ENVIRONMENTAL REVIEW RECORD

BINDER NO. 1

UPPER SKAGIT INDIAN TRIBE

BOW HILL FEE TO TRUST APPLICATION AND RESORT EXPANSION

Prepared for:

Upper Skagit Indian Tribe
Doreen Maloney, Tribal General Manager
25944 Community Plaza Way
Sedro Woolley, WA 98284

Prepared by:

Sehome Planning and Development Services
Rollin H. Harper, Principal
1323 Lincoln Street, #202
Bellingham, WA 98229

September 9, 2010

UPPER SKAGIT INDIAN TRIBE
BOW HILL FEE TO TRUST APPLICATION AND
PROPOSED RESORT EXPANSION

INDEX FOR ENVIRONMENTAL REVIEW RECORD (ERR)

ERR BINDER NO. 1

Technical Reports

1. Aqua-Terr Systems, Inc. (ATSI) Biological Assessment: Upper Skagit Indian Tribe-Skagit Resort Expansion dated July 2010
2. Aqua-Terr Systems, Inc. (ATSI) Upper Skagit Indian Tribe Skagit Casino Parking Lot Expansion & Road Realignment Wetland Mitigation Plan, Attachments B, C, D and E [Wetland Reconnaissance Reports] dated January 17, 2006
3. Aqua-Terr Systems, Inc. (ATSI) Upper Skagit Indian Tribe Wetland Mitigation Plan for Skagit Resort dated April 2008
4. Element Solutions Analysis of Potential Greenhouse Gas Emissions dated July 12, 2010
5. Equinox Research and Consulting Archaeological Investigation Report dated March 8, 2005
6. GeoEngineers Geotechnical Engineering Services Report dated February 26, 2007
7. GeoEngineers Phase I Environmental Site Assessment dated July 1, 2010
8. Pacific Surveying & Engineering Record of Survey as recorded under Skagit County Auditor's File No. 201006300037 (Appendix E to Environmental Assessment)
9. Pacific Surveying & Engineering Stormwater Management Report dated March 26, 2009
10. Pillar to Post Professional Home Inspection Lead Based Paint/Asbestos Review dated June 14, 2010
11. Transportation Solutions, Inc. Transportation Impact Analysis dated July 2010

ERR BINDER NO. 2

Consultation and Coordination

1. Letters to Federal, State, County, and Local Agencies dated June 25, 2010
2. Letters to Federal, State, County, and Local Agencies dated June 29, 2010
3. Letter from the Washington Department of Archaeology & Historic Preservation dated June 28, 2010
4. Letter from Skagit County Public Works Department dated July 14, 2010

5. Letter from the City of Burlington dated July 20, 2010
6. Letter from Washington State Department of Transportation dated July 23, 2010
7. Electronic message to Ken Berg, United States Fish and Wildlife Service dated July 23, 2010
8. Electronic message from Martha Jensen, United States Fish and Wildlife Service dated July 27, 2010
9. Letter from the Skagit County Administrator dated July 23, 2010
10. Letter from River Valley View Estates Road Association dated August 31, 2010
11. Letter from Skagit County Board of Commissioners dated September 1, 2010
1. City of Burlington Letter dated March 5, 2010
2. Samish Water District Letter dated April 9, 2010
3. Skagit Public Utility District No. 1 Letter dated April 14, 2010
12. Correspondence between Sehome Planning and Daniel Cain, Skagit County Fire Marshall dated January 13, 2010
13. E-mail from Tom Stacey, WSDOT, dated January 11, 2010
14. Letter to Washington Department of Archaeology and Historic Preservation dated January 18, 2006
15. Letter from Washington Department of Archaeology & Historic Preservation dated January 24, 2006
16. Letter to Washington Department of Fish and Wildlife dated January 26, 2006
17. Letter from Washington Department of Fish and Wildlife dated January 27, 2007 (stamped received on January 30, 2006)

Other Reference Documents

1. Economic Development Association of Skagit County: Skagit County Demographics 2010
2. Upper Skagit Indian Tribe Chairperson, Jennifer Washington, Letter dated August 2, 2010 regarding cultural resources
3. Upper Skagit Tribal Housing Department Demographic Statistics Reports, December 30, 2009 and January 15, 2010
4. Upper Skagit Tribal Council: Petition for An Upper Skagit Indian Reservation submitted February 18, 1981

5. Upper Skagit Indian Tribe (USIT): Final Draft Environmental Assessment for Bow Hill Gaming Facility dated April 1995
6. U.S. Department of the Interior Bureau of Indian Affairs: American Indian Population and Labor Force Report 2003
7. Upper Skagit Indian Tribe Labor Force Report 2010
8. Washington Department of Ecology Guidance on Addressing Greenhouse Gas Emissions, 2010
9. Washington Department of Fish and Wildlife Habitats and Species Report dated February 24, 2005 [See attached letter from Upper Skagit Indian Tribe dated January 26, 2006
10. Washington State Unemployment Rates by County dated November 2009
11. State of Washington Office of Financial Management Population Density and Land Area by County dated 2009
12. E-mail from Randy Dolittle to Bob Hayden dated December 30, 2009
13. E-mail from Scott Schuyler to Bob Hayden dated January 4, 2010

Miscellaneous Documents

1. GeoEngineers Phase I Environmental Site Assessment dated October 26, 2007
2. Transportation Solutions, Inc. Transportation Impact Analysis dated August 2007
3. Various: Skagit County Demographics
4. Upper Skagit Tribal Housing Department (USTHD) Demographic Statistics Report: Rentals 2006
5. Letter from Washington Department of Fish and Wildlife dated February 25, 2005
6. Letter from the Bureau of Indian Affairs (BIA) with updated traffic count dated July 19, 2006
7. Letter to Washington Department of Fish and Wildlife dated February 16, 2005
8. Fax from BIA with Fee-to-Trust Conversion Checklist dated March 29, 2007
9. BIA Correspondence with Tribal Leaders regarding Labor Force documents dated March 31, 2004
10. Washington State Employment Security Department Labor Market Information 2006

Biological Assessment:
Upper Skagit Indian Tribe-Skagit Resort Expansion

July 2010

Prepared for:

Upper Skagit Indian Tribe
Attention: Doreen Maloney
25944 Community Plaza Way
Sedro-Woolley, Washington 98284
(360) 854-7000

Prepared by:

Aqua-Terr Systems, Inc.
21993 Grip Road
Sedro-Woolley, Washington 98284
(360) 856-2139

ATSI
Aqua-Terr Systems, Inc.

Biological Assessment:
Upper Skagit Indian Tribe-Skagit Resort Expansion

July 2010

Prepared for:

Upper Skagit Indian Tribe
Attention: Doreen Maloney
25944 Community Plaza Way
Sedro-Woolley, Washington 98284
(360) 854-7000

Prepared by:

Jim Wiggins, MS, PWS
President

Karla Van Leaven, BS, WPIT
Associate Biologist

Aqua-Terr Systems, Inc.
21993 Grip Road
Sedro-Woolley, Washington 98284
(360) 856-2139

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

EXECUTIVE SUMMARY

Aqua-Terr Systems, Inc. has been retained by the Upper Skagit Indian Tribe to prepare a Biological Assessment for the proposed expansion of their existing resort facilities. The proposed project area is comprised of approximately 134 acres located at the northeast corner of Bow Hill Road and North Darrk Lane in Skagit County, Washington.

There are six parcels located within the proposed project area that include parcel numbers P35839 and P123324 which lie within a portion of Section 6, Township 35 North, Range 4 East, Willamette Meridian (WM); P50416, P50414, and P119078 which lie within a portion of Section 31, Township 36 North, Range 4 East, WM; and P50500 which lies in a portion of Section 32, Township 36 North, Range 4 East, WM.

The proposed project includes conversion of 134 acres of fee land into tribal trust land for construction and operation of proposed resort facilities that include a recreation and hospitality facility with a hotel, indoor water park, meeting center, restaurant, spa, fitness center, gift shop, and lounge and infrastructure including parking lots, a parking garage, stormwater management facilities, and landscaping.

Conservation measures in the form of Best Management Practices and a Stormwater Control Plan will be utilized to minimize the potential effects to water quality/quantity that may result from the proposed project. Proposed mitigation for impacts to approximately 5 acres of wetlands that will result from the proposed project includes creation of approximately 9 acres of wetlands, installation of approximately 4,300 linear feet of fencing with Native Growth Protection Area signage, and placement of approximately 40 acres of land into a conservation easement for continued protection.

Of the endangered and threatened species and designated critical habitat located within Skagit County, Washington, there are three threatened species, bull trout (*Salvelinus confluentus*), Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), and Puget Sound steelhead (*Oncorhynchus mykiss*), and their designated critical habitat potentially located within the action area, a 1 mile radius around the project area (approximately 500 acres), of the proposed project.

No effects are anticipated to occur to these listed species or their designated critical habitat as the proposed project will not occur instream and there will be conservation measures in place; therefore, a No Effect (NE) determination is recommended. In addition, there is no Essential Fish Habitat located within the action area and therefore a NE determination is recommended.

INTRODUCTION

The Upper Skagit Indian Tribe (USIT) is proposing to expand their existing resort facilities, which include a casino and neighboring hotel with associated infrastructure, by converting adjacent fee land to tribal trust land for construction of proposed resort facilities, which will include a recreation and hospitality facility with infrastructure, here and after referred to as the proposed project (Appendix A; Figures 1 through 7).

1.0 PROJECT HISTORY

1.1 General

1.1.0 Correspondence

A request for comments regarding the proposed project was provided through the letter included in Appendix A to the following agencies:

Federal

National Oceanic and Atmospheric Administration (NOAA)/National Marine Fisheries Service
United States Army Corps of Engineers (Corps), Seattle District
United States Environmental Protection Agency (USEPA)
United States Fish and Wildlife Service (USFWS)

State

Northwest Clean Air Agency
Washington Department of Archaeology and Historic Preservation
Washington Department of Ecology (Ecology)
Washington Department of Fish and Wildlife (WDFW)
Washington Department of Natural Resources (DNR)
Washington Department of Transportation

County

Skagit County Commissioners
Skagit County Fire Marshall
Skagit County Planning and Development Services
Skagit County Public Works

Local and Other

City of Burlington
County Fire District No. 14 (Alger)
Samish Water District
Skagit PUD No. 1

1.1.1 Supplemental Information

The USIT is in the process of preparing an application to the United States Department of Interior, Bureau of Indian Affairs (BIA) requesting the conversion of fee land to tribal trust land to develop the proposed project (Appendix A). ATSI completed wetland/fish and wildlife reconnaissance reports on four of the six parcels located within the proposed project area which include parcel numbers P35839 (6 acre Brindal parcel), P123324 (21 acre Burkland parcel), P50416 (41 acre Nielson parcel), and P50414 (62 acre Goodyear-Nelson parcel) (ATSI 2004 and 2005; Figures 1 through 3). A biological evaluation for the proposed project was completed and submitted to the Corps (ATSI 2008). ATSI also prepared a mitigation plan for the proposed project (ATSI 2008; Figure 7). An Environmental Assessment is being prepared by a third party consultant for the proposed project (Appendix A). A water quality monitoring plan will be prepared by the USIT (Pacific Surveying and Engineering, Inc. (PSE) 2010).

2.0 PROPOSED PROJECT

2.1 Federal Authority/Agency Discretion

The federal authority for the proposed project is the BIA.

2.2 Purpose and Objectives

The purpose of the proposed project is to expand the existing resort facilities to support diversified economic growth for tribal members and the surrounding community (Appendix A; Figures 4 and 5). With a focus on tourism and hospitality, the objectives of the proposed project are to convert fee land to tribal trust land for construction of the proposed resort facilities (Appendix A; Figures 4 and 5).

2.3 Description

The proposed project includes conversion of approximately 134 acres of fee land into tribal trust land for construction and operation of 28 acres of proposed resort facilities that will include a recreation and hospitality facility with a hotel, indoor water park, meeting center, restaurant, spa, fitness center, gift shop, and lounge and infrastructure including parking lots, a parking garage, stormwater management facilities, and landscaping (Appendix A; Figures 4 and 5). The conservation measures described in Section 2.3.2 Conservation Measures will be utilized to minimize the potential effects to water quality/quantity that may result from the proposed project. Proposed mitigation for impacts to approximately 5 acres of wetlands that will result from the proposed project is described in Section 2.3.3 Mitigation (Figure 7).

2.3.0 Activities

Phase 1

An application to convert fee land to tribal trust land will be submitted in 2010 (Harper 2010; Figure 4).

Phase 2

Construction of the proposed resort facilities and proposed mitigation will be conducted in 2011 (Harper 2010; Figures 5 and 7). Construction will involve contractors and equipment including, but not limited to, chainsaws, excavators, backhoes, bulldozers, and dump trucks and building materials (Harper 2010). Land will be cleared and soil will be moved to prepare the proposed project area for construction. Excavated soil will be placed in the proposed soil stockpile (Figure 5).

2.3.1 Operational Characteristics

There are no known operational characteristics that will result from the proposed project.

2.3.2 Conservation Measures

Best Management Practices

The conservation measures that will be utilized during construction of the proposed resort facilities include the use of temporary erosion and sedimentation control Best Management Practices (BMPs) that will be developed by PSE to Ecology standards (Harper 2010).

Stormwater Control Plan

A preliminary Stormwater Control Plan (SCP) to Ecology standards has been developed to address water quality/quantity concerns (PSE 2010; Figure 5). The SCP includes construction of two stormwater management facilities with grass lined treatment and detention ponds, proposed stormwater management facilities #1 and #2, here and after referred to as the proposed stormwater facilities (ATSI 2008; Figure 5). In addition, the proposed stormwater facilities will discharge into a channel and stormwater management facility of the existing resort facilities before being released into a tributary of Bob Smith creek (ATSI 2008; Figure 5).

2.3.3 Mitigation

The proposed mitigation for fill and disturbance of approximately 5 acres of wetlands includes creation of approximately 9 acres of wetlands, installation of approximately 4,300 linear feet of fencing with Native Growth Protection Area signage, and placement of approximately 40 acres of land into a conservation easement for continued protection (ATSI 2008; Figure 7). The USIT will be the responsible party to provide funding to ensure that the wetland mitigation is implemented.

2.3.4 Underlying Action

There are no underlying actions of the proposed project and therefore there are no interdependent or interrelated actions as the proposed project actions are dependent and related. One potential underlying action would have been road access construction which was resolved in utilizing the existing resort facilities access, North Darrk Lane (Figure 5).

2.4 Ongoing and Previous Projects

A previous project within the action area (described below) included the construction of the existing resort facilities and mitigation located west and south of the proposed project area (Figures 2 and 3). Another previous project located within the action area, known as the Pulley Ridge project (Corps Reference Number 2002-4-00592 and Ecology Order Number 03SEANR-5414) located south of the proposed project area, included the construction of Bow Ridge Drive, a gas station, commercial structures, and a stormwater facility in which a No Effect (NE) determination was made (ATSI 2008; Figures 1 through 3).

2.5 Project and Action Areas

The action area for the proposed project was determined based on the maximum potential extent of direct and indirect effects that may result from the proposed project (Figures 5 and 6). The project area is the area in which the activities outlined in section 2.3.0 Activities will take place (Figures 5 and 6). Direct effects to wildlife habitat (vegetation and wetlands) are anticipated from clearing and filling of which the wetland effects will be mitigated for as described in section 2.3.3 Mitigation (Figures 2 through 7). Potential effects to fish habitat (water quality/quantity) from stormwater runoff are not anticipated because the proposed project will not occur instream and the conservation measures described in section 2.3.2 Conservation Measures will be in place (Figures 5 and 6). With the effects taken into consideration, the action area includes a 1 mile radius (approximately 500 acres) around the proposed project area (Figure 6).

2.5.0 Footprint and Potential Effect Areas

The footprint of the proposed project is located within the proposed project area within the action area (Figures 1 through 6). The proposed project area is comprised of approximately 134 acres located at the northeast corner of Bow Hill Road and North Darrk Lane in Skagit County, Washington (Figures 1 through 6). There are six parcels located within the proposed project area that include parcel numbers P35839 and P123324 which lie within a portion of Section 6, Township 35 North, Range 4 East, WM; P50416, P50414, and P119078 which lie within a portion of Section 31, Township 36 North, Range 4 East, WM; and P50500 which lies in a portion of Section 32, Township 36 North, Range 4 East, WM (Figures 2 through 5).

Direct effects to wildlife habitat (vegetation and wetlands) will occur as a result of the proposed project from clearing a portion of the site of native vegetation. Wetlands will be filled however the wetland effects will be mitigated for as described in section 2.3.3 Mitigation (Figures 2 through 7).

The footprint of the proposed stormwater facilities component of the proposed project is located within the proposed project area (Figures 2 through 5). Proposed stormwater management facilities #1 and #2 will discharge into a channel and stormwater management facility of the existing resort facilities before being released into a tributary of Bob Smith creek. This tributary flows into Bob Smith creek which flows into the Samish River and ultimately into Samish Bay, a portion of the Salish Sea/Puget Sound (Figures 1 through 6). Within the footprint of the stormwater facilities component of the proposed project, potential effects to fish habitat (water quality/quantity) from stormwater runoff are not anticipated due to the presence of the conservation measures described in section 2.3.2 Conservation Measures (Figures 2 through 6).

2.5.1 Location

The proposed project is located within United States Geological Survey Strait of Georgia watershed which has a Hydrological Unit Code of 17110002 (USEPA 2010). The proposed project is also located within a portion of Section 6, Township 35 North, Range 4 East, WM; Section 31, Township 36 North, Range 4 East, WM; and Section 32, Township 36 North, Range 4 East WM at Latitude 48°33'32" North and Longitude 122°20'47" West (Figure 1).

2.5.2 Potential Effect Area Quantifications

The proposed project area is approximately 134 acres in size (Figures 1 through 5). The action area, including the footprints of the potential effect areas of the proposed project and stormwater facilities, is approximately a 1 mile radius around the project area, comprising approximately 500 acres (Figures 1 through 6).

2.6 Maps

Maps are provided in Figures 1 though 7.

3.0 SPECIES AND CRITICAL HABITAT

3.1 Lists

Species lists were acquired from USFWS (Appendix B-Sections 13.2.0 and 13.2.1), NOAA (Appendix B-Section 13.2.2), WDFW (13 April 2010), and DNR (17 March 2010).

3.1.0 Listed Species

Of the endangered and threatened species provided on the lists in section 3.1 Lists, those chosen for review due to their potential presence within the action area include threatened bull trout (*Salvelinus confluentus*), Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), and Puget Sound steelhead (*Oncorhynchus mykiss*) (USFWS 2009 and NOAA 5 March 2010). The other species listed were not reviewed as their presence is unlikely due to lack of habitat.

Bull Trout

On 1 November 1999, bull trout was listed as threatened (USFWS 25 January 2010).

Puget Sound Chinook Salmon

The Puget Sound Chinook salmon Evolutionary Significant Unit (ESU) was listed as a threatened species on 24 March 1999 with its status reaffirmed on 28 June 2005 (NOAA, 5 March 2010). The Puget Sound Chinook salmon ESU includes all naturally spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound in Washington as well as 26 artificial propagation programs (NOAA 5 March 2010).

Puget Sound Steelhead

The Puget Sound steelhead Distinct Population Segment (DPS) was listed as threatened on 11 May 2007 (NOAA 5 March 2010). The Puget Sound steelhead DPS includes all naturally spawned anadromous winter-run and summer-run steelhead populations in streams in the river basins of Puget Sound in Washington and the Green River natural and Hamma Hamma winter-run steelhead hatchery stocks (NOAA 5 March 2010).

3.1.1 Designated Critical Habitat

Of the designated critical habitat provided on the lists in section 3.1 Lists, those chosen for review due to their potential presence within the action area include bull trout, Puget Sound Chinook salmon, and Puget Sound steelhead (USFWS 2009 and NOAA 5 March 2010). Puget Sound steelhead critical habitat status is currently under development (NOAA 5 March 2010). Critical habitat does not include habitat areas on Indian lands (USFWS 2 September 2005). The other designated critical habitats listed were not reviewed as their presence is unlikely (USFWS 2009 and NOAA 5 March 2010).

3.2 Species Descriptions

3.2.0 Bull Trout

Habitat

Bull trout have the most specific habitat requirements of any of the Pacific Northwest salmonids (USFWS 25 January 2010). Bull trout require the cold water temperatures; clean stream substrates for spawning and rearing; complex habitats, including streams with riffles and deep pools, undercut banks and large logs; and connections from river, lake, and ocean habitats to headwater streams for annual spawning and feeding migrations (USFWS 25 January 2010).

Distribution

Bull trout presence and presumed presence have been documented in the Samish River, downstream of the action area (WDFW 2003). *Bull trout require waters that are not necessarily found within the Samish River and no records of their presence have been recorded nor observed within the action area.

3.2.1 Chinook Salmon

Habitat

Juvenile Chinook salmon may spend from 3 months to 2 years in freshwater before migrating to estuarine areas as smolts and then into the ocean to feed and mature (NOAA 5 March 2010). They prefer streams that are deeper and larger than those used by other Pacific salmon species (NOAA 5 March 2010).

Distribution

Fall Chinook salmon presence, spawning, and rearing have been documented in the Samish River while presence has been documented in Bob Smith creek (WDFW 2003). *The run of Chinook salmon is of Green River origin that was introduced around the turn of the last century and therefore is not naturally spawned.

3.2.2 Steelhead

Habitat

Steelhead are capable of surviving in a wide range of temperature conditions (NOAA 5 March 2010). In streams, deep low-velocity pools are important wintering habitats (NOAA 5 March 2010). Spawning habitat consists of gravel substrates free of excessive silt.

Distribution

Winter steelhead presence, spawning, and rearing have been documented in the Samish River (WDFW 2003). *Steelhead are known to reside within the Samish River but not within Bob Smith creek.

*Statement based on ATSI's knowledge from field work within the Samish River and knowledge of the fish runs that are present within the river through field observations.

3.3 Critical Habitat Designation

3.3.0 Bull Trout

Geographical Extent

The geographical extent of bull trout designated critical habitat includes the Samish River downstream of the confluence with Bob Smith creek, south of the action area (USFWS 17 March 2010).

Primary Constituent Elements

In order to maintain bull trout populations, the critical habitat designation focuses on maintaining the following Primary Constituent Elements (PCEs): (1) protecting sufficient amounts of spawning and rearing habitat in upper watershed areas; (2) providing suitable habitat conditions in downstream rivers and lakes to provide foraging and overwintering habitat for fluvial and adfluvial fish; and (3) maintaining migratory routes and the potential for gene flow between populations by maintaining habitat conditions that allow for fish passage (USFWS 26 September 2005).

Activities that may destroy or adversely modify critical habitat are those that alter the PCEs to an extent that the conservation value of critical habitat for the bull trout is appreciably reduced. Activities that, when carried out, funded, or authorized by a Federal agency, may affect critical habitat and therefore result in consultation for the bull trout include, but are not limited to: (1) Detrimental altering of the minimum flow or the natural flow regime of any of the designated stream segments; (2) Alterations to the designated stream segments that could indirectly cause significant and detrimental effects to bull trout habitat; (3) Detrimental altering of the channel morphology of any of the designated stream segments; (4) Detrimental alterations to the water chemistry in any of the designated stream segments; (5) Proposed activities that are likely to result in the introduction, spread, or augmentation of nonnative aquatic species in any of the designated stream segments; and (6) Proposed activities that are likely to create significant instream barriers to bull trout movement (USFWS 26 September 2005).

3.3.1 Puget Sound Chinook Salmon

Geographical Extent

The geographical extent of Puget Sound Chinook salmon designated critical habitat includes the Samish River and Bob Smith creek, within the action area (USFWS 19 March 2010).

Primary Constituents Elements

See section 3.3.3 Puget Sound Chinook Salmon and Puget Sound Steelhead for a description of PCEs.

3.3.2 Puget Sound Steelhead

Geographical Extent

Puget Sound steelhead designated critical habitat may be present within the Samish River as species presence, spawning, and rearing have been documented (WDFW 2003) and *they are known to reside within the Samish River.

Primary Constituents Elements

See section 3.3.3 Puget Sound Chinook Salmon and Puget Sound Steelhead for a description of PCEs.

3.3.3 Puget Sound Chinook Salmon and Puget Sound Steelhead

Primary Constituents Elements

The PCEs essential for the conservation of the Puget Sound Chinook salmon and Puget Sound steelhead ESUs are those sites and habitat components that support one or more life stages, including: (1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development; (2) Freshwater rearing sites; (3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival; (4) Estuarine areas free of obstruction and excessive predation; (5) Nearshore marine areas free of obstruction and excessive predation; and (6) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation (USFWS 2 September 2005).

A wide variety of activities may affect critical habitat. Generally these include water and land management actions; timber sales and other vegetation management activities; irrigation diversions; road building and maintenance activities; and mining and road building/maintenance activities. Other actions of concern include dredge and fill, mining, diking, and bank stabilization activities, habitat modifications, and approval of water quality standards and pesticide labeling and use restrictions (USFWS 2 September 2005).

*Statement based on ATSI's knowledge from field work within the Samish River and knowledge of the fish runs that are present within the river through field observations.

4.0 ENVIRONMENTAL BASELINE

4.1 Project and Action Areas

The geographical area that the environmental baseline is being established for the proposed project includes the 1 mile radius of the action area described in section 2.5 Project and Action Areas (Figure 6).

4.2 Description

The known existing factors that may have affected and/or are affecting the environment of the potential species and critical habitat outlined in Section 3.0 SPECIES AND CRITICAL HABITAT present within the action area include the existing resort facilities, the Pulley Ridge project located adjacent to the proposed project area, Interstate 5, Old 99 South, Bow Hill Road, and adjacent farm land (Figures 1 through 6).

4.2.0 Impacts

The existing resort facilities were constructed within the action area in which the stormwater runoff may have affected/is affecting fish habitat (water quality/quantity) (Figures 2 through 6). The Pulley Ridge project was given a NE determination and therefore it is presumed that there are no resultant effects (ATSI 2008; Figures 1 through 6). Stormwater runoff from roads and farmland may affect water quality/quantity.

4.2.1 Justification

Utilizing those scientific based methods outlined in the wetland/fish and wildlife reconnaissance reports prepared for the parcels located within the proposed project area, the following habitats and species exist (ATSI 2004, 2005, and 2008; Figures 2 through 6):

Habitat

The proposed project area is comprised of a combination of upland and wetland areas that are fields, recently logged areas, gravel roads, and equipment storage areas.

A tributary of Bob Smith creek is located on and adjacent to the southwest portion of the proposed project area (Figures 2 through 6). The portion of the tributary of Bob Smith creek located within and adjacent to the proposed project area is within a steep well defined ravine. About 0.5 miles downstream of the proposed project area, Bob Smith creek has a gravel and cobble substrate and is approximately 6 to 8 feet wide in the meander channel with a standard width of stream flow about 3 to 4 feet wide. At the confluence with the Samish River, Bob Smith creek is about 6 to 12 inches deep and about 4 feet wide and is ditched. Overall, Bob Smith creek has numerous pieces of large woody debris.

Species

Hatchery stock Chinook salmon reside within the Samish River. It is likely these Chinook salmon can enter the lower portion of Bob Smith creek at the confluence with the Samish River, but it is unlikely that they enter the upper reaches because it is shallower and steeper upstream and because there is a passage barrier culvert located at Bow Hill Road.

4.2.2 Map

Maps of the vegetation and habitat are provided in Figures 2 and 4.

4.2.3 Photographs

No photographs of the action area were taken and, therefore, photographs are not provided.

4.3 Potential Affected Habitat Features

Direct effects to wildlife habitat (vegetation and wetlands) are anticipated from clearing and filling of which the wetland effects will be mitigated for as described in section 2.3.3 Mitigation (Figures 2 through 7). Potential effects to fish habitat (water quality/quantity) from stormwater runoff are not anticipated because the proposed project will not occur instream and the conservation measures described in section 2.3.2 Conservation Measures will be in place (Figures 5 and 6).

5.0 PROJECT EFFECTS

Direct, indirect, interdependent and interrelated, ongoing project activities, environmental baseline, and critical habitat effects to listed species and their designated critical habitat are not anticipated as the proposed project will not occur instream and the conservation measures described in section 2.3.2 Conservation Measures will be in place (Figures 5 and 6).

5.1 Data

There is no known data available, outside of this Biological Assessment (BA), concerning the impact of the proposed project on listed species or designated critical habitat. The BA has been prepared by Aqua-Terr Systems, Inc. (ATSI) staff that have been on and collected data within the action area. Data collected by ATSI have been prepared and presented within the reports referenced within this BA and include recent field reconnaissances of those portions of the action area that are relevant such as the proposed project site, the project area, the tributary to Bob Smith creek, Bob Smith creek, and the Samish River.

5.2 Effects Determinations

5.2.0 Listed Species and Designated Critical Habitat

A NE determination is recommended for listed species and their designated critical habitat as the proposed project will not occur instream, the conservation measures described in section 2.3.2 Conservation Measures will be in place, and a NE determination was made for the Pulley Ridge project located south of the proposed project area (Figures 5 and 6).

Listed Species

Bull Trout

A NE determination is recommended for bull trout. Although bull trout presence and presumed presence have been documented in the Samish River, they are downstream of the action area (WDFW 2003). *In addition, bull trout require waters that are not necessarily found within the Samish River and no records of their presence have been recorded nor observed within the action area.

Puget Sound Chinook Salmon
A NE determination is recommended for Puget Sound Chinook salmon. Although Fall Chinook salmon presence, spawning, and rearing have been documented in the Samish River and presence has been documented in Bob Smith creek (WDFW 2003), *the run is of Green River origin that was introduced around the turn of the last century and therefore is not naturally spawned.

Puget Sound Steelhead
A NE determination is recommended for Puget Sound steelhead. Although winter steelhead presence, spawning, and rearing have been documented in the Samish River (WDFW 2003) and *they are known to reside within the Samish River, see section 5.2.0 Listed Species and Designated Critical Habitat for reasoning which includes conservation measures, BMP utilization, and wetland mitigation.

*Statement based on ATSI's knowledge from field work within the Samish River and knowledge of the fish runs that are present within the river through field observations.

Designated Critical Habitat

Bull Trout
A NE determination is recommended for bull trout designated critical habitat. Although the geographical extent of bull trout designated critical habitat includes the Samish River, it is located downstream of the confluence with Bob Smith creek, south of the action area (USFWS 17 March 2010). *In addition, bull trout require waters that are not necessarily found within the Samish River and no records of their presence have been recorded nor observed within the action area.

Puget Sound Chinook Salmon
A NE determination is recommended for Puget Sound Chinook salmon designated critical habitat. Although the geographical extent of Puget Sound Chinook salmon designated critical habitat includes the Samish River and Bob Smith creek, within the action area (USFWS 19 March 2010), see section 5.2.0 Listed Species and Designated Critical Habitat for reasoning.

Puget Sound Steelhead
A NE determination is recommended for Puget Sound steelhead designated critical habitat. Although Puget Sound steelhead designated critical habitat may be present within the Samish River as species presence, spawning, and rearing have been documented (WDFW 2003) and *they are known to reside within the Samish River, see section 5.2.0 Listed Species and Designated Critical Habitat for reasoning.

*Statement based on ATSI's knowledge from field work within the Samish River and knowledge of the fish runs that are present within the river through field observations.

5.3 Summary

No effects are anticipated to occur to listed species or their designated critical habitat as the proposed project will not occur instream and the conservation measures described in section 2.3.2 Conservation Measures will be in place (Figures 5 and 6).

5.4 Tribal Effects

The proposed project will be constructed on tribal trust land after it is converted.

6.0 CUMMULATIVE EFFECTS

There are no known cumulative effects to listed species or their designated critical habitat that will result from the proposed project.

7.0 CONCLUSIONS

The proposed project is the construction of the proposed resort facilities (Figures 1 through 7). Of the endangered and threatened species located in Skagit County, Washington, there are three threatened species (bull trout, Puget Sound Chinook salmon, and Puget Sound steelhead) and their designated critical habitat potentially located within the action area. No effects are anticipated to occur to listed species or their designated critical habitat as the proposed project will not occur instream and the conservation measures described in section 2.3.2 Conservation Measures will be in place (Figures 5 and 6); therefore, a NE determination is recommended.

8.0 ESSENTIAL FISH HABITAT

8.1 Proposed Project

Refer to section 2.0 PROPOSED PROJECT for a description of the proposed project.

8.2 Fisheries Management Plan

Pacific coast groundfish, coastal pelagic, and west coast salmon Essential Fish Habitat (EFH) is located in Puget Sound and west coast salmon freshwater EFH is not located within the Samish River, therefore, no EFH is located within the action area (NOAA 24 March 2010).

8.3 Effects Determinations

A NE determination is recommended for EFH as there is none located within the action area (NOAA 24 March 2010).

8.4 Conservation Measures

Refer to section 2.3.2 Conservation Measures for a description of the conservation measures.

8.5 Conclusions

There is no EFH located within the action area and therefore a NE determination is recommended (NOAA 24 March 2010).

9.0 LIMITATIONS

We have used the most current, established methods to make determinations regarding listed species and designated critical habitat. All of the above statements are based on our best professional judgment. Although we follow the local, state, and federal criteria, we cannot guarantee that the local jurisdiction, Ecology, Corps, or other federal agency determination will correspond to ours. Please note that regulations pertaining to listed species and designated critical habitat are subject to change over time.

10.0 REFERENCES

Aqua-Terr Systems, Inc. 10 December 2004. *Wetland/Fish and Wildlife Reconnaissance, 6-acre Brindal parcel.*

Aqua-Terr Systems, Inc. 10 December 2004. *Wetland/Fish and Wildlife Reconnaissance, 20-acre Burkland parcel.*

Aqua-Terr Systems, Inc. 10 December 2004. *Wetland/Fish and Wildlife Reconnaissance, 40-acre Nielson parcel.*

Aqua-Terr Systems, Inc. 5 February 2005. *USIT Goodyear-Nelson parcel Wetland/Fish and Wildlife Reconnaissance.*

Aqua-Terr Systems, Inc. April 2008. *Upper Skagit Indian Tribe Wetland Mitigation Plan for Skagit Resort.*

Harper, R. H. 10 March 2010. Personal email communication.

National Oceanic and Atmospheric Administration Fisheries. Accessed 24 March 2010. Habitat Protection Division. Office of Habitat Conservation. Essential Fish Habitat website. *EFH Text Descriptions & GIS Data Inventory.* http://www.nmfs.noaa.gov/habitat/habitatprotection/efh/GIS_inven.htm

National Oceanic and Atmospheric Administration Fisheries. Accessed 5 March 2010. Office of Protected Resources. Marine and Anadromous Fish website. http://www.nmfs.noaa.gov/pr/species/fish/

Pacific Surveying and Engineering, Inc. 18 March 2010. Miles McEathron Personal email communication.

United States Environmental Protection Agency. 16 March 2010. Surf Your Watershed website. *Strait Of Georgia Watershed—17110002.* http://cfpub.epa.gov/surf/huc.cfm?huc_code=17110002 [Accessed 16 March 2010]

United States Fish and Wildlife Service. Accessed 19 March 2010. Critical Habitat Portal website. *FWS Critical Habitat for Threatened & Endangered Species.* http://criticalhabitat.fws.gov/

United States Fish and Wildlife Service. 13 January 2010. *Bull Trout (Salvelinus confluentus).* http://www.fws.gov/pacific/bulltrout/Biology.html [Accessed 25 January 2010]

United States Fish and Wildlife Service. 13 January 2010. Pacific Region. PowerPoint. *Bull Trout Proposed Critical Habitat.* http://www.fws.gov/pacific/bulltrout/ [Accessed 17 March 2010]

United States Fish and Wildlife Service. 16 December 2009. Washington Fish and Wildlife Office. *Endangered, Threatened, Proposed, and Candidate Species, Critical Habitat, and Species of Concern in Western Washington.* http://www.fws.gov/wafwo/pdf/species_list.pdf [Accessed 5 March 2010]

United States Fish and Wildlife Service. 1 November 2007. Western Washington Fish and Wildlife Office. *Listed and Proposed Endangered and Threatened Species and Critical Habitat; Candidate Species; and Species of Concern in Skagit County.* http://www.fws.gov/wafwo/speciesmap/SKAGIT.html [Accessed 5 March 2010]

United States Fish and Wildlife Service. 26 September 2005. Federal Register. Part II 50 CFR Part 17. *Endangered and Threatened Wildlife Plants; Designation of Critical Habitat for the Bull Trout: Final Rule.* http://www.fws.gov/pacific/bulltrout/FCH_05/BT_FCH_FR.pdf [Accessed 19 March 2010]

United States Fish and Wildlife Service. 2 September 2005. Federal Register. Part III 50 CFR Part 226. *Endangered and Threatened Wildlife Plants; Designation for 12 Evolutionary Significant Units of West Coast Salmon and Steelhead in Washington, Oregon, and Idaho: Final Rule.* http://www.nmfs.noaa.gov/pr/pdfs/fr/fr70-52630.pdf [Accessed 19 March 2010]

Washington Department of Fish and Wildlife. 13 April 2010. Priority Habitats and Species maps.

Washington Department of Fish and Wildlife. 2003. SalmonScape. http://wdfw.wa.gov/mapping/salmonscape/ [Accessed 22 March 2010].

Washington Department of Natural Resources. Accessed 17 March 2010. Available GIS Data website. *Natural Heritage-Rare Plants and High Quality Ecosystems.* http://fortress.wa.gov/dnr/app1/dataweb/dmmatrix.html

11.0 BIBLIOGRAPHY

Cooke, S.S. (editor). 1997. *A Field Guide to the Common Wetland Plants of Western Washington and Northwestern Oregon.* Seattle Audubon Society, Washington Native Plant Society. Seattle, Washington.

Cowardin, L.M. V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* Office of Biological Services, Fish and Wildlife Service, United States Department of the Interior. FWS/OBS-79/31.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual,* Technical Report Y-87-1, United States Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Federal Register. 12 March 2007. Part II. Reissuance of Nationwide Permits; Notice. http://www.epa.gov/owow/wetlands/pdf/2007NWPFedReg3-12-07.pdf

Franklin, J.F. and C.T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. Oregon State University Press. Corvallis, Oregon.

Granger, T., T. Hruby, A. McMillan, D. Peters, D. Sheldon, S. Stanley, and E. Stockdale. April 2005. Wetlands in Washington State – Volume 2: Guidance for Protecting and Managing Wetlands. Washington State Department of Ecology. Publication #05-06-008. Olympia, Washington.

Haeussler, S., D. Coates, and J. Mather. 1990. *Autecology of Common Plants in British Columbia: A Literature Review.* FRDA Report 158. British Columbia. Ministry of Forestry and Canada - B.V. Forest Resource Development Agreement; Victoria, British Columbia.

Hitchcock, C.L. and A. Cronquist. 1973. *Flora of the Pacific Northwest.* University of Washington Press. Seattle, Washington.

Holling, C.S. (editor). 1978. *Adaptive Environmental Assessment and Management.* John Wiley, New York.

Hruby, T., T. Granger, K. Brunner, S. Cooke, K. Dublanica, R. Gersib, L. Reinelt, K. Richter, D. Sheldon, E. Teachout, A. Wald, and F. Weinmann. July 1999. *Methods for Assessing Wetland Functions Volume 1: Riverine and Depressional* Wetlands in the Lowlands of Western Washington. Washington State Department Ecology Publication #99-115.

Leonard W.P., H.A. Brown, L.L.C. Jones, K.R. McAllister, and R.M. Storm. 1993. *Amphibians of Washington and Oregon.* Seattle Audubon Society. Seattle, Washington.

Mitsch, W.J. and J.G. Gosselink. 2000. *Wetlands*, 3rd edition. John Wiley and Sons, New York. 920 pp.

Peterson, R.T. 1990. *A Field Guide to Western Birds.* Peterson Field Guides. Houghton Mifflin Co. Boston, Massachusetts.

Richardson, J.L. and M.J. Vepraskas (Editors). 2001. *Wetland Soils: Genesis, Hydrology, Landscapes, and Classification.* Lewis Publishers, Boca Raton, Florida.

Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, T. Granger, S. Stanley, and E. Stockdale. March 2005. Wetlands in Washington State–Volume 1: A Synthesis of the Science. Washington State Department of Ecology. Publication #05-06-006. Olympia, Washington.

Stebbins, R.C. 1985. *A Field Guide to Western Reptiles and Amphibians,* 2nd edition. Houghton Mifflin Co. Boston, Massachusetts.

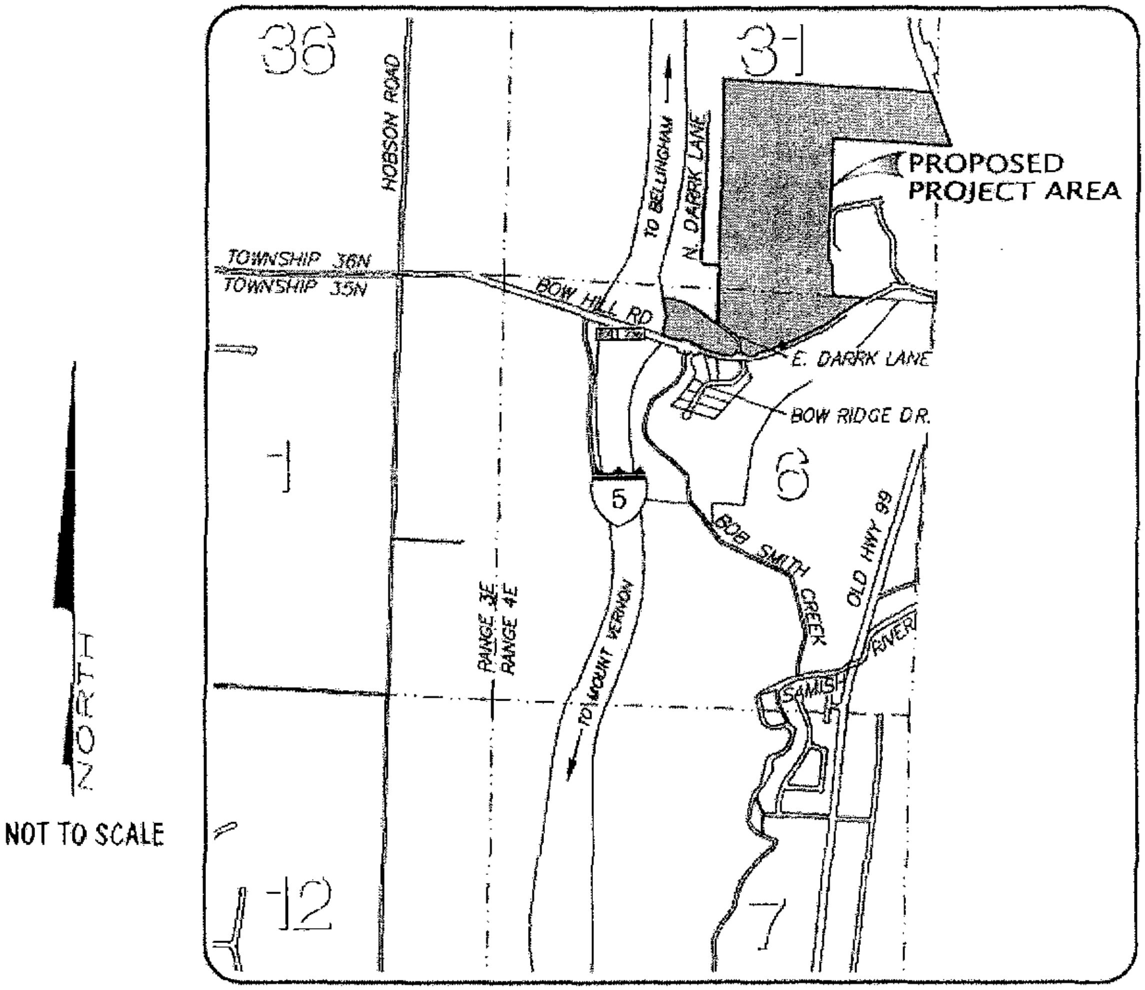
Tiner, R. W. 1999. *Wetland Indicators, A Guide to Wetland Identification, Delineation, Classification, and Mapping.* Lewis Publishers, Boca Raton, Florida.

United States Department of the Interior, Fish and Wildlife Service. 1977. National Wetlands Inventory Maps, Scale 1:24,000. Office of Biological Services

12.0 FIGURES

UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004

SITUATE IN A PORTIONS OF THE SW 1/4 OF SECTION 31, TOWNSHIP 36 NORTH, RANGE 4 EAST & NW 1/4 OF SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M., SKAGIT COUNTY, WASHINGTON
LATITUDE: 48°33'32" N, LONGITUDE: -122°20'47" W



VICINITY MAP

DIRECTIONS TO SITE:
-FROM INTERSTATE 5, TAKE EXIT 236 (BOW HILL RD)
-HEAD EAST ON BOW HILL ROAD
-TURN NORTH ON E. DARRK LN

PACIFIC SURVEY & ENGINEERING, INC.	VICINITY MAP UPPER SKAGIT INDIAN TRIBE – BIOLOGICAL ASSESSMENT BOW HILL RESORT EXPANSION	FIGURE 1 PREPARED: MARCH 19, 2010

UPPER SKAGIT INDIAN TRIBE

25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004

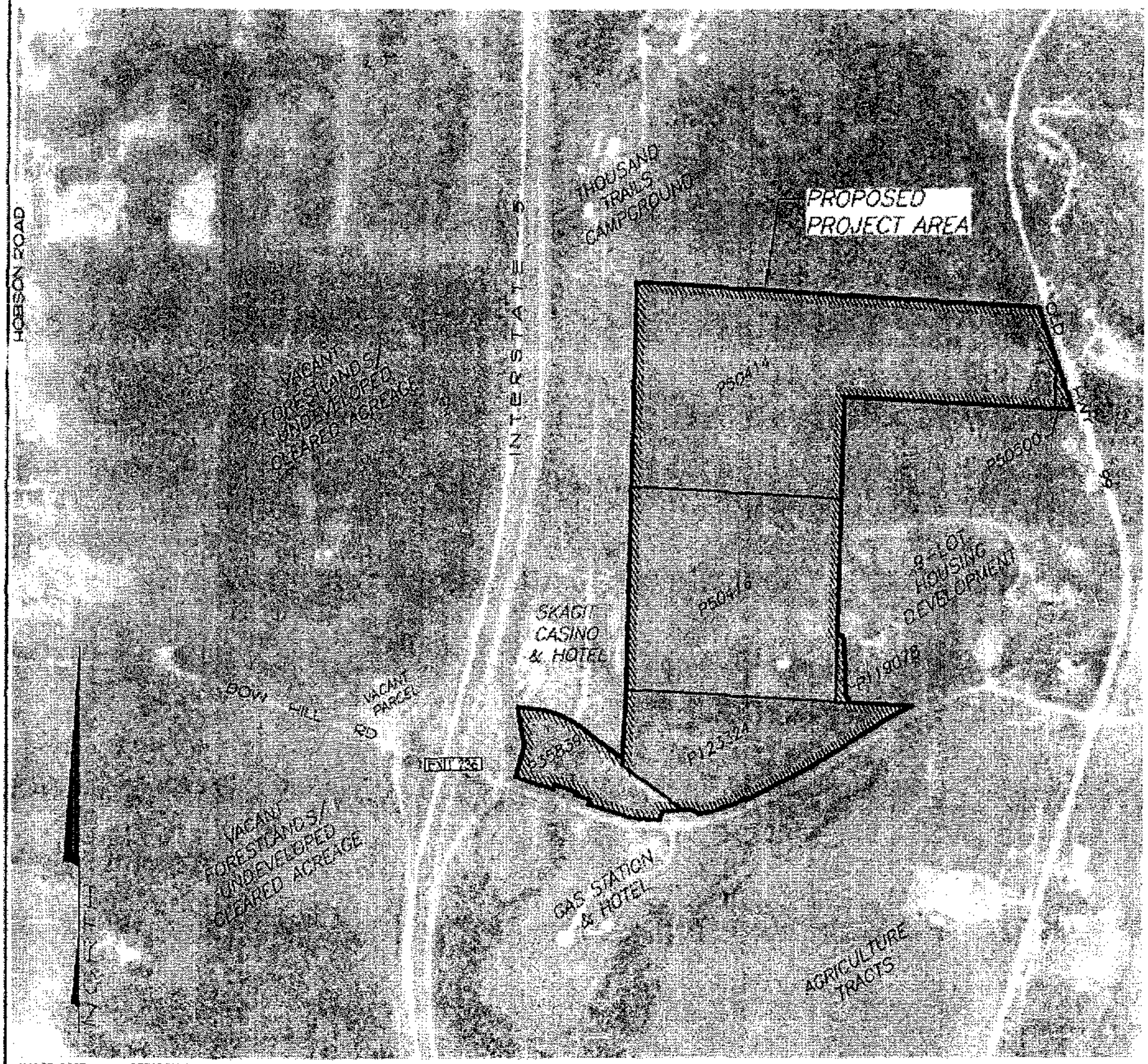


IMAGE: 2007 SKAGIT COUNTY iMAP

NOT TO SCALE

PACIFIC SURVEY & ENGINEERING, INC.

AERIAL PHOTOGRAPH

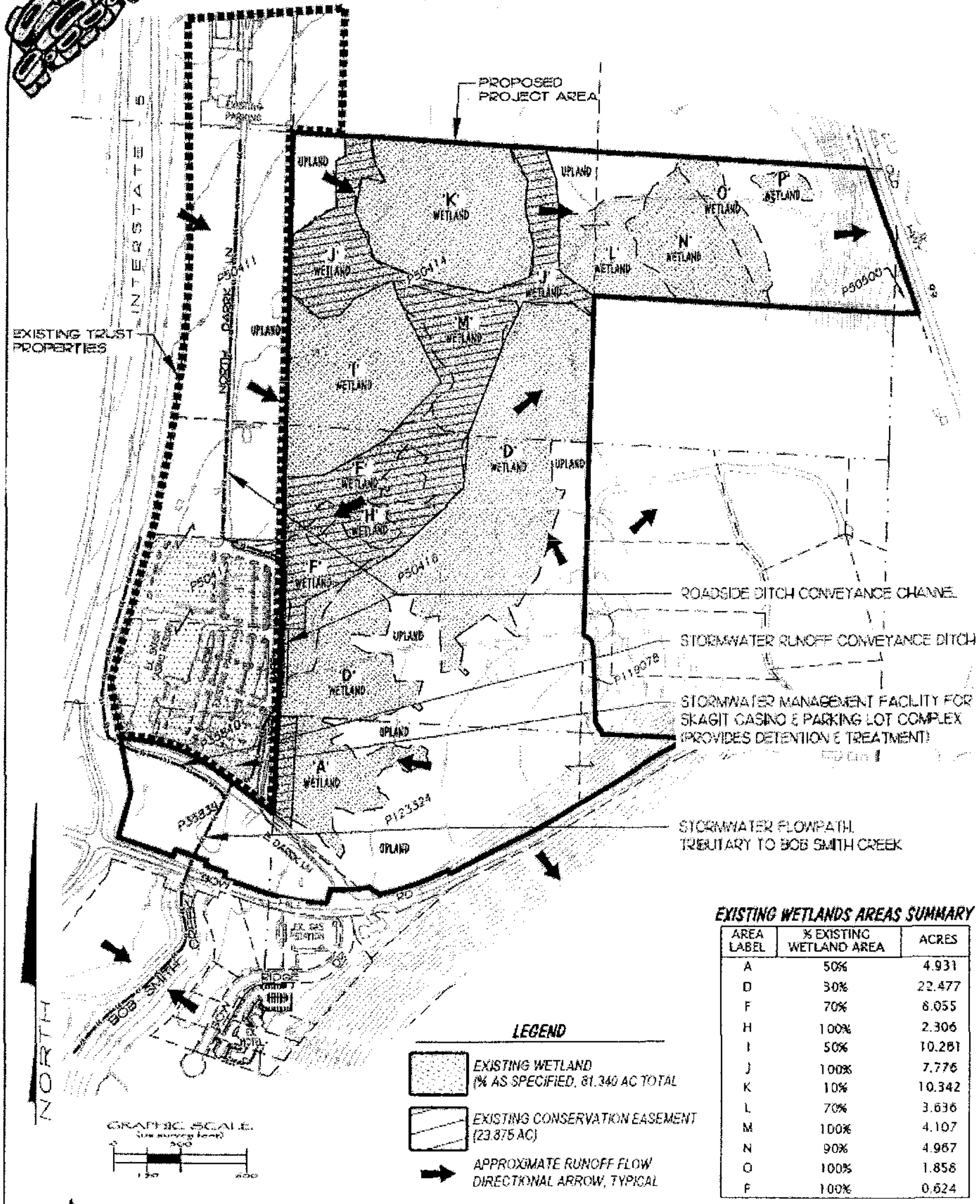
UPPER SKAGIT INDIAN TRIBE -- BIOLOGICAL ASSESSMENT
BOW HILL RESORT EXPANSION

FIGURE 2

PREPARED: MARCH 18, 2010

UPPER SKAGIT INDIAN TRIBE

25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004



LEGEND

- EXISTING WETLAND (% AS SPECIFIED, 81.340 AC TOTAL
- EXISTING CONSERVATION EASEMENT (23.875 AC)
- APPROXIMATE RUNOFF FLOW DIRECTIONAL ARROW, TYPICAL

EXISTING WETLANDS AREAS SUMMARY

AREA LABEL	% EXISTING WETLAND AREA	ACRES
A	50%	4.931
D	30%	22.477
F	70%	6.055
H	100%	2.306
I	50%	10.281
J	100%	7.776
K	10%	10.342
L	70%	3.636
M	100%	4.107
N	90%	4.967
O	100%	1.858
P	100%	0.624

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225

EXISTING CONDITIONS

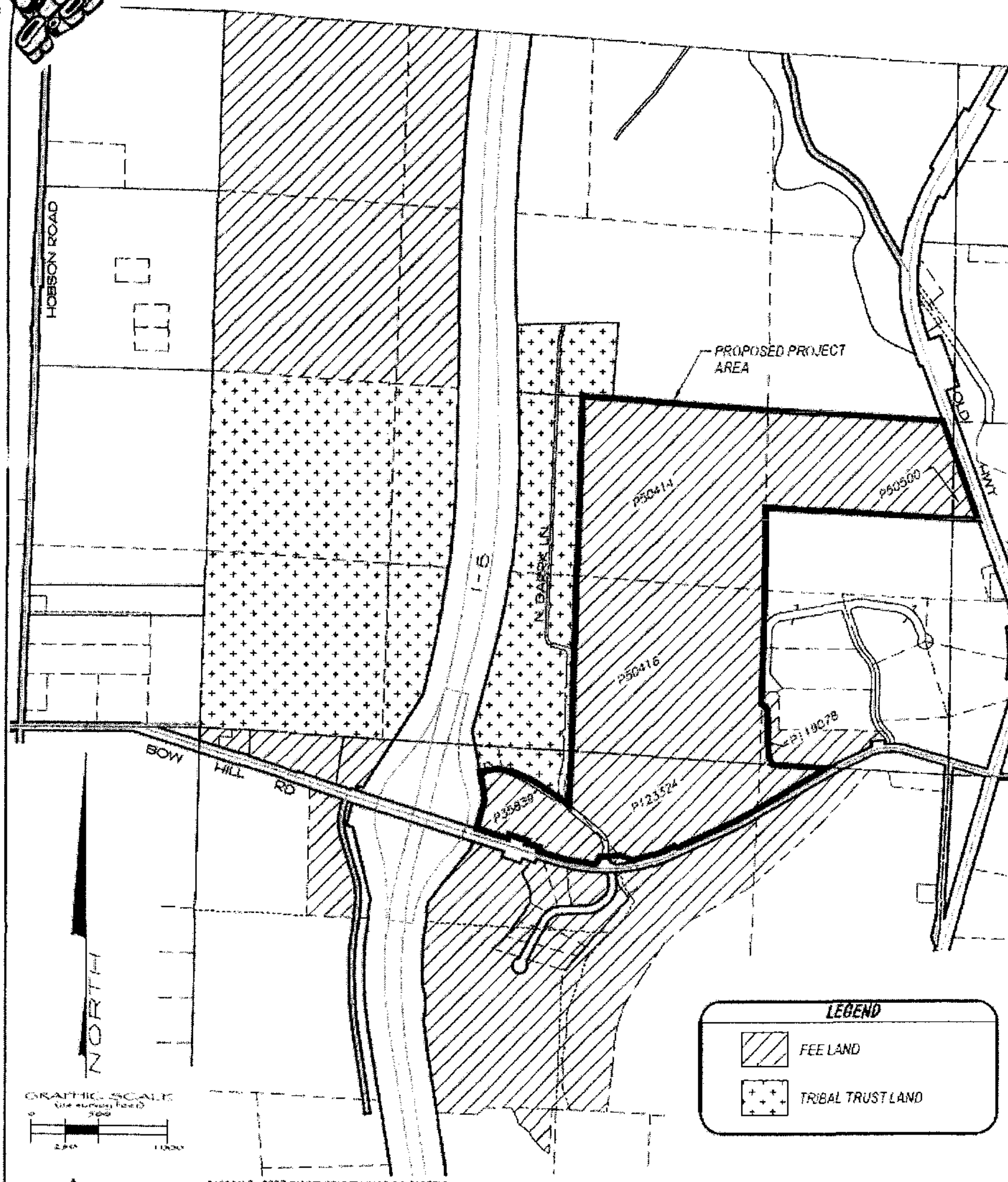
UPPER SKAGIT INDIAN TRIBE -- BIOLOGICAL ASSESSMENT
BOW HILL RESORT EXPANSION

FIGURE 3

PREPARED: MARCH 18, 2010

UPPER SKAGIT INDIAN TRIBE

25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004



BASE MAP: 2007 SKAGIT COUNTY iMAP GIS PARCELS

PACIFIC SURVEY & ENGINEERING, INC.

PROPOSED PROJECT CONDITIONS - CONVERT FEE LAND TO TRIBAL TRUST LAND

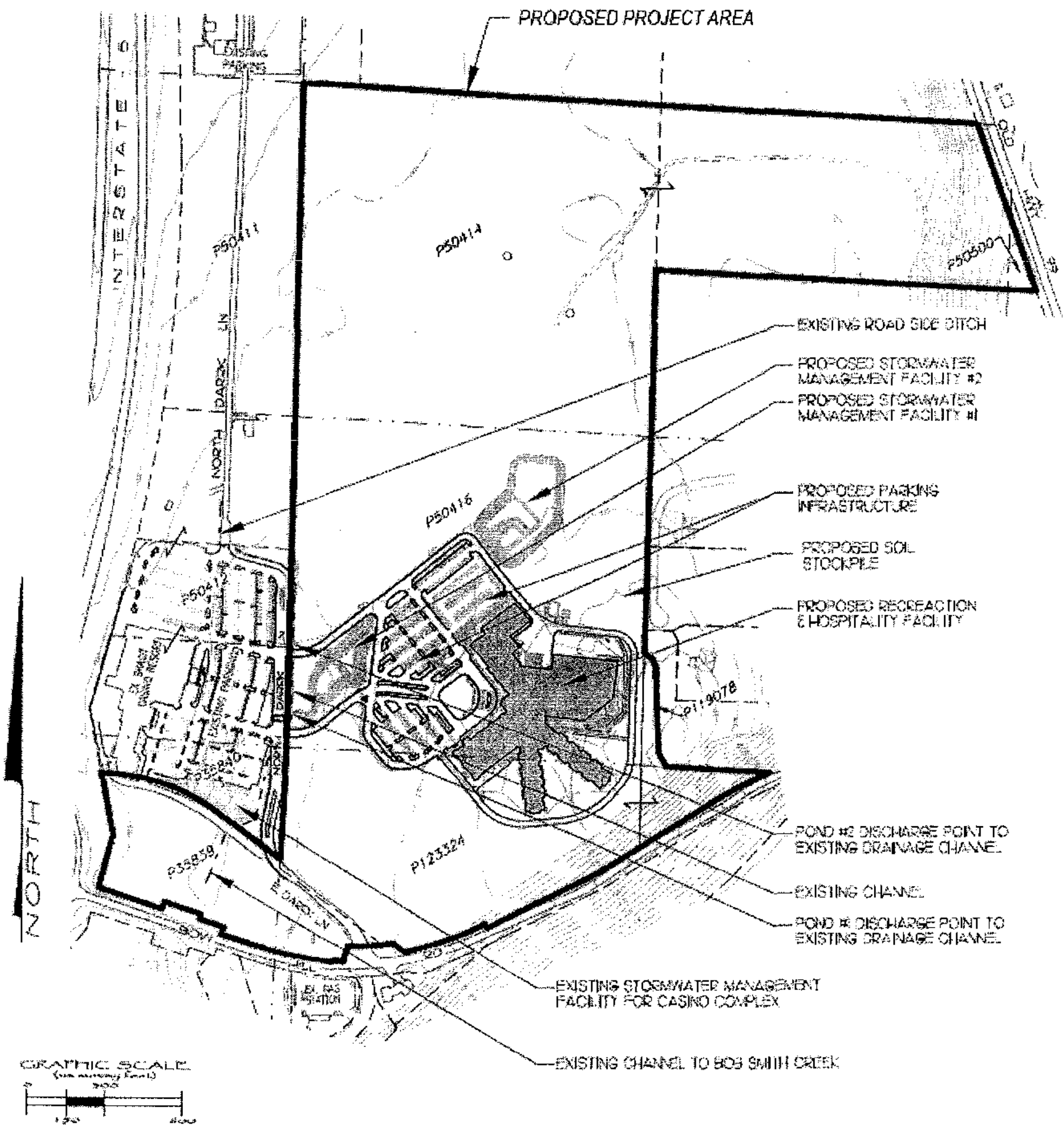
UPPER SKAGIT INDIAN TRIBE ~ BIOLOGICAL ASSESSMENT

BOW HILL RESORT EXPANSION

FIGURE 4

PREPARED: MARCH 18, 2010

UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004



PACIFIC SURVEY & ENGINEERING, INC.

PROPOSED PROJECT CONDITIONS - RESORT CONSTRUCTION

UPPER SKAGIT INDIAN TRIBE ~ BIOLOGICAL ASSESSMENT
BOW HILL RESORT EXPANSION

FIGURE 5

PREPARED: MARCH 18, 2010

UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004

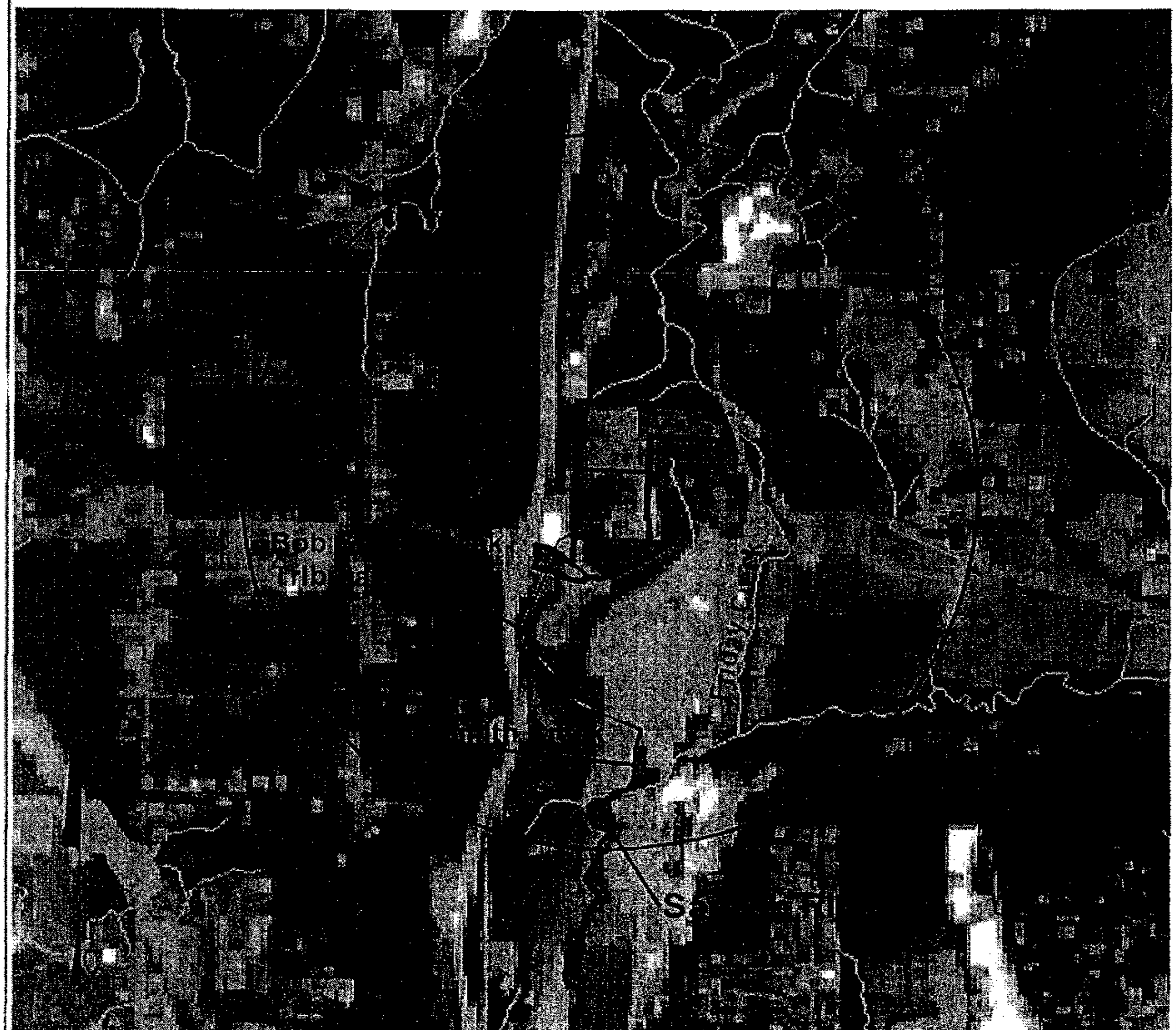


IMAGE: Washington Department of Fish and Wildlife Salmonscape

1 Mile Action Area

ATSI
Aquatic Systems, Inc.

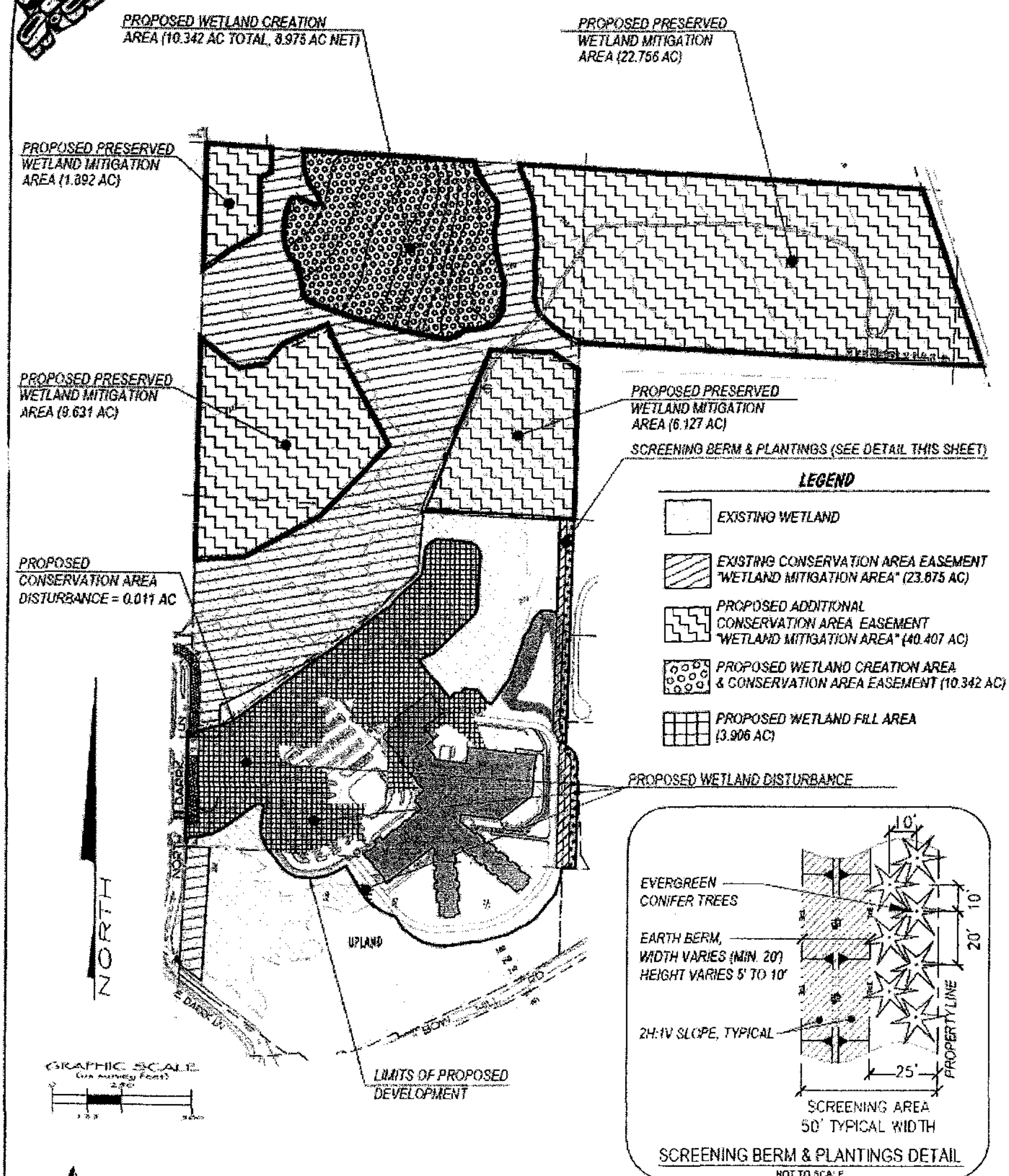
ACTION AREA
UPPER SKAGIT INDIAN TRIBE ~ BIOLOGICAL ASSESSMENT
BOW HILL RESORT EXPANSION

FIGURE 6

PREPARED: MARCH 22, 2010

UPPER SKAGIT INDIAN TRIBE

25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004



PACIFIC SURVEY & ENGINEERING, INC.

WETLAND IMPACTS & MITIGATION

UPPER SKAGIT INDIAN TRIBE ~ BIOLOGICAL ASSESSMENT
BOW HILL RESORT EXPANSION

FIGURE 7

PREPARED: MARCH 18, 2010

13.0 APPENDICES

13.1 Appendix A. Upper Skagit Indian Tribe-Bow Hill Trust Conversion and Resort Expansion 25 June 2010 Letter

UPPER SKAGIT INDIN TRIBE
25944 Community Plaza Way
Sedro-Woolley, WA 98284
Phone: (360) 854-7000 • Fax: (360) 854-7004

June 25, 2010
Skagit County Public Utility
District No. 1
P.O. Box 1436
Mt. Vernon, WA 98273-1436

Subject: Upper Skagit Indian Tribe
Bow Hill Fee-to-Trust Conversion Application and Proposed Resort Expansion

To Whom It May Concern:

The Upper Skagit Indian Tribe (Tribe) has one of its Reservation areas located at Exit 236 of Interstate 5 at Bow Hill Road in Skagit County, WA. This Reservation (all trust land) was previously set aside for economic development and currently houses the Tribe's existing Resort facilities, including the casino and neighboring hotel along with associated parking and infrastructure. The Tribe is in the process of preparing an application to the Bureau of Indian Affairs to convert approximately 134.13 acres of contiguous fee land into federal trust status for additional economic, non-gaming development. The purpose of this proposed trust conversion is to allow expansion of the Resort facilities to support diversified economic growth for tribal members and the surrounding community. Additional details regarding the proposed Resort expansion are included in the attached Project Description.

The Tribe is having an independent, third-party consultant prepare an Environmental Assessment pursuant to the National Environmental Policy Act (NEPA). The purpose of this letter is to provide your agency with an opportunity to submit formal comments to the Tribe at the address listed herein on the proposed trust conversion and Resort expansion. All comments received will be considered during the environmental review required under NEPA and will be included in the Environmental Review Record that is currently being compiled. Receipt of your comments is requested by July 25, 2010. A Site Map showing the subject property is attached.

Thank you for considering this request. We look forward to receiving your comments.

Sincerely,

Jennifer Washington, Chairman

Harold Chesnin
General Counsel to the Upper Skagit Indian Tribe
Encl.

Upper Skagit Indian Tribe
Bow Hill Fee-to-Trust Application and Proposed Resort Expansion
Comment Request Letter – June 14, 2010

Agencies to receive request for comment

Federal

National Oceanic and Atmospheric Administration / National Marine Fisheries Service
United States Department of the Army, Corps of Engineers, Seattle District
United States Environmental Protection Agency
United States Fish and Wildlife Service

State

Northwest Clean Air Agency
Washington Department of Archaeology and Historic Preservation
Washington Department of Ecology
Washington Department of Fish and Wildlife
Washington Department of Natural Resources
Washington Department of Transportation

County

Skagit County Commissioners
Skagit County Fire Marshall
Skagit County Planning and Development Services
Skagit County Public Works

Local and Other

City of Burlington
County Fire District No. 14 (Alger)
Samish Water District
Skagit PUD No. 1

UPPER SKAGIT INDIAN TRIBE

SKAGIT RESORT EXPANSION

PROJECT DESCRIPTION

The proposed project involves the conversion of approximately 134.13 acres (the "Land") of fee land into trust land for non-gaming hospitality / economic development purposes. The Land proposed for conversion is located immediately adjacent to and contiguous with the Upper Skagit Tribe's Bow Hill Reservation trust parcel, which Reservation parcel was previously taken into trust and declared Reservation by the United States. All of the land in question is located in Skagit County, Washington. Specifically, the proposed trust conversion and Resort expansion area is located in the SE ¼ of Section 31 and the NW ¼ of the SW ¼ of Section 32, Township 36 North; and the NE ¼ of the NW ¼ and the N ½ of the NE ¼ of Section 6, Township 35 North, all within Range 04 East of W.M.

The Tribe intends to use the Land, after conversion from fee to trust, for a hotel, indoor water park and conference space, all non-gaming, economic development activities that focus on the tourism and hospitality industry. Specifically, the Tribe intends to build, own and operate the hotel, indoor water park and meeting center including restaurant, spa, fitness center, gift shop, and lounge together with associated parking and other infrastructure on approximately 42 acres of the Land. See the attached Site Map.

Utilities

The Land is already served by public and private utilities. Domestic water is currently supplied to the existing Resort by the Skagit County Public Utility District No. 1. Adequate storage and transmission capacities are available to serve the proposed Resort expansion. Sanitary sewer service is provided by the Samish Water District and the City of Burlington. Adequate transmission and treatment and disposal capacities are currently available to serve the proposed Resort expansion. Stormwater runoff resulting from the proposal will be treated and detained on the site consistent with the Washington State Department of Ecology Stormwater Management Manual for Western Washington, 2005. Electrical power is currently available adjacent to the site and is provided by Puget Sound Energy.

Roads

Access to the Land is available from Interstate 5 at Exit 236, Bow Hill Road and Darrk Lane. Based on the traffic impact analysis prepared by Transportation Solutions, Inc. the proposed Resort expansion will not cause any roads or intersections to operate below adopted Level of Service standards.

Wetlands

Approximately 4 acres of wetlands will be filled to allow construction of the proposed Resort expansion, including buildings, accessory structures, parking and drainage facilities. A wetland mitigation plan has been prepared by Aqua-Terr Systems, Inc. that demonstrates that mitigation for all wetland impacts will be provided on the subject site through wetland creation and enhancement and through permanent preservation of existing and enhanced wetland areas.

Threatened and Endangered Species

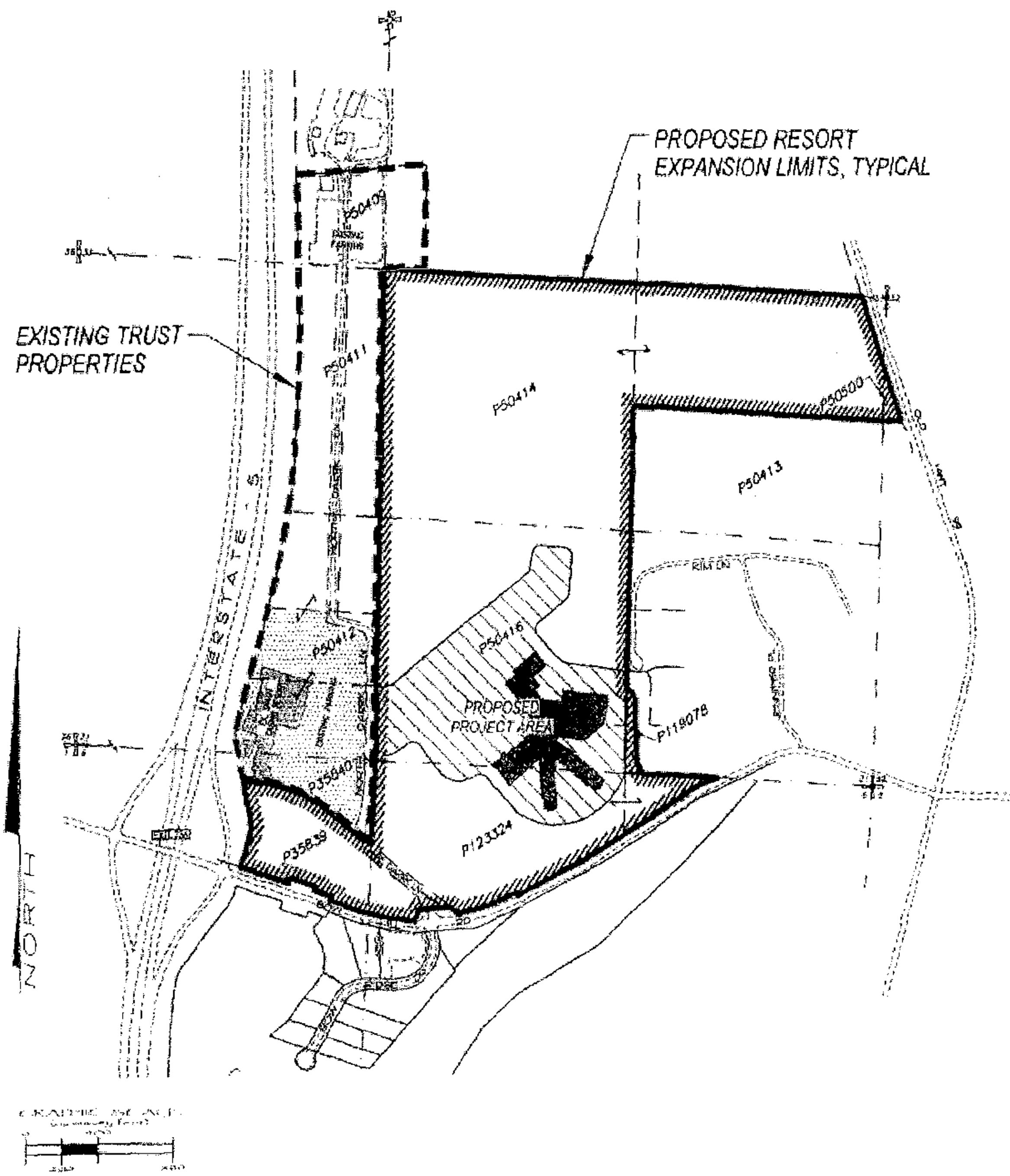
No species identified as threatened or endangered under the federal Endangered Species Act have been observed on the subject site. Based on the Biological Assessment prepared by Aqua-Terr Systems, Inc., the proposed Resort expansion project will have no effect on species listed as threatened, endangered or candidate species under federal or state ESA regulations.

Historic or Cultural Resources

No site listed as a known archaeological, historic or cultural site on state or federal registers has been identified as being located on the subject site. Based on the archaeological and cultural resource assessment prepared by Equinox Research and Consulting International, the proposed Resort expansion is not anticipated to have any adverse effect on archaeological, historic or cultural resources.

UPPER SKAGIT INDIAN TRIBE

25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284. 360-854-7000, FAX: 360-854-7004



PACIFIC SURVEY & ENGINEERING, INC.

UPPER SKAGIT INDIAN TRIBE – ENVIRONMENTAL ASSESSMENT

BOW HILL RESORT EXPANSION

UPDATED: JUNE 10, 2010

SITE MAP

13.2 Appendix B. Species and Critical Habitats Lists

13.2.0 United States Fish and Wildlife Service-Endangered, Threatened, Proposed, and Candidate Species, Critical Habitat, and Species of Concern in Western Washington.

ENDANGERED, THREATENED, PROPOSED, AND CANDIDATE SPECIES, CRITICAL HABITAT, AND SPECIES OF CONCERN IN WESTERN WASHINGTON[1]

COMMON NAME	SCIENTIFIC NAME	RECOVERY PRIORITY NUMBER
Endangered Animals		
Columbian white-tailed deer	*Odocoileus virginianus leucurus*	9c
Gray wolf	*Canis lupus*	3c
Leatherback sea turtle	*Dermochelys coriacea*	1
Short-tailed albatross	*Phoebastria albatrus*	8
Endangered Plants		
Bradshaw's desert-parsley	*Lomatium bradshawii*	2
Marsh sandwort	*Arenaria paludicola*	5
Threatened Animals		
Bull trout (Coastal-Puget Sound and Columbia River DPS)	*Salvelinus confluentus*	9c
Canada lynx	*Lynx canadensis*	15
Green sea turtle	*Chelonia mydas*	1c
Grizzly bear	*Ursus arctos horribilis*	3c
Loggerhead sea turtle	*Caretta caretta*	7c
Marbled murrelet	*Brachyramphus marmoratus*	2
Northern spotted owl	*Strix occidentalis caurina*	6c
Olive ridley sea turtle	*Lepidochelys olivacea*	8c
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	3c
Western snowy plover	*Charadrius alexandrinus nivosus*	3c
Threatened Plants		
Golden paintbrush	*Castilleja levisecta*	2
Kincaid's lupine	*Lupinus sulphureus* ssp. *Kincaidii*	9
Nelson's checker-mallow	*Sidalcea nelsoniana*	5
Water howellia	*Howellia aquatilis*	7

Designated Critical Habitat

Marbled murrelet
Northern spotted owl
Western snowy plover, Pacific Coast Population
Bull Trout
Kincaid's lupine

Proposed Species

Dolly Varden (*Salvelinus malma*) similarity of appearance

Proposed Critical Habitat

Revised marbled murrelet critical habitat

COMMON NAME	SCIENTIFIC NAME	LISTING PRIORITY NUMBER
Candidate[2] Animals		
Fisher (West Coast DPS)	*Martes pennanti*	6
Mardon skipper	*Polites mardon*	8
Mazama pocket gopher	*Thomomys mazama* (ssp. *couchi, douglasii, glacialis, louiei, melanops, pugetensis, tacomensis, tumuli, yelmensis*)	3
Oregon spotted frog	*Rana pretiosa*	2
Streaked horned lark	*Eremophila alpestris strigata*	3
Taylor's (Whulge or Edith's) checkerspot butterfly	*Euphydryas editha taylori*	3
Yellow-billed cuckoo	*Coccyzus americanus*	3
Candidate[2] Plants		
Northern wormwood	*Artemisia campestris* ssp. *borealis* var. *wormskioldii*	3
Animal Species of Concern[3]		
Aleutian Canada goose	*Branta canadensis leucopareia*	
Bald eagle	*Haliaeetus leucocephalus*	
Beller's ground beetle	*Agonum belleri*	
Brown pelican	*Pelecanus occidentalis*	
California bighorn sheep	*Ovis canadensis californiana*	
California floater (mussel)	*Anodonta californiensis*	
California wolverine	*Gulo gulo luteus*	
Cascades frog	*Rana cascadae*	
Cassin's auklet	*Ptychoramphus aleuticus*	
Coastal cutthroat trout	*Oncorhynchus clarki clarki*	
Columbia pebblesnail	*Fluminicola columbianus*	
Columbia torrent salamander	*Rhyacotriton kezeri*	
Destruction Island shrew	*Sorex trowbridgii destructioni*	
Fender's soliperlan stonefly	*Soliperla fenderi*	
Fringed myotis (bat)	*Myotis thysanodes*	
Hatch's click beetle	*Eanus hatchi*	
Island large marble butterfly	*Euchloe ausonides insulanus*	
Larch Mountain salamander	*Plethodon larselli*	
Long-eared myotis	*Myotis evotis*	
Long-legged myotis	*Myotis volans*	
Makah's copper butterfly	*Lycaena mariposa charlottensis*	
Margined sculpin	*Cottus marginatus*	
Newcomb's littorine snail	*Algamorda newcombiana*	
Northern goshawk	*Accipiter gentilis*	
Northern sea otter	*Enhydra lutris kenyoni*	
Northwestern pond turtle	*Emys (= Clemmys) marmorata marmorata*	
Olive-sided flycatcher	*Contopus cooperi*	
Olympic torrent salamander	*Rhyacotriton olympicus*	
Oregon vesper sparrow	*Pooecetes gramineus affinis*	

COMMON NAME	SCIENTIFIC NAME
Animal Species of Concern[3] (Cont'd)	
Pacific lamprey	*Lampetra tridentata*
Pacific Townsend's big-eared bat	*Corynorhinus townsendii townsendii*
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*
Peregrine falcon	*Falco peregrinus*
River lamprey	*Lampetra ayresi*
Small-footed myotis	*Myotis ciliolabrum*
Slender-billed white-breasted nuthatch	*Sitta carolinensis aculeata*
Tailed frog	*Ascaphus truei*
Tufted puffin	*Fratercula cirrhata*
Valley silverspot butterfly	*Speyeria zerene bremnerii*
Van Dyke's salamander	*Plethodon vandykei*
Western gray squirrel	*Sciurus griseus griseus*
Westslope cutthroat trout	*Oncorhynchus (=Salmo) clarki lewisi*
Western toad	*Bufo boreas*
Plant Species of Concern[3]	
Barrett's beardtongue	*Penstemon barrettiae*
Clackamas corydalis	*Corydalis aquae-gelidae*
Clustered lady's slipper	*Cypripedium fasciculatum*
Columbia yellow-cress	*Rorippa columbiae*
Cotton's milk-vetch	*Astragalus australis* var. *olympicus*
Footsteps of spring; bear's foot sanicle	*Sanicula arctopoides*
Frigid shootingstar	*Dodecatheon austrofrigidum*
Gorge daisy	*Erigeron oreganus*
Howell's daisy	*Erigeron howellii*
Obscure paintbrush	*Castilleja cryptantha*
Oregon sullivantia	*Sullivantia oregana*
Pale blue-eyed grass	*Sisyrinchium sarmentosum*
Pale larkspur	*Delphinium leucophaeum*
Pink sandverbena	*Abronia umbellata* ssp. *Acutalata*
Queen of the forest	*Filipendula occidentalis*
Rose checker-mallow	*Sidalcea malviflora* ssp. *Virgata*
Seely's silene	*Silene seelyi*
Stalked moonwort	*Botrychium pedunculosum*
Tall bugbane	*Cimicifuga elata*
Torrey's peavine	*Lathyrus torreyi*
Triangular-lobed moonwort	*Botrychium ascendens*
Whitebark pine	*Pinus albicaulis*
White meconella	*Meconella oregana*
White-top aster	*Sericocarpus rigidus*

[1]Hyperlinks are provided for species specific information available from the U.S. Fish and Wildlife Service's Environmental Conservation Online System. Recovery plans, listing actions, and critical habitat information are available at these hyperlinks.

[2]Candidate species are those species for which FWS has sufficient information to propose for listing. Hyperlinks are provided where available for electronic candidate forms or *Federal Register* notice of petition finding.

[3]Species of concern are those species whose conservation status is of concern to FWS, but more information is needed.

NOAA Fisheries threatened and endangered species list:
http://www.nmfs.noaa.gov/prot_res/species/ESA_species.html

Information for eastern Washington species can be found on the Upper Columbia Fish and Wildlife Office web page and for all listed species on the U.S. Fish and Wildlife Service Endangered Species Home Page.

13.2.1 United States Fish and Wildlife Service-Listed and Proposed Endangered and Threatened Species and Critical Habitat; Candidate Species; and Species of Concern in Skagit County.

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN SKAGIT COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WESTERN WASHINGTON FISH AND WILDLIFE OFFICE

(Revised November 1, 2007)

LISTED

Bull trout (*Salvelinus confluentus*)

Canada lynx (*Lynx canadensis*)

Gray wolf (*Canis lupus*)

Grizzly bear (*Ursus arctos = U. a. horribilis*)

Marbled murrelet (*Brachyramphus marmoratus*)

Northern spotted owl (*Strix occidentalis caurina*)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.

3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for bull trout

Critical habitat for the marbled murrelet

Critical habitat for the northern spotted owl

PROPOSED

Dolly Varden (*Salvelinus malma*) due to similarity of appearance

CANDIDATE

Oregon spotted frog (*Rana pretiosa*)

SPECIES OF CONCERN

Bald eagle (*Haliaeetus leucocephalus*)
California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana cascadae*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend=s big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Western toad (*Bufo boreas*)
Meconella oregana (white meconella)

13.2.2 National Oceanic and Atmospheric Administration - Marine/Anadromous Fish Species Under the Endangered Species Act.

NOAA Fisheries
Office of Protected Resources

Marine/Anadromous Fish Species Under the Endangered Species Act (ESA)

List of Fish Species under NMFS' Jurisdiction
(E = "endangered"; T = "threatened"; F = "foreign"; n/a = not applicable^)

Marine and Anadromous Fish (34 listed "species")

Species	Year Listed	Status	Critical Habitat*	Recovery Plan*
■ Atlantic salmon (1 listed DPS) (*Salmo salar*)				
○ Gulf of Maine	2009* *expanded	E	final	final
original listing -	2000			
■ Chinook salmon (9 listed ESUs) (*Oncorhynchus tshawytscha*)				
○ California coastal	1999**	T	final	in process
○ Central Valley spring-run	1999**	T	final	draft
○ Lower Columbia River	1999**	T	final	in process
○ Upper Columbia River spring-run	1999**	E	final	final
○ Puget Sound	1999**	T	final	final
○ Sacramento River winter-run	1994**	E	final	draft
○ Snake River fall-run	1992**	T	final	in process
○ Snake River spring/summer-run	1992**	T	final	in process
○ Upper Willamette River	1999**	T	final	in process

■ chum salmon (2 listed ESUs) *(Oncorhynchus keta)*				
○ Columbia River	1999**	T	final	in process
○ Hood Canal summer-run	1999**	T	final	final
■ coho salmon (4 listed ESUs) *(Oncorhynchus kisutch)*				
○ Central California coast	2005**	E	final	in process
original listing -	1996**	T		
○ Lower Columbia River	2005**	T	not yet proposed	in process
○ Oregon coast	2008	T	final	
○ Southern Oregon & Northern California coasts	1997**	T	final	in process
■ green sturgeon (1 listed DPS) *(Acipenser medirostris)*				
○ southern DPS	2006	T	final	no
■ Gulf sturgeon *(Acipenser oxyrinchus desotoi)*	1991	T	final	final
■ shortnose sturgeon *(Acipenser brevirostrum)*	1967	E	n/a	final
■ sockeye salmon (2 listed ESUs) *(Oncorhynchus nerka)*				
○ Ozette Lake	1999**	T	final	in process
○ Snake River	1991**	E	final	in process
■ smalltooth sawfish (1 listed DPS) *(Pristis pectinata)*				
○ U.S. portion of range	2003	E	final	final
■ steelhead trout (11 listed DPSs) *(Oncorhynchus mykiss)*				
○ Puget Sound	2007	T	under development	no

○ Central California coast	1997**	T	final	in process
○ Snake River Basin	1997**	T	final	in process
○ Upper Columbia River	1997**	E	final	final
○ Southern California	1997**	E	final	draft
○ Middle Columbia River	1999**	T	final	final
○ Lower Columbia River	1998**	T	final	in process
○ Upper Willamette River	1999**	T	final	in process
○ Northern California	2000**	T	final	in process
○ South-Central California coast	1997**	T	final	in process
○ California Central Valley	1998**	T	final	draft
■ totoaba (*Totoaba macdonaldi*)	1979	E (F)	n/a	n/a

* **NOTE:** Critical habitat and recovery plans are not required for foreign species; critical habitat is also not required for species listed prior to the 1978 ESA amendments that added critical habitat provisions.

** All Pacific salmonid listings were revisited in 2005 and 2006. Only the salmonids whose status changed as a result of the review will show the revised date; for all others, only the original listing date is shown. For more information on the listing history, please click on the link for each ESU/DPS.

Endangered and Threatened Marine Species

- Overview / How Does the ESA Define "Species"?
- Marine Mammals
- Marine Turtles
- Marine & Anadromous Fish
- Marine Invertebrates & Plants
- Candidate Species
- Marine Species Proposed for Listing
- Delisted Marine Species
- Printer-Friendly Species List [pdf]

Home | About Us | Forms | Privacy Policy | Information Quality | Disclaimer | Contact Us | Feedback | Search

UPPER SKAGIT INDIAN TRIBE
SKAGIT CASINO
PARKING LOT EXPANSION & ROAD REALIGNMENT
WETLAND MITIGATION PLAN

Prepared for:

Doreen Maloney
Upper Skagit Indian Tribe
25944 Community Plaza Way
Sedro-Woolley, WA 98284
360-854-7000

Prepared by:

ATSI
21993 Grip Road
Sedro-Woolley, WA 98284
360-856-2139

January 17, 2006

Table of Contents

ATTACHMENT B

ATSI

Aqua-Terr Systems, Inc.

10 December 2004

Doreen Maloney
Upper Skagit Indian Tribe
2285 Community Plaza
Sedro-Woolley, WA 98284-9739

Re: Wetland/Fish and Wildlife Reconnaissance, 20-acre Burkland parcel.

Dear Ms. Maloney:

As requested, Aqua-Terr Systems, Inc. (ATSI) reviewed an approximate 20-acre Burkland parcel to determine the presence of wetlands, streams, and other biological critical areas. The parcel is situated within a portion of Section 6, Township 35 North, Range 4 East, W.M. (Figures 1, 2 and 3).

The purpose of our review is to provide an assessment of the presence, location, and extent of wetlands, streams, and other biological critical areas that are regulated under the jurisdiction of the U.S. Army Corps of Engineers (COE). The subject parcel was reviewed on 4 December 2004.

