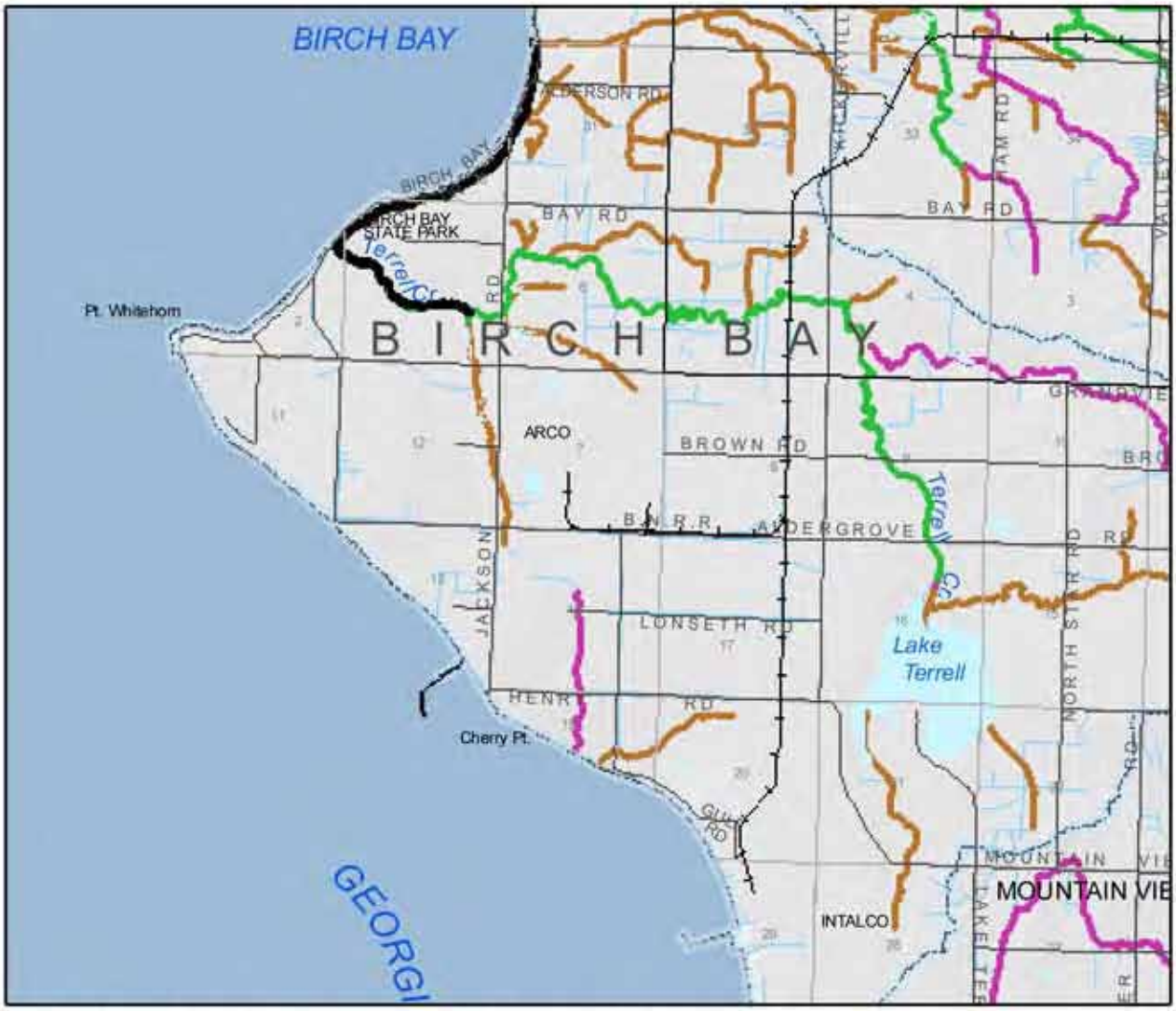
All drainages identified within the study site ultimately drain to the Strait of Georgia. Drainages include 2 unnamed streams (Stream 1 and 2), 5 roadside ditches identified as streams (Streams 3 through 7) by Whatcom County, and 6 roadside ditches that have not been identified as streams by Whatcom County (Table 5 and Figures 7 and 8).

Streams 1 through 7 ultimately drain to the Strait of Georgia, a traditional navigable water (TNW) of the U.S. Streams 1 through 7 have continuous flow for at least three months out of the year, and are therefore considered to be relatively permanent (RPW) tributaries to a TNW (see Figure 8 for locations). Other RPW tributaries on the site include roadside ditches adjacent to the south side of Lonseth Road, the south side of Henry road west of Gulf Road, and the west side of Gulf Road. All other drainages within the study area are considered to be non-RPW tributaries.

Characteristics of drainages including length, width, flow characteristics, and proximity to jurisdictional waters are presented in Appendix F.

Table 5. Summary of Streams Mapped in the Study Area

Stream ID	State of Washington Stream Type	Whatcom County Stream Type	Water Flow Characteristic	Location
Stream 1	3	HCA 1b	Relatively Permanent Water	Primary drainage that runs mainly south through the study area.
Stream 2	4	HCA 1b	Relatively Permanent Water	Natural drainage that runs southwest.
Stream 3	5	HCA 1c	Relatively Permanent Water	Drainage ditch on the south side of Aldergrove Road
Stream 4	5	HCA 1c	Relatively Permanent Water	Drainage ditch on the north side of Lonseth Road
Stream 5	5	HCA 1c	Relatively Permanent Water	Drainage ditch on the north side of Henry Road
Stream 6	5	HCA 1c	Relatively Permanent Water	Drainage ditch on the east side of Gulf Rd
Stream 7	5	HCA 1c	Relatively Permanent Water	Drainage ditch located between Henry Rd. and Lonseth Rd. along the west side of the BNSF railroad embankment.



Article VII - Fish Habitat Conservation Areas

SHORELINE MASTER PROGRAM STREAMS

HCA 1a - Streams - (150 ft Buffer Not Shown)

Streams (WADNR 2004)

HCA 1c - No Salmonid Fish Presence - (50 ft Buffer Not Shown)

Fish Distribution (WRIA 1 WMP 2004)

HCA 1b - Other fish bearing streams (100 ft Buffer Not Shown)

Current known distribution

Current presumed distribution

Presumed Potential/Historic distribution

Source: Whatcom County Critical Areas Ordinance, Article VII - Fish Habitat Conservation Areas