A palustrine forested scrub-shrub seasonally flooded/saturated wetlands (PFO/SSE) wetland complex was observed on the subject parcel (Figure 3). The wetland complex is varies between 30% to 50% wetland with the uplands on hummocks and the wetlands in depressional areas or disturbed areas that were cleared within the past 10 years.

METHODS AND PROCEDURES

The wetlands referred to in this report follow the Corps definition: "*...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.*" (Environmental Laboratory 1987). Through Section 404 of the Clean Water Act, the Corps has the authority to regulate the placement of fill materials in wetlands and other waters of the U.S., and requires permits for such activities.

A two-step procedure is used to determine the presence and extent of wetlands and other critical areas on the subject parcel. This procedure includes preliminary data review and an on-site reconnaissance. A qualitative analysis of biota and habitats is performed. We observe the general terrain and traverse the entire parcel to identify wetlands and other critical areas/habitats. Data are collected from the dominant plant communities and soils. In addition, aerial photographs, soil data, and topographic maps are used for orientation and to assist in locating wetlands, streams, and other unique or critical habitats.

The goal of this analysis and site review is to describe the biological aspects of the parcel in order to provide sufficient information for the client and regulating agency to make informed decisions regarding wetlands, streams, and other critical areas.

A preliminary review of public resource documents is used to provide initial information on soils, vegetation, hydrology, and critical areas of the site and surrounding area. These resources include but are not limited to:

- USDA, Natural Resource Conservation Service soil surveys.
- Natural Resource Conservation Service hydric soil list.
- National Wetland Inventory maps.

An on-site field reconnaissance was conducted on 4 December 2004 by Jim Wiggins, M.S., P.W.S. and Elizabeth Binney, Ph.D., P.W.S. Mr. Wiggins and Dr. Binney are Professional Wetland Scientists (P.W.S.) certified through the Society of Wetland Scientists. Dr. Binney is provisionally certified through the Seattle District of the U.S. Army Corps of Engineers as a Wetland Delineator and completed the five-day training course for the Washington State Wetland Function Assessment Project Methods for Assessing Wetland Functions.

All wetlands are identified based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology as described in the Corps of Engineers *Wetland Delineation Manual* (Environmental Laboratory 1987). All three parameters must be present for an area to be considered a jurisdictional wetland under normal circumstances. Atypical situations and problem areas are treated per the Corps and state manuals. Figure 3 depicts the approximate locations of the sample plots and the approximate location of the wetland complex. Data Forms for individual sample plots are at the back of this report.

An area has hydrophytic vegetation if greater than 50 percent of the total composition of the dominant plant species from all strata have an indicator status of Facultative (FAC), Facultative Wetland (FACW), or Obligate Wetland (OBL) (Environmental Laboratory 1987) as defined in the *National List of Plant Species that Occur in Wetlands: 1988 Washington* (Reed 1988) and the *1993 Supplement to List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1993). Additional indicator status of Facultative Upland (FACU) and Obligate Upland (UPL) are given to plants that usually occur in nonwetlands or nearly always occur in nonwetlands respectively (Reed 1988, 1993). No Indicator (NI) is given to species where sufficient information is lacking to give the species an indicator status (Reed 1988). The percent cover of the dominant plant species is estimated for each stratum (e.g. canopy, shrub layer, and herbaceous layer) within a thirty-foot radius plot and the indicator status of each species is determined.

Hydric soils, in general, are those soils that have high organic-matter, sulfidic material, reduced conditions, aquic or peraquic moisture regimes, soil colors with a chroma of 1, soil colors with a chroma of 2 with mottles, or the presence of iron or manganese concretions (Environmental Laboratory 1987). On-site soils are observed and described from a 20-inch (+/-) soil pit. Hydric characteristics and indicators such as redoxymorphic features (e.g. mottles) are examined within the profile and specifically just below the A-horizon or at 10 inches. Soil color, texture, and hydric indicators, if present, are recorded. Color is determined using a Munsell soil color chart (Kollmorgen 1998).

Wetland hydrology is present when direct or indirect indicators of seasonal or permanent soil saturation or inundation are observed. Indicators include: soil saturation; surface inundation; free water within the top 12 inches of the soil pit; oxidized rhizospheres, water-stained leaves; water marks; drift lines; sediment deposits; drainage patterns; or previously recorded data.

In order to provide an assessment of existing wetland functions, we use a combination of wetland functions listed in the Washington State Department of Ecology (DOE) Wetlands Rating Field Data Form (DOE 1993) and several wetland functional assessment methods, to provide a qualitative assessment of on-site wetlands. This assessment provides information that aids in categorization of the wetlands and baseline information if mitigation is required. Below is a list of functions and attributes addressed (for detailed methods please contact ATSI personnel); a similar list of functions is used to assess other critical areas:

1. Age and classes of wetland communities or populations.
2. Buffer size and character.
3. Cultural, heritage, recreational, and local value.
4. Ecotone complexity and transition zone between dry land and watercourses (sinuosity).
5. Enhancement potential.
6. Flood and storm drainage protection.
7. Habitat for fish and/or wildlife.
8. Presence of sensitive, threatened, or endangered species.
9. Presence and number of habitat features.
10. Shoreline stabilization.
11. Size of wetland or habitat.
12. Support of baseflow and surface or groundwater recharge or discharge.
13. Uniqueness of habitat to area or in general.
14. Water quality functions.
15. Wetland/habitat classification diversity.
16. Wildlife corridors and linkage to other habitats.

SITE DESCRIPTION

The subject parcel is triangular shaped that is bordered by recently cleared forested land to the north and east, Bow Hill Road to the south, and a casino parking area to the west (Figures 2 and 3). The entire parcel is wooded however the southern portion and a "swath" on along Darrk Lane and on the top of the slope along Bow Hill Road was cleared about 10 years ago and is currently dominated by young red alder (*Alnus rubra*) (Figure 3). The parcel has an overall slope to the west/northwest and the southeastern portion of the parcel that abuts Bow Hill Road is steeply sloped to the south. A PFO/SSE wetland complex occurs on the western portion of the parcel (Figure 3).

NWI
The National Wetlands Inventory (NWI) does not map wetlands on or near the subject parcel (Figure 4). We do not concur with this assessment. Palustrine wetlands were observed on the subject parcel (Figure 3).

NRCS Soils
The Natural Resource Conservation Service (NRCS) maps the (124) Skipopa silt loam 0 to 3 percent slope and the (69) Hoogdal silt loam 30 to 60% slope soil units on the subject parcel (Sheet 21; Klungland and McArthur 1989) (Figure 5). The soils on the western portion of the parcel resemble a combination of Skipopa and (16) Bow gravelly loam. Hoogdal soils or inclusions of sandy and gravelly soils were observed on the eastern and southern portions of the parcel. The Bow soil unit is listed as hydric by the NRCS, neither the Skipopa nor Hoogdal soil units are listed as hydric.

Vegetation
Vegetation on the parcel is forested. A PFO/SSE wetland complex was observed on the western portion of the parcel.

Upland forest
The vegetation within the upland forest has separate areas that vary is species composition. These are the northeastern portion, a "disturbed" swath of red alder in the central portion, and the steep slope along Bow Hill Road.

The northeastern portion is dominated a canopy of red alder, big leaf maple (*Acer macrophyllum;* FACU), western redcedar (*Thuja plicata*; FAC), and hemlock (*Tsuga heterophylla*; FACU). The shrub layer is dominated by salmonberry (*Rubus spectabilis*; FAC) and elderberry (*Sambucus racemosa*; FACU). The herbaceous layer is dominated by sword fern (*Polystichum munitum*; FACU) and piggyback plant (*Tolmiea menziesii*; FAC).

The red alder swath is dominated by red alder with subdominants of western redcedar, salmonberry, Himalayan blackberry (*Rubus procerus*; FACU), buttercup (*Ranunculus repens*; FACW), and trailing blackberry (*Rubus ursinus*; FACU).

The steep slope along Bow Hill Road is dominated by a canopy of mature Douglas fir, big leaf maple, and red alder trees. The shrub and herbaceous layers are dominated by Oregon grape (*Mahonia nervosa*; FACU), osoberry (*Oemleria cerasiformis*; FACU), elderberry, and vine maple (*Acer circinatum;* FAC-).

PFO/SSE wetland
The PFO/SSE wetland complex vegetation is dominated by a combination of upland plants and wetland vegetation. Generally, the uplands are dominated by canopy and

shrub species while the wetlands are dominated by herbaceous and shrubs species. The vegetation within the upland hummocks is dominated by Sitka spruce (*Picea sitchensis*; FAC), cottonwood (*Populus balsamifera*; FAC), red alder, and western redcedar in the canopy and salmonberry, elderberry, vine maple and sword fern in the shrub and herbaceous layers. The wetlands are dominated by salmonberry, hardhack (*Spiraea douglasii*; FACW) and buttercup in the shrub and herbaceous layers.

Soils

Soils observed in the upland areas were generally very dark grayish brown (10YR 3/2 and 2/2) loam in the top 6 to 10 inches underlain by dark reddish gray (2.5YR 4/2 and 5/2) silt loam or sandy loam with dark brown 10YR 3/3 and 3/4 mottles. The wetlands generally had a shallower hardpan with mottles closer to the surface and with soils that were very dark to dark gray (10YR 2/1) silt loams. Excerpts of the NRCS description (Klungland and McArthur 1989) for the Bow, Hoogdal, and Skipopa soil units are listed below:

> **Bow gravelly loam, 0 to 3 percent slopes (16)** - This very deep, somewhat poorly drained soil is on glaciated terraces and undulating till plains. If formed in glaciolacustrine material and gravelly glacial drift mantled with volcanic ash. The vegetation in areas not cultivated is mainly conifers and shrubs. Elevation is 50 to 400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 170 to 220 days.
>
> Typically, the surface layer is dark brown gravelly loam 7 inches thick. The upper 10 inches of the subsoil is dark brown very gravelly loam, the next 14 inches is grayish brown clay loam, olive gray silt clay, and light olive gray silt loam, and the lower part to a depth of 60 inches or more is olive gray silty clay. In some areas the surface layer is gravelly silt loam or black gravelly loam about 9 inches thick, and in some areas the subsoil is loamy.
>
> Included in this unit are small areas of Bellingham soils in wet depressional areas and along drainageways and Catla and Clallam soils on knolls.
>
> Permeability of this Bow soil is slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 6 to 18 inches from November to May. Runoff is slow, and the hazard of water erosion is slight.
>
> **Hoogdal silt loam, 30 to 60 percent slopes (69)** - This very deep, moderately well drained soil is on terrace escarpmets. It formed in loess and glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 100 to 300 feet. The average annual precipitation is 45 inches, the average annual air temperature is about 52 degrees F, and the average frost-free season is 160 to 200 days.
>
> Typically, the surface is covered with a mat of needles, leaves, and twigs 2 inch thick. The surface layer is dark brown silt loam 6 inches thick. The subsoil is

dark brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is mottled, olive gray and light olive gray silty clay. In some areas the surface layer is gravelly silt loam, and in some areas the substratum has lenses of sand.

Included in this unit are small areas of Barneston soils on outwash terraces and Tokul soils on hills.

Permeability of this Hoogdal soils is slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 18 to 24 inches from December to March. Runoff is rapid, and the hazard of water erosion is severe.

Skipopa silt loam, 0 to 3 percent slopes (124) - This very deep, somewhat poorly drained soil is on terraces. It formed in a mantle of loess and volcanic ash underlain by glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 150 to 450 feet. The average annual precipitation is about 45 inches, the average annual air temperature is about 51 degrees F, and the average frost-free season is 160 to 200 days.

Typically, the surface is covered with a mat of leaves and twigs 1 inch thick. The surface layer, where mixed to a depth of 8 inches, is dark brown silt loam. The subsoil is dark yellowish brown silt loam 8 inches thick. The substratum to a depth of 60 inches or more is gray, olive, and bluish gray silty clay. In some areas the surfaces layer is gravelly silt loam. In some areas the substratum has lenses of sandy material.

Included in this unit are small areas of Bellingham soils in depressional areas, Gilligan and Indianola soils on outwash terraces, and Tokul soils on hills.

Permeability of this Skipopa soil is very slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 12 to 24 inches from October to June. Runoff is slow, and the hazard of water erosion is slight.

Hydrology

Wetland hydrology was observed in the PFO/SSE wetlands during our field visits. All wetlands observed on the parcel and in the general area occur in shallow depressional areas. Hydrology is from runoff in the immediate area and a seasonal perched water table because of the shallow hardpan typical of Skipopa and Bow soils. The wetlands are within isolated closed depressions.

WILDLIFE & PRIORITY SPECIES

We did not observe endangered, threatened, or sensitive plant or animal species, or their habitats regulated by the federal government on the subject parcel or within the immediate vicinity.

The parcel is forested and connected to forested habitat to the north and west. Wildlife that likely use the subject parcel are birds, amphibians, and small mammals, as well as larger mammals such as coyote (*Canis latrans*) and black tailed deer (*Odocoileus hemionus*). The wetlands may provide amphibian breeding habitat for species such as the Pacific chorus frog (*Hyla regilla).*

WETLAND CATEGORIZATION AND FUNCTION EVALUATION

We have compiled information from agencies, professionals, the current literature to qualitatively evaluate the functions of wetlands and other habitats. References and a user manual for our evaluation are available upon request. Individual functions (see list in Methods and Procedures section above) are assessed point values of 0 through 3; 0=function or attribute is lacking; 1=low value, 2=medium or moderate value, and 3=high value. The average of the value for functions is used as the overall assessment of the wetland or habitat. Table 1 summaries of our evaluation of the on-site wetlands.

The overall value of PFO/SSE wetland complex is moderate (Table 1). The wetlands have two wetland classes: forested and scrub/shrub with a seasonal herbaceous component. The wetlands are within a well developed native forest with direct connection to forested habitat to the north but are separated from other habitats to the south by Bow Hill Road and Darrk Lane. Ecotone complexity (sinuosity) between uplands and wetlands is moderate, that is, the wetland is a complex of uplands and wetlands. Enhancement potential for the wetlands is low because the area is dominated by native vegetation. The wetlands have moderate potential and opportunity for flood and storm drainage protection because they are within isolated depressions, lack a direct connection with any streams, but because of the overall size do retain seasonally water and attenuate flow. Wildlife habitat is moderate because of the variation within the plant community structure (a well developed and diverse canopy and shrub community), presence of large woody debris, and seasonally ponded areas for amphibian breeding habitat. The wetlands no not provide fish habitat. The wetlands have low opportunity and potential to improve water quality because they are within isolated depressions and lack a connection to downgradient receiving waters.

Table 1. Functions and attributes of the PFO/SSE wetlands.

Functions and Attributes	Value
1. Age and classes of wetland communities or populations.	2
2. Buffer size and character.	2
3. Cultural, heritage, recreational, and local value.	0
4. Ecotone complexity & transition zone between dry land and watercourses (sinuosity).	1
5. Enhancement potential.	1
6. Flood and storm drainage protection.	1
7. Habitat for fish and/or wildlife.	1.5
8. Presence of sensitive, threatened, or endangered species.	0
9. Presence and number of habitat features.	2
10. Shoreline stabilization.	na
11. Size of wetland or habitat.	1.5
12. Support of baseflow and surface or groundwater recharge or discharge.	1

Table 1. Functions and attributes of the PFO/SSE wetlands.	
Functions and Attributes	Value
13. Uniqueness of habitat to area or in general.	1.5
14. Water quality functions.	1.5
15. Wetland/habitat classification diversity.	1.5
16. Wildlife corridors and linkage to other habitats.	1.5

DETERMINATION

A palustrine forested scrub-shrub seasonally flooded/saturated (PFO/SSE) wetland complex was observed on the western portion of the subject parcel. The PFO/SSE wetlands are within closed depressional areas within a forested area with a dominance of native plants. Wetland identification and delineation were made by the presence of positive indicators of hydrophytic vegetation, hydric soil, and wetland hydrology.

Regulations

The U.S. Army Corps of Engineers (Corps) requires notification of all disturbances to **all** wetlands, streams, and other waters and it is incumbent upon the landowner to disclose such disturbances. Isolated wetlands are not under the jurisdiction of the Corps but confirmation of isolation must be made by the Corps. The Environmental Protection Agency (EPA) require a 401 water quality certification for disturbance of wetlands depending upon the type of project and for disturbance of wetlands one-half (0.5) acre or greater. Any disturbance of a wetland area one-half (0.5) acre or greater, or within a 100-year floodplain requires an Individual Permit from the Corps which includes the requirement of compensatory mitigation and an alternatives analysis. The Corps also has the discretion to not allow disturbance to high quality wetlands. The Corps requires certification that no listed nor known endangered, threatened, or sensitive plant or animal species, or National Historic Places are present on the parcel.

Signatory

We have used the most current, established methods to make determinations as to the location, size, and types of wetlands on this parcel. All of the above statements are based on our best professional judgment. Although we follow the federal, state, and local criteria, we cannot guarantee that the U.S. Army Corps of Engineers or the local jurisdiction determination will correspond to ours. Please note that regulations pertaining to critical areas are subject to change over time.

If you have further questions or comments about this report, please contact Mr. Wiggins or Dr. Binney at (360) 856-2139 or FAX at (360) 856-5238. Please contact the COE to confirm our wetland determinations and to confirm current regulations.

Thank you,

Jim Wiggins, M.S., P.W.S. President ATSI	Elizabeth Binney, Ph.D., P.W.S. Vice-President ATSI

Enclosures: Bibliography
Figures (5)
Data Forms (10)


10
9
6
2
5
4
7
8
1
WETLAND COMPLEX
3
DARK LANE
Bow Hill Rd
N

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Brindal	Date:	4 December 2004
licant/Owner:	USIT	County:	Skagit
d Investigator(s):	E. Binney & J. Wiggins	State:	WA
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: East half of parcel mowed grass, W half forested, Type III Water (Bob Smith Creek) flows through approx. center. Plot in riparian zone of creek = UPL Forest.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	30	FAC	9			
2 *Picea sitchensis*	canopy	20	FAC	10			
3 *Thuja plicata*	canopy	20	FAC	11			
4 *Pseudotsuga menziesii*	canopy	20	FACU	12			
5 *Tsuga heterophylla*	canopy	10	FAC-	13			
6 *Oemleria cerasiformis*	shrub	25	FACU	14			
7 *Rubus spectabilis*	shrub	25	FAC+	15			
8 *Polystichum munitum*	herb.	35	FACU	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 50%
Other hydrophytic indicators: None

Remarks: Lacks indicators of hydrophytic vegetation.

HYDROLOGY

Depth to Surface Water: None
Depth to saturated soil: None
Depth to free standing water in soil pit: None

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in upper 12 inches	☐
t Photographs	☐	Saturated in Upper 12 Inches	☐	Water Stained Leaves	☐
(Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 69-Hoogdal silt loam, 30-60% slopes
Field observation confirm mapped type? Yes

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-9	10YR 3/2	none	na	duffy loam
9-20	2.5Y 5/2	none	na	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	No
ıd Hydrology present?	No
Soil present?	No

Is this sample plot within a wetland? NO

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Brindal	Date:	4 December 2004
^nplicant/Owner:	USIT	County:	Skagit
.d Investigator(s):	E. Binney & J. Wiggins	State:	WA
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: East half of parcel mowed grass, W half forested, Type III Water (Bob Smith Creek) flows through approx. center. Plot W. of creek = UPL Forest.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	40	FAC	9			
2 *Betula papyrifera*	canopy	30	FAC	10			
3 *Thuja plicata*	canopy	20	FAC	11			
4 *Acer macrophyllum*	canopy	20	FACU	12			
5 *Rubus spectabilis*	shrub	35	FAC+	13			
6 *Symphoricarpos allbus*	shrub	25	FACU	14			
7 *Sambucus racemosa*	shrub	20	FACU	15			
8 *Holodiscus discolor*	shrub	20	NI(upl)	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 59%   Other hydrophytic indicators: None

Remarks: Although FAC greater than 50% no spp "wetter" than FAC and dominants in canopy are typical forest spp; i.e,, not necessarily indicative of PFO.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: 16"   Depth to free standing water in soil pit: 17"

Recorded Data:	☐	Primary Indicators:	☐	Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in upper 12 inches	☐
Photographs	☐	Saturated in Upper 12 Inches	☐	Water Stained Leaves	☐
(Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes   Field observation confirm mapped type? Yes

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-18	10YR 3/2	none	na	silt loam
18-20+	2.5Y 5/3	2.5Y 4/3-4/4	10	silt loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators

WETLAND DETERMINATION

Hyd hytic Vegetation present? No   Is this sample plot within a wetland? NO
W l Hydrology present? No
H Soil present? No

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Brindal	Date:	4 December 2004
licant/Owner:	USIT	County:	Skagit
ld Investigator(s):	E. Binney & J. Wiggins	State:	WA
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: East half of parcel mowed grass, W half forested, Type III Water (Bob Smith Creek) flows through approx. center. Plot E of creek in mowed area w/compacted soil = PEMC.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Juncus effusus*	herb.	20	FACW	9			
2 *Juncus ensifolius*	herb.	20	FACW	10			
3 *Trifolium repens*	herb.	20	FAC	11			
4 *Holcus lanatus*	herb.	20	FAC	12			
5 *Agrostis capillaris*	herb.	20	FAC	13			
6 *Hypochaeris radicata*	herb.	20	FACU	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 83%   Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Depth to saturated soil: 9"   Depth to free standing water in soil pit: 10"

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake or Tide Gauge	☐	Inundated	☒*	Oxidized Root Channels in upper 12 inches	☐
al Photographs	☐	Saturated in Upper 12 inches	☒	Water-Stained Leaves	☐
s (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: *ponding on surface but soil saturated from 9 to 10 inches in soil column, free water at 10"; all sitting on clay layer.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes   Field observation confirm mapped type? Yes

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-12	10YR 3/2	none	na	silt loam
12-14	10YR 4/2	10YR 4/4-4/6	10	silt
14-20	2.5Y 5/1	10YR 4/6	20	clay

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes   Is this sample plot within a wetland? Yes*
nd Hydrology present? Yes
c Soil present? No

Remarks: *Plot transitional upl/wet; clearing and soil compaction likely enhanced - created wetland characteristics.

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Brindal	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E. Binney & J. Wiggins	State:	WA
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: East half of parcel mowed grass, W half forested, Type III Water (Bob Smith Creek) flows through approx. center. Plot w/in mowed grass = UPL field.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Agrostis capillaris*	herb.	30	FAC	9			
2 *Trifolium repens*	herb.	20	FAC	10			
3 *Poa pratensis*	herb.	20	FAC	11			
4 *Festuca arundinacea*	herb.	20	FAC-	12			
5 *Trifolium pratense*	herb.	20	FACU	13			
6 *Taraxacum officinale*	herb.	20	FACU	14			
7 *Hypochaeris radicata*	herb.	20	FACU	15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 41%
Other hydrophytic indicators: None
Remarks: Lacks hydrophytic vegetation indicators.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: None   Depth to free standing water in soil pit: None

[illegible]	☐	Primary Indicators		Secondary Indicators (2 or more required)	
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]	☐	[illegible]	☐	[illegible]	☐
		[illegible]	☐	[illegible]	☐
[illegible]	☒	[illegible]	☐	[illegible]	☐
		[illegible]	☐		

Remarks: Lacks wetland hydrology indicators

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes
Field observation confirm mapped type? Yes

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-10	10YR 3/2	none	na	silt loam (w/charcoal)
10-13	10YR 4/2	none	na	silt loam
13-20	2.5Y 5/1	10YR 4/6	20	clay

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? No
Wetland Hydrology present? No
Hydric Soil present? No

Is this sample plot within a wetland? NO

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Burkland	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes

Is this site significantly disturbed (Atypical Situation)? No

Is the Area a potential Problem Area? No

Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. Plot = PFO

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra* (2-4" dbh)	canopy	70	FAC	9			
2 *Picea sitchensis*	reprod.	05	FAC	10			
3 *Rubus spectabilis*	shrub	35	FAC+	11			
4 *Spiraea douglasii*	shrub	20	FACW	12			
5 *Ranunculus repens*	herb.	50	FACW	13			
6 *Tolmiea menziesii*	herb.	25	FAC	14			
7 *Mianthemum dilatatum*	herb.	20	FAC	15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%   Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: surface   Depth to free standing water in soil pit: 4"

		Primary Indicators		Secondary Indicators (2 or more required)	
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]	☐	[illegible]	☒	[illegible]	☐
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]		[illegible]	☐	[illegible]	☐
No Recorded Data Available	☒	[illegible]	☐	[illegible]	☐
[illegible]		[illegible]	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes   Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-10	10YR 2/1	None	na	silt loam
10-15+	2.5Y 5/1	10YR 4/6	20	clay

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes   Is this sample plot within a wetland? YES

Wetland Hydrology present? Yes

Hydric Soil present? Yes

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Burkland	Date:	4 December 2004
licant/Owner:	USIT	County:	Skagit
d Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. On hummock near Plot 1. Plot = UPL forest.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Populus balsamifera* (18-24"+ dbh)	canopy	65	FAC	9 *Glycerica elata*	herb.	20	FACW
2 *Picea sitchensis*	canopy	20	FAC	10			
3 *Alnus rubra*	canopy	10	FAC	11			
4 *Thuja plicata*	reprod.	10	FAC	12			
5 *Rubus spectabilis*	shrub	40	FAC+	13			
6 *Acer circinatum*	shrub	40	FAC-	14			
7 *Ranunculus repens*	herb.	20	FACW	15			
8 *Tolmiea menziesii*	herb.	25	FAC	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 83%* Other hydrophytic indicators: None

Remarks: *Dominants include spp 20% cover or greater. Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: surface Depth to free standing water in soil pit: 3"

[illegible]

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes Field observation confirm mapped type? Yes

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-18+	10YR 3/2	none	na	Silt loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicaotrs

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
nd Hydrology present? Yes
Soil present? No

Is this sample plot within a wetland? No*

Remarks: *Soils not present; hydrology present however duration of saturation questionable since soil does not display hydric characteristics.

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Burkland	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site?	Yes	Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. Within area cleared about 10 yrs ago. Plot = PFO
Is this site significantly disturbed (Atypical Situation)?	No	
Is the Area a potential Problem Area?	No	

VEGETATION

	Dominant Species	Stratum	%cover	Indicator		Dominant Species	Stratum	%cover	Indicator
1	*Alnus rubra* (2-4" dbh)	canopy	75	FAC	9				
2	*Rubus spectabilis*	shrub	30	FAC+	10				
3	*Ranunculus repens*	herb.	65	FACW	11				
4	*Tolmiea menziesii*	herb.	25	FAC	12				
5					13				
6					14				
7					15				
8					16				

Percent of Dominant Species that are OBL, FACW, or FAC: 100% Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: 4" Depth to free standing water in soil pit: 5"

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☒	Water-Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes Field observation confirm mapped type?

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-10	10YR 3/2	none	na	silt loam
10-17	10YR 3/2	10YR 3/4	30	silt
17-20	2.5Y 5/2	10YR 4/4	50	silty clay

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low-Chroma	☒

Remarks: Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	Yes	Is this sample plot within a wetland? YES
Wetland Hydrology present?	Yes	
Hydric Soil present?	Yes	

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name: USIT Burkland — Date: 4 December 2004
Applicant/Owner: USIT — County: Skagit
Field Investigator(s): E.Binney & J.Wiggins — State: Washington
S-T-R: 6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. Plot = UPL forest.

VEGETATION

	Dominant Species	Stratum	%cover	Indicator		Dominant Species	Stratum	%cover	Indicator
1	*Alnus rubra*	canopy	75	FAC	9				
2	*Acer macrophyllum*	canopy	20	FACU	10				
3	*Thuja plicata*	canopy	10	FAC	11				
4	*Thuja plicata*	reprod.	10	FAC	12				
5	*Rubus spectabilis*	shrub	45	FAC+	13				
6	*Sambucus racemosa*	shrub	25	FACU	14				
7	*Tolmiea menziesii*	herb.	35	FAC	15				
8	*Polystichum munitum*	herb.	25	FACU	16				

Percent of Dominant Species that are OBL, FACW, or FAC: 69%* — Other hydrophytic indicators: None

Remarks: *Includes spp cover 20% or greater. Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None — Depth to saturated soil: None — Depth to free standing water in soil pit: None

Recorded Data [illegible] — Primary Indicators [illegible] — Secondary Indicators (2 or more required) [illegible]

No Recorded Data Available ☒

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes — Field observation confirm mapped type? No

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-9	7.5YR 2/1	none	na	loam
9-13	7.5YR 3/3	none	na	loam
13-20+	10YR 3/3	none	na	sandy loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? No
Wetland Hydrology present? No
Hydric Soil present? No

Is this sample plot within a wetland? NO

Remarks: Hydro. veg. indicators present by percent of FAC or wetter, however no spp "wetter" than FAC and FACU spp in canopy, shrub layer, and herb. layer not typical of wetlands in this region.

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

ect Name:	USIT Burkland	Date:	4 December 2004
plicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. Plot w/in depressional swale. Plot = PFO

VEGETATION

	Dominant Species	Stratum	%cover	Indicator		Dominant Species	Stratum	%cover	Indicator
1	*Alnus rubra*	canopy	45	FAC	9				
2	*Thuja plicata*	canopy	20	FAC	10				
3	*Betula papyrifera*	canopy	10	FAC	11				
4	*Rubus spectabilis*	shrub	60	FAC+	12				
5	*Tolmiea menziesii*	herb.	45	FAC	13				
6					14				
7					15				
8					16				

Percent of Dominant Species that are OBL, FACW, or FAC: 100%   Other hydrophytic indicators: None
Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: Surface   Depth to free standing water in soil pit: Surface

[illegible] Recorded Data Available ☒

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes   Field observation confirm mapped type? No

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-7	10YR 2/1	none	na	loam
7-18	2.5Y 4/2	10YR 3/4	30	silty fine sand

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: Hydric soil indicators present.

WETLAND DETERMINATION

ophytic Vegetation present? Yes   Is this sample plot within a wetland? YES
Wetland Hydrology present? Yes
Hydric Soil present? Yes

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Burkland	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. Plot = UPL forest.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	80	FAC	9			
2 *Thuja plicata*	canopy	10	FAC	10			
3 *Tsuga heterophylla*	canopy	20	FACU	11			
4 *Rubus spectabilis*	shrub	40	FAC+	12			
5 *Sambucus racemosa*	shrub	30	FACU	13			
6 *Polystichum munitum*	herb.	30	FACU	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 60

Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None
Depth to saturated soil: None
Depth to free standing water in soil pit: None

[illegible]

No Recorded Data Available ☒

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes

Field observation confirm mapped type? Yes

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-18+	10YR 3/2 loam	none	na	Loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? No
Wetland Hydrology present? No
Hydric Soil present? No

Is this sample plot within a wetland? NO

Remarks: Hydro. veg. indicators present by dom. of FAC, however no spp. "wetter" than FAC and spp in canopy, shrub layer, and herb. layer not typical of wetlands in this region.

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Burkland	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. Plot = UPL forest.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	60	FAC	9			
2 *Thuja plicata*	canopy	10	FAC	10			
3 *Rubus spectabilis*	shrub	45	FAC+	11			
4 *Rubus procerus*	shrub	25	FACU	12			
5 *Ranunculus repens*	herb.	20	FACW	13			
6 *Rubus ursinus*	herb.	20	FACU	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 74%*
Other hydrophytic indicators: None
Remarks: * Includes spp cover 20% or greater. Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: [illegible]   Depth to free standing water in soil pit: [illegible]

Recorded Data		Primary Indicators		Secondary Indicators	
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]		[illegible]	☐	[illegible]	☐
No Recorded Data Available	☒	[illegible]	☐	[illegible]	☐
		[illegible]	☐		

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes
Field observation confirm mapped type? Yes

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-18	10YR 2/2	none	na	loam
18-20+	2.5Y 5/2	10YR 3/4	80	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
Wetland Hydrology present? No
Hydric Soil present? No

Is this sample plot within a wetland? NO

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Burkland	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. Plot on steep S-facing slope. Plot = UPL forest.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Pseudotsuga menziesii*	canopy	50	FACU	9 *Rubus ursinus*	herb.	30	FACU
2 *Acer macrophyllum*	canopy	25	FACU	10 *Polystichum munitum*	herb.	25	FACU
3 *Alnus rubra*	canopy	10	FAC	11			
4 *Betula papyrifera*	canopy	10	FAC	12			
5 *Mahonia nervosa*	shrub	45	FACU	13			
6 *Oemlerai cerasiformis*	shrub	20	FACU	14			
7 *Sambucus racemosa*	shrub	20	FACU	15			
8 *Acer circinatum*	shrub	10	FAC-	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 0%*
Other hydrophytic indicators: None
Remarks: * includes spp w/ 20% cover or greater. Lacks hydrophytic vegetation indicators.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: None   Depth to free standing water in soil pit: None

Recorded Data (Describe in Remarks)	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 inches	☐	Water-Stained Leaves	☐
Other	☐	Water Marks	☐	Local Soil Survey Data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 69-Hoogdal silt loam, 30-60% slopes
Field observation confirm mapped type? Yes

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-6	10YR 3/2	none	na	silt loam
6-20	10YR 5/2	none	na	silt loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? No
Wetland Hydrology present? No
Hydric Soil present? No

Is this sample plot within a wetland? NO

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

Plot 9 of 10

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Burkland	Date:	4 December 2004
ᐧᐧplicant/Owner:	USIT	County:	Skagit
ᐧid Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. Plot = UPL forest.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	40	FAC	9			
2 *Thuja plicata*	canopy	40	FAC	10			
3 *Picea sitchensis*	canopy	10	FAC	11			
4 *Rubus spectabilis*	shrub	40	FAC+	12			
5 *Sambucus racemosa*	shrub	30	FACU	13			
6 *Polystichum munitum*	herb.	20	FACU	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 71%* Other hydrophytic indicators: None

Remarks: *includes spp w/20% or greater cover. Hydrophytic vegetation indicators presetn

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: 13" Depth to free standing water in soil pit: 15"

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☐	Water-Stained Leaves	☐
ᐧer (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
ᐧ Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes Field observation confirm mapped type? Yes

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-16	10YR 3/3	none	na	silt loam
16-20	10YR 5/3	10YR 4/4	20	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
ᐧᐧetland Hydrology present? No
ᐧric Soil present? No

Is this sample plot within a wetland? NO

ᐧmarks:

ROUTINE WETLAND DETERMINATION DATA FORM

Plot 10 of 10

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT Burkland	Date:	4 December 2004
[illegible]licant/Owner:	USIT	County:	Skagit
[illegible]ld Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	6-35N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Forested parcel w/one area cleared ~10 yrs ago, now re-grown. Plot = PFO

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	30	FAC	9			
2 *Picea sitchensis*	canopy	30	FAC	10			
3 *Thuja plicata*	canopy	30	FAC	11			
4 *Populus balsamifera*	canopy	20	FAC	12			
5 *Rubus spectabilis*	shrub	60	FAC+	13			
6 *Acer circinatum*	shrub	25	FAC-	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 87%   Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: up to 3"   Depth to saturated soil: surface   Depth to free standing water in soil pit: surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
[illegible]	☐	[illegible]		[illegible]	☐
[illegible]	☐	[illegible]		[illegible]	☐
[illegible]	☐	[illegible]		Local Soil Survey Data	☐
		[illegible]		FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes   Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-10	10YR 3/1	none	na	silt loam
10-16+	10YR 5/3	10YR 4/4	20	silty fine sandy

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: Hydric soil indicators present.

WETLAND DETERMINATION

H[illegible]phytic Vegetation present? Yes
[illegible]d Hydrology present? Yes
[illegible] Soil present? Yes

Is this sample plot within a wetland? YES

Remarks:

ATTACHMENT C

ATSI
Aqua-Terr Systems, Inc.

10 December 2004

Doreen Maloney
Upper Skagit Indian Tribe
2285 Community Plaza
Sedro-Woolley, WA 98284-9739

Re: Wetland/Fish and Wildlife Reconnaissance, 6-acre Brindal parcel.

Dear Ms. Maloney:
As requested, Aqua-Terr Systems, Inc. (ATSI) reviewed an approximate 6-acre Brindal parcel to determine the presence of wetlands, streams, and other biological critical areas. The parcel is situated within a portion of Section 6, Township 35 North, Range 4 East, W.M. (Figures 1, 2 and 3).

The purpose of our review is to provide an assessment of the presence, location, and extent of wetlands, streams, and other biological critical areas that are regulated under the jurisdiction of the U.S. Army Corps of Engineers (COE). The subject parcel was reviewed on 4 December 2004.

A narrow palustrine emergent seasonally flooded wetlands (PEMC) and a seasonal stream were identified on the subject parcel (Figure 3).

METHODS AND PROCEDURES
The wetlands referred to in this report follow the Corps definition: "*...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.*" (Environmental Laboratory 1987). Through Section 404 of the Clean Water Act, the Corps has the authority to regulate the placement of fill materials in wetlands and other waters of the U.S., and requires permits for such activities.

A two-step procedure is used to determine the presence and extent of wetlands and other critical areas on the subject parcel. This procedure includes preliminary data review and an on-site reconnaissance. A qualitative analysis of biota and habitats is performed. We observe the general terrain and traverse the entire parcel to identify wetlands and other critical areas/habitats. Data are collected from the dominant plant communities and soils. In addition, aerial photographs, soil data, and topographic maps are used for orientation and to assist in locating wetlands, streams, and other unique or critical habitats.

The goal of this analysis and site review is to describe the biological aspects of the parcel in order to provide sufficient information for the client and regulating agency to make informed decisions regarding wetlands, streams, and other critical areas.

A preliminary review of public resource documents is used to provide initial information on soils, vegetation, hydrology, and critical areas of the site and surrounding area. These resources include but are not limited to:

- *USDA, Natural Resource Conservation Service soil surveys.*
- Natural Resource Conservation Service hydric soil list.
- National Wetland Inventory maps.

An on-site field reconnaissance was conducted on 4 December 2004 by Jim Wiggins, M.S., P.W.S. and Elizabeth Binney, Ph.D., P.W.S. Mr. Wiggins and Dr. Binney are Professional Wetland Scientists (P.W.S.) certified through the Society of Wetland Scientists. Dr. Binney is provisionally certified through the Seattle District of the U.S. Army Corps of Engineers as a Wetland Delineator and completed the five-day training course for the Washington State Wetland Function Assessment Project Methods for Assessing Wetland Functions.

All wetlands are identified based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology as described in the Corps of Engineers *Wetland Delineation Manual* (Environmental Laboratory 1987). All three parameters must be present for an area to be considered a jurisdictional wetland under normal circumstances. Atypical situations and problem areas are treated per the Corps and state manuals. Figure 3 depicts the approximate locations of the sample plots and the approximate location a wetland and stream (Bob Smith Creek). Data Forms for individual sample plots are at the back of this report.

An area has hydrophytic vegetation if greater than 50 percent of the total composition of the dominant plant species from all strata have an indicator status of Facultative (FAC), Facultative Wetland (FACW), or Obligate Wetland (OBL) (Environmental Laboratory 1987) as defined in the *National List of Plant Species that Occur in Wetlands: 1988 Washington* (Reed 1988) and the *1993 Supplement to List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1993). Additional indicator status of Facultative Upland (FACU) and Obligate Upland (UPL) are given to plants that usually occur in nonwetlands or nearly always occur in nonwetlands respectively (Reed 1988, 1993). No Indicator (NI) is given to species where sufficient information is lacking to give the species an indicator status (Reed 1988). The percent cover of the dominant plant species is estimated for each stratum (e.g. canopy, shrub layer, and herbaceous layer) within a thirty-foot radius plot and the indicator status of each species is determined.

Hydric soils, *in general*, are those soils that have *high organic-matter*, sulfidic material, reduced conditions, aquic or peraquic moisture regimes, soil colors with a chroma of 1, soil colors with a chroma of 2 with mottles, or the presence of iron or manganese concretions (Environmental Laboratory 1987). On-site soils are observed and described from a 20-inch (+/-) soil pit. Hydric characteristics and indicators such as redoxymorphic features (e.g. mottles) are examined within the profile and specifically just below the A-horizon or at 10 inches. Soil color, texture, and hydric indicators, if present, are recorded. Color is determined using a Munsell soil color chart (Kollmorgen 1998).

Wetland hydrology is present when direct or indirect indicators of seasonal or permanent soil saturation or inundation are observed. Indicators include: soil saturation; surface inundation; free water within the top 12 inches of the soil pit; oxidized rhizospheres, water-stained leaves; water marks; drift lines; sediment deposits; drainage patterns; or previously recorded data.

In order to provide an assessment of existing wetland functions, we use a combination of wetland functions listed in the Washington State Department of Ecology (DOE) Wetlands Rating Field Data Form (DOE 1993) and several wetland functional assessment methods, to provide a qualitative assessment of on-site wetlands. This assessment provides information that aids in categorization of the wetlands and baseline information if mitigation is required. Below is a list of functions and attributes addressed (for detailed methods please contact ATSI personnel); a similar list of functions is used to assess other critical areas:

1. Age and classes of wetland communities or populations.
2. Buffer size and character.
3. Cultural, heritage, recreational, and local value.
4. Ecotone complexity and transition zone between dry land and watercourses (sinuosity).
5. Enhancement potential.
6. Flood and storm drainage protection.
7. Habitat for fish and/or wildlife.
8. Presence of sensitive, threatened, or endangered species.
9. Presence and number of habitat features.
10. Shoreline stabilization.
11. Size of wetland or habitat.
12. Support of baseflow and surface or groundwater recharge or discharge.
13. Uniqueness of habitat to area or in general.
14. Water quality functions.
15. Wetland/habitat classification diversity.
16. Wildlife corridors and linkage to other habitats.

SITE DESCRIPTION

The subject parcel is triangular shaped that is bordered by Darrk Lane to the north, Bow Hill Road to the South, and the northbound entrance to Interstate-5 to the west (Figure 3). The eastern portion of the parcel is a mowed field that is used for summer parking. The central portion of the parcel is a forested riparian ravine and the headwaters of Bob Smith Creek. The western portion is also wooded. The topography is generally level with a slight slope to towards Bob Smith Creek. The wetland is situated within a gentle depression or swale where seasonal precipitation is conveyed and remains throughout the wet season.

NWI

The National Wetlands Inventory (NWI) does not map wetlands on or near the subject parcel (Figure 4). We do not concur with this assessment. A palustrine emergent seasonally flooded/saturated (PEME) wetland and a seasonal stream were observed on the subject parcel (Figure 3).

NRCS Soils

The Natural Resource Conservation Service (NRCS) maps the (124) Skipopa silt loam 0 to 3 percent slope and the (69) Hoogdal silt loam soil units on the subject parcel (Sheet 21); Klungland and McArthur 1989) (Figure 5). The soils on the parcel resemble a combination of Skipopa and (16) Bow gravelly loam. Although the Bow soil unit is listed as hydric by the NRCS, neither the Skipopa nor Hoogdal soil units are listed as hydric.

Vegetation

Vegetation on the eastern portion of the parcel is a mowed field that is maintained throughout the summer. A PEME wetland was observed within a shallow depressional area on the western edge of the field.

Upland field

The vegetation within the upland field is dominated by redtop (*Agrostis capillaris*; FAC.), fescue (*Festuca arundinacea*), poa (*Poa pratensis*; FAC), red clover (*Trifolium repens*; FAC*),* white clover (*T. pretense; FACU)*, dandelion (*Taraxacum officinale*; FACU), and cats ear (*Hypochaeris radicata*; FACU).

PEMC wetland

The PEMC wetland vegetation is redtop reed canarygrass (*Phalaris arundinacea*; FACW), soft rush (*Juncus effusus*; FACW), dagger leaf rush (*Juncus ensifolius*; FACW), velvet grass (*Holcus lanatus*; FAC), and cats ear.

Upland forest

The vegetation in the within the ravine and western portion of the parcel is composed of red alder (*Alnus rubra*; FAC), Sitka spruce (*Picea sitchensis*; FAC), western red cedar (*Thuja plicata*; FAC), Douglas fir (*Pseudotsuga menziesii*; FACU), hemlock (*Tsuga heterophylla*; FAC-), paper birch (*Betula papyrifera*; FAC) and big leaf maple (*Acer macrophyllum*; FACU) in the canopy. The shrub layer is composed of osoberry (*Oemleria cerasiformis*; FACU), salmonberry (*Rubus spectabilis*; FAC+), snowberry (*Symphoricarpos albus*; FACU), elderberry (*Sambucus racemosa*; FACU), and oceanspray (*Holodiscus discolor*; UPL). The herbaceous layer is composed of sword fern (*Polystichum munitum*; FACU).

Soils

Soils observed in the forested area on the western portion of the parcel were generally very dark grayish brown (10YR 3/2) silt loam underlain by grayish brown (10YR 5/2), silt and silt loam. The eastern portion of the parcel, including the wetland generally had a very dark grayish brown (10YR 3/2) surface layer about 10 inches deep underlain by a dark reddish gray (10YR 4/2) silt to silt loam or clay with (10YR 4/6) reddish brown mottles.

Excerpts of the NRCS description (Klungland and McArthur 1989) for the Bow, Hoogdal, and Skipopa soil units are listed below:

> **Bow gravelly loam, 0 to 3 percent slopes (16) -** This very deep, somewhat poorly drained soil is on glaciated terraces and undulating till plains. If formed in glaciolacustrine material and gravelly glacial drift mantled with volcanic ash. The vegetation in areas not cultivated is mainly conifers and shrubs. Elevation is 50 to 400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 170 to 220 days.
>
> Typically, the surface layer is dark brown gravelly loam 7 inches thick. The upper 10 inches of the subsoil is dark brown very gravelly loam, the next 14 inches is grayish brown clay loam, olive gray silt clay, and light olive gray silt loam, and the lower part to a depth of 60 inches or more is olive gray silty clay. In some areas the surface layer is gravelly silt loam or black gravelly loam about 9 inches thick, and in some areas the subsoil is loamy.
>
> Included in this unit are small areas of Bellingham soils in wet depressional areas and along drainageways and Catla and Clallam soils on knolls.
>
> Permeability of this Bow soil is slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 6 to 18 inches from November to May. Runoff is slow, and the hazard of water erosion is slight.
>
> **Hoogdal silt loam, 30 to 60 percent slopes (69)** - This very deep, moderately well drained soil is on terrace escarpments. It formed in loess and glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 100 to 300 feet. The average annual precipitation is 45 inches, the average annual air temperature is about 52 degrees F, and the average frost-free season is 160 to 200 days.
>
> Typically, the surface is covered with a mat of needles, leaves, and twigs 2 inch thick. The surface layer is dark brown silt loam 6 inches thick. The subsoil is dark brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is mottled, olive gray and light olive gray silty clay. In some areas the surface layer is gravelly silt loam, and in some areas the substratum has lenses of sand.

Included in this unit are small areas of Barneston soils on outwash terraces and Tokul soils on hills.

Permeability of this Hoogdal soils is slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 18 to 24 inches from December to March. Runoff is rapid, and the hazard of water erosion is severe.

Skipopa silt loam, 0 to 3 percent slopes (124) - This very deep, somewhat poorly drained soil is on terraces. It formed in a mantle of loess and volcanic ash underlain by glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 150 to 450 feet. The average annual precipitation is about 45 inches, the average annual air temperature is about 51 degrees F, and the average frost-free season is 160 to 200 days.

Typically, the surface is covered with a mat of leaves and twigs 1 inch thick. The surface layer, where mixed to a depth of 8 inches, is dark brown silt loam. The subsoil is dark yellowish brown silt loam 8 inches thick. The substratum to a depth of 60 inches or more is gray, olive, and bluish gray silty clay. In some areas the surfaces layer is gravelly silt loam. In some areas the substratum has lenses of sandy material.

Included in this unit are small areas of Bellingham soils in depressional areas, Gilligan and Indianola soils on outwash terraces, and Tokul soils on hills.

Permeability of this Skipopa soil is very slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 12 to 24 inches from October to June. Runoff is slow, and the hazard of water erosion is slight.

Hydrology

Wetland hydrology was observed in the PEME wetland during our field visit. Hydrology is from runoff in the immediate area and a seasonal perched water table because of the shallow hardpan typical of Skipopa and Bow soils. The wetland is within an isolated closed depression and appears to be an artifact of land clearing because of the similarity of the soils within the upland area.

WILDLIFE & PRIORITY SPECIES

We did not observe endangered, threatened, or sensitive plant or animal species, or their habitats regulated by the federal government on the subject parcel or within the immediate vicinity.

The parcel is surrounded by roads and is a combination of open field that is regularly mowed, and a riparian corridor that is functionally isolated from the downgradient riparian corridor by Bow Hill Road and a culvert. Wildlife that likely use the subject parcel are birds, amphibians, and small mammals, as well as larger mammals such as coyote (*Canis latrans*) and black tailed deer (*Odocoileus hemionus*). The wetlands may provide amphibian breeding habitat for species such as the Pacific chorus frog (*Hyla* *regilla).* The stream is connected to the Samish River, a salmonids stream about 1 mile down gradient. This portion of Bob Smith Creek may provide fish habitat because fish are known to reside in the lower portion of the stream.

WETLAND CATEGORIZATION AND FUNCTION EVALUATION

We have compiled information from agencies, professionals, the current literature to qualitatively evaluate the functions of wetlands and other habitats. References and a user manual for our evaluation are available upon request. Individual functions (see list in Methods and Procedures section above) are assessed point values of 0 through 3; 0=function or attribute is lacking; 1=low value, 2=medium or moderate value, and 3=high value. The average of the value for functions is used as the overall assessment of the wetland or habitat. Table 1 summaries of our evaluation of the on-site wetlands.

The overall value of PEME wetland is low (Table 1). The wetland has one wetland class: emergent. The buffers are dominated by roads, upland field, and a riparian corridor. Ecotone complexity (sinuosity) between uplands and wetland is low. Enhancement potential for the wetland is high because the area is dominated by non-native pasture vegetation, lacks habitat structure, and appears to have been man-made. The wetland has low to moderate potential and opportunity for flood and storm drainage protection because it is within an isolated depression, is underlain by a shallow hardpan that restricts percolation into groundwater, is adjacent to a riparian area, but is small. Wildlife habitat is low because the parcel is regularly mowed and seasonally used for parking. The wetland does not provide fish habitat and there is no direct connection to a fisheries stream. The wetland has low to moderate opportunity and potential to improve water quality because it is an isolated depression but contains an herbaceous filtering layer and likely receive runoffs from Darrk Lane, Bow Hill Road, and the field when it is used for parking.

Table 1. Functions and attributes of the PEME wetlands.

Functions and Attributes	Value
1. Age and classes of wetland communities or populations.	1
2. Buffer size and character.	1
3. Cultural, heritage, recreational, and local value.	0
4. Ecotone complexity & transition zone between dry land and watercourses (sinuosity).	1
5. Enhancement potential.	3
6. Flood and storm drainage protection.	1.5
7. Habitat for fish and/or wildlife.	1
8. Presence of sensitive, threatened, or endangered species.	0
9. Presence and number of habitat features.	1
10. Shoreline stabilization.	na
11. Size of wetland or habitat.	1
12. Support of baseflow and surface or groundwater recharge or discharge.	1
13. Uniqueness of habitat to area or in general.	1
14. Water quality functions.	1.5
15. Wetland/habitat classification diversity.	1
16. Wildlife corridors and linkage to other habitats.	1

DETERMINATION

A Palustrine emergent seasonally flooded/saturated (PEME) wetland was observed on the subject parcel within the western edge of the mowed field. A seasonal stream was observed within a ravine in the central portion of the parcel. The seasonal stream was flowing with a channel about 24 inches to 36 inches in width during our field visit. Wetland identification and delineation were made by the presence of positive indicators of hydrophytic vegetation, hydric soil, and wetland hydrology.

Regulations

The U.S. Army Corps of Engineers (Corps) requires notification of all disturbances to **all** wetlands, streams, and other waters and it is incumbent upon the landowner to disclose such disturbances. Isolated wetlands are not under the jurisdiction of the Corps but confirmation of isolation must be made by the Corps. The Environmental Protection Agency (EPA) require a 401 water quality certification for disturbance of wetlands depending upon the type of project and for disturbance of wetlands one-half (0.5) acre or greater. Any disturbance of a wetland area one-half (0.5) acre or greater, or within a 100-year floodplain requires an Individual Permit from the Corps which includes the requirement of compensatory mitigation and an alternatives analysis. The Corps also has the discretion to not allow disturbance to high quality wetlands. The Corps requires certification that no listed nor known endangered, threatened, or sensitive plant or animal species, or National Historic Places are present on the parcel.

Signatory

We have used the most current, established methods to make determinations as to the location, size, and types of wetlands on this parcel. All of the above statements are based on our best professional judgment. Although we follow the federal, state, and local criteria, we cannot guarantee that the U.S. Army Corps of Engineers or the local jurisdiction determination will correspond to ours. Please note that regulations pertaining to critical areas are subject to change over time.

If you have further questions or comments about this report, please contact Mr. Wiggins or Dr. Binney at (360) 856-2139 or FAX at (360) 856-5238. Please contact the COE to confirm our wetland determinations and to confirm current regulations.

Thank you,

Jim Wiggins, M.S., P.W.S.
President
ATSI

Elizabeth Binney, Ph.D., P.W.S.
Vice-President
ATSI

Enclosures: References
Figures (5)
Data Forms (4)

Bob Smith Creek

ATTACHMENT D

ATSI
Aqua-Terr Systems, Inc.

10 December 2004

Doreen Maloney
Upper Skagit Indian Tribe
2285 Community Plaza
Sedro-Woolley, WA 98284-9739

Re: Wetland/Fish and Wildlife Reconnaissance, 40-acre Nielson parcel.

Dear Ms. Maloney:

As requested, Aqua-Terr Systems, Inc. (ATSI) reviewed an approximate 40-acre Nielson parcel to determine the presence of wetlands, streams, and other biological critical areas. The parcel is situated within a portion of Section 31, Township 36 North, Range 4 East, W.M. (Figures 1, 2 and 3).

The purpose of our review is to provide an assessment of the presence, location, and extent of wetlands, streams, and other biological critical areas that are regulated under the jurisdiction of the U.S. Army Corps of Engineers (COE). The subject parcel was reviewed on 4 December 2004.

The western and northern portions of the parcel is a combination of palustrine forested scrub-shrub seasonally flooded/saturated wetlands (PFO/SSE) wetlands, palustrine emergent seasonally saturated/flooded (PEME) wetlands, a wetland complex that is about 50 percent wetland and a wetland complex that is about 30 percent wetland. The majority of the western and northern portions of the parcel are a wetland complex that is about 30 percent wetland.

METHODS AND PROCEDURES

The wetlands referred to in this report follow the Corps definition: "*...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.*" (Environmental Laboratory 1987). Through Section 404 of the Clean Water Act, the Corps has the authority to regulate the placement of fill materials in wetlands and other waters of the U.S., and requires permits for such activities.

A two-step procedure is used to determine the presence and extent of wetlands and other critical areas on the subject parcel. This procedure includes preliminary data review and an on-site reconnaissance. A qualitative analysis of biota and habitats is performed. We observe the general terrain and traverse the entire parcel to identify wetlands and other critical areas/habitats. Data are collected from the dominant plant communities and soils. In addition, aerial photographs, soil data, and topographic maps

21993 Grip Road Sedro-Woolley, WA 98284

are used for orientation and to assist in locating wetlands, streams, and other unique or critical habitats.
The goal of this analysis and site review is to describe the biological aspects of the parcel in order to provide sufficient information for the client and regulating agency to make informed decisions regarding wetlands, streams, and other critical areas.

A preliminary review of public resource documents is used to provide initial information on soils, vegetation, hydrology, and critical areas of the site and surrounding area. These resources include but are not limited to:

- USDA, Natural Resource Conservation Service soil surveys.
- Natural Resource Conservation Service hydric soil list.
- National Wetland Inventory maps.

An on-site field reconnaissance was conducted on 4 December 2004 by Jim Wiggins, M.S., P.W.S. and Elizabeth Binney, Ph.D., P.W.S. Mr. Wiggins and Dr. Binney are Professional Wetland Scientists (P.W.S.) certified through the Society of Wetland Scientists. Dr. Binney is provisionally certified through the Seattle District of the U.S. Army Corps of Engineers as a Wetland Delineator and completed the five-day training course for the Washington State Wetland Function Assessment Project Methods for Assessing Wetland Functions.

All wetlands are identified based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology as described in the Corps of Engineers *Wetland Delineation Manual* (Environmental Laboratory 1987). All three parameters must be present for an area to be considered a jurisdictional wetland under normal circumstances. Atypical situations and problem areas are treated per the Corps and state manuals. Figure 3 depicts the approximate locations of the sample plots and the approximate location wetlands. Data Forms for individual sample plots are at the back of this report.

An area has hydrophytic vegetation if greater than 50 percent of the total composition of the dominant plant species from all strata have an indicator status of Facultative (FAC), Facultative Wetland (FACW), or Obligate Wetland (OBL) (Environmental Laboratory 1987) as defined in the *National List of Plant Species that Occur in Wetlands: 1988 Washington* (Reed 1988) and the *1993 Supplement to List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1993). Additional indicator status of Facultative Upland (FACU) and Obligate Upland (UPL) are given to plants that usually occur in nonwetlands or nearly always occur in nonwetlands respectively (Reed 1988, 1993). No Indicator (NI) is given to species where sufficient information is lacking to give the species an indicator status (Reed 1988). The percent cover of the dominant plant species is estimated for each stratum (e.g. canopy, shrub layer, and herbaceous layer) within a thirty-foot radius plot and the indicator status of each species is determined.

Hydric soils, in general, are those soils that have high organic-matter, sulfidic material, reduced conditions, aquic or peraquic moisture regimes, soil colors with a chroma of 1, soil colors with a chroma of 2 with mottles, or the presence of iron or manganese concretions (Environmental Laboratory 1987). On-site soils are observed and described from a 20-inch (+/-) soil pit. Hydric characteristics and indicators such as redoxymorphic features (e.g. mottles) are examined within the profile and specifically just below the A-horizon or at 10 inches. Soil color, texture, and hydric indicators, if present, are recorded. Color is determined using a Munsell soil color chart (Kollmorgen 1998).

Wetland hydrology is present when direct or indirect indicators of seasonal or permanent soil saturation or inundation are observed. Indicators include: soil saturation; surface inundation; free water within the top 12 inches of the soil pit; oxidized rhizospheres, water-stained leaves; water marks; drift lines; sediment deposits; drainage patterns; or previously recorded data.

In order to provide an assessment of existing wetland functions, we use a combination of wetland functions listed in the Washington State Department of Ecology (DOE) Wetlands Rating Field Data Form (DOE 1993) and several wetland functional assessment methods, to provide a qualitative assessment of on-site wetlands. This assessment provides information that aids in categorization of the wetlands and baseline information if mitigation is required. Below is a list of functions and attributes addressed (for detailed methods please contact ATSI personnel); a similar list of functions is used to assess other critical areas:

1. Age and classes of wetland communities or populations.
2. Buffer size and character.
3. Cultural, heritage, recreational, and local value.
4. Ecotone complexity and transition zone between dry land and watercourses (sinuosity).
5. Enhancement potential.
6. Flood and storm drainage protection.
7. Habitat for fish and/or wildlife.
8. Presence of sensitive, threatened, or endangered species.
9. Presence and number of habitat features.
10. Shoreline stabilization.
11. Size of wetland or habitat.
12. Support of baseflow and surface or groundwater recharge or discharge.
13. Uniqueness of habitat to area or in general.
14. Water quality functions.
15. Wetland/habitat classification diversity.
16. Wildlife corridors and linkage to other habitats.

SITE DESCRIPTION

The subject parcel has a gravel entrance road on the southern portion, two buildings, old pastures adjacent to the road, and was logged within the past 10 years and is a regenerating forest. It is bordered by a wooded parcel to the south; a recently cleared parcel, a home site, and the casino to the west, home sites to the east, and a recently logged parcel and forest land to the north. A palustrine wetland complex and palustrine wetlands were observed on the parcel. The overall slope is to the southwest and west. There are a few scattered young stands of deciduous and conifer trees that were not logged on the parcel (Figure 3).

NWI
The National Wetlands Inventory (NWI) does not map wetlands on or near the subject parcel (Figure 4). We do not concur with this assessment. Palustrine wetlands were observed on the subject parcel (Figure 3).

NRCS Soils
The Natural Resource Conservation Service (NRCS) maps the (124) Skipopa silt loam 0 to 3 percent slope and the (69) Hoogdal silt loam 30 to 60% slope soil units on the subject parcel (Sheet 21; Klungland and McArthur 1989) (Figure 5). The soils on the western portion of the parcel, the area of the wetland complex, resembles a combination of Skipopa and (16) Bow gravelly loam. Hoogdal soils or inclusions of sandy and gravelly soils were observed on the eastern portion of the parcel. The Bow soil unit is listed as hydric by the NRCS, neither the Skipopa nor Hoogdal soil units are listed as hydric.

Vegetation
Vegetation on the parcel is forested, upland field, forested wetland, emergent wetland, and regenerating forest. Palustrine emergent seasonally saturated/flooded wetlands, Palustrine forested scrub-shrub seasonally saturated/flooded wetlands were observed on the western portion of the parcel. Most of the wetlands occur within shallow depressional areas within an upland area. This is a wetland complex that varies from 30 percent wet, 50 percent, to entirely wet.

Upland forest
The vegetation within the upland forested portions of the parcel are dominated a canopy of red alder (*Alnus rubra*; FAC), western redcedar (*Thuja plicata*; FAC), paper birch (*Betula papyrifera*; FAC), and Douglas fir (*Pseudotsuga menziesii*; FACU). The shrub layer is dominated by salmonberry (*Rubus spectabilis*; FAC) and elderberry (*Sambucus racemosa*; FACU), and Himalayan blackberry (*Rubus procerus*; FACU). The shrub and herbaceous layers are dominated by salmonberry (*Rubus spectabilis*; FAC) and sword fern (*Polystichum munitum*; FACU).

Upland field
The upland field vegetation is dominated by velvet grass (*Holcus lanatus*; FAC), red top (*Agrostis capillaris*; FAC), dandelion (*Taraxacum officinale*; FACU), geranium (*Geranium molle*; UPL), red clover (*Trifolium pretense*; FACU), festuca (*Festuca arundinacea*; FAC-), buttercup (*Ranunculus repens*; FACW), and soft rush (*Juncus effusus*; FACW).

PEME wetland

The PEME wetland vegetation is dominated by soft rush, buttercup, red top, and reed canarygrass (*Phalaris arundinacea*; FACW).

PFO/SSE wetland

The PFO/SSE wetland complex vegetation is dominated by cottonwood (*Populus balsamifera*; FAC), red alder, and western redcedar (*Thuja plicata*; FAC) in the canopy. The shrub layer is dominated by salmonberry, elderberry, Himalayan blackberry, hardhack (*Spiraea douglasii*; FACW), twinberry (*Lonicera involucrata;* FACW), and willow (*Salix lucida*; FACW) in the shrub layer. The herbaceous was dominated by slough sedge (*Carex obnupta*; OBL) and buttercup American brookline (*Oenanthe sarmentosa*; OBL), and water parsley (*Veronica americana*; OBL).

Soils

Soils observed in the upland areas on the western and northern portions of the parcel were generally very dark grayish brown (10YR 3/2 and 2/2) silt loam in the top 6 to 10 inches underlain by dark reddish gray (2.5YR 5/2) silt with dark brown 10YR 3/3 and 3/4 mottles. The soils in the upland area on the east central portion of the parcel were dark brown (10YR 3/3) very gravelly sandy loam. The soils within the wetlands generally had a shallower hardpan than the upland soils, the mottles closer to the surface, and were very dark to dark gray (10YR 2/1) silt loam.

The soils on the western portion of the parcel within the wetland complex appear to be a combination of Bow and Skipopa silt loams. The soils in the northern portion of the parcel where the forest was recently logged appear to be Skipopa silt loam. The soils on the parcel are a complex.

Excerpts of the NRCS description (Klungland and McArthur 1989) for the Bow, Hoogdal, and Skipopa soil units are listed below:

> **Bow gravelly loam, 0 to 3 percent slopes (16) -** This very deep, somewhat poorly drained soil is on glaciated terraces and undulating till plains. If formed in glaciolacustrine material and gravelly glacial drift mantled with volcanic ash. The vegetation in areas not cultivated is mainly conifers and shrubs. Elevation is 50 to 400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 170 to 220 days.
>
> Typically, the surface layer is dark brown gravelly loam 7 inches thick. The upper 10 inches of the subsoil is dark brown very gravelly loam, the next 14 inches is grayish brown clay loam, olive gray silt clay, and light olive gray silt loam, and the lower part to a depth of 60 inches or more is olive gray silty clay. In some areas the surface layer is gravelly silt loam or black gravelly loam about 9 inches thick, and in some areas the subsoil is loamy.
>
> Included in this unit are small areas of Bellingham soils in wet depressional areas and along drainageways and Catla and Clallam soils on knolls.

Permeability of this Bow soil is slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 6 to 18 inches from November to May. Runoff is slow, and the hazard of water erosion is slight.

Hoogdal silt loam, 30 to 60 percent slopes (69) - This very deep, moderately well drained soil is on terrace escarpmets. It formed in loess and glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 100 to 300 feet. The average annual precipitation is 45 inches, the average annual air temperature is about 52 degrees F, and the average frost-free season is 160 to 200 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs 2 inch thick. The surface layer is dark brown silt loam 6 inches thick. The subsoil is dark brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is mottled, olive gray and light olive gray silty clay. In some areas the surface layer is gravelly silt loam, and in some areas the substratum has lenses of sand.

Included in this unit are small areas of Barneston soils on outwash terraces and Tokul soils on hills.

Permeability of this Hoogdal soils is slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 18 to 24 inches from December to March. Runoff is rapid, and the hazard of water erosion is severe.

Skipopa silt loam, 0 to 3 percent slopes (124) - This very deep, somewhat poorly drained soil is on terraces. It formed in a mantle of loess and volcanic ash underlain by glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 150 to 450 feet. The average annual precipitation is about 45 inches, the average annual air temperature is about 51 degrees F, and the average frost-free season is 160 to 200 days.

Typically, the surface is covered with a mat of leaves and twigs 1 inch thick. The surface layer, where mixed to a depth of 8 inches, is dark brown silt loam. The subsoil is dark yellowish brown silt loam 8 inches thick. The substratum to a depth of 60 inches or more is gray, olive, and bluish gray silty clay. In some areas the surfaces layer is gravelly silt loam. In some areas the substratum has lenses of sandy material.

Included in this unit are small areas of Bellingham soils in depressional areas, Gilligan and Indianola soils on outwash terraces, and Tokul soils on hills.

Permeability of this Skipopa soil is very slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 12 to 24 inches from October to June. Runoff is slow, and the hazard of water erosion is slight.

Hydrology

Wetland hydrology was observed in the PEMC and PFO/SSE wetlands during our field visit. All wetlands observed on the parcel and in the general area occur in shallow depressional areas and swales. Hydrology is from runoff in the immediate area and a seasonal perched water table because of the shallow hardpan typical of Skipopa soil. Most of the onsite wetlands are within isolated closed depressions that have a seasonal surface connection to Bob Smith Creek.

WILDLIFE & PRIORITY SPECIES

We did not observe endangered, threatened, or sensitive plant or animal species, or their habitats regulated by the federal government on the subject parcel or within the immediate vicinity.

The parcel is forested and connected to forested habitat to the north. Wildlife that likely use the subject parcel are birds, amphibians, and small mammals, as well as larger mammals such as coyote (*Canis latrans*) and black tailed deer (*Odocoileus hemionus*). The wetlands likely provide amphibian breeding habitat for species such as the Pacific chorus frog (*Hyla regilla*).

WETLAND CATEGORIZATION AND FUNCTION EVALUATION

We have compiled information from agencies, professionals, the current literature to qualitatively evaluate the functions of wetlands and other habitats. References and a user manual for our evaluation are available upon request. Individual functions (see list in Methods and Procedures section above) are assessed point values of 0 through 3; 0=function or attribute is lacking; 1=low value, 2=medium or moderate value, and 3=high value. The average of the value for functions is used as the overall assessment of the wetland or habitat. Table 1 summaries of our evaluation of the on-site wetlands.

The overall value of PFO/SSE wetlands that were not logged (those in the central portion of the parcel) is moderate to high (Table 1). The wetlands have two wetland classes: forested and scrub/shrub but have an herbaceous component. The wetlands have are dominated by a diverse native plant community and have large woody debris and snags present. Ecotone complexity (sinuosity) between uplands and wetlands is moderate. Enhancement potential for the wetlands is low because the area is dominated by native vegetation. The wetlands have moderate potential and opportunity for flood and storm drainage protection because, although they are within isolated depressions, they do have a seasonal connection with Bob Smith Creek. Wildlife habitat is moderate because of reasons described above. The wetlands no not provide fish habitat. The wetlands have low opportunity and potential to improve water quality because they are within isolated depressions and lack a connection to downgradient receiving waters and are surrounded by native forest.

Table 1. Functions and attributes of the PFO/SSE wetlands.	
Functions and Attributes	Value
1. Age and classes of wetland communities or populations.	2

Table 1. Functions and attributes of the PFO/SSE wetlands.	
Functions and Attributes	Value
2. Buffer size and character.	2
3. Cultural, heritage, recreational, and local value.	2
4. Ecotone complexity & transition zone between dry land and watercourses (sinuosity).	2
5. Enhancement potential.	1
6. Flood and storm drainage protection.	2
7. Habitat for fish and/or wildlife.	2
8. Presence of sensitive, threatened, or endangered species.	0
9. Presence and number of habitat features.	2
10. Shoreline stabilization.	na
11. Size of wetland or habitat.	2
12. Support of baseflow and surface or groundwater recharge or discharge.	2
13. Uniqueness of habitat to area or in general.	2
14. Water quality functions.	1.5
15. Wetland/habitat classification diversity.	2
16. Wildlife corridors and linkage to other habitats.	2

The overall value of PEME and recently logged PFO/SSE wetlands is low to moderate (Table 2). The PEME wetlands have one wetland class: emergent and the PFO/SSE wetlands have two classes: forested and scrub-shrub. The buffers are dominated by upland field and forested areas, except those PEMC wetlands that are directly adjacent to the gravel road. Ecotone complexity (sinuosity) between uplands and wetlands is moderate. Enhancement potential for the emergent wetlands is high because they are dominated by non-native pasture vegetation. Enhancement potential for the PFO/SSE wetlands is low because they are dominated by native trees and shrubs except for the Himalayan blackberry. The wetlands have low to moderate potential and opportunity for flood and storm drainage protection because they are within isolated depressions and are underlain by a shallow hardpan that restricts percolation into groundwater, however some of the wetlands are adjacent to ditches that convey surface drainage into the headwaters of Bob Smith Creek, and the wetlands are seasonally connected by surface flow to the headwaters of Bob Smith Creek. Wildlife habitat of the PEME wetlands is low to moderate because they are regularly mowed and are dominated by pasture grasses but are connected and buffered by native shrub and forest. Wildlife habitat of the PFO/SSE wetlands is low to moderate. The wetlands no not provide fish habitat. The wetlands have low to moderate opportunity and potential to improve water quality because they are isolated depressions but contain an herbaceous filtering layer but do not receive runoff from potential polluted areas such as roads.

Table 2. Functions and attributes of the PEME and PFO/SSE wetlands respectively.	
Functions and Attributes	Value
1. Age and classes of wetland communities or populations.	1
2. Buffer size and character.	2
3. Cultural, heritage, recreational, and local value.	0
4. Ecotone complexity & transition zone between dry land and watercourses (sinuosity).	1
5. Enhancement potential.	3-2

Table 2. Functions and attributes of the PEME and PFO/SSE wetlands respectively.	
Functions and Attributes	Value
6. Flood and storm drainage protection.	1.5
7. *Habitat for fish and/or wildlife.*	1-2
8. Presence of sensitive, threatened, or endangered species.	0
9. Presence and number of habitat features.	1-2
10. Shoreline stabilization.	na
11. Size of wetland or habitat.	1
12. Support of baseflow and surface or groundwater recharge or discharge.	2
13. Uniqueness of habitat to area or in general.	1
14. Water quality functions.	1.5
15. Wetland/habitat classification diversity.	1
16. Wildlife corridors and linkage to other habitats.	1.5

DETERMINATION

Palustrine forested/scrub-shrub seasonally saturated/flooded and PEME wetlands were observed on the subject parcel. Most of the wetlands are within a complex of uplands and wetlands. Generally, the wetlands are within depressional areas. Wetland identification and delineation were made by the presence of positive indicators of hydrophytic vegetation, hydric soil, and wetland hydrology.

Regulations

The U.S. Army Corps of Engineers (Corps) requires notification of all disturbances to **all** wetlands, streams, and other waters and it is incumbent upon the landowner to disclose such disturbances. Isolated wetlands are not under the jurisdiction of the Corps but confirmation of isolation must be made by the Corps. The Environmental Protection Agency (EPA) require a 401 water quality certification for disturbance of wetlands depending upon the type of project and for disturbance of wetlands one-half (0.5) acre or greater. Any disturbance of a wetland area one-half (0.5) acre or greater, or within a 100-year floodplain requires an Individual Permit from the Corps which includes the requirement of compensatory mitigation and an alternatives analysis. The Corps also has the discretion to not allow disturbance to high quality wetlands. The Corps requires certification that no listed nor known endangered, threatened, or sensitive plant or animal species, or National Historic Places are present on the parcel.

Signatory

We have used the most current, established methods to make determinations as to the location, size, and types of wetlands on this parcel. All of the above statements are based on our best professional judgment. Although we follow the federal, state, and local criteria, we cannot guarantee that the U.S. Army Corps of Engineers or the local jurisdiction determination will correspond to ours. Please note that regulations pertaining to critical areas are subject to change over time.

If you have further questions or comments about this report, please contact Mr. Wiggins or Dr. Binney at (360) 856-2139 or FAX at (360) 856-5238. Please contact the COE to confirm our wetland determinations and to confirm current regulations.

Thank you,

Jim Wiggins, M.S., P.W.S.
President
ATSI

Elizabeth Binney, Ph.D., P.W.S.
Vice-President
ATSI

Enclosures: Bibliography
Figures (5)
Data Forms (13)

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. Plot at SE corner, cleared, graded, & seeded w/grass.
Plot = UPL field.

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Holcus lanatus*	herb.	30	FAC	9			
2 *Agrostis capillaris*	herb.	25	FAC	10			
3 *Taraxacum officinale*	herb.	20	FACU	11			
4 *Geranium molle*	herb.	20	NI (upl)	12			
5 *Triofoium pratense*	herb.	20	FACU	13			
6 *Festuca arundinacea*	herb.	20	FAC-	14			
7 *Ranunculus repens*	herb.	20	FACW	15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 35%
Other hydrophytic indicators: None
Remarks: Lacks hydrophytic vegetation indicators.

HYDROLOGY

Depth to Surface Water: None
Depth to saturated soil: top 2"*
Depth to free standing water in soil pit: None

Recorded Data		Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☐	Water-Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: *Top 2" of soil profile saturated, not below & no free water. Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes
Field observation confirm mapped type? Yes

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-13	10YR 3/2	none	na	silt loam
13-18	2.5Y 5/2-5/3	10YR 4/4	20	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Soils graded & compacted. Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present?
Wetland Hydrology present? No
Hydric Soil present? No

Is this sample plot within a wetland? NO

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. Plot w/in stand of *Alnus* & *Populus*. PFO

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	50	FAC	9			
2 *Populus balsamifera*	canopy	30	FAC	10			
3 *Thuja plicata*	canopy	20	FAC	11			
4 *Salix lucida*	canopy	20	FACW	12			
5 *Rubus spectabilis*	shrub	45	FAC+	13			
6 *Ranunculus repens*	herb.	80	FACW	14			
7 *Juncus effusus*	herb.	30	FACW	15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%

Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators presetn.

HYDROLOGY

Depth to Surface Water: Up to 6" Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

Recorded Data		Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 inches	☒	Water-Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey Data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks:

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes

Field observation confirm mapped type? No

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-16+	10YR 2/1	none	na	silt loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
Wetland Hydrology present? Yes
Hydric Soil present? Yes

Is this sample plot within a wetland? YES

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
oplicant/Owner:	USIT	County:	Skagit
eld Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes

Is this site significantly disturbed (Atypical Situation)? No

Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. W/in cleared area, hummocky, Plot on hummock. Plot = Trans. upl/wetland.

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Holcus lanatus*	herb.	45	FAC	9			
2 *Juncus effusus*	herb.	30	FACW	10			
3 *Poa pratensis*	herb.	25	FAC	11			
4 *Ranunclus repens*	herb.	20	FACW	12			
5 *Agrostis canpillaris*	herb.	20	FAC	13			
6 *Festuca arundinacea*	herb.	20	FAC-	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 88%

Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation present.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: Top 1" Depth to free standing water in soil pit: None

Recorded Data		Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in upper 12 inches	☐
al Photographs	☐	Saturated in Upper 12 Inches	☐	Water Stained Leaves	☐
r (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Top 1" sat. no sat. below or free water. Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes

Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-14	10YR 3/1	none	na	silt loam
14-20	2.5Y 5/2	10YR 4/4 & 4/6	40	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	Yes	Is this sample plot within a wetland? Yes--transitional
W 1 Hydrology present?	No	
H oil present?	Yes	

Remarks: Area was cleared in past several years; positive indicator of wet. hydrology not obs. , possible that soils were graded from wet areas to plot area; veg. spp weedy and colonizers of disturbed areas as well as hydro. veg. indicators.

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site?	Yes
Is this site significantly disturbed (Atypical Situation)?	No
Is the Area a potential Problem Area?	No

Description: Parcel logged, partially cleared, with several forested stands. Plot adj. to Plot 3 w/in depression. Plot = PEM

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Juncus effusus*	herb.	70	FACW	9			
2 *Phalaris arundinacea*	herb.	20	FACW	10			
3 *Ranunculus repens*	herb.	20	FACW	11			
4				12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%

Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up to 3" Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in Upper 12 in.	☐
Aerial Photographs	☐	Saturated in Upper 12 inches	☒	Water-Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey Data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes

Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-14	10YR 3/2	none	na	silt loam
14-16+	2.5Y 5/2	10YR 4/4 & 4/6	40	very fine sandy silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: *too sat. for accurate profile description below 16". Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	Yes
Wetland Hydrology present?	Yes
Hydric Soil present?	No

Is this sample plot within a wetland? Yes

Remarks: See remarks for Plot 3. Here wet. hydro. and hydro. veg present but soils not. Again, clearing and possible grading activities my have moved soils.

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. Plot adj. to forested stand on S. end of parcel. Plot = PEM

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Holcus lanatus*	herb.	55	FAC	9			
2 *Juncus effusus*	herb.	45	FACW	10			
3 *Ranunculus repens*	herb.	20	FACW	11			
4 *Juncus ensifolius*	herb.	10	FACW	12			
5 *Phalaris arundinacea*	herb.	10	FACW	13			
6 *Scirpus microcarpos*	herb.	10	OBL	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%*   Other hydrophytic indicators: None

Remarks: * includes spp >/= 20% cover. Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up to 4"   Depth to saturated soil: Surface   Depth to free standing water in soil pit: Surface

Recorded Data		Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☒	Water-Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes   Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-14	10YR 3/2	10YR 3/4	05	silt loam
14+*	2.5Y 5/2	10YR 3/4	20	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: *too sat. for accurate soil description below 14".

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes   Is this sample plot within a wetland? YES
Wetland Hydrology present? Yes
Hydric Soil present? Yes

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name: USIT - Nielsen
Applicant/Owner: USIT
Field Investigator(s): E.Binney & J.Wiggins

Date: 4 December 2004
County: Skagit
State: Washington
S-T-R: 31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. Plot w/in *Alnus* stand adj. to Plot 5. Plot = PFO

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	80	FAC	9			
2 *Rubus spectabilis*	shrub	55	FAC+	10			
3 *Ranunculus repens*	herb.	45	FACW	11			
4				12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%
Other hydrophytic indicators: None
Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up to 6" Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☒	Water-Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes
Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-16	10YR 3/1	none	na	silt loam
16+*	10YR 5/2	10YR $\frac{3}{4}$ & 3/6	30	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: *too sat. for accurate profile descript. below 16". Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
Wetland Hydrology present? Yes
Hydric Soil present? Yes

Is this sample plot within a wetland? YES

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
…plicant/Owner:	USIT	County:	Skagit
…ld Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. W/in cleared area W. end of parcel; upl-wet. complex. Plot within upl. Plot = UPL field

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Holcus lanatus*	herb.	50	FAC	9			
2 *Ranunculus repens*	herb.	25	FACW	10			
3 *Agrostis capillaris*	herb.	20	FAC	11			
4				12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%
Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: 15" Depth to free standing water in soil pit: [illegible]

[illegible]

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes
Field observation confirm mapped type? Yes

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-18	10YR 3/2	none	na	silt loam (charcoal)

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (Sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
V… d Hydrology present? No
H… Soil present? No

Is this sample plot within a wetland? NO

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. W/in cleared area W. end of parcel; upl-wet. complex. Plot within wet. Plot = PEM

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Juncus effusus*	herb.	50	FACW	9			
2 *Ranunculus repens*	herb.	25	FACW	10			
3 *Agrostis capillaris*	herb.	20	FAC	11			
4				12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%

Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up to 3" Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 inches	☒	Water Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes

Field observation confirm mapped type? No

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-14*	10YR 3/1	none	na	silt loam (charcoal)

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: *too sat. below 14" for accurate profile descript. Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	Yes	Is this sample plot within a wetland? YES
Wetland Hydrology present?	Yes	
Hydric Soil present?	Yes	

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
plicant/Owner:	USIT	County:	Skagit
eld Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. W/in upl-wet complex (similar to 7a & 7b but forested-scrub-shrub). Plot=UPL

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	20	FAC	9 *Juncus effusus*	herb.	20	FACW
2 *Thuja plicata*	canopy	20	FAC	10 *Ranuculus repens*	herb.	30	FACW
3 *Betula papyrifera*	canopy	10	FAC	11			
4 *Populus balsamifera*	canopy	10	FAC	12			
5 *Lonicera incolucrata*	shrub	35	FAC+	13			
6 *Spiraea douglasii*	shrub	25	FACW	14			
7 *Rubus procerus*	shrub	20	FACU	15			
8 *Phalaris arundinacea*	herb.	20	FACW	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 89%*
Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None
Depth to saturated soil: None
Depth to free standing water in soil pit: None

Recorded Data		Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in Upper 12 Inches	☐
al Photographs	☐	Saturated in Upper 12 Inches	☐	Water-Stained Leaves	☐
(Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes
Field observation confirm mapped type? Yes

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-18	10YR 3/2	none	na	silt loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
W d Hydrology present? No
H Soil present? No

Is this sample plot within a wetland? NO

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name: USIT - Nielsen
Applicant/Owner: USIT
Field Investigator(s): E.Binney & J.Wiggins

Date: 4 December 2004
County: Skagit
State: Washington
S-T-R: 31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. W/in upl-wet complex (similar to 7a & 7b but forested-scrub-shrub). Plot=UPL

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	20	FAC	9 *Juncus effusus*	herb.	20	FACW
2 *Thuja plicata*	canopy	20	FAC	10 *Ranuculus repens*	herb.	30	FACW
3 *Betula papyrifera*	canopy	10	FAC	11			
4 *Populus balsamifera*	canopy	10	FAC	12			
5 *Lonicera incolucrata*	shrub	35	FAC+	13			
6 *Spiraea douglasii*	shrub	25	FACW	14			
7 *Rubus procerus*	shrub	20	FACU	15			
8 *Phalaris arundinacea*	herb.	20	FACW	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 89%*

Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up to 6" Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

[illegible]

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes

Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-14*	10YR 3/1	none	na	silt loam (charcoal)

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: *too sat. below 14" for accurate profile descript. Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
Wetland Hydrology present? Yes
Hydric Soil present? Yes

Is this sample plot within a wetland? YES

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
plicant/Owner:	USIT	County:	Skagit
eld Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes

Is this site significantly disturbed (Atypical Situation)? No

Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. W/in *Alnus* stand w/Carex N. of Plot B. Plot = PFO

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	75	FAC	9			
2 *Salix lucida*	canopy	20	FACW	10			
3 *Rubus spectabilis*	shrub	45	FAC+	11			
4 *Carex obnupta*	herb.	85	OBL	12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100% Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present. Surrounding area outside of *Carex* stand dom. By *Spiraea*

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in Upper 12 inches	☐
Photographs	☐	Saturated in Upper 12 Inches	☒	Water-Stained Leaves	☐
(Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks:

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes Field observation confirm mapped type? No

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-5	10YR 2/1	none	na	silt loam
5-14*	2.5Y 5/2	10YR 4/4 & 4/6	20	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: *too sat. for accurate profile descript. Below 14". Hydric soil indicators present.

WETLAND DETERMINATION

Hy phytic Vegetation present?	Yes	Is this sample plot within a wetland? YES
d Hydrology present?	Yes	
Soil present?	Yes	

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Deline0ation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
licant/Owner:	USIT	County:	Skagit
d Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. Plot in logged area N end of parcel dom. By saplings. Hummocky upl-wet complex. Plot=UPL forest (regenerating).

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Betula papyrifera*	reprod.	40	FAC	9			
2 *Alnus rubra*	reprod.	30	FAC	10			
3 *Populus balsamifera*	reprod.	20	FAC	11			
4 *Spiraea douglasii*	shrub	50	FACW	12			
5 *Juncus effusus*	herb.	85	FACW	13			
6 *Holcus lanatus*	herb.	20	FAC	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100% Other hydrophytic indicators: None

Remarks: *Rubus ursinus* 40% but growing on top of other veg. Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: None Depth to free standing water in soil pit: None

[illegible]

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes Field observation confirm mapped type? Yes*

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-5	10YR 3/2	none	na	silt loam
4-15	10YR 4/2	10YR 4/3	40	silt loam
15-20	2.5Y 5/2	10YR 4/4	30	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: *but w/light mottling. Mottles not distinct. Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	Yes	Is this sample plot within a wetland? NO
W d Hydrology present?	No	
H Soil present?	No	

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Deline0ation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
...plicant/Owner:	USIT	County:	Skagit
...eld Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. Plot in logged area N end of parcel dom. By saplings. Hummocky upl-wet complex. Plot=PFO (regenerating).

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Betula papyrifera*	reprod.	40	FAC	9			
2 *Alnus rubra*	reprod.	30	FAC	10			
3 *Populus balsamifera*	reprod.	20	FAC	11			
4 *Spiraea douglasii*	shrub	50	FACW	12			
5 *Juncus effusus*	herb.	85	FACW	13			
6 *Holcus lanatus*	herb.	20	FAC	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100% Other hydrophytic indicators: None

Remarks: *Rubus ursinus* 40% but growing on top of other veg. Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up to 10" Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in upper 12 inches	☐
...l Photographs	☐	Saturated in Upper 12 Inches	☒	Water-Stained Leaves	☐
...(Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Lacks wetland hydrology indicators. .

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes Field observation confirm mapped type? No

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-5	10YR 3/1	none	na	silt loam
4-14*	10YR 4/2	10YR 4/6	40	silt loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	Yes	Is this sample plot within a wetland? YES
W... Hydrology present?	Yes	
H... Soil present?	Yes	

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. Large PFO in stand of *Alnus* near center of N end (not logged). Plot = PFO

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	80	FAC	9 *Oenanthe sarmentosa*	herb.	20	OBL
2 *Salix lucida*	canopy	20	FACW	10 *Agrostis stolonifera*	herb.	20	FAC
3 *Salix scouleriana*	canopy	10	FAC	11 *Veronica americana*	herb.	10	OBL
4 *Populus balsamifera*	canopy	05	FAC	12			
5 *Spiraea douglasii*	shrub	40	FACW	13			
6 *Lonicera involucrata*	shrub	20	FAC+	14			
7 *Ranunculus repens*	herb.	50	FACW	15			
8 *Carex obnupta*	herb.	25	OBL	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%   Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: 10"+ in places Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☒	Water-Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes   Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-16	10YR 2/1	none	na	silt loam
16+*	2.5Y 5/2	10YR 4/6	40	clay

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: *too sat. for accurate profile descript. below 16". Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes   Is this sample plot within a wetland? YES
Wetland Hydrology present? Yes
Hydric Soil present? Yes

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. Logged area NE end of parcel, dom. by saplings. Hummocky upl-wet. Plot = PFO (regen.)

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra* (sapling)	rerpod.	20	FAC	9			
2 *Betula papyrifera* (sapling)	reprod.	20	FAC	10			
3 *Juncus effusus*	herb.	80	FACW	11			
4 *Phalaris arundinacea*	herb.	10	FACW	12			
5 *Scirpus microcarpos*	herb.	10	OBL	13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100% Other hydrophytic indicators: None
Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up to 6" Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☒	Water Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-4	10YR 3/1	none	na	silt loam
4-12	10YR 2/2	10YR 3/4	20	silt loam
12-16+*	2.5Y 5/2	10YR 3/4	30	silty clay

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: *too sat. for accurate profile descript. below 16". Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes Is this sample plot within a wetland? YES
Wetland Hydrology present? Yes
Hydric Soil present? Yes

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Nielsen	Date:	4 December 2004
licant/Owner:	USIT	County:	Skagit
d Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-T35N-R4e

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Parcel logged, partially cleared, with several forested stands. Near Plot 12 on upl hummock. Plot = UPL forest (regen.).

Field recon. during heavy rains.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra* (sapling)	reprod.	45	FAC	9			
2 *Pseudotsuga menziesii* (planted)	reprod.	35	FACU	10			
3 *Rubus procerus*	shrub	45	FACU	11			
4 *Rubus laciniatus*	shrub	25	FACU	12			
5 *Holcus lanatus*	herb.	20	FAC	13			
6 *Juncus effusus*	herb.	10	FACW	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 26%*
Other hydrophytic indicators: None
Remarks: *includes spp =/> 20%. Lacks hydrophytic vegetation indicators.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: None Depth to free standing water in soil pit: None

Recorded Data		Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in Upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☐	Water-Stained Leaves	☐
Other	☐	Water Marks	☐	Local Soil Survey Data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes
Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-2	10YR 2/1	none	na	silt loam
2-20	10YR 3/3	none	na	very gravelly sandy loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

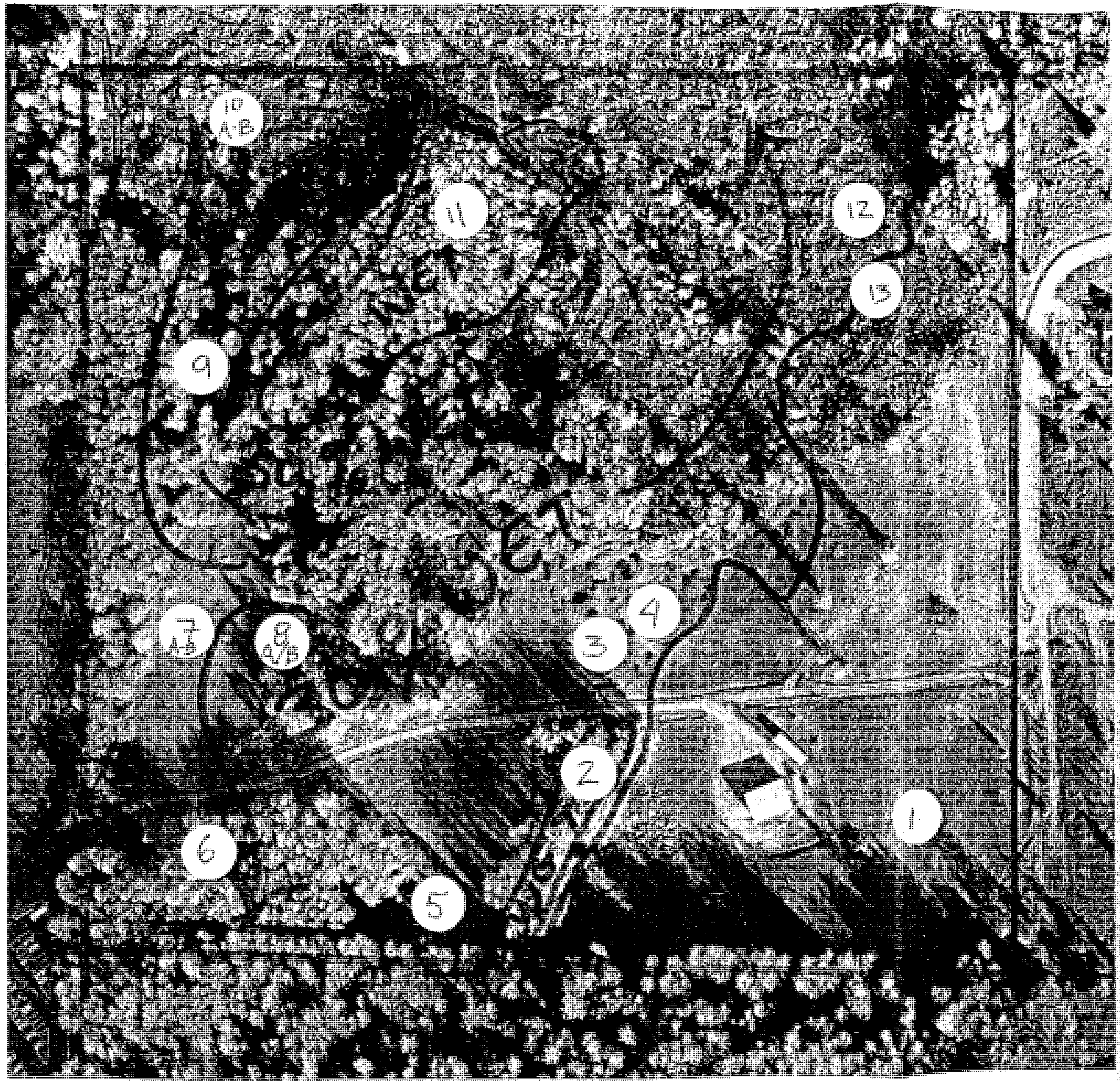
Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? No
Ne ' Hydrology present? No
Hy oil present? No

Is this sample plot within a wetland? NO

Remarks:



1
2
3
4
5
6
9
11
12
13

ATTACHMENT E

ATSI
Aqua-Terr Systems, Inc.

5 February 2005

Doreen Maloney
Upper Skagit Indian Tribe
2285 Community Plaza
Sedro-Woolley, WA 98284-9739

Re: USIT Goodyear-Nelson parcel Wetland/Fish and Wildlife Reconnaissance.

Dear Ms. Maloney:
As requested, Aqua-Terr Systems, Inc. (ATSI) reviewed an approximate 70-acre Goodyear-Nelson parcel to determine the presence of wetlands, streams, and other biological critical areas. The parcel is situated within a portion of Section 31, Township 36 North, Range 4 East, W.M. (Figures 1 and 2).

The purpose of our review is to provide an assessment of the presence, location, and extent of wetlands, streams, and other biological critical areas that are regulated under the jurisdiction of the U.S. Army Corps of Engineers (COE). The field reconnaissance was performed on 29 January 2005.

A palustrine forested seasonally flooded (PFOC) wetland complex was observed over much of the subject parcel (Figure 2). A wetland complex is a mix of wetland and upland areas too intricate to separate, generally with the uplands on hummocks and wetlands in depressions or swales. The wetland complex on this parcel consists of areas that are 10, 30, 50, 70, and 100 percent wetland (Figure 2). All but the extreme eastern edge of the parcel was logged and replanted within the past 10 years.

METHODS AND PROCEDURES

The wetlands referred to in this report follow the Corps definition: "*...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.*" (Environmental Laboratory 1987). Through Section 404 of the Clean Water Act, the Corps has the authority to regulate the placement of fill materials in wetlands and other waters of the U.S., and requires permits for such activities.

A two-step procedure is used to determine the presence and extent of wetlands and other critical areas on the subject parcel. This procedure includes preliminary data review and an on-site reconnaissance. A qualitative analysis of biota and habitats is performed. We observe the general terrain and traverse the entire parcel to identify wetlands and other critical areas/habitats. Data are collected from the dominant plant communities and soils. In addition, aerial photographs, soil data, and topographic maps are used for orientation and to assist in locating wetlands, streams, and other unique or critical habitats.

The goal of this analysis and site review is to describe the biological aspects of the parcel in order to provide sufficient information for the client and regulating agency to make informed decisions regarding wetlands, streams, and other critical areas.

A preliminary review of public resource documents is used to provide initial information on soils, vegetation, hydrology, and critical areas of the site and surrounding area. These resources include but are not limited to:

- USDA, Natural Resource Conservation Service soil surveys.
- Natural Resource Conservation Service hydric soil list.
- National Wetland Inventory maps.

An on-site field reconnaissance was conducted on 29 January 2005 by Jim Wiggins, M.S., P.W.S. and Elizabeth Binney, Ph.D., P.W.S. Mr. Wiggins and Dr. Binney are Professional Wetland Scientists (P.W.S.) certified through the Society of Wetland Scientists. Dr. Binney is provisionally certified through the Seattle District of the U.S. Army Corps of Engineers as a Wetland Delineator and completed the five-day training course for the Washington State Wetland Function Assessment Project Methods for Assessing Wetland Functions.

All wetlands are identified based on the presence of hydrophytic vegetation, hydric soils, and wetland hydrology as described in the Corps of Engineers *Wetland Delineation Manual* (Environmental Laboratory 1987). All three parameters must be present for an area to be considered a jurisdictional wetland under normal circumstances. Atypical situations and problem areas are treated per the Corps and state manuals. Figure 2 depicts the approximate locations of the sample plots and the approximate locations of various percentages of wetland-upland complex areas. Data Forms for individual sample plots are at the back of this report.

An area has hydrophytic vegetation if greater than 50 percent of the total composition of the dominant plant species from all strata have an indicator status of Facultative (FAC), Facultative Wetland (FACW), or Obligate Wetland (OBL) (Environmental Laboratory 1987) as defined in the *National List of Plant Species that Occur in Wetlands: 1988 Washington* (Reed 1988) and the *1993 Supplement to List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Reed 1993). Additional indicator status of Facultative Upland (FACU) and Obligate Upland (UPL) are given to plants that usually occur in nonwetlands or nearly always occur in nonwetlands respectively (Reed 1988, 1993). No Indicator (NI) is given to species where sufficient information is lacking to give the species an indicator status (Reed 1988). The percent cover of the dominant plant species is estimated for each stratum (e.g. canopy, shrub layer, and herbaceous layer) within a thirty-foot radius plot and the indicator status of each species is determined.

Hydric soils, in general, are those soils that have high organic-matter, sulfidic material, reduced conditions, aquic or peraquic moisture regimes, soil colors with a chroma of 1, soil colors with a chroma of 2 with mottles, or the presence of iron or manganese concretions (Environmental Laboratory 1987). On-site soils are observed and described from a 20-inch (+/-) soil pit. Hydric characteristics and indicators such as redoxymorphic features (e.g. mottles) are examined within the profile and specifically just below the A-horizon or at 10 inches. Soil color, texture, and hydric indicators, if present, are recorded. Color is determined using a Munsell soil color chart (Kollmorgen 1998).

Wetland hydrology is present when direct or indirect indicators of seasonal or permanent soil saturation or inundation are observed. Indicators include: soil saturation; surface inundation; free water within the top 12 inches of the soil pit; oxidized rhizospheres, water-stained leaves; water marks; drift lines; sediment deposits; drainage patterns; or previously recorded data.

In order to provide an assessment of existing wetland functions, we use a combination of wetland functions listed in the Washington State Department of Ecology (DOE) Wetlands Rating Field Data Form (DOE 1993) and several wetland functional assessment methods, to provide a qualitative assessment of on-site wetlands. This assessment provides information that aids in categorization of the wetlands and baseline information if mitigation is required. Below is a list of functions and attributes addressed (for detailed methods please contact ATSI personnel); a similar list of functions is used to assess other critical areas:

1. Age and classes of wetland communities or populations.
2. Buffer size and character.
3. Cultural, heritage, recreational, and local value.
4. Ecotone complexity and transition zone between dry land and watercourses (sinuosity).
5. Enhancement potential.
6. Flood and storm drainage protection.
7. Habitat for fish and/or wildlife.
8. Presence of sensitive, threatened, or endangered species.
9. Presence and number of habitat features.
10. Shoreline stabilization.
11. Size of wetland or habitat.
12. Support of baseflow and surface or groundwater recharge or discharge.
13. Uniqueness of habitat to area or in general.
14. Water quality functions.
15. Wetland/habitat classification diversity.
16. Wildlife corridors and linkage to other habitats.

SITE DESCRIPTION

The subject parcel is located in Skagit County to the east of Interstate-5 and an existing tribal casino (Figures 1 and 2). The parcel is surrounded by a mix of forested land, residential acreage, and commercial businesses (i.e., tribal casino, parking lots, etc.). The parcel is nearly level with hummocky surface topography. The eastern edge of the parcel consists of a steep slope that slopes to Highway 99 and Friday Creek. The parcel was logged and replanted sometime within the past 10 years. Logging activities may have increased the number or size of wetlands on portions of the parcel by compacting the soils and removing the canopy. The steep slope on the eastern edge of the parcel was not logged. Much of the parcel consists of a logged palustrine forested seasonally flooded (PFOC) wetland-upland complex that form the headwaters of two of the three tributaries of Bob Smith Creek. The wetland complex consists of several areas of varying percentage of wetland to upland as indicated on Figure 2.

NWI

The National Wetlands Inventory (NWI) does not map wetlands on or near the subject parcel (Figure 3). We do not concur with this assessment. Palustrine wetlands were observed on the subject parcel (Figure 3).

NRCS Soils

The Natural Resource Conservation Service (NRCS) maps the (124) Skipopa silt loam 0 to 3 percent slope and the (69) Hoogdal silt loam 30 to 60% slope soil units on the subject parcel (Sheet 21; Klungland and McArthur 1989) (Figure 4).

Vegetation

The parcel was logged and replanted with Douglas fir (*Pseudotsuga menziesii*; FACU) within the past 10 years. Enough growth and natural recruitment of plant species was observed to identify plant communities. The vegetation consists of a logged PFOC wetland-upland complex, with wetland forest vegetation dominating the depressions and swales and upland forest vegetation dominating the hummocks.

Upland forest

The upland forest consists of a reproduction layer of canopy species up to approximately 10 years old with several mature trees scattered across the parcel, and a stand of mature trees on the steep slope on the east edge of the subject parcel. This vegetation type is found in several discrete stands and on upland hummocks in the PFOC wetland-upland complex.

This vegetation type is dominated by a reproduction layer of Douglas fir, paper birch (*Betula papyrifera*; FAC), and red alder (*Alnus rubra*; FAC). Other canopy species observed included western hemlock (*Tsuga heterophylla*; FACU-), big leaf maple (*Acer macrophyllum*; FACU), and western red cedar (*Thuja plicata*; FAC). The shrub layer is dominated by vine maple (*Acer circinatum*; FAC-), salmonberry (*Rubus spectabilis*; FAC+), red elderberry (*Sambucus racemosa*; FACU), and Himalayan blackberry (*Rubus procerus*; FACU). The herbaceous layer is dominated by sword fern (*Polystichum* *munitum*; FACU), fireweed (*Epilobium angustifolium*; FACU), and trailing blackberry (*Rubus ursinus*; FACU).

The mature stand on the steep slope on the east edge of the parcel is dominated by a canopy of western red cedar, big leaf maple, and Douglas fir; with the shrub layer dominated by red elderberry; and, the herbaceous layer dominated by sword fern.

PFOC Wetland

The PFOC wetland vegetation is found in several discrete stands, within swales, and in depressions within the PFOC wetland-upland complex.

This vegetation type is dominated by a reproduction layer of paper birch and red alder. Various combinations of salmonberry, red-osier dogwood (Cornus sericea; FACW), black twinberry (Lonicera involucrata; FAC+), vine maple, and hardhack (Spiraea douglasii; FACW) dominate the shrub layer. The herbaceous layer is dominated by various combinations of soft rush (*Juncus effusus*; FACW), slough sedge (*Carex obnupta*; OBL), water parsley (*Oenanthe sarmentosa*; OBL), small-fruited bulrush (*Scirpus microcarpos*; OBL), woolly sedge (*Scirpus atrocinctus*; OBL), skunk cabbage (*Lysichiton americanum*; OBL), cattail (*Typha latifolia*; OBL), hare-foot sedge (*Carex leporina*; FACW), and velvetgrass (*Holcus lanatus*; FAC).

Soils

Soils observed in the upland areas were generally dark brown (10YR 3/3) loam in the top 6 to 17 inches underlain by very dark grayish brown (10YR 3/2) silt loam. The subsoil often formed a hardpan layer. In some areas, the subsoil was mottled, and in some areas, particularly the western end of the parcel, the texture was gravelly loam to gravelly silt loam.

The wetlands generally had a shallower hardpan than the upland soils with mottles closer to the surface and chromas that were very dark grayish brown (10YR 3/2) to very dark gray (10YR 3/1) silt loams. Excerpts from the NRCS description (Klungland and McArthur 1989) Hoogdal and Skipopa soil units are listed below:

> **Hoogdal silt loam, 30 to 60 percent slopes (69) -** This very deep, moderately well drained soil is on terrace escarpmets. It formed in loess and glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 100 to 300 feet. The average annual precipitation is 45 inches, the average annual air temperature is about 52 degrees F, and the average frost-free season is 160 to 200 days.
>
> Typically, the surface is covered with a mat of needles, leaves, and twigs 2 inch thick. The surface layer is dark brown silt loam 6 inches thick. The subsoil is dark brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is mottled, olive gray and light olive gray silty clay. In some areas the surface layer is gravelly silt loam, and in some areas the substratum has lenses of sand.

Included in this unit are small areas of Barneston soils on outwash terraces and Tokul soils on hills.

Permeability of this Hoogdal soils is slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 18 to 24 inches from December to March. Runoff is rapid, and the hazard of water erosion is severe.

Skipopa silt loam, 0 to 3 percent slopes (124) - This very deep, somewhat poorly drained soil is on terraces. It formed in a mantle of loess and volcanic ash underlain by glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 150 to 450 feet. The average annual precipitation is about 45 inches, the average annual air temperature is about 51 degrees F, and the average frost-free season is 160 to 200 days.

Typically, the surface is covered with a mat of leaves and twigs 1 inch thick. The surface layer, where mixed to a depth of 8 inches, is dark brown silt loam. The subsoil is dark yellowish brown silt loam 8 inches thick. The substratum to a depth of 60 inches or more is gray, olive, and bluish gray silty clay. In some areas the surfaces layer is gravelly silt loam. In some areas the substratum has lenses of sandy material.

Included in this unit are small areas of Bellingham soils in depressional areas, Gilligan and Indianola soils on outwash terraces, and Tokul soils on hills.

Permeability of this Skipopa soil is very slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 12 to 24 inches from October to June. Runoff is slow, and the hazard of water erosion is slight.

Hydrology

Primary indicators of wetland hydrology, inundation and saturation at the soil surface, were observed in the PFOC wetlands during our field reconnaissance. The wetlands occur in depressions or swales. Hydrology is from runoff from the immediate area and a seasonal perched water table caused by the shallow hardpan. The wetlands form the headwaters of two of the three tributaries to Bob Smith Creek, which occurs to the south of the subject parcel. Surface hydrology on the southwest corner of the subject parcel is sheet flow toward the central tributary to Bob Smith Creek and surface hydrology on the south-central portion of the parcel contributes hydrology to the eastern tributary to Bob Smith Creek (Figures 1 and 2). The northern portion of the parcel slopes to the north with surface hydrology flowing in that direction. Because the water flows off-site onto private property, we were unable to determine where this water is conveyed.

WILDLIFE & PRIORITY SPECIES

We did not observe endangered, threatened, or sensitive plant or animal species, or their habitats regulated by the federal government on the subject parcel or within the immediate vicinity.

The parcel is forested and is connected to forested habitat to the north and south. Wildlife that likely use the subject parcel are birds, amphibians, and small mammals, as well as larger mammals such as coyote (*Canis latrans*) and black tailed deer (*Odocoileus hemionus*). The wetlands provide amphibian-breeding habitat for species such as the Pacific chorus frog (*Hyla regilla*) and waterfowl.

WETLAND CATEGORIZATION AND FUNCTION EVALUATION

We have compiled information from agencies, professionals, the current literature to qualitatively evaluate the functions of wetlands and other habitats. References and a user manual for our evaluation are available upon request. Individual functions (see list in Methods and Procedures section above) are assessed point values of 0 through 3; 0=function or attribute is lacking; 1=low value, 2=medium or moderate value, and 3=high value. The average of the value for functions is used as the overall assessment of the wetland or habitat. Table 1 summaries of our evaluation of the on-site wetlands.

The overall value of PFOC wetland-upland complex is moderate to high (Table 1). The wetland complex is primarily forested (logged but regenerating) with small components of emergent and scrub-shrub. The complex connects to forested land to the north and south but lacks direct connection to other habitats. Bow Hill Road, Darrk Lane, Highway 99, and Interstate-5 come between the wetland complex and other significant habitats. Ecotone complexity (sinuosity) between uplands and wetlands is high. Enhancement potential for the wetlands is low because the area is dominated by native vegetation, has habitat features (e.g., logs and snags), and a developing vertical structure. Although logged, the site was replanted and has extensive recruitment of native canopy and shrub species. The wetlands have moderate to high potential and opportunity for flood and storm drainage protection because they are within depressions and swales over a large area, and comprise the headwaters of Bob Smith Creek. They retain seasonal hydrology, attenuate flow, and provide baseflow for Bob Smith Creek. Wildlife habitat is moderate to high because of the complexity of plant community structure (wetland and upland areas interspersed), dominance of native vegetation, presence of large woody debris, and seasonally ponded areas for amphibian and waterfowl breeding habitat. The wetlands no not provide fish habitat. The wetland complex has moderate opportunity and high potential to improve water quality. Moderate opportunity because not all of the impervious surface area runoff is treated and high potential because the wetlands have a well-developed herbaceous layer. Hydrology from the wetlands connects to Bob Smith Creek through developed areas.

Table 1. Functions and attributes of the PFOC wetland-upland complex.

Functions and Attributes	Value

Table 1. Functions and attributes of the PFOC wetland-upland complex.	
Functions and Attributes	Value
1. Age and classes of wetland communities or populations.	2.5
2. Buffer size and character.	2.5
3. Cultural, heritage, recreational, and local value.	1
4. Ecotone complexity & transition zone between dry land and watercourses (sinuosity).	3
5. Enhancement potential.	1
6. Flood and storm drainage protection.	2.5
7. Habitat for fish and/or wildlife.	2,5
8. Presence of sensitive, threatened, or endangered species.	0
9. Presence and number of habitat features.	3
10. Shoreline stabilization.	na
11. Size of wetland or habitat.	2.5
12. Support of baseflow and surface or groundwater recharge or discharge.	2
13. Uniqueness of habitat to area or in general.	2
14. Water quality functions.	2
15. Wetland/habitat classification diversity.	2
16. Wildlife corridors and linkage to other habitats.	1.5

DETERMINATION

A palustrine forested seasonally flooded (PFOC) wetland-upland complex was observed throughout the subject parcel. The percentage of wetland to upland varies from 10 to 100 percent (Figure 2). The site is hummocky with several broad wetland swales that connect to Bob Smith Creek and to the north of the subject parcel. The wetlands occur in the depressions and swales with upland areas on the hummocks and in several discrete areas (Figure 2). Some of the depressional wetlands are isolated. The site is dominated by native vegetation. Wetland identification and delineation were made by the presence of positive indicators of hydrophytic vegetation, hydric soil, and wetland hydrology.

Regulations

The U.S. Army Corps of Engineers (Corps) requires notification of all disturbances to **all** wetlands, streams, and other waters and it is incumbent upon the landowner to disclose such disturbances. Isolated wetlands are not under the jurisdiction of the Corps but confirmation of isolation must be made by the Corps. The Environmental Protection Agency (EPA) require a 401 water quality certification for disturbance of wetlands depending upon the type of project and for disturbance of wetlands one-half (0.5) acre or greater. Any disturbance of a wetland area one-half (0.5) acre or greater, or within a 100-year floodplain requires an Individual Permit from the Corps which includes the requirement of compensatory mitigation and an alternatives analysis. The Corps also has the discretion to not allow disturbance to high quality wetlands. The Corps requires certification that no listed nor known endangered, threatened, or sensitive plant or animal species, or National Historic Places are present on the parcel.

SIGNATORY

We have used the most current, established methods to make determinations as to the location, size, and types of wetlands on this parcel. All of the above statements are based on our best professional judgment. Although we follow the federal, state, and local criteria, we cannot guarantee that the U.S. Army Corps of Engineers or the local jurisdiction determination will correspond to ours. Please note that regulations pertaining to critical areas are subject to change over time.

If you have further questions or comments about this report, please contact Mr. Wiggins or Dr. Binney at (360) 856-2139 or FAX at (360) 856-5238. Please contact the COE to confirm our wetland determinations and to confirm current regulations.

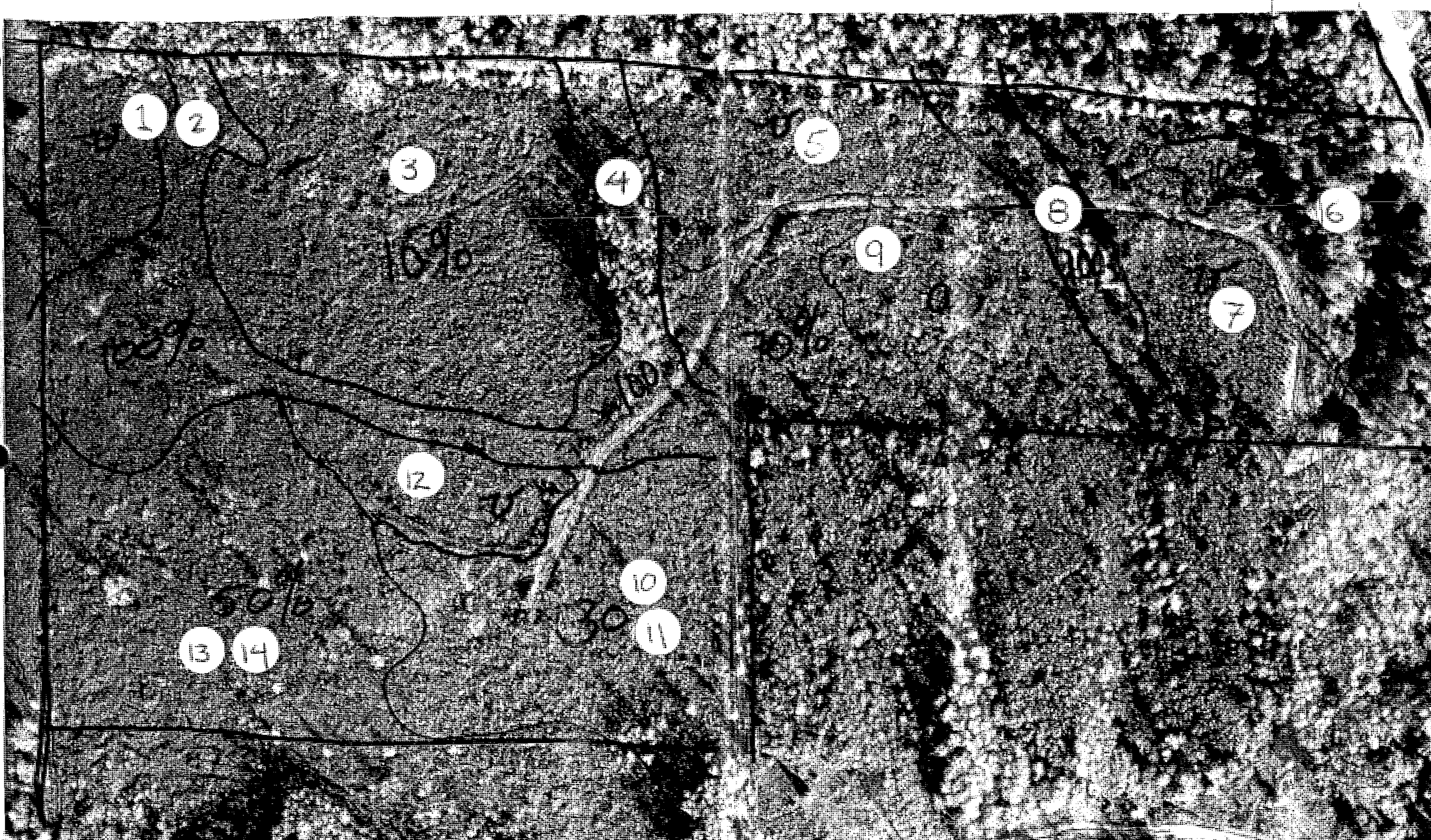
Thank you,

Jim Wiggins, M.S., P.W.S.
President
ATSI

Elizabeth Binney, Ph.D., P.W.S.
Vice-President
ATSI

Enclosures: Bibliography
Figures (4)
Data Forms (14)

GOODYEAR NELSON



ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
Applicant/Owner:	USIT	County:	Skagit
l Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Plot near northwest corner. UPL

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	reprod.	40	FAC	9			
2 *Pseudotsuga menziesii*	reprod.	30	FACU	10			
3 *Rubus spectabilis*	shrub	60	FAC+	11			
4 *Rubus procerus*	shrub	30	FACU	12			
5 *Polystichum munitum*	herb.	20	FACU	13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 56%   Other hydrophytic indicators: None

Remarks: No spp. "wetter" than FAC - spp present typical of region, not necessarily indicative of wet.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: None   Depth to free standing water in soil pit: None

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in upper 12 Inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☐	Water Stained Leaves	☐
(Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
ecorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Lacks hydric soil indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.   Field observation confirm mapped type? Yes

Profile Description:

Depth(in.)	Color	Mottle	Mottle %	Texture
0-13	7.5YR 2.5/2	none	na	gravelly sandy loam
13-20	10YR 3/2	none	na	gravelly silt loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present? No   Is this sample plot within a wetland? NO
Wetland Hydrology present? No
Hy oil present? No

Re s:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Goodyeor-Nelson	Date:	29 January 2005
Applicant/Owner:	USIT	County:	Skagit
Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site?	Yes
Is this site significantly disturbed (Atypical Situation)?	No
Is the Area a potential Problem Area?	No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Logged (w/in prev. 10yrs) PFOC.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	reprod.	30	FAC	9 *Acer circinatum*	shrub	10	FAC-
2 *Betula papyrifera*	reprod.	30	FAC	10 *Carex obnupta*	herb.	40	OBL
3 *Papulus balsamifera*	reprod.	20	FAC	11 *Juncus effusus*	herb.	40	FACW
4 *Pseudotsuga menziesii*	reprod.	20	FACU	12 *Scirpus microcarpos*	herb.	20	OBL
5 *Thuja plicata*	reprod.	10	FAC	13			
6 *Rubus spectabilis*	shrub	40	FAC+	14			
7 *Cornus sericea*	shrub	20	FACW	15			
8 *Lonicera involucrota*	shrub	20	FAC+	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 82%*   Other hydrophytic indicators:

Remarks: *excludes spp w/<10% cover. Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: up to 2"   Depth to saturated soil: Surface   Depth to free standing water in soil pit: Surface

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.   Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottles	Mottle %	Texture
0-12	10YR 3/1	none	na	silt loam
12-14*	10YR 4/2	10YR 3/3	30	clay

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: *too sat. below for accurate profile descript. below 14". Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	Yes	Is this sample plot within a wetland? YES
Wetland Hydrology present?	Yes	
Hydric Soil present?	Yes	

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
A··ant/Owner:	USIT	County:	Skagit
nvestigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. UPL

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Betula papyrifera*	reprod.	65	FAC	9			
2 *Pseudotsuga menziesii*	reprod.	25	FACU	10			
3 *Rubus spectabilis*	shrub	30	FAC+	11			
4 *Rubus procerus*	shrub	20	FACU	12			
5 *Rubus laciniatus*	shrub	20	FACU	13			
6 *Epilabium angustifolium*	herb.	20	FACU	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 53%   Other hydrophytic indicators: None

Remarks: No spp "wetter" than FAC - Lacks hydrophytic vegetation indicators.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: 10"   Depth to free standing water in soil pit: 12"

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☒	Water Stained Leaves	☐
Ot··xplain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
··corded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Sat. at 10 inches; this time a year would expect to see sat. at the surface, esp. with heavy precip. in past 7 days.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.   Field observation confirm mapped type? Yes*

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-10	10YR 3/3	none	na	loam
10-18	10YR 4/3	10YR 3/6	10	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: *Skipopa w/shallow A-horizon.; redoxy. features at 10" w/chroma of 3.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	No	Is this sample plot within a wetland? NO
Wetl··Hydrology present?	Yes**	
Hy··il present?	No	

Remarks: **see comment under hydrology.

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name: USIT - Goodyear-Nelson
A ant/Owner: USIT
nvestigator(s): E.Binney & J.Wiggins

Date: 29 January 2005
County: Skagit
State: Washington
S-T-R: 31-36N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Plot w/in stand of trees not logged. PFO

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	canopy	60	FAC	9 *Scirpus microcarpos*	herb.	20	OBL
2 *Thuja plicata*	canopy	20	FAC	10 *Juncus effusus*	herb.	20	FACW
3 *Rubus spectabilis*	shrub	40	FAC+	11			
4 *Cornus sericea*	shrub	35	FACW	12			
5 *Lonicera involucrata*	shrub	35	FAC+	13			
3 *Acer circinatum*	shrub	35	FAC-	14			
7 *Carex obnupta*	herb.	35	OBL	15			
3 *Oenanthe sarmentosa*	herb.	35	OBL	16			

ercent of Dominant Species that are OBL, FACW, or FAC: 90%
Other hydrophytic indicators: None
Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

epth to Surface Water: Up to 10" Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

[illegible]

emarks: Wetland hydrology indicators present.

OILS

eries/Phase-Mapped: 124-Skipopo silt loam, 0-3% slopes.
Field observation confirm mapped type? No

rofile Description:

epth (in.)	Color	Mottle	Mottle %	Texture
8	10YR 3/1	none	na	silt loam
12+*	10YR 5/1	10YR 4/6	40	clayey silt

dric Soil Indicators:

stosol	☐	Concretions	☐
stic Epipedon	☐	High Organic Content	☐
lfidic Odor	☐	Organic Streaking (sand)	☐
uic Moisture Regime	☐	On Hydric Soils List	☐
ducing Conditions	☐	Gleyed or Low Chroma	☒

marks: *too sat. for accurate profile descript. below 12". Hydric soil indicators present.

ETLAND DETERMINATION

drophytic Vegetation present? Yes
etl ydrology present? Yes
dr present? Yes

Is this sample plot within a wetland? YES

marks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
[illegible]ant/Owner:	USIT	County:	Skagit
[illegible]nvestigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site? Yes

Is this site significantly disturbed (Atypical Situation)? No

Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. UPL

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Betula papyrifera*	reprod.	55	FAC	9 *Polystichum munitum*	herb.	20	FACU
2 *Thuja plicata*	reprod.	20	FAC	10			
3 *Rhamnus purshiana*	reprod.	20	FAC-	11			
4 *Pseudotsuga menziesii*	reprod.	20	FACU	12			
5 *Tsuga heteraphylla*	reprod.	20	FACU-	13			
6 *Rubus procerus*	shrub	30	FACU	14			
7 *Rubus laciniatus*	shrub	20	FACU-	15			
8 *Epilobium angustifolium*	herb.	30	FACU	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 29%

Other hydrophytic indicators: None

Remarks: Lacks hydrophytic vegetation indicators.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: 11"   Depth to free standing water in soil pit: 12-12"

[illegible]

Remarks: Sat. at 11", expect to sbs. sat. at surface this time of year, esp. with heavy precip. w/in prev. 7 days.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.

Field observation confirm mapped type? Yes

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-4	10YR 2/2	none	na	duffy loam
4-10	10YR 3/2	none	na	silt loam
10-16	10YR 5/2	10YR 4/4	20	silt

Hydric Soil Indicators:

[illegible]

Remarks: Redoxy. features at 10"; shallow A-horizon.

WETLAND DETERMINATION

Hydrophytic Vegetation present? No

W[illegible]d Hydrology present? Yes**

[illegible] Soil present? No

Is this sample plot within a wetland? NO

Remarks: **see comments under hydrology.

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Pr' Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
nt/Owner:	USIT	County:	Skagit
Fi nvestigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site? Yes

Is this site significantly disturbed (Atypical Situation)? No

Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Plot on E. edge of parcel; steep slope. UPL mature forest.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Thuja plicata*	canopy	60	FAC	9			
2 *Acer macrophyllum*	canopy	35	FACU	10			
3 *Pseudotsuga menziesii*	canopy	20	FACU	11			
4 *Tsuga heterophylla*	canopy	10	FACU-	12			
5 *Sambucus raceomosa*	shrub	20	FACU	13			
6 *Polystichum munitum*	herb.	65	FACU	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 30%*

Other hydrophytic indicators: None

Remarks: *spp. w/min. 20% cover. Lacks hydrophytic vegetation indicators.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: None Depth to free standing water in soil pit: None

[illegible]

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 69-Hoogdal silt loam, 30-60% slopes

Field observation confirm mapped type? Yes

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-14	10YR 3/3	none	na	loam
14-20+	10YR 4/3	none	na	loam

Hydric Soil Indicators:

[illegible]

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation present? No

Wetland Hydrology present? No

Hydric Soil present? No

Is this sample plot within a wetland? NO

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

P[illegible]t Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
[illegible]ant/Owner:	USIT	County:	Skagit
[illegible] Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Plot E. of parcel; logged. UPL

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Alnus rubra*	reprod.	20	FAC	9			
2 *Betula papyrifera*	reprod.	20	FAC	10			
3 *Pseudotsuga menziesii*	reprod.	20	FACU	11			
4 *Rubus spectabilis*	shrub	20	FAC+	12			
5 *Rubus procerus*	shrub	80	FACU	13			
6 *Sambucus racemosa*	shrub	25	FACU	14			
7 *Rubus laciniatus*	shrub	20	FACU	15			
8 *Epilobium angustifolium*	herb.	35	FACU	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 25%
Other hydrophytic indicators: None
Remarks: Lacks hydrophytic vegetation indicators.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: 17" Depth to free standing water in soil pit: 20"

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]	☐	[illegible]	☐	[illegible]	☐
		[illegible]	☐	[illegible]	☐
No Recorded Data Available	☒	[illegible]	☐	[illegible]	☐
		[illegible]	☐		

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.
Field observation confirm mapped type? Yes

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-17	10YR 3/3	none	na	silt loam
17-20+	10YR 4/2	10YR 4/6	10	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (Sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

H[illegible]hytic Vegetation present? No
[illegible]d Hydrology present? No
H[illegible] Soil present? No

Is this sample plot within a wetland? NO

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
Applicant/Owner:	USIT	County:	Skagit
Field Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Plot w/in wet. swale; logged on edges; PEMC.

VEGETATION

	Dominant Species	Stratum	%cover	Indicator		Dominant Species	Stratum	%cover	Indicator
1	*Lonicera involucrate*	shrub	30	FAC+	9	*Typha latifolia*	herb.	10	OBL
2	*Rubus spectabilis*	shrub	20	FAC+	10				
3	*Carex obnupta*	herb.	40	OBL	11				
4	*Oenanthe sarmentosa*	herb.	40	OBL	12				
5	*Scirpus microcarpos*	herb.	40	OBL	13				
6	*Ranunculus repens*	herb.	40	FACW	14				
7	*Juncus effusus*	herb.	35	FACW	15				
8	*Lysichiton americanum*	herb.	20	OBL	16				

Percent of Dominant Species that are OBL, FACW, or FAC: 100%   Other hydrophytic indicators: None

Remarks: Mix of reprod. and mature *Alnus rubra* & *Thuja plicata* on edges. Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: 12"+   Depth to saturated soil: Surface   Depth to free standing water in soil pit: NA

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 Inches	☐	Water-Stained Leaves	☐
Other (Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC-Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Flowing water obs. Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.   Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-6+*	10YR 3/1	none	na	silty clay

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: *too inundated for accurate profile descript. below 6". Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes   Is this sample plot within a wetland? YES
Wetland Hydrology present? Yes
Hydric Soil present? Yes

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
licant/Owner:	USIT	County:	Skagit
d Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Plot in slightly hummocky are (90% wet). Logged; PFO

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Betula papyrifera*	reprod.	30	FAC	9 *Lysichiton americanum*	herb.	20	OBL
2 *Salix sitchensis*	reprod.	20	FACW	10 *Typha latifolia*	herb.	20	OBL
3 *Thuja plicata*	reprod.	20	FAC	11 *Juncus effusus*	herb.	20	FACW
4 *Cornus sericea*	shrub	35	FACW	12 *Juncus ensifolius*	herb.	20	FACW
5 *Lonicera involucrata*	shrub	35	FAC+	13 *Carex leporina*	herb.	20	FACW
6 *Rubus spectabilis*	shrub	20	FAC+	14			
7 *Oenanthe sarmentosa*	herb.	40	OBL	15			
8 *Scirpus microcarpos*	herb.	30	OBL	16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100% Other hydrophytic indicators: None
Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up tp8"+ Depth to saturated soil: Surface Depth to free standing water in soil pit: Surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☒	Oxidized Root Channels in upper 12 inches	☐
A Photographs	☐	Saturated in Upper 12 Inches	☐	Water-Stained Leaves	☐
Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC Neutral Test	☐
No Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes. Field observation confirm mapped type?

Profile Description:

Depth(in)	Color	Mottle	Mottle %	Texture
0-6	10YR 2/1	none	na	silt loam
6-8+*	10YR 5/1	none	na	silt

Hydric Soil Indicators:

listosol	☐	Concretions	☐
listic Epipedon	☐	High Organic Content	☐
ulfidic Odor	☐	Organic Streaking (sand)	☐
quic Moisture Regime	☐	On Hydric Soils List	☐
educing Conditions	☐	Gleyed or Low Chroma	☐

emarks: *too sat. for accurate profile descript. below 8". Hydric soil indicators present.

VETLAND DETERMINATION

lydro-hytic Vegetation present? Yes Is this sample plot within a wetland? YES
Vet ydrology present? Yes
y il present? Yes

emarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
...icant/Owner:	USIT	County:	Skagit
Investigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site?	Yes
Is this site significantly disturbed (Atypical Situation)?	No
Is the Area a potential Problem Area?	No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Wet-upl complex. Plot on UPL hummock.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Betula papyrifera*	reprod.	60	FAC	9			
2 *Pseudotsuga menziesii*	reprod.	20	FACU	10			
3 *Rubus spectabilis*	shrub	20	FAC+	11			
4 *Polystichum munitum*	herb.	20	FACU	12			
5				13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 67%   Other hydrophytic indicators: None

Remarks: No spp. "wetter" than FAC - dom. reprod. spp. not necessarily indicative of wet.

HYDROLOGY

Depth to Surface Water: None   Depth to saturated soil: 10"   Depth to free standing water in soil pit: 12"

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
Stream, Lake, or Tide Gauge	☐	Inundated	☐	Oxidized Root Channels in Upper 12 inches	☐
Aerial Photographs	☐	Saturated in Upper 12 inches	☒	Water-Stained Leaves	☐
...Explain in Remarks)	☐	Water Marks	☐	Local Soil Survey data	☐
		Drift Lines	☐	FAC Neutral Test	☐
...Recorded Data Available	☒	Sediment Deposits	☐	Other (Explain in Remarks)	☐
		Drainage Patterns in Wetlands	☐		

Remarks: Although sat. in upper 12" (@10"), expect to obs. sat. at surface this time of year and w/heavy precip. in prev. 7 days.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.   Field observation confirm mapped type? Yes

Profile Description:

Depth (in)	Color	Mottles	Mottle %	Texture
0-12	10YR 3/3	none	na	silt loam
12-20	10YR 4/3	none	na	silt loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (Sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	No	Is this sample plot within a wetland? NO
W... nd Hydrology present?	No	
... Soil present?	No	

R...arks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name: USIT - Goodyear-Nelson
A ant/Owner: USIT
nvestigator(s): E.Binney & J.Wiggins

Date: 29 January 2005
County: Skagit
State: Washington
S-T-R: 31-36N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Plot adj. to Plot 10; w/in wet. depression. Logged PFO.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Betula papyrifera*	reprod.	20	FAC	9			
2 *Salix sitchensis*	reprod.	25	FACW	10			
3 *Spiraea douglasii*	shrub	20	FACW	11			
4 *Juncus effusus*	herb.	75	FACW	12			
5 *Carex leporina*	herb.	20	FACW	13			
6				14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%
Other hydrophytic indicators: None
Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up to 8"   Depth to saturated soil: Surface   Depth to free standing water in soil pit: Surface

Recorded Data	☐	Primary Indicators		Secondary Indicators (2 or more required)	
[illegible]	☐	[illegible]	☒	[illegible]	☐
[illegible]	☐	[illegible]	☒	[illegible]	☐
[illegible]	☐	[illegible]	☐	[illegible]	☐
[illegible]		[illegible]	☐	[illegible]	☐
[illegible]	☒	[illegible]	☐	[illegible]	☐
		[illegible]	☐		

Remarks: Soil pit in sat. soil; inundation surrounding and in plot. Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.
Field observation confirm mapped type? No

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-8	10YR 3/2	none	na	silt loam
8-16+	10YR 5/1	10YR 5/4	20	silty clay

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
W nd Hydrology present? Yes
Soil present? Yes

Is this sample plot within a wetland? YES

Remarks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
[illegible]ant/Owner:	USIT	County:	Skagit
[illegible]nvestigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site? Yes

Is this site significantly disturbed (Atypical Situation)? No

Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Upl area.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Pseudotsuga menziesii*	reprod.	40	FACU	9			
2 *Betula papyrifera*	reprod.	20	FAC	10			
3 *Acer circinatum*	shrub	20	FAC-	11			
4 *Rubus spectabilis*	shrub	20	FAC+	12			
5 *Pteridium aquilinum*	herb.	85	FACU	13			
6 *Rubus ursinus*	herb.	50	FACU	14			
7 *Polystichum munitum*	herb.	20	FACU	15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 16%

Other hydrophytic indicators: None

Remarks: Lacks hydrophytic vegetation indicators.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: 12" Depth to free standing water in soil pit: 14"

[illegible]

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.

Field observation confirm mapped type? Yes

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-12	10YR 3/3	none	na	loam
12-20	10YR 3/2	10YR 3/3	10	silt loam

Hydric Soil Indicators:

[illegible]

Remarks: Lacks hydric soil indicators.

WETLAND DETERMINATION

Hydrophytic Vegetation present?	No	Is this sample plot within a wetland? NO
W[illegible]d Hydrology present?	No	
[illegible] Soil present?	No	

Remarks:

ROUTINE WETLAND DETERMINATIONLakc DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name: USIT - Goodyear-Nelson
Applicant/Owner: USIT
Fi[illegible] /estigator(s): E.Binney & J.Wiggins

Date: 29 January 2005
County: Skagit
State: Washington
S-T-R: 31-36N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Plot w/in upl-wet complex - hummocky; plot on UPL hummock.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Betula papyrifera*	reprod.	40	FAC	9			
2 *Alnus rubra*	reprod.	30	FAC	10			
3 *Populus balsamifera*	reprod.	20	FAC	11			
4 *Spiraea douglasii*	shrub	50	FACW	12			
5 *Juncus effusus*	herb.	65	FACW	13			
6 *Holcus lanatus*	herb.	20	FAC	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%
Other hydrophytic indicators: None
Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: None Depth to saturated soil: None Depth to free standing water in soil pit: None

[illegible]

Remarks: Lacks wetland hydrology indicators.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.
Field observation confirm mapped type? Yes*

Profile Description:

Depth (in)	Color	Mottle	Mottle %	Texture
0-4	10YR 3/2	none	na	silt loam
4-15	10YR 4/2	10YR 4/3	40	silt loam
15-20	2.5Y 5/2	10YR 4/4	30	silt

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☐

Remarks: *but w/mottling near surface - compacted top soil? Mottles not distinct.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
Wetland Hydrology present? No
H[illegible] Soil present? No

Is this sample plot within a wetland? NO

R[illegible]ks:

ROUTINE WETLAND DETERMINATION DATA FORM

(1987 COE Wetlands Delineation Manual)

Project Name:	USIT - Goodyear-Nelson	Date:	29 January 2005
A[illegible]nt/Owner:	USIT	County:	Skagit
[illegible]nvestigator(s):	E.Binney & J.Wiggins	State:	Washington
		S-T-R:	31-36N-4E

Do Normal Circumstances exist on the site? Yes
Is this site significantly disturbed (Atypical Situation)? No
Is the Area a potential Problem Area? No

Description: Site logged w/in past 10yrs; replanted, and forest reestablishing; plant communities not mature but are recognizable. Plot adj. to Plot 13; w/in wet. depression. Logged PFO. Note similar veg. composition and abundance.

VEGETATION

Dominant Species	Stratum	%cover	Indicator	Dominant Species	Stratum	%cover	Indicator
1 *Betula papyrifera*	reprod.	40	FAC	9			
2 *Alnus rubra*	reprod.	30	FAC	10			
3 *Populus balsamifera*	reprod.	20	FAC	11			
4 *Spiraea douglasii*	shrub	50	FACW	12			
5 *Juncus effusus*	herb.	85	FACW	13			
6 *Holcus lanatus*	herb.	20	FAC	14			
7				15			
8				16			

Percent of Dominant Species that are OBL, FACW, or FAC: 100%   Other hydrophytic indicators: None

Remarks: Hydrophytic vegetation indicators present.

HYDROLOGY

Depth to Surface Water: Up to 10"   Depth to saturated soil: Surface   Depth to free standing water in soil pit: Surface

[illegible]	☐	Primary Indicators		Secondary Indicators (2 or more required)	
[illegible]	☐	[illegible]	☒	[illegible]	☐
[illegible]	☐	[illegible]	☒	[illegible]	☐
[illegible]	☐	[illegible]	☐	[illegible]	☐
		[illegible]	☐	[illegible]	☐
No Recorded Data Available	☒	[illegible]	☐	[illegible]	☐
		[illegible]	☐		

Remarks: Soil pit dug in sat. soils, surrounding inund. Wetland hydrology indicators present.

SOILS

Series/Phase-Mapped: 124-Skipopa silt loam, 0-3% slopes.   Field observation confirm mapped type? No

Profile Description:

Depth (in.)	Color	Mottle	Mottle %	Texture
0-5	10YR 3/1	none	na	silt loam
5-14*	10YR 4/2	10YR 4/6	40	silt loam

Hydric Soil Indicators:

Histosol	☐	Concretions	☐
Histic Epipedon	☐	High Organic Content	☐
Sulfidic Odor	☐	Organic Streaking (sand)	☐
Aquic Moisture Regime	☐	On Hydric Soils List	☐
Reducing Conditions	☐	Gleyed or Low Chroma	☒

Remarks: Low chroma and redoxy. features. Hydric soil indicators present.

WETLAND DETERMINATION

Hydrophytic Vegetation present? Yes
[illegible]nd Hydrology present? Yes
[illegible] Soil present? Yes

Is this sample plot within a wetland? YES

Remarks:

UPPER SKAGIT INDIAN TRIBE
WETLAND MITIGATION PLAN
for
SKAGIT RESORT

April 2008

Prepared for:
Doreen Maloney
Upper Skagit Indian Tribe
25944 Community Plaza Way
360-854-7000

Prepared by:
ATSI
21993 Grip Rd
Sedro-Woolley, WA 98284
360-856-2139

ATSI
Aqua-Terr Systems, Inc.

Table of Contents

1.0 Executive Summary

The proposed project is the construction of a resort on the east side of North Darrk Lane across from the existing casino. The project will impact a total of 4.94-acres of wetland. Impacts are comprised of 3.94-acres of wetland fill from development and 1.00-acre of wetland disturbance from wetland creation. Proposed mitigation to compensate for wetland impacts is the creation of 8.97-acres of scrub-shrub wetland and setting aside 40.41-acres of land for continued protection into a conservation easement.

2.0 Project Description

The Upper Skagit Indian Tribe (USIT) is proposing to build a resort on the east side of North Darrk Lane across from the existing casino (Figures 1 to 4). The proposed resort will include the resort building, a parking lot, an area designated for a future parking garage, and two stormwater management facilities (Figure 4). Development is proposed to occur across two previously purchased parcels referred to in this report as the Burkland and Nielson properties (P123324 and P50416 respectively, Figures 2 and 3). Mitigation for development impacts is proposed to occur on a third previously purchased parcel referred to in this report as the Goodyear-Nelson parcel (P50414, Figures 2 and 3).

The project will impact a total of 4.94-acres of wetland. Impacts are comprised of 3.94-acres of wetland fill from development within Wetland Areas A, D and F (Figures 4 to 6) and 1.00-acre of wetland disturbance from wetland creation within Wetland K, a wetland complex comprised of 10 percent wetland (Figures 7 and 8). The wetland fill and wetland mitigation areas occur on tribal trust land (Figures 7 to 9).

For descriptive purposes, we will refer to the "development area" as the area where the proposed development is to occur on the Burkland and Neilson parcels, the "mitigation area" as the area of mitigation occurring on the Goodyear-Nelson parcel, and the "project area" as all inclusive.

2.1 Project Location

The project area is located within an approximately 124-acre area located at the northeast corner of Bow Hill Road and North Darrk Lane, in Skagit County, Washington. The approximate 21-acre Burkland parcel (P123324) lies within a portion of Section 6, Township 35, Range 4 East, W.M. The approximate 41-acre Nielson parcel (P50416) and the approximate 62-acre Goodyear-Nelson parcel (P50414) lie within Section 31, Township 36 North, Range 4 East, W.M. (Figures 1 and 2).

2.1.1 Project Name

Upper Skagit Indian Tribe - Skagit Resort

2.1.2 Location of Wetlands

Wetlands are located throughout the project area and occur as wetland complexes with varying percentages of wetlands versus upland areas (Figure 3). The project will impact a total of 4.94-acres of wetland. Impacts are comprised of 3.94-acres of wetland fill from development within Wetland Areas A, D and F (Figure 4) and 1.00-acre of wetland disturbance from wetland creation within Wetland K, a wetland complex comprised of 10 percent wetland (Figure 7).

2.1.3 NWI

The National Wetlands Inventory (NWI) does not map wetlands on or near the project area. We do not concur with this assessment. On the Burkland parcel, a palustrine forested scrub-shrub seasonally flooded/saturated (PFO/SSE) wetland complex was observed to the south. On the Nielsen parcel we observed a combination of palustrine forested scrub-shrub seasonally flooded/saturated (PFO/SSE wetlands), and palustrine emergent seasonally saturated/flooded (PEME) wetlands, a wetland complex that is approximately 50 percent wetland, and a wetland complex that is about 30 percent wetland that comprises the majority of the western and northern portions of the parcel. On the Goodyear-Nelson parcel we observed PFOC complexes that varied from 10, 30, 50, 70 and 100 percent wetland (Figure 3 and Attachments A, B, and C).

2.1.4 NRCS

The Natural Resource Conservation Service (NRCS) maps two soils units across the project site (Attachment A). These are the (124) Skipopa silt loam 0 to 3 percent slopes and the (69) Hoogdal silt loam 30 to 60 percent slope (Sheet 21; Klungland and McArthur 1989). On the Burkland and Nielsen parcels, we observed soils characteristic of Skipopa soils, Hoogdal soils or inclusions of sandy and gravelly soils, and soils that resembled a combination of Skipopa and (16) Bow gravelly loam (Attachments A and B). On the Goodyear-Nelson parcel, we observed soils characteristic of Skipopa soils and hydric inclusions (Attachment C). The Bow soils unit is listed as hydric by the NRCS; neither the Skipopa nor Hoogdal soil units are listed as hydric.

2.2 Responsible Parties

Doreen Maloney
Upper Skagit Indian Tribe
25944 Community Plaza Way
Sedro-Woolley, WA 98284
360-854-7000

2.3 Description of Overall Project

The Upper Skagit Indian Tribe (USIT) is proposing to build a resort on the east side of North Darrk Lane across from the existing casino (Figures 1 to 4). Development is proposed to occur on two recently purchased parcels referred to in this report as the Burkland and Nielson properties (P123324 and P50416 respectively, Figures 2 and 3).

The proposed resort will fill 3.9-acres of wetland for the construction of a resort building, a parking lot, an area designated for a future parking garage, and two stormwater management facilities (Figures 4 to 6).

Mitigation for development impacts is proposed to occur on a third recently purchased parcel referred to in this report as the Goodyear-Nelson parcel (P50414, Figures 2 and 3), within a wetland complex, Wetland K, which is comprised of 10 percent wetland. Wetland construction will impact 1.00-acre of the existing 10 percent wetlands found within the complex (Figures 7 to 9). Figure 8 best illustrates the proposed wetland creation.

The proposed mitigation for impacting a total of 4.94-acres of wetland is a combination of 8.97-acres wetland creation, setting aside 40.41-acres of land for continued protection (conservation easement), and the construction of two proposed stormwater management facilities and a stormwater management facility discharge point into an existing intercept swale to mimic stream type conditions (Figures 7 to 9). Figure 7 best illustrates the locations of the proposed mitigation.

We have completed a wetland reconnaissance report for each parcel (Attachments A, B, and C) as follows:

* 21-acre Burkland Parcel (Attachment A)
* 41-acre Nielson Parcel (Attachment B)
* 62-acre Goodyear-Nelson Parcel (Attachment C)

Mitigation includes: wetland creation within an upland/wetland complex (Wetland K; 90 percent upland and 10 percent wetland), the placement of additional lands from Wetlands D, I, L, M, N, O and P and remaining upland areas within the Nielsen and Goodyear-Nelson parcels into a conservation easement, and the construction of two stormwater (quality and quantity) facilities (Figure 7).

2.4 Wetland Delineation of Impact Area

Wetland impacts from the proposed resort will occur in Wetland Areas A, D, and F (Figure 4). Wetland impacts will occur from mitigation as a result of the construction of wetlands within Wetland K (Figure 7). Wetland delineation reports for these areas are in Attachments A, B and C.

3.0 Existing Conditions of Impact Wetlands

On the Burkland parcel, a palustrine forested scrub-shrub seasonally flooded/saturated (PFO/SSE) wetland complex was observed to the south (Attachment A). On the Nielsen parcel we observed a combination of palustrine forested scrub-shrub seasonally flooded/saturated (PFO/SSE wetlands, palustrine emergent seasonally saturated/flooded (PEME) wetlands, a wetland complex that is approximately 50 percent wetland, and a wetland complex that is about 30 percent wetland that comprises the majority of the western and northern portions of the parcel (Attachment B). On the Goodyear-Nelson parcel, Wetland K, which consists of approximately 10 percent wetland, will be impacted by the creation of additional wetlands for mitigation (Attachments C).

A wetland complex is a mix of wetland and upland areas too intricate to separate, generally with the uplands on hummocks and wetlands in depressions or swales. Wetland percentages for the complex were determined by direct observation and estimating percent cover of either uplands or wetlands depending which had the greater percent cover. A majority of the project area (Neilson and Goodyear-Nelson) was logged and partially cleared several months prior to our reconnaissance.

Attachment A is the delineation report for the impacted Wetland A (ATSI, 10 December 2004), Attachment B is the wetland delineation report for the impacted Wetland D and Wetland F (ATSI, 10 December 2004), and Attachment C is the wetland delineation report for the impacted Wetland K (ATSI, 5 February 2005).

The following sections describe the existing vegetation, wetland hydrology, soils, functions, and wildlife for the wetlands in the project area.

3.1 Existing Vegetation

Existing Vegetation is broken down into a general overview of observed vegetation followed by the specific upland and wetland vegetation areas on each of the three parcels.

Burkland Parcel – General Vegetation Overview
The Burkland Parcel vegetation is predominantly forested with one PFO/SSE wetland, Wetland A. The forest includes areas that vary in species composition and are described separately as a mixed forest in the northeastern portion of the site, a disturbed red alder area in the middle portion of the site and a mature forest along the steep slopes of Bow Hill Road.

Burkland Parcel – Upland forests
The northeastern mixed forest is dominated by a canopy of red alder (*Alnus rubra*; FAC), big leaf maple (*Acer macrophyllum*; FACU), western red cedar (*Thuja plicata*; FAC), and hemlock (*Tsuga heterophylla*; FACU). The shrub layer is dominated by salmonberry (*Rubus spectabilis;* FAC+) and elderberry (*Sambucus racemosa;* FACU). The herbaceous layer is dominated by sword fern (*Polystichum munitum;* FACU) and piggyback plant (*Tolmieia menziesii*; FAC). The disturbed red alder area is dominated by red alder with subdominants of western red cedar, salmonberry, Himalayan blackberry (*Rubus discolor;* FACU), buttercup (*Ranunculus repens*; FACW), and trailing blackberry (*Rubus ursinus;* FACU). The mature forest along the steep slopes of Bow Hill Road is dominated by a canopy of mature Douglas fir (*Pseudotsuga menziesii*;

FACU), big leaf maple, and red alder trees. The shrub and herbaceous layers are dominated by Oregon grape (Mahonia nervosa; FACU), osoberry (*Oemleria cerasiformis*; FACU), elderberry and vine maple (*Acer circinatum*; FAC-)

Burkland Parcel - PFO/SSE Wetland
The PFO/SSE wetland complex vegetation is dominated by a combination of upland plants and wetland vegetation. Generally, the uplands are dominated by canopy and shrub species while the wetlands are dominated by herbaceous and shrub species. The vegetation within the upland hummocks is dominated by Sitka spruce (*Picea sitchensis;* FAC*)*, cottonwood *(Populus balsamifera;* FAC*)*, red alder, and western red cedar in the canopy and salmonberry, elderberry, vine maple and sword fern in the shrub and herbaceous layers. The wetlands are dominated by salmonberry, hardhack (*Spiraea douglasii*; FACW) and buttercup in the shrub and herbaceous layers.

Neilson Parcel - General Vegetation Overview
Existing vegetation in Neilson Parcel is forested, upland field, forested wetland, emergent wetland, and regenerating forest. Palustrine emergent seasonally saturated/flooded wetlands were observed on the western portion of the parcel. Most of the wetlands occur within shallow depressional areas within upland areas. This is a wetland complex that varies from 30 percent, 50 percent, and 100 percent wet.

Neilson Parcel - Upland forest
The vegetation within the upland forested portions of the parcel are dominated by a canopy of red alder, western red cedar, paper birch (*Betula papyrifera*; FAC), and Douglas fir. The shrub layer is dominated by salmonberry, elderberry, and Himalayan blackberry. The shrub and herbaceous layers are dominated by salmonberry and sword fern.

Neilson Parcel – Upland field
The upland field vegetation is dominated by velvet grass *(Holcus lanatus; FAC)*, red top *(Agrostis capillaries; FAC)*, dandelion *(Taraxacum officinale; FACU)*, geranium *(Geranium molle*; UPL), red clover (*Trifolium pratense;* FACU*)*, tall fescue *(Festuca arundinacea;* FAC-), buttercup, and soft rush (*Juncus effusus; FACW)*.

Neilson Parcel – PEM Wetland & PFO/SSE Wetland Complexes
The PEME wetland vegetation is dominated by soft rush, buttercup, red top, and reed canarygrass (*Phalaris arundinacea*; FACW). The PFO/SSE wetland complex vegetation is dominated by a canopy of cottonwood, red alder, and western red cedar. The shrub layer is dominated by salmonberry, elderberry, Himalayan blackberry, hardhack, twinberry (*Lonicera involucrata;* FACW), and willow (*Salix lucida*, FACW). The herbaceous layer was dominated by slough sedge (*Carex obnupta*; OBL), buttercup, American Brookline (*Veronica americana; OBL)*, and water parsley (*Oenanthe sarmentosa*; OBL).

Goodyear-Nelson Parcel – General Vegetation Overview

The Goodyear-Nelson mitigation area parcel was logged and replanted with Douglas fir within the past 10 years. The vegetation consists of logged PFOC wetland/upland complexes with wetland forest vegetation dominating the depressions and swales and upland forest vegetation dominating the hummocks.

Goodyear-Nelson – Upland forest

The upland forest consists of a reproduction layer of canopy species up to approximately 10 years old with several mature trees scattered across the parcel, and a stand of mature trees on the steep slope on the east edge of the subject parcel. This vegetation type is found in several discrete stands and on upland hummocks in the PFOC wetland-upland complex. The reproduction layer is dominated by Douglas fir, paper birch, and red alder. Other canopy species observed included western hemlock, big leaf maple, and western red cedar. The shrub layer is dominated by vine maple, salmonberry, red elderberry, and Himalayan blackberry. The herbaceous layer is dominated by sword fern, fireweed (*Epilobium angustifolium;* FACU), and trailing blackberry. The mature stand on the steep slope on the east edge is dominated by a canopy of western red cedar, big leaf maple, and Douglas fir. The shrub layer is dominated by red elderberry and the herbaceous layer by sword fern.

Goodyear-Nelson – PFOC Wetland Complexes

The PFOC wetlands are found in several discrete stands, within swales, and in depressions within the wetland-upland complex. Vegetation is dominated by a reproduction layer of paper birch and red alder. The shrub layer includes various combinations of salmonberry, red-osier dogwood (*Cornus sercea; FACW),* black twinberry, vine maple, and hardhack. The herbaceous layer is dominated by various combinations of soft rush, slough sedge, water parsley, small-fruited bulrush (*Scirpus microcarpos; OBL)*, woolly sedge (*Scirpus atrocinctus;* OBL), skunk cabbage (*Lysichitum americanum*; OBL), cattail (*Typha latifolia; OBL), hare-foot sedge (Carex leporine; FACW),* and velvet grass.

3.2 Existing Wetland Hydrology

Within the development area of the Burkland and Neilson parcels we observed primary indicators of wetland hydrology, inundation, and saturation at the soil surface in the wetlands during our field reconnaissance. The wetlands occur in shallow depressions or swales that generally vary between 1 and 12 inches in depth. Hydrology is from runoff from the immediate area and a seasonal perched water table caused by the shallow hardpan. The wetlands form the headwaters of two of the tributaries to Bob Smith Creek, which begins on the Nielson parcel. A portion of the creek (near the intersection of Darrk Lane and the existing parking area) was historically recontoured to form a stormwater detention pond has since been modified again per Corps Ref: 200600146. Surface hydrology flows toward the east side of Darrk Lane where it becomes Bob Smith Creek.

The northern portion of the Goodyear-Nelson parcel slopes to the north with surface hydrology flowing in that direction. Because the water flows off-site and onto private property, we were unable to determine where this water is conveyed but assume that it is within the Friday Creek watershed which is a portion of the Samish River watershed.

The flow path (water conveyance off the site) to the south is two tributaries to Bob Smith Creek that are conveyed into the Samish River (Figure 10). A preliminary stormwater management review has been completed by Pacific Surveying & Engineering, Inc. (Attachment D). This preliminary plan will construct two new stormwater facilities that will detain and treat all water from the new and existing improvement areas. All stormwater currently flowing onto the site from undeveloped areas will be routed into a discharge point to an existing stormwater intercept swale (Figure 4). The existing intercept swale and new stormwater facilities are designed to the standards set forth in the Washington State Department of Ecology "Stormwater Management Manual for Western Washington" 2001 publication.

3.3 Existing Soils

The Natural Resource Conservation Service (NRCS) maps two soils units across the project site. These are the (124) Skipopa silt loam, 0 to 3 percent slopes, and the (69) Hoogdal silt loam, 30 to 60 percent slopes (Sheet 21; Klungland and McArthur 1989). On the Burkland and Nielsen parcels, we observed soils characteristic of Skipopa soils, Hoogdal soils or inclusions of sandy and gravelly soils, and soils that resembled a combination of Skipopa and (16) Bow gravelly loam (Attachments A and B). On the Goodyear-Nelson parcel, we observed soils characteristic of Skipopa soils and hydric inclusions (Attachment C). The Bow soils unit is listed as hydric by the NRCS, neither the Skipopa nor Hoogdal soil units are listed as hydric. Excerpts from the NRCS descriptions for each soil unit is listed below (Klungland and McArthur 1989):

> **(124) Skipopa silt loam, 0 to 3 percent slopes** - This very deep, somewhat poorly drained soil is on terraces. It formed in a mantle of loess and volcanic ash underlain by glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 150 to 450 feet. The average annual precipitation is about 45 inches, the average annual air temperature is about 51 degrees F, and the average frost-free season is 160 to 200 days.
>
> Typically, the surface is covered with a mat of leaves and twigs 1 inch thick. The surface layer, where mixed to a depth of 8 inches, is dark brown silt loam. The subsoil is dark yellowish brown silt loam 8 inches thick. The substratum to a depth of 60 inches or more is gray, olive, and bluish gray silty clay. In some areas the surfaces layer is gravelly silt loam. In some areas the substratum has lenses of sandy material.
>
> Included in this unit are small areas of Bellingham soils in depressional areas, Gilligan and Indianola soils on outwash terraces, and Tokul soils on hills.

Permeability of this Skipopa soil is very slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 12 to 24 inches from October to June. Runoff is slow, and the hazard of water erosion is slight.

(69) Hoogdal silt loam, 30 to 60 percent slopes - This very deep, moderately well drained soil is on terrace escarpmets. It formed in loess and glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 100 to 300 feet. The average annual precipitation is 45 inches, the average annual air temperature is about 52 degrees F, and the average frost-free season is 160 to 200 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs 2 inch thick. The surface layer is dark brown silt loam 6 inches thick. The subsoil is dark brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is mottled, olive gray and light olive gray silty clay. In some areas the surface layer is gravelly silt loam, and in some areas the substratum has lenses of sand.

Included in this unit are small areas of Barneston soils on outwash terraces and Tokul soils on hills.

Permeability of this Hoogdal soils is slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 18 to 24 inches from December to March. Runoff is rapid, and the hazard of water erosion is severe.

(16) Bow gravelly loam, 0 to 3 percent slopes - This very deep, somewhat poorly drained soil is on glaciated terraces and undulating till plains. It formed in glaciolacustrine material and gravelly glacial drift mantled with volcanic ash. The vegetation in areas not cultivated is mainly conifers and shrubs. Elevation is 50 to 400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 170 to 220 days.

Typically, the surface layer is dark brown gravelly loam 7 inches thick. The upper 10 inches of the subsoil is dark brown very gravelly loam, the next 14 inches is grayish brown clay loam, olive gray silt clay, and light olive gray silt loam, and the lower part to a depth of 60 inches or more is olive gray silty clay. In some areas the surface layer is gravelly silt loam or black gravelly loam about 9 inches thick, and in some areas the subsoil is loamy.

Included in this unit are small areas of Bellingham soils in wet depressional areas and along drainageways and Catla and Clallam soils on knolls.

Permeability of this Bow soil is slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is at a depth of 6 to 18 inches from November to May. Runoff is slow, and the hazard of water erosion is slight.

3.4 Wetland Functional Evaluation

We have compiled information from agencies, professionals, the current literature to qualitatively evaluate the functions of wetlands and other habitats. References and a user manual for our evaluation are available upon request. Individual functions (see list in Methods and Procedures section above) are assessed point values of 0 through 3; 0=function or attribute is lacking; 1=low value, 2=medium or moderate value, and 3=high value. The average of the value for functions is used as the overall assessment of the wetland or habitat. Tables 1 to 4 summarize our evaluations of the project area wetlands.

On the Burkland parcel, the overall value of PFO/SSE wetland complex is moderate (Table 1). The wetlands have two wetland classes: forested and scrub/shrub with a seasonal herbaceous component. The wetlands are within a well developed native forest with direct connection to forested habitat to the north but are separated from other habitats to the south by Bow Hill Road and Darrk Lane. Ecotone complexity (sinuosity) between uplands and wetlands is moderate, that is, the wetland is a complex of uplands and wetlands. Enhancement potential for the wetlands is low because the area is dominated by native vegetation. The wetlands have moderate potential and opportunity for flood and storm drainage protection because they are within isolated depressions, lack a direct connection with any streams, but because of their overall size do retain seasonal water and attenuate flow. Wildlife habitat is moderate because of the variation within the plant community structure (a well developed and diverse canopy and shrub community), presence of large woody debris, and seasonally ponded areas for amphibian breeding habitat. The wetlands do not provide fish habitat. The wetlands have low opportunity and potential to improve water quality because they are within isolated depressions and lack a connection to downgradient receiving waters.

Table 1. Functions and attributes of the Burkland Parcel PFO/SSE wetlands.

Functions and Attributes	Value
1. Age and classes of wetland communities or populations.	2
2. Buffer size and character.	2
3. Cultural, heritage, recreational, and local value.	0
4. Ecotone complexity & transition zone between dry land and watercourses (sinuosity).	1
5. Enhancement potential.	1
6. Flood and storm drainage protection.	1
7. Habitat for fish and/or wildlife.	1.5
8. Presence of sensitive, threatened, or endangered species.	0
9. Presence and number of habitat features.	2
10. Shoreline stabilization.	na
11. Size of wetland or habitat.	1.5
12. Support of baseflow and surface or groundwater recharge or discharge.	1

Table 1. Functions and attributes of the Burkland Parcel PFO/SSE wetlands.	
Functions and Attributes	Value
13. Uniqueness of habitat to area or in general.	1.5
14. Water quality functions.	1.5
15. Wetland/habitat classification diversity.	1.5
16. Wildlife corridors and linkage to other habitats.	1.5

On the Nielsen parcel, the functions and attributes of the wetlands are broken down into two distinct areas on the parcel: the unlogged PFO/SSE wetlands (Table 2) and the recently logged PEME and PFO/SSE wetlands (Table 3).

The overall value of the PFO/SSE wetlands that were not logged (those in the central portion of the Nielsen parcel) is moderate to high (Table 2). The wetlands have two wetland classes: forested and scrub/shrub and also have an herbaceous component. The wetlands are dominated by a diverse native plant community and have large woody debris and snags present. Ecotone complexity (sinuosity between uplands and wetlands) is dominated by native vegetation. The wetlands have moderate potential and opportunity for flood and storm drainage protection because, although they are within isolated depressions, they do have a seasonal connection with Bob Smith Creek. Wildlife habitat is moderate because of reasons described above. The wetlands do not provide fish habitat. The wetlands have low opportunity and potential to improve water quality because they are within isolated depressions and lack a connection to downgradient receiving waters and are surrounded by native forest.

Table 2. Functions and attributes of the Nielsen Parcel unlogged PFO/SSE wetlands.	
Functions and Attributes	Value
1. Age and classes of wetland communities or populations.	2
2. Buffer size and character.	2
3. Cultural, heritage, recreational, and local value.	2
4. Ecotone complexity & transition zone between dry land and watercourses (sinuosity).	2
5. Enhancement potential.	1
6. Flood and storm drainage protection.	2
7. Habitat for fish and/or wildlife.	2
8. Presence of sensitive, threatened, or endangered species.	0
9. Presence and number of habitat features.	2
10. Shoreline stabilization.	na
11. Size of wetland or habitat.	2
12. Support of baseflow and surface or groundwater recharge or discharge.	2
13. Uniqueness of habitat to area or in general.	2
14. Water quality functions.	1.5
15. Wetland/habitat classification diversity.	2
16. Wildlife corridors and linkage to other habitats.	2

The overall value of PEME and recently logged PFO/SSE wetlands on the Nielsen parcel is low to moderate (Table 3). The PEME wetlands have one wetland class:

emergent and the PFO/SSE wetlands have two classes: forested and scrub-shrub. The buffers are dominated by upland field and forested areas, except those PEMC wetlands that are directly adjacent to the gravel road. Ecotone complexity (sinuosity) between uplands and wetlands is moderate. Enhancement potential for the emergent wetlands is high because they are dominated by non-native pasture vegetation. Enhancement potential for the PFO/SSE wetlands is low because they are dominated by native trees and shrubs except for the Himalayan blackberry. The wetlands have low to moderate potential and opportunity for flood and storm drainage protection because they are within isolated depressions and are underlain by a shallow hardpan that restricts percolation into groundwater; however, some of the wetlands are adjacent to ditches that convey surface drainage into the headwaters of Bob Smith Creek, and the wetlands are seasonally connected by surface flow to the headwaters of Bob Smith Creek. Wildlife habitat of the PEME wetlands is low to moderate because they are regularly mowed and are dominated by pasture grasses but are connected to and buffered by native shrub and forest. Wildlife habitat of the PFO/SSE wetlands is low to moderate. The wetlands do not provide fish habitat. The wetlands have low to moderate opportunity and potential to improve water quality because they are isolated depressions that contain an herbaceous filtering layer but do not receive runoff from potential polluted areas such as roads.

Table 3. Functions and attributes of the Neilsen Parcel logged PEME and PFO/SSE wetlands.

Functions and Attributes	Value
1. Age and classes of wetland communities or populations.	1
2. Buffer size and character.	2
3. Cultural, heritage, recreational, and local value.	0
4. Ecotone complexity & transition zone between dry land and watercourses (sinuosity).	1
5. Enhancement potential.	3-2
6. Flood and storm drainage protection.	1.5
7. Habitat for fish and/or wildlife.	1-2
8. Presence of sensitive, threatened, or endangered species.	0
9. Presence and number of habitat features.	1-2
10. Shoreline stabilization.	na
11. Size of wetland or habitat.	1
12. Support of baseflow and surface or groundwater recharge or discharge.	2
13. Uniqueness of habitat to area or in general.	1
14. Water quality functions.	1.5
15. Wetland/habitat classification diversity.	1
16. Wildlife corridors and linkage to other habitats.	1.5

On the Goodyear-Nelson parcel, the overall value of PFO/SSE wetland-upland complex is moderate to high (Table 4). The wetland complex is primarily forested (logged but regenerating) with small components of emergent and scrub-shrub. The complex connects to forested land to the north and south but lacks direct connection to other habitats. Bow Hill Road, Darrk Lane, Highway 99, and Interstate-5 come between the wetland complex and other significant habitats. Ecotone complexity (sinuosity) between uplands and wetlands is high. Enhancement potential for the wetlands is low because the area is dominated by native vegetation, has habitat features (e.g., logs and snags), and a developing vertical structure. Although logged, the site was replanted and has extensive recruitment of native canopy and shrub species. The wetlands have moderate to high potential and opportunity for flood and storm drainage protection because they are within depressions and swales over a large area, and comprise the headwaters of Bob Smith Creek. They retain seasonal hydrology, attenuate flow, and provide baseflow for Bob Smith Creek. Wildlife habitat is moderate to high because of the complexity of plant community structure (wetland and upland areas interspersed), dominance of native vegetation, presence of large woody debris, and seasonally ponded areas for amphibian and waterfowl breeding habitat. The wetlands do not provide fish habitat. The wetland complex has moderate opportunity and high potential to improve water quality. Moderate opportunity because not all of the impervious surface area runoff is treated and high potential because the wetlands have a well-developed herbaceous layer. Hydrology from the wetlands connects to Bob Smith Creek through developed areas.

Table 4. Functions and attributes of the Goodyear-Nelson Parcel PFO/SSE wetland-upland complex.

Functions and Attributes	Value
1. Age and classes of wetland communities or populations.	2.5
2. Buffer size and character.	2.5
3. Cultural, heritage, recreational, and local value.	1
4. Ecotone complexity & transition zone between dry land and watercourses (sinuosity).	3
5. Enhancement potential.	1
6. Flood and storm drainage protection.	2.5
7. Habitat for fish and/or wildlife.	2.5
8. Presence of sensitive, threatened, or endangered species.	0
9. Presence and number of habitat features.	3
10. Shoreline stabilization.	na
11. Size of wetland or habitat.	2.5
12. Support of baseflow and surface or groundwater recharge or discharge.	2
13. Uniqueness of habitat to area or in general.	2
14. Water quality functions.	2
15. Wetland/habitat classification diversity.	2
16. Wildlife corridors and linkage to other habitats.	1.5

3.5 Wetland Rating

The on-site wetlands have not been rated.

3.6 Buffers

The buffers for wetlands in the project area consist of a mix of paved parking areas, gravel roads, logged and partially cleared land, cleared mown pasture, and upland forest. Darrk Lane occurs to the west of the project area, paved parking areas to the north and west, gravel roads within the Nielsen and Goodyear-Nelson parcels, pasture within the Nielsen parcel, logged and partially logged lands throughout the project area, mixed forest off-site to the north, and single-family residential to the east.

3.7 Existing Wildlife Habitat and Priority Habitat & Species

We did not observe endangered, threatened, or sensitive plant or animal species, or their habitats regulated by the federal government on the subject parcel or within the immediate vicinity. The Washington State Department of Fish and Wildlife Habitat and Priority Species maps do not indicate priority species within a 1-mile radius of the site. In addition, a no-effects determination was made for the USIT Pulley Ridge development, Corps Reference: 2002-4-00592, project.

The project area and general area is a combination of forested and developed areas connected to forested habitat to the north. Wildlife that likely use the site are birds, amphibians, and small mammals, as well as larger mammals such as coyote (*Canis latrans*) and black tailed deer (*Odocoileus hemionus*). The wetlands likely provide amphibian breeding habitat for species such as the Pacific chorus frog (*Hyla regilla)* and red legged frog (*Rana aurora*).

Neither fisheries habitat, nor bald eagle habitat, nor their prey species habitat occur on the project area or within the general area. No eagle nest or perch trees occur in the general area. The forested wetlands on the project area are the headwaters to a tributary to Bob Smith Creek. The lower reaches of Bob Smith Creek, off-site, provide habitat for salmonids. Chinook salmon (*Oncorhynchus tshawytscha*) reside within the Samish River; however, this run of Chinook is a hatchery stock. Chinook salmon can enter the lower portion of Bob Smith Creek but it is unlikely that they enter the upper reaches of the creek because the creek is shallow at the confluence with the Samish River, about 6 to 12 inches deep and about 4 feet wide, and is steep with shallower water near the project site. A culvert and log weirs that lack sufficient splash pools for Chinook fish passage occur near the toe of the slope to the southeast of the site.

That portion of Bob Smith Creek to the south of the Pulley parcel, about ½ mile down gradient of the project area has a gravel to cobble substrate, is approximately 6 to 8 feet wide in the meander channel with a standard width of stream flow about 3 to 4 feet wide, and has numerous pieces of large woody debris. Silver salmon (*O. kisutch*) and cutthroat trout (*O. clarki*) are known to spawn within this reach of the main stem of Bob Smith Creek and reside within all tributaries of Bob Smith Creek. There is also a chum (*O. keta*) egg rearing facility off-site within this reach, but it is not known if it is still in use.

4.0 Mitigation

4.1 Proposed Mitigation

Proposed mitigation for 4.94-acres of impacts to wetlands includes a combination of wetland creation, the placement of additional lands into a conservation easement, and the construction of two stormwater (quality and quantity) facilities (Figure 7).

Specifically mitigation consists of 8.97-acres of wetland creation within Wetland K (an upland/wetland complex; 90 percent upland and 10 percent wetland), setting aside 40.41-acres of land (38.51-acres from Wetlands D, I, L, M, N, O and P and 1.89-acres remaining upland) into a conservation easement, and the construction of two proposed stormwater management facilities and a stormwater management facility discharge point into an existing intercept swale (Figures 7 to 9). Figure 7 best illustrates the locations of the proposed mitigation.

4.2 Mitigation Site Selection

The mitigation sites were selected by completing a wetland reconnaissance and delineation on the approximately 124-acres of land previously purchased by the USIT. All land is adjacent to the resort.

During our site assessment, we determined the headwater wetlands that are tributary to Bob Smith Creek extend onto the Nielson parcel. This area is 100 percent wetland and was field flagged and surveyed. The watershed for this tributary to Bob Smith Creek extends onto the Goodyear Nelson parcel. We selected this area for suitable mitigation because the upland areas can be converted to wetlands and a corridor of wetlands and upland/wetland complex can be placed into a conservation easement for protection, therefore protecting the headwater upland/wetland complex where practicable. The corridor extends south on the west edge of the project area, through the stormwater detention pond and then onto the tributary to Bob Smith Creek.

4.3 Goals & Objectives

The goal of this wetland mitigation plan is to provide a no-net-loss of wetland area, increase amphibian habitat; increase habitat diversity, increase structural diversity, increase wetland classification diversity, increase wetland dependant species diversity, provide increased connectivity to the adjacent stream corridor for Bob Smith Creek in certain areas, mitigate the stormwater functions that the wetlands currently provide with the stormwater facilities, and provide protection from human intrusion into the wetland areas adjacent to the proposed resort with the installation of fencing and native growth protection area (NGPA) signage.

To achieve these goals we propose to:

1. Create 8.97-acres (a 1.5:1 ratio of creation to fill/disturbance) of scrub-shrub wetlands to compensate for wetland loss in Wetlands A, D, F and K. This will also increase the habitat for amphibians and other wetland dependant species.

2. Place 40.41-acres of additional lands on the Good-Year Nelson parcel (38.51-acres from Wetlands D, I, L, M, N, O and P and 1.89-acres remaining upland) into a conservation area easement.

3. Place 4,300-lineal feet (l.f.) of fencing and NGPA signage along the boundaries between the developed areas of the proposed resort and adjacent wetland areas to the north and south.

The objectives of the mitigation plan are to compensate for the loss of wetlands on the project site by creating 8.97-acres of wetlands (Area K) within an upland/wetland complex (Wetland K; 90 percent upland and 10 percent wetland) and setting aside 40.41-acres of remaining lands including wetlands, upland/wetland complexes, and uplands (Figures 7 to 9).

4.4 Performance Standards

The created wetland shall be no less than 8.97-acres by the end of the 10^{th} monitoring year.

4.4.1 Hydrology

The seasonally saturated to ponded wetland will have a hydrological regime that varies from seasonal saturation to inundation with 12 inches of water from December through April during normal rainfall years. The goal is to have a variety of seasonally ponded to seasonally saturated conditions of the headwater wetlands of the tributary to Bob Smith Creek and Friday Creek. This hydrological regime will occur during the wet season with the mitigation site becoming dry in the mid to late summer.

4.4.2 Vegetation

A performance standard of percent survival of native species for years 1 and 2 (to begin 1 year post construction) and a performance standard for percent cover of native species for years 3 through 10 will be used for this site. However, percent cover success will not be a monotypic stand of single species of tree or shrub such as red alder and hardhack for any year.

To ensure that a diverse plant community is established, a performance standard of 90 percent survival after the 2^{nd} year of planting shall be deemed success. If greater than 10 percent of the installed plants die, (natural recruitment of native species may be counted) they shall be replaced.

A performance standard of 20 percent cover for year 3, 35 percent cover for year 5, 60 percent cover for year 7, and an 80 percent cover for year 10 shall constitute success.

The possible presence of natural regeneration of native trees or shrubs will be factored into the decision whether new plant material is required or thinning an abundance of a single species such as red alder.

A qualified wetlands biologist will supervise or perform all on-site work (excavation, planting, monitoring/maintenance).

Non-native invasive species will comprise no more than 10 percent of the emergent layer and none of the shrub or tree layers. Non-native invasive species such as, but not limited to:

reed canarygrass	*Phalaris arundinacea*
Himalayan blackberry	*Rubus procerus*
evergreen blackberry	*Rubus laciniatus*
Canada thistle	*Cirsium arvense*
poison hemlock	*Conium maculatum*
hedge bindweed	*Convolvulus sepium*
Scot's broom	*Cytisus scoprius*
English ivy	*Hedra helix*
Japanese knotweed	*Polygonum convolvulus*
tansy ragwort	*Senecio jacobaea*

Percentages of non-native species that do not meet the above criteria will require strict control methods. Hand pulling is the preferred option and will be the first approach during maintenance. However, if any one area of reed canarygrass, Himalayan blackberry or other undesirable plant exceeds 100 square feet in size or greater than 10 percent cover, the plants will be sprayed with glycophosate or a suitable herbicide by a licensed applicator in the spring and rechecked during the summer and fall seasons, as necessary, until the plant(s) are under control.

4.5 Construction and Installation

4.5.1 Construction

The proposed wetland creation areas will be cleared of debris and stumps (the site cleared to bare soil) and then delineated and surveyed to accurately determine the wetland square footage and upland berm areas required to create the proposed 8.97-acres of wetland area (Figure 8).

The creation area will then be excavated and bermed to appropriate elevations to maintain wetland hydrology to the performance standards set below.

Excavation and planting of the wetland area will be done in the presence of a competent and experienced wetlands biologist and under the supervision of the project engineer. The selected wetlands biologist will consult with a representative from ATSI on site as to the intent of the wetland design.

Topsoil and large woody debris will be stockpiled to reintroduce to the mitigation site post excavation. The area will then be excavated, to create a series of berms designed, according to the plans and specifications prepared by the project engineer, to intercept surface water run-off from the surrounding sloped landscape and create areas of seasonal saturation and seasonal ponding (Figure 8). Elevations of the wetland depressions will be no more than 12 inches in depth on the uphill slope of each berm. The berms will be 6 feet wide at the crest and have 4H:1V maximum side slopes. Reintroduction of the topsoil as well as materials from the resort excavation will be used to create the berms.

Prior to planting (post construction) the entire mitigation area will be roto-tilled to loosen compacted soils, if required, to improve the survivability of the plants. All bare ground will be planted with annual rye (*Lolium multiflorum*) to inhibit invasion by weedy exotic species, reduce erosion, and improve the quality of the soil.

Planting will take place in the late winter or early spring (during the 'wet' season) if practicable. If planting occurs during the summer (dry season) all plants will be watered. Plant stock will come from off-site sources (a local native plant nursery) in quantities sufficient for adequate cover (Figure 11) and will be finalized post wetland creation. At the discretion of a competent biologist, planting of the wetland site may be staggered over a period of two years to allow time to ascertain the water table and observe the naturalization of plants. We anticipate that much of the area will seed naturally from the surrounding area.

After the first year of monitoring the site for the hydrological regime post construction, trees shall be planted on 20-foot centers, shrubs shall be planted on 2 to 5-foot centers, and herbaceous species shall be planted on 6-inch centers in groups of 3 plugs (and/or in conjunction with the application of seed mix, a seed mix is preferred). It is anticipated that natural regeneration of this site will occur, therefore adding to the abundance and diversity of vegetation that will become established. Additional plantings shall occur if the performance standards described below are not met.

Large woody debris salvaged from the excavation of the mitigation area will be reintroduced into the wetland depressional areas. Insects inhabiting decaying wood in snags and downed logs provide food for a number of species including, woodpeckers, squirrels, rough skinned newts, northwestern salamander, and western red-backed salamander. Logs within the wetland provide pathways through the wetlands and substrate for wetland vegetation. The species mentioned above require a diversity of terrestrial and aquatic habitats that we are attempting to create within this immediate area and will potentially use the created habitat because of the connection to Bob Smith Creek and the adjacent wooded area.

4.5.2 Installation

Plantings at the mitigation site are categorized according to two broad vegetation zones: upland berm areas and wetland vegetation areas in between each berm. Many species that will be included in each of these zones are listed in Attachment E and illustrated graphically on Figure 11. As discussed, the final plant quantities, species, and locations will be determined post creation, that is, after the wetland creation sites have been cleared, final wetland delineation occurring to determine actual wetland versus upland areas and locations, and the wetland constructed.

Plant species occur independently along a gradient of water availability, shade/sun characteristics, soil characteristics, nutrients, and as the vegetation matures at a site, species will tend to grow in a patchy distribution according to individual requirements. Systems are dynamic and change as they mature and as environmental conditions change. It is not always possible to replicate certain conditions of the target community. It is therefore the purpose of this mitigation project to set the stage for the target community to become established on the site over time, therefore this initial design is conceptual, the final product will become an "as built" system base upon adaptive management, that fits the actual results of construction, saturated soil conditions, and species of plants that become established.

The zone system allows species to be chosen that take advantage of select but different hydrologic conditions, assuring a diversity of species and a successful project. A benefit of planting several different species and allowing many native or non-invasive plants to naturalize, in addition to providing diversity of wildlife habitat, is the increased success in providing plant stock adapted to the eventual soil and water characteristics of mitigation sites.

Each zone, upland berm area and vegetation area will be identified prior to planting the mitigation site. It is anticipated that the site will remain unplanted the first year post construction to determine the hydrology of the mitigation area for success of the performance standard and to determine where the plants will be installed.

A minimum of 2 species of trees, 7 species of shrubs, and 3 species of herbs of equal percentage, at the recommended spacing and/or seed mixture amounts (Figure 11) shall be planted on this site after the 2nd year. Trees are not recommended for the upland berm areas due to the potential for damage to the berm from roots or blowdowns. However, a limited number of trees may be planted far enough from downhill sides of the berms to avoid causing damage, while still remaining in areas dry enough for survival. Natural recruitment of native species may be counted to determine which species and what spacing shall occur.

4.5.2.1 Timing

Planting will take place in the late winter or early spring (during the 'wet' season) if practicable. If planting occurs during the summer (dry season) all plants will be watered. Plant stock will come from off-site sources (a local native plant nursery) in quantities sufficient for adequate cover (Figure 11) and will be finalized post wetland creation. At the discretion of a competent biologist, planting of the wetland site may be staggered over a period of two years to allow time to ascertain the water table and observe the naturalization of plants. We anticipate that much of the area will seed naturally from the surrounding area.

4.5.2.2 Plant Source

Plant stock will be from a local native plant nursery with plant stock from the same region as the mitigation site, unless not available.

4.5.2.3 Spacing

Trees will be planted on 20-foot centers, shrubs shall be planted on 2 to 5-foot centers, and emergents shall be planted on 6-inch centers in groups of 3 plugs and/or seeded. Figure 11 is a conceptual plan for planting details for the mitigation area. Attachment E discusses proposed plant species, indicator status (location for planting), and hydrological requirements.

4.5.2.4. Substitutions

Substitutions for the plant species and minimum size listed may be made upon approval by a qualified biologist or native plant landscaper with justification (e.g. in some cases bareroot may be more appropriate than 1 gallon sized plants or seed rather than plants).

4.5.2.5 Habitat Features

Large woody debris salvaged from the excavation of the mitigation area will be reintroduced into the wetland depressional areas. Prior to planting, a minimum of twenty two logs, > 12" diameter, > 15' long, will be placed throughout the mitigation site. The logs will be western red cedar or Douglas fir.

At least three standing snags, western red cedar or Douglas fir, at a minimum height of 15' will be placed on the site. The standing snags shall be buried at a depth that is sufficient to allow the snag to remain standing for the life span of the wood. We suggest that the snag be buried a minimum of 20 percent of its length into bearing soil.

4.5.2.6 Quality Control

To assure success of this project, a professional biologist will be on-site during all construction phases of this project to talk with the construction person in charge and the operators of the excavation equipment. This will ensure that the intent of the project is achieved.

4.5.2.7 As-Built

An as-built drawing will be provided post-construction of the mitigation site. The as-built shall be prepared by a professional biologist with the assistance of a licensed surveyor to produce the final drawing. This drawing shall indicate topography, created wetland areas, and the approximate locations of the installed trees, shrubs, herbaceous plants, and large woody debris. The actual quantity and species of the planted material will be indicated in a table on the drawing.

5.0 Monitoring & Maintenance

Monitoring shall occur during and after construction, during the first wet season, during planting, and periodically as required during the monitoring period and continue for a period of 10 years. This monitoring is required to assure the success of the mitigation site.

A single monitoring period will consist of a spring and late-summer on-site review. The monitoring period shall continue for a period of 10 years in years 1, 2, 3, 5, 7 and 10, beginning 1 year from the date the Corps accepts the as-built drawings. Monitoring reports shall be due by December 31 of each year as stated above. This monitoring is required to assure the success of the mitigation site. Year one report shall document site conditions after mitigation site construction has been completed and one-year post-mitigation construction. Panoramic shots will be taken before construction and for each monitoring period. The monitoring report shall include maintenance options and suggested requirements to maintain the mitigation site.

Any plants that do not survive the first year post-planting shall be replaced in-kind. If planting occurs during the dry season, plants shall be irrigated regularly as needed; otherwise plants shall be irrigated as deemed necessary. Weeding shall occur as necessary. Weeding shall be by hand when possible. If any spraying of weedy species is recommended it will be carried out by a qualified herbicide applicator.

If a monetary bond for monitoring and maintenance is required by the regulating agencies to ensure construction, planting, and maintenance & monitoring; bond amounts are typically 150 percent of the estimated costs of the three phases of mitigation: 1. construction; 2. planting; 3. maintenance and monitoring.

6.0 Contingency Plan

Should the mitigation site fail to meet the criteria of success, steps shall be taken to remedy failure. If at any time during the monitoring period it is determined that failure has occurred, steps shall be taken to correct the situation at that time. The Corps shall be consulted should mitigation fail to meet the performance standards and the Corps and biologist must approve contingency measures prior to implementing changes to the plan. The natural conversion of the emergent to scrub-shrub or scrub-shrub to forest of the created wetlands 5 to 10 years post-installation shall not be deemed failure.

Failure of plantings may necessitate replanting. Once the reason for failure is determined and corrected, replanting would take place and monitoring would follow the same schedule as the first planting. Possible reasons for failure may include poor quality of the original stock, poor soil, insufficient watering, herbivory, improper installation, or competition by exotic plants. If poor soil quality is determined then the area shall be fertilized. Fertilizer application shall be discussed and determined by a qualified landscaper or biologist preferably by soil testing to determine whether or which soil amendments are necessary or desirable. In the latter case the contingency plan would simply be to continue weeding and planting with native seeds or plants until the native vegetation becomes established.

Invasion by species such as reed canarygrass (*Phalaris arundinacea*) and non-native blackberry (*Rubus discolor, R. laciniatus*) will require strict control methods. Hand pulling is the preferred option and will be the first approach during the maintenance portion. However, if any one area of reed canarygrass, Himalayan blackberry, or other undesirable plant exceeds 100 square feet in size or greater than 10 percent cover, it will be sprayed with glyphosate or a suitable herbicide by a licensed applicator in the spring and rechecked during the summer and fall seasons.

7.0 Mitigation Site Protection

The mitigation site shall be placed into a Native Growth Protection Area (NGPA), Protected Critical Area (PCA), Conservation Easement, or other deed restriction to ensure protection of the mitigation site in perpetuity as required by the regulating agency. Additionally, an estimated 4,300-lineal feet of fencing and NGPA signage will be placed along the boundaries between the developed areas of the proposed resort and adjacent wetland areas to the north and south (Figure 12).

8.0 Signatory

We have used the most current, established methods to make determinations as to the location, size, and types of wetlands on these parcels and the accuracy of our recommendations within this mitigation plan. All of the above statements are based on our best professional judgment. Although we follow the federal criteria, we cannot guarantee that the Corps, the Environmental Protection Agency or other regulatory jurisdiction determinations will correspond to ours. Please note that regulations pertaining to critical areas are subject to change over time.