N

0 1 2 Miles

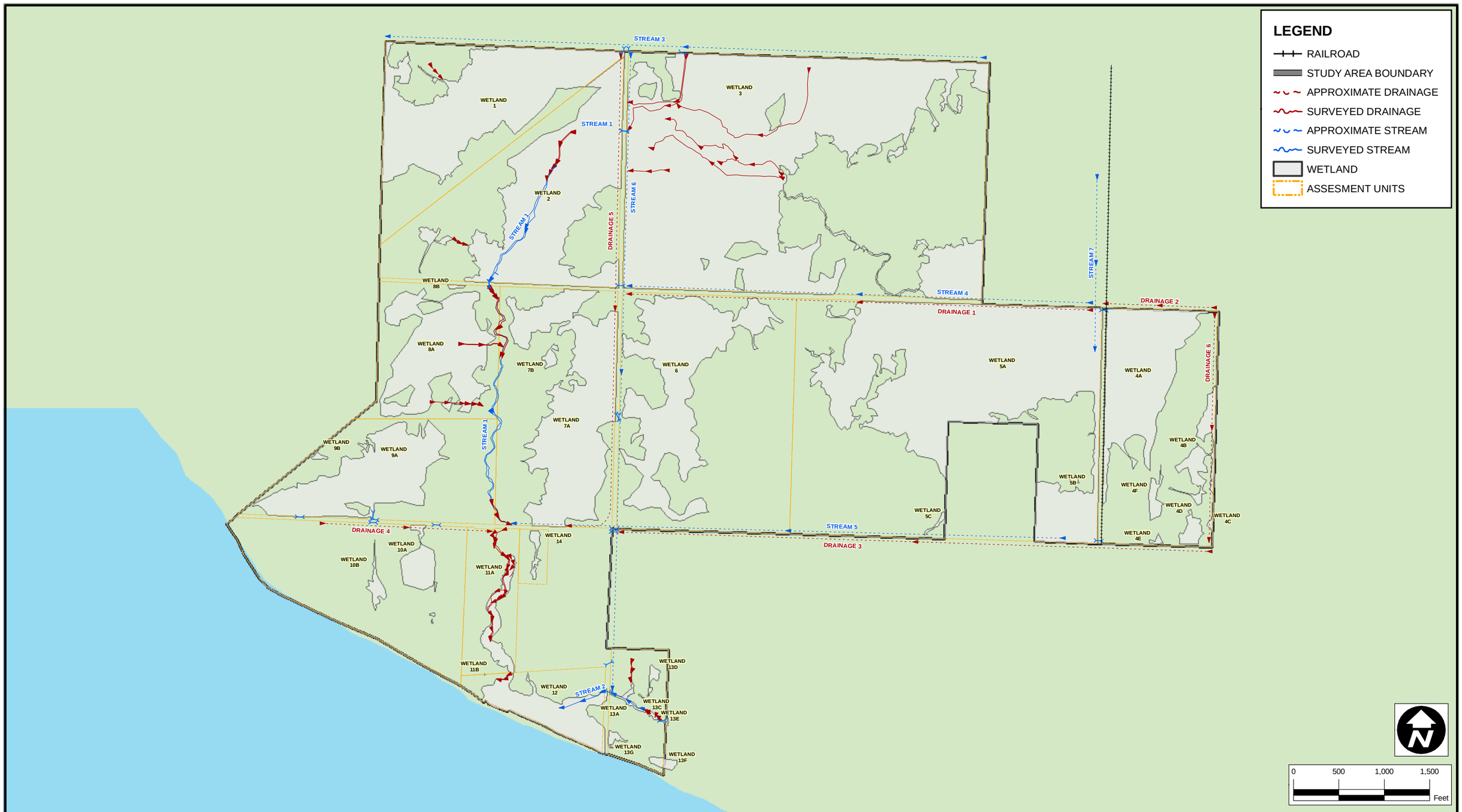
0 1.25 2.5 Kilometers

FIGURE 7

Water Courses classified as streams in the Study Area

591M15338

amec



	CLIENT LOGO	CLIENT: GATEWAY PACIFIC TERMINALS	DWN BY: PM	PROJECT: WETLAND DELINEATION	DATE: FEBRUARY 2008	
			CHK'D BY: MG		PROJECT NO.: 5-91M-15338-0	
			DATUM: NAD83	TITLE: STREAMS AND DRAINAGE	REV. NO.: X	
		AMEC Earth & Environmental 7376 SW Durham Road Portland, OR, U.S.A. 97224	PROJECTION: WA SP North, Ft.		FIGURE NO.: FIGURE 8	
			SCALE: 1 inch equals 1,000 feet			

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3.7.1 Stream 1

The primary drainage (WRIA number 01.0100), referred to as Stream 1, is fed by surface flow through excavated roadside ditches, isolated channels within wetlands, groundwater that seeps, and in some places, by surface sheet flow. Stream 1 is approximately 1.25-miles long (USGS NHD database), and drains a total of approximately 800 acres, approximately 90 percent of which is contained within the study area.

Stream 1 provides moderate habitat for terrestrial and aquatic species. The stream has its headwaters in the northeast portion of the study area, where flow is loosely channelized. The stream becomes more channelized as it approaches Gulf Road, then passes under Gulf Road through a culvert. The stream emerges from the culvert in the open field, where it continues south through surface flow, into a ravine lined by an alder forest. In this area, the stream is again culverted at Lonseth Road. This segment of the stream provides little habitat quality. The vegetation composition includes primarily alder, with little variation in the canopy. The channel is generally narrow with an unvegetated bed, and no wetlands are associated with it. It is separated from the lower reach of the stream by a third culvert at Henry Road.

The lower portion of the stream from Henry Road to the stream mouth has a canopy layer limited to alder forest, with areas characterized by an understory including willows and a lower shrub layer of twinberry. Portions of the stream contain wetlands banks, with obligate species of skunk cabbage and water parsley. Along with the vegetation, the lower section of the stream contains a large amount of trash and man-made debris dumped into it and surrounding ditches. The stream winds through the ravine and is braided in segments. The stream exits the forest canopy to the coastal lagoon through a thicket of Nootka rose. In the lagoon, the stream meanders to its outlet in the Strait of Georgia.

According to the WDFW classification system, Stream 1 would be likely classified as a Type III and/or IV stream, although no official stream rating exists. Whatcom County categorizes Stream 1 as a HCA-1b stream.

3.7.2 Stream 2

Stream 2 drains the eastern portion of the study area, and is approximately 1-mile long (USGS NHD database). At a location, approximately 400 feet east of Gulf Road, a tributary flowing from the north converges with the primary drainage. The two tributaries continue to flow west, through a culvert under Gulf Road, and leave the site through the eastern portion of the same coastal lagoon as Stream 1.

The habitat value of Stream 2 is relatively low. It is an intermittent stream, with an inconsistent and relatively sparse forest canopy of alder. The stream bank is lined with wetland areas including several obligate species. The band of wetland generally becomes larger and more consistent as the stream approaches Gulf Road.

No official rating of Stream 2 exists. However, based on the bank width and other criteria defined in Table 2, the stream would likely be classified as a Type IV stream.

According to the Whatcom County CAO (Whatcom County 2005), this stream is categorized as HCA-1b (see Table 3).

3.7.3 Stream 3 through 7

Whatcom County identifies five other streams on the site that function as tributaries to Stream 1 and/or Stream 2 (see Figure 8). Streams 3 through 6 flow in excavated and maintained roadside ditches that flow seasonally for at least three months yearly. Stream 3 is located on the south side of Aldergrove Rd; Stream 4 is located on the north side of Lonseth Road; Stream 5 is located on the north side of Henry Road, west of the BNSF railroad tracks; and Stream 6 is located on the east side of Gulf Road. Stream 7 is located between Henry Road and Lonseth Road, along the west side of the BNSF railroad berm.

Except for Stream 7, drainages are partially or wholly vegetated with primarily hydrophytic species including lady fern, common cattail, reed canarygrass, salmonberry, Cooley's hedge-nettle, field horsetail, birds-foot trefoil, and small-fruited bulrush.

Deposits of gravel and cobble are generally present, and substrate particle sizes increase as drainages approach Stream 1 on Lonseth and Henry roads. Ditches are mowed annually and excavated approximately once every three years, according to a utility worker maintaining the ditches during a follow-up field visit (pers. comm. July 16, 2007). Streams 3 through 7 provide little habitat for aquatic or terrestrial species. They have little to no overstory cover, are of relatively constant width (3 to 5 feet), and the stream bank is steep and compacted. Unidentified aquatic insects and tadpoles were observed during field visits.

Based on stream characteristics, Streams 3 through 7 would likely be classified by WDFW as Type V streams. Whatcom County categorizes Streams 3 through 7 as a HCA-1c stream, as there are no fish present and no suitable fish habitat.

3.7.4 Other Drainages

Six other drainages were identified within the study area. These drainages are excavated and maintained roadside ditches that function as tributaries to Streams 1 through 6. RPW tributaries include the roadside ditch along the south side of Lonseth Road, the roadside ditch on the south side of Henry Road, and the roadside ditch along the west side of Gulf Road Non-RPW tributaries include the roadside ditch on the north side of Henry Road east of the railroad tracks, the roadside ditch on the south side of Henry Road east of Gulf Road, and the roadside ditch on the west side of Kickerville Road.