Jim Wiggins ~~MS~~, PWS
President
ATSI

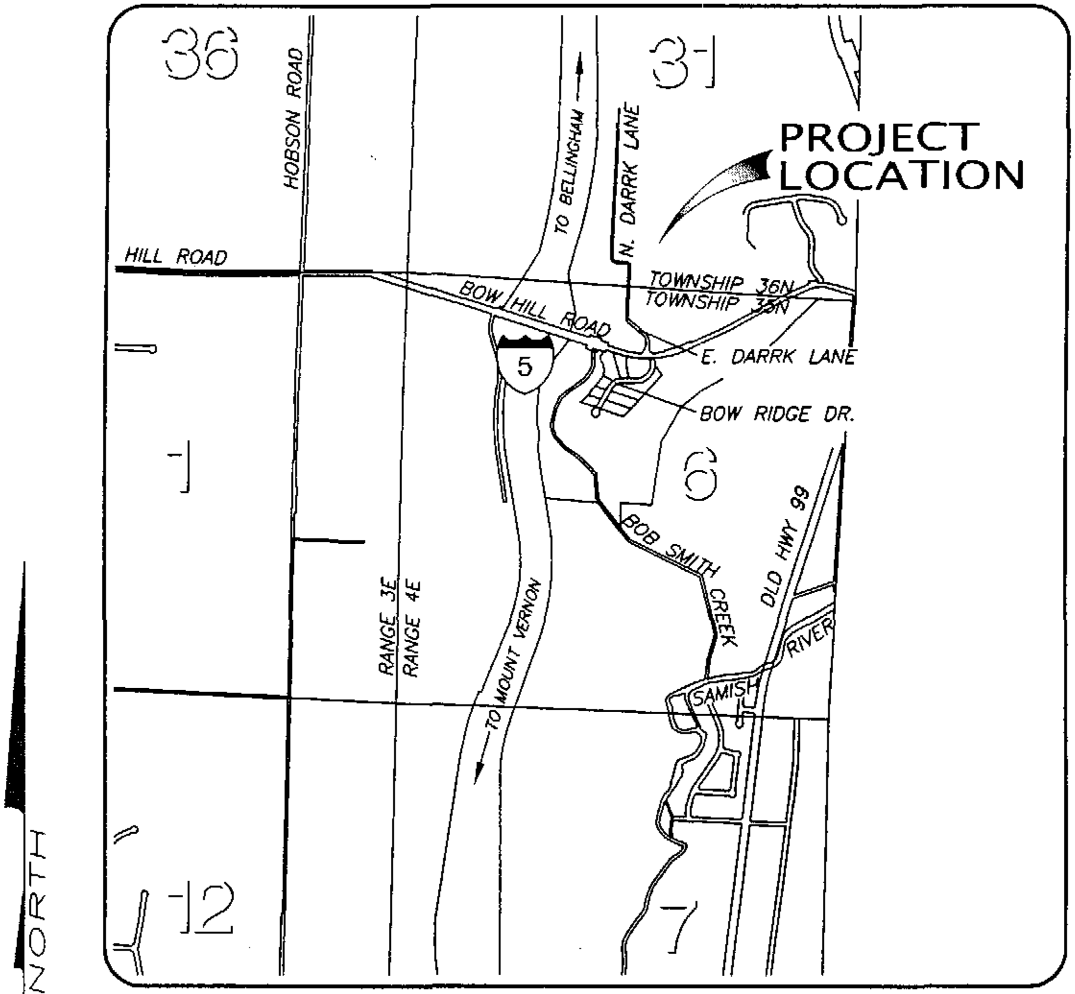
29 July 2010

9.0 Figures

UPPER SKAGIT INDIAN TRIBE ~ SKAGIT RESORT

SITUATE IN A PORTIONS OF THE SW 1/4 OF SECTION 31, TOWNSHIP 36 NORTH, RANGE 4 EAST & NW 1/4 OF SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M., SKAGIT COUNTY, WASHINGTON
LATITUDE: 48°33'32" N, LONGITUDE: -122°20'47" W

DIRECTIONS TO SITE:
- -FROM INTERSTATE 5, TAKE EXIT 236 (BOW HILL RD)
- -HEAD EAST ON BOW HILL ROAD
- -TURN NORTH ON E. DARRK LN
- -E. DARRK LN TURNS INTO N. DARRK LN
- -SITE IS ON EAST SIDE OF N. DARRK LN



NOT TO SCALE

PACIFIC SURVEY & ENGINEERING, INC. 1812 CORNWALL, BELLINGHAM, WA 98225 PHONE:671.7387 FAX:671.4685 WWW.PSESURVEY.COM	PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT PURPOSE: SKAGIT RESORT LOCATION: BOW, WASHINGTON, SKAGIT COUNTY VERTICAL DATUM: NAVD 88	APPLICANT: UPPER SKAGIT INDIAN TRIBE REFERENCE: DATE: APRIL 1, 2008

VICINITY MAP

FIGURE 1 SHEET: 1 of

SCALE: 1"=1,000'

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE:671.7387 FAX:671.4685 WWW.PSESURVEY.COM

PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

REGIONAL AERIAL PHOTOGRAPH

FIGURE 2 SHEET: 2 of

NOTE: Existing topographic contour mapping prepared by Walker and Associates from aerial photography taken October 25, 2004, using procedures that have been demonstrated to yield mapping which complies with the National Standard for Spatial Data Accuracy (NSSDA) for a scale of 1"=100'. The presence of dashed contours indicates that the ground is obscured by vegetation, buildings or shadows and that the data in those areas may not meet the NSSDA.

LEGEND

EXISTING WETLAND (% AS SPECIFIED, 81.340 AC TOTAL)

EXISTING CONSERVATION EASEMENT (23.875 AC)

EXISTING AREAS SUMMARY

AREAS SUMMARY		
AREA LABEL	DESCRIPTION (% EXISTING WETLAND AREA)	ACRES
A	EXISTING WETLAND (50%)	4.931
D	EXISTING WETLAND (30%)	22.477
F	EXISTING WETLAND (70%)	8.055
H	EXISTING WETLAND (100%)	2.306
I	EXISTING WETLAND (50%)	10.261
J	EXISTING WETLAND (100%)	7.776
K	EXISTING WETLAND (10%)	10.342
L	EXISTING WETLAND (70%)	3.636
M	EXISTING WETLAND (100%)	4.107
N	EXISTING WETLAND (90%)	4.967
O	EXISTING WETLAND (100%)	1.858
P	EXISTING WETLAND (100%)	0.624
TOTAL WETLAND AREA		81.340

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 www.PSESURVEY.COM

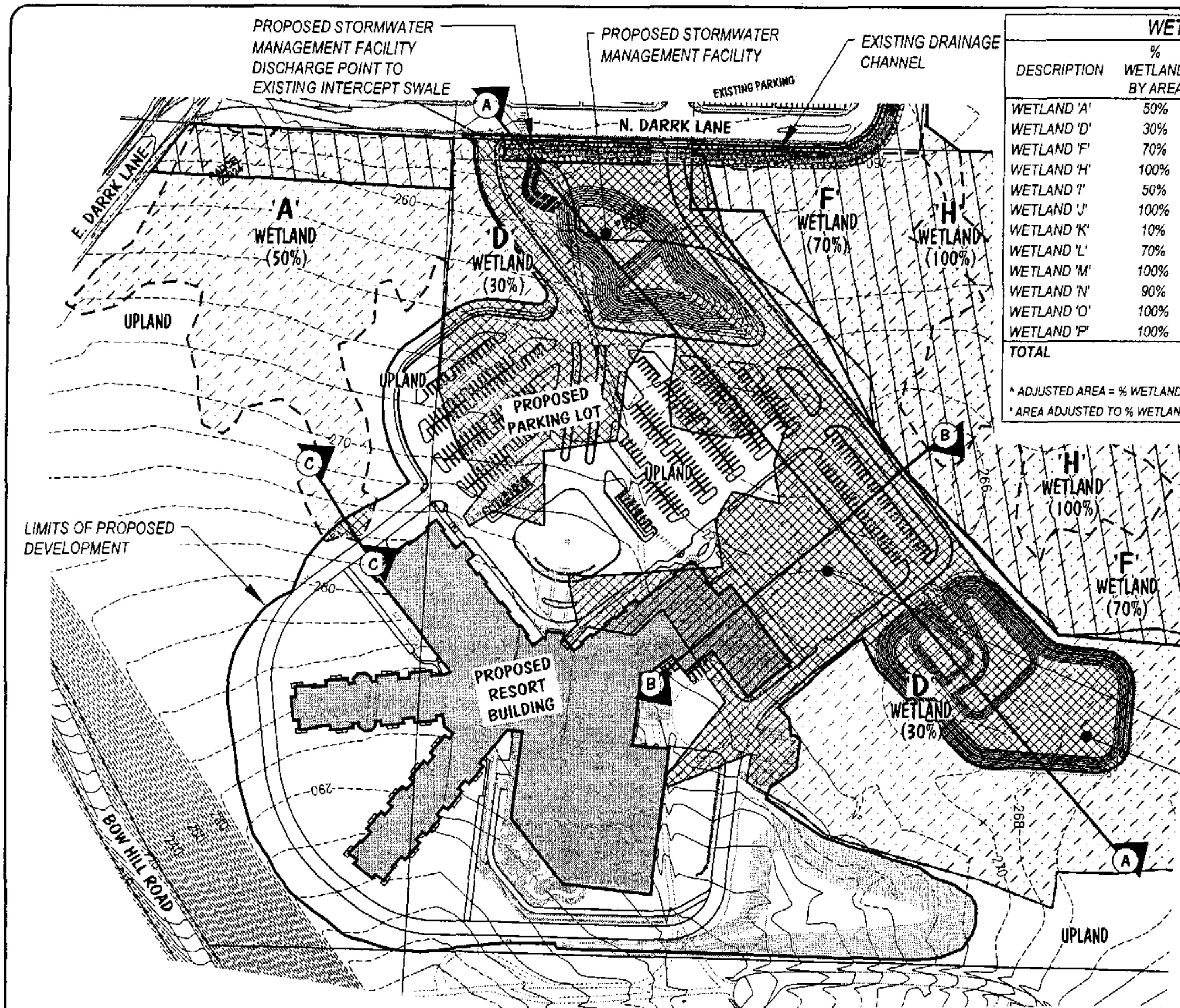
PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

REGIONAL EXISTING SITE CONDITIONS MAP

FIGURE 3

SHEET: 3 of



WETLAND FILL SUMMARY TABLE					
DESCRIPTION	% WETLAND BY AREA	EXISTING AREA (AC)	ADJUSTED AREA (AC)^	PROPOSED FILL (AC)*	UNDISTURBED (AC)*
WETLAND 'A'	50%	4.931	2.466	0.028	2.438
WETLAND 'D'	30%	22.477	6.743	3.340	3.403
WETLAND 'F'	70%	8.055	5.639	0.538	5.101
WETLAND 'H'	100%	2.306	2.306	-	2.306
WETLAND 'I'	50%	10.261	5.131	-	5.131
WETLAND 'J'	100%	7.776	7.776	-	7.776
WETLAND 'K'	10%	10.342	1.034	-	1.034
WETLAND 'L'	70%	3.636	2.545	-	2.545
WETLAND 'M'	100%	4.107	4.107	-	4.107
WETLAND 'N'	90%	4.967	4.471	-	4.471
WETLAND 'O'	100%	1.858	1.858	-	1.858
WETLAND 'P'	100%	0.624	0.624	-	0.624
TOTAL		81.340	44.700	3.906	40.794

^ ADJUSTED AREA = % WETLAND BY AREA x EXISTING AREA

* AREA ADJUSTED TO % WETLAND BY AREA

LEGEND

- EXISTING WETLAND (% AS SPECIFIED, 81.340 AC TOTAL)
- EXISTING CONSERVATION EASEMENT (23.805 AC)
- PROPOSED WETLAND FILL AREAS

GRAPHIC SCALE (us survey feet)

SCALE: 1"=250'

NOTE: Existing topographic contour mapping prepared by Walker and Associates from aerial photography taken October 25, 2004, using procedures that have been demonstrated to yield mapping which complies with the National Standard for Spatial Data Accuracy (NSSDA) for a scale of 1"=100'. The presence of dashed contours indicates that the ground is obscured by vegetation, buildings or shadows and that the data in those areas may not meet the NSSDA.

(SEE SHEETS 5 & 6 FOR CORRESPONDING CROSS SECTION VIEWS)

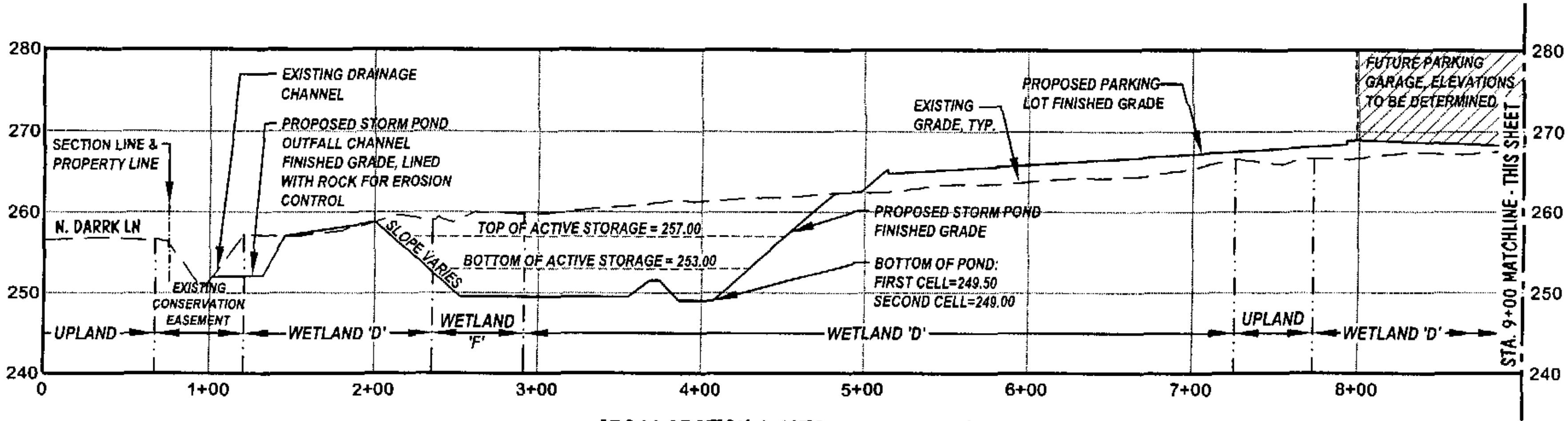
PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 WWW.PSESURVEY.COM

PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

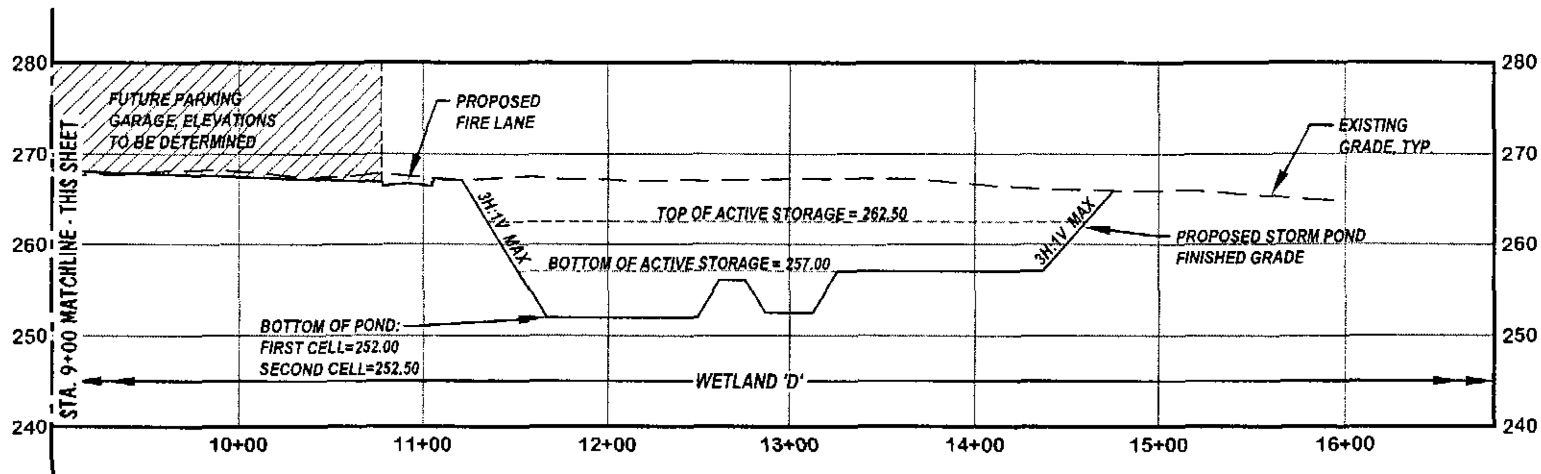
PROPOSED PROJECT SITE MAP & WETLAND FILL AREAS

FIGURE 4



CROSS-SECTION A (STA. 0+00 - 9+00)

SCALE: HORIZONTAL: 1"=100' VERTICAL: 1"=20'



CROSS-SECTION A (STA. 9+00 - 16+80)

SCALE: HORIZONTAL: 1"=100' VERTICAL: 1"=20'

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 www.PSESURVEY.COM

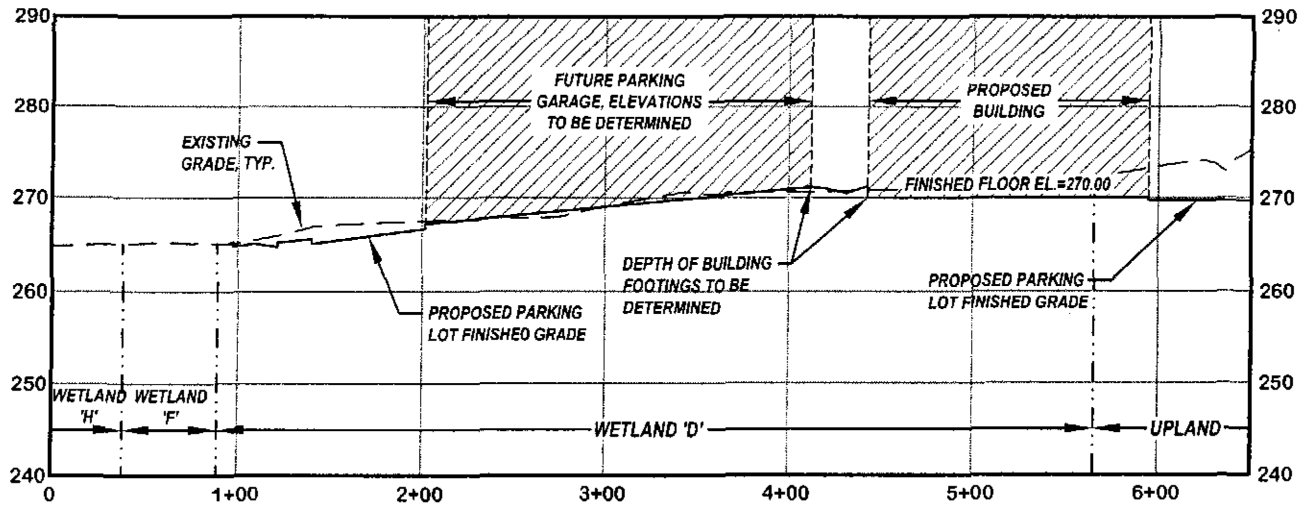
PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

WETLAND CROSS-SECTIONS (A)

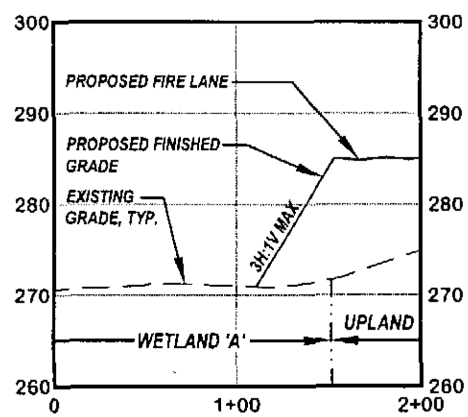
FIGURE 5

SHEET: 5 of



CROSS-SECTION B

SCALE: HORIZONTAL: 1"=100' VERTICAL: 1"=20'



CROSS-SECTION C

SCALE: HORIZONTAL: 1"=100' VERTICAL: 1"=20'

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 www.PSESURVEY.COM

PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

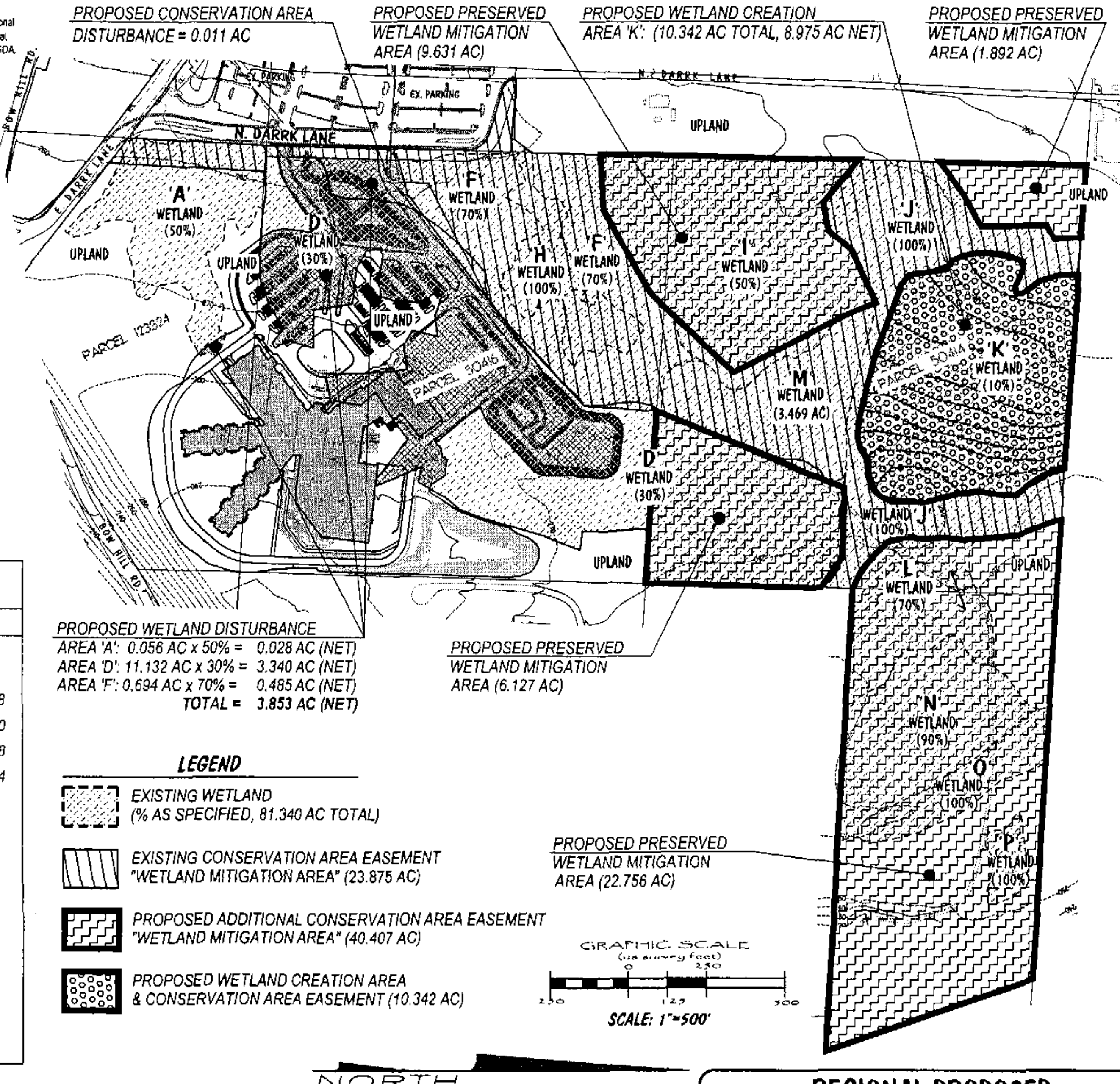
APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

WETLAND CROSS-SECTIONS (B & C)

FIGURE 6

SHEET: 6 of

NOTE: Existing topographic contour mapping prepared by Walker and Associates from aerial photography taken October 25, 2004, using procedures that have been demonstrated to yield mapping which complies with the National Standard for Spatial Data Accuracy (NSSDA) for a scale of 1"=100'. The presence of dashed contours indicates that the ground is obscured by vegetation, buildings or shadows and that the data in those areas may not meet the NSSDA.



EXISTING CONSERVATION EASEMENT	
AREA	ACRES
A	0.857
D	2.048
F	7.080
H	2.306
I	0.648
J	7.770
M	2.314
OTHER	0.852
TOTAL	**23.875**

PROPOSED MITIGATION AREAS SUMMARY		
AREA DESCRIPTION	ACRES	
EXISTING WETLAND AREA (TOTAL)	**81.340**	
PROPOSED WETLAND DISTURBANCE		
AREA 'A'	0.056	x 50% = 0.028
AREA 'D'	11.132	x 30% = 3.340
AREA 'F'	0.768	x 70% = 0.538
AREA 'K'	10.342	x 10% = 1.034
TOTAL WETLAND DISTURBANCE		**4.940**
WETLAND CREATION RATIO	1.5:1	1.5 x 4.940
REQUIRED WETLAND CREATION		7.410
PROPOSED WETLAND CREATION (AREA 'K')	10.342	
WETLAND CREATION - UPLAND BERM AREA	1.367	
TOTAL WETLAND CREATION (AREA 'K')	**8.975**	
ADDITIONAL CONSERV. AREA EASEMENT	40.407	
TOTAL MITIGATION AREA	**49.382**	

*AREA AVAILABLE FOR WETLAND CREATION BASED UPON PERCENT EXISTING WETLAND BY AREA

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 www.PSESURVEY.COM

PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

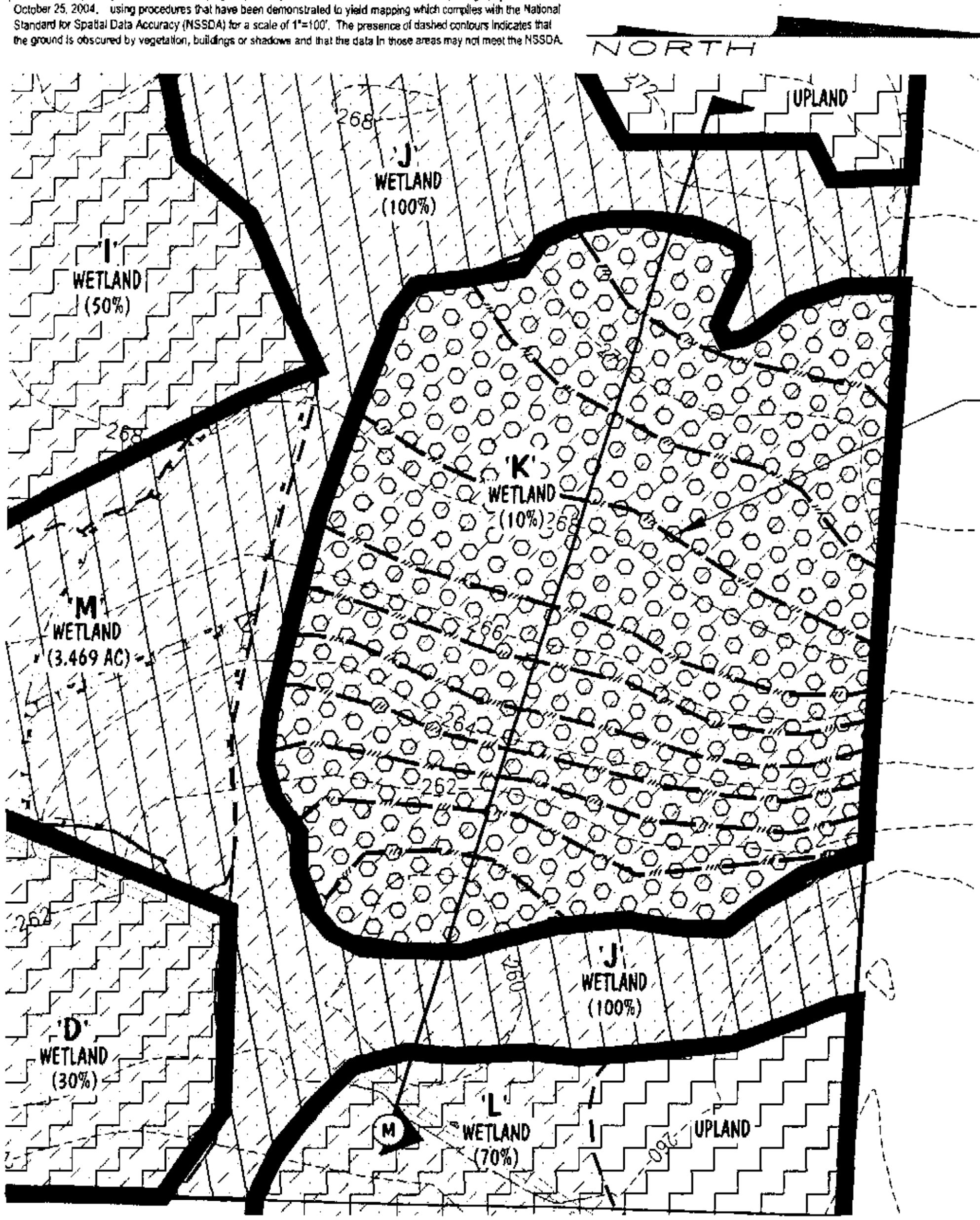
APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

REGIONAL PROPOSED MITIGATION AREAS MAP

FIGURE 7

SHEET: 7 of

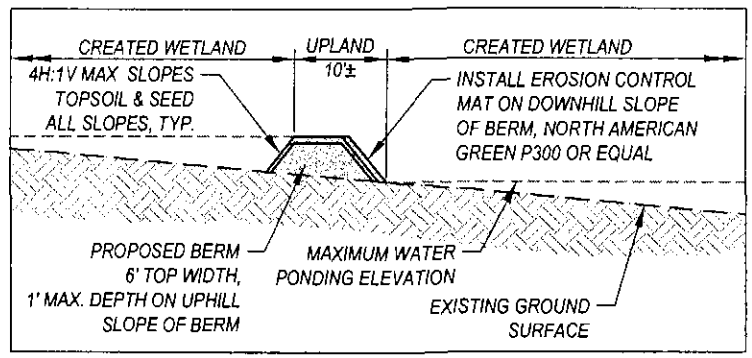
NOTE: Existing topographic contour mapping prepared by Walker and Associates from aerial photography taken October 25, 2004, using procedures that have been demonstrated to yield mapping which complies with the National Standard for Spatial Data Accuracy (NSSDA) for a scale of 1"=100'. The presence of dashed contours indicates that the ground is obscured by vegetation, buildings or shadows and that the data in those areas may not meet the NSSDA.



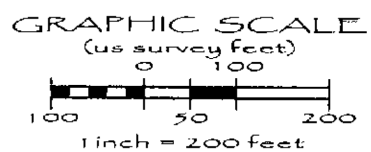
LEGEND

- EXISTING WETLAND (% AS SPECIFIED)
- EXISTING CONSERVATION EASEMENT
- PROPOSED WETLAND CREATION AREA

CONSTRUCT BERM WITH MATERIAL FROM WATER PARK EXCAVATION, TYP., 6' WIDE AT CREST OF BERM 4H:1V MAX. SIDE SLOPES, 1' MAX. DEPTH ON UPHILL SLOPE OF BERM



TYPICAL CONSTRUCTED WETLAND BERM DETAIL
NOT TO SCALE



PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 WWW.PSESURVEY.COM

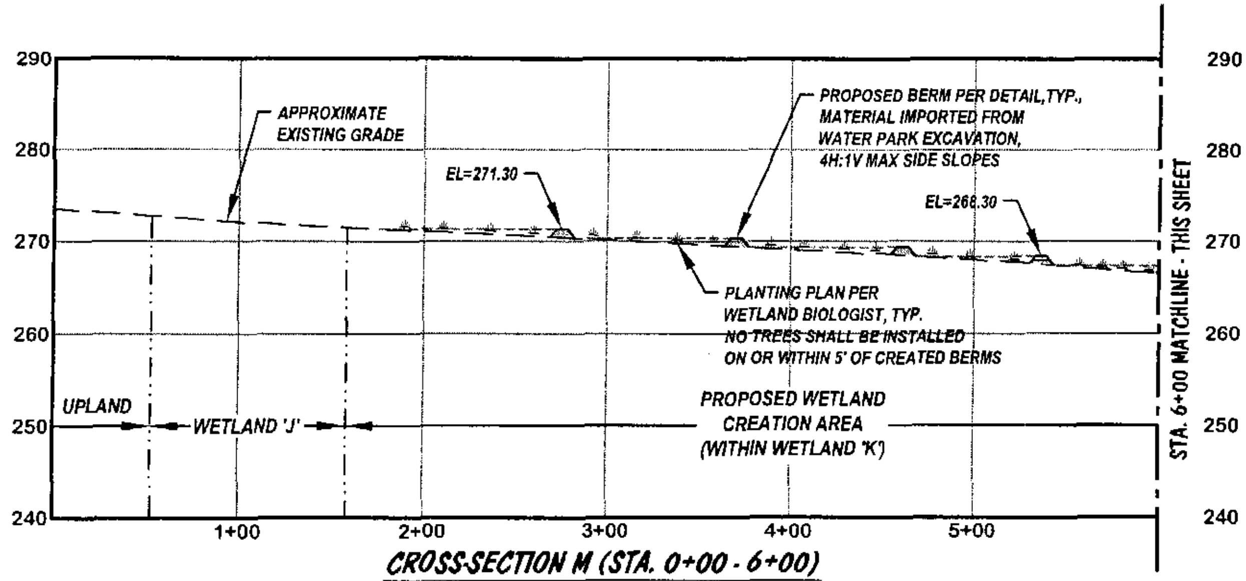
PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

PROPOSED MITIGATION AREAS MAP

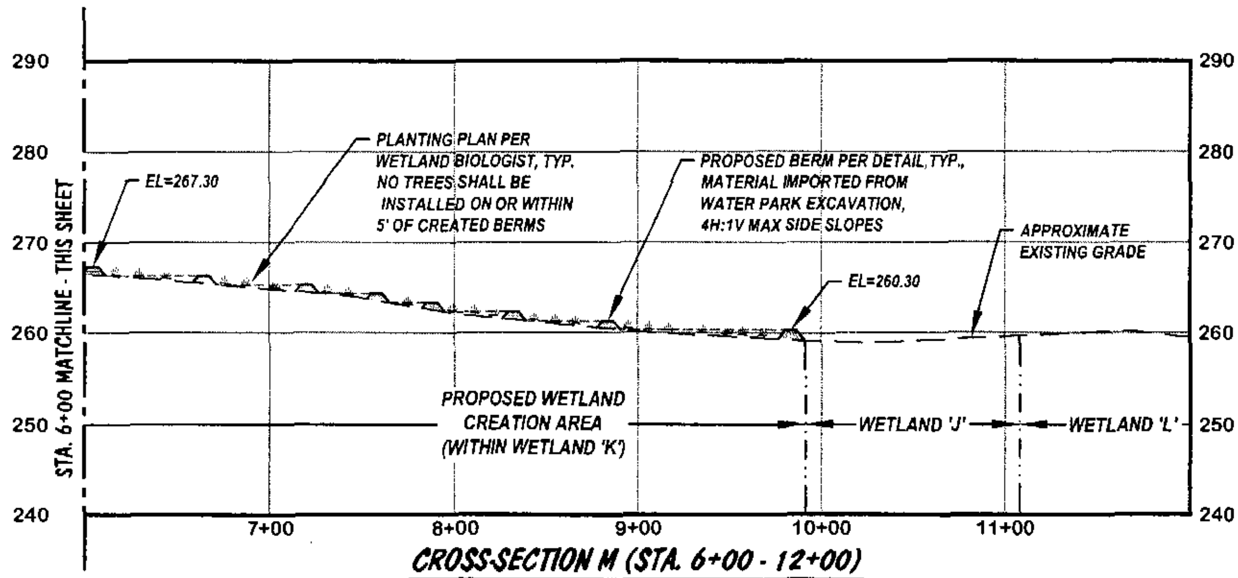
FIGURE 8

SHEET: 8 of



CROSS-SECTION M (STA. 0+00 - 6+00)

SCALE: HORIZONTAL:1"=100' VERTICAL:1"=20'



CROSS-SECTION M (STA. 6+00 - 12+00)

SCALE: HORIZONTAL:1"=100' VERTICAL:1"=20'

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE:671.7387 FAX:671.4685 WWW.PSESURVEY.COM

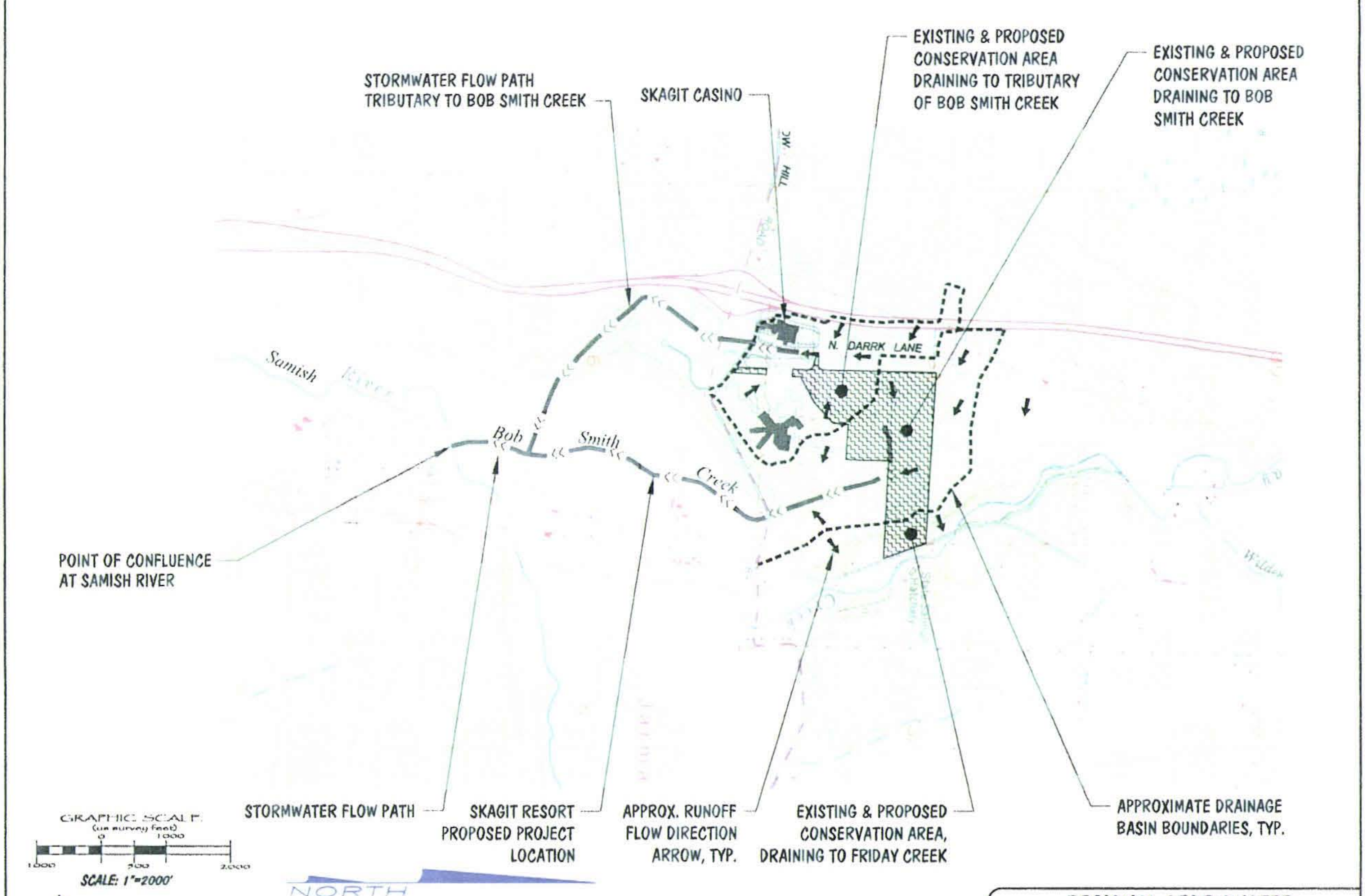
PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

PROPOSED MITIGATION AREA CROSS-SECTION (M)

FIGURE 9

SHEET: 9 of



PACIFIC SURVEY & ENGINEERING, INC.

PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

REGIONAL STORMWATER FLOW PATH EXHIBIT

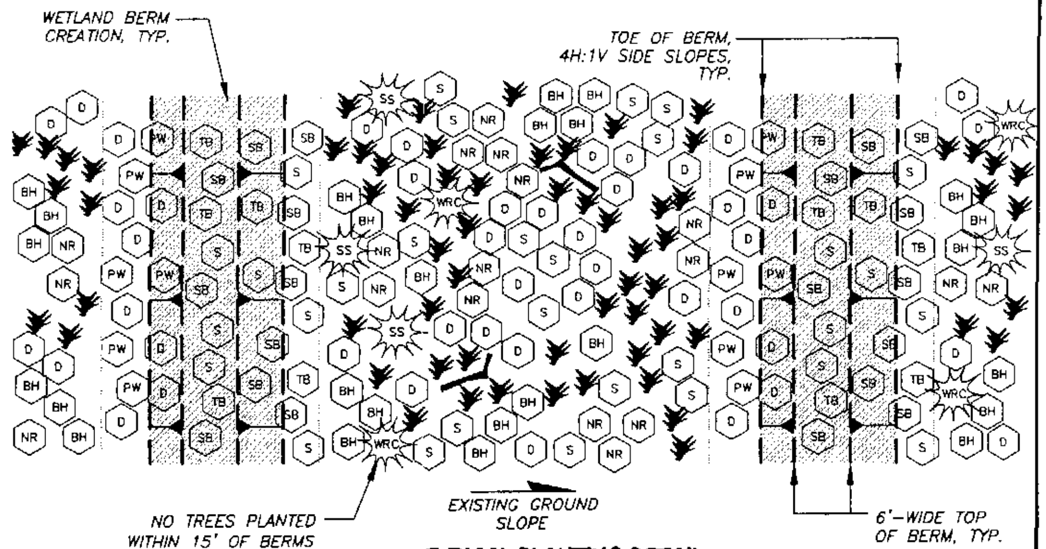
FIGURE 10

SHEET: 10 of

RECOMMENDED PLANTING DETAIL

SYMBOL	SPECIES	SPACING (FEET O.C.)	MINIMUM SIZE	APPROXIMATE QUANTITY
	TREES			
SS	Sitka spruce (Picea sitchensis)	20'	24"	
WRC	Wester Red Cedar (Thuja plicata)	20'	24"	
	SHRUBS			
BH	Black Hawthorn (Crataegus douglasii)	2 to 5'	1 gal. **	
NR	Nootka Rose (Rosa nutkana)	2 to 5' *	1 gal. **	
D	Red Osier Dogwood (Cornus sericea)	2 to 5'	1 gal. **	
SB	Salmonberry (Rubus spectabilis)	2 to 5'	1 gal. **	
S	Snowberry (Symphoricarpos albus)	2 to 5' *	1 gal. **	
PW	Pacific Willow (Salix lasiandra)	2 to 5'	1 gal. **	
TB	Twinberry (Lonicera involucrata)	2 to 5'	1 gal. **	
	EMERGENTS			
	Daggerleaf Rush (Juncus ensifolius)	6"	bareroot ***	
	Sawbeak Sedge (Carex stipata)	6"	bareroot ***	
	Slough Sedge (Carex obnupta)	6"	bareroot ***	
	MISCELLANEOUS			
	Log		12' to 15' long	

* 2-foot o.c. along split rail fencing
** 1 gal or equivalent bareroot (approx. 18")
*** and/or seed mixture



TYPICAL PLANTING DETAIL
WETLAND CREATION

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 www.PSESURVEY.COM

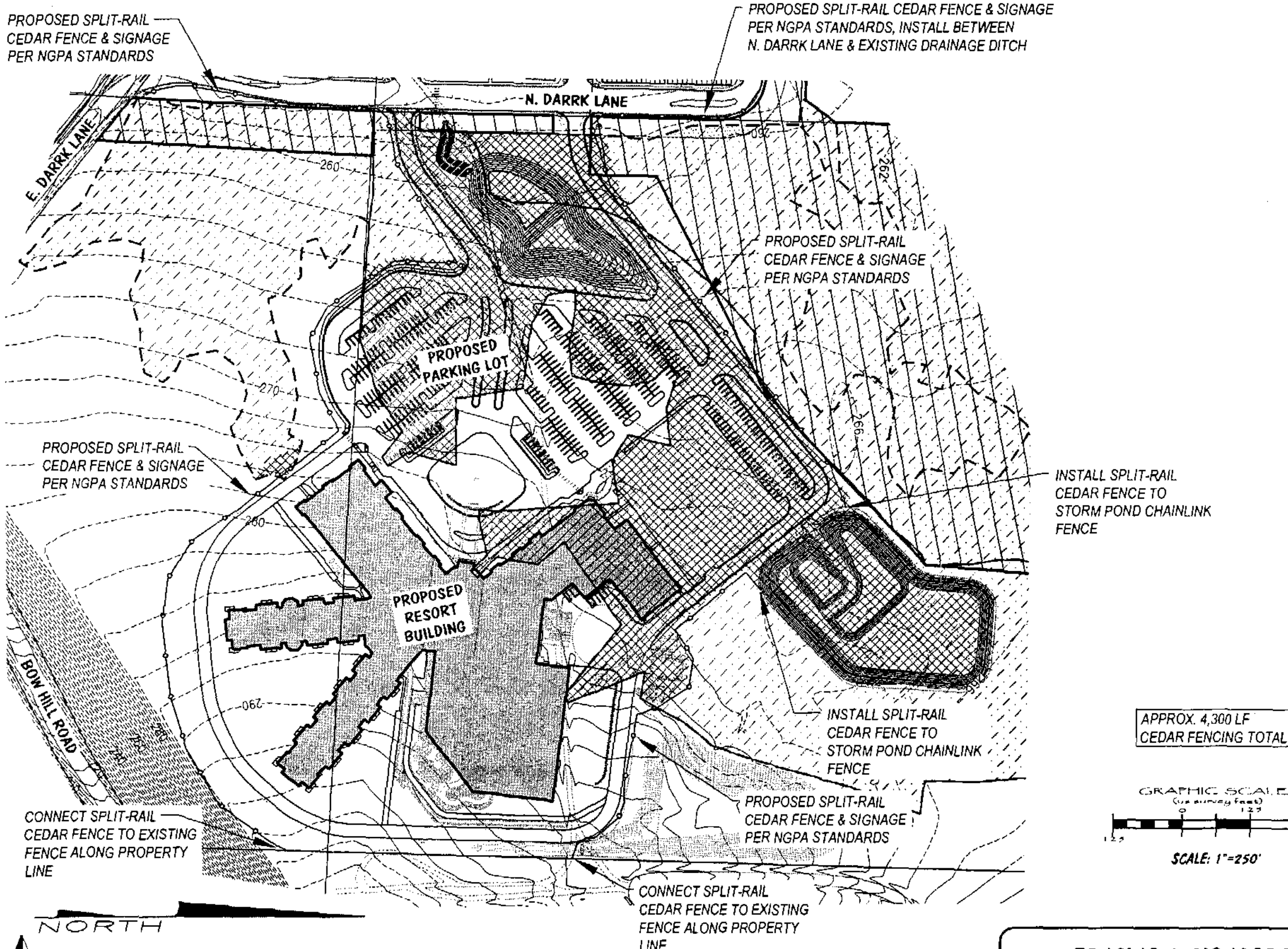
PROPOSED: WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE: SKAGIT RESORT
LOCATION: BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM: NAVD 88

APPLICANT: UPPER SKAGIT INDIAN TRIBE
REFERENCE:
DATE: APRIL 1, 2008

CONCEPTUAL PLANTING PLAN

FIGURE 11

SHEET: 11 of



PSE
PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE:671.7387 FAX:671.4685 www.PSESURVEY.COM

PROPOSED:	WETLAND FILL FOR SITE DEVELOPMENT
PURPOSE:	SKAGIT RESORT
LOCATION:	BOW, WASHINGTON, SKAGIT COUNTY
VERTICAL DATUM:	NAVD 88
APPLICANT:	UPPER SKAGIT INDIAN TRIBE
REFERENCE:	
DATE:	APRIL 1, 2008

FENCING & SIGNAGE PLAN

FIGURE 12 SHEET: 12 of

TECHNICAL MEMORANDUM

UPPER SKAGIT INDIAN TRIBE
BOW HILL FEE-TO-TRUST APPLICATION AND PROPOSED RESORT EXPANSION

ANALYSIS OF POTENTIAL GREENHOUSE GAS EMISSIONS

JULY 12, 2010

ELEMENT

PREPARED BY:

ELEMENT SOLUTIONS
1812 CORNWALL AVENUE
T: 360.617.9172
F: 360.671.4685
W: elementsolutions.org

Brian Walker
Environmental Project Specialist

Paul Pittman, LEG
Earth Sciences Manager

INTRODUCTION

Element Solutions was retained by Sehome Planning to perform a brief analysis and estimate of the potential greenhouse gas (GHG) emissions for a development being proposed by the Upper Skagit Indian Tribe located in Skagit County, Washington. The results of this analysis are summarized within this technical memorandum and can be used to support planning efforts and an Environmental Assessment (EA) for the proposed development. In addition, the results of this memo can be used to respond to items related to the National Environmental Protection Act (NEPA) permitting approval process.

The NEPA process, with respect to the federal government, is in the early stages of developing assessment methods and a threshold for GHG emissions that result as part of a proposed development. GHGs emitted to the atmosphere have been linked to specific climatological changes, however it is currently not technically feasible to link direct climatological changes or the resulting environmental impacts to individual development proposals. Currently, the Council for Environmental Quality (CEQ) has provided draft NEPA guidance for GHG assessments at the federal level. Within Washington State, SEPA guidance is also currently being developed.

GHGs, as defined by the CEQ, include carbon dioxide, methane, nitrous oxide, hydroflourocarbons, perflourocarbons, and sulfur hexafluoride. The common unit for comparing emissions of different GHGs is the carbon dioxide equivalent (CO_2e). GHGs can occur from direct or indirect sources related to development.

Thresholds for GHG emissions levels requiring quantitative assessment are still being developed. The CEQ Draft NEPA guidance references 25,000 metric tons/year of CO_2e as a proposed possible threshold because this quantity has been used in rule-makings under the Clean Air Act reporting requirements that apply to stationary sources of emissions (e.g. EPA's Mandatory Reporting of Greenhouse Gases Final Rule, 74 FR 56260, October 30, 2009).

The CEQ GHG guidance recommends that analyses consider cumulative emissions over the life of the project and offer a discussion of measures to reduce GHG emissions. To address these recommendations in this analysis, we utilized guidance from Washington Department of Ecology (May 27, 2010) and methods developed by King County as described in detail later in this document.

PROJECT DESCRIPTION

The proposed project involves the conversion of approximately 134.13 acres (the "Land") of fee land into trust land for non-gaming hospitality and economic development purposes. See Figure 1 "Bow Hill Resort Expansion Site Map". The Land proposed for conversion is located immediately adjacent to and contiguous with the Upper Skagit Tribe's Bow Hill Reservation trust parcels. All of the land in question is located in Skagit County, Washington. The Tribe intends to use the Land, after conversion from fee to trust, for a hotel, indoor water park and conference space, all non-gaming, economic development activities that focus on the tourism and hospitality industry. Specifically, the Tribe intends to build, own and operate the hotel, indoor water park and meeting center including restaurant, spa, fitness center, gift shop, and lounge together with associated parking and other infrastructure on approximately 42 acres of the Land.

Access to the Land is available from Interstate 5 at Exit 236, Bow Hill Road and Darrk Lane. Based on the traffic impact analysis prepared by Transportation Solutions, Inc. the proposed Resort expansion will not cause any roads or intersections to operate below adopted Level of Service standards.

EMISSIONS MODELING METHODS

Potential GHG emissions have been estimated for the lifespan of the proposed project. This includes emissions associated with obtaining construction materials, fuel used during construction, energy consumed during building operation, and transportation by building occupants. The King County Department of Development and Environmental Services SEPA GHG Emissions Worksheet (Version 1.7, 12/26/07), hereinafter referred to as the GHG Emissions Worksheet, was used to provide an approximated assessment of GHG emissions that might be created by the project over its lifetime.

The GHG Emissions Worksheet accepts user input of the proposed land use or commercial building principal activity types, in square feet, and computes the total emissions for that type of activity use. The proposed resort facility and associated site improvements are comprised of multiple land uses and commercial activities as outlined in the Table 1 below. Due to the multiple use nature of proposed commercial buildings, a pro-ration of principal activity types was entered into the GHG Emissions Worksheet, including food service, lodging, public assembly, and pavement.

Table 1 ~ Project Land Use and Principal Activity Type Summary

Proposed Principal Activity Type or Land Use	*Proposed Area (square feet)*
Food Service	10,000 sf
Lodging (hotel)	80,000 sf
Public Assembly (conference center and entertainment facilities)	145,000 sf
Subtotal Commercial Building Area	235,000 sf
Pavement (parking and access roads)	448,000 sf
Landscaping & Stormwater Management Facilities	487,000 sf
Subtotal Other Site Improvements Area	935,000 sf
Total Project Area	1,170,000 sf

The proposed project will change the land use from existing forest and vegetated areas to developed land. Such a change will result in additional GHG emissions from the clearing activities and a reduction in vegetation available to act as a GHG sink. This GHG emission quantity has not been included in the model.

Annualized GHG emissions were calculated by dividing the Total Lifespan Emissions by the life expectancy of commercial buildings, assumed to be 62.5 years. For consistency, this life expectancy value was the same used in the GHG Emissions Worksheet and used for annualizing the estimated emissions quantities. See Table 2 - GHG Emissions Summary below.

EMISSIONS MODELING RESULTS

GHG emissions associated with each of the proposed project's principal activities or land use type come from multiple sources and are summarized in Table 2 below. The embodied emissions column encompasses the extraction, processing, transportation, construction and disposal of materials and landscape disturbance. Energy emissions are comprised of energy demands created by the development after it is completed. The transportation emissions column represents transportation demands created by the development.

Table 2 ~ GHG Emissions Summary

Proposed Principal Activity Type or Land Use	Lifespan Emission Sources (MTCO2e)				Annualized Emissions (MTCO2e)
	Embodied	Energy	Trans-portation	Total Lifespan Emissions	
Food Service	387	19,942	5,609	25,938	415
Lodging	3,097	62,180	9,373	74,650	1,194
Public Assembly	5,614	106,253	21,820	133,686	2,139
Pavement	-	-	-	22,400	358
Total Emissions	9,098	188,375	36,801	256,675	4,107

The GHG emissions summary table includes possible total lifespan emissions and annualized emissions, both represented in millions of tons of carbon dioxide equivalency (MTCO2e). This is the metric measurement unit for greenhouse gas emissions. The global warming impact of all greenhouse gases is measured in terms of equivalency to the impact of carbon dioxide. See Appendix A for full copy GHG Emissions Worksheet results and worksheet background information.

EMISSIONS MITIGATION OPTIONS

Per CEQ guidelines a qualitative analysis identifying possible GHG emissions, and their potential sources, that might be created over the life span of the proposed project and associated mitigation measures are summarized in Table 3 below. The project lifespan includes activities associated with obtaining construction materials, fuel used during construction, energy consumed during building operation, and transportation by building occupants. Mitigation measures have been identified that may be implemented to reasonably avoid, reduce or compensate for the adverse effects of the GHG emissions. The listed mitigation measures are provided as suggested options for project development, and should be integrated into final project design plans and operations and maintenance programs as necessary.

There are three types of emissions sources that may be considered when assessing the proposal's GHG emissions outlined as below as Scope 1, Scope 2, and Scope 3.

- Scope 1 emissions are under the direct control of the project proponent. These emissions come directly from sources owned by or necessarily associated with a proposal, including fugitive emissions such as on-site stationary combustion of fossil fuels or mobile combustion of fossil fuels by vehicles that are owned or operated as a necessary component of the proposal.
- Scope 2 emissions come from purchased energy to produce electricity, heat, steam or cooling to support or operate the project.
- Scope 3 emissions are those produced as a consequence of the activities of the proposal – but occur from sources not owned by or a part of the proposal such as transportation demand created by the project including contractor and/or visitor-owned vehicles, emissions from outsourced activities, and line losses from electricity transmission and distribution. Scope Three emissions can also include embodied emissions from the extraction, production, and transportation of purchased goods.

TABLE 3 ~ GHG Emission Sources and Mitigation Options

GHG Emission Source Category (CO2e)	***Activity Description and Estimated Duration of Emissions***	***Potential Mitigation Option***
On-Road Mobile Sources (Scope 1)	Owned mobile sources operating both within the Proponent's facility and off-site, including staff, maintenance, and security fleet vehicles. Duration: lifespan of facility	• Fuel efficient vehicles • Alternative fuel vehicle
Non-Road Mobile Sources (Scope 1)	Non-road mobile sources used for construction, maintenance, and facility operation (e.g. heavy machinery, maintenance equipment. Duration: lifespan of facility	• Fuel efficient vehicles • Alternative fuel vehicles • Use of low maintenance landscaping and building materials.
Stationary Combustion (Scope 1)	On-site combustion emissions from company-owned equipment (e.g. heat and cooling) Duration: lifespan of facility	• LEED building design and operation • High-efficient facility machinery • Adopt efficient operations and maintenance programs
Fugitive Emissions (Scope 1)	Non-combustion emissions from owned resources electricity transmission, refrigeration, and air conditioning) Duration: lifespan of facility	• Install high-efficient facility machinery • Adopt efficient operations and maintenance programs • Incorporate features to lower ambient temperatures such as lighter roofing and building materials and tree plantings.
Land Use Change (Scope 1)	Emissions from land use changes and vegetation disturbance, including lost sequestration from forest clearing. Duration: lifespan of facility	• Site design and location • Low impact development
Purchased Electricity and Steam (Scope 2)	Off-site emissions produced to generate purchased electricity or steam. Duration: lifespan of facility	• Building design and operation • Maximize energy efficiency in facility design including building design, the use of compact florescent lights and other low-voltage light, the use of energy efficient equipment, and solar panels.
Construction (Scope 3)	Combustion emissions from contractor on-road and non-road mobile sources used as part of construction, including off-site haul trucks during construction. Building material emissions. Duration: Approx. 18 months	• Efficient and/or alternative fuel vehicles • Site Location • Implement efficient construction management to minimize vehicle travel and run times. • Purchase building materials from local sources. • Utilize vapor recovery equipment in the gas station fuel pumps • Use of low-VOC exterior and interior paints and coatings
Extraction, Processing, and Transportation of Construction Materials (Scope 3)	Emissions produced in the mining, harvest, processing, and transportation of materials purchased for construction of the project (e.g. cement, metals, plastics, wood) Duration: Approx. 18 months	• Sustainable building materials • Waste reduction management • Reused building materials • Alternative and renewable fuels • Low carbon shipping modes • Locally sourced materials

GHG Emission Source Category (CO2e)	Activity Description and Estimated Duration of Emissions	Potential Mitigation Option
Employee Commute (Scope 3)	Combustion emissions from employee commuting both during project construction and operation. Duration: lifespan of facility	• Efficient and alternative fueled vehicles and infrastructure • Site location • Public transit infrastructure and incentives • Provide bicycle and pedestrian accessibility and facilities. • Facilitate public transit system use for employee and patrons by providing incentives for transit use, incorporation of public transit facilities such as bus stops, and coordinate transit service with regional providers.
Other Mobile Emissions (Scope 3)	Mobile emissions from vehicle trips and traffic pattern changes that result from a project (e.g. changes in traffic pattern, customer vehicle emissions, increased commute distances, and emergency services). Duration: lifespan of facility	• Traffic planning and efficient traffic control device usage • Public transit infrastructure and incentives • Bike/ped accessibility
Water Use and Wastewater Disposal (Scope 3)	Combustion and fugitive emissions created to provide water and dispose of wastewater Duration: lifespan of facility	• Low impact development • Site location • Reuse water • High efficiency plumbing facilities • Employee conservation training
Waste Management (Scope 3)	Emissions from off-site solid waste disposal, including transportation of waste and fugitive emissions from disposal	• Waste reduction • Implement recycling programs in operations. • Employee conservation training

CONCLUSION

This analysis provides a qualitative assessment of potential GHG emissions quantities, sources, and mitigation recommendations associated with the development of the Upper Skagit Indian Tribe's proposed resort expansion project. In consideration of the currently evolving guidelines, and lack of formally established regulations, in determining GHG threshold indicators for use in determining significant impacts, the proposed development will produce annual GHG emissions, on a magnitude of 4100 MTCO2e, which is considerably less than 25,000 MTCO2e, the per year threshold indicator suggested by the CEQ for requiring the proposed development to prepare an in depth qualitative analysis.

The project has the potential to add to the cumulative contribution to global climate change, and therefore mitigation measures should be considered to reasonably avoid, reduce, or compensate for the adverse effects of the GHG emissions.

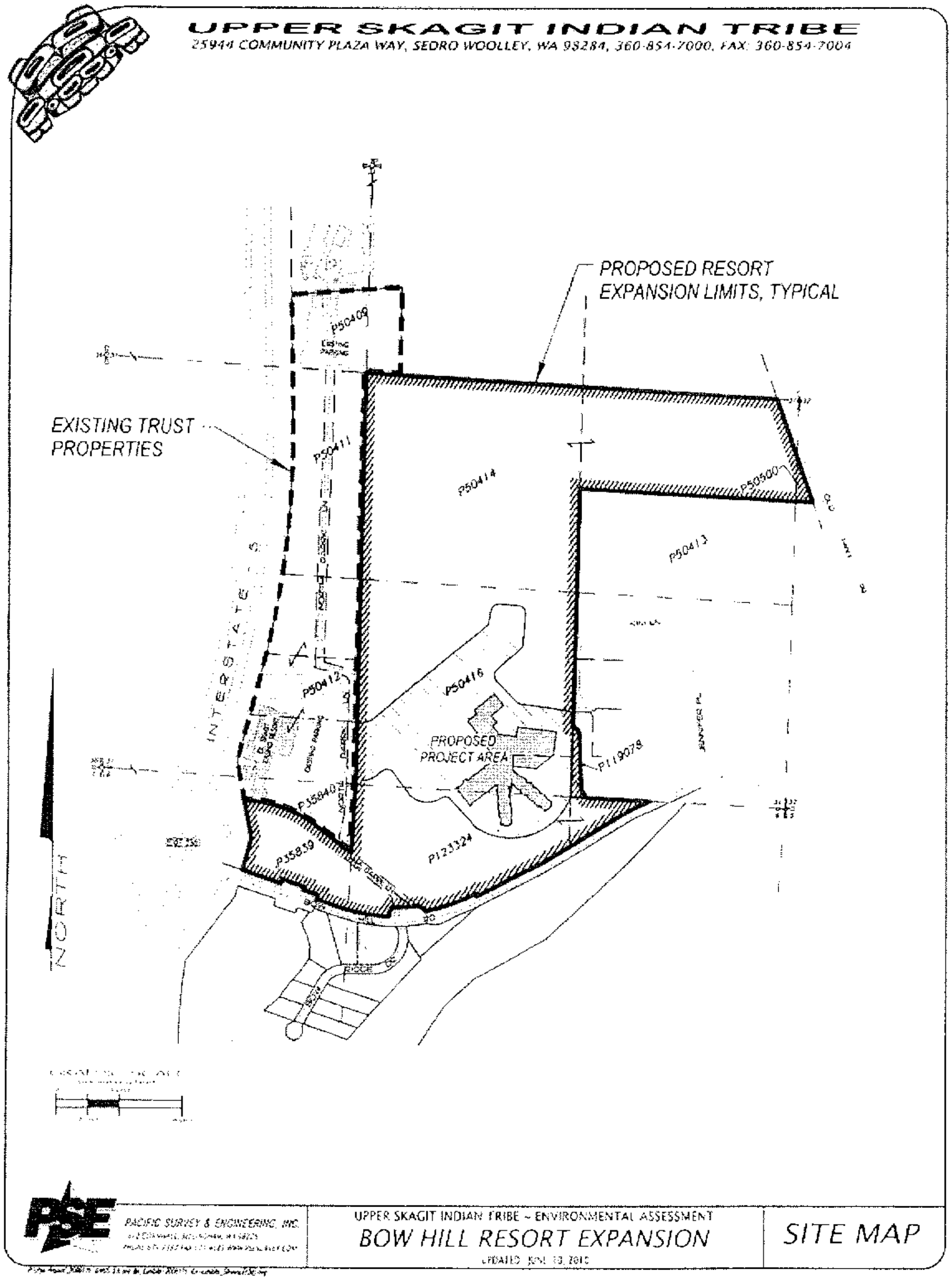
REFERENCES

Sutley, Nancy H. (Chair, Council on Environment Quality), *Memorandum for Heads of Federal Departments and Agencies, Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions*, February 18, 2010. http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf (July 2010)

State of Washington Department of Ecology, Climate Change Resources, SEPA Guidance on Addressing Greenhouse Gas Emissions, http://www.ecy.wa.gov/climatechange/sepa.htm (July 2010)

King County, Climate change and development regulations, State Environmental Policy Act, GHG emissions worksheet, http://www.kingcounty.gov/property/permits/info/SiteSpecific/ClimateChange.aspx (July 2010)

FIGURE 1


UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004
PROPOSED RESORT EXPANSION LIMITS, TYPICAL
EXISTING TRUST PROPERTIES
P50409
P50411
P50414
P50500
P50413
P50412
P50416
PROPOSED PROJECT AREA
P119078
P35840
P35839
P123324
INTERSTATE 5
NORTH
PACIFIC SURVEY & ENGINEERING, INC.
UPPER SKAGIT INDIAN TRIBE ~ ENVIRONMENTAL ASSESSMENT
BOW HILL RESORT EXPANSION
SITE MAP

APPENDIX A

King County Department of Development and Environmental Services
SEPA GHG Emissions Worksheet

King County Department of Development and Environmental Services
SEPA GHG Emissions Worksheet
Version 1.7 12/26/07

Introduction
The Washington State Environmental Policy Act (SEPA) requires environmental review of development proposals that may have a significant adverse impact on the environment. If a proposed development is subject to SEPA, the project proponent is required to complete the SEPA Checklist. The Checklist includes questions relating to the development's air emissions. The emissions that have traditionally been considered cover smoke, dust, and industrial and automobile emissions. With our understanding of the climate change impacts of GHG emissions, King County requires the applicant to also estimate these emissions.

Emissions created by Development
GHG emissions associated with development come from multiple sources:

- The extraction, processing, transportation, construction and disposal of materials and landscape disturbance (Embodied Emissions)
- Energy demands created by the development after it is completed (Energy Emissions)
- Transportation demands created by the development after it is completed (Transportation Emissions)

GHG Emissions Worksheet
King County has developed a GHG Emissions Worksheet that can assist applicants in answering the SEPA Checklist question relating to GHG emissions.

The SEPA GHG Emissions worksheet estimates all GHG emissions that will be created over the life span of a project. This includes emissions associated with obtaining construction materials, fuel used during construction, energy consumed during a buildings operation, and transportation by building occupants.

Using the Worksheet

1. Descriptions of the different residential and commercial building types can be found on the second tabbed worksheet ("Definition of Building Types"). If a development proposal consists of multiple projects, e.g. both single family and multi-family residential structures or a commercial development that consists of more than on type of commercial activity, the appropriate information should be estimated for each type of building or activity.

2. For paving, estimate the total amount of paving (in thousands of square feet) of the project.

3. The Worksheet will calculate the amount of GHG emissions associated with the project and display the amount in the "Total Emissions" column on the worksheet. The applicant should use this information when completing the SEPA checklist.

4. The last three worksheets in the Excel file provide the background information that is used to calculate the total GHG emissions.

5. The methodology of creating the estimates is transparent; if there is reason to believe that a better estimate can be obtained by changing specific values, this can and should be done. Changes to the values should be documented with an explanation of why and the sources relied upon.

6. Print out the "Total Emissions" worksheet and attach it to the SEPA checklist. If the applicant has made changes to the calculations or the values, the documentation supporting those changes should also be attached to the SEPA checklist.

TOTAL EMISSIONS SUMMARY

Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Emissions Per Unit or Per Thousand Square Feet (MTCO2e)			Subtotal Emissions Per Source (MTCO2e)			Lifespan Emissions (MTCO2e)
			Embodied	Energy	Trans-portation	Embodied	Energy	Trans-portation	
Single-Family Home	0		98	672	792	-	-	-	-
Multi-Family Unit in Large Building	0		33	357	766	-	-	-	-
Multi-Family Unit in Small Building	0		54	681	766	-	-	-	-
Mobile Home	0		41	475	709	-	-	-	-
Education		0.0	39	646	361	-	-	-	-
Food Sales		0.0	39	1,541	282	-	-	-	-
Food Service		10.0	39	1,994	561	387	19,942	5,609	25,938
Health Care Inpatient		0.0	39	1,938	582	-	-	-	-
Health Care Outpatient		0.0	39	737	571	-	-	-	-
Lodging		80.0	39	777	117	3,097	62,180	9,373	74,650
Retail (Other Than Mall)		0.0	39	577	247	-	-	-	-
Office		0.0	39	723	588	-	-	-	-
Public Assembly		145.0	39	733	150	5,614	106,253	21,820	133,686
Public Order and Safety		0.0	39	899	374	-	-	-	-
Religious Worship		0.0	39	339	129	-	-	-	-
Service		0.0	39	599	266	-	-	-	-
Warehouse and Storage		0.0	39	352	181	-	-	-	-
Other		0.0	39	1,278	257	-	-	-	-
Vacant		0.0	39	162	47	-	-	-	-

Section II: Pavement

Pavement		448.00							22,400
Total Project Emissions (Lifespan):						9,098	188,375	36,801	256,675
Expected lifespan of project									62.5
Total Annual Project Emissions									4107

DEFINITIONS OF BUILDING TYPES

Type (Residential) or Principal Activity (Commercial)	Description
Single-Family Home	Unless otherwise specified, this includes both attached and detached buildings
Multi-Family Unit in Large Building	Apartments in buildings with more than 5 units
Multi-Family Unit in Small Building	Apartments in building with 2-4 units
Mobile Home	
Education	Buildings used for academic or technical classroom instruction, such as elementary, middle, or high schools, and classroom buildings on college or university campuses. Buildings on education campuses for which the main use is not classroom are included in the category relating to their use. For example, administration buildings are part of "Office," dormitories are "Lodging," and libraries are "Public Assembly."
Food Sales	Buildings used for retail or wholesale of food.
Food Service	Buildings used for preparation and sale of food and beverages for consumption.
Health Care Inpatient	Buildings used as diagnostic and treatment facilities for inpatient care.
Health Care Outpatient	Buildings used as diagnostic and treatment facilities for outpatient care. Doctor's or dentist's office are included here if they use any type of diagnostic medical equipment (if they do not, they are categorized as an office building).
Lodging	Buildings used to offer multiple accommodations for short-term or long-term residents, including skilled nursing and other residential care buildings.
Retail (Other Than Mall)	Buildings used for the sale and display of goods other than food.
Office	Buildings used for general office space, professional office, or administrative offices. Doctor's or dentist's office are included here if they do not use any type of diagnostic medical equipment (if they do, they are categorized as an outpatient health care building).
Public Assembly	Buildings in which people gather for social or recreational activities, whether in private or non-private meeting halls.
Public Order and Safety	Buildings used for the preservation of law and order or public safety.
Religious Worship	Buildings in which people gather for religious activities, (such as chapels, churches, mosques, synagogues, and temples).
Service	Buildings in which some type of service is provided, other than food service or retail sales of goods
Warehouse and Storage	Buildings used to store goods, manufactured products, merchandise, raw materials, or personal belongings (such as self-storage).
Other	Buildings that are industrial or agricultural with some retail space; buildings having several different commercial activities that, together, comprise 50 percent or more of the floorspace, but whose largest single activity is agricultural, industrial/ manufacturing, or residential; and all other miscellaneous buildings that do not fit into any other category.
Vacant	Buildings in which more floorspace was vacant than was used for any single commercial activity at the time of interview. Therefore, a vacant building may have some occupied floorspace.

Sources:

Residential 2001 Residential Energy Consumption Survey, Square footage measurements and comparisons
http://www.eia.doe.gov/emeu/recs/sqft-measure.html

CommercialCommercial Buildings Energy Consumption Survey (CBECS), Description of CBECS Building Types
http://www.eia.doe.gov/emeu/cbecs/pba99/bldgtypes.html

EMBODIED EMISSIONS WORKSHEET

Section I: Buildings			
Type (Residential) or Principal Activity (Commercial)	# thousand sq feet/ unit or building	Life span related embodied embodied GHG emissions (MTCO2e/ unit)	Life span related embodied GHG emissions (MTCO2e/ thousand square feet) See calculations in table below
Single-Family Home	2.53	98	39
Multi-Family Unit in Large Building	0.85	33	39
Multi-Family Unit in Small Building	1.39	54	39
Mobile Home	1.06	41	39
Education	25.6	991	39
Food Sales	5.6	217	39
Food Service	5.6	217	39
Health Care Inpatient	241.4	9,346	39
Health Care Outpatient	10.4	403	39
Lodging	35.8	1,386	39
Retail (Other Than Mall)	9.7	376	39
Office	14.8	573	39
Public Assembly	14.2	550	39
Public Order and Safety	15.5	600	39
Religious Worship	10.1	391	39
Service	6.5	252	39
Warehouse and Storage	16.9	654	39
Other	21.9	848	39
Vacant	14.1	546	39
Section II: Pavement			
All Types of Pavement			50

Life span related embodied GHG emissions table (MTCO2e per 1000 SF)

	Columns and Beams	Intermediate Floors	Exterior Walls	Windows	Interior Walls	Roofs	Total Embodied Emissions (MTCO2e)	Total Embodied Emissions (MTCO2e/ thousand sq
Average GWP (lbs CO2e/sq ft) Vancouver, Low Rise Building	5.3	7.8	19.1	51.2	5.7	21.3		
Average Materials in a 2,272-square foot single family home	0.0	2269.0	3206.0	285.0	6050.0	3103.0		
MTCO2e	0.0	8.0	27.8	6.6	15.6	30.0	88.0	38.7

EMBODIED EMISSIONS WORKSHEET BACKGROUND INFORMATION

BUILDINGS

Embodied GHG emissions are emissions that are created through the extraction, processing, transportation, construction and disposal of building materials as well as emissions created through landscape disturbance (by both soil disturbance and changes in above ground biomass).

Estimating embodied GHG emissions is new field of analysis; the estimates are rapidly improving and becoming more inclusive of all elements of construction and development.

The estimate included in this worksheet is calculated using average values for the main construction materials that are used to create a typical family home. In 2004, the National Association of Home Builders calculated the average materials that are used in a typical 2,272 square foot single-family household. The quantity of materials used is then multiplied by the average GHG emissions associated with the life-cycle GHG emissions for each material.

This estimate is a rough and conservative estimate; the actual embodied emissions for a project are likely to be higher. For example, at this stage, due to a lack of comprehensive data, the estimate does not include important factors such as landscape disturbance or the emissions associated with the interior components of a building (such as furniture).

King County realizes that the calculations for embodied emissions in this worksheet are rough. For example, the emissions associated with building 1,000 square feet of a residential building will not be the same as 1,000 square feet of a commercial building. However, discussions with the construction community indicate that while there are significant differences between the different types of structures, this method of estimation is reasonable; it will be improved as more data become available.

Additionally, if more specific information about the project is known, King County recommends two online embodied emissions calculators that can be used to obtain a more tailored estimate for embodied emissions: www.buildcarbonneutral.org and www.athenasmi.ca/tools/ecoCalculator/.

PAVEMENT

Four recent life cycle assessments of the environmental impacts of roads form the basis for the per unit embodied emissions of pavement. Each study is constructed in slightly different ways; however, the aggregate results of the reports represent a reasonable estimate of the GHG emissions that are created from the manufacture of paving materials, construction related emissions, and maintenance of the pavement over its expected life cycle. For specifics, see the worksheet.

SOURCES

King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov	
Residential floorspace per unit	2001 Residential Energy Consumption Survey (National Average, 2001) Square footage measurements and comparisons, http://www.eia.doe.gov/emeu/recs/sqft-measure.html
Floorspace per building	EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003) Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003 http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls
Average GWP (lbs CO2e/sq ft): Vancouver, Low Rise Building	Athena EcoCalculatorM, Athena Assembly Evaluation Tool v2.3- Vancouver Low Rise Building Assembly Average GWP (kg) per square meter, http://www.athenasmi.ca/tools/ecoCalculator/index.html 2.20 Lbs per kg, 10.76 Square feet per square meter
Average Materials in a 2,272-square foot single family home	Buildings Energy Data Book: 7.3 Typical/Average Household Materials Used in the Construction of a 2,272-Square-Foot Single-Family Home, 2000 http://buildingsdatabook.eren.doe.gov/?id=view_book_table&TableID=2036&t=xls See also: NAHB, 2004 Housing Facts, Figures and Trends, Feb. 2004, p. 7.
Average window size	Energy Information Administration/Housing Characteristics 1993 Appendix B, Quality of the Data. Pg. 5., ftp://ftp.eia.doe.gov/pub/consumption/residential/rx93hcf.pdf
Pavement Emissions Factors	50 MTCO2e/thousand square feet of asphalt or concrete pavement

EMBODIED EMISSIONS WORKSHEET BACKGROUND INFORMATION (CONTINUED)

SPECIAL SECTION: ESTIMATING THE EMBODIED EMISSIONS FOR PAVEMENT

Four recent life cycle assessments of the environmental impacts of roads form the basis for the per unit embodied emissions of pavement. Each study is constructed in slightly different ways; however, the aggregate results of the reports represent a reasonable estimate of the GHG emissions that are created from the manufacture of paving materials, construction related emissions, and maintenance of the pavement over its expected life cycle.

The results of the studies are presented in different units and measures; considerable effort was undertaken to be able to compare the results of the studies in a reasonable way. For more details about the below methodology, contact matt.kuharic@kingcounty.gov.

The four studies, Meil (2001), Park (2003), Stripple (2001) and Treolar (2001) produced total GHG emissions of 4-34 MTCO2e per thousand square feet of finished paving (for similar asphalt and concrete based pavements). This estimate does not including downstream maintenance and repair of the highway. The average (for all concrete and asphalt pavements in the studies, assuming each study gets one data point) is ~17 MTCO2e/thousand square feet.

Three of the studies attempted to thoroughly account for the emissions associated with long term maintenance (40 years) of the roads. Stripple (2001), Park et al. (2003) and Treolar (2001) report 17, 81, and 68 MTCO2e/thousand square feet, respectively, after accounting for maintenance of the roads.

Based on the above discussion, King County makes the conservative estimate that 50 MTCO2e/thousand square feet of pavement (over the development's life cycle) will be used as the embodied emission factor for pavement until better estimates can be obtained. This is roughly equivalent to 3,500 MTCO2e per lane mile of road (assuming the lane is 13 feet wide).

It is important to note that these studies estimate the embodied emissions for roads. Paving that does not need to stand up to the rigors of heavy use (such as parking lots or driveways) would likely use less materials and hence have lower embodied emissions.

Sources:

Meil, J. A Life Cycle Perspective on Concrete and Asphalt Roadways: Embodied Primary Energy and Global Warming Potential. 2006. Available: http://www.cement.ca/cement.nsf/eee9ec7bbd630126852566c40052107b/6ec79dc8ae03a782852572b90061b914/$FILE/ATTK0WE3/athena%20report%20Feb.%202%202007.pdf

Park, K, Hwang, Y., Seo, S., M.ASCE, and Seo, H. , "Quantitative Assessment of Environmental Impacts on Life Cycle of Highways," Journal of Construction Engineering and Management , Vol 129, January/February 2003, pp 25-31, (DOI: 10.1061/(ASCE)0733-9364(2003)129:1(25)).

Stripple, H. Life Cycle Assessment of Road. A Pilot Study for Inventory Analysis. Second Revised Edition. IVL Swedish Environmental Research Institute Ltd. 2001. Available: http://www.ivl.se/rapporter/pdf/B1210E.pdf

Treloar, G., Love, P.E.D., and Crawford, R.H. Hybrid Life-Cycle Inventory for Road Construction and Use. Journal of Construction Engineering and Management. P. 43-49. January/February 2004.

ENERGY EMISSIONS WORKSHEET

Type (Residential) or Principal Activity (Commercial)	Energy consumption per building per year (million Btu)	Carbon Coefficient for Buildings	MTCO2e per building per year	Floorspace per Building (thousand square feet)	MTCE per thousand square feet per year	MTCO2e per thousand square feet per year	Average Building Life Span	Lifespan Energy Related MTCO2e emissions per unit	Lifespan Energy Related MTCO2e emissions per thousand square feet
Single-Family Home	107.3	0.108	11.61	2.53	4.6	16.8	57.9	672	266
Multi-Family Unit in Large Building	41.0	0.108	4.44	0.85	5.2	19.2	80.5	357	422
Multi-Family Unit in Small Building	78.1	0.108	8.45	1.39	6.1	22.2	80.5	681	489
Mobile Home	75.9	0.108	8.21	1.06	7.7	28.4	57.9	475	448
Education	2,125.0	0.124	264.2	25.6	10.3	37.8	62.5	16,526	646
Food Sales	1,110.0	0.124	138.0	5.6	24.6	90.4	62.5	8,632	1,541
Food Service	1,436.0	0.124	178.5	5.6	31.9	116.9	62.5	11,168	1,994
Health Care Inpatient	60,152.0	0.124	7,479.1	241.4	31.0	113.6	62.5	467,794	1,938
Health Care Outpatient	985.0	0.124	122.5	10.4	11.8	43.2	62.5	7,660	737
Lodging	3,578.0	0.124	444.9	35.8	12.4	45.6	62.5	27,826	777
Retail (Other Than Mall)	720.0	0.124	89.5	9.7	9.2	33.8	62.5	5,599	577
Office	1,376.0	0.124	171.1	14.8	11.6	42.4	62.5	10,701	723
Public Assembly	1,338.0	0.124	166.4	14.2	11.7	43.0	62.5	10,405	733
Public Order and Safety	1,791.0	0.124	222.7	15.5	14.4	52.7	62.5	13,928	899
Religious Worship	440.0	0.124	54.7	10.1	5.4	19.9	62.5	3,422	339
Service	501.0	0.124	62.3	6.5	9.6	35.1	62.5	3,896	599
Warehouse and Storage	764.0	0.124	95.0	16.9	5.6	20.6	62.5	5,942	352
Other	3,600.0	0.124	447.6	21.9	20.4	74.9	62.5	27,997	1,278
Vacant	294.0	0.124	36.6	14.1	2.6	9.5	62.5	2,286	162

ENERGY EMISSIONS WORKSHEET BACKGROUND INFORMATION

This section helps estimate the GHG emissions associated with energy used after the building has been constructed. It includes energy used by an average building. All estimates in this section are based on national average building energy usage from the Energy Information Administration and from the Department of Energy's Buildings Energy Data Book.

An important part of this estimate, as well as the transportation related estimate described in the next section, is to determine the average life span of buildings. This is not an easy task and no uniform estimates have been documented. However, one way to estimate building life spans is to estimate the ratio of the number of existing building units to that of annually constructed new units. This is the method employed in this worksheet. This method is most likely an underestimate of average building life spans as it does not account for growth in the total overall number of buildings. When compared with a literature review, the average life span of 62.5 years per building used in this worksheet is conservative but reasonable (e.g., 80-100 year average U.S. building service life reported by the Environment Policy Committee).

Environment Policy Committee. Design of Sustainable Building Policies: Scope for Improvement and Barriers. Organisation for Economic Co-operation and Development. Available:
http://www.olis.oecd.org/olis/2001doc.nsf/43bb6130e5e86e5fc12569fa005d004c/203e895174de4e56c1256bd7003be835/$FILE/JT00128164.PDF

SOURCES

King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

Energy consumption for residential buildings	2007 Buildings Energy Data Book: 6.1 Quad Definitions and Comparisons (National Average, 2001) Table 6.1.4: Average Annual Carbon Dioxide Emissions for Various Functions http://buildingsdatabook.eren.doe.gov/ Data also at: http://www.eia.doe.gov/emeu/recs/recs2001_ce/ce1-4c_housingunits2001.html
Energy consumption for commercial buildings and Floorspace per building buildings energy consumption survey)	EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003) Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003 http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls
Carbon Coefficient for Buildings	Buildings Energy Data Book (National average, 2005) Table 3.1.7. 2005 Carbon Dioxide Emission Coefficients for Buildings (MMTCE per Quadrillion Btu) http://buildingsdatabook.eere.energy.gov/?id=view_book_table&TableID=2057 Note: Carbon coefficient in the Energy Data book is in MTCE per Quadrillion Btu. To convert to MTCO2e per million Btu, this factor was divided by 1000 and multiplied by 44/12.
Residential floor space per unit	2001 Residential Energy Consumption Survey (National Average, 2001) Square footage measurements and comparisons http://www.eia.doe.gov/emeu/recs/sqft-measure.html

Average life span of buildings, estimated by replacement time method

	Single Family Homes	Multi-Family Units in Large and Small Buildings	All Residential Buildings	
New Housing Construction 2001	1,273,000	329,000	1,602,000	
Existing Housing Stock, 2001	73,700,000	26,500,000	100,200,000	
Replacement time	57.9	80.5	62.5	(national average, 2001)

Note: Single family homes calculation is used for mobile homes as a best estimate life span.
Note: At this time, KC staff could find no reliable data for the average life span of commercial buildings
Therefore, the average life span of residential buildings is being used until a better approximation can be ascertained.

New Housing Construction,	2001Quarterly Starts and Completions by Purpose and Design - US and Regions (Excel) http://www.census.gov/const/quarterly_starts_completions_cust.xls See also: http://www.census.gov/const/www/newresconstindex.html
Existing Housing Stock, 2001	Residential Energy Consumption Survey (RECS) 2001 Tables HC1:Housing Unit Characteristics. Million U.S. Households 2001 Table HC1-4a. Housing Unit Characteristics by Type of Housing Unit, Million U.S. Households, 2001 Million U.S. Households, 2001 http://www.eia.doe.gov/emeu/recs/recs2001/hc_pdf/housunits/hc1-4a_housingunits2001.pdf

TRANSPORTATION EMISSIONS WORKSHEET

Type (Residential) or Principal Activity (Commercial)	# people/ unit or building	# thousand sq feet/ unit or building	# people or employees/ thousand square feet	Vehicle related GHG emissions (metric tonnes CO2e per person per year)	MTCO2e/ year/ unit	MTCO2e/ year/ thousand square feet	Average Building Life Span	Life span transportation related GHG emissions (MTCO2e/ per unit)	Life span transportation related GHG emissions (MTCO2e/ thousand sq feet)
Single-Family Home	2.8	2.53	1.1	4.9	13.7	5.4	57.9	792	313
Multi-Family Unit in Large Building	1.9	0.85	2.3	4.9	9.5	11.2	80.5	766	904
Multi-Family Unit in Small Building	1.9	1.39	1.4	4.9	9.5	6.8	80.5	766	550
Mobile Home	2.5	1.06	2.3	4.9	12.2	11.5	57.9	709	668
Education	30.0	25.6	1.2	4.9	147.8	5.8	62.5	9247	361
Food Sales	5.1	5.6	0.9	4.9	25.2	4.5	62.5	1579	282
Food Service	10.2	5.6	1.8	4.9	50.2	9.0	62.5	3141	561
Health Care Inpatient	455.5	241.4	1.9	4.9	2246.4	9.3	62.5	140506	582
Health Care Outpatient	19.3	10.4	1.9	4.9	95.0	9.1	62.5	5941	571
Lodging	13.6	35.8	0.4	4.9	67.1	1.9	62.5	4194	117
Retail (Other Than Mall)	7.8	9.7	0.8	4.9	38.3	3.9	62.5	2394	247
Office	28.2	14.8	1.9	4.9	139.0	9.4	62.5	8696	588
Public Assembly	6.9	14.2	0.5	4.9	34.2	2.4	62.5	2137	150
Public Order and Safety	18.8	15.5	1.2	4.9	92.7	6.0	62.5	5796	374
Religious Worship	4.2	10.1	0.4	4.9	20.8	2.1	62.5	1298	129
Service	5.6	6.5	0.9	4.9	27.6	4.3	62.5	1729	266
Warehouse and Storage	9.9	16.9	0.6	4.9	49.0	2.9	62.5	3067	181
Other	18.3	21.9	0.8	4.9	90.0	4.1	62.5	5630	257
Vacant	2.1	14.1	0.2	4.9	10.5	0.7	62.5	657	47

TRANSPORTATION EMISSIONS WORKSHEET BACKGROUND INFORMATION

This section helps estimate the emissions associated with transportation of building occupants. At this time, it is based on average vehicle miles traveled by the average Washington State citizen.

SOURCES

King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov

# people/ unit	Estimating Household Size for Use in Population Estimates (WA state, 2000 average) Washington State Office of Financial Management Kimpel, T. and Lowe, T. Research Brief No. 47. August 2007 http://www.ofm.wa.gov/researchbriefs/brief047.pdf Note: This analysis combines Multi Unit Structures in both large and small units into one category; the average is used in this case although there is likely a difference
Residential floorspace per unit	2001 Residential Energy Consumption Survey (National Average, 2001) Square footage measurements and comparisons http://www.eia.doe.gov/emeu/recs/sqft-measure.html
# employees/thousand sf	Commercial Buildings Energy Consumption Survey commercial energy uses and costs (National Median, 2003) Table B2 Totals and Medians of Floorspace, Number of Workers, and Hours of Operation for Non-Mall Buildings, 2003 http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set1/2003excel/b2.xls Note: Data for # employees/thousand square feet is presented by CBECS as square feet/employee. In this analysis employees/thousand square feet is calculated by taking the inverse of the CBECS number and multiplying by 1000.

SOURCES (CONTINUED)

Vehicle related GHG emissions:

Estimate calculated as follows (Washington state, 2006)_

56,531,930,000 2006 Annual WA State Vehicle Miles Traveled

Data was daily VMT. Annual VMT was 365*daily VMT.

http://www.wsdot.wa.gov/mapsdata/tdo/annualmileage.htm

6,395,798 2006 WA state population

http://quickfacts.census.gov/qfd/states/53000.html

8839 vehicle miles per person per year

0.0506 gallon gasoline/mile

This is the weighted national average fuel efficiency for all cars and 2 axle, 4 wheel light trucks in 2005. This
includes pickup trucks, vans and SUVs. The 0.051 gallons/mile used here is the inverse of the more commonly

known term "miles/per gallon" (which is 19.75 for these cars and light trucks). Transportation Energy Data Book. 26th Edition. 2006. Chapter 4: Light Vehicles and Characteristics. Calculations

based on weighted average MPG efficiency of cars and light trucks.

http://cta.ornl.gov/data/tedb26/Edition26_Chapter04.pdf
Note: This report states that in 2005, 92.3% of all highway VMT were driven by the above described vehicles.

http://cta.ornl.gov/data/tedb26/Spreadsheets/Table3_04.xls

24.3 lbs CO2e/gallon gasoline

The CO2 emissions estimates for gasoline and diesel include the extraction, transport, and refinement of petroleum

as well as their combustion.

Life-Cycle CO2 Emissions for Various New Vehicles. RENew Northfield. Available:
http://renewnorthfield.org/wpcontent/uploads/2006/04/CO2%20emissions.pdf
Note: This is a conservative estimate of emissions by fuel consumption because diesel fuel,

2205 with a emissions factor of 26.55 lbs CO2e/gallon was not estimated.

4.93 lbs/metric tonne

vehicle related GHG emissions (metric tonnes CO2e per person per year)

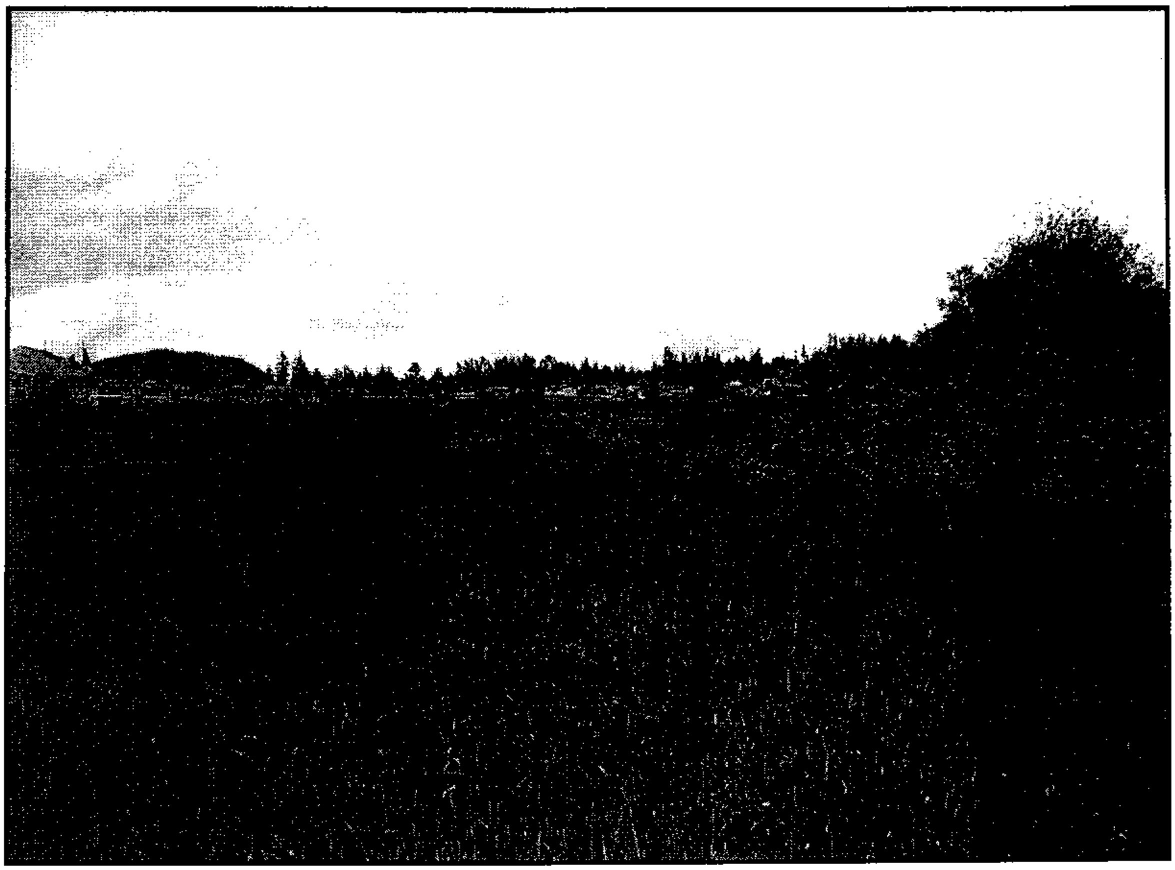
Average lief span of buildings, estimated by replacement time method	See Energy Emissions Worksheet for Calculations
Commercial floorspace per unit	EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003) Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003 http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls

ARCHAEOLOGICAL INVESTIGATION REPORT

Upper Skagit Indian Tribe Land Exchange Project
Bow, Washington

Prepared for:

Upper Skagit Indian Tribe



March 8, 2005

Prepared by:

41507 South Skagit Highway Concrete, WA 98237 Tel 360-826-4930 Fax 360-826-4830

CREDITS AND ACKNOWLEDGMENTS

PROJECT COORDINATOR..Kelly R. Bush, M.A.

REPORT AUTHOR..Kelly R. Bush, Richard M. Hutchings M.A.

FIELD RESEARCHERS..Kelly R. Bush, Richard M. Hutchings, Rebekah L. Ross, B.A.
Shannon Maloney, USIT, Craig Fernando, USIT

GRAPHICS..Rebekah L. Ross, B.A.

CLIENT CONTACT..Doreen Maloney, Upper Skagit Indian Tribe

TRIBAL CONTACT..Scott Schuyler, Upper Skagit Indian Tribe

OAHP CONTACT..Robert Whitlam, Ph.D.

Equinox Research and Consulting International Inc. would like to thank the Upper Skagit Indian Tribe for retaining us for this investigation and for their commitment to the process and the archaeological resource.

We extend our thanks to Scott Schuyler of the Upper Skagit Indian Tribe for his insights and timely attention to this matter. Mr. Schuyler provided feedback, tribal representatives for the fieldwork.

The opinions and recommendations in this report are those of Equinox Research and Consulting International Inc. alone and do not necessarily reflect those held by any of the organizations or individuals mentioned above. Any errors or omissions are the responsibility of Equinox Research and Consulting International Inc. (ERCI).

ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effect
BIA	Bureau of Indian Affairs
CFR	Code of Federal Regulations
NEPA	National Environmental Policy Act
OAHP	Office of Archaeology and Historic Preservation
NHPA	National Historic Preservation Act
Project	Upper Skagit Indian Tribe Cultural Resource Survey on Approximately 130 acres near Bow Hill interchange
SHPO	State Historic Preservation Officer
TCP	Traditional Cultural Properties
USIT	Upper Skagit Indian Tribe

MANAGEMENT SUMMARY

Subject Property: 130 Acres near Bow Hill interchange

Parcel #s: P35839, P35837, P50416, P50414

Section 31 Township 35 and 36 North, Range 4 East

Quad Map: Bow

Elevation: >200 feet

Owner: Upper Skagit Indian Tribe

The management recommendations now provided are based on the testing carried out during this cultural resource investigation.

1. We recommend this land status change proceed as planned.

2. In the event that any ground-disturbing activities on any of the properties associated with future development uncover protected cultural material (such as bone, stone, or shell artifacts or features), the developer or contractor will cease excavation, secure the area, and contact the Upper Skagit Indian Tribe, the Office of Archaeology and Historic Preservation, and a qualified and professional archaeologist.

3. In the event that any ground-disturbing activities on any of the properties associated with this project uncover human remains, the landowner or representative will cease excavation, secure the area, and follow the unanticipated discoveries protocol in Appendix 4.

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

This report provides the documentation of the pedestrian survey and shovel testing carried out on the four land parcels involved in a land status change (Figures 2-6). No protected cultural material was encountered or collected during this project. All photographs and the photograph logs are on file at the offices of Equinox Research and Consulting International Inc. (ERCI).

The Upper Skagit Indian Tribe provided two tribal representatives to work on the entire fieldwork portion of the survey project. Mr. Scott Schuyler, the Natural Resources Policy Coordinator, with receive a copy of this report.

Rob Whitlam from the Office of Archaeology and Historic Preservation will provide review for this project.

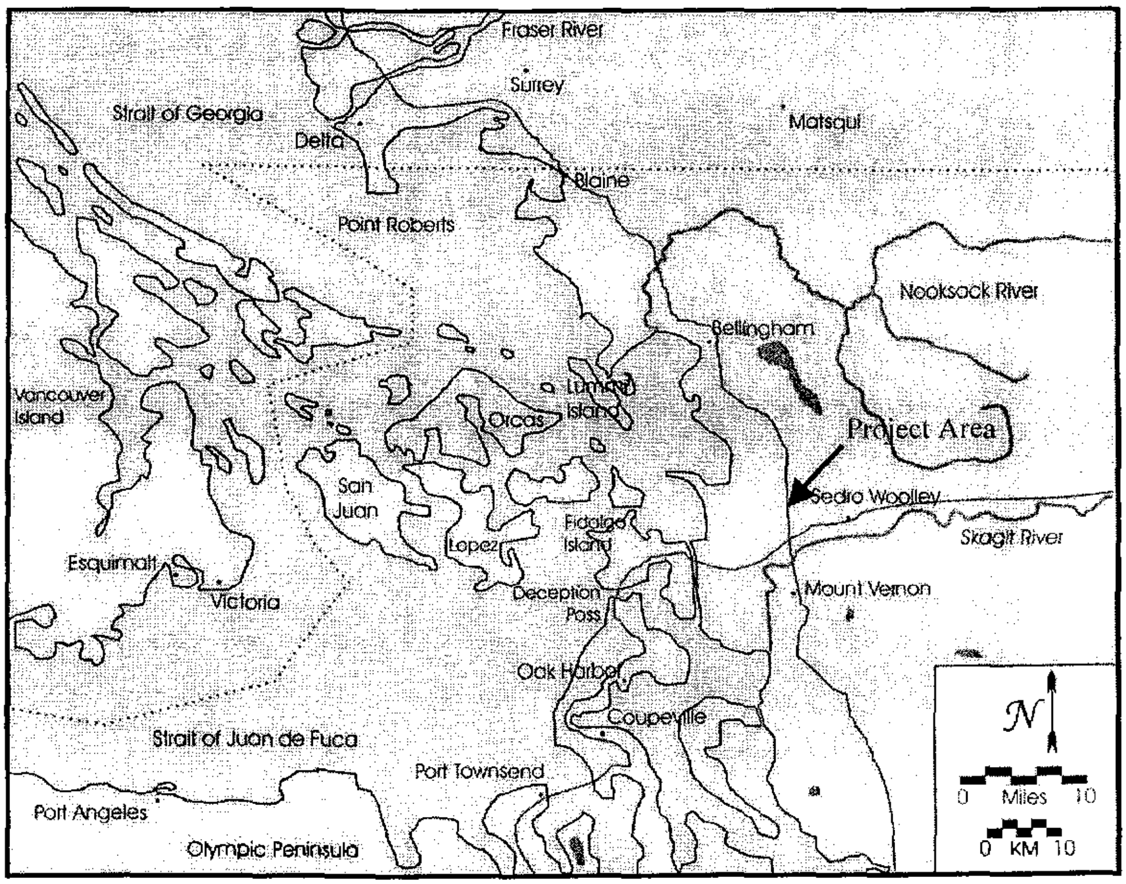


Figure 1: Regional map of Puget Sound showing the location of the project area.

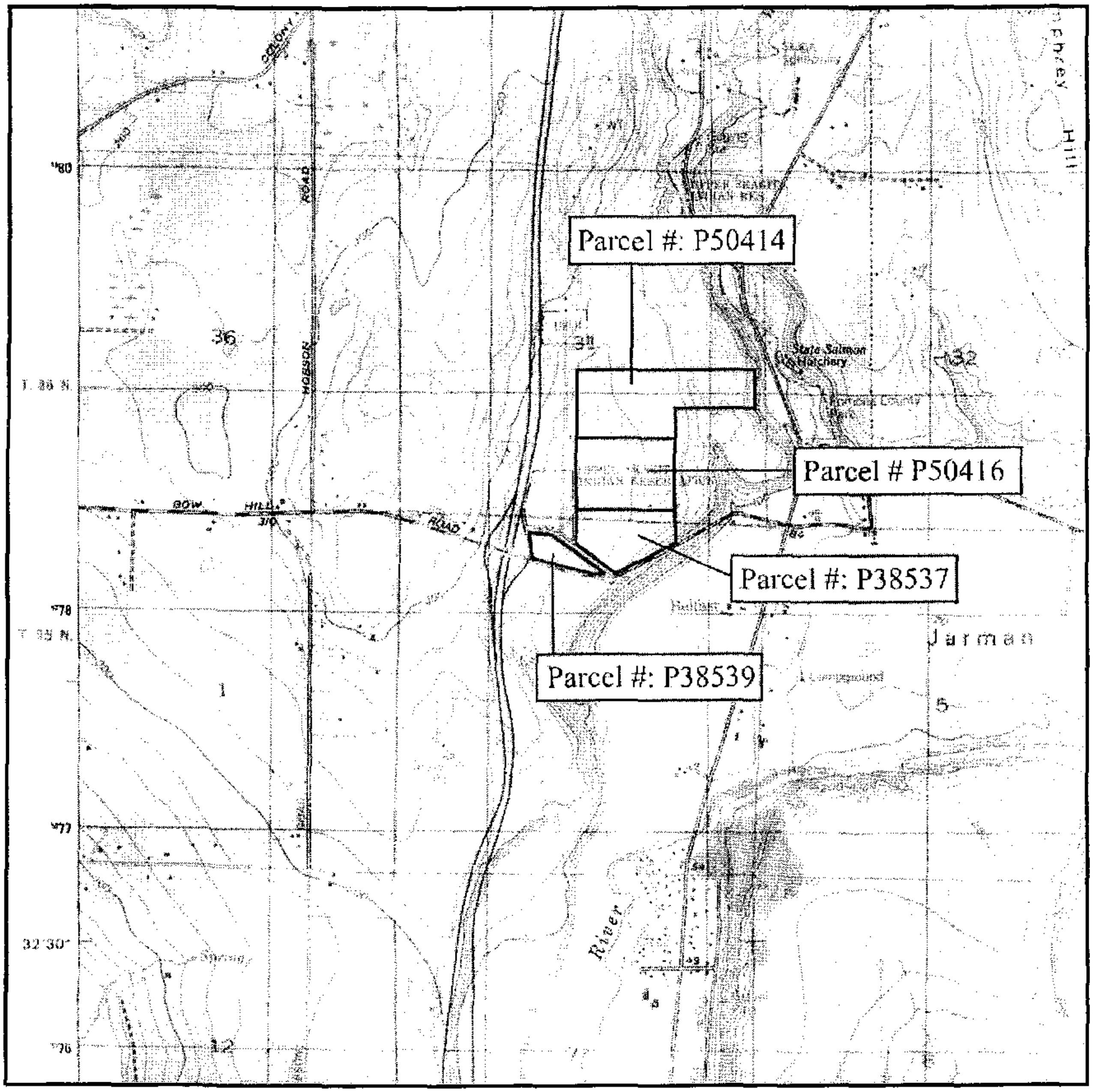


Figure 2: 1:24,000 Bow Quad Map with project locations.

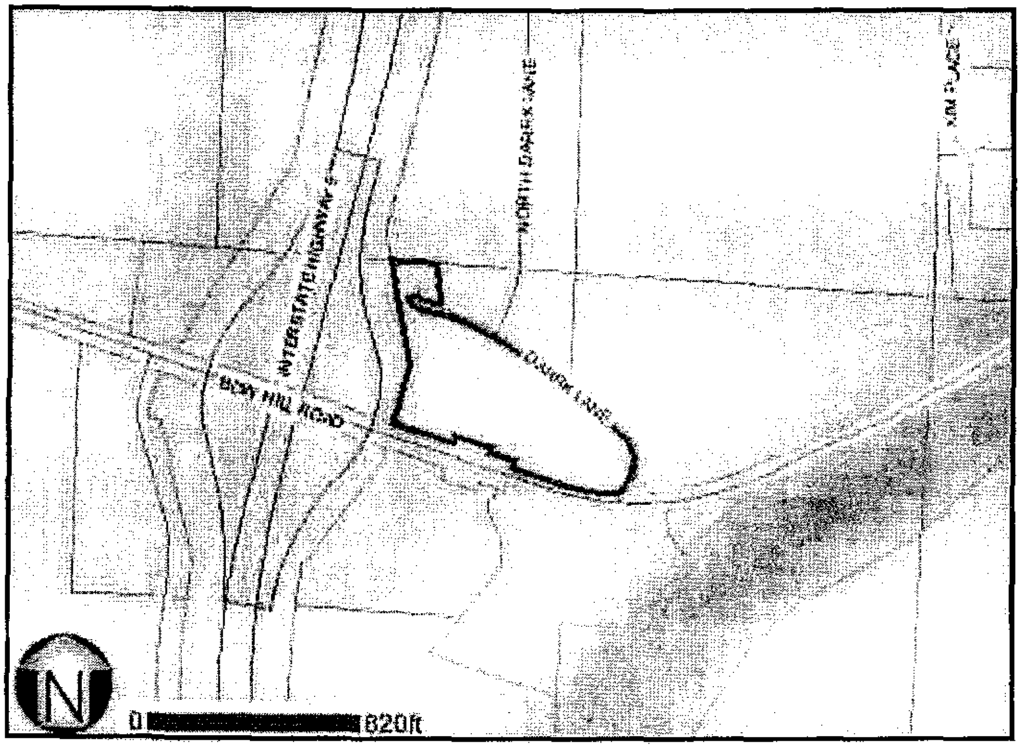


Figure 3: Parcel map of P35839.

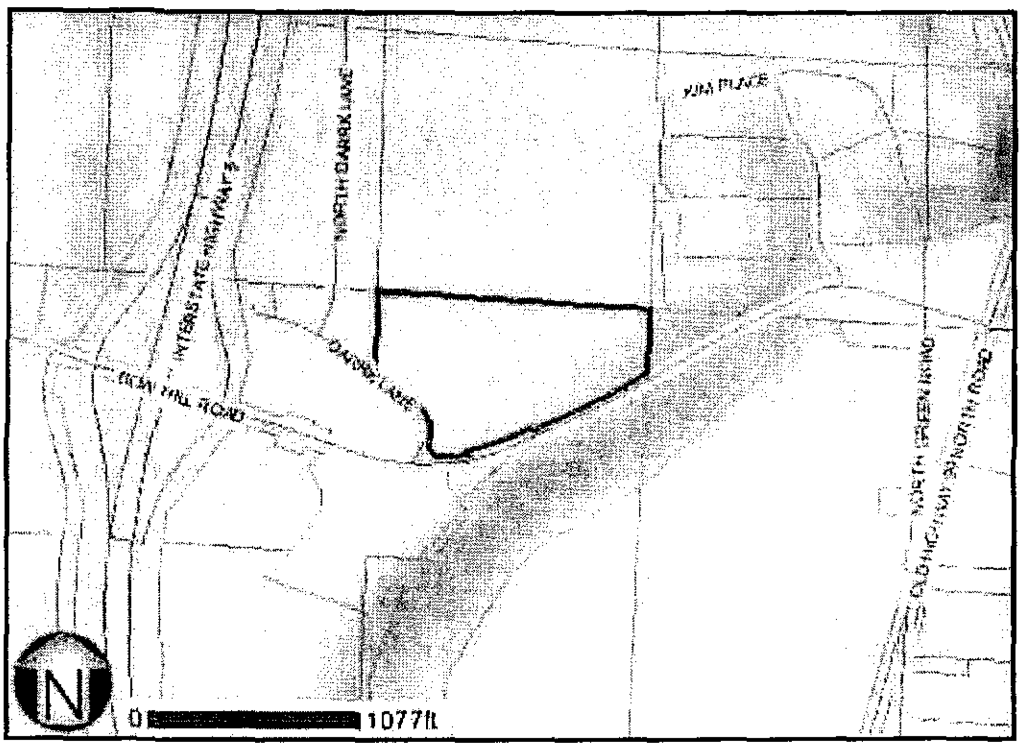


Figure 4: Parcel map of P35837.

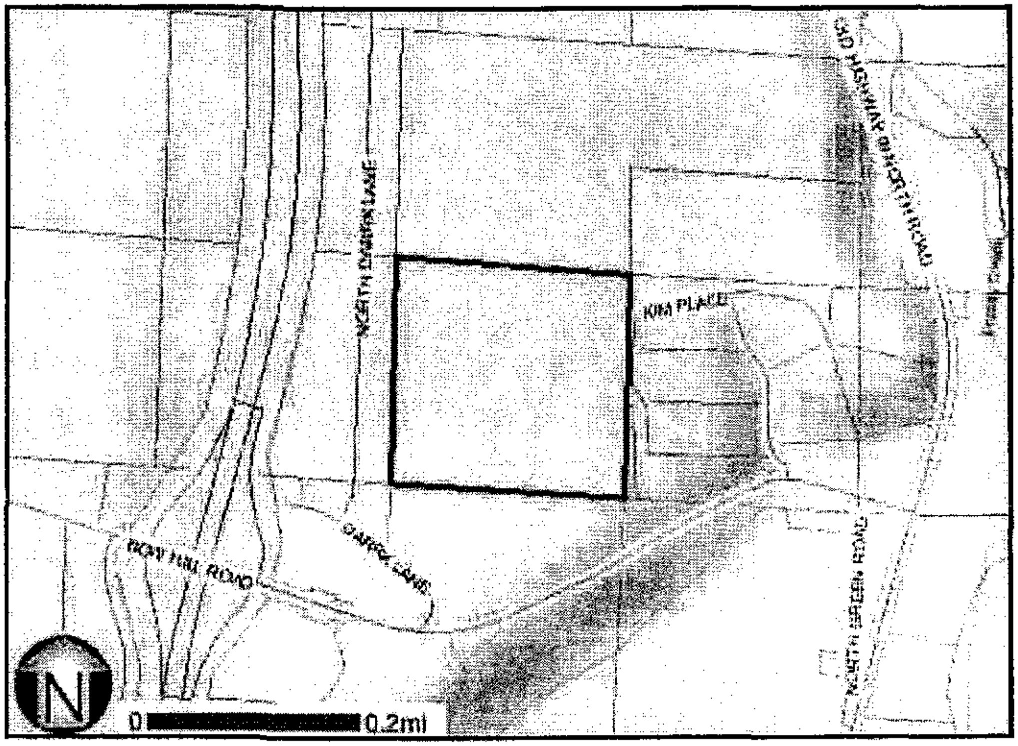


Figure 5: Parcel map of P50416.

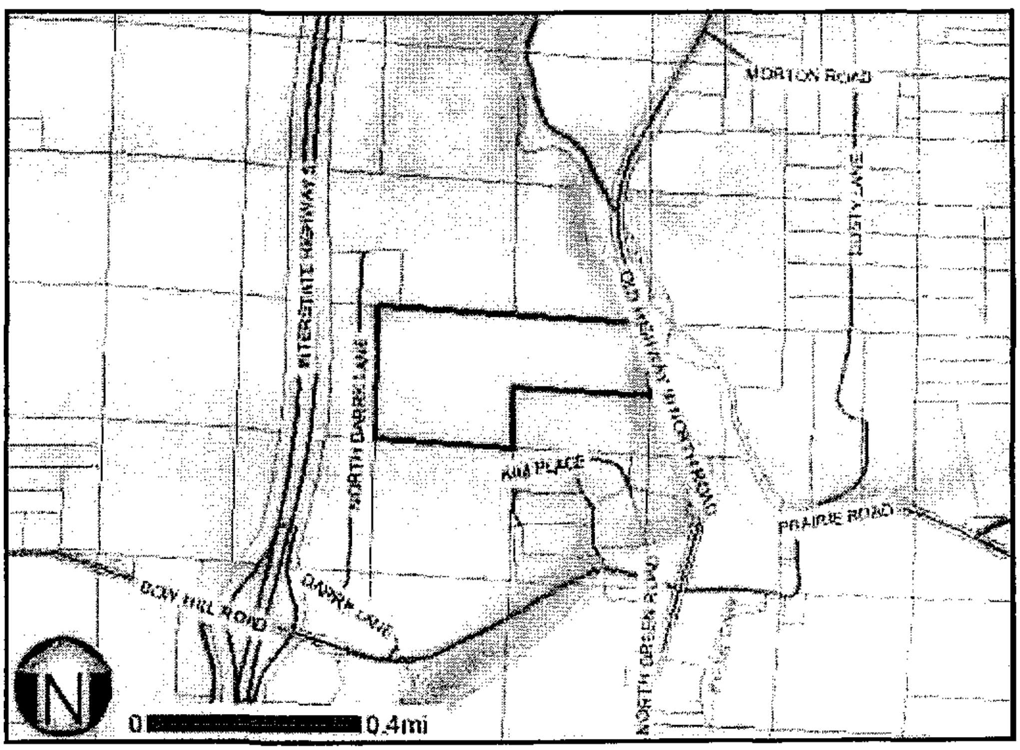


Figure 6: Parcel map of P50414.

2.0 BACKGROUND

2.1 Tribal Consultation

Kelly R. Bush of Equinox Research and Consulting International Inc. (ERCI) was initially contacted by Ms. Doreen Maloney to carry out a cultural resource survey as part of the requirement for compliance to Section 106 of the National Historic Preservation Act for a Land Status Change for the described 4 subject properties. After reviewing the related archival data from the Office of Archaeology and Historic Preservation, the following was discussed:

- The scope of the proposed development
- The concerns and interests of the Upper Skagit Indian Tribe
- Previous archaeology carried out in the vicinity of the APE

The Upper Skagit Indian Tribe will receive a copy of this final report.

2.2 Project Area

The Area of Potential Effect (APE) for these four land status changes is the property boundaries for the lots (Figure 2-6). The properties have been logged for commercial timber sales at various times in the past 40 years. The properties are all on the upland above the Samish River plain (Figure 1) and west of Friday Creek. The properties are adjacent to the existing Skagit Casino (Figure 2). No archaeological sites have been recorded in the project APE. Previous disturbance on the properties include:

- Logging and the associated road construction
- Road building for the new Bow Hill Road and the original Bow Road (Darrk Lane).
- Farming and the associated land clearing, plowing, access road maintenance, fence building, and other land altering activities for approximately 100 years.
- Access road construction and maintenance
- The construction of one large storage barn and gravel turn around with room for other mobile buildings.
- Grading and planting for overflow area for the outdoor amphitheater.

2.3 Environmental Setting

It is outside the scope of this project to describe in detail the landform processes which sculpted the current Puget Sound environment; however, detailed descriptions of landform origins for this region and sea-level stabilization can be found in Armstrong 1977; Burns 1985; Clague 1980; Downing 1983; Easterbrook 1963, 1968; Fladmark 1975; Goudie 1983; Hilbert and Miller 2001; Ness and Richins 1958; Pielou 1991; Prater 1991; Thorson 1980, 1989; White 1980; Whitlock 1992; Wright 1983.

The Project APE is located within the Puget Sound area subset of the *Tsuga heterophylla* environmental zone, in the northern half of the Puget Trough Province, characterized by glacial geology and topography (Franklin and Dyrness 1983: 16). As the most recent glacial epoch retreated, glacial till and outwash were deposited with soils formed in glacial materials under the influence of coniferous forest vegetation. Glacial retreat also caused isostatic rebound as the weight of glacial ice on the surface subsided; isostatic rebound reached heights of 140 meters. Modern sea level and shoreline configurations did not stabilize until about 5,000 years ago (Thorson 1981). The climate is significantly tempered by the Pacific Ocean and Puget Sound. Summers are fairly warm and hot days are rare; winters are cool with snow and freezing temperatures common at higher elevations. This wet, mild, maritime climate is responsible for the unique nature and wide distribution of the *Tsuga heterophylla* (Western hemlock) zone, the most extensive vegetation zone in western Washington, Oregon and south western British Columbia.

In describing southwestern British Columbia's vegetation and climate history, with a focus on 6000 BP, Hebda (1995) synthesizes available data for the Fraser River lowland. He concludes that the 6000 BP horizon followed climatic adjustments marked by both cooling and increased mean precipitation. Williams and Hebda (1991) report a climatic sequence on the Fraser River delta based on temporal changes in the flora of deltaic wetlands. They describe 6800 BP as marking a transition from herb to shrub wetland vegetation. They note an increase of arboreal taxa including Western hemlock (*Tsuga heterophylla*), spruce (*Picea* spp.), pine (*Pinus* spp.) and alder (*Alnus* spp.). Hebda (1995) believes this record is the result of a regional transition from an open state to a forested state and is the product of cooler and wetter climatic conditions. He suggests this period also marks an increase of the culturally significant (see Stewart 1984) Western red cedar (*Thuja plicata*). Hebda and Mathewes (1985) cite *Thuja* as occurring in low frequency throughout the region from between 10000 and 6000 BP with both cedar and hemlock beginning to expand after 6800 BP and dominating the Puget Lowland by 5000 BP. The cooler and wetter climate also added to the increase of deltaic wetland and riparian habitat (Hebda 2000; Hutchings and Campbell 2005).

Geomorphology and Soils

Late Pleistocene glacial deposits mantle the mountains and partly fill the Skagit and Samish River valleys (Dragovich et al. 2000:1). Vashon Stade continental glaciation resulted in deposition of basal till over much of the region. During the Everson Interstade the Puget Sound ice sheet wasted back through the northern half of the Puget Lowland. Marine waters entered the isostatically depressed Puget Sound basin and floated the rapidly retreating ice and thinning continental ice. Marine and estuarine conditions that prevailed in the area resulted in a blanket of glaciomarine drift. Terraces and perched valley-train deposits in the Samish River valley are composed of fluvial outwash that are likely attributable to the Sumas Stade, a minor readvance of the Puget ice lobe.

According to Dragovich et al. (2000:11), the lower Skagit River valley appears to have been a marine embayment whose margin shifted as the isostatically depressed crust rebounded from the Vashon ice load. Post-glacial fluvial, estuarine and deltaic in filling of the Skagit River valley was accompanied by catastrophic input and deposition of volcanic sediments and lahars from Glacier Peak (2000:1). According to Thompson (1978), the Skagit River began its estuarine delta near the present town of Hamilton, which is approximately 15 miles east of the Project APE. Its earliest progradation was between Hamilton and Burlington. Between approximately 9000 and 5000 BP, the 30 to 60 feet lowering of sea levels likely caused some downcutting of the channel and dissection of the delta. After the estuary was filled, the delta built out alternately into Samish, Padilla, and Skagit Bays, and in the process capturing several former islands, including Burlington Hill, Bay View Ridge, Cedar Hill, Pleasant Ridge, and at present, Samish Island. Thompson (1978) and Stilson (1972) have explored the archaeological significance of delta progradation on the Skagit River.

The Project APE is located on a glaciated upland above the area where Friday Creek enters the Samish River valley, approximately 10 miles north of the Skagit River near the City of Burlington (Figure 1). The dominant soil of the Project APE is Skipopa silt loam. This soil represents the near-level portion of the upland. To the east and south of the Project Area, steep slopes drop rapidly to the Jarman Prairie of the Samish River valley below. Soils on these slopes are Sehome loam and Hoogdal silt loam. The most dynamic and significant environmental features of the area include Friday Creek and the Samish River, immediately to the east of the Project Area, and the massive Skagit River, located approximately 10 miles to the south. Both of these systems have undergone extreme changes across the Holocene horizon.

At a much finer scale, Klungland and McArthur (1989) have mapped three soil units as occurring within the Project APE. These are: Sehome loam with 8 to 15 percent slopes; Hoogdal silt loam with 30 to 60 percent slopes; and Skikopa silt loam with 0 to 3 percent slopes. The first two mapped soils units, Sehome and Hoogdal, reflect the steep terrain that borders the Project Area to the south and east above the Friday Creek and Samish River floodplain below. The third map unit, Skikopa silt loam, represents the near level upland portion of the Project Area. This map unit dominates the APE and from a cultural perspective represents the highest potential for site preservation of the immediate environment, and as such, emphasis in the following descriptions is placed on Skikopa silt loam. The following soil descriptions are from Klungland and McArthur (1989).

Sehome loam - 8 to 15 percent slopes.
This moderately deep, moderately well drained soil is on glaciated hills. It formed in volcanic ash and loess underlain by glacial till. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 200 to 1,100 feet. The average annual precipitation is about 55 inches, the average annual air temperature is about 51 degrees F and the average frost-free season is 140 to 180 days. Typically, the surface is covered with a mat of leaves and twigs 2 inches thick. The surface layer, where mixed to a depth of 6 inches, is strong brown loam. The upper 9 inches of the subsoil is strong brown loam, and the lower 13 inches is yellowish brown gravelly loam. Light olive gray, dense glacial till that crushes to gravelly loam is at a depth of about 28 inches. Depth to dense glacial till ranges from 24 to 40 inches. In some areas, the surface layer is gravelly loam or gravelly silt loam. Included in this unit are some soils that have a clayey or very gravelly sand substratum and soils that are poorly drained. Also included are small areas of soils that have slopes of more than 15 percent. Douglas fir is the main woodland species on this unit. Among the trees of limited extent are western hemlock, red alder, western red cedar, and big leaf maple. Common forest understory plants are salal, Oregon grape, western sword fern, vine maple, trailing blackberry and salmon berry (Klungland and McArthur 1989:93).

Hoogdal silt loam - 30 to 60 percent slopes.
This very deep, moderately well drained soil is found on terrace escarpments, formed in loess and glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 100 to 300 feet, with the average annual precipitation at about 45 inches, the average annual air temperature at about 52 degrees F, and the average frost-free season is 160 to 200 days. Typically, the surface is covered with a mat of needles, leaves and twigs 2 inches thick. The surface layer is dark brown silt loam 6 inches thick. The subsoil is dark brown and brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is mottled, olive gray and light olive gray silty clay. In some areas, the surface layer is gravelly silt loam, and in some areas, the substratum has lenses of sand. Included in this unit are small areas of Barneston soils on outwash terraces and Tokul soils on hills. Permeability of this Hoogdal soil is slow. Douglas fir and western red cedar are the main woodland species on this unit. Among the trees of limited extent are red alder and western hemlock. Common forest understory plants are red huckleberry, salal, Oregon grape, western sword fern and salmonberry (Klungland and McArthur 1989:60).

Skipopa silt loam- 0 to 3 percent slopes.
This very deep, somewhat poorly drained soil is found on terraces, formed in a mantle of loess and volcanic ash nnderlain by glaciolacustrine sediment. The native vegetation is mainly mixed conifers and hardwoods. Elevation is 150 to 450 feet with an average annual precipitation of about 45 inches and an average annual air temperature of about 51 degrees F and the average frost-free season is 160 to 200 days.

Typically, the surface is covered with a mat of leaves and twigs 1 inch thick. The surface layer, where mixed to a depth of 8 inches, is dark brown silt loam. The subsoil is dark yellowish brown silt loam 8 inches thick. The substratum to a depth of 60 inches or more is gray, olive, and bluish gray silty clay. In some areas, the surface layer is gravelly silt loam, and in some areas, the substratum has lenses of sandy material. Included in this unit are small areas of Bellingham soils depressional areas, Gilligan and Indianola soils on outwash terraces, and Tokul soils on hills. Permeability of this Skipopa soil is very slow. Available water capacity is high. Effective rooting depth is limited by a perched water table that is found at a depth of 12 to 24 inches from October to June. Runoff is slow, and the hazard of water erosion is slight. Douglas fir and red alder are the main woodland species on this unit. Among the trees of limited extent is western red cedar, western hemlock, and big leaf maple. Common forest understory plants are western sword fern, bedstraw, salmonberry, Pacific trillium and red huckleberry (Klungland and McArthur 1989:97).

Prior to the influx of European settlers, the Samish and the surrounding hills likely supported a mixed prairie/forest vegetation of Western Washington's climax hemlock (*Tsuga heterophylla*)/cedar (*Thuja plicata*) forests. A solid component of Douglas fir (*Pseudotsuga menziesii*) is likely to have existed, which is interesting and rare in much of the Skagit River area. Soil development and traditional cultural practices in some areas of the Skagit River drainage encouraged many indigenous prairie areas. For a more detailed description of the flora associated with these areas, see Franklin and Dyrness 1988, Huesser 1983, Pojar and Mackinnon 1994, and Turner 1995.

Warm, dry summers and mild, wet winters prevail in this biogeoclimatic zone. The Samish Valley likely supported a wide variety of large and small mammals, birds, reptiles and amphibians common to river deltas and foothill transition zones. Bears, cougars, deer and elk are the indigenous large mammals with small mammals including otter, beaver, fox, porcupine, marten, snowshoe hare, bobcat, chipmunk and squirrel. Birds found in the project area consist of a wide variety of migratory and permanent waterfowl, shorebirds, raptors and songbirds. All five salmon species, trout, Dolly Varden, whitefish, sucker, lamprey and sturgeon live in the nearby Skagit River. Both Friday Creek and the Samish River would have been healthy streams full of fish, wild fowl and other reptiles and amphibians.

Prior to European settlement in this area, land mammals and plant resources would have been abundant during all seasons. Traditionally, much of the use of upland sites near rivers and creeks, such as we might expect to find in this project area is interpreted as related primarily to fishing and fish processing, as well as village habitation sites. However, in this project area which falls in the transition zone between the delta and the foothills, land mammals would account for a great deal of the total calorie consumption prehistorically.

2.4 Cultural Setting

It is beyond the scope of this study to provide a detailed description of traditional Coast Salish land use and lifeways. For in-depth descriptions of traditional Coast Salish culture readers should consider the following references: Adamson 1969; Allen 1976; Ames and Maschner 1999; Amoss 1977a, 1977b, 1978, 1981; Barnett 1938, 1955; Belcher 1986; Bennett 1972; Bierwert 1993, 1999; Borden 1950, 1951, 1975; Boxberger 1986, 1996; Boyd 1999; Bryan 1955; Bryan and Lurman 1953; Burtchard 1998; Carlson 1990, 1996; Collins 1952, 1974a, 1974b, 1974c; Dewhirst 1976; Duncan 1977; Elmendorf 1971, 1974, 1993; Fladmark 1982; Guilmet *et al.* 1991; Gunther 1928, 1945; Haeberlin and Gunther 1930; Harmon 1998; Harris 1994; Howay 1918; Island County Historical Society 1993; Jermann 1977; Jorgensen 1969; Kew 1972, 1990; Kozloff 1973; Lane and Lane 1977; Mansfield 1993; Mattson 1971, 1985; B. Miller 1993, 1995, 1997, 1998, 2001; Miller and Boxberger 1994; J. Miller 1988; Mitchell 1971; Mooney 1976; Onat 1987; Roberts 1975; Ruby and Brown 1986; Sampson 1972; H. Smith 1900, 1907; Smith and Fowkes 1901; M. Smith 1941, 1950, 1956; Snyder 1954, 1964, 1981; Spier 1935, 1936; Stein 1984, 2000; Stewart 1977; Strickland 1984, 1990; Suttles 1958, 1960, 1987, 1990; Taylor n.d.; Thompson 1978; Wessen 1988; White 1980; Whitlam 1980; Willis 1973.

The southern Northwest Coast Salish peoples that traditionally inhabited the project area prior to European settlement lived a comfortable, successful and highly adapted lifestyle. They excelled at resource extraction, processing, and tool and structure manufacture in this west coast environment. Their lives followed a seasonal round that included temporary summer camps along the coast for shellfish and plant gathering and fishing. Permanent settlements occurred along the Samish River and its tributaries. In pre-contact times, the Skagit River corridor, which included the Samish River and Friday Creek, was likely an increasingly populated transportation corridor since the beginning of the Holocene. The riverine and terrestrial resources available traditionally on this river could easily and comfortably support the populations of people estimated for this area near the time of contact with Europeans.

Early cultural traditions would have reflected a highly mobile hunting, foraging, and gathering lifestyle as the ice sheets were receding and ecosystems were stabilizing and transitioning in the early Holocene. Lifestyles would have become more complex with increasing populations as resources became more stable and procurement strategies improved. By 5000 years ago, shorelines would have been fairly stable and salmon runs flourishing. Artifact assemblages reflect this increasing population and complexity in resource acquisition and social structure.

Terrestrial resources including mammals, birds and the harvest of plant resources were observed as being carefully maintained and utilized at the time of early contact with Europeans. A larger aggregate village in the Samish River is common in the narratives of the Upper Skagit people. Much of the evidence for this extensive pre-contact and proto-historic land use has been obliterated by development in the last two hundred years, including the displacement of an Indian Smokehouse or Council house and the associated Indian cemetery from the corner of Old 99 and Prairie road sometime around 1913 (Jordan 1977:380). The cemetery is now maintained on Tribe owned land on the west side of Interstate 5.

According to Sampson (1975), The Noo-wha-ah People possessed the land from Red Creek (Dwoch-churn-um) north along the waterfront to Nooksack River through the west half of Whatcom Lake, around Warner Prairie, down the valley of the Samish River and the Olympic Marsh and to the Red Creek. They were a strong and powerful people supported by the spirits of the Wolf and Thunderbird. Sadly, the small pox epidemics of the 1700's and 1830's reduced the population drastically. The following story is from Sampson (1975:25).

> Only one out of a village on Jarman Prairie was saved, a baby girl. A visiting Uncle found her in her dead mother's arms, moved her to the north side of the Prairie and left her in a shelter. He then went back to the houses on the bank of the Samish River, and after making sure that no others were alive, set the torch to all of the buildings. Checking the houses on Friday Creek and finding all of the inhabitants dead, he also burned this village. There, as a further sanitary measure, he took off all his clothing and tossed his garments on the flames. Stripped naked and with the bare little orphan in his arms, he then set out over the long tail across Bow hill to the village on the head of Edison Creek where his family lived. This was near what is now Bow, on what the Indian s called Du-wha-chub-up, later called Edison Slough or the north fork of the Samish River.

Sampson also describes a fort or village at the mouth of Edison Creek as a gateway to the inland kingdom as it was the point of entrance to the canoe route from the Sound to the village at Bow. From the Bow village a trail led over Bow hill to a village at Belfast on Friday Creek. This joined trails that went north to Lake Samish and south to village on Jarman's Prairie. The Southern trail is said to turn up the Samish River (Squil-col-lich) to a village at Warner Prairie, then on to Wickersham and through a saddle to Lake Whatcom. Jarman and Warner Prairie were considered as a great source of roots and bulbs essential to the traditional diet. Pat-the-us, the famous chief who signed the 1855 treaty for the Noo-wha-ah had his home near Bayview.

The Treaty of Múckl-te-óh (Point Elliot), signed on January 22, 1855, but not ratified by congress until March of 1859, (AFSC 1970: 36) has provisions important to the management of federal lands in the United States. Although no federally managed lands are within the APE for this project, federal intersections exist in the permitting process and a brief discussion of treaty provisions may put into perspective some of the historic preservation requirements. Included in the Treaty of Múckl-te-óh is the Subsistence Clause (Article 5), which reserves the right of members of federally recognized tribes to fish at all usual and accustomed grounds and stations and to hunt and gather on open and unclaimed lands.

The turn of the twentieth century saw a shift in federal policy to facilitate the assimilation of native populations into the dominant culture. These policies were often in contravention of signed treaties and included practices such as the removal of children from families and traditional territories to government-sanctioned residential schools. As treaty obligations were left unfulfilled, treaty tribes in 1927 brought a suit against the federal government (*Duwamish et al. v. United States*). Evidence was submitted on behalf of several tribes, including the Upper Skagit, primarily dealing with village locations at the time of treaty. References to hunting and plant gathering in the Skagit Drainage from these proceedings may be of interest to resource management in the Samish Valley (Boxberger 1996: 65).

After the 1950s, the treaty-reserved right to fish became a focus for many natives in the Puget Sound. AFSC's *Uncommon Controversy* 1970, Fay Cohen's *Treaties on Trial*, and the 1981 *US Commission on Civil Rights* documents this period of Indian and state government clashes.

In addition to fishing, gathering rights are included in the Subsistence Clause (Article 5) of the 1855 treaty. If gathering involves collecting materials for sacred ritual, then access for gathering might be further protected under American Indian Religious Freedom Act (AIRFA). If gathering sites are eligible for the National Register as a Traditional Cultural Property, they are afforded another layer of protection under the NHPA. It benefits all stakeholders of cultural resources in the Samish Valley to recognize that members of the Upper Skagit Indian Tribe have a long history of cultural and spiritual connection to this valley.

To fully document the origins of the Traditional Peoples the Skagit River, information from oral histories of the people who consider this valley the place of their ancestors/immortals must also be incorporated.

From the preface to her third volume of text from oral traditions, Vi Hilbert describes the value and place of narratives:

> We do not know how long it has taken for these stories to come down to us, for we did not use the kind of calendar everyone uses today. My people marked time by referring to especially remarkable occasions, such as the year of the solar eclipse, or the period when the big log jam still blocked the Skagit River, all of our culture had to be committed to memory. To this end, our historians developed excellent memories in order to pass on important information to later generations.
>
> Our legends are like gems with many facets. They need to be read, savored and reread from many angles. My elders never said to me, "this story carries such and such a meaning." I was expected to listen carefully and learn why the story was being told. Though guided, I was allowed the dignity of finding my own interpretation (Hilbert 1985: iv).

Information passed down in the narratives of the people who consider this valley part of their ancestry provides the context and richness that fill in ethnographic gaps.

Traditionally the river drainage was the primary unifying concept among the loosely organized groups of the Puget Sound Salish. Cultural distinctions were recognized along the following biogeoclimatic culture zones (AFSC 1970: 6): saltwater people, river people, inland people and prairie people.

The land was not owned in the European understanding of ownership; in order to travel across the landscape individuals considered convenience and the feelings about the people they might encounter (AFSC 1970: 7)

These habitations would have been used year-round providing close access to the diversity of resources in the valley and mountains around the Samish and Skagit Rivers. Summer encampments in the higher elevations for resource gathering would have been common and the trails and travel corridors to these resource-gathering areas would have been well known to the users and their neighbors.

Another famous local was Plidy Consank or Friday, as he was known by the non-Indian settlers. Friday lived at Bow three miles west of Belfast south of where W. J. Brown homesteaded property on Edison Slough in 1879. Plidy was seen well up the Samish River collecting willow branches to weave into baskets for sale. He was thought to live from sometime around 1815 to 1923. At some point he had a cabin for many years next to the Smokehouse on the ashes of the old village a half-mile south of the Samish Fish Hatchery on the east bank of Friday Creek. This would have been visible from the Project APE. Plidy was well known as a fire dancer and carried respect among his people.

It is important to note that there is evidence for human occupation and use in this region for at least 10,000 years. Although some archaeologists believe that North America was populated by migrations of people from present-day Asia crossing a bridge of land in the Bering Straight of Alaska. Local Native Americans do not believe this, as their origin narratives take place here in the mountains of the Skagit Drainage.

Numerous historic references are available for the Skagit and Samish Valleys. The reader is directed to Jeffcott 1949, Jenkins 1984, Jordan 1974, Majors 1984, Meany 1957, Meeker 1905, Neil 1989, Sampson 1972, Strickland 1984 and 1990, Thompson 1989, and Willis 1973.

Jarman Prairie is the lowland area that borders the east and south boundaries of the project APE and was named after the explorer William Robert "Blanket Bill" Jarman, born in England on April 3, 1820. Raised in a family of sea-fairers, he was apprenticed at a young age to a relative, Captain Henry Jarman. On a trip to Tasmania in 1844, the crew of the ship abandoned the captain and young Jarman, leaving them to cross to Australia on their own means. After arriving, Robert Jarman signed with Captain Richard Hardy of the *Platypus* for fir and skin trapping of aquatic animals. The ship sailed to the Pacific Northwest, hoping to cash in on the "China Market". After getting lost looking for the mouth of the Columbia River, the ship made for Vancouver Island. The *Platypus* anchored in Nootka Sound in 1846 to take aboard fresh water, and while Jarman was ashore, Nootka Warriors took control of the ship. Jarman became the chief's slave but soon achieved distinction amongst the tribe.

Figure 7: View southeast from shovel test 15 down to Jarman Prairie, mine is visible across valley.

In the summer of 1848, Governor James Douglas, the head of the Hudson's Bay Company in Victoria, heard of Jarman's enslavement and negotiated for his release. Jarman was brought to the city, and was ransomed for 32 blankets, a pile equal to his height. Thereafter, he was knowu as "Blanket Bill". Jarman remained in Victoria for two months acting as a messenger for the governor. After the life of civil ease, Jarman felt restricted by social regulations. In the dead of night, he stole a canoe, and crossed the Strait of Juan de Fuca to Wilson Point. There he moved into a Clallum village under the leadership of Chief King George.

A man going by the name of Cooper, working as a carrier between forts in 1856, sought the help of Jarman and his wife after getting lost mid-rout. After assisting the man, Jarman was hired as a carrier, bringing messages, mail and express between Forts Steilacoom, Townsend and Bellingham. Jannan hired nine local tribal members to row him between the forts; in return, he paid them in highly sought red shirts. Towards the end of his contract, Cooper skipped out on paying Jarman, leaving him $200 in debt to pay his row-men. To pay them back, Jarman worked at Fort Bellingham until he had made enough money.

1858 arrived, and Jarman and Alice moved to a land claim of 160 acres south of Lake Samish, an area that came to be known as Jarman's Prairie (Figure 7). In the 1860's, he was hired as a telegraph line technician for the California State Telegraph Company for the lines along the coast going up to Sehome. He died at 92 on June 11, 1912.

2.5 Previous Archaeology

The earliest archaeological studies of the region are from the now famous Harlan I. Smith 1900 and 1907. For more detail about the archaeology of this area see Bryan 1955; Carlson 1990, 1996; Duncan 1977; Hale 1991; Hearne and Hollenbeck 1996; Jermann 1977; Mattson 1971, 1985; Onat 1987, 1980;

Robinson 1980, 1981, 1999; Snyder 1981; Stein 1984, 2000. Other more comprehensive archaeological investigations that include the project area are Gail Thompson's 1978 dissertation "Prehistoric Settlement Changes in the Southern Northwest Coast: A Functional Approach" and two reports from Onat, Bennett and Hollenbeck 1979 and 1980 respectively: "Skagit River Cultural Resource Reconnaissance: Bibliographic Review and Field Reconnaissance for the Skagit River levee and Channel Improvement Project" and "Cultural Resource Overview and Sample Survey of the Skagit Wild and Scenic River".

Archaeology in the Pacific Northwest is full of interesting stories and complex facets and components. Preservation of sites, history of research, modern demographics, and most importantly the actual taphonomic processes of landform creation and movement in the study area provide the plot lines to this fascinating story. The retreat of the glacial ice over 10,000 years ago has had the greatest impact of all processes on the surface of the earth within the Skagit drainage. The scouring of the land surface by retreating ice and the associated mechanisms related to outwash of water from the melting ice create the interesting and varied patterns of landforms and surface geology common in the Skagit Watershed.

How archaeological sites are recorded often has a great deal to do with where and how we look for them. Federally managed lands (sometimes have a cultural resource management plan that includes active inventorying for sites. Projects that require a federal permit, license or review may also have survey and inventories on project areas. In some counties, policy or law requires shoreline or critical areas planning to include inventories for sites with cultural significance. Although state and federal laws prohibit the disturbance of archaeological sites without a state permit, private development often goes ahead without and archaeological review. It is the jurisdiction of a land parcel that often determines whether or not archaeological sites will be recorded on or around that parcel. There are few recent archaeological investigations in this area of Skagit County. A federal nexus in a project initiating compliance to Section 106 of the National Historic Preservation Act has instigated most archaeological investigations. In Skagit County, many of the sites recorded are also a product of sponsored survey programs from the 1950s and 1960s.

There are no archaeological sites currently recorded within 2 miles of the Project area.

3.0 METHODOLOGY

3.1 Archival Research

- Review of site forms and previous reports on file at the Office of Archaeology and Historic Preservation in Olympia, Washington
- Review of other archaeological reports and related documents on file at the ERCI office, Sedro Woolley, Washington
- Review of published information on the prehistory or traditional native use of the area including the Skagit River Valley

3.2 Field Methods

The fieldwork portion of the project involved a surface pedestrian survey of recently and more distantly logged fields within the project area. Zigzag transects with crews of 4 to 5 people were carried out in all the field areas of the project area. Subsurface testing with shovels and screens was employed. Each tree was examined for cultural modification and the ground surface for any features or protected material.

Road cuts and other exposures were also examined for any cultural indicators. Kelly R. Bush, M.A., Richard M. Hutchings, M.A., Rebekah L. Ross, B.A., Craig Fernando, USIT and Shannon Maloney, USIT carried out all the fieldwork.

4.0 RESULTS AND RECOMMENDATIONS

4.1 Results

No protected cultural resources were identified in the APE during this investigation. All four properties have had some recent modifications on them. Logging and the associated stump pulling, yarding, road building and equipment operation has disturbed the surface of most of the four properties in some locations first growth stumps with spring board notches are still in place, but over much of the project area the old stumps have been pulled during the second and third cuttings.

Parcel #P50414:
This lot (Figure 8) is the most northerly in the project area and has an old access road built from Old Highway 99 near the salmon hatchery up through the property. The timber has been cut in the last 25 years, with some original stumps left in place. Our crew of 4 carried out a zig zag pedestrian survey in transects from south to north (Figure 9) and then followed the old road out and tested along a distinct land form above the salmon hatchery. We then followed the road back in to the center of the lot avoiding the wet area and proceeded to survey south back to the access road and buildings. No protected cultural material was identified.

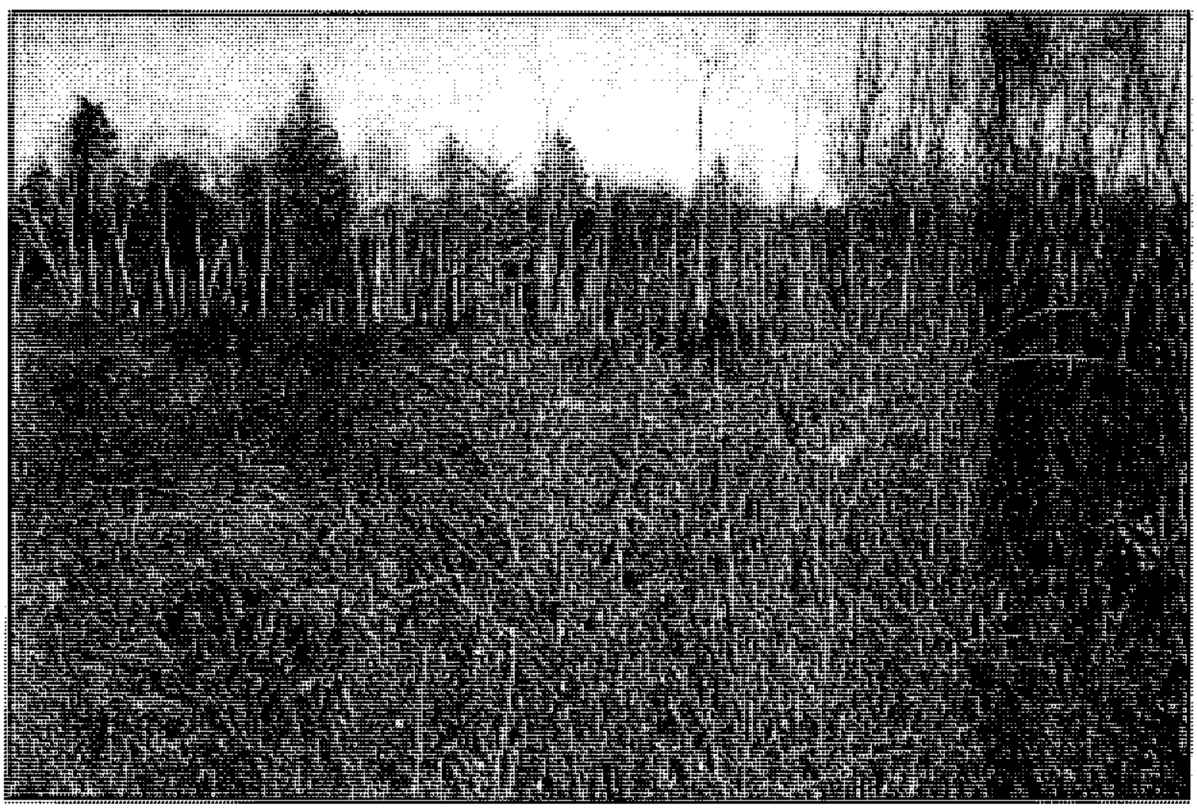


Figure 8: View north across P50414.

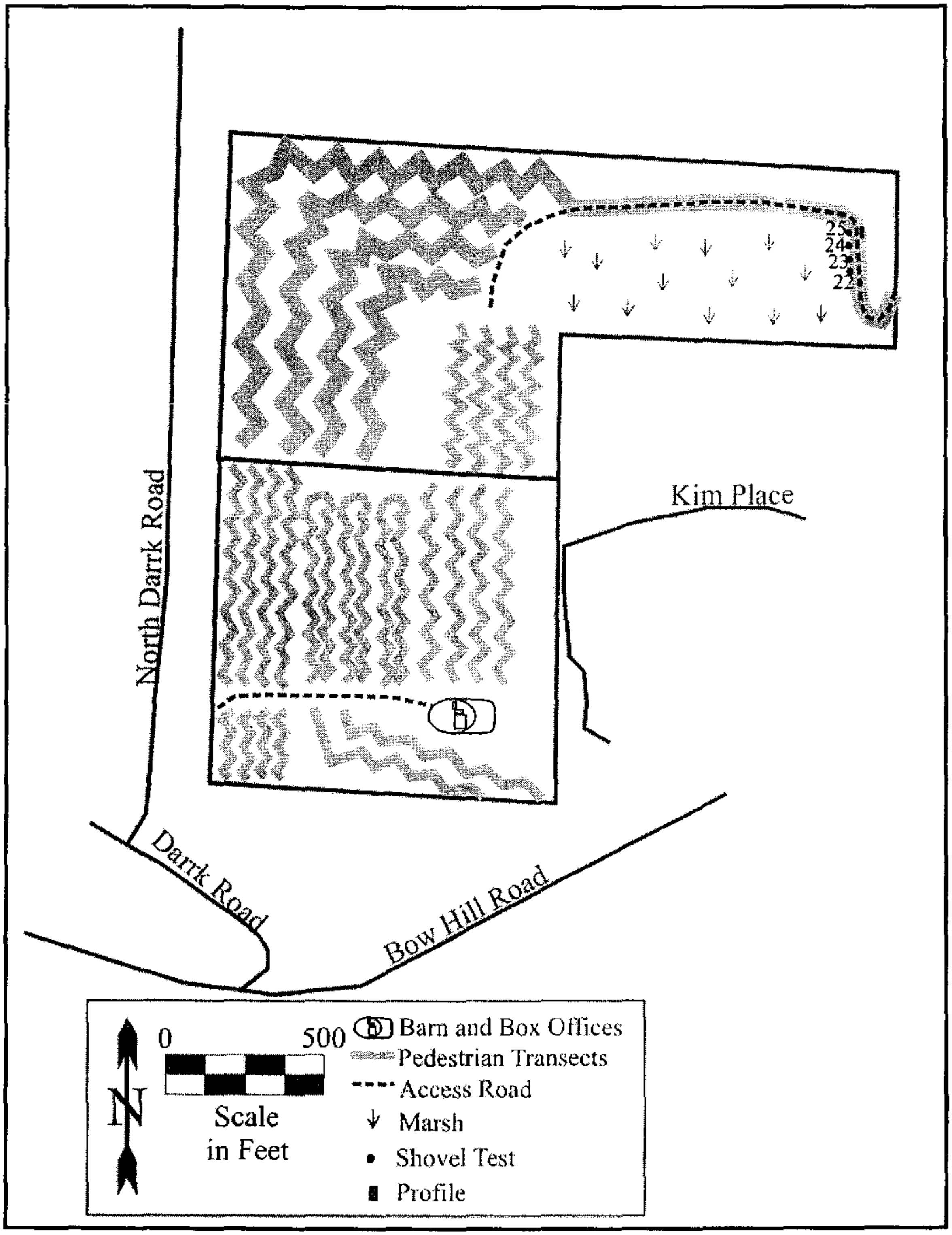


Figure 9: Sketch map of P50414 and 50416.

Parcel #P504416:

This parcel is directly south of P50414 (Figure 9) and has been logged in the past 25 years with a strip along the west side having just been logged (Figure 10 and 11). Much of the area was cleared after logging and some has young deciduous growth. Our crew of 4 carried out a zig zag pedestrian survey in transects from south to north and into P50414, then back south through the lot after completely the lot to the north (Figure 9). No shovel test holes were dug in this lot as there was no significant landforms deemed of high potential for cultural resources. In both lots, logging activities have disturbed much of the surface.

Figure 10: View North from access road across P50416.

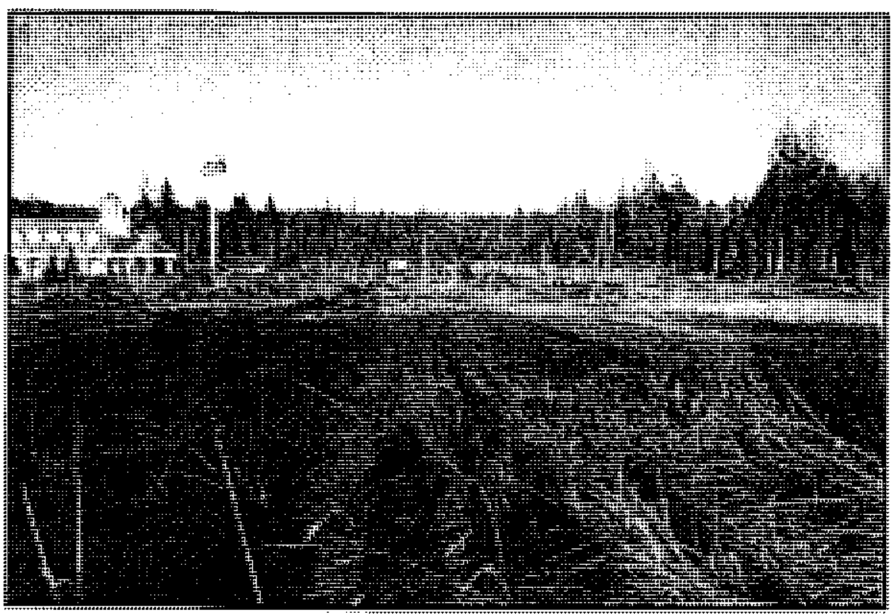


Figure 11: View northwest across south end of P50416 showing recently logged strip along Darrk Lane.

Parcel #P38537:

This lot is directly south of P50416 and has been logged in the past 25 years. An unimproved road enters the property from North Darrk Lane to access the buildings near the east side of the property (Figure 12). Shovel testing was employed in this lot as the southern boundary follows a distinct landform overlooking Jarman's prairie. Bow Hill Road (Figure 14) is part of the southern boundary and like many modern roads may have followed an old road or even older trail system. No cultural material was identified in the 16 holes dug along this landform. The rest of the lot was covered with a pedestrian survey as per Figure 13.

Figure 12: View southeast over P38537 showing access road from the west and the storage barn.

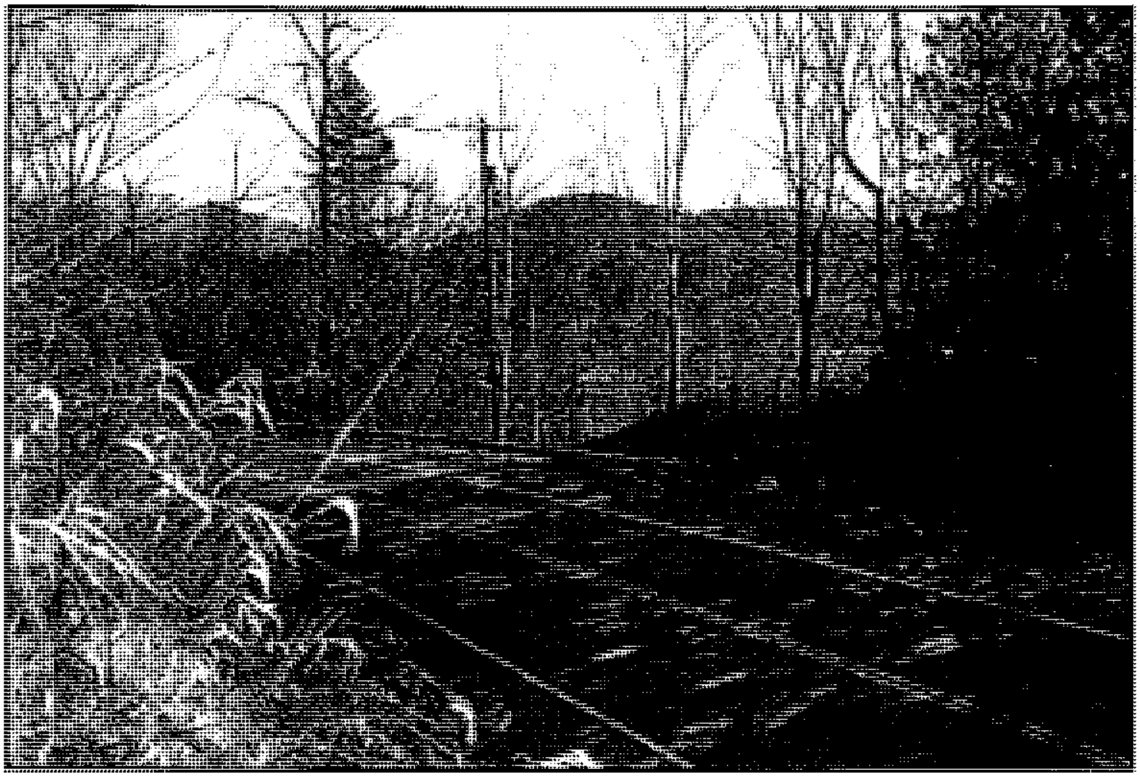


Figure 13: View southeast down Bow Hill Road from P38537.

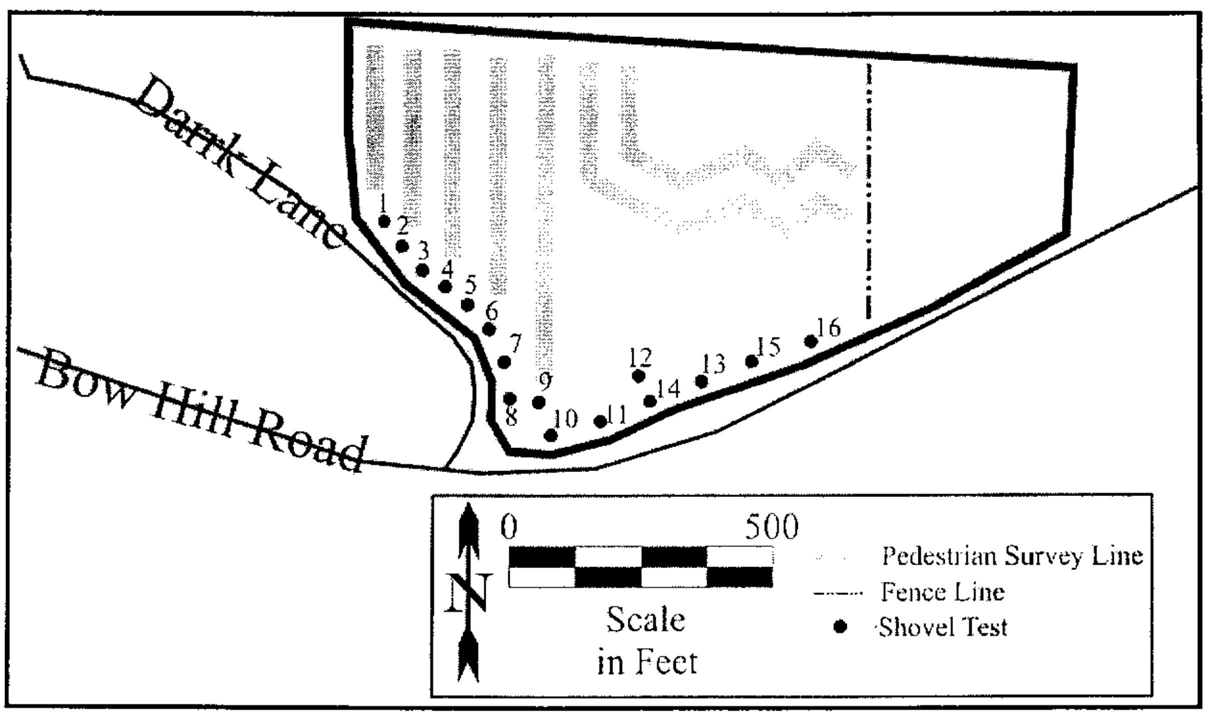


Figure 14: Sketch map of parcel # P38537.

Parcel #P38539:

This parcel has two distinct zones. The east half is a leveled and grassed parking area and the western half is forested with a small north-south creek running through the property (Figure 15). The western half also had recent restoration work along the north end of the creek that includes a small gravel trail and other stream clean up. Shovel test holes were excavated along the west side of the ravine and the rest of the forested area had a pedestrian survey (Figure 18) . No protected cultural material was identified in the shovel probes or the pedestrian survey however; we encountered an interesting historic dump. The dump is likely related to either the old Bow Road that followed the existing Darrk Lane or a use area or habitation, although no evidence of a structure was found. The refuse (Figures 16 and 17) dated from sometime in the late 1930s or 1940s through the 1960s. There was also evidence of modification to two small side seeps that drained into the small north-south creek.

Figure 15: View north up small creek in Lot #P38539.

Figure 16: Example of Refuse from P38539.

Figure 17: Example of Refuse from P38539.

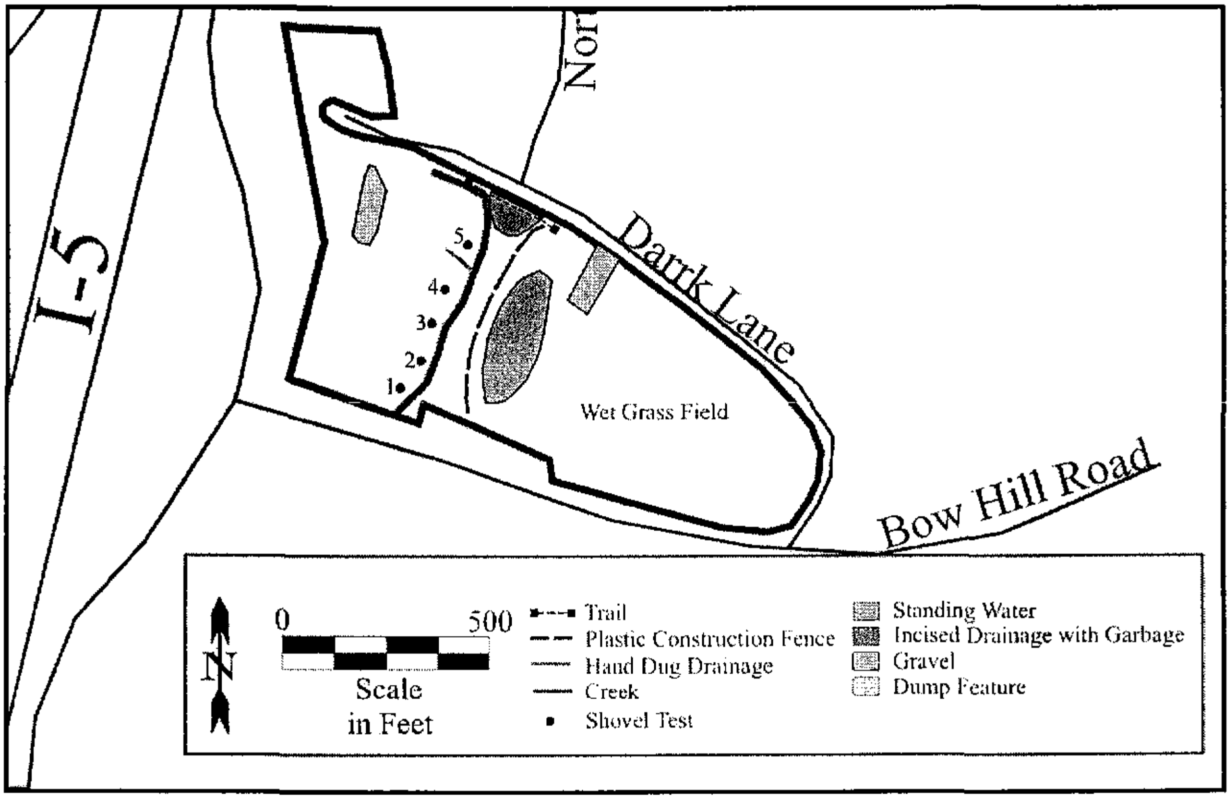


Figure 18: Sketch map of parcel # P38539.

4.2 Management Recommendations

The management recommendations now provided are based on the testing carried out during this cultural resource investigation.

1. We recommend this land status change proceed as planned.

2. In the event that any ground-disturbing activities on any of the properties associated with future development uncover protected cultural material (such as bone, stone, or shell artifacts or features), the developer or contractor will cease excavation, secure the area, and contact the Upper Skagit Indian Tribe, the Office of Archaeology and Historic Preservation, and a qualified and professional archaeologist.

3. In the event that any ground-disturbing activities on any of the properties associated with this project uncover human remains, the landowner or representative will cease excavation, secure the area, and follow the unanticipated discoveries protocol in Appendix 4.

6.0 REFERENCES CITED

Adamson, Thelma

1969 *Folk-Tales of the Coast Salish*. The American Folklore Society, New York, G.E. Stechert and Co.

Allen, Edwin J. Jr.

1976 "Intergroup Ties and Exogamy among the Northern Coast Salish." *Northwest Anthropological Research Notes* 10 (2): 161-172.

American Friends Service Committee

1970 *Uncommon Controversy: Fishing Rights of the Muckleshoot, Puyallup and Nisqually Indians*. UW Press, Seattle.

Ames, K.M. and H.D.G. Maschner

1999 *Peoples of the Northwest Coast: Their Archaeology and Prehistory*. Thames & Hudson, New York.

Amoss, Pamela T.

1977a "The Power of Secrecy among the Coast Salish," in Raymond D. Fogelson and Richard N. Adams (editors) *The Anthropology of Power: Ethnographic Studies from Asia, Oceania, and the New World*. Academic Press, New York: 131-140.

1977b "Strategies of Reorientation: the Contribution of Contemporary Winter Dancing to Coast Salish Identity and Solidarity." *Arctic Anthropology* 14 (1): 77-83

1978 *Coast Salish Spirit Dancing: The Survival of an Ancestral Religion*. University of Washington Press, Seattle, Washington.

1981 Coast Salish Elders, in Pamela T. Amoss and Steven Harrell (editors), *Other Ways of Growing Old: Anthropological Perspectives*. Stanford University Press, California: 227-248.

Armstrong, J. E.

1977 *Quaternary Stratigraphy of the Fraser Lowland.* Geological Association of Canada, Mineralogical Association of Canada, Society of Economic Geologist, Canadian Geophysical Union, Joint Annual Meetings, Fieldtrip Guidebook.

Barnett, Homer Garner

1938 "The Coast Salish of Canada." *American Anthropologist* 40: 118-141; Menasha, Wisconsin.

1955 "The Coast Salish of British Columbia." *University of Oregon Monographs, Studies in Anthropology*, No. 4.

Belcher, William R.

1986 Coast Salish Social Organization and Economic Redistribution *Northwest Anthropological Research Notes* 20 (2): 203-211.

Bennett, Lee Ann
1972 "Effect of White Contact on the Lower Skagit Indians." Washington Archaeological Society, Occasional Paper No. 3.

Bierwert, Crisca
1993 *New Voices in Native American Literary Criticism.* Smithsonian Institution Press, Washington D.C.

1999 *Brushed by Cedar, Living by the River: Coast Salish Figures of Power.* University of Arizona Press. Tucson, Arizona.

Borden, Charles
1950 "Notes on the Prehistory of the Southern Northwest Coast." *British Columbia Historical Quarterly* 14: 241-246. Victoria.

1951 "Facts and Problems of Northwest Coast Prehistory." *Anthropology in British Columbia* 2:35-37. British Columbia Provincial Museum, Victoria.

1975 "Origins and Development of Early Northwest Coast Culture to about 3000 B.C." *National Museum of Man Mercury Series, Archaeological Survey of Canada Paper* No. 45.

Boxberger, Daniel L.
1986 *Resource Allocation and Control on the Lummi Indian Reservation: A Century of Conflict and Change in the Salmon Fishery.* PhD Dissertation, University of British Columbia. Vancouver, British Columbia.

1996 *Ethnographic Overview and Assessment of North Cascades National Park Service Complex.* National Park Service, Cultural Resources. Seattle, Washington.

Boyd, Robert
1999 *Indians, Fire, and the Land in the Pacific Northwest.* OSU Press, Corvallis, Oregon.

Bryan, Alan L.
1955 *An Intensive Archaeological Reconnaissance in the Northern Puget Sound Region.* Unpublished M.A. Thesis in Anthropology, University of Washington, Seattle.

Bryan, Alan L. and Ralph Lurman
1953 Archaeological Site Inventory Record for 45IS54. Record on file at the Washington State Office of Archaeology and Historic Preservation, Olympia.

Burns, Robert
1985 *The Shape and Form of Puget Sound.* Puget Sound Books, University of Washington Press, Seattle.

Burtchard, Greg
1998 *Environment, Prehistory, and Archaeology of Mt. Rainier National Park, Washington.* Report prepared for National Park Service, Seattle, Washington. International Archaeology Research Institute, Honolulu, Hawaii.

Carlson, Roy
1990 "Cultural Antecedent." *Handbook of North American Indians Vol. 7: Northwest Coast.* Edited by Wayne Suttles, Smithsonian Institute, Washington, D.C.

1996 *Early Human Occupation in British Columbia.* UBC Press, Vancouver, British Columbia.

Clague, John J.
1980 *Late Quaternary Geology and Geochronology of British Columbia, Part I: Radiocarbon Dates,* Geological Survey of Canada.

Collins, June McCormick
1952 "A Mythological Attitude toward Animals among Salish-Speaking Indians." *Journal of American Folklore.* University of Illinois, Chicago, Illinois.

1974a "The Influence of White Contact on Class Distinctions and Political Authority Among the Indians of Northern Puget Sound" in *Coast Salish and Western Washington Indians, Volume II.* Garland Publishing, Inc., New York and London.

1974b "A Study of Religious Change among the Skagit Indians," Western Washington in *Coast Salish and Western Washington Indians Volume IV.* Garland Publishing, Inc., New York & London: 619-763.

1974c *Valley of the Spirits: The Upper Skagit Indians of Western Washington.* University of Washington Press. Seattle, Washington.

Dewhirst, John
1976 "Coast Salish Summer Festivals: Rituals for Upgrading Social Identity." *Anthropologica* 28: 231-275.

Downing, John
1983 T*he Coast of Puget Sound – Its Processes and Development.* Puget Sound Books, University of Washington Press, Seattle.

Dragovich J.D., D.K. Norman and G. Anderson
2000 Interpreted Geologic History of the Sedro-Wooley North and Lyman 7.5-minute Quadrangles, Western Skagit County, Washington. *Washington Division of Geology and Earth Resources, Open File Report 2000-1.*

Duncan, Mary Ann
1977 *A Report of Archaeological Investigation within Camano Island State Park.* Office of Public Archaeology, Reconnaissance Report No. 14, University of Washington.

Easterbrook, Donald J.
1963 "Late Pleistocene Glacial Events and Relative Sea Level Changes in the Northern Puget Lowland, Washington." *Geological Society of America Bulletin* 74: 1465-1484.

1968 "Pleistocene Stratigraphy of Island County." *Water Supply Bulletin* 25. Washington State Department of Water Resources.

Elmendorf, William W.

1971 "Coast Salish Status Ranking and Intergroup Ties." *Southwestern Journal of Anthropological Research* Vol. 27: 4.

1974 Structure of Twana Culture Coast Salish and Western Washington Indians IV, Garland Publishing, Inc., New York & London: 27-618.

1993 *Twana Narratives: Native Historical Accounts of a Coast Salish Culture*. University of Washington Press, Seattle, University of British Columbia Press, Vancouver.

Fladmark, Knut

1975 "Paleoecological Model for Northwest Coast Prehistory." National Museum of Man, *Mercury Series No 43*. Ottawa, Canada.

1982 "An Introduction to the Prehistory of British Columbia." *Canadian Journal of Archaeology* No. 6.

Franklin, Jerry F. and C. T. Dyrness

1988 *Natural Vegetation of Oregon and Washington*. OSU Press. Corvallis, Oregon.

Goudie, Andrew

1983 *Environmental Change* (Second Edition). Clarendon Press, Oxford.

Guilmet, George M., Robert T. Boyd, David L. Whited, and Nile Thompson

1991 "The Legacy of Introduced Disease: The Southern Coast Salish." *American Indian Culture and Research Journal* 15 (4): 1-32.

Gunther, Erna

1928 *A Further Analysis of the First Salmon Ceremony*. Ph.D thesis, University of Washington. University of Washington Press. Seattle, Washington.

1945 *Ethnobotany of Western Washington*. University of Washington Press. Seattle, Washington.

Haeberlin, Hermann and Erna Gunther

1930 *Indians of Puget Sound*. University of Washington Press. Seattle, Washington.

Hale, James

1991 "Cultural Resource Reconnaissance Report for East Baker Lake Hiking Trail Extension, CR05-91-20." Report on file at the Mt. Baker-Snoqualmie National Forest, Mt. Baker Ranger District, Sedro Woolley, Washington.

Harmon, Alexandra

1998 *Indians in the Making: Ethnic Relations and Indian Identities in the Puget Sound*. University of California, Berkley Press. California.

Harris, Cole

1994 "Voices of Disaster: Smallpox around the Strait of Georgia in 1782." *Ethnohistory* 41 (4): 591-626.

Hearne, Carol and Jan L. Hollenbeck
1996 Cultural Resource Reconnaissance Report. Mt. Baker-Snoqualmie National Forest CRR No. (FY) CR05-92-026.

Hebda R.J.
1995 British Columbia Vegetation and Climate History with Focus on 6 KA BP. *Geographie Physique et Quaternaire* 49:55-79, Canada.

Hebda R.J. and R.W. Mathewes
1985 Holocene History of Cedar and Native Indian Cultures of the North American Pacific Coast. *Science* 225:711-713.

Hilbert, Vi
1985 *Haboo.* Lushootseed Press, Federal Way, Washington.

Hilbert, Vi and J. Miller
2001 *Puget Sound Geography Original Manuscript from T.T. Waterman.* Lushootseed Press, Federal Way, Washington.

Howay, F.W.
1918 "The Dog's Hair Blankets of the Coast Salish." *Pacific Northwest Quarterly* 9 (2): 83-92.

Huesser, Calviu J.
1983 "Vegetational History of the Northwestern U.S. including Alaska." In *Late Quaternary Environments of the United States. Vol.1: The Late Pleistocene,* edited by H. E. Wright Jr.: 239-258. University of Minnesota Press. Minneapolis.

Hutchings R.M.
2004 *Mid-Holocene River Development and South-Central Pacific Northwest Coast Prehistory: Geoarchaeology of the Ferndale Site (45WH34), Nooksack River, Washington.* Unpublished MA thesis, Western Washington University, Department of Anthropology, Bellingham, WA.

Hutchings R.M. and S.K. Campbell
2005 The Importance of Deltaic Wetland Resources: A Perspective from the Nooksack River Delta, Washington State. *Journal of Wetland Archaeology* 5. Oxbow Books, U.K.

Island County Historical Society
1993 *Sails, Steamships, and Sea Captains.* Island County Historical Society. Coupeville, Washington.

Jeffcott, Percival Robert
1949 *Nooksack Tales and Trails.* Sincyrly Ours Publishing, Bellingham, Washington.

Jenkins, Will D.
1984 *The Last Frontier in the North Cascades: Tales of the Wild Upper Skagit.* Skagit County Historical Society, La Conner, Washington.

Jermann, Jerry V.
1977 "Penn Cove Marina Facilities Preliminary Archaeological Assessment." Unpublished report on file with the Washington State OAHP, Olympia, Washington.

Jordan, Ray
1974 *Yarns of the Skagit Country.* The Printers, Everett, Washington.

Jorgensen, Joseph G.
1969 "Salish Language and Culture, a Statistical Analysis of Internal Relationships, History and Evolution." *Language Science Monographs No. 3.* Bloomington.

Kew, John E. Michael
1972 *Coast Salish Ceremonial Life: Status and Identity in a Modern Village.* Ph.D thesis, University of Washington. University of Washington Press. Seattle, Washington.

Kew, John E. Michael (edited by Wayne Suttles)
1990 "Central and Southern Coast Salish Ceremonies Since 1900." *Handbook of North American Indians, Vol. 7, Northwest Coast*: 476-480. Smithsonian Institution, Washington, D.C.

Klungland M.W. and M Mcarthur
1989 *Soil Survey of Skagit County Area, Washington.* United States Department of Agriculture, Soil Conservation Service.

Kozloff, Eugene N.
1973 *Seashore Life of Puget Sound, the Strait of Georgia, and the San Juan Archipelago.* University of Washington Press, Seattle.

Lane, Robert and Barbara Lane
1977 "Indians and Indian Fisheries of the Skagit River System." *Skagit Salmon Studies*, St. Johns.

Majors, Harry M.
1984 "First Crossing of the Pickett Range." *Northwest Discovery* 5 (22): 88-168.

Mansfield, Emily
1993 "Balance and Harmony: Peacemaking in Coast Salish Tribes of the Pacific Northwest." *Meditation Quarterly* 10 (4): 339-353.

Mattson, John L.
1971 *A Contribution to Skagit Prehistory.* M.A. Thesis, Washington State University. Pullman, Washington.

1985 *Puget Sound Prehistory: Postglacial Adaptation in the Puget Sound Basin with Archaeological Implications for a Solution to the "Cascade Problem".* Unpublished Ph.D. dissertation, University of North Carolina at Chapel Hill, Chapel Hill.

Meany, Edmond S.
1957 *Vancouver's Discovery of Puget Sound.* Binfords & Mort Publishers, Portland.

Meeker, Ezra
1905 *Pioneer Reminiscences of Puget Sound.* Lowman & Hanford Stationary & Print Co., Seattle, Washington.

Miller, Bruce G.
1993 "The Press, the Boldt Decision, and Indian-White Relations." *American Indian Culture ad Research Journal* 17 (2): 75-97.

1995 "Folk Law and Contemporary Coast Salish Tribal Code." *American Indian Culture and Research Journal* 19 (3): 141-164.

1997 "The "Really Real" Border and the Divided Salish Community." *BC Studies* No. 112.

1998 *The Great Race of 1941: A Coast Salish Public Relations Coup.* Online University of Washington Special Collections.

2001 *The Problem of Justice: Tradition and Law in the Coast Salish World.* University of Nebraska Press, Lincoln, Nebraska.

Miller, Bruce G. and Daniel L Boxberger
1994 "Creating Chiefdoms: The Puget Sound Case." *Ethnohistory* 41: 2.

Miller, Jay
1988 "Shamanic Odyssey: The Lushootseed Salish Journey to the Land of the Dead." *Anthropology Papers No. 32*, Ballena Press.

Mitchell, Donald H.
1971 "Archaeology of the Gulf of Georgia Area, a Natural Region and its Culture Types." *Syesis* 4: 1-228. The British Columbia Provincial Museum.

Mooney, Kathleen A.
1976 "Urban and Reserve Coast Salish Employment: A Test of Two Approaches to the Indian's Niche." *Southwestern Journal of Anthropological Research* 32 (4): 390-410.

Neil, Dorothy
1989 *By Canoe and Sailing Ship They Came.* Spindrift Publishing. Oak Harbor, Washington.

Ness, A. and C. Richins
1958 Island County, Washington. *Soil Survey Series 1949*, No. 6 Soil Conservation Service, USDA.

Onat, Astrida R. Blukis
1980 "Skwikwikwab: A Methodological Study of a Prehistoric Puget Sound Site" (PhD Thesis). Washington State University, Department of Anthropology, Pullman, Washington.

1987 Identification of Prehistoric Archaeological Resources in the Northern Puget Sound Study Unit. Resource Protection Planning Process, Draft report prepared for the Office of Archaeology and Historic Preservation, Olympia, Washington.

Pielou, E.C.
1991 *After the Ice Age.* University of Chicago Press. Chicago, Illinois.

Pojar, Jim and Andy MacKinnon
1994 *Plants of the Pacific Northwest Coast.* B.C. Forest Service, Lone Pine Publishing. Vancouver, British Columbia.

Prater, B.
1991 *Soil Survey of Skagit County Area, Washington*. USDA Soil Conservation Service.

Roberts, Natalie
1975 *A History of the Swinomish Indian Tribal Community*. Ph.D thesis, University of Washington, University of Washington Press. Seattle, Washington.

Robinson, Joan M.
1980 Preliminary Archaeological Reconnaissance of SR 20 from Libbey Road to Penn Cove Road. Unpublished letter report to the Washington State Department of Transportation.

1981 Final Report of Excavations at Penn Cove SR 20: Libbey Road to Penn Cove Road. Unpublished report on file at the Washington State Office of Archaeology and Historic Preservation, Olympia, Washington.

1999 Cultural Resource Monitoring of the Washington State Department of Transportation's SR20: Zylstra Road Coring Project, Island County, Washington. Report prepared for the Office of Archaeology and Historic Preservation, Olympia.

Ruby, Robert H. and John A. Brown
1986 *A Guide to the Indian Tribes of the Pacific Northwest.* University of Oklahoma Press. Norman, Oklahoma.

Sampson, Chief Martin J.
1972 *Indians of Skagit County.* Skagit County Historical Society. La Conner, Washington.

Schuyler, S. Scott
2003 Personal communication with Kelly R. Bush, Equinox Research and Consulting International, Inc.

Smith, Harlan I.
1900 "Archaeological Investigations on the North Pacific Coast in 1899." *American Anthropologist* 3: 563-567.

1907 "Archaeology of the Gulf of Georgia and Puget Sound." *American Museum of Natural History Memoir* 4, part 6. New York.

Smith, Harlan I. and Gerald Fowkes
1901 *Cairns of B.C. and Washington.* American Museum of Natural History Memoir 4, part 2. New York.

Smith, Marian
1941 The Coast Salish of Puget Sound. *American Anthropologist* 43 (2): 197-211.

1950 "The Nooksack, the Chilliwack, and the Middle Fraser." *Pacific Northwest Quarterly* 41: 330-341

1956 "The Cultural Development of the Northwest Coast." *Southwestern Journal of Anthropological Research* 12: 272-294.

Snyder, Sally

1954 *Aboriginal Saltwater Fisheries: Swinomish, Lower Skagit, Kikialus, and Samish Tribes of Indians*. Department of Sociology and Anthropology, University of Windsor, Ontario.

1964 *Skagit Society and its Existential Basis: An Ethnofolkloric Reconstruction*. Ph.D thesis, University of Washington. University of Washington Press. Seattle, Washington.

1981 "Swinomish, Upper Skagit and Sauk-Suiattle: Study Area on the Mt. Baker-Snoqualmie National Forest, Washington State" in Astrida Onat and Jan L. Hollenbeck (editors) *Inventory of Native American Religious Use, Practices, Localities and Resources*. On file, Mt. Baker-Snoqualmie National Forest. Mountlake Terrace, WA.

Spier, Leslie

1935 *The Prophet Dance of the Northwest and its Derivatives: The Source of the Ghost Dance*. George Banta Publishing. Menasha, Wisconsin.

1936 *Tribal Distribution in Washington*. General Series in Anthropology 3 George Banta Publishing. Menasha, Wisconsin.

Stein, Julie K.

1984 "Interpreting the Stratigraphy of Northwest Coast Shell Middens." *Tebiwa* 2: 26-34.

2000 *Exploring Coast Salish Prehistory: The Archaeology of San Juan Island*. Burke Museum of Natural History and Culture, University of Washington Press. Seattle, Washington.

Stewart, Hilary

1977 *Indian Fishing: Early Methods on the Northwest Coast*. Douglas & McIntyre, Vancouver, Toronto.

1984 *Cedar: Tree of Life to the Northwest Coast Indians*. University of Washington Press, Seattle.

Stilson M. Leyland

1972 *Fluctuations in Aboriginal Environmental Utilization in Response to Delta Progration: Three Sites from Skagit County*. Unpublished BA honors thesis. Department of Anthropology, University of Washington. 123 pgs.

Strickland, R.

1984 *River Pigs and Cayuses: Oral Histories from the Pacific Northwest*. Lexikos, San Francisco, California.

1990 *Whistlepunks and Geoducks: Oral Histories from the Pacific Northwest*. Paragon House, New York.

Suttles, Wayne

1958 "Private Knowledge, Morality, and Social Classes among the Coast Salish." *American Anthropologist*, Vol. 60: 3.

1960 "Affinal Ties, Subsistence, and Prestige among the Coast Salish." *American Anthropologist*, Vol. 62:2.

1987 *Coast Salish Essays*. University of Washington Press, Seattle.

1990 *Handbook of North American Indians*. No.7. Edited by Wayne Suttles, Smithsonian Institute, Washington D.C.

Taylor, Herbert Jr.
n.d. *Mollusks, Western Washington Indians and the Steven's Treaties of 1854-1856*. George Banta Publishing Co., Menasha, Wisconsin.

Thompson, Gail
1978 *Prehistoric Settlement Changes in the Southern Northwest Coast: A Functional Approach*. University of Washington, Department of Anthropology, Report in Archaeology, No. 5. Seattle, Washington.

Thorson, Robert M.
1980 "Ice-sheet Glaciation of the Puget Lowland, Washington, During the Vashon Stade (late Pleistocene)." *Quaternary Research* 13: 303-312.

1989 "Glacio-isostatic Response of the Puget Sound Area, Washington." *Geological Society of America Bulletin* 101: 1163-1174.

Turner, Nancy J.
1995 *Food Plants of Coastal First Peoples*. Royal B.C. Museum Handbook. Victoria, British Columbia.

United States Surveyor General
1872 General Land Office Notes, Township 32 North, Range 1 East, Willamette Meridian. Washington State Department of Natural Resources, Olympia.

Wessen, Gary C.
1988 Prehistoric Cultural Resources of Island Country, Washington. Report on file with the Washington State Office for Archaeology and Historic Preservation, Olympia.

White, Richard
1980 *Land Use, Environment and Social Change – The Shaping of Island County, Washington*. University of Washington Press. Seattle, Washington.

Whitlam, Robert
1980 *Models of Coastal Adaptation: The Northwest Coast and Maritimes*. Department of Archaeology, Simon Fraser University, No. 11.

Whitlock, Cathy
1992 "Vegetational and Climatic History of the Pacific Northwest During the Last 20,000 Years: Implication for Understanding Present-Day Biodiversity". *Northwest Environmental Journal* 8: 5-28.

Willis, Margaret
1973 *Chechacos All – The Pioneering of the Skagit*. Skagit County Historical Society, Mount Vernon, Washington.

Wright, H. E. Jr.
1983 *Late-Quaternary Environments, Vol. 1, The Late Pleistocene.* The University of Minnesota Press, Minneapolis.

7.0 APPENDICES

Appendix 1: Subsurface Testing and Matrix Descriptions

Test #	Depth (dbs)	Diameter	Location	Matrix Description	Comments
1	25 cm	38 cm	Parcel# 38537	**Level 1**: 0-25 cm: 7.5 YR 2.5/1 silty clay soil, water table at 15 cm.	No protected cultural materials.
2	20 cm	42 cm	Parcel# 38537	**Level 1**: 0-20 cm: 7.5 YR 2.5/1 silty clay soil, water table at 10 m.	No protected cultural materials.
3	53 cm	43 cm	Parcel# 38537	**Level 1**: 0-30: 7.5 YR 2.5/1 silty clay. **Level 2**: 30-53 cm: 7.5 YR 7/1 mottled silty clay with pockets of fine sand.	No protected cultural materials.
4	40 cm	44 cm	Parcel# 38537	**Level 1**: 0-40 cm: 7.5 YR 2.5/1 silty clay soil, water table at 40 cm.	No protected cultural materials.
5	42 cm	38 cm	Parcel# 38537	**Level 1**: 0-42 cm: 7.5 YR 2.5/1 silty clay soil, water table at 17 cm.	No protected cultural materials.
6	48 cm	40 cm	Parcel# 38537	**Level 1**: 0-48 cm: 7.5 YR 2.5/1 silty clay soil, water table at 38 cm.	No protected cultural materials.
7	60 cm	36 cm	Parcel# 38537	**Level 1**: 0-60 cm: 7.5YR 2.5/1 silty clay with 2 subangular cobbles, no strata, no water table.	No protected cultural materials.
8	42 cm	52 cm	Parcel# 38537	**Level 1**: 0-42 cm: 7.5 YR 2.5/1 silty clay, few subrounded gravels, 2 angular cobbles, water table at 42 cm.	No protected cultural materials.
9	60 cm	50 cm	Parcel# 38537	**Level 1**: 0-35 cm: 7.5 YR 2.5/1 silty clay. **Level 2**: 35-60 cm: 7.5 YR 7/1 mottled silt with very few angular pebbles.	No protected cultural materials.
10	54 cm	44 cm	Parcel# 38537	**Level 1**: 0-45 cm: 7.5 YR 2.5/1 silty clay. **Level 2**: 45-54 cm: gray, few rounded to subrounded gravels, water table at 54 cm.	No protected cultural materials.
11	65 cm	50 cm	Parcel# 38537	**Level 1**: 0-14 cm: 7.5 YR 2.5/1 silty sand, many roots. **Level 2**: 14-18 cm: 7.5 YR 4/4 silty sand, many roots. **Level 3**: 18-65 cm: 7.5 YR 7/1 mottle fine sandy silt, many small-subrounded cobbles.	No protected cultural materials.
12	60 cm	52 cm	Parcel# 38537	**Level 1**: 0-14 cm: 7.5YR 2.5/1 sandy silt. **Level 2**: 14-60 cm: gray sandy silt.	No protected cultural materials.

13	64 cm	46 cm	Parcel# 38537	**Level 1**: 0-64 cm: no strata, many cedar roots.	No protected cultural materials.
14	66 cm	50 cm	Parcel# 38537	**Level 1**: 0-47 cm: 7.5 YR 2.5/1. **Level 2**: 47-66 cm: gray, no roots, water table at 66 cm.	No protected cultural materials.
15	58 cm	50 cm	Parcel# 38537	**Level 1**: 0-14 cm: 7.5 YR 2.5/1, many roots, no rocks. **Level 2**: 14-58 cm: gray mottled sand, no rocks.	No protected cultural materials.
16	69 cm	50 cm	Parcel# 38537	**Level 1**: 0-24 cm: 7.5 YR2.5/1 silty sand, many medium roots, many discord to subrounded cobbles. **Level 2**: 24-69 cm: 7.5 YR 4/4 sand, many discord to subrounded cobbles.	No protected cultural materials.
17	54 cm	50 cm	Parcel# 38539	**Level 1**: 0-54 cm: gray silty clay with some sand profiles, water table at 38 cm.	No protected cultural materials.
18	64 cm	46 cm	Parcel# 38539	**Level 1**: 0-8 cm: organic mat. **Level 2**: 8-64 cm: 7.5 YR 3/3 silty clay, no rocks, many roots, thin charcoal stained horizon stained to 10 cm.	No protected cultural materials.
19	50 cm	40 cm	Parcel# 38539	**Level 1**: 0-34 cm: 7.5 YR 3/3 silty clay. **Level 2**: 34-50 cm: 2.5 YR 5/4 mottled silt clay, water table at 49 cm, no rocks.	No protected cultural materials.
20	30 cm	43 cm	Parcel# 38539	**Level 1**: 0-30 cm: 7.5 YR 3/3 silty clay.	No protected cultural materials.
21	20 cm	90 cm (square)	Parcel# 38539	**Level 1**: 0-20 cm: 7.5 YR 3/3 silty clay.	Vegetation scrape carried out to look for additional faunal material that was identified near the surface in that location.
22	45 cm	45 cm	Parcel# 50414	**Level 1**: 0-10 cm: medium brown silty sand. **Level 2**: 10-22 cm: medium gray orange silt with clay. **Level 3**: 22-25 cm: brown buried rotten wood or root. **Level 4**: 25-45 cm: gray silt clay, moist, parent material, with subangular pebbles and cobbles.	No protected cultural materials.
23	40 cm	45 cm	Parcel# 50414	**Level 1**: medium brown silt with sand, water table at 40 cm.	No protected cultural materials.
24	40 cm	45 cm	Parcel# 50414	**Level 1**: 0-40 cm: gray parent material.	No protected cultural materials.