3.8 Wetlands

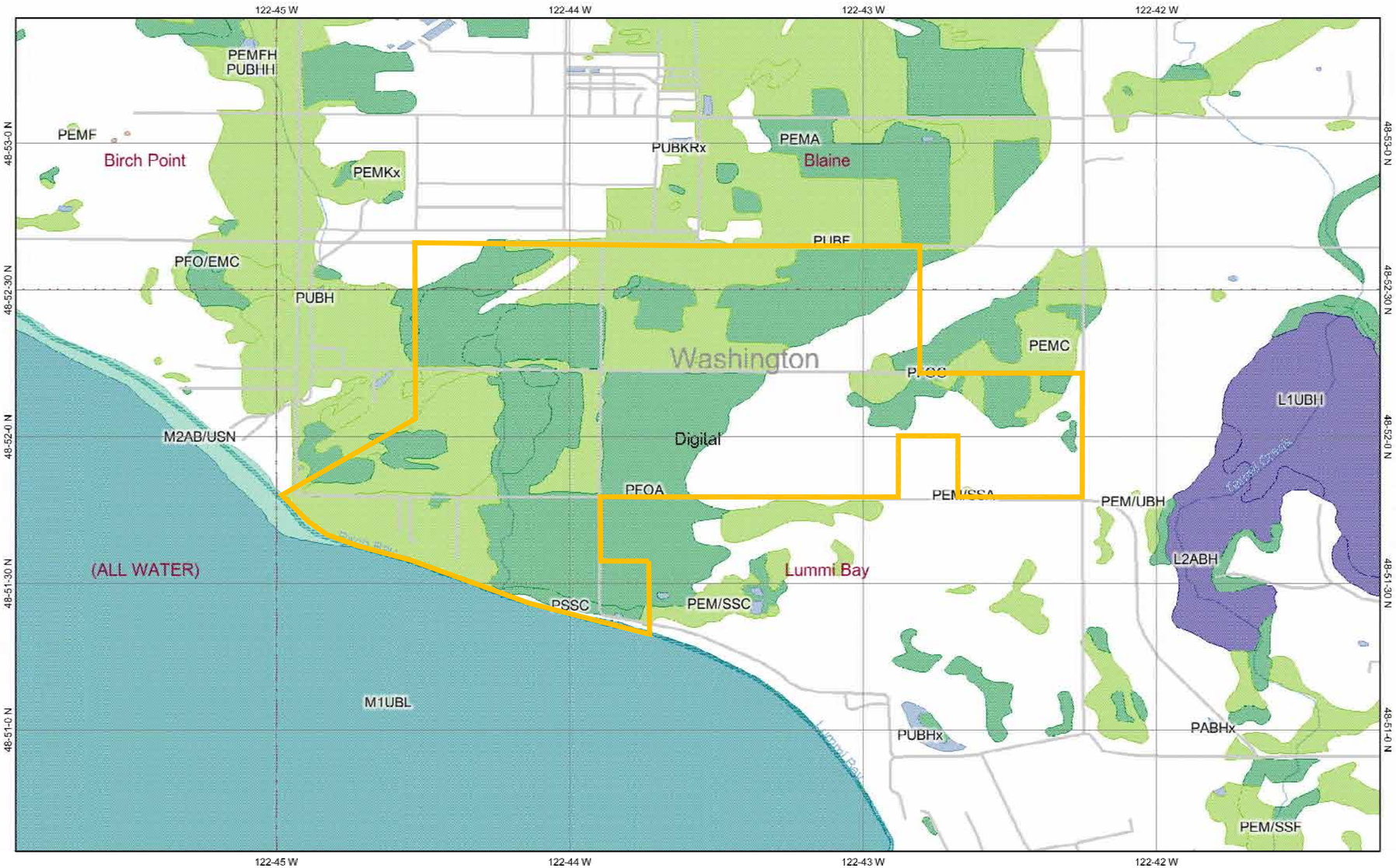
3.8.1 National Wetlands Inventory and Critical Areas Maps

The National Wetland Inventory (USFWS 2007, Figure 9) and the Whatcom County Critical Areas Maps (Whatcom County 2006) show that the study area supports a combination of palustrine forested and shrub wetlands.

Wetlands and other waters of the U.S. were identified in the study area. Wetlands comprised approximately 521 acres of the study area (Table 6 and see Appendices A through E for additional maps and details). Wetlands were classified as riverine, slope, and depressional HGM classes.

Palustrine forested (PFO) wetlands were most common, followed by wet pastures and hayfields (PEM), and a small amount of scrub-shrub wetlands (PSS). One wetland was identified as an estuarine emergent system (Wetland 12).

National Wetlands Inventory- GPT Project Site



Legend

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- 0
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Interstate
Major Roads
- Other Road
- Interstate
- State highway
- US highway

Roads
Cities
USGS Quad Index 24K
Lower 48 Wetland Polygons
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Lower 48 Available Wetland Data
- Non-Digital
- Digital
- No Data
- Scan

NHD Streams
Counties 100K
Urban Areas 300K
States 100K
South America
North America
Approximate Site Area

Map center: 48° 52' 0" N, 122° 43' 34" W

1:38,500
Scale is approximate

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.

CLIENT: GATEWAY PACIFIC TERMINALS		DWN BY: LM/PM	PROJECT: WETLAND DELINEATION	DATE: FEBRUARY 2008	
		CHK'D BY: MG		PROJECT NO: 5-91M-15338-0	
AMEC Earth & Environmental 11335 NE 122ND WAY, SUITE 100 KIRKLAND, WA USA 98034-6918		DATUM:	TITLE: NATIONAL WETLANDLANDS INVENTORY MAP	REV. NO.: 2	
		PROJECTION:		FIGURE No. FIGURE 9	
		SCALE: AS SHOWN			

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Table 6. Summary of Wetlands Identified in the Study Area

Wetland Name	Hydro-geomorphic Class	Area by Cowardin Classification			Total Area (acres)
		Palustrine Scrub-shrub (acres)	Palustrine Emergent (acres)	Palustrine Forested (acres)	
1	Flats/Depressional	1.29	5.10	37.82	44.21
2	Slope	4.97	11.29	32.67	48.94
3	Slope	15.15	72.31	63.22	150.68
4A	Slope	2.17	5.00	19.46	26.62
4B	Depressional	0.69	0.00	3.66	4.36
4C	Depressional	0.06	0.00	0.09	0.15
4D	Slope	0.00	0.00	1.31	1.31
4E	Slope	0.00	0.17	0.00	0.17
4F	Slope	0.29	0.78	0.00	1.07
5A	Slope	8.65	3.20	83.39	95.24
5B	Depressional	0.00	0.00	0.13	0.13
5C	Slope	0.00	0.00	0.22	0.22
6	Slope	0.00	0.00	36.93	36.93
7A	Slope	2.08	3.48	34.50	40.06
7B	Depressional	0.00	0.00	0.59	0.59
8A	Slope	9.78	5.91	9.01	24.69
9A	Slope	6.87	6.44	11.50	24.81
9B	Depressional	0.00	0.00	0.18	0.18
10A	Slope	0.47	0.19	3.07	3.73
10B	Depressional	0.56	0.26	0.27	1.09
11A	Riverine	0.00	0.00	3.54	3.54
11B	Depressional	0.00	0.00	0.00	0.00
12A	Depressional[1]	4.73	0.67	5.78	11.171
13A	Riverine	0.00	0.00	0.63	0.63
13C	Depressional	0.00	0.00	0.02	0.02

Table 6. Summary of Wetlands Identified in the Study Area (Continued).

Wetland Name	Hydro-geomorphic Class	Area by Cowardin Classification			Total Area (acres)
		Palustrine Scrub-shrub (acres)	Palustrine Emergent (acres)	Palustrine Forested (acres)	
13D	Slope	0.00	0.00	0.42	0.42
13E	Riverine	0.00	0.00	0.06	0.06
13F	Depressional	0.00	0.00	0.62	0.62
13G	Depressional	0.00	0.00	0.37	0.37
14	Depressional	0.00	0.00	0.67	0.67

[1] Estuarine, not Palustrine

3.8.2 Wetland Vegetation Communities

Table 7 provides the typical plant community compositions for forested wetlands, shrub communities, and wet pastures.

3.8.2.1 *Forest Vegetation*

Forest vegetation throughout the study area is largely homogeneous, with very little variation in stand age or community composition. Palustrine forested wetlands are dominated by a 50-75 foot overstory of red alder, with black cottonwood abundant and western paper birch interspersed. Abundant standing or fallen dead trees (mainly smaller diameter red alder) and very few light gaps characterize the forests. Coniferous species are relatively rare—usually only one or two trees of western red cedar per acre, some of which appear to be much older than the surrounding red alder forest.

The 4-to-8-foot-high forest understory consists of a dense mosaic of stands of twinberry, salmonberry, and red-osier dogwood. Small areas of Pacific and Sitka willow are common in some wetter locations. Dense thickets of Nootka rose and Himalayan blackberry are common along forest edges.

3.8.2.2 *Shrub Vegetation*

Palustrine scrub-shrub wetlands are present in discontinuous patches around the study area. Wetland shrub areas are commonly comprised of Nootka rose, Douglas spirea, and Himalayan blackberry.

3.8.2.3 *Emergent Vegetation (Wet Pastures)*

There are few areas of perennial ponding on the site; thus, obligate and aquatic emergent wetland vegetation is not common. Vegetation in palustrine emergent systems mainly consists of pasture grass species. Wet pastures (located north of Lonseth Road) are dominated by a mixture of non-native pasture grasses including bentgrass, meadow foxtail, and sweet vernalgrass. In some grazed portions and in areas no longer grazed, extensive stands of reed canarygrass exist.