25	45 cm	40 cm	Parcel# 50414	**Level 1**: 0-30 cm: medium brown silt with few coarse sand particles. **Level 2**: 30-40 cm: gray silty clay, moist, few subangular pebbles and cobbles.	No protected cultural materials.

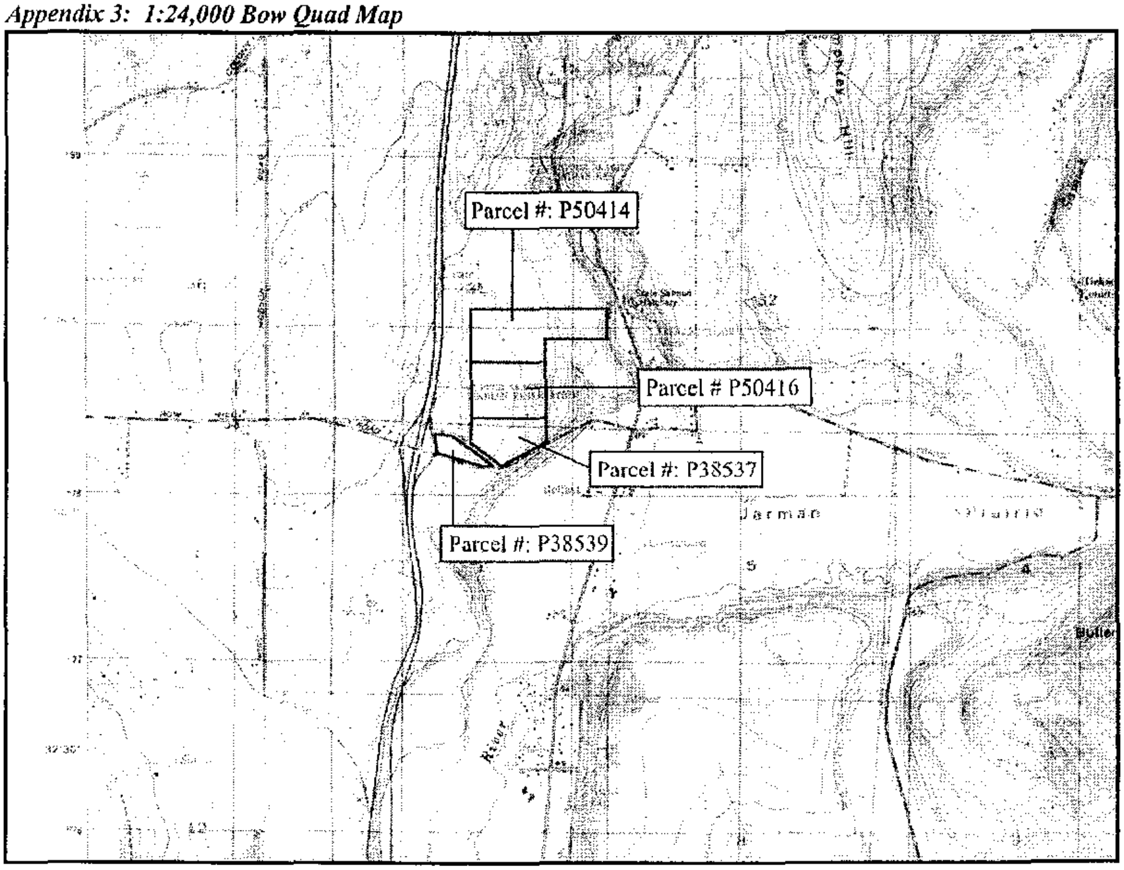
Appendix 2: Photograph Log

Photo #	Comments
1	Shovel test 1.
2	Shovel test 2.
3	View north into alder grove from Darrk Lane.
4	Shovel test 3.
5	Shovel test 4.
6	Shovel test 5.
7	View west at shovel test 6 in alder grove.
8	View northwest at southwest corner of Parcel #38537 from corner of Bow Hill Road and Darrk Lane.
9	Shovel test 6.
10	Shovel test 7.
11	Shovel test 8.
12	Shovel test 9.
13	Shovel test 10.
14	View east from shovel test 10 down at Jarman Prairie.
15	Shovel test 11.
16	View northeast up Friday Creek floodplain from shovel test 11.
17	Shovel test 12.
18	Shovel test 13.
19	Shovel test 14.
20	View north from shovel test 14 from cedar grove on ridge above Bow Hill Road down slope to alder grove, landform sloping to the west.
21	View southeast from shovel test 15 down to Jarman Prairie, mine is visible across valley.
22	Shovel test 15.
23	Blade implement, 15 meters northeast of shovel test 16.
24	Shovel test 16.
25	Cobble pile from shovel test 16.

26	Creek bottom adjacent to Darrk Lane.
27	Springboard notch in cedar sump.
28	Metal bucket and other metal objects.
29	Shovel test 17.
30	Shovel test 18.
31	Shovel test 19.
32	Shovel test 20.
33	View southwest at dump feature.
34	View northwest close-up of dump feature.
35	Drums and galvanized washtub.
36	Syrup can.
37	Clorox bottle and other bottle with hard plastic.
38	View northeast of dump area.
39	Deer rack.
40	Royal Triton Motor Oil can.
41	View northeast of utility sink.
42	View east of hand dug drainage.
43	Shovel test 21.
44	View of long bone from shovel test 21.
45	View of long bone from shovel test 21.
46	Metal buckets on trees.
47	Close-up of bucket and machined steel wheel.
48	View south of creek and buckets.
49	View northwest over 50416.
50	View north from beginning of survey area on 50416.
51	View south over recent logging disturbance in 50416.
52	Close-up of tree throw of 50416.
53	View south across 50414.
54	View south from north end of bock 50414.
55	View southeast of barn and mobile ticket booths on skids.

56	Shovel test 22.
57	Shovel test 23.
58	Shovel test 24.
59	Shovel test 25.
60	Profile east of shovel test 25.
61	View south across 50416 from east boundary of Kim Place.
62	View southwest from Kim Place.
63	View west from Kim Place.
64	View north up Kim Place.
65	View south across 50416 from access road.
66	View east from casino parking lot across 50416.
67	View northeast from casino parking lot across 50416.
68	View southeast from casino parking lot across 50416.

Appendix 3: 1:24,000 Bow Quad Map



Appendix 4: Unanticipated Discoveries Protocol

Upper Skagit Indian Tribe Land Exchange Project

Federal laws that affect the management of cultural resources include: National Environmental Policy Act (NEPA) of 1966; Archaeological Resources Protection Act (ARPA) of 1979; American Indian Religious Freedom Act (AIRFA) of 1978; Native American Graves Protection and Repatriation Act (NAGPRA) of 1990; Executive Order 11593, Protection and Enhancement of the Cultural Environment (1971); Executive Order 13007, Indian Sacred Sites (1996); and Executive Order 13287, Preserve America (2003).

As some potential for uncovering disturbed artifacts or other cultural material exists in this location. The following is the protocol for unanticipated discoveries of cultural material:

1. When an unanticipated discovery of protected cultural material (see definitions below) occurs, the developer or contractor will completely secure the location and move land-altering activity to another location in the project area. The Office of Archaeology and Historic Preservation, The Upper Skagit Indian Tribe, and a professional archaeologist will be contacted immediately to evaluated the cultural material and determine a management plan for the uncovered material.

2. If the discovery is human remains, the developer or contractor will stop work in and adjacent to the discovery, completely secure the work area moving the land-altering equipment to a reasonable distance to continue working and will immediately contact:
    a. The Skagit County Coroner Bruce Bacon (360-336-9431) and The Office of Archaeology and Historic Preservation (OAHP): Ms. Stephenie Kramer (360-856-3083) or Dr. Robert Whitlam, State Archaeologist (360-856-3080) to determine if this is a crime scene.

    b. If the human remains are determined to be remains of antiquity and are not associated with a crime scene, the Upper Skagit Indian Tribe will be contacted and treatment of the remains will follow the Upper Skagit Indian Tribe protocol.

Cultural material that may be protected by law could include but not be limited to:

- Logging, mining, or agriculture equipment or features such as building foundations older than 50 years
- Historic bottles and soldered dot cans
- Massive culture rich shellfish remains which includes the dark shell midden with fish and mammal bones, stone or bone artifacts and other cultural indicators.
- Stone tools, weapon or stone flakes removed to make these implements.
- Stone, bone, shell, horn, or antler tools that may include projectile points (arrowheads), scrapers, cutting tools, wood working wedges or axes, and grinding stones.
- Petroglyphs or pecked stone either in small stones or large boulders.
- Perennially damp areas may have preservation conditions that allow for remnants of wood and other plant fibers; in these locations there may be remains including fragments of basketry, weaving, wood tools, or carved wood pieces
- Pre-contact features such as hearths or remnants of resource processing areas such as plant, fish or meat drying racks, shellfish processing, butchering or stone reduction.
- Human remains

Appendix 5: Contact List

Name	**Affiliation**	**Telephone**	**Email**
Kelly Bush	ERCI	360-826-4930	kelrbush@earthlink.net
Doreen Maloney	**USIT**	360-856-5501	
Scott Schuyler	**USIT**	360-856-7004	
Stephenie Kramer	OAHP	360-586-3083	StephenieK@cted.wa.gov
Rob Whitlam	OAHP	360-586-3080	RobW@cted.wa.gov
Bruce Bacon	Skagit County Coroner	360-336-9431	

REPORT
GEOTECHNICAL ENGINEERING SERVICES
PROPOSED SKAGIT RESORT WATER PARK
BOW, WASHINGTON

FEBRUARY 26, 2007

FOR
UPPER SKAGIT INDIAN TRIBE

GEOENGINEERS

File No. 0829-020-00

GEOENGINEERS

February 26, 2007

Upper Skagit Indian Tribe
5984 North Darrk Lane
Bow, Washington 98232

Attention: Bob Hayden

Subject: Geotechnical Engineering Services Report
Proposed Skagit Resort Water Park
Bow, Washington
File No. 0829-020-00

We are pleased to submit three copies of our "Geotechnical Engineering Services Report, Proposed Skagit Resort Water Park, Bow, Washington." Our geotechnical services were completed in general accordance with our proposal dated December 12, 2006. Our services were authorized by Doreen Maloney of the Upper Skagit Indian Tribe on December 18, 2006. Preliminary results of our study were discussed with you and the design team as information became available.

We appreciate the opportunity to work you on this project. Please call if you have any questions regarding this report.

Sincerely yours,

GeoEngineers, Inc.

J. Robert Gordon, PE
Principal

SCW.JRG:ims
BELL:P:\0\0829020\00\F\0829020000R.doc

cc: Planning Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
Attn: Robert Feller, AIA

Pacific Surveying & Engineering
1812 Cornwall Ave
Bellingham, WA 98225
Attn: Brian Walker

Geotechnical Engineering Services Report
Proposed Skagit Resort Water Park
Bow, Washington
File No. 0829-020-00

February 26, 2007

Prepared for:

Upper Skagit Indian Tribe
5984 North Darrk Lane
Bow, Washington 98232

Attention: Bob Hayden

Prepared by:

GeoEngineers, Inc.
600 Dupont Street
Bellingham, Washington 98225
(360) 647-1510

GeoEngineers, Inc.

Sean W. Cool, PE
Geotechnical Engineer

J. Robert Gordon, PE
Principal

J. ROBERT GORDON
STATE OF WASHINGTON
22151
REGISTERED
PROFESSIONAL ENGINEER
Expires: 12 / 08 / 08

Table of Contents

Page No.

List of Figures

TABLE OF CONTENTS (CONT.)

APPENDICES

GEOTECHNICAL ENGINEERING SERVICES REPORT
PROPOSED SKAGIT RESORT WATER PARK
BOW, WASHINGTON
FOR
UPPER SKAGIT INDIAN TRIBE

INTRODUCTION AND SCOPE

This report presents the results of our geotechnical services for the proposed Skagit Resort Water Park to be constructed across Darrk Lane from The Skagit Casino in Bow, Washington. The location of the site is shown in the Vicinity Map, Figure 1.

Our understanding of the project is based on the request for proposal (RFP), site plans provided and numerous communications with the project designer, PLANNING/Design Build, Inc. The proposed development will occur at the approximately 25-acre site area located southeast of the existing Skagit Casino. The proposed project will include a new hotel, conference center, water park and parking structure.

The purpose of our geotechnical engineering services was to explore subsurface soil and groundwater conditions at the site as a basis for providing geotechnical engineering recommendations and design criteria for the proposed development. Our scope of services included excavating 17 test pits and drilling 8 borings at the site, completing laboratory testing on the samples obtained from the explorations, analyses and report preparation. This report includes geotechnical conclusions and recommendations for design and construction of the proposed resort. Our specific scope of services is described in our proposal for the project dated December 12, 2006.

PROJECT DESCRIPTION

The proposed site development includes construction of a new resort that includes a lobby, hotel, conference center, water park and dry play area, parking garage, and at-grade parking area. Key aspects of the project are described below. The various project elements are shown in the Site Plan, Figure 2.

The proposed hotel will be a five-story steel-framed structure with a footprint of approximately 40,000 square feet divided between two wings. Total column loads on the order of 430 kips (280 kips dead load plus 150 kips live load) are anticipated for the hotel structure. The finished floor of the hotel wings is planned at Elevation 286 feet. The north end of the hotel wings will be near existing site grades and cuts on the order of 15 feet will be required to reach finished floor elevation at the south end of the hotel wings.

The proposed conference center will be a single-story steel-framed structure with high ceilings and have a footprint of approximately 21,000 square feet. Total column loads on the order of 60 kips (30 kips dead load plus 30 kips live load) are anticipated for the conference center structure. The finished floor of the conference center is planned at Elevation 286 feet requiring fill up to about 13 feet above existing site grades.

The proposed lobby area will be a three-story steel-framed structure with a first floor, entertainment level, and partial basement with an approximate footprint of 41,000 square feet. Total column loads on the order of 400 kips (230 kips dead load plus 170 kips live load) are anticipated for the basement portion of the lobby and 220 kips (130 kips dead load plus 90 kips live load) are anticipated for the portion of the lobby without a basement. The finished floor in the basement area of the conference center is planned at Elevation 258.7 feet, with an entertainment level at Elevation 270 and the main floor at Elevation 286 feet. The basement will require cuts ranging from 20 to 30 feet below existing site grades.

The proposed indoor water park will be a single-story steel-framed structure with high ceilings and a mezzanine along the north wall of the structure. Total column loads on the order of 320 kips (170 kips dead load plus 150 kips live load) are anticipated for the mezzanine portion of the structure and 160 kips (90 kips dead load plus 70 kips live load) are anticipated for the portion of the water park without a mezzanine. The water park will encompass a footprint of approximately 12,500 square feet. The finished floor of the water park is planned at Elevation 270 feet requiring cuts ranging from 10 to 20 feet below existing site grades to reach the finished floor elevation.

The proposed dry play area will be a single-story steel-framed structure with high ceilings and have a footprint of approximately 26,000 square feet. The finished floor of the dry play area is planned at Elevation 270 feet. Total column loads on the order of 70 kips (35 kips dead load plus 35 kips live load) are anticipated for the dry play area requiring cuts up to about 5 feet below existing site grades to reach the finished floor elevation.

The proposed parking garage will be a four-story cast-in-place concrete structure possibly with post-tensioned decks. The parking garage will have a footprint of approximately 170,000 square feet. Total column loads on the order of 400 kips (350 kips dead load plus 50 kips live load) are anticipated for the parking garage. The finished floor of the parking garage was unknown at the time of this report; however a finished floor approximately ½-story below existing site grades is planned, resulting in a finished floor elevation of about 262 feet and requiring cuts of approximately 5 to 10 feet.

Other site improvements include at-grade paved parking lots and driveway areas, stormwater detention facilities, and miscellaneous appurtenant structures. Fill up to about 12 feet thick is anticipated in some of the parking areas.

SITE CONDITIONS

GEOLOGY

We reviewed a published geologic map prepared by the Washington State Department of Natural Resources (DNR), titled, Geologic Map of Bellingham 1:100,000 Quadrangle, Washington, 2000. The map indicates that the soil conditions at the site consist of glaciomarine drift and glacial till.

Glaciomarine drift (GMD) generally consists of brown to gray, unsorted, unstratified silt and clay with varying amounts of sand and gravel, cobbles and boulders. This material was carried by glaciers, melted out of floating ice, and deposited on the sea floor during the Everson Interstade of the Frasier Glaciation. The GMD is widespread throughout the Whatcom County and northern Skagit County area and typically mantles upland areas below Elevation 600 feet. This material was deposited over a broad area with gentle topography beneath the floating glacial ice and was modified by currents, wave and tidal action. The presence of shells at some locations indicates a marine environment. Glaciomarine drift can have a relatively high compressibility because of its mode of deposition. Oftentimes the upper 5 to 15 feet of GMD on upland sites has been consolidated through desiccation or partial ice contact. The consolidation can provide a higher shear strength and lower compressibility within the affected zone.

Glacial till generally consists of an unsorted, non-stratified mixture of clay, silt, sand, gravel, cobbles and boulders. This material was deposited beneath a large glacier during the Vashon Stade. This material at this site has been compacted by the weight of a several thousand feet of glacial ice and has high shear strength and low compressibility.

SURFACE CONDITIONS

The site area is located on an undeveloped 25-acre site. The site is bounded to the north by undeveloped property. Several single-family residences on large lots are located to the east. Bow Hill Road is located to the south, and Darrk Lane is located to the southwest and west of the property. The existing Skagit Casino and parking areas are located on the other side of Darrk Lane.

The site has a gentle slope down from southwest to northeast, ranging in elevation from about 305 feet at the southwest corner to about 260 feet at the northeast corner. Near the property boundary to the southeast the site slopes steeply down to Bow Hill Road. A gravel access road runs through the middle of the site with a pole building located at the end of the access road near the middle of the site. The vegetation at the site area consists mainly of field grasses, blackberry brambles, evergreen and deciduous trees, and shrubs. Several debris piles are located in the northwestern section of the site.

SUBSURFACE EXPLORATIONS

Subsurface soil and groundwater conditions were evaluated by completing 17 test pits using an operator and equipment provided by the owner, and by drilling eight borings using a drilling contractor subcontracted to GeoEngineers. The test pits were completed to depths of 6 to 17½ feet below the existing ground surface (bgs) on December 14 and 15, 2006. The borings were completed to depths of 22 to 50 feet bgs on January 9 and 24, 2007. The locations of the test pits and borings completed for this report are shown in the Site and Exploration Plan, Figure 2. Details of the field exploration program and the test pit and boring logs are presented in Appendix A. The results of laboratory testing program are presented in Appendix B.

SUBSURFACE CONDITIONS

Soil Conditions

The soil conditions encountered at the site were consistent with the mapped geology. The general subsurface soil profile consisted of topsoil overlying very stiff glaciomarine drift over medium stiff glaciomarine drift over very dense glacial till. Some possible glacial outwash was encountered overlying the glaciomarine drift. Not all soil units were encountered at all locations. The following sections describe the characteristics of each soil unit. More detailed descriptions the conditions encountered at each exploration location can be found on the exploration logs in Appendix A. Representative subsurface cross sections are presented in Figure 3a and 3b.

Topsoil. The site has a well developed topsoil horizon consisting of loose, dark brown, organic, silty sand. The topsoil is typically between 1 and 1½ feet thick as logged in the test pits. Slightly greater thicknesses of topsoil were noted in the boring logs, from about 1½ to 3 feet thick. The topsoil thickness in the boring logs may be slightly overstated because of the sample interval at shallow depths.

Fill. Possible fill was encountered at TP-1 extending to a depth of about 3½ feet bgs. The fill was interpreted to be disturbed soil associated with a past site utility. No other significant thicknesses of fill were encountered during our subsurface explorations.

Glacial Outwash. Explorations TP-3, TP-5, TP-15, B-1, B-2, and B-8 encountered a thin near-surface layer of silty fine sand. The deposit was less than 4 feet thick at all locations. The silty fine sand was interpreted to be an isolated glacial outwash or reworked glaciomarine drift.

Very Stiff Glaciomarine Drift. Very stiff glaciomarine drift was encountered at all test pit and boring explorations underlying the topsoil, fill and/or possible glacial outwash units. This soil unit consisted of brown-gray, moist, sandy clay with occasional gravel and ranged from stiff to hard. The very stiff glaciomarine drift unit typically extended to depths between 12 and 18 feet bgs. The very stiff glaciomarine drift is interpreted to be overconsolidated through the effects of desiccation or partial ice grounding. At about one-half of the exploration locations, the upper several feet of the unit was somewhat weathered with noticeable iron staining, and was typically medium stiff. The very stiff glaciomarine drift was encountered to the depths explored in TP-7, TP-8, TP-10, and TP-11. Although no boulders were encountered during our drilling program, they have been encountered randomly within the GMD.

Medium Stiff Glaciomarine Drift. Typically beginning between about 12 and 17 feet bgs, the glaciomarine drift transitions to medium stiff, gray clay. Although the same geologic unit, the lower portion of the glaciomarine drift has less sand and gravel than the upper portion of the unit and has not been overconsolidated from desiccation or ice grounding. This lower portion of the geologic unit has lower shear strength and increased compressibility characteristics. The medium stiff portion of the glaciomarine drift was encountered to the depths explored in test pits TP-4 through TP-6, TP-9, and TP-12 through TP-15. The unit was encountered as an intermediate layer extending to 19 to 36 feet below ground surface in boring B-5 through B-8. The medium stiff portion of the glaciomarine drift exists as a thickening wedge underlying the stiffer glaciomarine drift starting at about the middle of the Lobby building and extending northwesterly. We have provided an estimate of the origination of this unit in Figure 2, and a profile of this unit in the subsurface cross section, Figure 3a.

Glacial Till. Glacial till was encountered underlying the very stiff or medium stiff glaciomarine drift. The glacial till typically consisted of gray to blue gray, moist, dense to very dense, silty fine to coarse sand with occasional gravel to hard, sandy silt with trace gravel. Increased gravel content and/or very dense conditions resulted in refusal of the drill at some locations during the subsurface exploration program. The surface of the till unit appears to slope downward toward the northwest, roughly following the slope of the ground surface. Glacial till was encountered between about 12 feet and 36 feet bgs. Where encountered, our explorations did not penetrate the glacial till unit.

Groundwater Conditions

Perched groundwater conditions were observed in all test pits, typically between depths of ½ and 3 feet bgs. The perched groundwater resulted in slow to rapid seepage near the contact of the topsoil and glacially deposited soils or weathered/unweathered soils. Groundwater seepage was not observed in any of the test pit explorations at depths below about 3 feet. A shallow perched groundwater condition typically develops during the wetter portions of the year. Sandier zones within the glaciomarine drift and glacial till will sometimes produce seepage as well. The static groundwater table is interpreted to be very deep at the site. Localized groundwater conditions should be expected to vary as a function of season, precipitation, and other factors.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

Based on the results of our subsurface exploration program and our geotechnical evaluation, it is our opinion that the proposed Skagit Resort Water Park may be developed satisfactorily as planned with respect to geotechnical issues. However, the presence of the wedge of medium stiff, compressible clay creates some special settlement and foundation support considerations. A summary of the primary design and development considerations for the proposed project is provided below. The summary is presented for introductory purposes only and should be used in conjunction with the complete recommendations presented in this report.

- The site is designated as Soil Profile Type D per the 2003 and 2006 IBC.
- Shallow foundations bearing on very stiff glaciomarine drift or very dense glacial till may be proportioned using allowable bearing pressures of 3,500 pounds per square foot (psf) and 6,000 psf, respectively. Some moderately compressible medium stiff clay soil is present below portions of the site. We recommend that the heavily loaded lobby, hotel, and water park mezzanine be supported on shallow foundations extending below the compressible layer. We do not recommend shallow foundations for the proposed parking garage.
- In areas where the medium stiff compressible layer is present below the foundation subgrade elevation, heavily loaded shallow foundations should be extended to the glacial till bearing layer or be founded on controlled density fill (CDF) backfilled excavations extended to the glacial till bearing layer.
- We recommend that the proposed parking garage be supported on pile foundation extending into the very dense glacial till. Recommendations are proved for 14- to 18-inch diameter augercast piles with axial capacities between 90 and 130 kips.
- Conventional slabs-on-grade are feasible for all structures.
- The building should be constructed with perimeter footing drains. Drainage should also be provided behind below grade walls and a below slab drainage system. The basement will be in a "bathtub" condition that we assume will require sumps and pumps.
- Excavations ranging up to approximately 30 feet below existing site grades are anticipated based on the current development plans. Temporary open cut slopes are feasible at the site. Preliminary temporary cut slope inclinations of ¾H:1V to 1H:1V are considered feasible for most of the site soils. Temporary excavation over 20 feet deep at these inclinations should be evaluated during construction.
- The near-surface native soils consist of clay which is very susceptible to disturbance when wet. Earthwork should be scheduled for the drier summer months to minimize grading costs for the project.
- The results of our exploration program indicate that the natural moisture content of this surficial soil is over its optimum moisture content. The surficial soil should be expected to have considerably higher moisture content during the winter and spring months. Therefore, it will not be possible to use this material as structural fill except during hot dry summer months. Even then, aeration may be required to achieve compaction.
- We recommend including a contingency in the earthwork and foundation construction budgets. Some overexcavation of the medium stiff clay will be necessary and the deep basement cuts may remove some bearing soils that require additional foundation improvements during construction.

It will be critical that we observe foundation conditions for this project to confirm adequate bearing.

SEISMIC DESIGN CONSIDERATIONS

Seismicity

The site is located within the Puget Sound region, which is seismically active. Seismicity in this region is attributed primarily to the interaction between the Pacific, Juan de Fuca and North American plates. The Juan de Fuca plate is subducting beneath the North American plate. It is thought that the resulting deformation and breakup of the Juan de Fuca plate might account for the deep focus earthquakes in the region. Hundreds of earthquakes have been recorded in the Puget Sound area. In recent history, four of these earthquakes were large events: (1) in 1946, a Richter magnitude 7.2 earthquake occurred in the Vancouver Island, British Columbia area; (2) in 1949, a Richter magnitude 7.1 earthquake occurred in the Olympia area; (3) in 1965, a Richter magnitude 6.5 earthquake occurred between Seattle and Tacoma; and (4) in 2001, a Richter magnitude 6.8 earthquake occurred near Olympia.

Research has concluded that historical large magnitude subduction-related earthquake activity has occurred along the Washington and Oregon coasts. Evidence suggests several large magnitude earthquakes (Richter magnitude 8 to 9) have occurred in the last 1,500 years, the most recent of which occurred about 300 years ago. No earthquakes of this magnitude have been documented during the recorded history of the Pacific Northwest. Local design practice in Puget Sound and local building codes now include the possible effect of a very large subduction earthquake and local known faults in the design of structures.

2003/2006 IBC Seismic Design Information

The project will be designed utilizing 2003 or 2006 IBC. We recommend the project site be classified as Site Class D as defined in the IBC. The design parameters for the 2003 and 2006 IBC are summarized in Table 1 below. These values are based on an earthquake event that has a 2 percent chance of exceedance in a 50-year period. Some of the structures will be founded on glacial till which are considered Site Class C soils; however, considering that some of the structure will be founded over fill soils, and possibly medium stiff clay, we recommend using the Site Class D designation.

Table 1: Spectral Response Accelerations (SRAs)

(SRA) and Site Coefficients	Short Period	1 Second Period
Mapped SRA	$S_S = 1.01$	$S_1 = 0.34$
Site Coefficients	$F_a = 1.10$	$F_v = 1.72$
Max. Considered Earthquake SRA	$S_{MS} = 1.11$	$S_{M1} = 0.58$
Design SRA	$S_{DS} = 0.74$	$S_{D1} = 0.39$

Note: 1) Soil Profile Type D Description: Stiff Soil Profile ($15 < N < 50$)

Liquefaction Potential

Liquefaction is a phenomenon where soils experience a rapid loss of internal strength as a consequence of strong ground shaking. Ground settlement, lateral spreading and/or sand boils may result from liquefaction. Structures supported on liquefied soils could suffer foundation settlement or lateral movement that could be severely damaging to the structure. Conditions favorable to liquefaction occur in loose to medium dense, clean to moderately silty sand that is below the groundwater level. Dense soils or soils that exhibit cohesion are less likely to be susceptible to liquefaction. The proposed buildings will be underlain by medium stiff to hard cohesive soils and dense to very dense glacial till which are not considered susceptible to liquefaction.

FOUNDATION SUPPORT

The site subsurface conditions generally consist of glaciomarine drift overlying glacial till. As discussed in the Subsurface Conditions section of this report, the glaciomarine drift is typically stiff to hard sandy clay in the upper 12 to 15 feet below site grades. A wedge of medium stiff compressible clay is present below the site extending from the north end of the hotel and thickening toward the northwest.

We conclude that the stiff glaciomarine drift will provide suitable shallow foundation support for the most of proposed structures; however the more heavily loaded structures will be susceptible to settlement where the medium stiff compressible clay is present below the stiffer crust. We have provided building specific shallow foundation recommendations for the proposed lobby, hotel, conference center, water park and dry play areas below. Due to the heavy dead loads applied by the proposed parking garage and thickness of compressible soil in that area, we recommend that the parking garage be supported on pile foundations extending into the glacial till. We have also provided recommendations for augercast piles below.

Shallow Foundations

General. Based on soils observed in our explorations, we anticipate that stiff to hard glaciomarine drift or dense to very dense glacial till will be present at or near the proposed building foundation grades. In our opinion, with the exception of the proposed parking garage, the proposed structures can be supported on conventional shallow spread footings bearing on undisturbed stiff to hard glaciomarine drift, very dense glacial till, or on suitably compacted structural fill placed over the undisturbed native soils. Some overexcavation may be required to remove some of the underlying medium stiff clay as discussed below.

Exterior footings should be founded at least 18 inches below adjacent grade for frost protection in accordance with local codes. We recommend that continuous wall footings and individual column footings have minimum widths of 18 and 24 inches, respectively. The allowable soil bearing pressure values presented in the sections that follow apply to the total of dead and long-term live loads and may be increased by up to one-third for wind or seismic loads.

Footing Subgrade Preparation. Shallow foundations should bear on undisturbed, firm native soil or properly compacted structural fill extending down to native soil. Specific recommendations for CDF are presented below. Any disturbed material should be removed from the excavation. The clayey or silty footing subgrade soils will be susceptible to disturbance when wet. It may be prudent to pour a lean concrete "mud mat" or place a layer of crushed rock on the bottom of the footing excavations to protect the footing subgrade soils from water and/or wet weather during reinforcement bar placement and preparation for concrete placement. If it is necessary to place structural fill, we recommend that the structural fill extend horizontally a distance equal to ½ the depth of the fill. The fill should be compacted to 95 percent of the maximum dry density (MDD) in accordance with ASTM D 1557 and our recommendations for structural fill. Structural fill should not be placed where an allowable bearing pressure of 6,000 psf is used for design.

Overexcavation and CDF Backfill. For some buildings, we have recommended that the compressible medium stiff clay be removed from the bearing prism of heavily loaded foundations where 6,000 psf can be used for design. Based on experience, we have found that the most cost effective option is to complete a vertical excavation approximately ½ to 1 foot wider than the foundation element all the way down to the dense glacial till as an open excavation. After confirmation of adequate bearing by GeoEngineers, the overexcavation can be backfilled with either 1-sack CDF, or lean concrete. The CDF or lean concrete should extend at least ½ foot beyond the edge of the footing and then extend vertically to the bearing soils. The CDF will allow driving of rebar for formwork. The CDF should be consistent with Washington State Department of Transportation (WSDOT) *Standard Specifications* Section 2-09.3(1)E with the exception that the cement should be increased to 96 pounds per cubic yard.

Lobby. The proposed lobby portion of the new construction will have a basement at Elevation 258.7 feet. The results of our borings indicate that the basement foundations will likely extend into or very near the glacial till unit. The foundation for the non-basement portions of the building will be higher at Elevation 270 feet, portions of which will be at or near the compressible medium stiff clay unit. To limit differential settlement between the basement and non-basement portions of the structure, we recommend the entire lobby structure be supported on glacial till or on CDF placed over glacial till. The basement could be extended in footprint area to minimize the overexcavation of the GMD in the foundation areas. Regardless, we recommend that the stiff and medium stiff glaciomarine drift at all footing subgrades be overexcavated down to the glacial till and the excavation backfilled with CDF. Placing the non-basement portion of the structure on foundations extending to till or on CDF directly overlying glacial till will also limit settlement resulting from the adjacent driveway fill.

For foundations bearing directly on undisturbed glacial till we recommend footings be proportioned using a net allowable bearing pressure of 6,000 psf. Settlement of shallow foundations constructed in this manner is estimated to be ¾-inch or less with differential settlement between individual columns of one-half of the total settlement.

We assume that a lightly loaded entrance roof structure will extend from the lobby out over the drive area. For entrance area footings bearing on properly placed and compacted structural fill, we recommend a net allowable bearing pressure of 3,500 psf. Settlement of shallow foundations constructed in this manner is estimated to be ½-inch or less with differential settlement between individual columns of one-half of the total settlement.

Hotel. The proposed hotel structures will largely be supported on very stiff glaciomarine drift directly overlying glacial till. Portions of the excavation may extend into the glacial till, particularly at the south end of the hotel wings. The north end of the structures may be underlain at depth by a limited thickness of compressible medium stiff glaciomarine drift. To limit differential settlement between the hotel and lobby structures, we recommend that hotel foundations not be constructed above the compressible clay unit. This should be verified during construction by careful observation during excavation of the southern portion of the lobby basement. Some construction contingency should be included for ground improvement with CDF backfilled excavations extending through the compressible clay as necessary.

For foundations bearing directly on very stiff glaciomarine drift or properly placed and compacted structural fill placed directly on glaciomarine drift, we recommend footings be proportioned using a net allowable bearing pressure of 3,500 psf. If it is more economical, the allowable bearing pressure may be increased to 6,000 psf in the southern 1/2 to 1/3 of the hotel wings. However, any glaciomarine drift would need to be overexcavated to undisturbed glacial till. Settlement of shallow foundations constructed over the glacial till will be nominal, with an increasing settlement when the footings farther north along the wings are founded on glaciomarine drift. We estimate total settlement to be ¾-inch or less with differential settlement between individual columns of one-half of the total settlement.

Conference Center. The conference center will be supported near existing grade on stiff glaciomarine drift or on structural fill placed over stiff glaciomarine drift. The conference center area is underlain at depth by compressible medium stiff clay. The relatively light foundation loads will result in minimal post construction settlement directly; however, the structural fill placed to raise the finished floor and adjacent driveway area will be up to about 12 feet thick and could result in settlements. We estimate settlement from the aerial fill could be up to about 2 inches where fill is the thickest and negligible were foundations are constructed at grade with minimal surrounding fill.

Provided that the structure can accommodate the settlement resulting from the aerial fill, for foundations bearing directly on very stiff glaciomarine drift or properly placed and compacted structural fill placed directly on glaciomarine drift, we recommend footings be proportioned using a net allowable bearing pressure of 3,500 psf. We recommend that the conference center be structurally isolated from the adjacent lobby area or other precautions be incorporated to allow for differential settlement between the two buildings.

It is very difficult to accurately estimate settlement of large aerial fills in this geologic environment because of the bridging action that occurs in the stiff clay over the medium stiff clay. We do not have a boring in the northwest corner of the proposed Conference Center, and it appears that the medium stiff layer thickens in this direction. The medium stiff clay does not appear to be present at the southeast corner of the proposed Conference Center, so any settlement will occur increasingly to the north and northwest. We estimate that the maximum settlement will be on the order of 2 inches at the northwest corner, and it may be less. Additional exploration and analysis could be accomplished in this area to better predict the settlements. We expect that the differential settlement will not exceed ½ inch between columns and over a 50-foot length of continuous footing. We recommend that building drainage be planned for increased settlement to the northwest. This settlement could be avoided by incorporating pile foundations.

Water Park. The proposed water park will be supported largely on glacial till or very stiff glaciomarine drift over glacial till. The northwest corner of the water park structure may be underlain at depth by a limited thickness of compressible medium stiff glaciomarine drift. Due to the heavier loads, we recommend that the foundations for the mezzanine portion of the water park not be underlain by any medium stiff glaciomarine drift. Some construction contingency in the west half of the mezzanine area should be included for ground improvement with CDF backfilled excavations extending below the compressible clay as necessary. The presence of the compressible clay should be verified during construction by careful observation during excavation the nearby basement portion of the water park and lobby.

For foundations bearing directly on very stiff glaciomarine drift or properly placed and compacted structural fill placed directly on glaciomarine drift, we recommend footings be proportioned using a net allowable bearing pressure of 3,500 psf. The southeast portion of the water park, divided roughly between the line between B-4 and TP-17 (or approximate existing surface contour of 284 feet) could reasonably be assumed to fall on glacial till and could be designed for an increased bearing pressure of 6,000 psf. Some minor overexcavation may be required to reach the undisturbed glacial till in this area. Settlement of shallow foundations constructed in this manner is estimated to be ¾-inch or less with differential settlement between individual columns of one-half of the total settlement.

Dry Play. The proposed dry play area will be supported near existing grade on stiff glaciomarine drift or a limited thickness of structural fill placed over stiff glaciomarine drift. The dry play area is underlain at depth by compressible medium stiff clay. The relatively light foundation loads for will result in minimal post construction settlement directly, however, the structural fill placed for the adjacent driveway area will be up to about 12 feet thick and could result in significant settlement. We estimate settlement from the aerial fill itself will be up to about 1½ inches where fill is the thickest (at the southwest corner near the lobby entry) and negligible were foundations are constructed at grade with minimal adjacent fill (at the north and east edges of the building and the building interior). Because of the sharp transition in fill depth from the driveway to the interior of the building, the 1½ inches of estimated settlement could be realized over a short distance, on the order of 10 to 15 feet, extending out from the edge of the fill toward the middle of the building. The differential settlement could result in cracking of footings, retaining walls, or slabs-on-grade. This is different than expected at the conference center where the fill depth gradually tapers and differential settlement over short distances will be minimal.

The settlement from the large aerial fill along the western side of the dry play area could be reduced by installing geofoam. This product typically has a unit density between 1 and 2 pcf. The geofoam requires 2 feet of mineral structural fill for stability and protection of the geofoam; therefore, it is incorporated into the thicker fill prisms. The geofoam blocks typically used in earthwork are 2'x2'x8' blocks. We estimate that using geofoam blocks as fill where more than 4 feet of fill is required, would reduce the expected settlements. The foam blocks could be placed adjacent to the dry play retaining wall extending out from the building on the order of 10 to 20 feet, possibly with a tapered thickness. We could provide additional recommendations regarding the use of lightweight fill if requested.

Provided that the structure can accommodate the settlement resulting from the aerial fill, for foundations bearing directly on very stiff glaciomarine drift or properly placed and compacted structural fill placed directly on glaciomarine drift, we recommend footings be proportioned using a net allowable bearing pressure of 3,500 psf. We recommend that the dry play area be structurally isolated from the adjacent lobby area to allow for differential settlement between the two buildings.

Lateral Resistance. Lateral foundation loads may be resisted by friction on the base of the footings computed using a coefficient of friction of 0.4 applied to vertical dead-load forces. This friction coefficient includes a factor of safety of about 1.5. Lateral foundation loads may also be resisted by passive resistance on the sides of the footings. The allowable passive resistance may be computed using an equivalent fluid density of 300 pcf (pounds per cubic foot). The allowable passive resistance includes a factor of safety of about 1.5.

Deep Foundations

The medium stiff clay glaciomarine drift underlying portions of the site is compressible and will not be satisfactory to support some of the heavy foundation loads for the project. We have recommended localized overexcavations for all structures because of the cost of deep foundations. However, because of the increasing thickness and depth to the medium stiff compressible layer in the parking garage area, we recommend that this structure be pile supported. Given the site soil conditions and variable depth to the bearing layer, it is our experience that augercast piles are a cost effective method of pile foundation support. GeoEngineers can provide recommendations regarding alternate pile types if requested.

Augercast piles are constructed using a continuous flight hollow stem auger attached to a set of leads supported by a crane. The first step in the pile casting process consists of drilling the auger into the ground to the specified depth into the bearing layer. Grout is then pumped through the hollow stem auger during steady withdrawal of the auger and replaces the soils on the flights of the auger. The final step is to install a steel reinforcing cage and typically a center bar into the column of fresh grout. One benefit of using augercast piles is that the auger provides support for the soils during the pile installation process, thus eliminating the need for temporary casing or drilling fluid. Design criteria for augercast piles are presented in the following sections.

Vertical Load Capacity. Vertical pile load capacity in compression is developed from end bearing and from frictional resistance. Our recommendations for allowable vertical load capacities for 14-inch, 16-inch, and 18-inch diameter augercast piles extending a minimum of 5 feet into dense glacial till unit are presented in the following table.

Augercast Pile Diameter (inches)	Allowable Axial Capacity (kips)	Allowable Uplift Capacity (kips)
14	90	35
16	110	42
18	130	50

Allowable pile capacities are provided for Allowable Stress Design (ASD), and are for combined dead plus long term live loads and may be increased by one-third when considering design loads of short duration such as seismic forces. The allowable capacities are based on the strength of the supporting soils for the depths below the existing ground surface and include a factor of safety of three for end bearing and two for shaft friction. The capacities apply to single piles. If piles are spaced at least three pile diameters on center, as recommended, no reduction for group action is needed.

The structural characteristics of pile materials and structural connections may impose limitations on pile capacities and should be evaluated by the structural engineer. For example, steel reinforcing will be needed for augercast piles subjected to uplift or large bending moments.

Lateral Pile Capacity. Lateral resistance and deflections of vertical pile foundations are governed primarily by the lateral capacity of near-surface soil and the strength of the pile itself. The design lateral capacity of the vertical piles will depend to a large extent on the allowable lateral deflections of the piles. Lateral load capacity will be resisted by passive soil pressure on the vertical pile and the pile cap; these may be considered concurrently. Base friction along the bottom of the pile cap should not be included in calculations of lateral capacity.

Piles spaced closer than eight pile diameters apart will experience group effects that will result in a lower lateral load for trailing piles with respect to leading piles for an equivalent deflection. We recommend that the lateral load for trailing piles spaced three pile diameters apart be reduced by 60 percent. Reductions of the lateral load for trailing piles at spacing greater than three pile diameters but less than eight pile diameters apart can be linearly interpolated.

We understand that analysis of lateral pile behavior lateral will be conducted by the structural engineer using the program LPILE™. The following table provides the recommended input soil parameters for an LPILE™ (or similar computer program) analysis of lateral pile behavior. For analyses, the soil profile should be divided into two layers as shown in the following table and based on the subsurface cross-section or nearest soil boring. Lateral pile capacity will not be determined by the glacial till layer and it was not included in the table. The soil parameters below do not include a factor of safety.

Table 3. *Recommended* Lateral Pile Analysis Soil Input Parameters

Soil Parameter	Layer 1	Layer 2
Soil Unit	Very Stiff Glaciomarine Drift	Medium Stiff Glaciomarine Drift
Soil Type	Clay	Clay
Soil Unit Weight (pci)	0.072	0.072
Soil Internal Angle of Friction (degrees)	NA	NA
Soil Modulus, k (pci)	75	30
Soil Cohesion (psi)	15	5
E_{50}	0.005	0.007

The passive resistance acting on the pile cap is a function of pile displacement and the quality of pile cap backfill material. We have developed recommendations assuming native stiff glaciomarine drift or compacted structural fill. For the condition where stiff glaciomarine drift or adequately compacted structural fill is present adjacent to the pile cap, we recommend that the passive soil pressure acting on the pile cap be estimated using an equivalent fluid density of 300 pounds per cubic foot (pcf) for drained soil conditions. The structural fill should extend laterally a distance equal to the depth of the pile cap. The above passive equivalent fluid density value incorporates a factor of safety of about 1.5 and assumes a 4-foot deep pile cap and a minimum lateral deflection of ½-inch to fully develop the passive resistance. Deflections that are less than ½-inch will not fully mobilize the passive resistance in the soil.

Settlement. We estimate that the post-construction settlement of augercast piles, designed and installed as recommended, will be on the order of ¾-inch or less. Maximum differential settlement should be less than about one-half the post-construction settlement. Most of this settlement will occur rapidly as loads are applied.

Construction Considerations. The augercast piles should be installed using a continuous-flight, hollow-stem auger. As is standard practice, the pile grout must be pumped under pressure through the hollow stem as the auger is withdrawn. Maintenance of adequate grout pressure at the auger tip is critical to reduce the potential for encroachment of adjacent native soils into the grout column. The rate of withdrawal of the auger must remain constant throughout the installation of the piles in order to reduce the potential for necking of the piles. Failure to maintain a constant rate of withdrawal of the auger will result in immediate rejection of that pile. Reinforcing steel for bending and uplift should be placed in the fresh grout column as soon as possible after withdrawal of the auger. Centering devices should be used to provide concrete cover around the reinforcing steel.

We recommend that there be a waiting period of at least 6 hours between the installation of piles spaced closer than three pile diameters, center-to-center. This waiting period is necessary to avoid disturbing the curing concrete in previously cast piles.

Grout pumps must be fitted with a volume-measuring device and pressure gauge so that the volume of grout placed in each pile and the pressure head maintained during pumping can be observed. A minimum grout line pressure of 100 pounds per square inch (psi) should be maintained. The rate of auger withdrawal should be controlled during grouting such that the volume of grout pumped is more than 110 percent of the theoretical pile volume. A minimum head of 10 feet of grout should be maintained above the auger tip during withdrawal of the auger to maintain a full column of grout and prevent hole collapse or necking.

It should be noted that no direct information regarding the capacity of augercast piles (e.g., driving resistance data) can be obtained while this type of pile is being installed. Therefore, it is important that the pile installation operations be monitored by GeoEngineers. We will observe the drilling operations, monitor grout injection procedures, record the volume of grout placed in each pile relative to the calculated volume of the hole, and evaluate the adequacy of individual pile installations. We also strongly recommend that a pre-construction meeting take place with the pile contractor, the owner and GeoEngineers to discuss pile construction techniques.

SLAB-ON-GRADE SUPPORT

The first floors of the proposed structures may be supported as slabs-on-grade. The slabs should be supported on the native stiff to very stiff clay, very dense till or on structural fill placed over these materials in accordance with the described site preparation and structural fill recommendations.

The exposed subgrade should be evaluated after site grading is complete. Probing should be used to evaluate the subgrade during periods of wet weather or if access is not feasible for construction equipment. The exposed soil should be firm and unyielding, and without significant groundwater. Disturbed areas should be re-compacted if possible or removed and replaced with compacted structural fill. For slabs designed as a beam on an elastic foundation, a modulus of subgrade reaction of 200 pounds per cubic inch (pci) may be used for subgrade soils prepared as recommended.

We recommend that a minimum 6-inch thick capillary break layer be included below the slab to reduce the potential for moisture migration for interior slabs-on-grade. The capillary break material should have positive drainage to a suitable discharge point. The capillary break material should consist of a well-graded sand and gravel, pea gravel or crushed rock with a maximum particle size of 3/4 inch and have less than 3 percent fines. The capillary break material should be compacted to at least 95 percent of the maximum dry density (MDD) in accordance with ASTM D 1557. If moisture sensitive floor coverings will be used, we also recommend a vapor barrier with bonded seams.

The glaciomarine drift is relatively impermeable with a seasonal perched groundwater condition that creates a "bathtub" effect in excavations. If a seep or an isolated saturated sand pod or other condition is encountered during construction, some additional drainage provisions, such as a thickened capillary break section and/or slab under drain system, may be appropriate to limit the potential for slab moisture problems. With appropriate construction monitoring, these additional precautions could be evaluated at the time of construction.

The lobby basement will be significantly below grade and has a high risk of ponded water in the excavation over time from sand lenses. We recommend that the basement include 12 inches of capillary break with a sub-drain system. For planning purposes, we suggest 3-inch perforated pipes on about 20-foot spacing, manifolded together and routing water to a sump(s) and pump(s) system.

RETAINING WALLS

We recommend that retaining walls be designed for lateral pressures based on an equivalent fluid density of 35 pcf for level backfill if the walls are free to rotate 0.001 times the wall height. The walls should be designed for 50 pcf for level backfill if the walls will be restrained against rotation when backfill is placed. In areas where sidewalks or parking will be within 10 feet of the top of the wall, we recommend using a uniform surcharge pressure of 250 psf. We also recommend a uniformly distributed seismic surcharge of 8H psf (H=Height of wall) be applied to the wall with a corresponding reduction in the factors of safety to 1.1 or greater.

The recommended lateral earth pressure assumes a free-draining condition behind the wall. Drainage should be provided by placing an 18-inch-wide zone of sand and gravel containing less than 5 percent fines against the wall. This drainage zone should extend to within 12 inches of the top of the wall, preferably with less permeable native soil compacted above the drainage zone. Perforated drainpipe should be embedded in the free-draining sand and gravel zone along the base of the building retaining walls. The drainpipe should be tightlined to the stormwater system. A sump and pump may be necessary if the elevation of the storm sewer is too high for gravity discharge.

In order to prevent overstressing the concrete retaining walls and causing bulging or rotation, we recommend that the structural fill placed against the back of the wall be compacted within the range of 90 to 92 percent of the MDD, and the use of light compaction equipment. Backfill should be placed after the concrete has had sufficient time to cure and develop the necessary strength.

SITE DRAINAGE CONSIDERATIONS

We recommend that final site grading direct water away from the buildings to the extent practical. The site experiences seasonally perched ground water conditions because of the relatively low permeability of glaciomarine drift that occurs at shallow depths. Therefore, we recommend the structures be provided with a perimeter drainage system. The footing drains should be installed at the base of the retaining walls or pile caps and sloped to drain. The drains should consist of rigid perforated pipe, a minimum of 4 inches in diameter, enveloped within a minimum thickness of 6 inches of 1-inch washed gravel. A non-woven geotextile fabric such as Mirafi 140N, or other as approved by GeoEngineers, should be placed between the 1-inch washed gravel and the native/fill soils to prevent movement of the soils into the drainage material. This drainage should be tightlined to the stormwater system. Consideration should be given to the use of clean-outs for drain pipe maintenance, particularly for the basement drainage system. A larger diameter pipe will facilitate maintenance of drainage systems. Additional drainage recommendations are provided below:

- Elevator pits, if located below the gravity stormwater system, may require sumps and pumps.
- All subsurface walls should be adequately waterproofed.
- We did not observe soil conditions that suggest that an underslab drainage system is necessary for all buildings. However, this could be used as an extra precaution and the benefit could be further evaluated during construction based on conditions encountered. We have recommended an underslab drainage system for the lobby basement because of the depth of the excavation.
- If earthwork will occur during the wet season, perimeter ditching or infiltration trenches may be required to manage surface water and perched groundwater entering the site.
- We recommend all downspouts be tightlined away from the building foundation area, preferably to the storm drain system. Downspouts should not be connected to footing drains.

EARTHWORK

General

The site soils generally consist of sandy clay, clay, and silty sand within the excavation depths anticipated for the project. These soils are very moisture sensitive and susceptible to disturbance by construction equipment during wet weather. These soils are very difficult or impossible to use as structural fill except during dry weather and on dry subgrades. If practical, the excavation to design subgrades should be performed during extended periods of dry weather. Exposed subgrades should not be left exposed to inclement weather. Earthwork costs will be significantly greater if grading must occur during wet weather.

Vehicular travel will be good at the site during extended periods of warm dry weather due to desiccation of surficial soils; however, it will be very difficult and in some cases impossible to operate rubber-tired equipment across the site during wet weather. Temporary roads will be required for access to construction areas during wet weather or wet subgrade conditions. Our experience suggests that 18 to 24 inches of sand and gravel with less than 5 percent fines (that portion passing the U.S. No. 200 sieve), crushed rock or quarry spalls with little to no fines will be necessary to provide support for construction equipment. A 12-inch thick layer may be sufficient over the stiff soils at this site during brief periods of wet weather. If repeated traffic will occur over the haul roads during wet weather, we recommend that a woven geotextile fabric with a minimum grab tensile strength (ASTM D4632) of 200 pounds (e.g., Mirafi 500X, Amoco 2002, or Layfield LP 200) should be placed between the fine grained subgrade and the haul road fill material.

If the project proceeds during the winter months, it may be appropriate to prepare an all-weather building pad to protect the silt subgrade from disturbance and facilitate crane access for augercast piles. We recommend that a track-mounted crane be used to minimize potential damage to the slab subgrade during the winter. In this case, we expect that at least 12-inches, and more likely 18-inches, of select import fill as subsequently described over a geotextile stabilization fabric (as above) will be required to provide a firm base during construction. If construction will occur during wet conditions with a thin (12-inch) layer of select import fill, a moderate strength needle-punched non-woven geotextile fabric placed between the select import fill and the fine grained subgrade will significantly aid performance.

Temporary erosion control measures should be used during construction depending on the weather, location, soil type, and other factors. Temporary erosion protection (e.g., straw, plastic, or rolled erosion control products [RECPs]) may be necessary to reduce sediment transport until vegetation is established or permanent surfacing applied. Appropriate best management practices (BMPs) should be incorporated into the temporary erosion and sediment control plan developed by the civil engineer. We are available to provide input if desirable.

Site Preparation and Excavation

We recommend that any existing fill, and topsoil, be stripped from the building and pavement areas. Additional excavation of the weathered portion of the glaciomarine drift may be necessary to reach suitable bearing soils for footings. Based on our explorations, the sod and topsoil thickness is typically ½ to 1½ feet thick and the weathered zone can extend several feet below existing site grades. Stripped material should be wasted from the site or used in landscaping areas. We recommend using lightweight construction equipment to perform the stripping and keeping construction equipment off the stripped subgrades as much as possible during the wet season. We recommend that the floor slab and pavement be underlain by a capillary break layer and a subbase layer, respectively, as described in the pertinent sections of this report. It should be noted that these layers for slab and pavement support will not provide adequate subgrade protection from disturbance by construction equipment if the subgrade is wet of optimum or wet weather occurs. In either of these cases, additional precautions will be appropriate as described in this report.

The excavation necessary to achieve building subgrades and parking subgrades can be accomplished using standard excavation techniques. If encountered in the excavation, it may be necessary to rip the very dense soils locally to facilitate excavation. Cobbles and even large boulders can be encountered in excavations in the glacially deposited soils. We expect that the site soils will be dry during the summer months. However, a perched ground water condition and/or isolated pods of saturated sand may be encountered during winter and spring. We expect that the perched ground water encountered can be adequately handled with ditches, sumps and pumps. If prolonged winter construction is necessary and significant perched water occurs, interceptor drains (French drains) may be appropriate.

We recommend that the condition of the building and pavement subgrades be evaluated by a representative from our firm. It may be appropriate to perform proofrolling to determine if soft spots are present. We recommend that disturbed soils be compacted to a firm and unyielding condition or to 95 percent of the maximum dry density (MDD) in accordance with ASTM D 1557, or as determined appropriate by the field geotechnical engineer. It may be appropriate to overexcavate some of the unsuitable near surface soils and replace with structural fill for suitable foundation and pavement support.

Temporary Slopes

Regardless of the soil types encountered in the excavation, either shoring, trench boxes and/or temporary slopes will be required under Washington Industrial Safety and Health Act (WISHA). The stability of open-cut slopes is a function of soil type, ground water level, slope inclination and nearby surface loads. The use of inadequately designed open cuts could impact the stability of adjacent structures and existing utilities, and endanger personnel.

In our opinion, the contractor will be in the best position to observe subsurface conditions continuously throughout the construction process and to respond to the variable soil and groundwater conditions. Construction site safety is generally the responsibility of the contractor, who also is solely responsible for the means, methods, and sequencing of the construction operations and choices regarding temporary excavations and shoring. We are providing this information only as a service to our client. Under no circumstances should the information provided below be interpreted to mean that GeoEngineers, Inc. is assuming responsibility for construction site safety or the contractors' activities; such responsibility is not being implied and should not be inferred.

The WISHA guidelines allow temporary slopes for excavations less than 20 feet deep, from ¾H:1V (Horizontal:Vertical) to 1.5H:1V depending upon soil type. The guidelines assume that surface loads such as construction equipment and storage loads will be kept a sufficient distance away from the top of the cut so that the stability of the excavation is not affected. The guidelines also assume that no groundwater is present. Based on our explorations and other experience in the immediate area, the stiff to very stiff clayey glaciomarine drift and the glacial till soils are consistent with "Type A" soils by WISHA definition with a temporary maximum slope angle ¾H:1V. Where the glaciomarine drift becomes medium stiff the soil would be defined as "Type B" and the temporary maximum slope angle should be flattened to 1H:1V. Any existing fill soils, or granular soils would be typically consistent with "Type C" soils with a temporary maximum slope angle of 1.5H:1V.

Temporary excavations up to about 30 feet deep are anticipated to complete the excavation for the lobby basement. Our analysis suggests that the temporary slope inclinations presented above will be safe for an excavation of this depth at that location; however any slope in excess of the WISHA recommend 20 feet should only be conducted if we are allowed to monitor the excavation to verify that subsurface soil conditions match the anticipated conditions and we are allowed to regularly monitor the slope after excavation for signs instability.

It should be expected that unsupported cut slopes would experience some sloughing and raveling if exposed to surface water. Berms, hay bales, plastic sheeting, fencing laid over the slope or other provisions could be installed along the top and sides of the excavation to reduce the potential for sloughing and erosion of cut slopes during wet weather. Some slope treatment, such as plastic sheeting, chain link fence, or other may be necessary to minimize the risk of injury from gravel or small sloughs considering the depth of the temporary excavations for this project.

Permanent Slopes

We recommend a maximum permanent slope inclination of 2H:1V in the native soil or in structural fill placed in accordance with our recommendations. Structural fill placed within pavement areas should meet the criteria described in the previous section. Fill should be carefully compacted on the slope face, or the fill embankment can be overbuilt and cut back to a 2H:1V configuration. Permanent slopes must be hydroseeded or otherwise protected from erosion. Temporary erosion control measures may be necessary until permanent vegetation is established.

Structural Fill

General. All import structural fill material should be free of organics, debris and other deleterious material with no individual particles larger than 5 inches in diameter. As the amount of fines increases, the soil becomes increasingly sensitive to small changes in moisture content and adequate compaction becomes more difficult or impossible to achieve, particularly during wet weather. Generally, soils containing more than about 5 percent fines by weight cannot be properly compacted when the moisture content is more than a few percent from optimum.

During wet weather, we recommend all import fill consist of a well-graded sand or sand and gravel mixture with less than 5 percent fines. If the gravel content is high, a fines content of up to about 8 to 10 percent may be suitable for general purpose fill during wet weather.

Select Import Fill. During wet weather, placement on wet subgrades, or during times when the schedule is critical, we recommend using a select import fill. The select import should consist of well-graded sand and gravel, with at least 30 percent retained on the No. 4 sieve and less than 5 percent passing the U.S. No. 200 sieve. The percentage passing the No. 200 sieve should be based on that fraction passing the ¾-inch sieve. Requiring use of this type of material in the building area would significantly aid quality control and reduce compaction effort during earthwork procedures. The gravel fraction (percent retained on the No. 4 sieve) could be decreased in deeper fills in appropriate conditions with approval of the geotechnical engineer.

Suitability of On-site Soil. As previously mentioned, most of the excavations for the project will generate the upper silt and clay site soils for use as structural fill. In our experience, the optimum moisture content of these soils is about 14 percent; the natural moisture content ranged from 20 to 35 percent. In many cases, adequate aeration may occur during normal grading operations during the hot summer months such that compaction can be achieved where a 90 percent compaction criterion is appropriate. We do not recommend onsite soils where 95 percent compaction is necessary, such as under building foundations and floor slabs.

The upper fine grained glaciomarine drift soils will not respond to compaction when wet and can become disturbed by repeated vehicle traffic when over optimum. The natural moisture content of the upper soils increases considerably during the wetter season, particularly if a perched ground water condition occurs. It may be necessary to aerate these materials (typically using a disc) to achieve uniform compaction. Use of sheepsfoot type compaction equipment may help achieve compaction of the reworked glaciomarine drift.

The glacial till at depth has a lower moisture content and will typically be suitable for use as structural fill. It may be possible to achieve the 95 percent compaction criterion with this material, although it is still moisture sensitive. It also has an elevated silt content such that it is not considered suitable during wet weather.

For planning purposes, we suggest that the on-site materials not be considered for use as structural fill during the winter and spring months. Therefore, to minimize grading costs and use the on-site soils during grading operations, the earthwork should be performed during the drier summer months, if practical.

Fill Placement and Compaction Criteria. Structural fill should be mechanically compacted to a firm, non-yielding condition. Structural fill should be placed in loose lifts not exceeding 10 inches in loose thickness or that necessary to attain the specified compaction. Each lift should be conditioned to the proper moisture content and compacted to the specified density before placing subsequent lifts. Structural fill should be compacted to the following criteria:

- Structural fill placed in building areas (supporting foundations or slab on grade floors) and in pavement and sidewalk areas (including utility trench backfill) should be compacted to at least 95 percent of the MDD estimated in accordance with ASTM D-1557. Structural fill greater than two feet below pavement areas should be compacted to at least 90 percent of the same standard.
- Structural fill placed against subgrade walls should be compacted to between 90 and 92 percent. Care should be taken when compacting fill against subsurface walls to avoid over-compaction and hence overstressing the walls.
- Fill in non-structural areas should be compacted to at least 85 percent MDD to limit excessive post-construction settlement.

Weather Considerations

During wet weather, the glaciomarine drift soils become muddy and trafficability is very difficult to impossible with rubber tired equipment. We provide the following wet weather considerations:

- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practical and limit the size of areas that are stripped of topsoil or gravel surfacing and left exposed.
- The ground surface in and around the work area should be sloped so that surface water is directed to a sump or discharge location. The ground surface should be graded such that areas of ponded water do not develop.
- Slopes with exposed soils should be covered with plastic sheeting or similar means.
- Providing up-gradient perimeter ditches or low earthen berms and using temporary sumps to collect runoff will help prevent water from ponding and damaging exposed subgrades.
- The site soils should not be left un-compacted and exposed to moisture. Sealing the surficial soils by rolling with a smooth-drum roller prior to periods of precipitation will reduce the extent to which these soils become wet or unstable.
- Limit construction traffic over unprotected soil and by limiting the size and type of construction equipment used.
- Provide gravel "working mats" over areas of prepared subgrade, and providing haul roads for winter construction. To maintain the integrity of the gravel, it may be necessary to place a geotextile separation fabric between the fine grained subgrade. It is our experience that 12 to 24 inches of sand and gravel are necessary to support repeated construction traffic.

Fill Induced Settlement

It is our understanding that up to 12 feet of fill will be required under the conference center and adjacent to (west of) the conference center, lobby and dry play areas. Large aerial fills such as the one proposed impose new stresses that can cause elastic deformation and consolidation of underlying soils, particularly the medium stiff, moderately compressible clay. This can result in settlement of the fill which will extend in a bowl-shaped depression of surrounding ground outward from the fill prism and can result in differential settlement between affected infrastructure and building foundation elements. Because of the stiff (desiccated or ice contact) material over the more compressible soils, it is difficult to estimate settlements as previously described. A moderate fill prism, on the order of 4 feet or less over a stiff soil thickness of 10 feet, typically does not cause any settlement. However, as the fill loads get heavier, some settlement can occur. We estimate that large aerial fills up to 12 feet could result in 1½ to 2 inches of settlement. These settlements would be in addition to any settlement resulting from foundation loads.

If the proposed structures and infrastructure cannot accommodate the estimated settlement, it may be necessary to limit fill thicknesses, use lightweight fill, or provide additional ground improvement below affected structures. We can provide additional recommendations regarding this issue if necessary.

DETENTION PONDS AND BERMS

General

We understand that two detention ponds and one decorative pond are planned for the site. Pond #1 will be located at the west entrance to the proposed development and Pond #2 will be located north of the proposed parking structure. The two ponds will be used for stormwater detention and water quality. The pond bottom elevations will be at 249 feet and 254 feet for Pond #1 and Pond #2 respectively. Both ponds will be excavated below surrounding grades. The base of the stormwater ponds will be in the native soils. The native stiff silt has a very low permeability and will not have any significant infiltration. Therefore, a liner is not needed to prevent adverse affects on adjacent properties or slopes. However, the upper weathered soils are medium stiff and have a higher permeability as result of natural weathering processes. We recommend that the exposed sides and base of the ponds be evaluated at the time of construction to confirm that no sand lenses are present or other conditions that would require some local remediation. If the weathered soils are encountered, we recommend aeration and compaction of the weathered soils, or overexcavation of a maximum 2 feet and replacement with the on-site clay and silt compacted to approximately 90 percent compaction (+/- 2%).

Pond #3 will located near the lobby entrance and will be used for decorative purposes. Pond #3 will have a bottom elevation at Elevation 273, about 14 feet above the nearby lobby basement. The pond will be constructed largely above existing site grades. Provided the pond is constructed with reworked native clayey site soils and suitably compacted, we anticipate that infiltration at the pond bottom will be minimal. To prevent seepage at the contact of the native soil and pond fill, we recommend that organic soil be stripped from the pond area and that weathered soils be scarified, aerated and recompacted to approximately 90 percent compaction (+/- 2%).

Perched groundwater conditions were encountered in our test pit explorations which were completed during the wet season. The regional ground water table is well below the proposed bottom of the ponds. Most of the surface water will be intercepted and the site is at a localized topographic high. Therefore, we conclude that it is unlikely that there will be any significant contribution of ground water to the dead storage in the ponds. If seepage is encountered, it may be necessary to install an interceptor drain near the upgradient side of the ponds to intercept this water.

Berms

We understand that berms may be required to construct the detention ponds. We recommend that the berms forming the detention ponds be constructed with the on-site clayey soil. The berm material should be compacted to 90 to 92 percent of the MDD per the ASTM D 1557 test procedure. The subgrade preparation and berm material placement and compaction should conform to the recommendations in the "Subgrade Preparation" and "Structural Fill" sections of this report with the added recommendation that the berm material should be placed and compacted slightly wet of the optimum moisture content. The in-situ moisture content of the native soil is over the optimum moisture content, so this would be the case unless the contractor allowed significant aeration.

We recommend that the stormwater pond berms be designed with 3H:1V and 2H:1V side slopes inside and outside the ponds, respectively. It is critical that erosion protection and vegetation be established as quickly as possible on the inside of the ponds. The pond berm should be "overbuilt" and then cut back to the design grade, to ensure adequate compaction of the slope face.

PAVEMENT CONSIDERATIONS

We recommend that the site preparation be completed in accordance with the previous "Site Preparation" section. All unsuitable or yielding soils should be removed or remediated prior to placing gravel base. We recommend that the pavement section consist of a layer of gravel base to provide strength and drainage (and resistance to frost heave), a layer of crushed rock, and hot mix asphalt pavement. The pavement materials should be in conformance with the most recent WSDOT *Standard Specifications*. We recommend the following minimum pavement sections:

Automobile Parking Area

- 2 to 2.5 inches of Hot Mix Asphalt (HMA), Class ½ inch, PR 64-22 per the *2004 WSDOT Standard Specifications* (5-04 and 9-03.8) or Class B asphalt from previous specifications.
- 4 inches of crushed surfacing base course *WSDOT Standard Specifications* 9-03.9(3).
- 6 to 8 inches of gravel base consistent with the material previously described as "Select Import Fill."
- If the subgrade soils are silty, a woven geotextile placed directly over the prepared subgrade with a minimum grab tensile strength (ASTM 4632) of 200 pounds (such as Mirafi 500X, Amoco 2002 or Layfield LP 200).

Access Roads and Truck Routes

- 3 to 4 inches of HMA
- 4 to 6 inches of crushed surfacing base course
- 6 to 8 inches of gravel base
- A woven geotextile placed directly over the prepared subgrade.

The minimum thickness of gravel base recommended will not protect the subgrade from degradation during wet conditions. If possible, we recommend that the gravel not be placed over the native soils until a weather window will allow paving to occur without inclement weather. It is our experience that placing a layer of woven roadway stabilization geotextile fabric (as recommended above) will help stabilize the subgrade, prevent intrusion of the silty and clayey soils, and provide better long-term pavement performance even if constructed during the dry season. Considerations for haul roads are provided in the "Site Preparation" section of this report.

RECOMMENDED ADDITIONAL GEOTECHNICAL SERVICES

Plans and Specifications Review

The project has significant geotechnical design considerations related to structural and civil designs. We have made assumptions based on our best understanding of the project at the time the report was prepared. Considering the complexity of the project, we recommend that we be retained to review the project plans and specifications when complete to confirm that our design recommendations have been implemented as intended.

Construction Monitoring Services

We have provided specific recommendations based on conditions observed in our borings and design assumptions. Because of the complexity of this project and site conditions, and the high design loads, it is critical that the appropriate subsurface conditions be confirmed or modified recommendations be provided during construction. We recommend that GeoEngineers be contracted to perform construction monitoring services and consultation during earthwork and foundation construction. Specifically, we recommend that we observe the following:

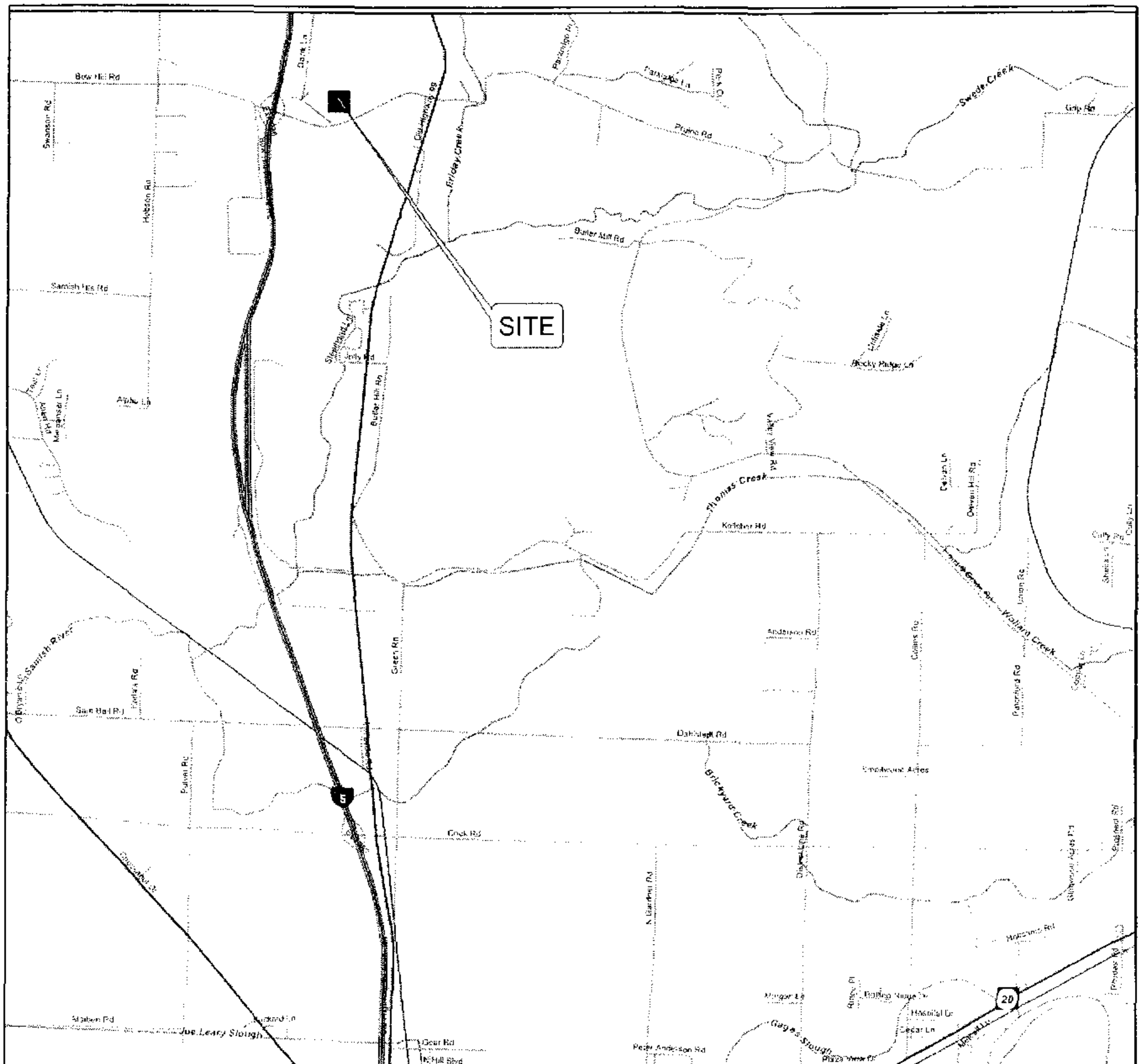
- Exposed footing subgrades prior to placement of reinforcing steel and structural concrete to confirm that the subsurface conditions are as expected and that the bearing surface has been prepared in a manner consistent with our recommendations.
- Any footing overexcavations to place structural fill or CDF. It may be necessary to excavate some test holes during construction at footing locations where the medium stiff, compressible soils could be. Any such excavations should be backfilled with CDF.
- Installation of piles in accordance with previous discussions in this report.
- Probing, proofrolling or other subgrade evaluations after stripping for fill placement, slab-on-grade construction, and pavement construction.
- Determine if subsurface drainage systems, such as underslab drainage, are appropriate.
- Sufficient earthwork monitoring including in-place density tests to evaluate fill placement and compaction operations.
- Temporary slope excavations to confirm that appropriate temporary slope inclinations are appropriate for the conditions encountered. This is particularly important for the deep basement cuts.
- Evaluate detention pond subgrade to determine if a liner is needed. Monitor fill placement during detention pond berm construction including evaluating suitability of fill soils for berm construction.
- In general, to confirm that subsurface conditions are consistent with those observed in the explorations and the other reasons described in Appendix C, Report Limitations and Guidelines for Use.

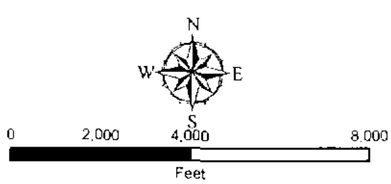
LIMITATIONS

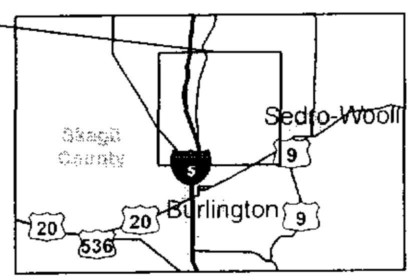
We have prepared this report for use by Upper Skagit Indian Tribe, PLANNING/Design Build, and other members of the design team for use in design of this project.

Within the limitation of scope, schedule and budget, our services have been executed in accordance with generally accepted geotechnical practices in the area at the time the report was prepared. No warranty or other conditions, express or implied, should be understood.

Please refer to the attachment titled Report Limitations and Guidelines for Use for additional information pertaining to use of this report.







Notes:

1. All locations and features shown are approximate.
2. This drawing is for informational purposes. It is intended to assist in showing features discussed in an attached document. The master file is stored by GeoEnginers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: Topographic map from Terraserver and the USGS County boundaries, cities, and waterbodies from Department of Ecology.

Lambert Conformal Conic, Washington State Plane North
North American Datum 1983

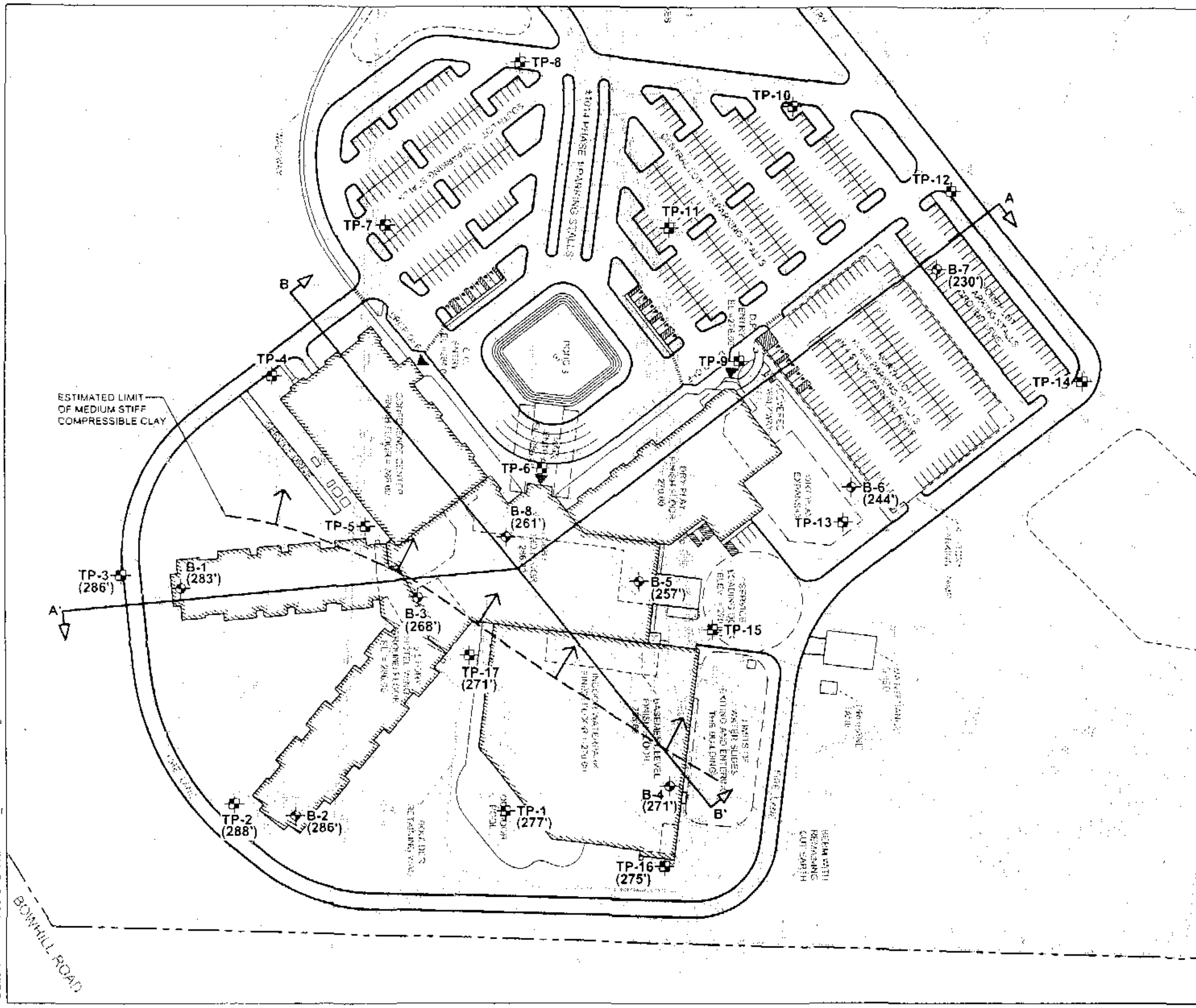
Vicinity Map

Proposed Skagit Resort Water Park
Bow, Washington

GEOENGINEERS

Figure 1

Office: BAM Path: P:\0\00829-020\00\82902000 VM-F1.mxd SWC:IMS 02/23/2007



Legend

B-1 (283') Boring number and approximate location
Approximate depth to glacial till

TP-1 (277') Test Pit number and approximate location
Approximate depth to glacial till

A A' Approximate cross section location

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Base drawing provided by PLANNING Design Build, Inc., February 22, 2007.

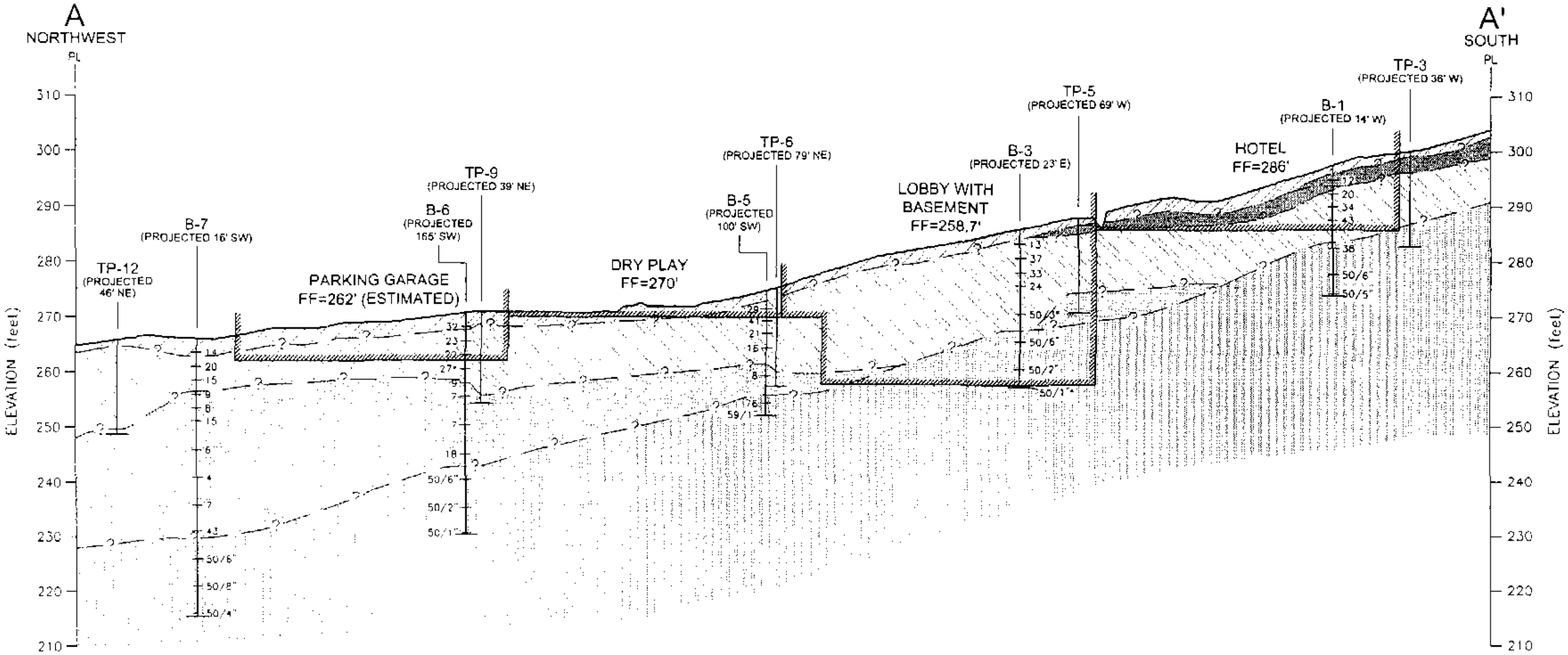
120 0 120
Feet

Site and Exploration Plan

Proposed Skagit Resort Water Park
Bow, Washington

GEOENGINEERS | Figure 2

BELL\0082902\0100\CAD\0082902000_F2 TO F3A-B.dwg SWC:SCY 02/23/07 rev 02/26/07



LEGEND

PROPOSED STRUCTURE

B-5 (PROJECTED 100' SW) — PENETRATION TEST (* INDICATES CALIFORNIA SAMPLER USED)

—?—?— INTERPRETED GEOLOGIC CONTACT

TOPSOIL: LOOSE SILTY SAND (TS)

GLACIAL OUTWASH: MEDIUM DENSE SILTY SAND TO SANDY SILT (SM/ML)

GLACIOMARINE DRIFT: STIFF TO HARD CLAY WITH SAND AND SILT AND OCCASIONAL WEATHERED ZONES (CL)

GLACIOMARINE DRIFT: MEDIUM STIFF CLAY (CL)

GLACIAL TILL: VERY DENSE SILTY SAND TO SANDY SILT WITH GRAVEL (SM/ML)

100 0 100

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'
VERTICAL EXAGGERATION: 5X

Notes:

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. Refer to Figure 2 for location of Section A-A'.
3. The locations of all features shown are approximate.
4. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Adapted from site plan provided by PLANNING Design Build, Inc., February 22, 2007.

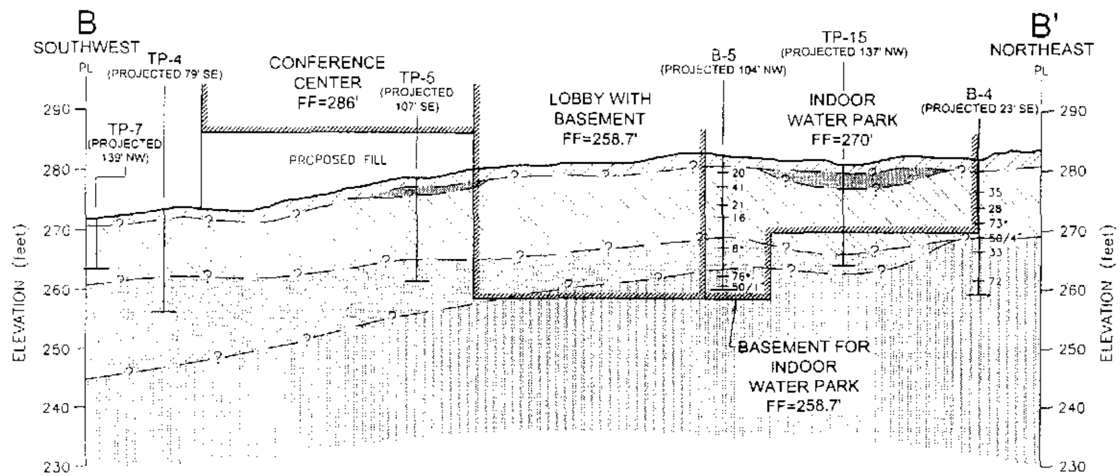
Subsurface Cross Section A-A'

Proposed Skagit Resort Water Park
Bow, Washington

GEOENGINEERS

Figure 3A

BELL\0082920\01\CAD\0829202000_F2 TO F3A-B.dwg SWC:SCY 02/23/07 rev 02/26/07



LEGEND

PROPOSED STRUCTURE

B-5 (PROJECTED 104' NW)

PENETRATION TEST (* INDICATES CALIFORNIA SAMPLER USED)

INTERPRETED GEOLOGIC CONTACT

TOPSOIL: LOOSE SILTY SAND (TS)

GLACIAL OUTWASH: MEDIUM DENSE SILTY SAND TO SANDY SILT (SM/ML)

GLACIOMARINE DRIFT: STIFF TO HARD CLAY WITH SAND AND SILT AND OCCASIONAL WEATHERED ZONES (CL)

GLACIOMARINE DRIFT: MEDIUM STIFF CLAY (CL)

GLACIAL TILL: VERY DENSE SILTY SAND TO SANDY SILT WITH GRAVEL (SM/ML)

100 0 100

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 20'
VERTICAL EXAGGERATION: 5X

Notes:
1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. Refer to Figure 2 for location of Section B-B'.
3. The locations of all features shown are approximate.
4. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Adapted from site plan provided by PLANNING Design Build, Inc., February 22, 2007.

Subsurface Cross Section B-B'

Proposed Skagit Resort Water Park
Bow, Washington

GEOENGINEERS

Figure 3B

BELL\0\0829020\09\CAD\082902000_F2 TO F3A-B.dwg SWC:SCY 02/23/07 rev 02/26/07

GeoEngineers

Appendix A
Field Explorations

APPENDIX A
FIELD EXPLORATIONS

Subsurface soil and groundwater conditions were evaluated across the site in December 2006 and January 2007 by completing at total of 17 test pits (TP-1 through TP-17) and 8 borings (B-1 through B-8). The test pits were completed to depths of 6 to 17½ feet using an operator and John Deere 225c tracked excavator provided by the owner. The borings were completed to depths of 22 feet to 50 feet using a drilling contractor and a small track-mounted drill rig subcontracted to GeoEngineers. The approximate locations of the test pits and borings are shown in Figure 2. Exploration locations were located in the field by taping or pacing from existing site features. The locations should be considered approximate.

Soil samples from the borings were obtained using the Standard Penetration Test (SPT) method. This method involves driving a split spoon sampler a total of 18 inches using a 140 pound rope and cat-head hammer free falling 30 inches. Samples were also obtained using a 3.0-inch O.D. modified California sampler driven into the soil with a 140-pound hammer free-falling 30 inches. For both sampler types used the number of blows required to drive the sampler the last 12 inches are recorded on the boring logs. The soil samples were placed in plastic bags to maintain the moisture content and transported back to our laboratory for analysis and testing.

The explorations were continuously monitored by a geologist from our firm who examined and classified the soils encountered, obtained representative disturbed and undisturbed soil samples, observed groundwater conditions, and prepared a detailed log of each exploration. Soils were visually classified in general accordance with ASTM D-2488-90, which is described in Figure A-1. An explanation of our boring log symbols is also shown in Figure A-1.

The logs of the test pits and borings completed for the geotechnical evaluation are presented in Figures A-2 through A-26. The exploration logs are based on our interpretation of the field and laboratory data and indicate the various types of soils encountered. They also indicate the depths at which these soils or their characteristics change, although the change might actually be gradual. If the change occurred between samples in the borings the depth was inferred.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES
				SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

- 2.4-inch I.D. split barrel
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	CC	Cement Concrete
	AC	Asphalt Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

- Measured groundwater level in exploration, well, or piezometer
- Groundwater observed at time of exploration
- Perched water observed at time of exploration
- Measured free product in well or piezometer

Graphic Log Contact

- Distinct contact between soil strata or geologic units
- Approximate location of soil strata change within a geologic soil unit

Material Description Contact

- Distinct contact between soil strata or geologic units
- Approximate location of soil strata change within a geologic soil unit

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

GEOENGINEERS

FIGURE A-1

Date(s) Drilled	1/9/2007	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor	Boretec, Inc.	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 1/2"	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	M55 track-mounted drill rig
Total Depth (ft)	23	Surface Elevation (ft)	297	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Depth feet	Recovered (in)	Blows/foot	Sample Number	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0				TS	Dark brown, organic silty fine sand with roots (loose, moist to wet) (topsoil)			
	16	12	1a	SM/ML	Brown silty fine sand to fine sandy silt with organic matter (medium dense, moist) (glacial outwash)	65		
			1b	ML	Brown sandy silt with clay and iron staining (stiff, moist) (weathered glaciomarine drift)	29		
5	16	20	2	CL	Brown-gray sandy silty clay with occasional gravel (very stiff to hard, moist) (glaciomarine drift)	24		%F=62; AL
	10	34	3			27		Blowcount possibly overstated due to gravel in shoe
10	5	43	4			27		Blowcount possibly overstated due to gravel in shoe
				SM/ML	Gray-blue silty fine sand to sandy silt (dense to very dense to hard, moist) (till)			
15	9	38	5			9		
20	6	50/6"	6			7		SA; AL
	5	50/5"	7		- refusal on hard drilling	7		

Elevation feet: 295, 290, 285, 280, 275, 270

Notes: See Figure A-1 for explanation of symbols.

V6_GTBORING P:\0\0829020\00\FINALS\082902000_B.GPJ GEIV6_1.GDT 2/26/07

LOG OF BORING B-1

GeoEngineers

Project:	Skagit Resort Water Park
Project Location:	Bow, Washington
Project Number:	0829-020-00

Figure: A-2
Sheet 1 of 1

Date(s) Drilled	1/9/2007	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor	Boretec, Inc.	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 1/2"	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	M55 track-mounted drill rig
Total Depth (ft)	25.2	Surface Elevation (ft)	299	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
299	0							TS	Dark brown, organic silty fine sand with roots (loose, moist to wet) (topsoil)			
								SM/ML	Brown silty fine sand to clayey silt with iron staining (medium dense/medium stiff, moist) (glacial outwash)			
295												
	5		18	50	1			CL	Gray-brown sandy silty clay (hard, moist) (glaciomarine drift)	27		
290												
	10		9	36	2					14		
			9	76/10"	3			SM/ML	Gray-blue silty fine to coarse sand to sandy clayey silt (very dense/hard, moist) (till)	11		
285												
	15		6	50/6"	4					12		
280												
	20		3	50/3"	5					18		
275												
	25		0	50/2"	6				- refusal on hard drilling			
270												
	30											

Notes: See Figure A-1 for explanation of symbols.

V6_GTBORING P:\0\0829020\00\FINALS\0829-020-00 B.GPJ GEIV6_1.GDT 2/26/07

LOG OF BORING B-2

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-3
Sheet 1 of 1

Date(s) Drilled	1/9/2007	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor	Boretec, Inc.	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 1/2"	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	M55 track-mounted drill rig
Total Depth (ft)	28	Surface Elevation (ft)	286	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	SAMPLES: Sample Number	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
286	0				TS	Dark brown, organic silty fine sand with roots (medium dense, moist to wet) (topsoil)			
					CL	Brown-gray silty clay with fine sand and occasional gravel (stiff to hard, moist) (glaciomarine drift)			
		16	13	1			27		
	5	18	37	2			23		
		18	33	3			24		
	10	18	24	4			32		
	15	3	50/3"	5			27	101	Tv=0.5-0.7 tsf California Sampler
					ML	Gray-blue sandy silt with clay and occasional gravel (hard, moist) (till)			
	20	6	50/6"	6			12		
	25	5	50/2"	7					
			50/1"	8		- refusal on hard drilling	12		California Sampler

Elevation scale: 285, 280, 275, 270, 265, 260. Depth scale: 0, 5, 10, 15, 20, 25, 30.