Table 7. Typical Plant Communities in Forested, Shrub and Wet Pasture Wetlands.

Red Alder Wetland Forest Community		
Common Name	***Scientific Name***	**Wetland Indicator Status**
Red alder	*Alnus rubra*	FAC
Black cottonwood	*Populus trichocarpa*	FAC
Western red cedar	*Thuja plicata*	FAC
Twinberry	*Lonicera involucrata*	FAC
Salmonberry	*Rubus spectabilis*	FAC
Red-osier dogwood	*Cornus stolonifera*	FACW
Pacific willow	*Salix lucida*	FACW+
Sitka willow	*Salix sitchensis*	FACW
Wetland Shrub Community		
Common Name	***Scientific Name***	**Wetland Indicator Status**
Nootka rose	*Rosa nutkana*	FAC
Douglas spirea	*Spiraea douglasii*	FACW
Himalayan blackberry	*Rubus armeniacus*	FACU-
Salmonberry	*Rubus spectabilis*	FAC
Lady fern	*Athyrium filix-femina*	FACW
Slough sedge	*Carex obnupta*	OBL
Pacific silverweed	*Potentilla pacifica*	OBL
Stinging nettle	*Urtica dioica*	FAC+
Wet Pasture Community		
Common Name	***Scientific Name***	**Wetland Indicator Status**
Bentgrass	*Agrostis* sp.	FACW-FACU
Meadow foxtail	*Alopecurus pratensis*	FACW
Sweet vernal grass	*Anthoxanthum odoratum*	FACU
Tall buttercup	*Ranunculus acris*	FACW-

In the following discussion, wetlands are grouped and described according to their HGM classification. Appendix A provides a large map of the entire study area and Appendix D provides a set of larger scale maps (Map D1, D2, etc.) showing wetlands mapped by

Assessment Area. Appendix F provides a table of wetlands and descriptions of their associated drainage.

3.8.3 Depressional Wetlands

Wetlands 1, 4B, 5B, 7B, 8B, 9B, 10B, 11B, 11C, 12A, 13C, 13G and 14A were classified as depressional HGM class, although most have at least one other HGM class present. By definition, HGM depressional wetlands are formed at low points in the landscape. The shape of the low point in the landscape may vary, but the flow of subsurface water is toward the lowest point in the depression. Wetlands of this system class may or may not have an outlet; however, if an outlet exists, it is somewhere within the wetland boundary.

None of the wetlands described as depressional in the study area have the defined outlet typical of this class, and some do not have easily recognized depression-shaped topography. These areas generally have undefined outlets more typical of slope wetlands. However, these wetlands have very low topographic gradients, they detain water, and therefore they function more like depressional systems than slope wetland systems.

3.8.3.1 *Wetland 1*

PFO and PEM
Category III
Abuts Stream 3
Continues off-site and appears to infiltrate to groundwater north of Lonseth Road.

Wetland 1 is a 44.27-acre shallow-depressional area (within the study area) that abuts Stream 3 in the northwestern most portion of the study area (Map D1). The wetland is bounded by a ridge of higher topography along the east and south, Aldergrove Road on the north, and it includes the roadside ditch along the south side of Aldergrove Road. To the west, the wetland extends off-site onto adjacent BP property. The red alder community typical of the area is present across most of the wetland. Heavily grazed wet meadows in the northeastern extent are vegetated with the study area's typical pasture mixture (see Table 7).

This wetland is hydrologically separated from the rest of the study area by a watershed boundary that occurs along a northeast-southwest trending ridgeline that lies southeast of the wetland. This is the only wetland within the study area that does not drain southward via a stream located within the study area. The wetland continues southwest onto the adjacent property, where it appears to infiltrate to groundwater north of Lonseth Road.

The wetland is flat, with a topographic gradient of less than 1 percent over most of the study area. While this area could be classified as a slope, the hydrodynamics are more similar to the conditions found in a depressional system. During high flows, a 6-inch culvert beneath Aldergrove Road conveys surface flow from the ditch on the north side of the road into the wetland. However, this inflow does not generate well-defined drainage channels. It appears that wetland hydrologic conditions exist primarily due to a seasonally high ground water table and local precipitation.

Soils are mapped as the hydric Whitehorn series with 0-to-2-percent slopes. As stated earlier, this soil has slow permeability. Observations indicate that soils generally meet the description for Whitehorn soils.

Wetland 1 occupies a large portion of its drainage basin, and may potentially function to improve water quality by processing nutrients. Wetland 1 could also provide wildlife habitat due to the presence of multiple Cowardin classes, hydroperiods, and relatively high habitat interspersion.

3.8.3.2 *Wetland 4B*

PFO and PEM
Category III
Abuts non-RPW tributary on the west side of Kickerville Road
Drains north in a roadside ditch to the roadside ditch at Lonseth Road, then to Stream 1 and ultimately to the Strait of Georgia.

Wetland 4B is a 4.36-acre depressional area that abuts the roadside ditch on the west side of Kickerville Road (Map D4). The wetland includes forested vegetation and mowed grasses along a pipeline right-of-way that runs parallel to Kickerville Road. The dominant vegetation in the wetland includes an overstory of red alder and an understory of Douglas spirea, reed canarygrass, and slough sedge. Soils in this area are mapped as the Whitehorn Series. Field observations are generally consistent with the mapped soil type. Based on existing topographic gradients and field observations, water from Wetland 4B drains to the roadside ditch along Kickerville Road.

Wetland 4B has a relatively constricted outlet, dense persistent vegetation, and multiple Cowardin classes and hydroperiods. Functions provided by Wetland 4B may slightly improve flood attenuation and erosion control; nutrient and sediment removal; and limited production of organic matter and terrestrial invertebrates.

3.8.3.3 *Wetland 4C*

PFO and PEM
Category III
Abuts non-RPW tributary on the west side of Kickerville Road.
Drains to the roadside ditch along Kickerville Road, then north to the RPW on the south side of Lonseth Road, to Stream 6, to Stream 5, to Stream 1, to the Strait of Georgia.

Wetland 4C is a small depressional area (0.15 acres) that abuts the roadside ditch on the west side of Kickerville Road (Map D4). The area includes a portion of the pipeline corridor that runs parallel to Kickerville Road, and extends slightly into a PSS area to the west.

The vegetation in Wetland 4C is a monotypic stand of reed canarygrass, with shrubs including Douglas' spirea near its western boundary. The soils in the wetland have more clay content and

are slightly darker than the description for the mapped soil type (Whitehorn silt loam). During the January field visit, the wetland was inundated, with surface water three inches deep.

Wetland 4C has a relatively unconstricted outlet, dense persistent vegetation, and multiple Cowardin classes and hydroperiods. Functions provided by Wetland 4C are likely to be minimal. Functions may include slight flood attenuation and erosion control; nutrient, and sediment removal; and production of organic matter and terrestrial invertebrates.

3.8.3.4 *Wetland 5B*

PFO and PSS
Category III
Isolated
No apparent outlet – infiltrates to groundwater that likely drains to the RPW on the south side of Lonseth Road, and ultimately to the Strait of Georgia.

Wetland 5B is a small, isolated wetland (0.13 acres) located in Assessment Area 5 (Map D4). The vegetation in Wetland 5B is typical of forested wetlands in the study area with hydrophytic emergent species. The soils are mapped as Whitehorn silt loam, and field observations are generally consistent with the mapped description. The wetland was inundated during the January field visit.

The wetland is a depression in the landscape without an apparent surface outlet. It is likely that Wetland 5B is connected to Wetland 5A by shallow interflow and/or groundwater. Drainage patterns were assumed based on topographic gradients and field observations.

Wetland 5B has a relatively constricted outlet, and consists of dense, persistent vegetation, multiple Cowardin classes, hydroperiods including areas of occasional ponding greater than 0.5 feet, and diverse plant species. Functions provided by Wetland 5B include slight flood attenuation and erosion control; some nutrient and sediment removal; and minimal production of organic matter and terrestrial invertebrates.

3.8.3.5 *Wetland 7B*

PFO
Category III
Isolated
No apparent outlet — likely infiltrates to groundwater, which drains southwest to Stream 1 and ultimately to the Strait of Georgia.