Notes: See Figure A-1 for explanation of symbols.

LOG OF BORING B-3

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-4
Sheet 1 of 1

Date(s) Drilled	1/9/2007	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor	Boretec, Inc.	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 1/2"	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	M55 track-mounted drill rig
Total Depth (ft)	22	Surface Elevation (ft)	284	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES Recovered (in)	Blows/foot	Sample Number	Water Level	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
	0					TS	Dark brown, organic silty fine sand with roots (loose, moist to wet) (topsoil)			
						CL	Gray-brown sandy silty clay with occasional gravel (very stiff to hard, moist) (glaciomarine drift)			
280										
	5	18	35	1				17		
		18	28	2				30		
275										
	10	18	73	3				30	96	Tv=0.15-0.25 tsf California Sampler
		4	50/4"	4		SM/ML	Gray silty fine to coarse sand to sandy silt with gravel (dense to very dense/hard, moist) (till)	10		
270										
	15	18	33	5			- becomes clayey	9		SA
265										
	20	18	72	6				12		
							- refusal on hard drilling or gravel			
260										
	25									
255										
	30									

Notes: See Figure A-1 for explanation of symbols.

LOG OF BORING B-4

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-5
Sheet 1 of 1

Date(s) Drilled	1/9/2007	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor	Boretec, Inc.	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 1/2"	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	M55 track-mounted drill rig
Total Depth (ft)	22.25	Surface Elevation (ft)	276	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	SAMPLES: Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0							TS	Dark brown, organic silty fine sand with roots (loose, moist to wet) (topsoil)			
275								CL	Brown-gray sandy silty clay with occasional gravel (very stiff to hard, moist) (glaciomarine drift)			
			18	20	1					25		
	5		6	41	2					22		
270												
			18	21	3					23		%F=76; AL
	10		18	16	4					27		
265												
								CL	Blue-gray clay with sand and occasional gravel (medium stiff to stiff, moist)			
	15		18	8	5					28		%F=85; AL California Sampler
260												
								SM/ML	Blue-gray silty fine to coarse sand to sandy silt with occasional gravel (dense to very dense/hard, moist) (till)			
	20		6	76	6					11		SA, California Sampler
255									- refusal on hard drilling or gravel			
			1	50/1"	7					9		
	25											
250												
	30											

Notes: See Figure A-1 for explanation of symbols.

V6_GTBORING P:\0\0829020\00\FINALS\0829-020-00 B.GPJ GEIV6_1.GDT 2/26/07

LOG OF BORING B-5

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-6
Sheet 1 of 1

Date(s) Drilled	1/24/2007	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor	Boretec, Inc.	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 1/2"	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	M55 track-mounted drill rig
Total Depth (ft)	40	Surface Elevation (ft)	271	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0							TS	Dark brown, organic silty fine sand with roots (loose, moist to wet) (topsoil)			
270												
			18	30	1a			CL	Brown silty clay with fine sand with orange staining (stiff to very stiff, moist) (glaciomarine drift)	61		
					1b					30		
	5		18	23	2							
265												
			16	22	3					23		
	10		16	22	4					32	91	Tv=0.3-0.4 California Sampler
260												
			18	9	5			CL	Brown-gray to gray silty clay, trace sand (medium stiff to stiff, moist)	40		
	15		18	7	6					42		
255												
	20		0	7	7							No recovery
250												
	25		0	18	8							No recovery
245												
								SM/ML	Gray silty fine to coarse sand to fine sandy silt with gravel (very dense/hard, moist) (glacial till)			
	30											

Notes: See Figure A-1 for explanation of symbols.

V6_GTBORING P:\0\0829020\00\FINALS\0829-020-00 B.GPJ GEIV6_1.GDT 2/26/07

LOG OF BORING B-6

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-7
Sheet 1 of 2

Elevation feet	Depth feet	Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	30		6	50/6"	9					7		
240												
	35		2	50/2"	10					6		
235												
	40		1	50/1"	11							
230												
	45											
225												
	50											
220												
	55											
215												
	60											
210												
	65											
205												

V5_GTBORING P:\0\0829020\00\FINALS\0829-020-00 B.GPJ GEIV6_1.GDT 2/26/07

LOG OF BORING B-6 (continued)

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-7
Sheet 2 of 2

Date(s) Drilled	1/24/2007	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor	Boretec, Inc.	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 1/2"	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	M55 track-mounted drill rig
Total Depth (ft)	50.5	Surface Elevation (ft)	266	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	SAMPLES: Sub-Sample	SAMPLES: Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
	0								TS	Dark brown, organic silty fine sand with roots (loose, moist to wet) (topsoil)			
265													
			18	14	[	1a							
						1b			CL	Gray silty clay with fine sand and occasional gravel (stiff to very stiff, moist) (glaciomarine drift)	129 / 30		
	5		18	20		2					29		
260													
			18	15		3					32		
	10		18	9		4			CL	Blue-gray clay with silt (medium stiff, moist)	34		
255													
			18	8		5							
	15		18	15		6					30	95	Tv=0.45-0.55 tsf California Sampler
250													
	20		18	6		7							
245									CL	Gray clay with fine to medium sand, silt and occasional gravel (medium stiff, moist)			
	25		18	4		8					43		
240													
	30												

Notes: See Figure A-1 for explanation of symbols.

V6_GTBORING P:\0\0829020\00\FINALS\0829-020-00 B.GPJ GEIV6_1.GDT 2/26/07

LOG OF BORING B-7

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-8
Sheet 1 of 2

Elevation feet	Depth feet	Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	30		18	7		9					22		
235													
	35		9	43		10					69		SA
230									SM	Gray silty fine to coarse sand with gravel to sandy gravel with silt (very dense, moist) (glacial till)			
	40		6	50/6"		11							
225													
	45		8	50/8"		12					6		
220													
	50		4	50/4"		13							
215													
	55												
210													
	60												
205													
	65												
200													

LOG OF BORING B-7 (continued)

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-8

Date(s) Drilled	1/24/2007	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor	Boretec, Inc.	Drilling Method	Hollow Stem Auger	Sampling Methods	SPT
Auger Data	3 1/2"	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	M55 track-mounted drill rig
Total Depth (ft)	40.5	Surface Elevation (ft)	280	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	SAMPLES: Sample Number	Water Level	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
280	0					TS	Dark brown, organic silty fine sand with roots (loose, moist to wet) (topsoil)			
		9	4	1						
						SM	Light brown silty fine sand (loose, wet) (glacial outwash)			
275	5	18	7	2				28		
						CL	Brown-gray silty clay with fine sand (stiff, moist) (glaciomarine drift)			
		18	14	3				29		
270	10	18	11	4						
		18	12	5				30		
						CL	Blue gray clay with silt (medium stiff, moist)			
265	15	18	14	6				25	95	Tv=0.38 tsf California Sampler
						SM/ML	Gray silty fine to course sandy silt with occasional gravel and clay (dense/hard, moist) (till)			
260	20	18	33	7				8		SA
255	25	16	37	8				10		
250	30									

Notes: See Figure A-1 for explanation of symbols.

V6_GTBORING P:\0\0829020\00\FINALS\0829-020-00 B.GPJ GEIV6_1.GDT 2/26/07

LOG OF BORING B-8

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-9
Sheet 1 of 2

Elevation feet	Depth feet	SAMPLES Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
250	30		18	64		9			SP-SM	Gray fine to medium sand with silt (very dense, wet)	11		
									SM/ML	Gray sandy silt to silty fine to coarse sand with clay and occasional gravel (very dense/hard, moist)			
245	35		6	50/6"		10				- disturbed sample			
240	40		4	50/4"		11				- disturbed sample			
235	45												
230	50												
225	55												
220	60												
215	65												

V6_GTBORING P:\0\0829020\00\FINALS\0829-020-00 B.GPJ GEIV6_1.GDT 2/26/07

LOG OF BORING B-8 (continued)

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-9
Sheet 2 of 2

Date(s) Drilled	1/14/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	17	Surface Elevation (ft)	290	Groundwater Elevation (ft)	288.7
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
290	0	⊠			1			TS	Dark brown organic silty fine sand with roots (loose, moist to wet)	69		
		⊠			2	▽		SM/ML	Brown silty fine sand to sandy clayey silt with occasional gravel and rootlets (loose, wet) (fill)	64		
		⊠			3				- possibly abandoned utility line	35		
								CL	Gray-brown sandy silty clay with occasional gravel (stiff to very stiff, wet) (glaciomarine drift)			
285	5											
		⊠			4							
		⊠			5							
		⊠			6					21		
280	10											
		⊠			7					25		
		⊠			8			SM/ML	Dark gray silty fine to coarse sand to sandy silt with occasional gravel (dense/hard, moist) (till)	10		
									- with large cobbles			
									- density decreases becomes clayey			
275	15	⊠			9					11		
		⊠			10					11		
270	20											

Moderate groundwater seepage observed from 1.3 feet
Slight caving observed at 1.5 feet

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

V6_GTBORING P:\0\0829020\00\FINALS\829020-1.GPJ GEIV6_1.GDT 2/26/07

LOG OF TEST PIT TP-1

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-10
Sheet 1 of 1

Date(s) Drilled	1/15/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	7.5	Surface Elevation (ft)	263	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
	0	⊠				1			TS	Dark brown organic silty fine sand to fine sandy silt with roots and organic matter			
		⊠				2			ML/CL	Gray-brown fine sandy clayey silt to silty clay with iron staining (stiff, moist to wet) (weathered glaciomarine drift)	20		
260		⊠				3			CL	Gray-brown silty clay with fine sand (very stiff to hard, moist) (glaciomarine drift)	33		
		⊠				4							
	5												
		⊠				5					33		
255										Moderate groundwater seepage observed from 0.3 to 0.4 feet Moderate caving observed at 1 foot			
	10												
250													
	15												
245													
	20												

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

V6_GTBORING P:\0\0829020\00\FINALS\829020-1.GPJ GEIV6_1.GDT 2/26/07

LOG OF TEST PIT TP-10

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-19
Sheet 1 of 1

Date(s) Drilled	1/15/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	7	Surface Elevation (ft)	269	Groundwater Elevation (ft)	267.75
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
	0	⊠				1	▼		TS	Dark brown organic silty fine sand to fine sandy silt with roots and organic matter (loose, wet) (topsoil)	85		
		⊠				2			ML	Brown-gray fine sandy silt with iron staining (medium dense, moist to wet) (weathered glaciomarine drift)	37		
									CL	Gray-brown silty clay with sand (stiff, moist) (glaciomarine drift)			
265		⊠				3							
	5												
		⊠				4				- becomes very stiff to hard	27		

Moderate groundwater seepage observed from 1 to 1.5 feet
Minor to moderate caving observed below 1 foot

260 — 10 — 255 — 15 — 250 — 20

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-11

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-20
Sheet 1 of 1

Date(s) Drilled	1/15/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	17	Surface Elevation (ft)	265	Groundwater Elevation (ft)	264
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
265	0	⊠			1	▼		TS	Dark brown organic silty fine sand with roots (loose, moist) (topsoil)	161		
		⊠			2			ML	Dark gray fine sandy clayey silt with occasional gravel and iron staining (medium stiff, moist to wet) (weathered glaciomarine drift)	38		
		⊠			3							
		⊠			4			CL	Gray-brown silty clay with sand (very stiff, moist) (glaciomarine drift)	28		
260	5											
		⊠			5							
255	10											
		⊠			6					33		
		⊠			7							
250	15											
								CL	Gray silty clay (medium stiff, moist)			
		⊠			8					35		
245	20											

Slow groundwater seepage observed at 1 feet
Minor caving observed at 1 feet

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-12

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-21
Sheet 1 of 1

Date(s) Drilled	1/15/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	17	Surface Elevation (ft)	272	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
	0	⊠				1			TS	Dark brown organic silty fine sand to fine sandy silt with occasional gravel, roots and organic matter (loose, moist to wet) (topsoil)	63		
270		⊠				2			ML	Gray-brown fine sandy clayey silt with iron staining (medium stiff, moist to wet) (weathered glaciomarine drift)	29		
									CL	Gray-brown silty clay with sand (very stiff, moist) (glaciomarine drift)			
		⊠				3					25		
	5												
265													
	10	⊠				4				- becomes very stiff to hard			
260													
	15								CL	Gray silty clay (medium stiff to stiff, moist)			
		⊠				5					43		
255													
	20												

Slow groundwater seepage observed at 2 feet
Minor caving observed at 2 feet

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-13

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-22
Sheet 1 of 1

V6_GTBORING P:\0\0829020\00\FINALS\082902001.GPJ GEIV6_1.GDT 2/26/07

Date(s) Drilled	1/15/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	17	Surface Elevation (ft)	266	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0								ML	Rust brown organic fine sandy silt with occasional gravel (medium stiff, moist to wet) (topsoil/disturbed soil)			
265		⊠				1					71		
									ML	Brown-gray fine sandy silt (medium stiff, moist to wet) (weathered glaciomarine drift)			
		⊠				2					33		
		⊠				3							
									CL	Gray-brown silty clay with sand (stiff to very stiff, moist)			
	5												
260													
		⊠				4				- becomes hard	28		
	10												
255													
		⊠				5				- decreasing stiffness			
	15												
250									CL	Gray silty clay (medium stiff to stiff, moist)			
		⊠				6					37		
	20												

Slow groundwater seepage observed at 1 to 1.5 feet
No caving observed

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-14

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-23
Sheet 1 of 1

V6_GTBORING P:\0\0829020\00\FINALS\829020-1.GPJ GEIV6_1.GDT 2/26/07

Date(s) Drilled	1/15/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	16.5	Surface Elevation (ft)	276	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0	☒				1			TS	Dark brown silty fine sand with organic matter and rootlets (loose, moist to wet) (topsoil)	50		
275									SM	Brown-gray silty fine sand with sandy silt seams (medium dense, moist to wet)			
		☒				2					27		
		☒				3			CL	Gray-brown silty clay with sand and occasional gravel (medium stiff to stiff, moist) (glaciomarine drift)			
	5												
270										- grades to very stiff to hard			
		☒				4					28		
	10												
265										- decreasing stiffness			
		☒				5							
	15	☒				6			CL	Gray silty clay (medium stiff to stiff, moist)	32		
260													

Slow groundwater seepage observed at 2 to 3 feet
Minor to moderate caving observed at 1.5 to 2 feet

20

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-15

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-24
Sheet 1 of 1

Date(s) Drilled	1/15/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	16	Surface Elevation (ft)	288	Groundwater Elevation (ft)	286
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval / Recovered (in)	Blows/foot	Sub-Sample / Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0						TS	Dark brown organic silty fine sand with gravel, roots and wood (loose to medium dense, moist to wet) (topsoil)			
		☒		1					54		
		☒		2			SM	Rust-brown gravelly silty fine sand (medium dense, wet)	27		
					▽		ML	Gray-brown fine sandy silt with iron staining (medium stiff, moist to wet) (weathered glaciomarine drift)			
285		☒		3							
							CL	Gray-brown silty clay with sand (stiff to very stiff, moist) (glaciomarine drift)			
	5										
280		☒		4				- becomes very stiff to hard	24		
	10										
		☒		5							
275		☒		6			SM	Blue-gray silty fine sand with occasional clay, gravel and cobbles (dense, to very dense, moist) (till)	14		
		☒		7					11		
	15										
		☒		8							
270											
	20										

Rapid groundwater seepage observed at 2 to 2.5 feet
Minor to moderate caving observed at 2.5 feet

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-16

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-25
Sheet 1 of 1

Date(s) Drilled	1/15/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	17	Surface Elevation (ft)	285	Groundwater Elevation (ft)	284.5
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample / Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
285	0					▽		TS	Dark brown silty fine sand with roots, organic matter, and rust staining (loose, wet) (topsoil)			
		⊠			1					84		
								SM	Gray-brown silty fine sand (medium dense, moist to wet) (weathered glaciomarine drift)			
		⊠			2					27		
								CL	Gray silty clay with sand (stiff to very stiff, moist) (glaciomarine drift)			
		⊠			3							
280	5											
									- becomes very stiff to hard			
275	10	⊠			4					25		
		⊠			5							
								SM	Gray silty fine to coarse sand with occasional clay, gravel, and occasional cobbles (very dense, moist) (till)			
		⊠			6					9		
270	15											
		⊠			7							
									Moderate to rapid groundwater seepage observed at 0.3 to 0.7 foot Moderate caving observed at 1 foot			
265	20											

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-17

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-26
Sheet 1 of 1

Date(s) Drilled	1/14/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	16.5	Surface Elevation (ft)	302	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0	⊠			1			TS	Dark brown organic silty fine sand with roots and occasional gravel (loose, moist) (topsoil)	52		
		⊠			2			ML	Brown fine sandy silt with iron staining (medium stiff, moist) (weathered glaciomarine drift)	41		
300												
		⊠			3			CL	Gray-brown sandy silty clay with occasional gravel (stiff to very stiff, moist) (glaciomarine drift)	23		
	5											
295												
		⊠			4							
	10	⊠			5				- with occasional gravel and large cobbles	26		
290		⊠			6							
		⊠			7			SM/ML	Gray-blue silty fine to coarse sand to sandy silt with occasional gravel (dense to very dense/very stiff to hard, moist) (till)	11		
	15	⊠			8					10		
		⊠			9					11		
285									Slow pockets of groundwater seepage observed at 2 feet No caving observed			
	20											

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-2

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-11
Sheet 1 of 1

Date(s) Drilled	1/14/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	17	Surface Elevation (ft)	299	Groundwater Elevation (ft)	296.7
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0	⊠				1			TS	Dark brown organic silty fine sand (loose, moist) (topsoil)	52		
									SM	Brown silty fine sand (medium dense, moist to wet) (glacial outwash)			
		⊠				2	▼				38		
		⊠				3					24		
295		⊠				4			CL	Gray-brown sandy silty clay with trace gravel (stiff, moist) (glaciomarine drift)			
	5												
										- becomes very stiff to hard			
		⊠				5					28		
290													
	10												
		⊠				6							
									ML	Blue-gray silt with clay and fine sand and occasional gravel (stiff, moist) (till)			
285		⊠				7					13		
	15								SM	Gray silty fine to coarse sand with gravel (very dense, moist)			
		⊠				8					10		

Moderate groundwater seepage observed at 2.3 feet
Moderate caving observed at 1 foot

280

20

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-3

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-12
Sheet 1 of 1

Date(s) Drilled	1/14/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	17	Surface Elevation (ft)	274	Groundwater Elevation (ft)	Not Determined
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0	⊠				1			TS	Dark brown organic silty fine sand with roots (loose, moist) (topsoil)	71		
		⊠				2			ML/CL	Gray-brown fine sandy silt to silty clay (medium stiff, moist to wet) (weathered glaciomarine drift)	31		
270		⊠				3			CL	Gray-brown sandy silty clay (stiff, moist) (glaciomarine drift)			
	5									- becomes very stiff to hard			
		⊠				4					44		
265	10												
		⊠				5			CL	Gray silty clay (medium stiff, moist)			
260	15	⊠				6					45		

Slow groundwater seepage observed at 2 feet
No caving observed

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-4

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-13
Sheet 1 of 1

V6_GTBORING P:\0\0829020\00\FINALS\829020-1.GPJ GEIV6_1.GDT 2/26/07

Date(s) Drilled	1/14/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	17	Surface Elevation (ft)	287	Groundwater Elevation (ft)	285.2
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
	0	⊠				1			TS	Dark brown organic silty fine sand with roots (loose, moist) (topsoil)	37		
285		⊠				2	▽		SM	Rust brown-gray silty fine sand with occasional organic matter (medium dense, moist to wet) (glacial outwash)	23		
		⊠				3			CL	Gray-brown sandy silty clay with iron staining (stiff, moist) (glaciomarine drift)			
	5												
280										- sand content decreases			
		⊠				4				- becomes very stiff to hard	28		
	10												
275													
		⊠				5			CL	Gray silty clay (medium stiff, moist)			
	15												
		⊠				6					36		
270		⊠				7					45		
	20												

Slow groundwater seepage observed at 1.8 feet
No caving observed

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-5

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-14
Sheet 1 of 1

V6_GTBORING P:\0\0829020\00\FINALS\082902001-1.GPJ GEIV6_1.GDT 2/26/07

Date(s) Drilled	1/14/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	17.5	Surface Elevation (ft)	275	Groundwater Elevation (ft)	273.5
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
275	0	☒			1			TS	Dark brown organic silty fine sand with rootlets and occasional gravel	87		
		☒			2	▽		ML	Gray-brown fine sandy clayey silt with iron staining and occasional gravel (stiff, moist to wet) (weathered glaciomarine drift)	34		
		☒			3			CL	Gray-brown silty clay with sand (very stiff, moist) (glaciomarine drift)			
270	5											
		☒			4					30		
265	10											
		☒			5							
260	15							CL	Gray silty clay (medium stiff to stiff, moist)			
		☒			6					28		
255	20											

Slow groundwater seepage observed at 1.5 feet
No caving observed

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-6

GeoEngineers

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-15
Sheet 1 of 1

Date(s) Drilled	1/14/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	8	Surface Elevation (ft)	265	Groundwater Elevation (ft)	263
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample	Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
265	0	⊠				1			TS	Dark brown organic silty fine sand with roots and wood fragments (loose, moist to wet) (topsoil)	138		
		⊠				2	▽		ML	Brown fine sandy silt with occasional gravel and cobbles (medium stiff to stiff, moist to wet) (weathered glaciomarine drift)	35		
		⊠				3			CL	Gray fine sandy silty clay (stiff, moist) (glaciomarine drift)			
260	5												
		⊠				4				- becomes very stiff to hard	33		
255	10												
250	15												
245	20												

Slow groundwater seepage observed at 2 feet
No caving observed

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

V6_GTBORING P:\0\0829020\00\FINALS\829020-1.GPJ GEIV6_1.GDT 2/26/07

LOG OF TEST PIT TP-7

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-16

Date(s) Drilled	1/14/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	5.9	Surface Elevation (ft)	263	Groundwater Elevation (ft)	262.5
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft^3	OTHER TESTS AND NOTES
	0	⊠			1	▽		TS	Dark brown organic silty fine sand with roots (loose, moist to wet) (topsoil)	72		
		⊠			2			ML	Gray-brown fine sandy clayey silt with iron staining (medium stiff, moist to wet) (weathered glaciomarine drift)	41		
260		⊠			3			CL	Gray-brown sandy silty clay (stiff to very stiff, moist to wet) (glaciomarine drift)	31		
	5	⊠			4							

Rapid groundwater seepage observed at 0.5 foot
Minor to moderate caving observed at 1 foot

Elevation scale: 255, 250, 245; Depth scale: 10, 15, 20

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-8

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-17
Sheet 1 of 1

V6_GTBORING P:\0\0829020\00\FINALS\829020-1.GPJ GEIV6_1.GDT 2/26/07

Date(s) Drilled	1/14/07	Logged By	A. Fickeisen	Checked By	S. Cool
Drilling Contractor		Drilling Method		Sampling Methods	Disturbed samples
Auger Data		Hammer Data		Drilling Equipment	Tracked Excavator
Total Depth (ft)	16.5	Surface Elevation (ft)	271	Groundwater Elevation (ft)	269
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0							TS	Dark brown-black organic silty fine sand to fine sandy silt (loose, moist to wet) (topsoil)			
270		⊠			1					128		
		⊠			2	▽		ML/CL	Brown-gray fine sandy clayey silt to silty clay with iron staining (medium stiff, moist to wet) (weathered glaciomarine drift)	32		
								CL	Gray silty clay with sand (stiff, moist) (glaciomarine drift)			
		⊠			3							
	5											
265												
		⊠			4				- becomes very stiff to hard	29		
	10	⊠			5							
260												
	15	⊠			6			CL	Gray silty clay (medium stiff to stiff, moist)			
255												
		⊠			7					43		
	20											

Rapid groundwater seepage observed at 2 feet
Moderate caving observed at 2 feet

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to 0.5 foot.

LOG OF TEST PIT TP-9

GEOENGINEERS

Project: Skagit Resort Water Park
Project Location: Bow, Washington
Project Number: 0829-020-00

Figure: A-18
Sheet 1 of 1

GEOENGINEERS

APPENDIX B
LABORATORY TESTING

APPENDIX B
LABORATORY TESTING

Soil samples obtained from the explorations were transported to our laboratory and examined to confirm or modify field classifications, as well as to evaluate index properties of the soil samples. Representative samples were selected for laboratory testing consisting of the determination of the moisture content, sieve analysis, and Atterberg limits (plasticity characteristics). The tests were performed in general accordance with test methods of the American Society for Testing and Materials (ASTM) or other applicable procedures.

MOISTURE CONTENT TESTING

Moisture content tests were completed in general accordance with ASTM D 2216 for representative samples obtained from the explorations. The results of these tests are presented on the exploration logs in Appendix A at the depths at which the samples were obtained.

SIEVE ANALYSES

Sieve analyses were performed on selected samples in general accordance with ASTM D 422 to determine the sample grain size distribution. The wet sieve analysis method was used to determine the percentage of soil greater than the U.S. No. 200 mesh sieve. The results of the sieve analyses were plotted, classified in general accordance with the Unified Soil Classification System (USCS), and are presented in Figures B-1 and B-2.

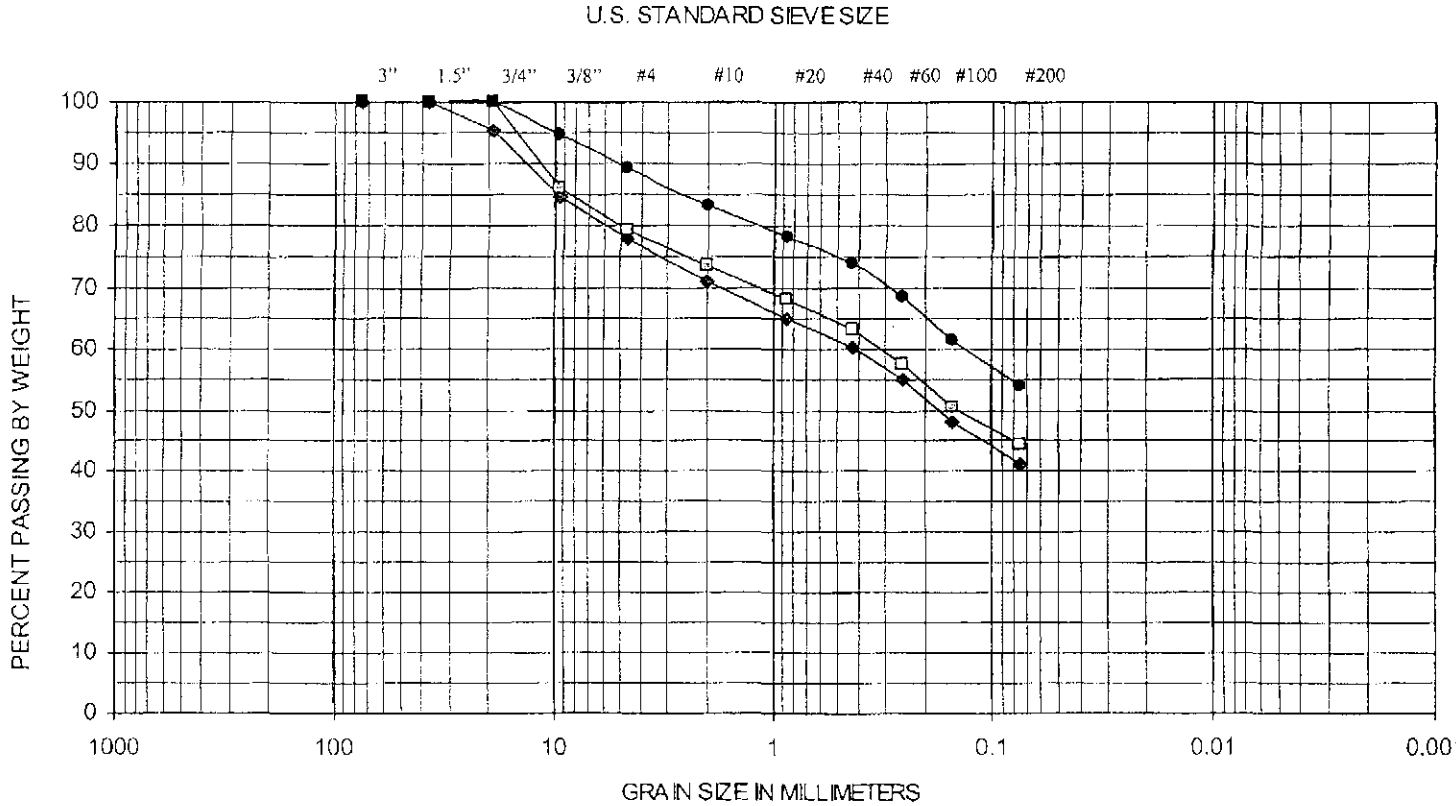
ATTERBERG LIMITS TESTING

Atterberg limits tests were performed on selected fine-grained soil samples. The tests were used to classify the soils as well as to evaluate index properties. The liquid limit and the plastic limit were estimated through a procedure performed in general accordance with ASTM D 4318. The results of the Atterberg limits tests are summarized in Figure B-3.

CONSOLIDATION TESTING

The consolidation characteristics of a selected fine-grained soil sample obtained from the exploratory borings was determined in our laboratory in general accordance with ASTM D 2435 test procedures. Samples on which consolidation testing was completed are designated with a "CS" in the column labeled "Other Tests and Notes" on the summary logs. The consolation test results are presented on Figure B-4 in this appendix.

0829-020-00 AF2 1-26-07 (Sieve.ppt)



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

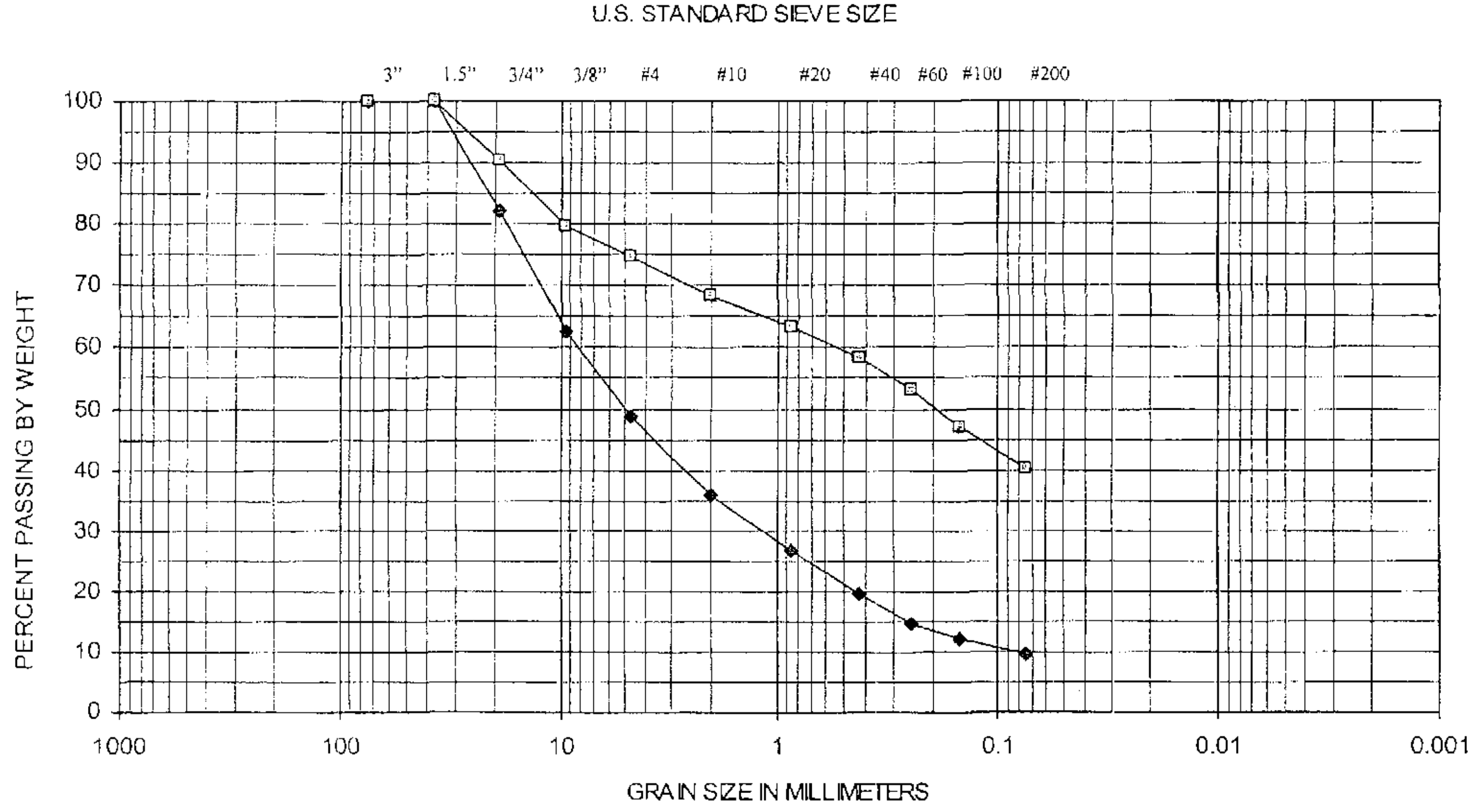
SYMBOL	DEPTH (FEET)	SOURCE	SOIL CLASSIFICATION
◆	20.5	B-1	Gray silty fine to coarse sand with gravel (SM)
□	15	B-4	Gray silty fine to coarse sand with gravel (SM)
●	20	B-5	Gray sandy silt with occasional gravel (ML)

SIEVE ANALYSIS RESULTS

FIGURE B-1

0829-020-00 AF2 1-29-07 (Sieve.ppt)

GEOENGINEERS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	DEPTH (FEET)	SOURCE	SOIL CLASSIFICATION
◆	36	B-7	Gray sandy fine to coarse gravel with silt (GW-GM)
□	20	B-8	Gray silty fine to coarse sand with gravel (SM)

SIEVE ANALYSIS RESULTS

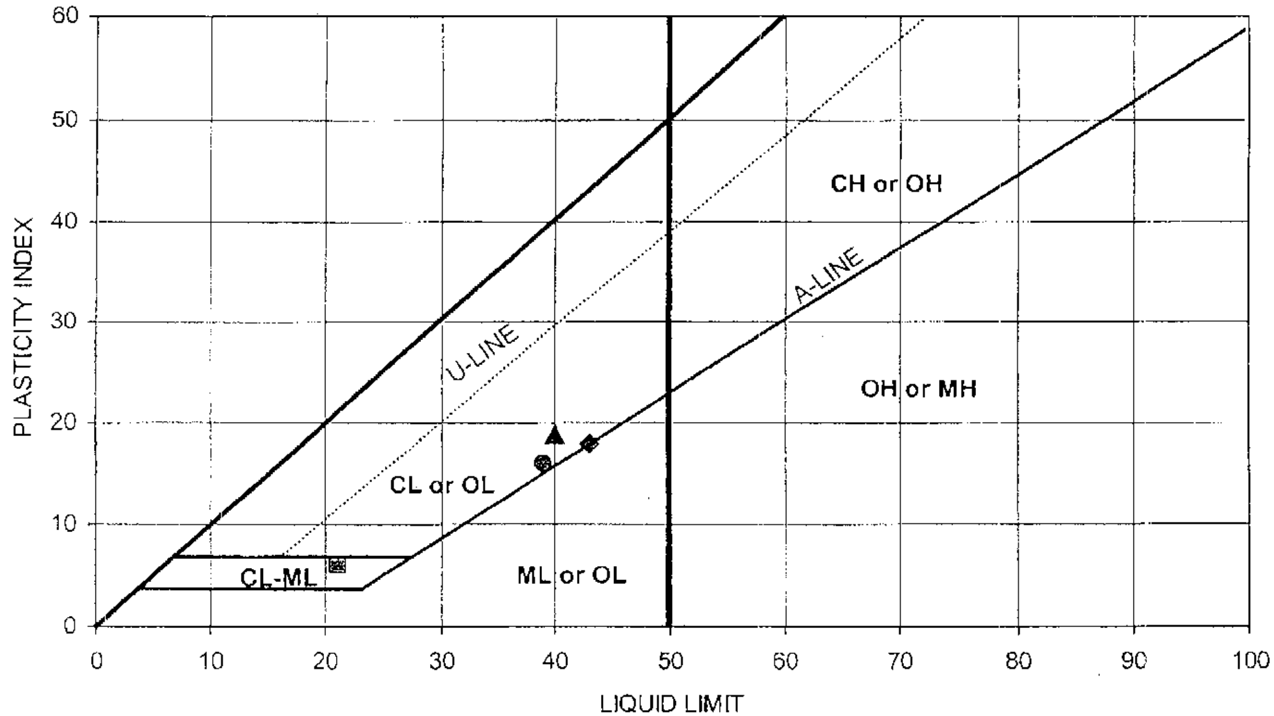
FIGURE B-2

GEOENGINEERS

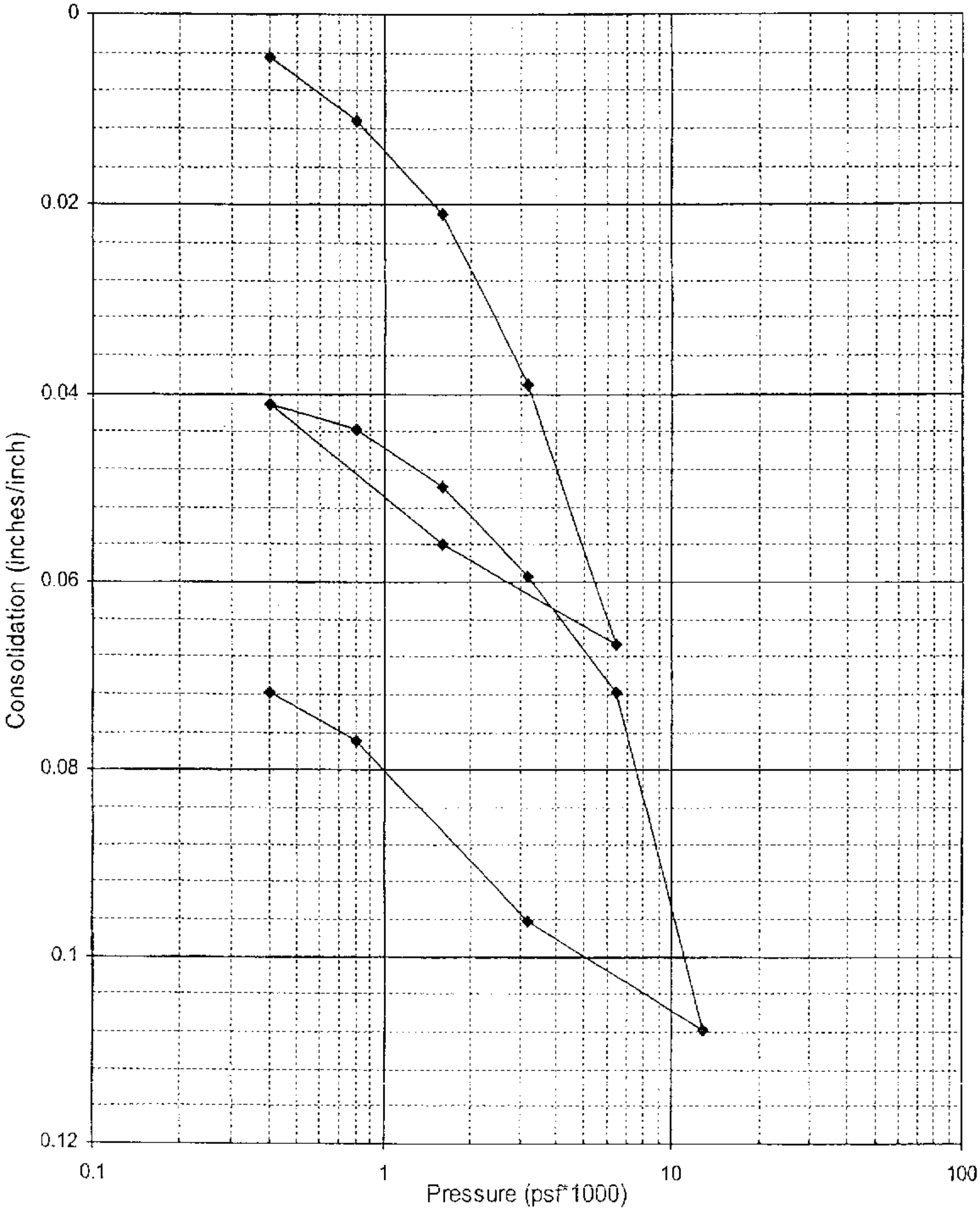
ATTERBERG LIMITS TEST RESULTS

FIGURE B-3

PLASTICITY CHART



SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	SOIL DESCRIPTION
◆	B-1	5.5'	24	43	18	Brown clay (CL)
▦	B-1	20.5'	7	21	6	Gray clay-silt (CL-ML)
▲	B-5	7.5'	23	40	19	Brown clay (CL)
●	B-5	15'	28	39	16	Gray clay (CL)



BORING NUMBER	SAMPLE DEPTH (FEET)	SOIL CLASSIFICATION	INITIAL MOISTURE CONTENT	INITIAL DRY DENSITY (LBS/FT³)
B-8	16.0	Gray lean clay (CL)	33.5	89.5

0829-020-00 JVJ : JVJ : jvj 2-20-07 (consol.ppt)

GEOENGINEERS

CONSOLIDATION TEST RESULTS

FIGURE B-4

APPENDIX C
REPORT LIMITATIONS AND GUIDELINES FOR USE

APPENDIX C
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report has been prepared for the exclusive use of the Upper Skagit Indian Tribe and their authorized agents. This report may be made available to other members of the design team. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

This report has been prepared for the proposed Skagit Resort Waterpark to be located in Bow, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

---

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org .

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

MOST GEOTECHNICAL AND GEOLOGIC FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

GEOTECHNICAL ENGINEERING REPORT RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT COULD BE SUBJECT TO MISINTERPRETATION

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

DO NOT REDRAW THE EXPLORATION LOGS

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

Contractors Are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical, Geologic and Environmental Reports Should Not be Interchanged

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of biological pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of biological pollutants and no conclusions or inferences should be drawn regarding biological pollutants, as they may relate to this project. The term "biological pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.

Phase I Environmental Site Assessment

Tax Parcels P35839, P123324, P50416, P50414, P50500, and P119078
Bow, Washington

for
Upper Skagit Indian Tribe

July 1, 2010

GeoEngineers

600 Dupont Street
Bellingham, Washington 98225
360.647.1510

Phase I Environmental Site Assessment
Tax Parcels P35839, P123324, P50416, P50414, P50500, and P119078
Bow, Washington

File No. 00829-021-01

July 1, 2010

Prepared for:

Upper Skagit Indian Tribe
5984 North Darrk Lane
Bow, Washington 98232

Attention: Bob Hayden

Prepared by:

GeoEngineers, Inc.
600 Dupont Street
Bellingham, Washington 98225
360.647.1510

State of Washington Licensed Geologist 2625 7/1/2010 Ronald M. Bek

Robert Gordon State of Washington 22151 Registered Professional Engineer 7/1/10

Ronald M. Bek, LG
Project Manager

J. Robert Gordon, PE
Principal

RMB:JRG:ims
0829-021-01 SharePoint

DECLARATIONS

- **"I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in Sec. 312.10 of 40 CFR Part 312."***
- **"I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. I performed and/or developed the all appropriate Inquiries in conformance with the standards and practices set forth in 40 CFR Part 312."***

**A person who does not qualify as an Environmental Professional may assist in the conduct of all appropriate inquiries in accordance with ASTM E 1527-05, if such person is under the supervision or responsible charge of a person meeting the definition of an environmental professional when conducting such activities*

GeoEngineers

Table of Contents

LIST OF FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AAI – All Appropriate Inquiries

AST – aboveground storage tank

ASTM – American Society for Testing and Materials

CERCLA – Comprehensive Environmental Response, Compensation and Liability Act

Ecology – Washington State Department of Ecology

EPA – U.S. Environmental Protection Agency

ESA – Environmental Site Assessment

LG – licensed geologist

PCBs – polychlorinated biphenyls

REC – *recognized environmental condition*

USGS – United States Geological Survey

UST – underground storage tank

EXECUTIVE SUMMARY

This report summarizes results of GeoEngineers' All Appropriate Inquiries (AAI) Phase I Environmental Site Assessment (ESA) for Tax Parcels P35839, P123324, P50416, P50414, P50500, and P119078 located in Bow, Washington. The Phase I ESA was conducted in January 2010 for Upper Skagit Indian Tribe. Results of our Phase I ESA indicate the historical land use of the subject property has been restricted to residential and logging. This Phase I ESA has revealed no evidence of recognized environmental conditions (RECs) in connection with the subject property with the exception of concrete sealant, motor oil, kerosene, diesel fuel, and power steering fluid storage within the pole building. No soil staining or other visual evidence of releases was observed from the containers.

Two potential off-site RECs were identified during our research:

- The Thousand Trails site located northwest of the subject property was formerly listed in Washington State Department of Ecology's (Ecology) leaking underground storage tank database. Thousand Trails was reported cleaned in 1995. Ecology did not issue a No Further Action opinion letter for Thousand Trails, meaning Ecology did not perform a formal review of the cleanup report for the site.
- A 10,000 gallon unleaded fuel UST is located west of the northwest corner of the subject property. The UST is in good working condition and no leaks have occurred based on the information obtained during our study.

Impacts to the subject property, should a major release occur (or have occurred) would be a manifestation of groundwater contamination migrating from Thousand Trails and the above referenced UST. The subject property is underlain by relatively impermeable glacial soils that would inhibit contamination migrating to the subject property. Evidence of petroleum contamination was not encountered in monitoring wells installed by others between Thousand Trails and the 10,000 gallon UST and the subject property or on the subject property. State law exempts property owners from fiscal liability for cleanup from off-site sources.

This Executive Summary should be used only in the context of the full report for which it is intended.

1.0 INTRODUCTION

This report summarizes the results of the Phase I Environmental Site Assessment (ESA) of Tax Parcels P35839, P123324, P50416, P50414, P50500, and P119078 ("subject property") in the Bow area of Skagit County. The subject property is approximately 132 acres in size and is undeveloped with the exception of a pole building. The subject property is shown relative to surrounding physical features in Vicinity Map, Figure 1. The layout of the subject property and surrounding properties is shown on the Site Plan and Surrounding Uses, Figure 2.

The subject property is currently owned by the Upper Skagit Indian Tribe (USIT). We understand results of this Phase I ESA will be used by USIT as part of their evaluation of potential environmental liabilities associated with placing the subject property in tribal trust lands.

GeoEngineers provided geotechnical engineering services for the proposed Skagit Resort Water Park which is proposed to be constructed on the subject property. The results of our previous study were presented in our report titled "Geotechnical Engineering Services Report, Proposed Skagit Resort Water Park, Bow, Washington", dated February 26, 2007. GeoEngineers also completed a Phase I ESA for the subject property in 2007. The results of our previous Phase I ESA were presented in our report titled "Phase I Environmental Site Assessment, Tax Parcels P35839, P123324, P50416, and P50414, Bow, Washington", dated October 26, 2007. Tax Parcels P50500 and P119078 are two parcels currently owned by USIT that have been added to the subject property for this Phase I ESA. Pertinent information from our previous geotechnical engineering study and Phase I ESA is included in this Phase I ESA report where appropriate. This report has been prepared for the exclusive use of USIT. Because this environmental report is not intended for use by others, no one except the USIT should rely on this report without first conferring with GeoEngineers.

1.1 Phase I ESA Scope of Services

The purpose of this Phase I ESA is to identify recognized environmental conditions1 (RECs) in connection with the subject property. Our scope of services is in general accordance with American Society for Testing and Materials (ASTM) Standard E 1527-05 for Phase I ESAs and the U.S. Environmental Protection Agency's (EPA's) Federal Standard 40 CFR Part 312 "Standards and Practices for All Appropriate Inquiries (AAI)," which are intended to permit a user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner or bona fide prospective purchaser limitations on liability under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The standard outlines the practice that constitutes "all

[1] Recognized environmental conditions are defined in ASTM E 1527-05 as "the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater or surface water of the property. The term includes hazardous substances or petroleum products even under conditions in compliance with laws. The term is not intended to include *de minimis* conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies."

appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice" as defined by 42 U.S.C. §9601. Our services, described below, were completed in general accordance with our proposal dated January 11, 2010. These services were completed by, or under the direction of, an environmental professional as described in 40 CFR Part 312.

Our specific scope of services for this Phase I ESA was as follows:

Review readily available environmental reports and/or other relevant documents pertaining to environmental conditions at the subject property.

Review the results of a federal, state, local and tribal environmental database search provided by an outside environmental data service for listings of properties with known or suspected environmental concerns on or near the subject property within the search distances specified by ASTM. Our database and file review search also included a review of Washington State Department of Ecology (Ecology) websites for readily available information (publications and reports) concerning area-wide soil and groundwater contamination on or adjacent to the subject property.

Identify a key site manager with specific knowledge of past and present property use and interview using email and phone communication.

Interview a representative of the local health department to gather information or fill data gaps regarding the history of the subject property and surrounding properties relative to the likely presence of hazardous substances.

Interview representatives from Wilson Engineering, LLC and Associated Earth Sciences, Inc. regarding groundwater monitoring wells installed at the subject property and other wells installed near the subject property regarding subsurface conditions encountered at the well sites.

Review historical aerial photographs, historical atlases and topographic maps, and land use and tax assessor records, as available and appropriate, to identify past development history on and adjacent to the subject property relative to the possible use, generation, storage, release or disposal of hazardous substances. We attempted to identify uses of the subject property from the present back to the time that records show no apparent structures on the subject property, back to the time that the property was first used for residential, agricultural, commercial, industrial or governmental purposes, or back to 1940, whichever is earliest.

Review current United States Geological Survey (USGS) topographic maps to identify the physiographic setting of the subject property and provide a statement on the local geologic, soil and groundwater conditions based on our general experience and sources such as geologic maps and soil surveys and our previous experience at the subject property.

Conduct a visual reconnaissance of the subject property and adjacent properties to identify visible evidence of RECs.

Identify the source(s) of potable water for the subject property and current heating and sewage disposal system(s) used at the subject property, if any, and their age if readily ascertainable.

Identify data gaps relative to the Phase I ESA study findings.

Provide a written summary of the Phase I ESA results and identified RECs along with our opinion and recommendations regarding the potential for contamination by hazardous substances at the subject property and the significance of any data gaps identified.

1.2 Special Considerations

Our scope of services did not include an environmental compliance audit or an evaluation for the presence of lead-based paint, toxic mold, polychlorinated biphenyls (PCBs) in light ballasts, radon, lead in drinking water, asbestos-containing building materials, urea-formaldehyde insulation in on-site structures or debris or other potentially hazardous building materials. Soil, groundwater or surface water sampling was not part of our Phase I ESA services. Our scope of services does not include an assessment of vapor intrusion into structures on the property per ASTM Standard E *2600-08.*

1.3 Qualifications of Environmental Professional

J. Robert Gordon is a registered Professional Engineer (PE) in Washington (#22151) and has at least 30 years of consulting experience and has been project manager and/or principal-in-charge on over 250 site assessment/contamination remediation projects in Washington. Mr. Gordon is an Environmental Professional per 40 CFR Part 312. Ronald M. Bek is a licensed geologist (LG) in Washington (#2625) and has at least 10 years of experience completing site assessment/contamination remediation projects. Mr. Bek is an Environmental Professional per 40 CFR Part 312.

2.0 PROPERTY DESCRIPTION

2.1 Involved Parties

The subject property currently is owned by USIT. USIT purchased parcels P50414 and P50416 from the Nielson Brothers Logging Company in approximately 2002 according to our key site manager interview. Parcel P35839 was purchased by USIT from Paul Brendle in 1995, according to the Assessor website. There was no sales history listed for parcel P123324 in the Assessor website. Parcel P50500 was purchased by USIT from Pacific State MTG Corporation in 2004, according to the assessor website. Parcel P119078 was purchased by USIT from Richmond JPJ Enterprises Inc. in 2003, according to the Skagit County Assessor website.

2.2 Location, Legal Description and Setting

General information, property use(s) and environmental setting of the subject property area are summarized in Table I below. The location is shown relative to surrounding physical features in Figure 1. The current layout of the subject property and immediate surrounding property uses are shown in Figure 2. Photographs of the pole building interior on the subject property are shown in Figure 3.

TABLE I. SUBJECT PROPERTY INFORMATION

[illegible]	[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Our knowledge of the general physiographic setting, geology and groundwater occurrence near the subject property is based on our review of the maps and references listed above, our previous experience at the subject property, and our general experience in the area.

2.3 Site Reconnaissance

2.3.1 *Summary of Observations*

A representative of GeoEngineers performed an unaccompanied visual reconnaissance of the subject property on January 14, 2010. The subject property was accessed from the gravel road in the southern portion of the subject property and from Old Highway 99 and Kim Place near the eastern side of the subject property. The subject property is covered primarily with tall grass and treed areas. Our visual reconnaissance focused on the areas where mobile homes were formally located, the pole building, along the trails, and along access roads on the subject property.

Table II below summarizes conditions observed during our site reconnaissance. Section 2.3.2 contains additional details regarding conditions of potential environmental significance observed during our site reconnaissance and a summary list of known or suspected environmental concerns identified by this portion of our study.

TABLE II. SUMMARY OF SITE RECONNAISSANCE OBSERVATIONS

	Observed		
Feature	Yes	No	Comment
[illegible]	X		[illegible]
[illegible]	X		[illegible]
[illegible]		X	
[illegible]		X	

	Observed		
Feature	Yes	No	Comment
[illegible]		x	[illegible]
[illegible]		x	
[illegible]			[illegible]
[illegible]	x		See above
[illegible]		x	[illegible]
[illegible]		x	
[illegible]		x	[illegible]
On-site Septic System	x		[illegible]
Sewage Disposal System		x	
Potable Water Supply	x		[illegible]
Solid Waste Refuse Receptacles	x		[illegible]
Hydraulic Lifts		x	
Oil/Water Separators		x	
[illegible]		x	
Hazardous Waste Disposal Areas		x	
Unidentified Debris, Refuse or Unidentified Waste Materials	x		Debris observed around the park building consisting of [illegible]

[illegible]

2.3.2 *Findings*

Known or suspected environmental concerns identified by this portion of the study are listed below

- Two empty drums, a 5 gallon container of concrete sealant, oil changing pan filled with motor oil, an approximate 5 gallon capacity empty kerosene container and diesel fuel container, a 1 gallon container of power steering fluid, and several 1 gallon containers of motor oil stored in pole building. No visual evidence of releases from the containers and no soil staining was observed.

- Fill soil was observed at the subject property. No visual evidence of contamination was observed in the fill soil. The fill soil does not represent a REC to the subject property based on our visual observations and key site manager interview.
- Uncontained debris was observed at the subject property. No visual evidence of contamination was observed in these areas. The observed uncontained debris does not represent a REC to the subject property in our opinion.
- A pole-mounted and a pad-mounted transformer are located on the subject property. Evidence of leaks from the transformers were not observed on the ground surface or on the exteriors of the transformers. The potential for a release from the transformers having impacts to soil or shallow perched groundwater at the subject property exists if the transformers should leak. The local power company has an emergency spill response program that includes excavation and removal of mineral oil impacted soil when transformers leak. The transformers do not pose a significant REC to the subject property in our opinion while they are in proper working condition.

2.3.3 Data Gaps

Data gaps were not identified by this portion of the study.

2.4 Adjacent Property and Vicinity Observations

2.4.1 Summary of Observations

We viewed properties located adjacent to and surrounding the subject property on January 14, 2010 from accessible public rights-of-way and the subject property. The subject property is situated in an area that is used primarily for residential or commercial uses. Section 2.4.2 contains additional details regarding conditions of potential environmental significance observed during our site reconnaissance and a list of known or suspected environmental concerns identified by this portion of our study. Table III below outlines adjacent land uses and pertinent observations with respect to conditions that could pose a REC on the subject property. Figure 2 shows adjacent property uses and locations in relation to the subject property.

TABLE III. ADJOINING STREETS AND ADJACENT PROPERTIES OBSERVATIONS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note:

[1] The inferred shallow groundwater flow direction in the vicinity of the subject property is likely toward the southeast, as described in Section 2.2.

2.4.2 Findings

Known or suspect environmental conditions identified by this portion of the study are summarized below:

- Bow Hill Gas and Food Mart is located south of the subject property. This facility is listed in the EDR report. See Section 3.2 for details.
- A pad-mounted transformer is located just off the northwestern corner of the subject property in the overflow parking lot for the casino. Another pad-mounted transformer is located along the Kim Place cul de sac east of the subject property. Four pole-mounted transformers were observed south of Darrk Lane near the northern boundary of the southwestern portion of the subject property. Three of the transformers had a blue placard indicating no PCBs. Evidence of leaks from the transformers was not observed on the ground surface or on the exteriors of the transformers. The potential for mineral oil releases from the transformers having impacts to soil or shallow perched groundwater at the subject property exists if the transformers should leak. The local power company has an emergency spill response program that includes excavation and removal of mineral oil impacted soil when transformers leak. The transformers do not pose a significant REC to the subject property in our opinion while they are in proper working condition.
- The four wells located near the northwest corner of the subject property were installed for an injection well study and do not represent a REC in our opinion.
- An Upper Skagit Indian Tribe unleaded gasoline fuel dispenser and associate UST are located in the paved parking area approximately 300 feet west of the northwest corner of the subject property. See Section 4.4 for details.

2.4.3 Data Gaps

Data gaps were not identified by this portion of the study.

2.5 Previous Reports

2.5.1 Summary of Previous Reports

We reviewed our reports titled "Geotechnical Engineering Services Report, Proposed Skagit Resort Water Park, Bow, Washington", dated February 26, 2007 and "Phase I Environmental Site Assessment, Tax Parcels P35839, P123324, P50416, and P50414, Bow, Washington", dated October 26, 2007.

Visual evidence of soil contamination was not encountered in subsurface explorations competed during our previous geotechnical engineering study. The Thousand Trails site located approximately 600 feet northwest of the subject property was formerly listed in Ecology's leaking underground storage tank (LUST) database during our 2007 Phase I ESA. The 2007 EDR report indicated that a final cleanup report was submitted to Ecology for Thousand Trails.

2.5.2 Findings

Known or suspected environmental concerns were not identified by this portion of the study with the exception that the Thousand Trails facility was formerly listed as LUST site. See Section 3.2 for additional details regarding Thousand Trails.

2.5.3 Data Gaps

Data gaps were not identified by this portion of the study.

3.0 ENVIRONMENTAL RECORDS REVIEW

3.1 Database Search

GeoEngineers reviewed the results of a search of pertinent environmental regulatory lists and databases for current or previous facilities listed at addresses located within ASTM-specified distances from the subject property. The search was performed on January 7, 2010. The information reviewed was provided by a subcontracted regulatory list search service, Environmental Data Resources (EDR). The EDR report is presented in Appendix A. The report includes details regarding the listed facilities identified and maps showing the approximate locations of the listed facilities relative to the subject property.

GeoEngineers reviewed the search results for listings pertaining to the subject property. GeoEngineers also reviewed EDR listing of database entries that could not be mapped by EDR because of insufficient addresses (orphans). Off-site facilities found within the specified distances from the subject property were evaluated for potential impact to the subject property.

The subject property is not listed in the EDR report. The listed facilities identified in Appendix A are summarized in Table IV. Regulatory database acronyms are defined in the EDR report.

TABLE IV. SUMMARY OF REGULATORY DATABASE SEARCH LISTINGS OF POTENTIAL ENVIRONMENTAL CONCERN

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

3.1.1 Findings

- The Thousand Trails site is listed in the UST database as having one unleaded gasoline UST removed in 1991. A fuel release occurred from the UST that impacted soil. The site was reported cleaned up in 1995 based on our review of the Ecology LUST List accessed on January 18, 2010.
- Bow Hill Gas & Food Mart is listed in the UST database to have one, 20,000 to 29,999 gallon UST in operation. The UST is listed as having 3 compartments containing gasoline and diesel fuel. Bow Hill Gas & Food Mart is located in a downgradient position relative to the subject property and does not represent a REC to the subject property in our opinion.

3.2 Review of Regulatory Files

We did not obtain or review files from Ecology regarding the Thousand Trails site because the site does not represent a significant REC in our opinion.

3.3 Review of Area-wide Contamination Reports

We conducted a search of Ecology and EPA websites for readily available information (publications and reports) that may concern area-wide soil and groundwater contamination on or adjacent to the subject property. Area-wide contamination reports pertaining to the subject property vicinity were not identified.

3.4 Findings

Known or suspected environmental concerns were not identified by this portion of the study with the exception of the Thousand Trails UST site to the northwest.

3.5 Data Gaps

A search of databases for engineering controls could not be conducted because such databases do not exist for state of Washington. In our opinion, the significance of this data gap is low based on the comprehensive nature of the databases searched and the results of other portions of our study that did not identify RECs.

The off-site Upper Skagit Indian Tribe UST located west of the subject property as described in Section 2.4.2 was not listed in the EDR report. This condition does not represent a significant data gap in our opinion. See Section 4.4 for details.

4.0 PROPERTY HISTORY

4.1 Historical Resources

Our understanding of the history of the subject property is based on a review of the information from the historical resources listed in Table IV, interviews with the individuals listed in Table V, and our previous Phase I ESA. Selected historical research documents are included in Appendix B.

TABLE V. HISTORICAL RESOURCES REVIEWED

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Description	Provider or Interviewee	Dates of Coverage or Dates of Knowledge of the Property	Date Reviewed or Contacted	Comment (See Section 4.2 for findings)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Recent	[illegible]	[illegible]
[illegible]	[illegible]	Recent	[illegible]	[illegible]
Interview	Charles Lindsay, AESI	Recent	01/22/10	Mr. Lindsay indicated that AESI did not note any petroleum odors or visual evidence of contamination *during soil and groundwater* sampling at the on-site and off-site wells.

Notes:

[1] The scale of the photographs reviewed allowed for an interpretation of general property development/configuration, such as identifying most structures, roadways and clearings. However, the scale of the photographs did not allow for identification of specific property features, such as fuel pumps, wells or chemical storage areas on the subject property, if any.

4.2 Historical Property Ownership and Use Summary

USIT purchased the northern portion of the subject property from Nielsen Brothers approximately six to seven years ago and the southern portion from Burkland approximately five years ago according to our key person interview. Additional property transaction details for the subject property are presented in Table V above (historical Metsker Atlases). The subject property has never been developed with the exception of a pole building and two former mobile home sites based on the resources reviewed.

According to Skagit County Health Department, no records of environmental contamination, complaints, or other information were on file for the subject property.

4.3 Adjacent Properties

Adjacent properties were developed primarily for residential and agricultural uses since 1952 based on our review of the historical topographic maps.

4.4 Information Provided by Key Site Manager

Bob Hayden was identified as a 'key site manager' for the Phase I ESA study. A summary of the key person interview is provided below:

- Mr. Hayden has been familiar with the subject property for approximately six to seven years. He indicated that the northern two parcels were bought from Nielsen Brothers six to seven years ago and the southern parcel was purchased from Burkland approximately five years ago. Mr. Hayden said that logging had occurred on the subject property while the Nielson Brothers owned it.
- To the best of his knowledge, Mr. Hayden indicated that the subject property has never been developed with the exception of one pole building used for storage and two former mobile homes. He stated that fill material was brought to the subject property to construct fill pads for the former mobile home sites. The fill pads were never paved.
- The fill soil stockpiled northwest of the pole building was derived from on site clearing and grubbing activities. The fill soil stockpiled approximately 350 feet east of the pole building is topsoil that came from an offsite parking lot construction project that occurred on USIT trust land off North Darrk Lane.
- The former mobile homes had electric heating systems. Mr. Hayden was not aware of current or past heating oil tanks or any other USTs/ASTs being present at the subject property.
- The monitoring wells located on the subject property were installed for the purposes of monitoring background groundwater quality related to a proposed sewage treatment plant project to be located north of the subject property.
- The 10,000 gallon unleaded gasoline UST at the Upper Skagit Indian Tribe fuel dispenser located west of the northwest corner of the subject property was installed in November 2008.

The UST is a double walled tank with an intermediary leak alarm, is in good working condition, and has had no leaks.

- Mr. Hayden was not aware of potential environmental impacts to the subject property from offsite sources.

4.5 Environmental Liens or Property Use Restrictions

During the course of our research, we did not find that environmental liens had been filed against the subject property.

4.6 Information Provided by User/User Obligations

We did not receive responses to the user questionnaire that we provided to Upper Skagit Indian Tribe.

4.7 Findings

No known or suspect environmental conditions were identified by this portion of the study.

4.8 Data Gaps

Data gaps were not identified by this portion of the study with the exception that responses to the user questionnaire were not provided to us. This condition does not represent a significant data gap in our opinion based on the results of this Phase I ESA and our previous experience at the subject property.

5.0 CONCLUSIONS

GeoEngineers has performed a Phase I ESA in conformance with the scope and limitations of ASTM Practice E 1527 of the subject property identified in this report in Bow, Washington. Any exceptions to, or deletions from, this practice are described in Section 1.2 of this report.

We identified no RECS in connection with the subject with the exception of containers of concrete sealant, motor oil, kerosene, diesel fuel, and power steering fluid stored in the pole building. No soil staining or other visual evidence of releases was observed from the containers.

Two potential off-site RECs were identified during our research:

- The Thousand Trails property is located approximately 600 feet northwest of the subject property in an upgradient position relative to the subject property. The property had a leaking underground storage tank. The site was reported cleaned up to Ecology in 1995.
- A 10,000 gallon unleaded gasoline UST at the Upper Skagit Indian Tribe is located approximately 300 feet west of the northwest corner of the subject property in an upgradient position relative to the subject property. This UST was installed in 2008 and is reportedly in good working condition.

Impacts to the subject property would be a manifestation of groundwater contamination migrating from Thousand Trails and the above referenced UST. The subject property is underlain by relatively impermeable glacial soils that would inhibit contamination migrating to the subject property. The

Thousand Trails property and UST at the Upper Skagit Indian Tribe do not represent a significant REC to the subject property based on the information reviewed.

Regardless of these potential off-site sources, the Washington State Model Toxics Control Act exempts the subject property owner/operator from classification as an "owner/operator" should contamination migrate to this property from off-site sources (RCW 70.105D.020(12)(iii)). The property owner should not have any fiscal or cleanup responsibility for any potential impacts from these potential off-site sources.

6.0 LIMITATIONS

This Phase I ESA has been prepared for use by Upper Skagit Indian Tribe. GeoEngineers has performed this Phase I ESA of the subject property identified in this report in general accordance with the scope and limitations of our proposal dated January 10, 2010 and ASTM E 1527-05, Standard Practice for Phase I ESAs and EPA's Federal Standard 40 CFR Part 312 "Standards and Practices for All Appropriate Inquiries (AAI)."

Within the limitations of scope, schedule and budget, our services have been executed in accordance with the generally accepted environmental science practices for Phase I ESAs in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Please refer to Appendix C titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

We appreciate the opportunity to be of service to Upper Skagit Indian Tribe. Please call if you require more information or have questions regarding this report.

7.0 REFERENCES

American Society for Testing and Materials (ASTM) Standard E 1527-05 for Phase I ESAs.

Area-Wide Soil Contamination Task Force Report dated June 30, 2003, Washington State Departments of Agriculture, Ecology, Health, and Community, Trade and Economic Development.

Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington, Washington Division of Geology and Earth Resources, Open File Report 2005-5, December 2000 by Thomas J. Lapen.

"Geotechnical Engineering Services Report, Proposed Skagit Resort Water Park, Bow, Washington", dated February 26, 2007 and "Phase I Environmental Site Assessment, Tax Parcels P35839, P123324, P50416, and P50414, Bow, Washington", dated October 26, 2007.

Metsker Atlas maps provided by Bellingham Public Library, dated 1935, 1950, 1972, 1983, 1996.

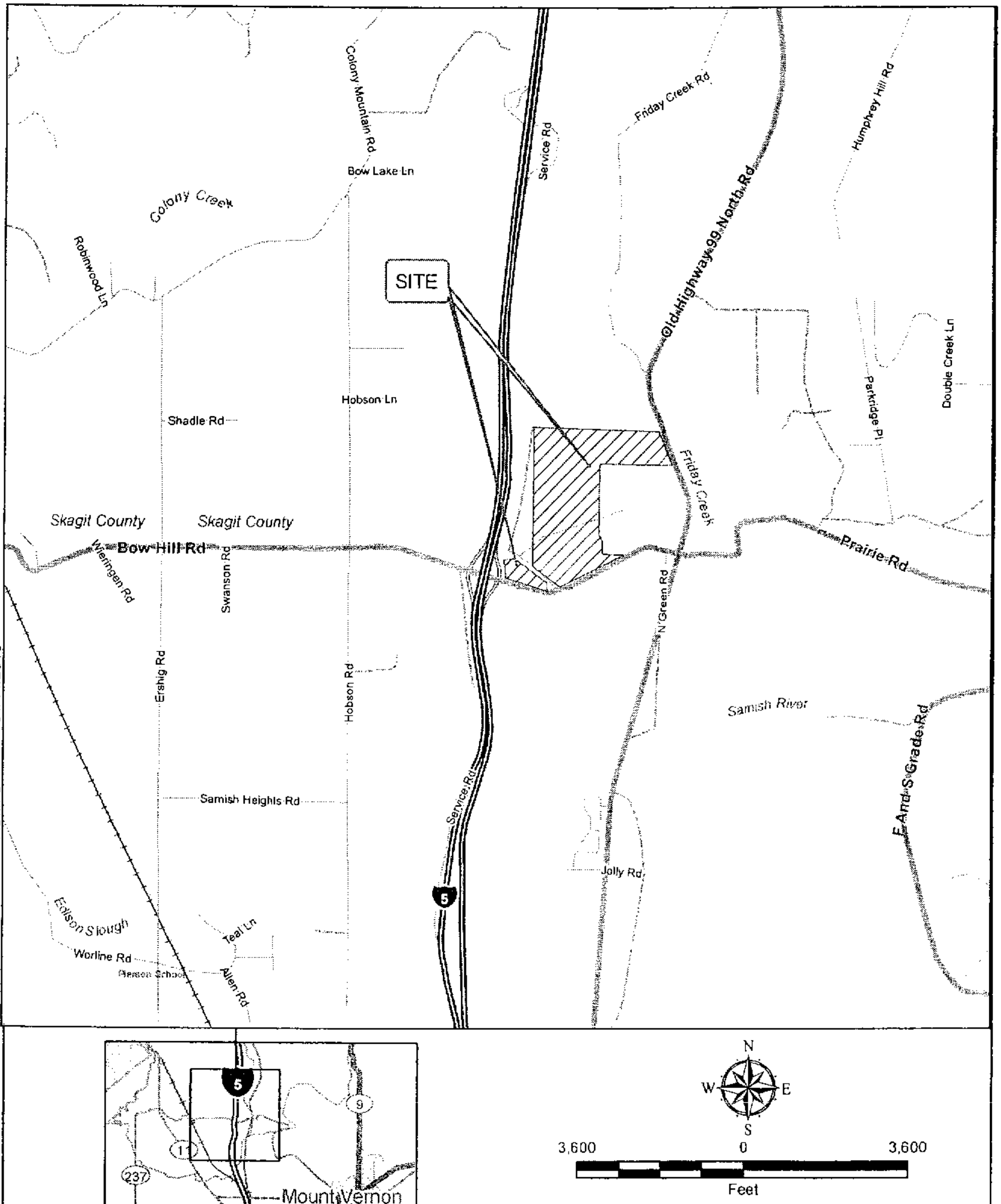
EDR, 2010. EDR Radius Map Report dated January 7, 2010 (comprehensive environmental database report, including Ecology and EPA databases).

Aerial photographs provided by EDR dated 1971, 1981, and 1990.

United States Geological Survey (USGS) topographic maps for Alger, Washington quadrangle provided by EDR, dated 1952, 1954, 1968, 1994.

U.S. Environmental Protection Agency (EPA) Federal Standard 40 CFR Part 312 "Standards and Practices for All Appropriate Inquiries (AAI)

Skagit County Tax Assessor records from Skagit County website http://www.skagitcounty.net/Common/Asp/Default.asp?d=assessor&c=search&a=ParcelSearch&p=Search.asp&st=address



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Maps 2005

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

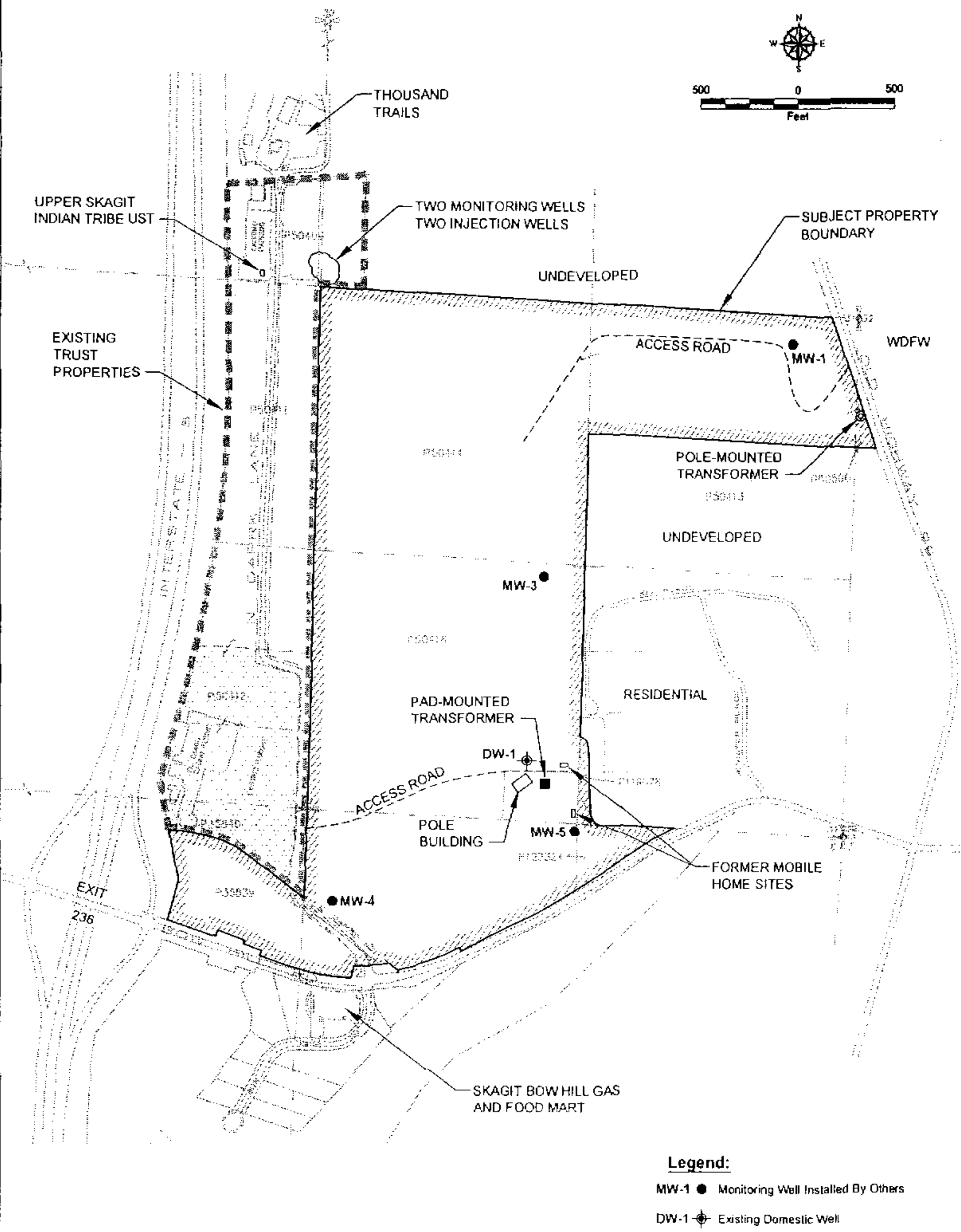
Vicinity Map

Tax Parcels 35839, 123324, 50416, 50414, 50500 and 119078
Bow, Washington

GEOENGINEERS

Figure 1

Office: BELL Path: P:\0\00829-021\01\GIS\82902101 VM F1.mxd RMB:IMS 01/14/2010



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Base drawing provided by Pacific Survey & Engineering, Inc., dated January 7, 2010.

Site Plan and Surrounding Property uses Tax Parcels; P35839, P123324, P50416, P50414, P50500, and P119078

Upper Skagit Indian Tribe
Bow, Washington

GEOENGINEERS

Figure 2

Empty 55-gallon drums and oil changing pan full of motor oil. No petroleum sheen observed on water surface below drums

Empty 5-gallon kerosene and diesel fuel containers

GeoEngineers	Site Photographs – Pole Building Interior
	Figure 3

APPENDIX A
EDR Report and Legal Descriptions

The EDR Environmental LienSearch™ Report

EDR® Environmental Data Resources Inc

NCO℠

UPPER SKAGIT INDIAN TRIBE SITE
SKAGIT COUNTY
BOW, WA 98232

Project Number 02022828.7

September 13, 2007

The Standard in Environmental Risk Information

440 Wheelers Farm Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EDR Environmental LienSearch™ Report

The EDR Environmental LienSearch Report includes results from a search of available current land title records for environmental cleanup liens and other activity and use limitations, such as engineering controls and institutional controls.

A network of professional, trained researchers follows established procedures to:

- search for parcel information, legal description, and ownership based on client supplied address information;
- research indexes and title repositories;
- obtain a copy of the deed;
- search for environmental encumbering instrument(s) associated with the deed;
- provide a copy of any environmental encumbrance(s) based upon a review of key words in the instrument (title, parties involved, and description); and
- provide a copy of the deed.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EDR Environmental LienSearch™ Report

TARGET PROPERTY INFORMATION

ADDRESS

UPPER SKAGIT INDIAN TRIBE SITE
5984 NORTH DARRK LANE
BOW, WA 98232

RESEARCH SOURCE

Sources: Skagit County

DEED INFORMATION

Type of Deed: WD ☒ QCD ☐ Other ☐ DEED

Title is vested in: Upper Skagit Indian Tribe, a Federally recognized Indian Tribe

Title received from: Pacific States Mortgage Corp., a Washington Corporation

Deed Dated: December 17, 2004
Deed Recorded: December 27, 2004
Document No. 200412270128

LEGAL DESCRIPTION

Description: Legal attached as Exhibit "A"

Assessor's Parcel Number: P50414

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

If yes:

1st Party:

2nd Party:

Dated:
Recorded:
Book:
Page:
Comments:

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AUL's: Found ☒ Not Found ☐

Use Limitations recorded in Warranty Deed vesting title, found on page 2 of the Warranty Deed.

EDR Environmental LienSearch™ Report

TARGET PROPERTY INFORMATION

ADDRESS

UPPER SKAGIT INDIAN TRIBE SITE
5984 NORTH DARRK LANE
BOW, WA 98232

RESEARCH SOURCE

Sources: Skagit County

DEED INFORMATION

Type of Deed: WD ☒ QCD ☐ Other ☐ DEED

Title is vested in: Upper Skagit Indian Tribe

Title received from: Richmond JPJ Enterprises, Inc., a Washington Corporation

Deed Dated: July 2, 2003
Deed Recorded: July 14, 2003
Document No. 200307140227

LEGAL DESCRIPTION

Description: Legal attached as Exhibit "B"

Assessor's Parcel Number: P50416

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

If yes:

1st Party:

2nd Party:

Dated:
Recorded:
Book:
Page:
Comments:

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AUL's: Found ☐ Not Found ☒

EDR Environmental LienSearch™ Report

TARGET PROPERTY INFORMATION

ADDRESS

UPPER SKAGIT INDIAN TRIBE SITE
5984 NORTH DARRK LANE
BOW, WA 98232

RESEARCH SOURCE

Sources: Skagit County

DEED INFORMATION

Type of Deed: WD ☒ QCD ☐ Other ☐ DEED

Title is vested in: Upper Skagit Indian Tribe

Title received from: Paul W. Brendle and Wanda M. Brendle, husband and wife

Deed Dated: April 24, 1995
Deed Recorded: April 25, 1995
Book: 1433
Page: 527

LEGAL DESCRIPTION

Description: Legal attached as Exhibit "C"

Assessor's Parcel Number: P35839

NOTE: Deed conveys an undivided 80% interest in the subject property.

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

If yes:

1st Party:

2nd Party:

Dated:
Recorded:
Book:
Page:
Comments:

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AUL's: Found ☐ Not Found ☒

EDR Environmental LienSearch™ Report

TARGET PROPERTY INFORMATION

ADDRESS

UPPER SKAGIT INDIAN TRIBE SITE
5984 NORTH DARRK LANE
BOW, WA 98232

RESEARCH SOURCE

Sources: Skagit County

DEED INFORMATION

Type of Deed: WD ☒ QCD ☐ Other ☐ DEED

Title is vested in: Upper Skagit Indian Tribe

Title received from: Paul W. Brendle and Wanda M. Brendle, husband and wife

Deed Dated: April 24, 1995
Deed Recorded: April 25, 1995
Book: 1433
Page: 529

LEGAL DESCRIPTION

Description: Legal attached as Exhibit "D"

Assessor's Parcel Number: P35839

NOTE: Deed conveys 20% interest in the subject property.

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

If yes:

1st Party:

2nd Party:

Dated:
Recorded:
Book:
Page:
Comments:

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AUL's: Found ☐ Not Found ☒

EDR Environmental LienSearch™ Report

TARGET PROPERTY INFORMATION

ADDRESS

UPPER SKAGIT INDIAN TRIBE SITE
5984 NORTH DARRK LANE
BOW, WA 98232

RESEARCH SOURCE

Sources: Skagit County

DEED INFORMATION

Type of Deed: WD ☐ QCD ☐ Other ☒ DEED

An extensive search of Skagit County public records was conducted and no deed vesting title could be found. Subject property has been owned by Upper Skagit Indian Tribe for an extended period of time and it is unknown when they took title.

LEGAL DESCRIPTION

Description: Legal attached as Exhibit "E"

Assessor's Parcel Number: P123324

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

If yes:

1st Party:

2nd Party:

Dated:
Recorded:
Book:
Page:
Comments:

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

Other AUL's: Found ☐ Not Found ☒

EDR Environmental LienSearch™ Report

EXHIBIT A

AFTER RECORDING MAIL TO:
Upper Skagit Indian Tribe
25948 Community Plaza Way
Sedro-Woolley, WA 98284

200412270128
Skagit County Auditor
12/27/2004 Page 1 of 2 11:18AM

Filed for Record at Request of
Land Title Company of Skagit
Escrow Number: 114414-PE1

LAND TITLE OF SKAGIT COUNTY

Statutory Warranty Deed

Grantor(s): Pacific States Mortgage Corp.
Grantee(s): Upper Skagit Indian Tribe
Abbreviated Legal: ptn SE ¼, 31-36-4 E W.M. & ptn SW ¼, 32-36-4 E W.M.
Assessor's Tax Parcel Number(s): 360431-4-002-0007, P50414, 360432-3-004-0006, P50500

THE GRANTOR Pacific States Mortgage Corp., a Washington Corporation for and in consideration of *TEN DOLLARS AND OTHER GOOD AND VALUABLE CONSIDERATION* in hand paid, conveys and warrants to **Upper Skagit Indian Tribe, a federally recognized indian tribe** the following described real estate, situated in the County of Skagit, State of Washington.

The North ½ of the Southeast ¼ of Section 31, and that portion of the Northwest ¼ of the Southwest ¼ of Section 32 lying West of the State Highway, all in Township 36 North, Range 4 East, W.M., EXCEPT that portion, if any, conveyed to the State of Washington, Department of Fisheries, including that conveyed by deed dated February 2, 1940, filed February 15, 1940 as File No. 321913 and recorded in Volume 180 of Deeds at page 30, AND EXCEPT that portion described as follows:

Beginning at the intersection of the West line of Highway 99 and the South line of the Northwest ¼ of the Southwest ¼ of said Section 32;
thence West along said South line and the South line of the Northeast ¼ of the Southeast ¼ of said Section 31 to the Southwest corner of said Northeast ¼ of the Southeast ¼;
thence North along the West line of said Northeast ¼ of the Southeast ¼ 660 feet;
thence East parallel to the South line of said Northeast ¼ of the Southeast ¼ and said Northwest ¼ of the Southwest ¼ to the West line of said Highway 99;
thence Southerly along said highway to the point of beginning.

Situate in the County of Skagit, State of Washington.

Subject to: Schedule "B-1" attached hereto and made a part thereof.

#6920
SKAGIT COUNTY WASHINGTON
REAL ESTATE EXCISE TAX
DEC 2 7 2004
Amount Paid $
Skagit Co. Treasurer
By Deputy

Dated December 17, 2004
Pacific States Mortgage Corp.

By: Robert Olsson, CEO

STATE OF Washington }
County of Skagit } SS:

I certify that I know or have satisfactory evidence Robert Olsson is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated He is authorized to execute the instrument and is CEO of Pacific States Mortgage Corp. to be the free and voluntary act of such party for the uses and purposes mentioned in this instrument.

Dated: December 17, 2004

CARRIE HUFFER
STATE OF WASHINGTON
NOTARY — PUBLIC
MY COMMISSION EXPIRES 12-31-07

Carrie Huffer
Notary Public in and for the State of Washington
Residing at Burlington
My appointment expires: 12/31/2007

P-50414

Schedule "B-1"

114414-PE

EXCEPTIONS:

A. NOTICE OF MORATORIUM ON NON-FORESTRY USE OF LAND, AND THE TERMS AND CONDITIONS THEREOF

Executed By:	Goodyear Nelson Hardwood Lumber Co.
Recorded:	October 17, 1997
Auditor's File No.:	9710170041
Approval Date:	October 16, 1997
Providing:	

...the land subject to this forest practices application/notification will not be converted to an active use incompatible with timber growing within six years after the approval date of the forest practices permitted in the forest practices application/notification.

B. NOTICE OF MORATORIUM ON NON-FORESTRY USE OF LAND, AND THE TERMS AND CONDITIONS THEREOF

Executed By:	Goodyear Nelson Hardwood Lumber Co.
Recorded:	December 16, 1997
Auditor's File No.:	9712160034
Approval Date:	October 1, 1997
Providing:	

...the land subject to this forest practices application/notification will not be converted to an active use incompatible with timber growing within six years after the approval date of the forest practices permitted in the forest practices application/notification.

C. NOTICE OF MORATORIUM ON NON-FORESTRY USE OF LAND, AND THE TERMS AND CONDITIONS THEREOF

Executed By:	Goodyear Nelson Hardwood Lumber Co.
Recorded:	December 20, 1999
Auditor's File No.:	199912200003
Approval Date:	
Providing:	

...the land subject to this forest practices application/notification will not be converted to an active use incompatible with timber growing within six years after the approval date of the forest practices permitted in the forest practices application/notification.

EXHIBIT B

AFTER RECORDING MAIL TO:
Upper Skagit Indian Tribe
25948 Community Plaza Way
Sedro-Woolley, WA 98284

200307140227
Skagit County Auditor
7/14/2003 Page 1 of 2 3:41PM

Filed for Record at Request of
Land Title Company Of Skagit County
Escrow Number: 107564-PE

LAND TITLE COMPANY OF SKAGIT COUNTY

Statutory Warranty Deed

Grantor(s): Richmond JPJ Enterprises, Inc.
Grantee(s): Upper Skagit Indian Tribe
Abbrev. Legal: Ptn SW1/4 SE 1/4 S31-T36-R4E
Additional legal(s) on page: 2
Assessor's Tax Parcel Number(s): 360431-4-004-0013/P50416, P50416

THE GRANTOR RICHMOND JPJ ENTERPRISES, INC., a Washington Corporation for and in consideration of TEN DOLLARS AND OTHER GOOD AND VALUABLE CONSIDERATION in hand paid, conveys and warrants to UPPER SKAGIT INDIAN TRIBE, a federally recognized Indian Tribe the following described real estate, situated in the County of Skagit, State of Washington.

SEE ATTACHED EXHIBIT "A" HERETO FOR LEGAL DESCRIPTION

TOGETHER WITH THAT CERTAIN MOBILE HOME TITLE ELIMINATIONS RECORDED UNDER AUDITOR'S FILE NO. 199907300085 AND 199907300086, LOCATED AND CONSIDERED A PART THEREOF.

ALSO TOGETHER WITH THE RIGHT OF INGRESS AND EGRESS THROUGH THE PLAT OF RIVER VALLEY VIEW ESTATES TO ACCESS THE SUBJECT PROPERTY UNTIL SEPTEMBER 30, 2003, AT WHICH TIME THIS EASEMENT SHALL BE TERMINATED.

Dated July 2, 2003

\# 3440
SKAGIT COUNTY WASHINGTON
REAL ESTATE EXCISE TAX
JUL 14 2003
Amount Paid $ 0779.75
Skagit Co. Treasurer
By Deputy

Richmond JPJ Enterprises, Inc.

By: Rob Nielsen, President

P-50416

STATE OF Washington }
County of ~~Skagit~~ WHATCOM } SS:

I certify that I know or have satisfactory evidence Rob Nielsen the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated authorized to execute the instrument and is President of Richmond JPJ Enterprises, Inc. to be the free and voluntary act of such party for the uses and purposes mentioned in this instrument.

Dated: 7/14/03

JENNIFER MARIE NIELSEN
NOTARY PUBLIC
COMMISSION EXPIRES 12-13-05
STATE OF WASHINGTON

Notary Public in and for the State of Washington
Residing at Bellingham
My appointment expires: 12/13/05

 LPB-10

Schedule "A-1"

DESCRIPTION:

PARCEL "A":

The Southwest ¼ of the Southeast ¼ of Section 31, Township 36 North, Range 4 East, W.M.

Situate in the County of Skagit, State of Washington.

PARCEL "B":

A non-exclusive easement for road and utilities as contained in instrument from Nielsen Brothers Inc. to Richmond/JPR Enterprises, Inc., recorded January 4, 2002, under Auditor's File No. 200201040067, records of Skagit County, Washington.

Situate in the County of Skagit, State of Washington.

PARCEL "C":

All that portion of Lot 1 as shown on the Plat of River Valley View Estates, recorded as Auditor's File No. 200105070102, records of Skagit County, Washington, and being more particularly described as follows:

Beginning at the Southwest corner of said Lot 1;
thence North 01°35'01" East, along the West line of said Lot 1, a distance of 448.00 feet;
thence South 57°45'27" East, a distance of 36.70 feet;
thence South 20°34'51" East, a distance of 36.70 feet;
thence South 02°00'00" East, a distance of 345.00 feet;
thence South 29°58'52" East, a distance of 63.00 feet to the South line of said Lot 1;
thence North 86°51'44" West, along said South line, a distance of 100.00 feet to the point of beginning.

TOGETHER WITH AND SUBJECT TO a 12.00 foot wide easement for ingress, egress over a portion of Lot 1, River Valley View Estates, as shown on Plat recorded as Auditor's File No. 200105070102, records of Skagit County, Washington, said easement being 6.00 feet on each side, measured at right angles, from the following described centerline:

Beginning at the Southwest corner of said Lot 1;
thence North 01°35'01" East, along the West line of said Lot 1, a distance of 448.00 feet to the true point of beginning;
thence South 57°45'27" East, a distance of 36.70 feet;
thence South 20°34'51" East, a distance of 36.70 feet;
thence South 02°00'00" East, a distance of 345.00 feet to the terminus.

The sidelines of the above described easement shall be lengthened and foreshortened to terminate at the West line of said Lot 1.

Situate in the County of Skagit, State of Washington.

200307140227
Skagit County Auditor
7/14/2003 Page 2 of 2 3:41PM

EXHIBIT C

Land Title Company
of Skagit County

6
8
9

Filed for Record at Request of
Land Title Company of Skagit County

AFTER RECORDING MAIL TO:

9504250042

This Space Reserved For Recorder's Use:
KATHY HILL
SKAGIT COUNTY AUDITOR
'95 APR 25 P1:16
RECORDED___FILED___
REQUEST OF___

Name The Upper Skagit Indian Tribe
Address 2284 Community Plaza
City, State, Zip Sedro Woolley, WA 98284

Escrow Number: T-74359-E

LAND TITLE COMPANY OF SKAGIT COUNTY

Statutory Warranty Deed

THE GRANTOR PAUL W. BRENDLE and WANDA M. BRENDLE, husband and wife

for and in consideration of TEN DOLLARS AND OTHER GOOD AND VALUABLE CONSIDERATION in hand paid, conveys and warrants to THE UPPER SKAGIT INDIAN TRIBE, a federally recognized Indian Tribe

the following described real estate, situated in the County of Skagit, State of Washington:
An undivided 80% interest in the following described property as shown in Exhibit A attached hereto and by this reference made a part hereof.

SUBJECT TO Easement recorded August 11, 1980 under Auditor's File No. 8008110023 and modified August 13, 1980 under Auditor's File No. 8008130012.

SKAGIT COUNTY WASHINGTON
Real Estate Excise Tax
7724
APR 25 1995
Amount Paid $ 1830.00
Skagit Co. Treasurer
By CD Deputy

Dated this 24th day of April, 1995

By Paul W. Brendle By ______
Paul W. Brendle

By Wanda M. Brendle By ______
Wanda M. Brendle

STATE OF Washington }
County of Skagit } ss:

I certify that I know or have satisfactory evidence that Paul W. Brendle and Wanda M. Brendle are the person s who appeared before me, and said person s acknowledged that they signed this instrument and acknowledge it to be their free and voluntary act for the uses and purposes mentioned in this instrument.