Wetland 7B is a small, isolated wetland (0.59 acres) situated west of Wetland 7A (Map D6). Vegetation consists mainly of the area's typical forest community, with a canopy dominated by red alder over a sparse shrub understory. The mapped soil type is a Whitehorn silt loam, and field observations were generally consistent with the description of the soil type. Indicators of wetland hydrology in the wetland include oxidized root channels and saturated soils.

Wetland 7B has a relatively constricted outlet, dense, persistent vegetation, multiple Cowardin classes and hydroperiods, including areas of occasional ponding greater than 0.5 feet, and diverse plant species. Minimal functions provided by Wetland 7B may include: slight flood attenuation and erosion control; some nutrient and sediment removal; and production of organic matter and terrestrial invertebrates.

3.8.3.6 *Wetland 8B*

PSS
Category III
Abuts RPW on the south side of Lonseth Road
Drains to the roadside ditch on the south side of Lonseth Road, then to Stream 1, and ultimately to the Strait of Georgia.

Wetland 8B is a small depressional wetland (0.15 acre) that abuts the south side of Lonseth Road (Map D7). Vegetation consists of emergent shrubs and herbaceous species, supported by the road side drainage. The dominant species include willows and red-osier dogwood. Soils in this vicinity are mapped as the Whitehorn series, and field observations were generally consistent with the soil type.

Wetland 8B has dense, persistent vegetation, and marks of ponding greater than 0.5 ft. Wetland 8B may function to improve the quality of water flowing downstream by removing nutrients and sediment, and may help prevent downstream scour and erosion through flood attenuation. High-level plant diversity and multiple hydroperiods contribute to the habitat value of Wetland 8B.

3.8.3.7 *Wetland 9B*

PFO
Category III
Isolated
No surface outlet – wetland likely infiltrates to groundwater, which drains southeast to Wetland 9A, then to the Strait of Georgia via Stream 1.

Wetland 9B is a small wetland (0.18 acre) located adjacent to the southwestern boundary of the study area (Map D8). This small, forested wetland has a red alder canopy with an understory that includes slough sedge, and a mixture of grasses that could not be identified in January due to a lack of seed heads and general field conditions. The dominant shrub in the wetland is salmonberry. Patches of open water and bare ground are typical of the wetland. Soils in the vicinity are mapped as the Whitehorn series. Field observations were generally consistent with the mapped soil type.

Wetland 9B has a relatively constricted outlet, dense, persistent vegetation, multiple Cowardin classes, and hydroperiods. Portions of Wetland 9B include areas of occasional ponding to a depth greater than 0.5 foot, and diverse plant species. Functions provided by Wetland 9B may include flood attenuation and erosion control; nutrient and sediment removal, and production of organic matter and terrestrial invertebrates.

3.8.3.8 *Wetland 10B*

PSS, PEM
Category III
Isolated
No surface outlet – wetland likely infiltrates to groundwater and drains to the Strait of Georgia.

Wetland 10B is a small, isolated wetland (0.04 acres) that extends south from Henry Road in an un-maintained roadside ditch in the western portion of the site (Map D9). The area opens up into an abandoned homestead site with a sparse forest canopy near its southern boundary. The vegetation is typical of the area's PSS community. The dominant species include grasses such as bentgrass, red clover, and soft rush in the understory, with shrubs including Douglas' spirea and Himalayan blackberry. The soil is mapped as Whitehorn series. Field observations were generally consistent with the mapped soil type.

Wetland 10B has dense, persistent vegetation, a constricted outlet, areas of seasonal ponding, and multiple Cowardin classes and hydroperiods. Functions provided by Wetland 10B may include slight flood attenuation and erosion control; some nutrient and sediment removal; and production of organic matter and terrestrial invertebrates.

3.8.3.9 *Wetland 11B*

PAB
Category III
Isolated
No surface outlet — likely drains to groundwater, then to the Strait of Georgia.

Wetland 11B is a small, isolated pond (0.003 acres) in an upland field, near the base of a slope that drops off a cliff to the shoreline (Map D10). The area is very sparsely vegetated with some duckweed in the aquatic bed. The pond provides some habitat for amphibians, but offers little habitat diversity. The majority of Wetland 11B is seasonally ponded.

Wetland 11B provides some limited functions, possibly including sediment removal, nutrient removal, and the attenuation of flooding and erosion. However, because of its small size, these functions are limited.

3.8.3.10 *Wetland 13C*

PFO
Category III
Isolated
No surface outlet — infiltrates to groundwater, which likely drains to Stream 2 and the Strait of Georgia.

Wetland 13C is a small, isolated wetland (0.02 acres) located near Stream 2 (Map D11). Water pools in Wetland 13C during the wet season, and there is no defined surface water outlet. The

vegetation in Wetland 13C is typical of a forested community in the study area, with an understory of salmonberry and reed canarygrass. The soil is mapped as a Whitehorn silt loam. Field observations are generally consistent with the mapped soil type.

Wetland 13C has dense, persistent vegetation, seasonal ponding to 2 feet, and multiple Cowardin classes and hydroperiods. Functions provided by Wetland 13C include some flood attenuation and erosion control; nutrient and sediment removal; and production of organic matter and terrestrial invertebrates.

A significant nexus with jurisdictional waters likely exists due to the wetland's water quality, biologic, and hydrologic functions, and likely groundwater connection to Stream 2.

3.8.3.11 *Wetland 13F*

PAB
Category III
Abuts Strait of Georgia
Drains directly to the Strait of Georgia via a culvert under Gulf Road.

Wetland 13F is located in the southern portion of the site, abutting the Strait of Georgia (Map D11). The wetland is separated from the coast by a culvert under the road. The on-site portion of the wetland measures approximately 0.62 acres. The culvert does not appear to be fully functional, as driftwood is swept ashore and typically blocks the opening.

The wetland is an aquatic bed that holds up to three feet of water during the winter. Water was observed flowing into the wetland as sheetflow from east of the study area. East of the study area, a pond was observed flooding its banks, with water flowing down slope into the wetland. The source of this water is east of Stream 2, and feeds into Stream 2.

The wetland is highly degraded, with a dense stand of Himalayan blackberry surrounding much of its perimeter. Other species present included Pacific willow, twinberry, and Nootka rose. The soil is mapped as Neptune—very gravelly sandy loam.

Wetland 13F has a highly constricted outlet and large areas of seasonal ponding. Functions provided by Wetland 13F may include slight nutrient and sediment removal, the production of terrestrial invertebrates, and the attenuation of shoreline erosion. The presence of multiple hydroperiods and special wildlife habitat features contribute to the habitat value of Wetland 13F.

3.8.3.12 *Wetland 13G*

PFO
Category III
Isolated
No surface outlet — infiltrates to groundwater which likely drains to the Strait of Georgia.

Wetland 13G is a small depression (0.37 acres) at the base of the slope located near the southwest corner of Gulf Road as the road turns to the east (Map D12). The wetland is separated from the Strait of Georgia Gulf Road to the south and from Wetland 12 by Gulf Road to the east. Vegetation is typical of the area's forested communities. Dominant species include an overstory of red alder and black cottonwood, shrubs including Pacific willow and Nootka rose, and an emergent community that includes slough sedge. Soils are mapped as a Neptune—very gravelly sandy loam. Field observations generally confirm the mapped soil type.

The major part of Wetland 13G is seasonally ponded. Plant diversity in Wetland 13G is high, and multiple Cowardin classes and hydroperiods are present. Additional wildlife habitat features include large woody debris and standing snags. Functions provided by Wetland 13G may include flood attenuation and erosion control; some nutrient and sediment removal; and production of organic matter and terrestrial invertebrates.

3.8.3.13 *Wetland 14*

PFO
Category III
Adjacent to but not abutting the RPW on the south side of Henry Road
No surface outlet — infiltrates to groundwater and likely flows down-slope to Stream 1 and ultimately to the Strait of Georgia.

Wetland 14 is a 0.67-acre forested wetland that lies adjacent to the roadside ditch on the south side of Henry Road, in the western portion of the study area (Map D9). The area may have been a logging haul or skid road at one time. The wetland is separated from the ditch by a high berm, and it is unlikely that the wetland receives water from overbank flooding at any time during the year.

Vegetation consists of the area's typical red alder forest community. Beneath the canopy, the shrub community includes salmonberry, and the emergent community is composed of slough sedge and bigflower tellima. During the January field visit, the wetland was inundated with water. The soil in the wetland is mapped as the Whitehorn Series. Field observations generally concur with the described soil type.

Wetland 14 has dense, persistent vegetation, seasonal ponding to 2 feet, and multiple Cowardin classes and hydroperiods. Functions provided by Wetland 14 may include flood attenuation and erosion control; some nutrient and sediment removal; and production of organic matter and terrestrial invertebrates.

3.8.4 Slope Wetlands

Wetlands 2, 3, 4A and 4D through F, 5A, 6, 7A, 8A, 9A were classified as slope wetlands. Slope wetlands occur where groundwater becomes exposed and begins to drain, either along the surface or immediately below the soil surface. In this HGM class, water flows in one direction (down the slope), and typically the gradient is steep enough that the water does not become impounded. By definition, a defined outlet is not usually present.

For most of the slope wetlands in the study area, there are no defined outlets present. Typically, water drains across a broad, low-gradient landscape until it is intercepted by roadside or other ditches that lie generally perpendicular to the direction of drainage and at the down gradient edge of the wetland. These roadside drainages flow to one of the streams.

3.8.4.1 *Wetland 2*

PFO and PEM
Category III
Abuts Streams 1 and 4
Drains to Streams 1 and 4, then to the Strait of Georgia.

Wetland 2 is a large (49.0-acre), mostly-forested slope wetland located north of Lonseth Road, south of Aldergrove and west of Gulf Road (Map D1). Wetland 2 abuts Streams 1 and 4, and a culvert beneath Gulf Road connects Wetland 2 with Wetland 3 via Stream 1.

Stream 1 flows west in a constructed ditch located in a pasture and then south in a natural drainage through a forested area. The stream gradient is very low and the channel is poorly defined for most of the area. Water collects in Wetland 2 as a result of a seasonally high groundwater table, precipitation, and some contribution of overbank flooding. The area was saturated during the first field effort in June 2006, and almost completely inundated in winter 2007, with depths of 2 to 8 inches in most portions.

The forested portion is vegetated by the young alder forest community typical of the forested wetlands in the study area (Table 7). The northern-most extent is heavily grazed wet pasture. Small thickets of rose, snowberry, and Himalayan Blackberry are common along the transition from forest to pasture and along the roadway. Reed canarygrass dominates the area surrounding Stream 1 in the pasture.

Soils are mapped as Whitehorn silt loam. Soils are black (10 YR 2/1) loam and silt loam in the top approximate 6 inches. The surface of soil near Stream 1 is high in organic content. The upper part of the subsoil varies by location and is loam or clay loam with redox features present, generally starting at approximately 6 inches. Pasture areas have some locations of compacted surface soils and extensive areas with much less organic matter than in adjacent forested areas.

Wetland 2 has a relatively shallow slope, dense, woody vegetation, and very few surface depressions. Functions provided by Wetland 2 may include the attenuation of overland flow

velocity, thereby decreasing erosion and sediment deposition in areas downslope. Multiple Cowardin classes, hydroperiods, habitat features, and interspersion contribute to the habitat value of Wetland 2.

3.8.4.2 *Wetland 3*

PFO, PSS, and PEM.
Category III
Abuts Streams 1, 3, 4, and 6
Drains to Streams 1, 3, 4, and 6, then to the Strait of Georgia.

Wetland 3 is a large (143.44 acres) wetland located north of Lonseth Road, south of Aldergrove Road, and east of Gulf Road (Map D3). Stream 1 originates in Wetland 3 through the confluence of many small, undefined drainages into one constructed, well-defined stream just prior to flowing out of the wetland on the east side of Gulf Road. A constructed roadside ditch drains the northwestern part of the wetland on the south side of Aldergrove Road (Stream 3). A long, shallow swale connects two portions of the wetland. This swale appears meandering and stream-like on maps; however, no bed or bank is present and the swale is well vegetated for its full extent.

The area is actively-grazed pasture in the western half and forested wetland in the eastern half. The pasture vegetation is the typical mixed grass community found in the study area. The forested wetland has the red alder community typical of the study area. The slightly wetter conditions in the vicinity of the outlet at Gulf Road support a willow shrub community interspersed with small, open water areas with cattail, rushes, and sedges.

Soils are mapped as Whitehorn silt loam for most of the area in the western and central portions. Soils on the eastern most extent are mapped as Birchbay Silt loams on 0 to 3 percent slopes. Soils are a compact, very dark brown (10 YR 2/2) clay loam in the top approximate 6 inches. Below 6 inches, soils are a dark brown silt loam with redox features.

Wetland 3 has a relatively shallow gradient, very little dense or rigid vegetation, and surface depressions are present throughout. Wetland 3 provides some attenuation of overland flow due to its ability to retain a limited amount of water. Multiple Cowardin classes and hydroperiods, plant diversity and habitat interspersion contribute to the habitat value of Wetland 3.

3.8.4.3 *Wetland 4A*

PFO and PEM
Category III
Abuts the RPW on the south side of Lonseth Road
Drains to roadside ditch on south side of Lonseth Road, then to Stream 1 and ultimately to the Strait of Georgia.

Wetland 4A is a 26.6-acre forested and emergent wetland located near Kickerville Road in the eastern study area (Map D4). The wetland is bounded on the north by Lonseth Road and includes the roadside drainage (a RPW). The BNSF rail embankment forms the western

boundary. A BPA transmission line easement with mowed vegetation cuts north-south through the eastern portion of the wetland.

Vegetation in the wetland consists of mowed vegetation along the north-south linear transmission line easement and forested vegetation outside of the easement. The dominant species include red alder trees in the overstory with a shrub community composed of Himalayan blackberry, trailing blackberry, salmonberry, and red alder saplings. The herbaceous community is dominated by reed canarygrass. Soils are mapped as Birch Bay silt loam. Field observations were generally consistent with the soil description.

Wetland 4A has dense, woody vegetation and small depressions throughout. Functions provided by Wetland 4A may include the attenuation of overland flow velocity, thereby decreasing erosion and sediment deposition in areas downslope, and the removal of some nutrients, and sediments. Multiple Cowardin classes and hydroperiods, special habitat features, plant diversity and habitat interspersion contribute to the habitat value of Wetland 4A.

3.8.4.4 *Wetland 4D through 4F*

PFO, PEM, and PSS
Category III and IV
Adjacent to but not abutting (4D and 4E) the non-RPW on the north side of Henry Road, or isolated (4F)
No surface outlets — water appears to infiltrate to groundwater and connect to adjacent wetlands through shallow interflow, where the wetlands collectively drain to the RPW on the south side of Lonseth Road, then to Stream 1, and ultimately to the Strait of Georgia.

These small, slope wetlands (less than 5 acres) are located adjacent to each other in the eastern portion of the study area just west of Kickerville Road (Map D4). A road-level berm separates Wetlands 4D and 4E from the adjacent roadside ditch, and the wetlands are not likely to receive water from ditch overflow. Vegetation varies within the wetlands, but generally consists of the area's typical PEM, PSS, and PFO communities. Soils in this area are mapped as Whitehorn silt loam on the flats, with Birch Bay silt loam in areas where the slope increases slightly.

Wetland 4D has patches of dense, rigid vegetation, multiple Cowardin classes and hyrdoperiods, and surface depressions throughout. Functions provided by Wetland 4D may include organic-matter and terrestrial invertebrate production; flood attenuation and erosion control; and a minimal amount of sediment and nutrient removal.

Wetland 4E has a relatively unconstricted outlet, multiple hydroperiods with areas of ponding to 0.5 feet, and dense, persistent vegetation with multiple Cowardin classes. Functions provided by Wetland 4E may include: flood attenuation; erosion control and sediment removal; and production of organic matter and terrestrial invertebrates.

Wetland 4F has minimal rigid or uncut vegetation, low diversity of plant species, multiple Cowardin classes and hydroperiods, and surface depressions throughout. Functions provided by Wetland 4F may include production of organic matter and terrestrial invertebrates; a minimal amount of flood attenuation and erosion control; and a minimal amount sediment and nutrient removal.

3.8.4.5 *Wetland 5A and 5C*

PFO and PEM
Category III
Wetland 5A abuts RPW tributary on the south side of Lonseth Road
Water in the northern portion of the wetland drains north to the roadside ditch on the south side of Lonseth Road, then to Stream 6 and ultimately to the Strait of Georgia. Water in the southern portion of the wetland appears to infiltrate to groundwater, then flow south to Stream 5, then to Stream 1 and ultimately to the Strait of Georgia.

Wetland 5A is a large (95.3-acre), primarily forested slope wetland that abuts the roadside ditch on the south side of Lonseth Road to the north, and lies adjacent to Stream 5 to the south (Map D4-5). The wetland is bounded on the north by Lonseth Road, on the south and west by forested uplands on slopes, and is separated from Wetland 4A to the east by the BNSF rail embankment. Old logging roads and skid trails are common, and result in linear areas of ponding throughout the area. Wetland 5A receives some water from the roadside ditch on the north side of Henry, which empties into the wetland via a culvert under the railroad tracks.

Vegetation is the typical forest community for almost all of the area. A 100-foot-wide easement adjacent to the rail embankment, vegetated mainly with reed canarygrass, is mowed annually. Soils are mapped as Whitehorn silt loam. Soils were very dark brown (10 Y/R 2/2) or black (10 YR 2/1) in the upper 5 to 6 inches. In some areas, depth below 6 inches had a depleted matrix (10 YR 4/1) with distinct redox features. Most areas had redox features within 6 inches of the surface, and some small depressional features showed increased organic matter at the surface.

Reconnaissance investigation of the exclusion area (in assessment unit 5) revealed that Wetland 5C is likely a finger that extends west from the southern portion of Wetland 5A. Much of the central portion of Wetlands 5A and 5C has very low gradient topography with slightly steeper slopes on the south (north aspects) and east (west aspects) perimeters.

Wetland 5A, located on a shallow slope, has dense, rigid vegetation throughout most of its area, and many small surface depressions that can trap water. Wetland 5A may function to improve downstream water quality by trapping nutrients and sediments, and to decrease downstream erosion by attenuating overland flow velocity. Multiple Cowardin classes and hydroperiods, plant diversity, and habitat interspersion and features contribute to the habitat value of Wetland 5A.

3.8.4.6 *Wetland 6*

PFO
Category III
Abuts Stream 6 and the RPW tributary on the south side of Lonseth Road
Drains to Stream 6, then Stream 5 and ultimately the Strait of Georgia.

Wetland 6 is a large (36.93-acre), forested, slope wetland that abuts Stream 6 and the roadside ditch on the south side of Lonseth Road (Map D6). Gulf Road borders the area on the west and Lonseth Road on the north. Upland forests border the south and eastern portions. Old logging roads and skid trails are common and result in linear areas of ponding throughout the area.

Vegetation is the area's typical forest community. The overstory consists of red alder and black cottonwood, with a shrub community that includes salmonberry, Douglas spirea and twinberry. The emergent community includes slough sedge and Hood's sedge. Soils are mapped as Whitehorn silt loam. Field observations are generally consistent with the mapped soil type.

Wetland 6, located on a shallow slope, has dense, rigid vegetation throughout most of its area, and many small surface depressions that can trap water. Wetland 6 functions to improve downstream water quality by trapping nutrients and sediments, and to decrease downstream erosion by attenuating overland flow velocity. Multiple Cowardin classes and hydroperiods, plant diversity and habitat features contribute to the habitat value of Wetland 6.

3.8.4.7 *Wetland 7A*

PFO, PSS, and PEM.
Category III
Abuts Stream 5 and other RPW tributaries on Gulf and Lonseth roads
Drains to Stream 5, then to Stream 1, and to the Strait of Georgia. Water may also infiltrate and drain towards the Stream 1 ravine, ultimately to be expressed as base flow for Stream 1.

Wetland 7A, a 40.06-acre slope wetland, abuts Stream 5, the roadside ditch on the east side of Gulf Road, and the roadside ditch on the south side of Lonseth Road (Map D6). Upland forests are present between the western edge of Wetland 7A and the Stream 1 ravine. Water in the roadside ditch on the south side of Lonseth Road was observed to overflow into this wetland in January 2007.

Vegetation in the wetland consists of the area's typical forest and shrub communities. The overstory includes a canopy of red alder, with an understory shrub community of Douglas' spirea, and twinberry and emergent slough sedge. Indicators of wetland hydrology include water-stained leaves observed during the June survey and observations of inundation in January 2007. The soils are mapped as Whitehorn silt loam. Field observations indicate that the soils have higher clay content and the matrix is darker than the mapped type. Redoxymorphic features were observed below 8 inches.

Wetland 7A, located on a shallow slope, has dense, woody vegetation throughout most of its area, and many small surface depressions that trap water. Wetland 7A may function to improve downstream water quality by trapping nutrients and sediments, decreasing downstream erosion by attenuating overland flow velocity. Multiple Cowardin classes and hydroperiods, plant diversity, and habitat interspersion contribute to the habitat value of Wetland 7A.

3.8.4.8 *Wetland 8A*

PFO, PSS, and PEM
Category III
Abuts Stream 1
Drains southeast to Stream 1 via constructed drainages, then to the Strait of Georgia.

Wetland 8A is a 24.69-acre forest, shrub, and emergent complex slope wetland abutting Stream 1, and currently vegetation for most of the area is succeeding from old field to forest and shrub communities (Map D7). Some parts in the northern extent were hayed and one area was scraped in the summer of 2006.

Vegetation in the forested portions is typical of the study area. Emergent portions have a mixed grass community with some of the lower portions and ditches supporting thick stands of sedge, reed, and rushes. Some small portions show pure stands of reed canarygrass. Indicators of wetland hydrology include water within 2.5 inches of the surface and saturated soil throughout the soil profile. Soils in the wetland are mapped as a Whitehorn silt loam. Field observations indicate that the soil profile was homogenous throughout a 16-inch sample hole, with no redoxymorphic features. The texture of the soil is a silt loam or loam.

Wetland 8A is located on a shallow slope with patchy vegetation and many surface depressions that can retain water. Wetland 8A may function to improve the water quality in Stream 1 by removing some nutrients and sediments. The wetland may also attenuate downstream flooding, scouring, and erosion by retaining a small amount of water. Multiple Cowardin classes and hydroperiods, high levels of plant diversity and habitat interspersion, habitat features, and relatively undisturbed buffers contribute to the habitat value of Wetland 8A.

3.8.4.9 *Wetland 9A*

PFO, PSS, and PEM.
Category III
Abuts Stream 5
Drains south to Stream 5, then to Stream 1 via and ultimately to the Strait of Georgia.

Wetland 9A (25.69 acres) is a forest, shrub, and pasture area that abuts Stream 5 in the western portion of the study area (Map D9). It is bounded on the east by a large hayfield, on the south by Henry Road, and on the north and west by upland forests and shrub areas on slopes that extend offsite.

During the 2006 investigation, a portion the southern extent had recently been moldboard-plowed while the adjacent field was likely turned and reseeded the previous year. The area was seeded in spring 2006. Vegetation in the plowed area was sparse and young during our 2007 field investigation, and consisted of weedy annuals, reed canarygrass, and Himalayan blackberry. The remaining portions of the wetland are forested with the typical red alder forest community.

Soil in the vicinity is mapped as Whitehorn silt loam. During the field investigation, soils were hard and compacted. The plowed area was inundated with up to 10 inches of water during our 2007 field investigation. Most of the wetland was inundated with up to 6 inches of water during the 2007 investigation.

Wetland 9A has a shallow slope, patches of dense, woody vegetation, and surface depressions throughout that trap water. Wetland 9A may function to improve water quality downstream by removing nutrients and sediments, and by attenuating overland flow velocity. Wetland 9A also provides organic matter and terrestrial invertebrates to downstream communities. Multiple Cowardin classes and hydroperiods, high levels of plant diversity and habitat interspersion, special habitat features, and relatively undisturbed buffers contribute to the habitat value of Wetland 9A.

3.8.4.10 *Wetland 10A*

PFO, PSS, and PEM.
Category III
Abuts RPW tributary on the south side of Henry Road
No apparent outlet; likely drains to Strait of Georgia downslope via groundwater.

Wetland 10A is a 3.73 acre forested wetland that abuts the roadside ditch on the south side of Henry Road (Map D10). The wetland may receive water from the ditch during high flows. The wetland appears to be the site of a former homestead or residence. A small fruit orchard and concrete foundation are situated in the southern portion of the wetland.

The dominant vegetation in Wetland 10A consists of wetland species including slough sedge and common rush, as well as facultative species typical of forested communities in the study area. Indicators of wetland hydrology include saturated soil in the upper 12 inches, and free water in the sampling pit. The soil is mapped as Whitehorn silt loam, and field observations generally confirm the mapped soil type.

Wetland 10A has a shallow slope, dense, woody vegetation, and surface depressions throughout that can trap water. Wetland 10A functions to improve water quality downstream by removing nutrients and sediments, and attenuating overland flow velocity. Wetland 10A also provides organic matter and terrestrial invertebrates to downstream communities. Multiple hydroperiods, a high degree of habitat interspersion, special habitat features, and relatively undisturbed buffers contribute to the habitat value of Wetland 10A.

3.8.4.11 *Wetland 13D*

PFO
Category III
Adjacent to but does not abut Stream 2
No apparent outlet — likely drains to groundwater flowing downslope to Stream 2 and ultimately the Strait of Georgia.

Wetland 13D (0.37 acres) lies adjacent to, but does not abut, Stream 2 (Map D11). The area consists of a forested community situated on a relatively distinct slope. The dominant vegetation consists of skunk cabbage, an obligate wetland species, as well as reed mannagrass and the saxifrage, slender boykina. The soil was saturated to the surface during the January field visit, and the soils are low chroma. The soils in the wetland are mapped as Whitehorn silt loam, 0 to 2 percent slopes. Field observations of the soil are generally consistent with the soil description for a Whitehorn silt loam.

Wetland 13D is located on a relatively steep slope, and has no surface depressions that can trap water. Wetland 13D has dense, rigid and herbaceous vegetation, multiple Cowardin classes and hydroperiods, and a diverse plant community. Wetland 13D may function to improve water quality downstream by attenuating overland flooding and erosion, thereby decreasing sediment inputs. Other biologic functions of Wetland 13D may include production of organic matter and terrestrial invertebrates.

3.8.5 Riverine Wetlands

Riverine wetlands in the study area, associated with one of three stream channels, are generally inundated by the mid-rainy season and high-intensity storms. These wetlands may present some features of slope and depressional wetlands, including groundwater discharge and limited areas of impounding.

3.8.5.1 *Wetland 11A*

PFO
Category I
Abuts Stream 1
Drains to Stream 1 then to Strait of Georgia.

Wetland 11A is a forested riverine system that abuts Steam 1. The wetland lies in the ravine south of Henry Road (Map D11). Stream 1 flows south through the wetland. The wetland is bounded by upland forest to the east and west and by Henry Road on the north. Wetland 12A (coastal lagoon) forms the southern boundary.

Vegetation in Wetland 11A consists of a mixture of western red cedar and deciduous trees, primarily red alder and black cottonwood. Soil is mapped as Whatcom silt loam on 30 to 60 percent slopes. Soil in the wetland is a mixture of sorted colluvium and mucky areas as a result of water movement and the accumulation of organic matter.

Wetland 11A has dense, woody vegetation, surface depressions that trap water, and a large capacity for storage of overbank flooding. Wetland 11A may function to improve water quality in Stream 1 and the Strait of Georgia by decreasing scouring and erosion, and to a lesser extent, removing nutrients and sediments. Multiple Cowardin classes and hydroperiods, habitat interspersion, special habitat features, and relatively undisturbed buffers contribute to the overall habitat value of Wetland 11A.

3.8.6 Wetland 13A

PFO
Category I
Abuts Stream 2
Drains to Stream 2 and Wetland 12A, then to the Strait of Georgia

Wetland 13A is a narrow forested riverine system in the south central study area that abuts Stream 2 and its tributary (Map D11). The on-site portion of the wetland is approximately 5.50 acres. Stream 2 arises off-site to the east and flows through the wetland in the study area. A tributary to Stream 2 flows south to confluence with Stream 2 and lies entirely within the study area. The wetland is bounded by upland forest to the north and south except for at Gulf Road at the west, where the wetland drains through a culvert to Wetland 12A (coastal lagoon). The wetland continues to the east along the stream corridor beyond the project area an old earthen dam is encountered that blocks stream flow and floods the ravine above it.

Vegetation is dominated by the typical red alder forest community, with an understory of wetland obligate species adjacent to the stream. The dominant species include skunk cabbage and red stem dogwood. Portions of this area are directly adjacent to recently abandoned home sites on fill that have disturbed and invasive vegetation. Soils are mapped as Whitehorn silt loam and Birch Bay silt loam; however, soils in the wetland are a mixture of depositional bars comprised of sorted alluvium and shallow swales with muck and silts.

Wetland 13A has dense, woody vegetation, surface depressions that can trap water, and a large capacity for storage of overbank flooding. Wetland 13A functions to improve water quality in Stream 2 and the Strait of Georgia by decreasing scouring and erosion, and to a lesser extent, removing nutrients and sediments. Multiple Cowardin classes and hydroperiods, habitat interspersion, habitat features, and relatively undisturbed buffers contribute to the overall habitat value of Wetland 13A.

3.8.6.1 *Wetland 13E*

PFO
Category I
Abuts Stream 2
Receives water from and drains to Stream 2, then to the Strait of Georgia.

Wetland 13E connects to Wetland 13A through a degraded 12-inch culvert, and is nearly contiguous with Wetland 13A (Map D11).

Vegetation in Wetland 13E is dominated by the typical red alder forest community. Soils are mapped as Whitehorn silt loam and Birch Bay silt loam; however, soils are a mixture of depositional layers comprised of sorted alluvium and shallow swales with muck and silts.

Wetland 13E has dense, woody vegetation, and surface depressions that can trap water. Wetland 13E functions to improve water quality in Stream 1 and the Strait of Georgia by decreasing scouring and erosion, thereby decreasing sediment deposition downstream. Multiple Cowardin classes and hydroperiods, habitat interspersion, habitat features, and relatively undisturbed buffers contribute to the overall habitat value of Wetland 13E.

3.8.6.2 *Wetland 12 (Coastal Lagoon)*

Estuarine Emergent, Palustrine Forested
Category I
Abuts Strait of Georgia
Drains to Strait of Georgia.

Wetland 12 is a 12.11-acre coastal lagoon that abuts the shoreline west of Gulf Road (Map D12). The wetland lies between the marine shoreline and upland slopes and riparian communities. The lagoon, a shallow depression, is separated from the sea by a barrier beach with two well-defined outlets. Both Stream 1 and Stream 2 supply fresh water to this area. The lagoon also receives inputs of saltwater through the porous sediments of the beach and over the beach during severe storm events.

Stream 1 enters the depression from the north along the western extent and divides, forming two forks, both of which drain to the Strait of Georgia. Stream 2 flows through a culvert beneath Gulf Road and meanders westward through the wetland to converge with the eastern-most fork of Stream 1. The wetland was classified as depressional because freshwater entering the area is detained, water levels in the wetland are not controlled by tides, and the wetland has a defined outlet.

Vegetation includes emergent vegetation adapted to brackish conditions including fat-hen saltbush, saltgrass, pickleweed, salt marsh dodder, arrowgrass, and Pacific silverweed. Other species present include Sitka spruce, Douglas spirea, and Nootka rose. Soil in Wetland 12 is mapped as Neptune very gravelly, sandy loam. While the shape of the mapped landform appears to have been effectively characterized by the soil survey, the soil series is probably not correct because Neptune series is a well-drained gravelly soil. The coastal lagoon has salt-affected, organic-rich soils grading to soils that appear similar to Whitehorn silt loam and Whatcom silt loam.

This wetland is classified as a Category 1 due to the unique functions it provides as an estuarine wetland system.

4. Conclusions and Limitation of Information Provided

This report summarized the findings of the wetland determination and delineation conducted in June 2006 and January 2007. This report provides data to support the delineated wetland boundaries, characterizes wetland areas and waters of the U.S., and assesses the value and functions of the delineated wetlands. The information in this report is provided to support jurisdictional determination and boundary concurrence by the USACE.

4.1 Summary of Waters of the U.S. and Wetlands

Wetlands and other waters of the U.S. were identified in the study area. Wetlands comprise a total of approximately 521 acres of the study area. The wetlands were classified as riverine, slope, and depressional HGM classes. Palustrine forested (PFO) wetlands were most common, followed by wet pastures and hayfields (PEM), and a small amount of scrub-shrub wetland (PSS). One wetland was identified as an estuarine emergent system (Wetland 12).

Two streams flowing through natural ravines were identified within the study area. An extensive network of roadside ditches was also present, five of which convey streams as identified by Whatcom County. All drainages identified within the study site ultimately drain to the Strait of Georgia.

4.2 Limitations of this Study

The wetland boundaries, classification, and ratings, and the potential for jurisdiction described herein, are the professional opinion of AMEC staff based on the circumstances and site conditions at the time of this study. Local, state, and federal jurisdictions make final determinations of wetland boundaries and classifications.

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