Dated: April 24th, 1995

Nancy Lee Cleave
Nancy Lee Cleave
Notary Public in and for the State of Washington
Residing at Mount Vernon
My appointment expires: 9-1-98

NOTARY PUBLIC

9504250042

LPB-10

BK 1433 PG 0527

P-3839

Exhibit A

That portion of Government Lots 2 and 3 in Section 6, Township 35, North, Range 4 East, W.M., lying Southerly of the Old Bow Hill County road, (as located and established prior to January 18, 1963), Northerly of the county road as conveyed to Skagit County by deed dated January 18, 1963, recorded January 18, 1963, as Auditor's File No. 631052 and Easterly of P.S.H. #1, EXCEPT that portion, if any, lying within the boundaries of the following described tract:

Beginning at the Northwest corner of said Government Lot 2;
thence South 2°35'28" West along the West line thereof a distance of 1066.36 feet;
thence South 87°24'32" East a distance of 542.13 feet to a 3/4 inch iron pipe and the true point of beginning;
thence North 35°31'45" West a distance of 123.81 feet to a 3/4 inch iron pipe;
thence North 11°01'45" East a distance of 68 feet, more or less, to the South line of the County Road (Bow Hill Road);
thence Easterly along the South line of said County Road a distance of 220 feet, more or less, to a point bearing North 48°04'10" East from the true point of beginning;
thence South 48°04'10" West a distance of 213 feet, more or less, to the true point of beginning; EXCEPT County Road and right of way therefore, if any.

Situate in the County of Skagit, State of Washington.

9504250042

BK 1433 PG 0528

EXHIBIT D

Land Title Company
of Skagit County

6-8

Space Reserved For Recorder's Use

'95 APR 25 P1:16

KATHY HILL
RECORDED FILED
REQUEST OF

Filed for Record at Request of
Land Title Company of Skagit County

AFTER RECORDING MAIL TO:

9504250043

Name: The Upper Skagit Indian Tribe
Address: 2284 Community Plaza
City, State, Zip: Sedro Woolley, WA 98284

Escrow Number: T-74359-E

LAND TITLE COMPANY OF SKAGIT COUNTY

Statutory Warranty Deed

THE GRANTOR PAUL W. BRENDLE and WANDA M. BRENDLE, husband and wife

for and in consideration of No Consideration, Gift to Grantee
in hand paid, conveys and warrants to THE UPPER SKAGIT INDIAN TRIBE, a federally recognized Indian Tribe

the following described real estate, situated in the County of Skagit, State of Washington:
An undivided 20% interest in the following described property as shown in Exhibit A attached hereto and by this reference made a part hereof.

P-35832

SUBJECT TO Easement recorded August 11, 1980 under Auditor's File No. 8008110023 and modified August 13, 1980 under Auditor's File No. 8008130012.

SKAGIT COUNTY WASHINGTON
Real Estate Excise Tax
APR 25 1995
Amount Paid $
Skagit Co. Treasurer
By Deputy

7705

Dated this 24th day of April, 1995

By [signature] By
Paul W. Brendle

By [signature] By
Wanda M. Brendle

STATE OF Washington } ss:
County of Skagit }

I certify that I know or have satisfactory evidence that Paul W. Brendle and Wanda M. Brendle are the persons who appeared before me, and said persons acknowledged that they signed this instrument and acknowledge it to be their free and voluntary act for the uses and purposes mentioned in this instrument.

Dated: April 24th, 1995

[signature]
Nancy Lea Cleave
Notary Public in and for the State of Washington
Residing at Mount Vernon
My appointment expires: 9-1-98

9504250043

LPB-10

BK 1433 PG 0529

Exhibit A

That portion of Government Lots 2 and 3 in Section 6, Township 35, North, Range 4 East, W.M., lying Southerly of the old Bow Hill County road, (as located and established prior to January 18, 1963), Northerly of the county road as conveyed to Skagit County by deed dated January 18, 1963, recorded January 18, 1963, as Auditor's File No. 631052 and Easterly of P.S.H. #1, EXCEPT that portion, if any, lying within the boundaries of the following described tract:

Beginning at the Northwest corner of said Government Lot 2;
thence South 2°35'28" West along the West line thereof a distance of 1066.36 feet;
thence South 87°24'32" East a distance of 542.13 feet to a 3/4 inch iron pipe and the true point of beginning;
thence North 35°31'45" West a distance of 123.81 feet to a 3/4 inch iron pipe;
thence North 11°01'45" East a distance of 68 feet, more or less, to the South line of the County Road (Bow Hill Road);
thence Easterly along the South line of said County Road a distance of 220 feet, more or less, to a point bearing North 48°04'10" East from the true point of beginning;
thence South 48°04'10" West a distance of 213 feet, more or less, to the true point of beginning; EXCEPT County Road and right of way therefore, if any.

Situate in the County of Skagit, State of Washington.

9504250043

BK 1433 PG 0530

EXHIBIT E

Legal Description

ACREAGE ACCOUNT, ACRES 20.74, THAT PORTION OF GOVERNMENT LOTS 1 AND 2, IN SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M., LYING NORTHERLY OF THE RIGHT OF WAY FOR THE BOW HILL COUNTY ROAD, AS SAID ROAD EXISTED ON APRIL 16, 1968, EXCEPT THAT PORTION THEREOF LYING SOUTHERLY OF THE OLD BOW HILL COUNTY ROAD, AS SAID ROAD EXISTED ON JANUARY 18, 1963. SURVEY RECORDED AF#200508020064.

Upper Skagit Indian Tribe Site
6019 NORTH DARRK LANE
Bow, WA 98232

Inquiry Number: 2673432.1s
January 07, 2010

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

6019 NORTH DARRK LANE
BOW, WA 98232

COORDINATES

Latitude (North):	48.561500 - 48° 33' 41.4"
Longitude (West):	122.343100 - 122° 20' 35.2"
Universal Tranverse Mercator:	Zone 10
UTM X (Meters):	548469.1
UTM Y (Meters):	5378701.0
Elevation:	261 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	48122-E3 ALGER, WA
Most Recent Revision:	1994

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL.............................. National Priority List
Proposed NPL.................. Proposed National Priority List Sites
NPL LIENS...................... Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL.................. National Priority List Deletions

EXECUTIVE SUMMARY

Federal CERCLIS list

CERCLIS........................ Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY........ Federal Facility Site Information listing

Federal CERCLIS NFRAP site List

CERC-NFRAP.................. CERCLIS No Further Remedial Action Planned

Federal RCRA CORRACTS facilities list

CORRACTS.................... Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF................... RCRA - Transporters, Storage and Disposal

Federal RCRA generators list

RCRA-LQG..................... RCRA - Large Quantity Generators
RCRA-SQG..................... RCRA - Small Quantity Generators
RCRA-CESQG................ RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS........ Engineering Controls Sites List
US INST CONTROL.......... Sites with Institutional Controls

Federal ERNS list

ERNS............................. Emergency Response Notification System

State- and tribal - equivalent NPL

HSL............................... Hazardous Sites List

State- and tribal - equivalent CERCLIS

CSCSL........................... Confirmed and Suspected Contaminated Sites List

State and tribal landfill and/or solid waste disposal site lists

SWF/LF.......................... Solid Waste Facility Database

State and tribal leaking storage tank lists

LUST............................. Leaking Underground Storage Tanks Site List
INDIAN LUST.................. Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

AST............................... Aboveground Storage Tank Locations
INDIAN UST.................... Underground Storage Tanks on Indian Land
FEMA UST..................... Underground Storage Tank Listing

EXECUTIVE SUMMARY

State and tribal institutional control / engineering control registries

INST CONTROL............ Institutional Control Site List

State and tribal voluntary cleanup sites

VCP........................ Voluntary Cleanup Program Sites
INDIAN VCP................ Voluntary Cleanup Priority Listing
ICR........................ Independent Cleanup Reports

State and tribal Brownfields sites

BROWNFIELDS.............. Brownfields Sites Listing

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS.......... A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

ODI........................ Open Dump Inventory
DEBRIS REGION 9.......... Torres Martinez Reservation Illegal Dump Site Locations
SWTIRE.................... Solid Waste Tire Facilities
INDIAN ODI................ Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL..................... Clandestine Drug Labs
CSCSL NFA................ Confirmed & Contaminated Sites - No Further Action
CDL........................ Clandestine Drug Lab Contaminated Site List
HIST CDL.................. List of Sites Contaminated by Clandestine Drug Labs
US HIST CDL.............. National Clandestine Laboratory Register

Local Land Records

LIENS 2................... CERCLA Lien Information
LUCIS..................... Land Use Control Information System

Records of Emergency Release Reports

HMIRS.................... Hazardous Materials Information Reporting System
SPILLS................... Reported Spills

Other Ascertainable Records

RCRA-NonGen............. RCRA - Non Generators
DOT OPS.................. Incident and Accident Data
DOD...................... Department of Defense Sites
FUDS..................... Formerly Used Defense Sites
CONSENT.................. Superfund (CERCLA) Consent Decrees
ROD...................... Records Of Decision

EXECUTIVE SUMMARY

UMTRA	Uranium Mill Tailings Sites
MINES	Mines Master Index File
TRIS	Toxic Chemical Release Inventory System
TSCA	Toxic Substances Control Act
FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing
SSTS	Section 7 Tracking Systems
ICIS	Integrated Compliance Information System
PADS	PCB Activity Database System
MLTS	Material Licensing Tracking System
RADINFO	Radiation Information Database
FINDS	Facility Index System/Facility Registry System
RAATS	RCRA Administrative Action Tracking System
UIC	Underground Injection Wells Listing
MANIFEST	Hazardous Waste Manifest Data
DRYCLEANERS	Drycleaner List
NPDES	Water Quality Permit System Data
AIRS	Washington Emissions Data System
Inactive Drycleaners	Inactive Drycleaners
INDIAN RESERV	Indian Reservations
SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing
COAL ASH EPA	Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER	PCB Transformer Registration Database
COAL ASH DOE	Sleam-Electric Plan Operation Data
COAL ASH	Coal Ash Disposal Site Listing

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Manufactured Gas Plants..... EDR Proprietary Manufactured Gas Plants

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

State and tribal registered storage tank lists

EXECUTIVE SUMMARY

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Department of Ecology's Statewide UST Site/Tank Report.

A review of the UST list, as provided by EDR, and dated 11/24/2009 has revealed that there is 1 UST site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
BOW HILL GAS & FOOD MART	*5984 N DARRK LN*	*NNW 1/8 - 1/4 (0.233 mi.)*	*1*	*7*

ADDITIONAL ENVIRONMENTAL RECORDS

Local Lists of Hazardous waste / Contaminated Sites

ALLSITES: Information on facilities and sites of interest to the Department of Ecology.

A review of the ALLSITES list, as provided by EDR, and dated 11/07/2009 has revealed that there are 2 ALLSITES sites within approximately 0.5 miles of the target property.

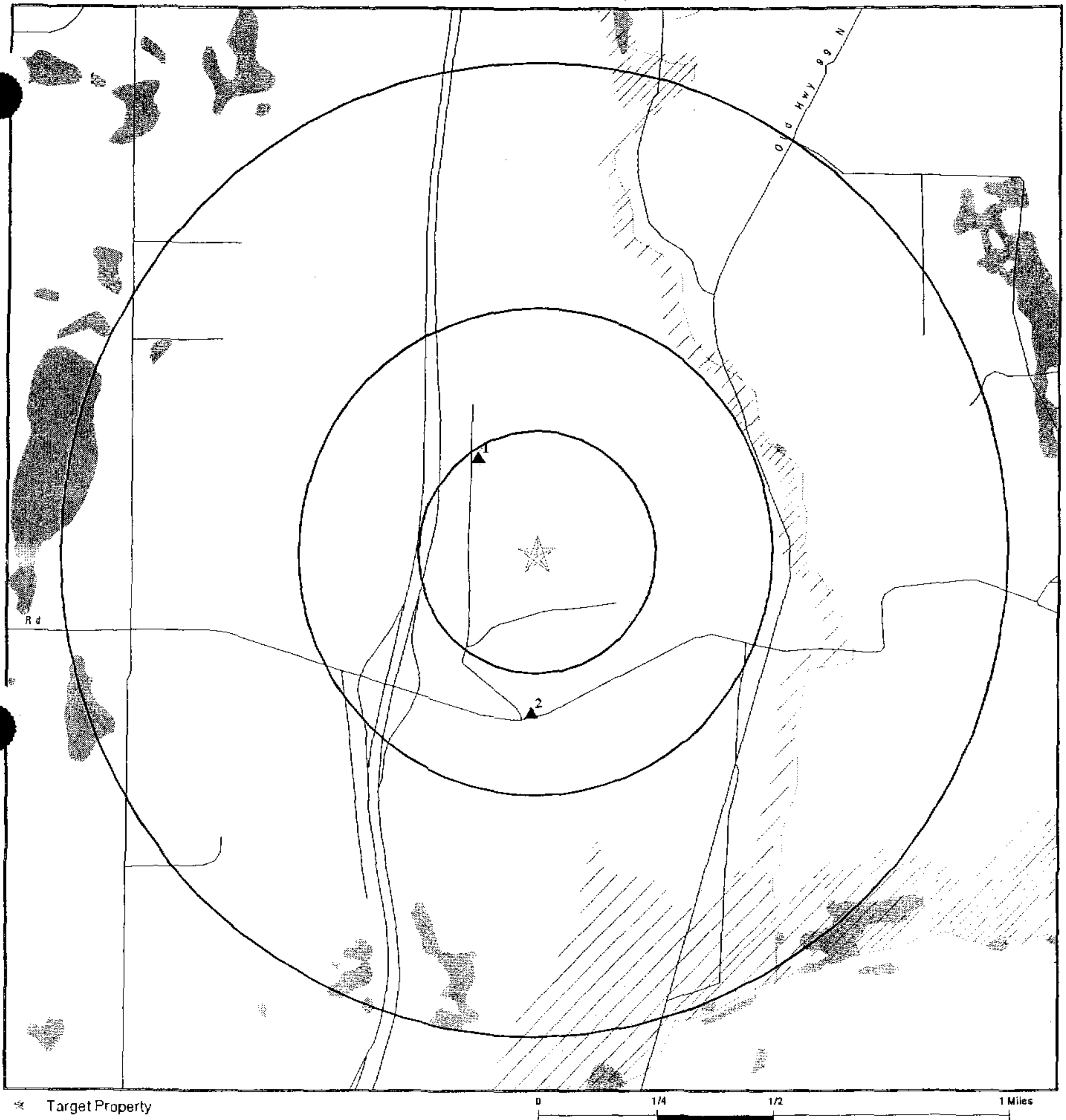
Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
BOW HILL GAS & FOOD MART	*5984 N DARRK LN*	*NNW 1/8 - 1/4 (0.233 mi.)*	*1*	*7*
THOUSAND TRAILS INC MOUNT VERN	*5409 DARRK LN*	*S 1/4 - 1/2 (0.331 mi.)*	*2*	*8*

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

Site Name	Database(s)
TONY E GOODE	ALLSITES, UST
PULLEY RIDGE WETLAND MITIGATION SI	ALLSITES
5 SOUTHBOUND MP 238	RCRA-CESQG, FINDS, ALLSITES
BOUSLOG INDUSTRIAL SITE DEVELOPMEN	ALLSITES
1495 RT 20	FINDS, ALLSITES
NORTHWEST AIR POLLUTION AUTHOR BUR	ALLSITES
STEEN RETAIL CENTER	ALLSITES
1340 HWY 99	FINDS, ALLSITES
RALLYE AUTO SALES INC	ALLSITES
SITE PLAN FOR RE CARPET	ALLSITES
WASTE MGMT SKAGIT CO HAULING	ALLSITES
SKAGIT PREVENTIVE DENTAL CLINIC	ALLSITES
BEN RICHARDS FABRICATION	ALLSITES
MOTOR WORKS NW	ALLSITES
SKAGIT COUNTY DEPARTMENT OF PARKS	ALLSITES
HYUNDAI DEALERSHIP FOR SKAGIT CROS	ALLSITES
SKAGIT CNTY PWD BUTLER PIT	ALLSITES
SKAGIT TRANSMISSION LILA LANE	ALLSITES
[illegible] OLD HWY 99 N	FINDS, ALLSITES, UST
3570 OLD HWY 99 N	FINDS, ALLSITES, UST
200 OLD HWY 99	FINDS, ALLSITES
OLD HWY 99 MP 439	RCRA-NonGen, FINDS, ALLSITES
RONNIES STATION	ALLSITES
CONCRETE NORWEST BELLEVILLE PIT	ALLSITES
CAMPING WORLD INC	ALLSITES
PSE SKAGIT SERVICE CENTER	ALLSITES, MANIFEST
SKAGIT FARMERS SUPPLY	ALLSITES, UST
TUDOR SITE COMMERCIAL	ALLSITES
NORTH BURLINGTON BLVD IMPROVEMENT	ALLSITES
CLEMENTS CONDOMINIUMS	RCRA-NonGen, FINDS, ALLSITES
ALGER VIDEO	LUST
680 HWY 20 W	RCRA-SQG, FINDS
HWY 20 & ALDER RD	RCRA-NonGen, FINDS
PSE SKAGIT SERVICE CENTER	RCRA-NonGen
UPPER BIGGER LAKE	ERNS
PSE SKAGIT SERVICE CENTER	FINDS
SKAGIT FARMERS SUPPLY II	FINDS
SKAGIT COUNTY PUBLIC WORKS DEPT. -	ICR
PORT OF SKAGIT COUNTY	ICIS
SKAGIT COUNTY DRAINAGE DISTRICT 5	NPDES

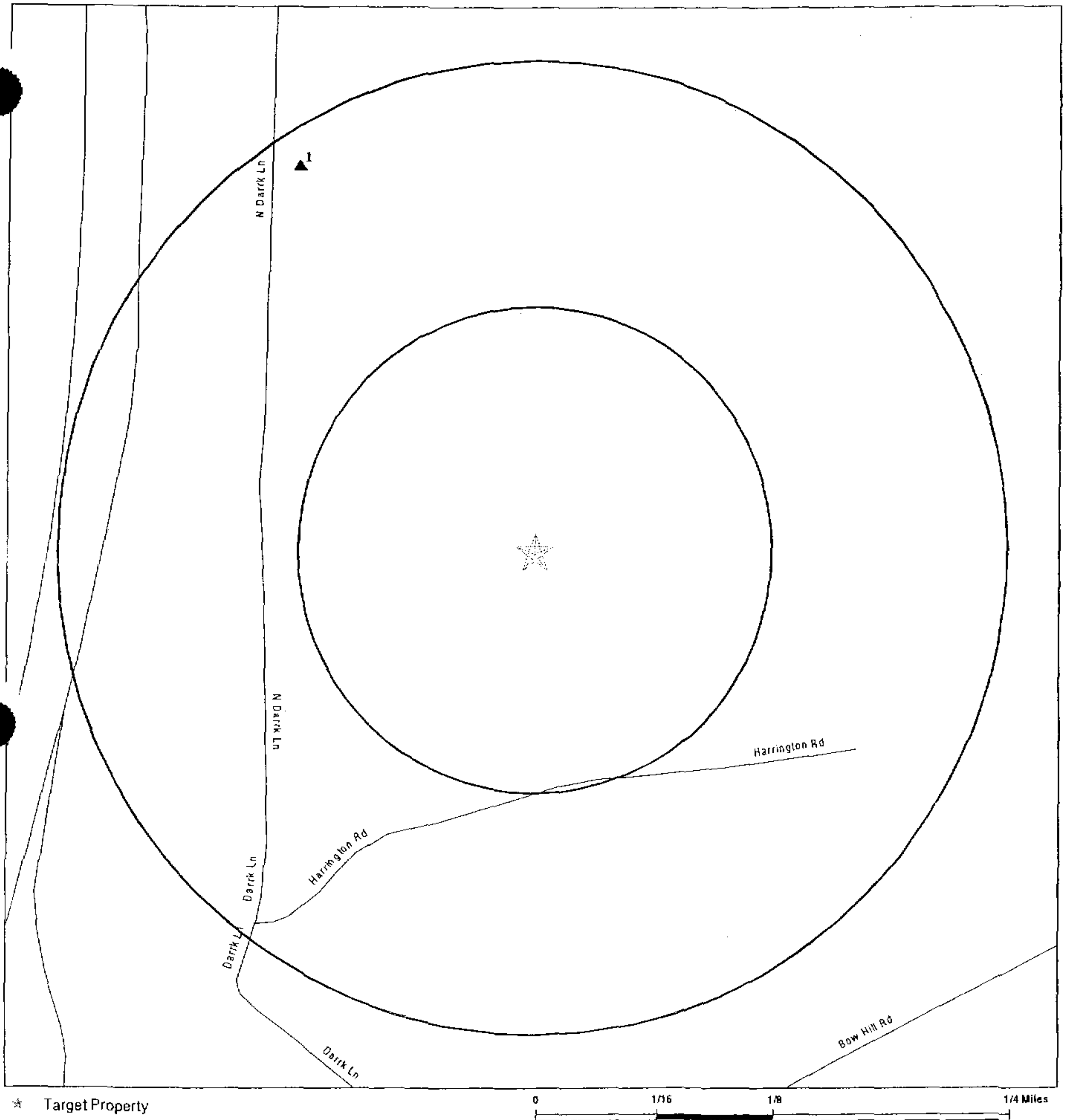
OVERVIEW MAP - 2673432.1s



- Target Property
- ▲ Sites at elevations higher than or equal to the target property
- ◆ Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory

SITE NAME: Upper Skagit Indian Tribe Site	CLIENT: Geo Engineers, Inc.
ADDRESS: 6019 NORTH DARRK LANE	CONTACT: Ron Bek
Bow WA 98232	INQUIRY #: 2673432.1s
LAT/LONG: 48.5615 / 122.3431	DATE: January 07, 2010 6:36 pm

DETAIL MAP - 2673432.1s



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone

SITE NAME: Upper Skagit Indian Tribe Site ADDRESS: 6019 NORTH DARRK LANE Bow WA 98232 LAT/LONG: 48.5615 / 122.3431	CLIENT: Geo Engineers, Inc. CONTACT: Ron Bek INQUIRY #: 2673432.1s DATE: January 07, 2010 6:37 pm

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL		1.000	0	0	0	0	NR	0
Proposed NPL		1.000	0	0	0	0	NR	0
NPL LIENS		TP	NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL		1.000	0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS		0.500	0	0	0	NR	NR	0
FEDERAL FACILITY		1.000	0	0	0	0	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP		0.500	0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS		1.000	0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF		0.500	0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG		0.250	0	0	NR	NR	NR	0
RCRA-SQG		0.250	0	0	NR	NR	NR	0
RCRA-CESQG		0.250	0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS		0.500	0	0	0	NR	NR	0
US INST CONTROL		0.500	0	0	0	NR	NR	0
Federal ERNS list								
ERNS		TP	NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
HSL		1.000	0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
CSCSL		1.000	0	0	0	0	NR	0
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF		0.500	0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST		0.500	0	0	0	NR	NR	0
INDIAN LUST		0.500	0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
State and tribal registered storage tank lists								
UST		0.250	0	1	NR	NR	NR	1
AST		0.250	0	0	NR	NR	NR	0
INDIAN UST		0.250	0	0	NR	NR	NR	0
FEMA UST		0.250	0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL		0.500	0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
VCP		0.500	0	0	0	NR	NR	0
INDIAN VCP		0.500	0	0	0	NR	NR	0
ICR		0.500	0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS		0.500	0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS		0.500	0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
ODI		0.500	0	0	0	NR	NR	0
DEBRIS REGION 9		0.500	0	0	0	NR	NR	0
SWTIRE		0.500	0	0	0	NR	NR	0
INDIAN ODI		0.500	0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL		TP	NR	NR	NR	NR	NR	0
ALLSITES		0.500	0	1	1	NR	NR	2
CSCSL NFA		0.500	0	0	0	NR	NR	0
CDL		TP	NR	NR	NR	NR	NR	0
HIST CDL		TP	NR	NR	NR	NR	NR	0
US HIST CDL		TP	NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2		TP	NR	NR	NR	NR	NR	0
LUCIS		0.500	0	0	0	NR	NR	0
Records of Emergency Release Reports								
HMIRS		TP	NR	NR	NR	NR	NR	0
SPILLS		TP	NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA-NonGen		0.250	0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
DOT OPS		TP	NR	NR	NR	NR	NR	0
DOD		1.000	0	0	0	0	NR	0
FUDS		1.000	0	0	0	0	NR	0
CONSENT		1.000	0	0	0	0	NR	0
ROD		1.000	0	0	0	0	NR	0
UMTRA		0.500	0	0	0	NR	NR	0
MINES		0.250	0	0	NR	NR	NR	0
TRIS		TP	NR	NR	NR	NR	NR	0
TSCA		TP	NR	NR	NR	NR	NR	0
FTTS		TP	NR	NR	NR	NR	NR	0
HIST FTTS		TP	NR	NR	NR	NR	NR	0
SSTS		TP	NR	NR	NR	NR	NR	0
ICIS		TP	NR	NR	NR	NR	NR	0
PADS		TP	NR	NR	NR	NR	NR	0
MLTS		TP	NR	NR	NR	NR	NR	0
RADINFO		TP	NR	NR	NR	NR	NR	0
FINDS		TP	NR	NR	NR	NR	NR	0
RAATS		TP	NR	NR	NR	NR	NR	0
UIC		TP	NR	NR	NR	NR	NR	0
MANIFEST		0.250	0	0	NR	NR	NR	0
DRYCLEANERS		0.250	0	0	NR	NR	NR	0
NPDES		TP	NR	NR	NR	NR	NR	0
AIRS		TP	NR	NR	NR	NR	NR	0
Inactive Drycleaners		0.250	0	0	NR	NR	NR	0
INDIAN RESERV		1.000	0	0	0	0	NR	0
SCRD DRYCLEANERS		0.500	0	0	0	NR	NR	0
COAL ASH EPA		0.500	0	0	0	NR	NR	0
PCB TRANSFORMER		TP	NR	NR	NR	NR	NR	0
COAL ASH DOE		TP	NR	NR	NR	NR	NR	0
COAL ASH		0.500	0	0	0	NR	NR	0

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Manufactured Gas Plants		1.000	0	0	0	0	NR	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

Map ID Direction Distance Elevation	Site	Database(s)	EDR ID Number EPA ID Number

MAP FINDINGS

1 **NNW** **1/8-1/4** **0.233 mi.** **1228 ft.**	**BOW HILL GAS & FOOD MART** **5984 N DARRK LN** **BOW, WA 98232**	**FINDS** **ALLSITES** **UST**	**1007122134** **N/A**

Relative: **Higher**

Actual: **268 ft.**

FINDS:

Registry ID: 110015930162

Environmental Interest/Information System
Washington Facility / Site Identification System (WA-FSIS) provides a means to query and display data maintained by the Washington Department of Ecology. This system contains key information for each facility/site that is currently, or has been, of interest to the Air Quality, Dam Safety, Hazardous Waste, Toxics Cleanup, and Water Quality Programs.

ALLSITES:

Facility Id:	5177350
Latitude:	48.564389000942597
Longitude:	-122.345333
Geographic location identifier (alias facid):	5177350
Facility Name:	BOW HILL GAS & FOOD MART
Latitude Decimal Degrees:	48.564388999999998
Longitude Decimal Degrees:	-122.345333
Coordinate Point Areal Extent Code:	4
Horizontal Accuracy Code:	99
Coordinate Point Geographic Position Code:	8
Location Verified Code:	N

Geographic location identifier (alias facid):	5177350
Facility Name:	BOW HILL GAS & FOOD MART
Latitude Decimal Degrees:	48.564388999999998
Longitude Decimal Degrees:	-122.345333
Coordinate Point Areal Extent Code:	4
Horizontal Accuracy Code:	99
Coordinate Point Geographic Position Code:	8
Location Verified Code:	N

UST:

Facility ID:	5177350
Site ID:	618944
Lat Deg:	48
Lat Min:	33
Lat Sec:	51.8004033934784
Long Deg:	-122
Long Min:	20
Long Sec:	43.1987999999365
UBI:	602611962001 0002
Phone Number:	3607240223

Tank ID:	618313
Tank Name:	TANK #1
Install Date:	6/17/2003
Capacity:	20,000 to 29,999 Gallons

BOW HILL GAS & FOOD MART (Continued) **1007122134**

Tank Upgrade Date:	6/17/2003
TankSystem Status:	Operational
TankSystem Status Change Date:	1/1/0001
Tank Status:	Operational
Tank Permit Expiration Date:	5/31/2010
Tank Closure Date:	1/1/0001
Tank Pumping System:	Pressurized System
Tank Spill Prevention:	Spill Bucket/Spill Box
Tank Overfill Prevention:	Automatic Shutoff (fill pipe)
Tank Material:	Fiberglass Reinforced Plastic
Tank Construction:	Double Wall Tank
Tank Tightness Test:	Not reported
Tank Corrosion Protection:	Corrosion Resistant
Pipe Material:	Flexible Piping
Pipe Construction:	Double Wall Pipe
Pipe Primary Release Detection:	Automatic Line Leak Detection
Pipe Second Release Detection:	Interstitial Monitoring (sump sensor)
Pipe Corrosion Protection:	Corrosion Resistant
Tank Primary Release Detection:	Interstitial Monitoring
Tank Second Release Detection:	Not reported
Pipe Tightness Test:	No
Tank Actual Status Date:	6/17/2003
Tag Number:	A5241

2
South
1/4-1/2
0.331 mi.
1745 ft.

THOUSAND TRAILS INC MOUNT VERNON
5409 DARRK LN
BOW, WA 98232

FINDS **1007075808**
ALLSITES **N/A**
UST

Relative:
Higher

Actual:
265 ft.

FINDS:

Registry ID: 110015524574

Environmental Interest/Information System
Washington Facility / Site Identification System (WA-FSIS) provides a means to query and display data maintained by the Washington Department of Ecology. This system contains key information for each facility/site that is currently, or has been, of interest to the Air Quality, Dam Safety, Hazardous Waste, Toxics Cleanup, and Water Quality Programs.

ALLSITES:

Facility Id:	13182941
Latitude:	48.56718
Longitude:	-122.34556000000001
Geographic location identifier (alias facid):	13182941
Facility Name:	THOUSAND TRAILS INC MOUNT VERNON
Latitude Decimal Degrees:	48.56718
Longitude Decimal Degrees:	-122.34556000000001
Coordinate Point Areal Extent Code:	4
Horizontal Accuracy Code:	4
Coordinate Point Geographic Position Code:	5
Location Verified Code:	Y

Geographic location identifier (alias facid): 13182941

THOUSAND TRAILS INC MOUNT VERNON (Continued) **1007075808**

Facility Name:	THOUSAND TRAILS INC MOUNT VERNON
Latitude Decimal Degrees:	48.56718
Longitude Decimal Degrees:	-122.34556000000001
Coordinate Point Areal Extent Code:	4
Horizontal Accuracy Code:	4
Coordinate Point Geographic Position Code:	5
Location Verified Code:	Y

UST:

Facility ID:	13182941
Site ID:	200592
Lat Deg:	48
Lat Min:	34
Lat Sec:	1.84800000000166
Long Deg:	-122
Long Min:	20
Long Sec:	44.0160000000219
UBI:	Not reported
Phone Number:	L00191

Tank ID:	563561
Tank Name:	1
Install Date:	1/1/1975
Capacity:	Not reported
Tank Upgrade Date:	1/1/0001
TankSystem Status:	Removed
TankSystem Status Change Date:	1/4/1991
Tank Status:	Removed
Tank Permit Expiration Date:	1/1/0001
Tank Closure Date:	1/1/0001
Tank Pumping System:	Not reported
Tank Spill Prevention:	Not reported
Tank Overfill Prevention:	Not reported
Tank Material:	Not reported
Tank Construction:	Not reported
Tank Tightness Test:	Not reported
Tank Corrosion Protection:	Not reported
Pipe Material:	Not reported
Pipe Construction:	Not reported
Pipe Primary Release Detection:	Not reported
Pipe Second Release Detection:	Not reported
Pipe Corrosion Protection:	Not reported
Tank Primary Release Detection:	Not reported
Tank Second Release Detection:	Not reported
Pipe Tightness Test:	Not reported
Tank Actual Status Date:	3/30/2001
Tag Number:	Not reported

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
BOW	U004041020	TONY E GOODE	1264 HWY 237	98232	ALLSITES, UST
BOW	S109823967	PULLEY RIDGE WETLAND MITIGATION SI	BOW HILL RD	98232	ALLSITES
BOW	1001491300		5 SOUTHBOUND MP 238	98232	RCRA-CESQG, FINDS, ALLSITES
BOW	S109140198	SKAGIT COUNTY DRAINAGE DISTRICT 5	13501 SULLIVAN RD	98232	NPDES
BURLINGTON	S110040590	BOUSLOG INDUSTRIAL SITE DEVELOPMEN	12185TH & 12209 BAYRIDGE DR	98233	ALLSITES
BURLINGTON	1007451864		1495 RT 20	98233	FINDS, ALLSITES
BURLINGTON	1001082019		680 HWY 20 W	98233	RCRA-SQG, FINDS
BURLINGTON	1000411159		HWY 20 & ALDER RD	98233	RCRA-NonGen, FINDS
BURLINGTON	S109555361	NORTHWEST AIR POLLUTION AUTHOR BUR	HWY 20 & ALDER RD	98233	ALLSITES
BURLINGTON	S110040904	STEEN RETAIL CENTER	740 HWY 20	98233	ALLSITES
BURLINGTON	1007070319		1340 HWY 99	98233	FINDS, ALLSITES
BURLINGTON	S110040218	RALLYE AUTO SALES INC	1010 HWY 99	98233	ALLSITES
BURLINGTON	S110039474	SITE PLAN FOR RE CARPET	478 ANDIS RD	98233	ALLSITES
BURLINGTON	S104485670	SKAGIT COUNTY PUBLIC WORKS DEPT. -	201 E AVON	98233	ICR
BURLINGTON	S110037641	WASTE MGMT SKAGIT CO HAULING	12122 BAY RIDGE DR	98233	ALLSITES
BURLINGTON	S110037855	SKAGIT PREVENTIVE DENTAL CLINIC	241 S BURLINGTON BLVD	98233	ALLSITES
BURLINGTON	S110038266	BEN RICHARDS FABRICATION	702 CASCADE HWY	98233	ALLSITES
BURLINGTON	S110040273	MOTOR WORKS NW	701 CASCADE HWY	98233	ALLSITES
BURLINGTON	S109824275	SKAGIT COUNTY DEPARTMENT OF PARKS	690 COUNTY SHOP LN	98233	ALLSITES
BURLINGTON	S110035994	HYUNDAI DEALERSHIP FOR SKAGIT CROS	1359 GOLDENROD RD	98233	ALLSITES
BURLINGTON	1011492584	PORT OF SKAGIT COUNTY	1180 HIGGINS AIRPORT WAY	98233	ICIS
BURLINGTON	S110037652	SKAGIT CNTY PWD BUTLER PIT	1647 KELLEHER RD	98233	ALLSITES
BURLINGTON	S109824206	SKAGIT TRANSMISSION LILA LANE	303 LILA LN	98233	ALLSITES
BURLINGTON	1007071732		5585 OLD HWY 99 N	98233	FINDS, ALLSITES, UST
BURLINGTON	1007077709		3570 OLD HWY 99 N	98233	FINDS, ALLSITES, UST
BURLINGTON	1007062132		200 OLD HWY 99	98233	FINDS, ALLSITES
BURLINGTON	1001600555		OLD HWY 99 MP 439	98233	RCRA-NonGen, FINDS, ALLSITES
BURLINGTON	S102997431	ALGER VIDEO	3570 OLD HWY 99 N	98233	LUST
BURLINGTON	S109824804	RONNIES STATION	1714 OLD HWY 99 S	98233	ALLSITES
BURLINGTON	S110036871	CONCRETE NORWEST BELLEVILLE PIT	8198 OLD HWY 99 N RD	98233	ALLSITES
BURLINGTON	S110039786	CAMPING WORLD INC	1240 OLD HWY 99	98233	ALLSITES
BURLINGTON	1011399842	PSE SKAGIT SERVICE CENTER	1660 PARK LN NE	98233	FINDS
BURLINGTON	1011266889	SKAGIT FARMERS SUPPLY II	1660 PARK LN	98233	FINDS
BURLINGTON	S109053276	PSE SKAGIT SERVICE CENTER	1660 PARK LN NE	98233	ALLSITES, MANIFEST
BURLINGTON	U004060319	SKAGIT FARMERS SUPPLY	1660 PARK LN	98233	ALLSITES, UST
BURLINGTON	1010788406	PSE SKAGIT SERVICE CENTER	1660 PARK LN NE	98233	RCRA-NonGen
BURLINGTON	S110036949	TUDOR SITE COMMERCIAL	200 PEASE RD	98233	ALLSITES
BURLINGTON	S110039919	NORTH BURLINGTON BLVD IMPROVEMENT	N SR20 HWY	98233	ALLSITES
CONCRETE	1001620232	CLEMENTS CONDOMINIUMS	4820 HWY 20	98233	RCRA-NonGen, FINDS, ALLSITES
SKAGIT COUNTY	2008903332	UPPER BIGGER LAKE	UPPER BIGGER LAKE		ERNS

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number **of Days to Update:** Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 10/01/2009
Date Data Arrived at EDR: 10/14/2009
Date Made Active in Reports: 11/09/2009
Number of Days to Update: 26

Source: EPA
Telephone: N/A
Last EDR Contact: 11/13/2009
Next Scheduled EDR Contact: 01/25/2010
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 10
Telephone 206-553-8665

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 10/01/2009
Date Data Arrived at EDR: 10/14/2009
Date Made Active in Reports: 11/09/2009
Number of Days to Update: 26

Source: EPA
Telephone: N/A
Last EDR Contact: 11/13/2009
Next Scheduled EDR Contact: 01/25/2010
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/17/2009
Next Scheduled EDR Contact: 11/16/2009
Data Release Frequency: No Update Planned

Federal Delisted NPL site list

DELISTED NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 10/01/2009	Source: EPA
Date Data Arrived at EDR: 10/14/2009	Telephone: N/A
Date Made Active in Reports: 11/09/2009	Last EDR Contact: 11/13/2009
Number of Days to Update: 26	Next Scheduled EDR Contact: 01/25/2010
	Data Release Frequency: Quarterly

Federal CERCLIS list

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 06/30/2009	Source: EPA
Date Data Arrived at EDR: 08/11/2009	Telephone: 703-412-9810
Date Made Active in Reports: 09/21/2009	Last EDR Contact: 12/28/2009
Number of Days to Update: 41	Next Scheduled EDR Contact: 04/12/2010
	Data Release Frequency: Quarterly

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of NPL and Base Realighnment & Closure sites found in the CERCLIS database where FERRO is involved in cleanup projects.

Date of Government Version: 10/03/2008	Source: Environmental Protection Agency
Date Data Arrived at EDR: 07/10/2009	Telephone: 703-603-8704
Date Made Active in Reports: 09/29/2009	Last EDR Contact: 10/16/2009
Number of Days to Update: 81	Next Scheduled EDR Contact: 01/25/2010
	Data Release Frequency: Varies

Federal CERCLIS NFRAP site List

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 06/23/2009	Source: EPA
Date Data Arrived at EDR: 09/02/2009	Telephone: 703-412-9810
Date Made Active in Reports: 09/21/2009	Last EDR Contact: 11/24/2009
Number of Days to Update: 19	Next Scheduled EDR Contact: 03/15/2010
	Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 09/15/2009	Source: EPA
Date Data Arrived at EDR: 09/22/2009	Telephone: 800-424-9346
Date Made Active in Reports: 11/09/2009	Last EDR Contact: 11/16/2009
Number of Days to Update: 48	Next Scheduled EDR Contact: 03/01/2010
	Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Transporters, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 11/12/2008
Date Data Arrived at EDR: 11/18/2008
Date Made Active in Reports: 03/16/2009
Number of Days to Update: 118

Source: Environmental Protection Agency
Telephone: (206) 553-1200
Last EDR Contact: 12/17/2009
Next Scheduled EDR Contact: 01/18/2010
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 11/12/2008
Date Data Arrived at EDR: 11/18/2008
Date Made Active in Reports: 03/16/2009
Number of Days to Update: 118

Source: Environmental Protection Agency
Telephone: (206) 553-1200
Last EDR Contact: 12/17/2009
Next Scheduled EDR Contact: 01/18/2010
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 11/12/2008
Date Data Arrived at EDR: 11/18/2008
Date Made Active in Reports: 03/16/2009
Number of Days to Update: 118

Source: Environmental Protection Agency
Telephone: (206) 553-1200
Last EDR Contact: 12/17/2009
Next Scheduled EDR Contact: 01/18/2010
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 11/12/2008
Date Data Arrived at EDR: 11/18/2008
Date Made Active in Reports: 03/16/2009
Number of Days to Update: 118

Source: Environmental Protection Agency
Telephone: (206) 553-1200
Last EDR Contact: 12/17/2009
Next Scheduled EDR Contact: 01/18/2010
Data Release Frequency: Varies

Federal institutional controls / engineering controls registries

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 10/01/2009
Date Data Arrived at EDR: 10/09/2009
Date Made Active in Reports: 11/09/2009
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 12/10/2009
Next Scheduled EDR Contact: 03/29/2010
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 10/01/2009
Date Data Arrived at EDR: 10/09/2009
Date Made Active in Reports: 11/09/2009
Number of Days to Update: 31

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 12/10/2009
Next Scheduled EDR Contact: 03/29/2010
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 08/31/2009
Date Data Arrived at EDR: 09/17/2009
Date Made Active in Reports: 11/09/2009
Number of Days to Update: 53

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 10/06/2009
Next Scheduled EDR Contact: 01/18/2010
Data Release Frequency: Annually

State- and tribal - equivalent NPL

HSL: Hazardous Sites List

The Hazardous Sites List is a subset of the CSCSL Report. It includes sites which have been assessed and ranked using the Washington Ranking Method (WARM).

Date of Government Version: 08/19/2009
Date Data Arrived at EDR: 09/04/2009
Date Made Active in Reports: 09/22/2009
Number of Days to Update: 18

Source: Department of Ecology
Telephone: 360-407-7200
Last EDR Contact: 11/13/2009
Next Scheduled EDR Contact: 03/01/2010
Data Release Frequency: Semi-Annually

State- and tribal - equivalent CERCLIS

CSCSL: Confirmed and Suspected Contaminated Sites List

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 10/27/2009
Date Data Arrived at EDR: 10/29/2009
Date Made Active in Reports: 11/25/2009
Number of Days to Update: 27

Source: Department of Ecology
Telephone: 360-407-7200
Last EDR Contact: 10/29/2009
Next Scheduled EDR Contact: 02/08/2010
Data Release Frequency: Semi-Annually

State and tribal landfill and/or solid waste disposal site lists

SWF/LF: Solid Waste Facility Database

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that *failed to meet* RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 09/29/2009
Date Data Arrived at EDR: 09/29/2009
Date Made Active in Reports: 10/14/2009
Number of Days to Update: 15

Source: Department of Ecology
Telephone: 360-407-6132
Last EDR Contact: 12/28/2009
Next Scheduled EDR Contact: 03/29/2010
Data Release Frequency: Annually

State and tribal leaking storage tank lists

LUST: Leaking Underground Storage Tanks Site List

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 11/23/2009
Date Data Arrived at EDR: 11/23/2009
Date Made Active in Reports: 12/03/2009
Number of Days to Update: 10

Source: Department of Ecology
Telephone: 360-407-7183
Last EDR Contact: 11/23/2009
Next Scheduled EDR Contact: 03/08/2010
Data Release Frequency: Quarterly

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 11/24/2009
Date Data Arrived at EDR: 11/25/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 21

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 10/30/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Quarterly

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 12/07/2009
Date Data Arrived at EDR: 12/09/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 7

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 10/30/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Semi-Annually

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 11/10/2009
Date Data Arrived at EDR: 11/12/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 34

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 10/30/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Quarterly

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land

A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 02/19/2009
Date Data Arrived at EDR: 02/19/2009
Date Made Active in Reports: 03/16/2009
Number of Days to Update: 25

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 10/30/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 11/12/2009
Date Data Arrived at EDR: 11/12/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 34

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 10/30/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Varies

INDIAN LUST R7: Laaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 03/24/2009
Date Data Arrived at EDR: 05/20/2009
Date Made Active in Reports: 06/17/2009
Number of Days to Update: 28

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 11/04/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Varies

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 12/01/2009
Date Data Arrived at EDR: 12/01/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 15

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 10/30/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Quarterly

State and tribal registered storage tank lists

UST: Underground Storage Tank Database
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 11/24/2009
Date Data Arrived at EDR: 11/25/2009
Date Made Active in Reports: 12/22/2009
Number of Days to Update: 27

Source: Department of Ecology
Telephone: 360-407-7183
Last EDR Contact: 11/25/2009
Next Scheduled EDR Contact: 03/08/2010
Data Release Frequency: Quarterly

AST: Aboveground Storage Tank Locations
A listing of aboveground storage tank locations regulated by the Department of Ecology's Spill Prevention, Preparedness and Response Program.

Date of Government Version: 05/27/2009
Date Data Arrived at EDR: 05/28/2009
Date Made Active in Reports: 06/19/2009
Number of Days to Update: 22

Source: Department of Ecology
Telephone: 360-407-7562
Last EDR Contact: 11/09/2009
Next Scheduled EDR Contact: 02/22/2010
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 12/07/2009
Date Data Arrived at EDR: 12/09/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 7

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 10/30/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Semi-Annually

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 11/12/2009	Source: EPA Region 9
Date Data Arrived at EDR: 11/20/2009	Telephone: 415-972-3368
Date Made Active in Reports: 12/16/2009	Last EDR Contact: 10/30/2009
Number of Days to Update: 26	Next Scheduled EDR Contact: 02/15/2010
	Data Release Frequency: Quarterly

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 12/01/2009	Source: EPA Region 8
Date Data Arrived at EDR: 12/01/2009	Telephone: 303-312-6137
Date Made Active in Reports: 12/16/2009	Last EDR Contact: 10/30/2009
Number of Days to Update: 15	Next Scheduled EDR Contact: 02/15/2010
	Data Release Frequency: Quarterly

INDIAN UST R10: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 11/10/2009	Source: EPA Region 10
Date Data Arrived at EDR: 11/12/2009	Telephone: 206-553-2857
Date Made Active in Reports: 12/16/2009	Last EDR Contact: 10/30/2009
Number of Days to Update: 34	Next Scheduled EDR Contact: 02/15/2010
	Data Release Frequency: Quarterly

INDIAN UST R1: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 02/19/2009	Source: EPA, Region 1
Date Data Arrived at EDR: 02/19/2009	Telephone: 617-918-1313
Date Made Active in Reports: 03/16/2009	Last EDR Contact: 10/30/2009
Number of Days to Update: 25	Next Scheduled EDR Contact: 02/15/2010
	Data Release Frequency: Varies

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 11/05/2009	Source: EPA Region 5
Date Data Arrived at EDR: 11/05/2009	Telephone: 312-886-6136
Date Made Active in Reports: 12/16/2009	Last EDR Contact: 10/22/2009
Number of Days to Update: 41	Next Scheduled EDR Contact: 11/16/2009
	Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 11/12/2009	Source: EPA Region 6
Date Data Arrived at EDR: 11/12/2009	Telephone: 214-665-7591
Date Made Active in Reports: 12/16/2009	Last EDR Contact: 10/30/2009
Number of Days to Update: 34	Next Scheduled EDR Contact: 02/15/2010
	Data Release Frequency: Semi-Annually

INDIAN UST R7: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 04/01/2008
Date Data Arrived at EDR: 12/30/2008
Date Made Active in Reports: 03/16/2009
Number of Days to Update: 76

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 11/04/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Varies

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 10/01/2009
Date Data Arrived at EDR: 10/29/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 48

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 10/19/2009
Next Scheduled EDR Contact: 02/01/2010
Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

INST CONTROL: Institutional Control Site List
Sites that have institutional controls.

Date of Government Version: 11/17/2009
Date Data Arrived at EDR: 11/18/2009
Date Made Active in Reports: 11/25/2009
Number of Days to Update: 7

Source: Department of Ecology
Telephone: 360-407-7170
Last EDR Contact: 11/18/2009
Next Scheduled EDR Contact: 03/01/2010
Data Release Frequency: Varies

State and tribal voluntary cleanup sites

INDIAN VCP R1: Voluntary Cleanup Priority Listing
A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 04/02/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 01/05/2010
Next Scheduled EDR Contact: 04/19/2010
Data Release Frequency: Varies

VCP: Voluntary Cleanup Program Sites
Sites that have entered either the Voluntary Cleanup Program or its predecessor Independent Remedial Action Program.

Date of Government Version: 10/27/2009
Date Data Arrived at EDR: 10/29/2009
Date Made Active in Reports: 11/25/2009
Number of Days to Update: 27

Source: Department of Ecology
Telephone: 360-407-7200
Last EDR Contact: 10/27/2009
Next Scheduled EDR Contact: 02/08/2010
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng
A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

ICR: Independent Cleanup Reports

These are remedial action reports Ecology has received from either the owner or operator of the sites. These actions have been conducted without department oversight or approval and are not under an order or decree. This database is no longer updated by the Department of Ecology.

Date of Government Version: 12/01/2002
Date Data Arrived at EDR: 01/03/2003
Date Made Active in Reports: 01/22/2003
Number of Days to Update: 19

Source: Department of Ecology
Telephone: 360-407-7200
Last EDR Contact: 08/10/2009
Next Scheduled EDR Contact: 11/09/2009
Data Release Frequency: No Update Planned

State and tribal Brownfields sites

BROWNFIELDS: Brownfields Sites Listing

A listing of brownfields sites included in the Confirmed & Suspected Sites Listing. Brownfields are abandoned, idle or underused commercial or industrial properties, where the expansion or redevelopment is hindered by real or perceived contamination. Brownfields vary in size, location, age, and past use -- they can be anything from a five-hundred acre automobile assembly plant to a small, abandoned corner gas station.

Date of Government Version: 10/27/2009
Date Data Arrived at EDR: 10/29/2009
Date Made Active in Reports: 11/25/2009
Number of Days to Update: 27

Source: Department of Ecology
Telephone: 360-725-4030
Last EDR Contact: 10/29/2009
Next Scheduled EDR Contact: 02/08/2010
Data Release Frequency: Varies

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites

Included in the listing are brownfields properties addresses by Cooperative Agreement Recipients and brownfields properties addressed by Targeted Brownfields Assessments. Targeted Brownfields Assessments-EPA's Targeted Brownfields Assessments (TBA) program is designed to help states, tribes, and municipalities--especially those without EPA Brownfields Assessment Demonstration Pilots--minimize the uncertainties of contamination often associated with brownfields. Under the TBA program, EPA provides funding and/or technical assistance for environmental assessments at brownfields sites throughout the country. Targeted Brownfields Assessments supplement and work with other efforts under EPA's Brownfields Initiative to promote cleanup and redevelopment of brownfields. Cooperative Agreement Recipients-States, political subdivisions, territories, and Indian tribes become Brownfields Cleanup Revolving Loan Fund (BCRLF) cooperative agreement recipients when they enter into BCRLF cooperative agreements with the U.S. EPA. EPA selects BCRLF cooperative agreement recipients based on a proposal and application process. BCRLF cooperative agreement recipients must use EPA funds provided through BCRLF cooperative agreement for specified brownfields-related cleanup activities.

Date of Government Version: 10/01/2009
Date Data Arrived at EDR: 11/04/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 42

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 01/07/2010
Next Scheduled EDR Contact: 04/12/2010
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009	Source: EPA, Region 9
Date Data Arrived at EDR: 05/07/2009	Telephone: 415-972-3336
Date Made Active in Reports: 09/21/2009	Last EDR Contact: 01/07/2010
Number of Days to Update: 137	Next Scheduled EDR Contact: 03/22/2010
	Data Release Frequency: Varies

SWTIRE: Solid Waste Tire Facilities

This study identified sites statewide with unauthorized accumulations of scrap tires.

Date of Government Version: 11/01/2005	Source: Department of Ecology
Date Data Arrived at EDR: 03/16/2006	Telephone: N/A
Date Made Active in Reports: 04/13/2006	Last EDR Contact: 12/14/2009
Number of Days to Update: 28	Next Scheduled EDR Contact: 03/29/2010
	Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands

Location of open dumps on Indian land.

Date of Government Version: 12/31/1998	Source: Environmental Protection Agency
Date Data Arrived at EDR: 12/03/2007	Telephone: 703-308-8245
Date Made Active in Reports: 01/24/2008	Last EDR Contact: 11/09/2009
Number of Days to Update: 52	Next Scheduled EDR Contact: 02/22/2010
	Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 03/01/2009	Source: Drug Enforcement Administration
Date Data Arrived at EDR: 06/22/2009	Telephone: 202-307-1000
Date Made Active in Reports: 09/21/2009	Last EDR Contact: 12/14/2009
Number of Days to Update: 91	Next Scheduled EDR Contact: 03/22/2010
	Data Release Frequency: Quarterly

ALLSITES: Facility/Site Identification System Listing

Information on facilities and sites of interest to the Department of Ecology.

Date of Government Version: 11/07/2009	Source: Department of Ecology
Date Data Arrived at EDR: 11/10/2009	Telephone: 360-407-6423
Date Made Active in Reports: 11/25/2009	Last EDR Contact: 11/10/2009
Number of Days to Update: 15	Next Scheduled EDR Contact: 02/22/2010
	Data Release Frequency: Quarterly

CSCSL NFA: Confirmed and Contaminated Sites - No Further Action

The data set contains information about sites previously on the Confirmed and Suspected Contaminated Sites list that have received a No Further Action (NFA) determination. Because it is necessary to maintain historical records of sites that have been investigated and cleaned up, sites are not deleted from the database when cleanup activities are completed. Instead, a No Further Action code is entered based upon the type of NFA determination the site received.

Date of Government Version: 10/27/2009
Date Data Arrived at EDR: 10/29/2009
Date Made Active in Reports: 12/03/2009
Number of Days to Update: 35

Source: Department of Ecology
Telephone: 360-407-7170
Last EDR Contact: 10/29/2009
Next Scheduled EDR Contact: 02/08/2010
Data Release Frequency: Semi-Annually

CDL: Clandestine Drug Lab Contaminated Site List

Illegal methamphetamine labs use hazardous chemicals that create public health hazards. Chemicals and residues can cause burns, respiratory and neurological damage, and death. Biological hazards associated with intravenous needles, feces, and blood also pose health risks.

Date of Government Version: 02/09/2009
Date Data Arrived at EDR: 03/18/2009
Date Made Active in Reports: 03/24/2009
Number of Days to Update: 6

Source: Department of Health
Telephone: 360-236-3380
Last EDR Contact: 11/17/2009
Next Scheduled EDR Contact: 03/01/2010
Data Release Frequency: Varies

HIST CDL: List of Sites Contaminated by Clandestine Drug Labs

This listing of contaminated sites by Clandestine Drug Labs includes non-remediated properties. The current CDL listing does not. This listing is no longer updated by the state agency.

Date of Government Version: 02/08/2007
Date Data Arrived at EDR: 06/26/2007
Date Made Active in Reports: 07/19/2007
Number of Days to Update: 23

Source: Department of Health
Telephone: 360-236-3381
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 09/01/2007
Date Data Arrived at EDR: 11/19/2008
Date Made Active in Reports: 03/30/2009
Number of Days to Update: 131

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

Local Land Records

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 11/03/2009
Date Data Arrived at EDR: 11/05/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 41

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 11/02/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 12/09/2005
Date Data Arrived at EDR: 12/11/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 31

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 11/20/2009
Next Scheduled EDR Contact: 03/08/2010
Data Release Frequency: Varies

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 10/05/2009
Date Data Arrived at EDR: 10/05/2009
Date Made Active in Reports: 11/09/2009
Number of Days to Update: 35

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 01/06/2010
Next Scheduled EDR Contact: 04/12/2010
Data Release Frequency: Annually

SPILLS: Reported Spills
Spills reported to the Spill Prevention, Preparedness and Response Division.

Date of Government Version: 09/24/2009
Date Data Arrived at EDR: 09/24/2009
Date Made Active in Reports: 10/14/2009
Number of Days to Update: 20

Source: Department of Ecology
Telephone: 360-407-6950
Last EDR Contact: 12/28/2009
Next Scheduled EDR Contact: 03/29/2010
Data Release Frequency: Semi-Annually

Other Ascertainable Records

RCRA-NonGen: RCRA - Non Generators
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 11/12/2008
Date Data Arrived at EDR: 11/18/2008
Date Made Active in Reports: 03/16/2009
Number of Days to Update: 118

Source: Environmental Protection Agency
Telephone: (206) 553-1200
Last EDR Contact: 12/17/2009
Next Scheduled EDR Contact: 01/18/2010
Data Release Frequency: Varies

DOT OPS: Incident and Accident Data
Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 10/13/2009
Date Data Arrived at EDR: 11/10/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 36

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 11/10/2009
Next Scheduled EDR Contact: 02/22/2010
Data Release Frequency: Varies

DOD: Department of Defense Sites
This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 703-692-8801
Last EDR Contact: 10/23/2009
Next Scheduled EDR Contact: 02/01/2010
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites
The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 12/31/2008
Date Data Arrived at EDR: 09/30/2009
Date Made Active in Reports: 12/01/2009
Number of Days to Update: 62

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 12/18/2009
Next Scheduled EDR Contact: 03/29/2010
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 08/03/2009	Source: Department of Justice, Consent Decree Library
Date Data Arrived at EDR: 10/27/2009	Telephone: Varies
Date Made Active in Reports: 11/09/2009	Last EDR Contact: 01/05/2010
Number of Days to Update: 13	Next Scheduled EDR Contact: 04/19/2010
	Data Release Frequency: Varies

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 09/01/2009	Source: EPA
Date Data Arrived at EDR: 09/22/2009	Telephone: 703-416-0223
Date Made Active in Reports: 10/22/2009	Last EDR Contact: 12/15/2009
Number of Days to Update: 30	Next Scheduled EDR Contact: 03/29/2010
	Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 01/05/2009	Source: Department of Energy
Date Data Arrived at EDR: 05/07/2009	Telephone: 505-845-0011
Date Made Active in Reports: 05/08/2009	Last EDR Contact: 12/23/2009
Number of Days to Update: 1	Next Scheduled EDR Contact: 03/15/2010
	Data Release Frequency: Varies

MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 08/07/2009	Source: Department of Labor, Mine Safety and Health Administration
Date Data Arrived at EDR: 09/18/2009	Telephone: 303-231-5959
Date Made Active in Reports: 11/09/2009	Last EDR Contact: 12/08/2009
Number of Days to Update: 52	Next Scheduled EDR Contact: 03/22/2010
	Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2007	Source: EPA
Date Data Arrived at EDR: 04/09/2009	Telephone: 202-566-0250
Date Made Active in Reports: 06/17/2009	Last EDR Contact: 12/01/2009
Number of Days to Update: 69	Next Scheduled EDR Contact: 03/15/2010
	Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2002	Source: EPA
Date Data Arrived at EDR: 04/14/2006	Telephone: 202-260-5521
Date Made Active in Reports: 05/30/2006	Last EDR Contact: 12/29/2009
Number of Days to Update: 46	Next Scheduled EDR Contact: 04/12/2010
	Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 12/14/2009
Next Scheduled EDR Contact: 03/15/2010
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 12/14/2009
Next Scheduled EDR Contact: 03/15/2010
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing
A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems
Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2007
Date Data Arrived at EDR: 05/19/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 125

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 11/02/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 08/21/2009
Date Data Arrived at EDR: 08/27/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 56

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 12/23/2009
Next Scheduled EDR Contact: 04/12/2010
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 09/01/2009
Date Data Arrived at EDR: 10/21/2009
Date Made Active in Reports: 12/01/2009
Number of Days to Update: 41

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 10/21/2009
Next Scheduled EDR Contact: 02/01/2010
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 09/25/2009
Date Data Arrived at EDR: 10/23/2009
Date Made Active in Reports: 12/16/2009
Number of Days to Update: 54

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 12/14/2009
Next Scheduled EDR Contact: 03/29/2010
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 10/15/2009
Date Data Arrived at EDR: 10/16/2009
Date Made Active in Reports: 12/01/2009
Number of Days to Update: 46

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 10/16/2009
Next Scheduled EDR Contact: 01/25/2010
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 10/19/2009
Date Data Arrived at EDR: 10/22/2009
Date Made Active in Reports: 12/01/2009
Number of Days to Update: 40

Source: EPA
Telephone: (206) 553-1200
Last EDR Contact: 12/10/2009
Next Scheduled EDR Contact: 03/29/2010
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

BRS: Biennial Reporting System
The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2007
Date Data Arrived at EDR: 02/19/2009
Date Made Active in Reports: 05/22/2009
Number of Days to Update: 92

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 11/20/2009
Next Scheduled EDR Contact: 03/05/2010
Data Release Frequency: Biennially

UIC: Underground Injection Wells Listing
A listing of underground injection wells.

Date of Government Version: 11/23/2009
Date Data Arrived at EDR: 11/23/2009
Date Made Active in Reports: 12/03/2009
Number of Days to Update: 10

Source: Department of Ecology
Telephone: 360-407-6143
Last EDR Contact: 11/23/2009
Next Scheduled EDR Contact: 03/08/2010
Data Release Frequency: Varies

WA MANIFEST: Hazardous Waste Manifest Data
Hazardous waste manifest information.

Date of Government Version: 12/31/2008
Date Data Arrived at EDR: 06/05/2009
Date Made Active in Reports: 06/19/2009
Number of Days to Update: 14

Source: Department of Ecology
Telephone: N/A
Last EDR Contact: 10/23/2009
Next Scheduled EDR Contact: 02/08/2010
Data Release Frequency: Annually

DRYCLEANERS: Drycleaner List
A listing of registered drycleaners who registered with the Department of Ecology (using the SIC code of 7215 and 7216) as hazardous waste generators.

Date of Government Version: 12/31/2008
Date Data Arrived at EDR: 06/05/2009
Date Made Active in Reports: 06/19/2009
Number of Days to Update: 14

Source: Department of Ecology
Telephone: 360-407-6732
Last EDR Contact: 10/23/2009
Next Scheduled EDR Contact: 02/08/2010
Data Release Frequency: Varies

NPDES: Water Quality Permit System Data
A listing of permitted wastewater facilities.

Date of Government Version: 10/27/2009
Date Data Arrived at EDR: 10/29/2009
Date Made Active in Reports: 11/25/2009
Number of Days to Update: 27

Source: Department of Ecology
Telephone: 360-407-6073
Last EDR Contact: 10/29/2009
Next Scheduled EDR Contact: 02/08/2010
Data Release Frequency: Quarterly

AIRS (EMI): Washington Emissions Data System
Emissions inventory data.

Date of Government Version: 12/31/2007
Date Data Arrived at EDR: 01/15/2009
Date Made Active in Reports: 03/24/2009
Number of Days to Update: 68

Source: Department of Ecology
Telephone: 360-407-6040
Last EDR Contact: 12/28/2009
Next Scheduled EDR Contact: 04/12/2010
Data Release Frequency: Annually

INACTIVE DRYCLEANERS: Inactive Drycleaners
A listing of inactive drycleaner facility locations.

Date of Government Version: 12/31/2008
Date Data Arrived at EDR: 06/09/2009
Date Made Active in Reports: 06/19/2009
Number of Days to Update: 10

Source: Department of Ecology
Telephone: 360-407-6732
Last EDR Contact: 10/23/2009
Next Scheduled EDR Contact: 02/08/2010
Data Release Frequency: Annually

INDIAN RESERV: Indian Reservations
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 10/23/2009
Next Scheduled EDR Contact: 02/01/2010
Data Release Frequency: Semi-Annually

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing
The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 09/09/2009
Date Data Arrived at EDR: 09/09/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 43

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 11/09/2009
Next Scheduled EDR Contact: 02/08/2010
Data Release Frequency: Varies

FEDLAND: Federal and Indian Lands
Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 10/23/2009
Next Scheduled EDR Contact: 02/01/2010
Data Release Frequency: N/A

COAL ASH: Coal Ash Disposal Site Listing
A listing of coal ash disposal site locations.

Date of Government Version: 06/29/2009
Date Data Arrived at EDR: 07/02/2009
Date Made Active in Reports: 07/08/2009
Number of Days to Update: 6

Source: Department of Ecology
Telephone: 360-407-6933
Last EDR Contact: 12/28/2009
Next Scheduled EDR Contact: 03/29/2010
Data Release Frequency: Varies

COAL ASH DOE: Steam-Electric Plan Operation Data
A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 10/23/2009
Next Scheduled EDR Contact: 02/01/2010
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List
A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 09/21/2009
Date Data Arrived at EDR: 09/25/2009
Date Made Active in Reports: 11/09/2009
Number of Days to Update: 45

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 12/15/2009
Next Scheduled EDR Contact: 03/29/2010
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 01/01/2008
Date Data Arrived at EDR: 02/18/2009
Date Made Active in Reports: 05/29/2009
Number of Days to Update: 100

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 11/13/2009
Next Scheduled EDR Contact: 02/15/2010
Data Release Frequency: Varies

EDR PROPRIETARY RECORDS

EDR Proprietary Records

Manufactured Gas Plants: EDR Proprietary Manufactured Gas Plants
The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

COUNTY RECORDS

KING COUNTY:

Abandoned Landfill Study in King County
The King County Abandoned Landfill Survey was conducted from October through December 1984 by the Health Department's Environmental Health Division at the request of the King County Council. The primary objective of the survey was to determine if any public health problems existed at the predetermined 24 sites.

Date of Government Version: 04/30/1985
Date Data Arrived at EDR: 11/07/1994
Date Made Active in Reports: N/A
Number of Days to Update: 0

Source: Seattle-King County Department of Public Health
Telephone: 206-296-4785
Last EDR Contact: 10/21/1994
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

SEATTLE COUNTY:

Abandoned Landfill Study in the City of Seattle
The Seattle Abandoned Landfill Survey was conducted in June and July of 1984 by the Health Department's Environmental Health Division at the request of the Mayor's Office. The primary objective of the survey was to determine if any public health problems existed at the predetermined 12 sites.

Date of Government Version: 07/30/1984
Date Data Arrived at EDR: 11/07/1994
Date Made Active in Reports: N/A
Number of Days to Update: 0

Source: Seattle - King County Department of Public Health
Telephone: 206-296-4785
Last EDR Contact: 10/21/1994
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

SEATTLE/KING COUNTY:

Seattle - King County Abandoned Landfill Toxicity / Hazard Assessment Project

This report presents the Seattle-King County Health Department's follow-up investigation of two city owned and four county owned abandoned landfills which was conducted from February to December 1986.

Date of Government Version: 12/31/1986
Date Data Arrived at EDR: 08/18/1995
Date Made Active in Reports: 09/20/1995
Number of Days to Update: 33

Source: Department of Public Health
Telephone: 206-296-4785
Last EDR Contact: 08/14/1995
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

SNOHOMISH COUNTY:

Solid Waste Sites of Record at Snohomish Health District

Solid waste disposal and/or utilization sites in Snohomish County.

Date of Government Version: 10/01/2008
Date Data Arrived at EDR: 01/30/2009
Date Made Active in Reports: 03/24/2009
Number of Days to Update: 53

Source: Snohomish Health District
Telephone: 206-339-5250
Last EDR Contact: 01/06/2010
Next Scheduled EDR Contact: 04/12/2010
Data Release Frequency: Semi-Annually

TACOMA/PIERCE COUNTY:

Closed Landfill Survey

Following numerous requests for information about closed dumpsites and landfills in Pierce County, the Tacoma-Pierce County Health Department decided to conduct a study on the matter. The aim of the study was to evaluate public health risks associated with the closed dumpsites and landfills, and to determine the need, if any, for further investigations of a more detailed nature. The sites represent all of the known dumpsites and landfills closed after 1950.

Date of Government Version: 09/01/2002
Date Data Arrived at EDR: 03/24/2003
Date Made Active in Reports: 05/14/2003
Number of Days to Update: 51

Source: Tacoma-Pierce County Health Department
Telephone: 206-591-6500
Last EDR Contact: 03/19/2003
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 12/31/2007
Date Data Arrived at EDR: 08/26/2009
Date Made Active in Reports: 09/11/2009
Number of Days to Update: 16

Source: Department of Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 11/24/2009
Next Scheduled EDR Contact: 03/08/2010
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data
Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 10/27/2009
Date Data Arrived at EDR: 11/10/2009
Date Made Active in Reports: 12/09/2009
Number of Days to Update: 29

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 11/10/2009
Next Scheduled EDR Contact: 02/22/2010
Data Release Frequency: Annually

PA MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2008
Date Data Arrived at EDR: 12/01/2009
Date Made Active in Reports: 12/14/2009
Number of Days to Update: 13

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 11/23/2009
Next Scheduled EDR Contact: 03/08/2010
Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2008
Date Data Arrived at EDR: 07/17/2009
Date Made Active in Reports: 08/10/2009
Number of Days to Update: 24

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 12/21/2009
Next Scheduled EDR Contact: 04/05/2010
Data Release Frequency: Annually

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Electric Power Transmission Line Data
Source: PennWell Corporation
Telephone: (800) 823-6277
This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Daycare Center Listing
Source: Department of Social & Health Services
Telephone: 253-383-1735

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2009 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

STREET AND ADDRESS INFORMATION

GEOCHECK®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

UPPER SKAGIT INDIAN TRIBE SITE
6019 NORTH DARRK LANE
BOW, WA 98232

TARGET PROPERTY COORDINATES

Latitude (North):	48.56150 - 48° 33' 41.4"
Longitude (West):	122.3431 - 122° 20' 35.2"
Universal Tranverse Mercator:	Zone 10
UTM X (Meters):	548469.1
UTM Y (Meters):	5378701.0
Elevation:	261 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	48122-E3 ALGER, WA
Most Recent Revision:	1994

EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

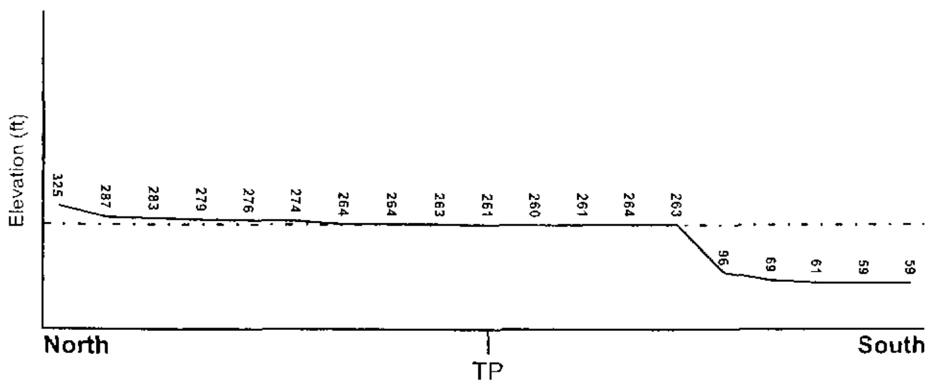
TOPOGRAPHIC INFORMATION

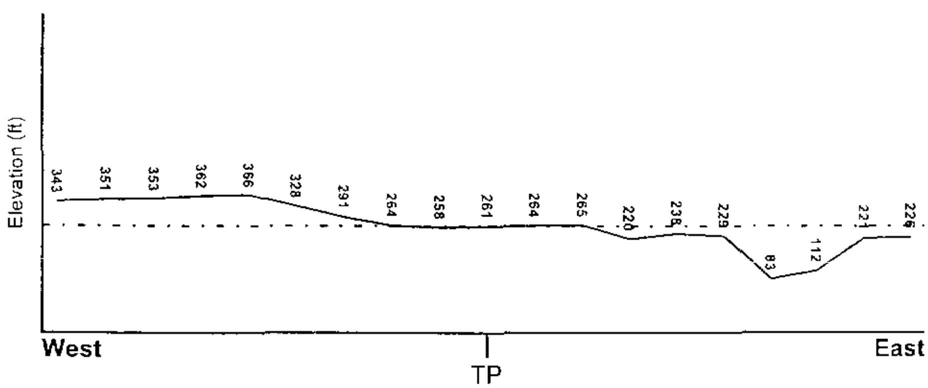
Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General ESE

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES





0 1/2 1 Miles

Target Property Elevation: 261 ft.

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
SKAGIT, WA	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 5301510045C

Additional Panels in search area: Not Reported

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
ALGER	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Site-Specific Hydrogeological Data*:

Search Radius:	1.25 miles
Status:	Not found

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

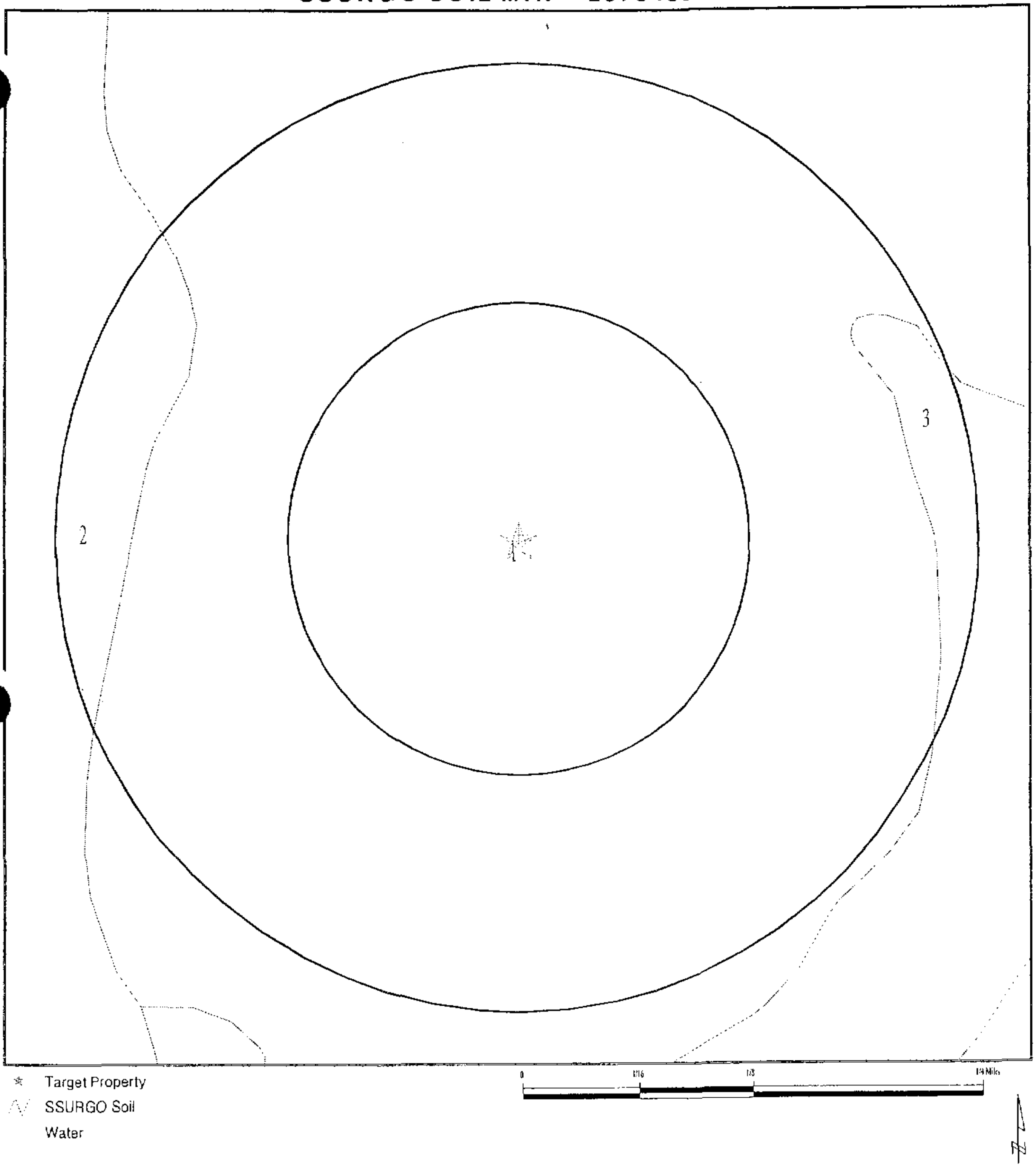
Era:	Cenozoic
System:	Quaternary
Series:	Quaternary
Code:	Q *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratifed Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 2673432.1s



* Target Property
SSURGO Soil
Water

SITE NAME: Upper Skagit Indian Tribe Site ADDRESS: 6019 NORTH DARRK LANE Bow WA 98232 LAT/LONG: 48.5615 / 122.3431	CLIENT: Geo Engineers, Inc. CONTACT: Ron Bek INQUIRY #: 2673432.1s DATE: January 07, 2010 6:37 pm

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Skipopa

Soil Surface Texture: silt loam

Hydrologic Group: Class D - Very slow infiltration rates. Soils are clayey, have a high water table, or are shallow to an impervious layer.

Soil Drainage Class: Somewhat poorly drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 46 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		Soil Reaction (pH)
1	0 inches	7 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 0 Min: 0	Max: 6.5 Min: 5.6
2	7 inches	16 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 0 Min: 0	Max: 6.5 Min: 5.6
3	16 inches	59 inches	silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Fat Clay.	Max: 0 Min: 0	Max: 6.5 Min: 5.6

Soil Map ID: 2

Soil Component Name: Sehome

Soil Surface Texture: loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Moderately well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 76 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	14 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 0.42 Min: 0.01	Max: 6.5 Min: 5.1
2	14 inches	27 inches	gravelly loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 0.42 Min: 0.01	Max: 6.5 Min: 5.1
3	27 inches	59 inches	gravelly loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 0.42 Min: 0.01	Max: 6.5 Min: 5.1

Soil Map ID: 3

Soil Component Name: Hoogdal

Soil Surface Texture: silt loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Moderately well drained

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Moderate

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 54 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	5 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Elastic silt.	Max: 1.4 Min: 0.42	Max: 6.5 Min: 6.1
2	5 inches	22 inches	silt loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Elastic silt.	Max: 1.4 Min: 0.42	Max: 6.5 Min: 6.1
3	22 inches	59 inches	silty clay	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit 50% or more), Elastic silt.	Max: 1.4 Min: 0.42	Max: 6.5 Min: 6.1

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
2	USGS3260766	1/4 - 1/2 Mile ESE
3	USGS3260749	1/4 - 1/2 Mile SSE
A4	USGS3260767	1/4 - 1/2 Mile WSW
A5	USGS3260768	1/2 - 1 Mile WSW
B7	USGS3260785	1/2 - 1 Mile ENE
8	USGS3260771	1/2 - 1 Mile ESE
9	USGS3260756	1/2 - 1 Mile SE
10	USGS3260772	1/2 - 1 Mile West
11	USGS3260739	1/2 - 1 Mile SE
13	USGS3260773	1/2 - 1 Mile West
15	USGS3260793	1/2 - 1 Mile ENE
16	USGS3260748	1/2 - 1 Mile ESE

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

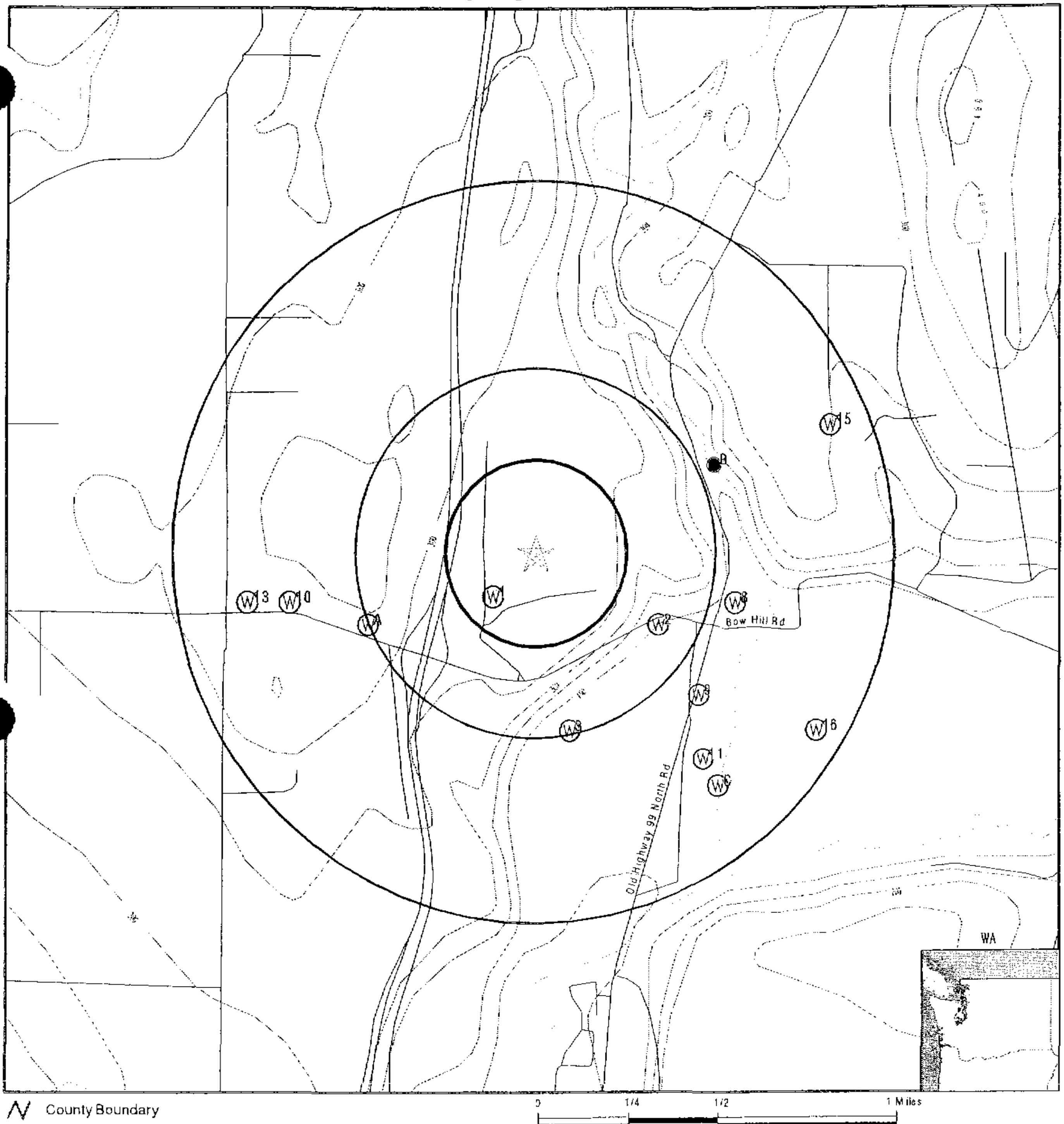
MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	WA5000000019966	1/8 - 1/4 Mile SW
B6	WA5000000019999	1/2 - 1 Mile ENE
C12	WA5000000019900	1/2 - 1 Mile SE
C14	WA5000000019906	1/2 - 1 Mile SE

PHYSICAL SETTING SOURCE MAP - 2673432.1s



County Boundary
Major Roads
Contour Lines
Earthquake epicenter, Richter 5 or greater
Water Wells
Public Water Supply Wells
Cluster of Multiple Icons

Groundwater Flow Direction
(GI) Indeterminate Groundwater Flow at Location
(GV) Groundwater Flow Varies at Location
(HD) Closest Hydrogeological Data

SITE NAME: Upper Skagit Indian Tribe Site ADDRESS: 6019 NORTH DARRK LANE Bow WA 98232 LAT/LONG: 48.5615 / 122.3431	CLIENT: Geo Engineers, Inc. CONTACT: Ron Bek INQUIRY #: 2673432.1s DATE: January 07, 2010 6:37 pm

Map ID Direction Distance Elevation		Database	EDR ID Number
1 **SW** **1/8 - 1/4 Mile** **Lower**		**WA WELLS**	**WA5000000019966**

Objectid:	19118	Srcid:	122626
Srcrootid:	19253	Wsorgid:	79714
Wsleid:	133629	Wslerootid:	62736
Pwsid:	50678	Srcnum:	01
Pwssrcid:	5067801	Systemname:	WSP - BOW HILL PORT OF ENTRY #33
Systemgrp:	B	Systemtype:	Group B
Sourcename:	WELL	Sourcetype:	Well
Sourcelbl:	S01 / WELL	Region:	Northwest
Wria:	03	County:	SKAGIT
Contadd1:	Not Reported	Contadd2:	Po Box 42626
Contphone:	(360) 596-6011	Contcity:	Olympia
Contstate:	WA	Contzipcd:	985042626
Sma:	Not Reported	Smaname:	Not Reported
Usecode:	Permanent		
Capacity:	10		
Treated:	Not Reported	Suscept:	Not Rated
Whpatype:	Not Reported	Doewellid:	Not Reported
Latitude:	48.559797		
Longitude:	-122.345701		
Llmethod:	Map	Site id:	WA5000000019966

2 **ESE** **1/4 - 1/2 Mile** **Lower**		**FED USGS**	**USGS3260766**

Agency cd:	USGS	Site no:	483332122200401
Site name:	36N/04E-31R01		
Latitude:	483332	EDR Site id:	USGS3260766
Longitude:	1222004	Dec lat:	48.55871928
Dec lon:	-122.33571696	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	SE SE S31 T36N R04E W
Location map:	ALGER	Map scale:	24000
Altitude:	95		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	19730407
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	52	Hole depth:	Not Reported
Source of depth data:	driller		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00

Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1973-04-07	Ground water data end date:	1973-04-07
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1973-04-07	30	

3
SSE
1/4 - 1/2 Mile
Lower

FED USGS USGS3260749

Agency cd:	USGS	Site no:	483317122202301
Site name:	35N/04E-06G01		
Latitude:	483317	EDR Site id:	USGS3260749
Longitude:	1222023	Dec lat:	48.55455249
Dec lon:	-122.34099489	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	SW NE S06 T35N R04E W
Location map:	ALGER	Map scale:	24000
Altitude:	60		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	19731201
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	38	Hole depth:	Not Reported
Source of depth data:	other		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	1981-07-21
Water quality data end date:	1981-07-21	Water quality data count:	1
Ground water data begin date:	1973-12-01	Ground water data end date:	1973-12-01
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1973-12-01	2	

A4
WSW
1/4 - 1/2 Mile
Higher

FED USGS USGS3260767

Agency cd:	USGS	Site no:	483332122210601
Site name:	35N/04E-06D01		
Latitude:	483332	EDR Site id:	USGS3260767
Longitude:	1222106	Dec lat:	48.55871911
Dec lon:	-122.35293985	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	NW NW S06 T35N R04E W
Location map:	ALGER	Map scale:	24000
Altitude:	340		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	19730701
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	259	Hole depth:	Not Reported
Source of depth data:	driller		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1973-10-10	Ground water data end date:	1973-10-10
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1973-10-10	229	

A5
WSW
1/2 - 1 Mile
Higher

FED USGS **USGS3260768**

Agency cd:	USGS	Site no:	483332122210801
Site name:	35N/04E-06D02		
Latitude:	483332	EDR Site id:	USGS3260768
Longitude:	1222108	Dec lat:	48.5587191
Dec lon:	-122.35349542	Coor meth:	M
Coor accr:	F	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	NW NW S06 T35N R04E W
Location map:	ALGER	Map scale:	24000
Altitude:	335		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Hilltop		
Site type:	Ground-water other than Spring	Date construction:	19730730
Date inventoried:	19890224	Mean greenwich time offset:	PST

Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Confined single aquifer		
Aquifer:	Not Reported		
Well depth:	259	Hole depth:	259
Source of depth data:	driller		
Project number:	WA00200		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	1989-10-02
Water quality data end date:	1989-10-02	Water quality data count:	1
Ground water data begin date:	0000-00-00	Ground water data end date:	0000-00-00
Ground water data count:	0		

Ground-water levels, Number of Measurements: 0

B6
ENE
1/2 - 1 Mile
Lower

WA WELLS **WA5000000019999**

Objectid:	23318	Srcid:	125682
Srcrootid:	23464	Wsorgid:	81484
Wsleid:	135632	Wslerootid:	65762
Pwsid:	75677	Srcnum:	01
Pwssrcid:	7567701	Systemname:	SAMISH STATE SALMON HATCHERY
Systemgrp:	B	Systemtype:	Group B
Sourcename:	DOMESTIC WELL	Sourcetype:	Well
Sourcelbl:	S01 / DOMESTIC WELL	Region:	Northwest
Wria:	03	County:	SKAGIT
Contadd1:	Not Reported	Contadd2:	5585 Old Hwy 99 North Rd
Contphone:	(360) 724-3131	Contcity:	Burlington
Contstate:	WA	Contzipcd:	98233
Sma:	Not Reported	Smaname:	Not Reported
Usecode:	Permanent		
Capacity:	27		
Treated:	Not Reported	Suscept:	Not Rated
Whpatype:	Not Reported	Doewellid:	Not Reported
Latitude:	48.565067		
Longitude:	-122.332775		
Llmethod:	Map	Site id:	WA5000000019999

B7
ENE
1/2 - 1 Mile
Lower

FED USGS **USGS3260785**

Agency cd:	USGS	Site no:	483354122195001
Site name:	36N/04E-32M01		
Latitude:	483354	EDR Site id:	USGS3260785
Longitude:	1221950	Dec lat:	48.56483053
Dec lon:	-122.33182799	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	NW SW S32 T36N R04E W
Location map:	ALGER	Map scale:	24000

Altitude:	100		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	19620625
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	40	Hole depth:	Not Reported
Source of depth data:	driller		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1962-06-25	Ground water data end date:	1962-06-25
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1962-06-25	7	

8
ESE
1/2 - 1 Mile
Lower

FED USGS USGS3260771

Agency cd:	USGS	Site no:	483335122194701
Site name:	36N/04E-32N01		
Latitude:	483335	EDR Site id:	USGS3260771
Longitude:	1221947	Dec lat:	48.55955267
Dec lon:	-122.33099457	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	SW SW S32 T36N R04E W
Location map:	ALGER	Map scale:	24000
Altitude:	85		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	19731027
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	82	Hole depth:	Not Reported
Source of depth data:	driller		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00

Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1973-10-27	Ground water data end date:	1973-10-27
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1973-10-27	40	

9
SE
1/2 - 1 Mile
Lower

FED USGS **USGS3260756**

Agency cd:	USGS	Site no:	483322122195501
Site name:	35N/04E-05D01		
Latitude:	483322	EDR Site id:	USGS3260756
Longitude:	1221955	Dec lat:	48.55594148
Dec lon:	-122.33321683	Coor meth:	M
Coor accr:	F	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	NW NW S05 T35N R04E W
Location map:	ALGER	Map scale:	24000
Altitude:	70		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Valley flat		
Site type:	Ground-water other than Spring	Date construction:	19661022
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	44	Hole depth:	44
Source of depth data:	driller		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1967-02-02	Ground water data end date:	1967-02-02
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1967-02-02	14	

10
West
1/2 - 1 Mile
Higher

FED USGS **USGS3260772**

Agency cd:	USGS	Site no:	483335122212401
Site name:	36N/03E-36R02		
Latitude:	483335	EDR Site id:	USGS3260772
Longitude:	1222124	Dec lat:	48.5595524
Dec lon:	-122.35794005	Coor meth:	M
Coor accr:	F	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	SE SE S36 T36N R03E W
Location map:	ALGER	Map scale:	24000
Altitude:	345		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Hilltop		
Site type:	Ground-water other than Spring	Date construction:	19830526
Date inventoried:	19890224	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Confined single aquifer		
Aquifer:	Not Reported		
Well depth:	290	Hole depth:	291
Source of depth data:	driller		
Project number:	WA00200		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	1989-10-02
Water quality data end date:	1989-10-02	Water quality data count:	1
Ground water data begin date:	1989-02-24	Ground water data end date:	1989-02-24
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1989-02-24	286	

11
SE
1/2 - 1 Mile
Lower

FED USGS **USGS3260739**

Agency cd:	USGS	Site no:	483313122195401
Site name:	35N/04E-05E01		
Latitude:	483313	EDR Site id:	USGS3260739
Longitude:	1221954	Dec lat:	48.55344144
Dec lon:	-122.33293902	Coor meth:	M
Coor accr:	F	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	SW NW S05 T35N R04E W
Location map:	ALGER	Map scale:	24000
Altitude:	72		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Valley flat		
Site type:	Ground-water other than Spring	Date construction:	19760506
Date inventoried:	Not Reported	Mean greenwich time offset:	PST

Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	37	Hole depth:	49
Source of depth data:	driller		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1976-05-06	Ground water data end date:	1976-05-06
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1976-05-06	4	

C12
SE
1/2 - 1 Mile
Lower

WA WELLS **WA5000000019900**

Objectid:	9573	Srcid:	142810
Srcrootid:	9633	Wsorgid:	89377
Wsleid:	144448	Wslerootid:	55460
Pwsid:	09535	Srcnum:	02
Pwssrcid:	0953502	Systemname:	BURLINGTON KOA
Systemgrp:	A	Systemtype:	Transient Non-Community
Sourcename:	WELL #2	Sourcetype:	Well
Sourcelbl:	S02 / WELL #2	Region:	Northwest
Wria:	03	County:	SKAGIT
Contadd1:	Not Reported	Contadd2:	6397 N GREENE RD
Contphone:	(360) 724-5511	Contcity:	BURLINGTON
Contstate:	WA	Contzipcd:	98233
Sma:	Not Reported	Smaname:	Not Reported
Usecode:	Permanent		
Capacity:	25		
Treated:	Not Reported	Suscept:	Not Rated
Whpatype:	Not Reported	Doewellid:	Not Reported
Latitude:	48.552301		
Longitude:	-122.332664		
Llmethod:	GPS	Site id:	WA5000000019900

13
West
1/2 - 1 Mile
Higher

FED USGS **USGS3260773**

Agency cd:	USGS	Site no:	483335122213301
Site name:	36N/03E-36R01		
Latitude:	483335	EDR Site id:	USGS3260773
Longitude:	1222133	Dec lat:	48.55955238
Dec lon:	-122.36044015	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	SE SE S36 T36N R03E W
Location map:	ALGER	Map scale:	24000
Altitude:	340		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	19681107
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	18	Hole depth:	Not Reported
Source of depth data:	driller		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1968-11-07	Ground water data end date:	1968-11-07
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1968-11-07	7	

C14
SE
1/2 - 1 Mile
Lower

WA WELLS **WA5000000019906**

Objectid:	9572	Srcid:	142809
Srcrootid:	9632	Wsorgid:	89377
Wsleid:	144448	Wslerootid:	55460
Pwsid:	09535	Srcnum:	01
Pwssrcid:	0953501	Systemname:	BURLINGTON KOA
Systemgrp:	A	Systemtype:	Transient Non-Community
Sourcename:	WELL# 1	Sourcetype:	Well
Sourcelbl:	S01 / WELL# 1	Region:	Northwest
Wria:	03	County:	SKAGIT
Contadd1:	Not Reported	Contadd2:	6397 N GREENE RD

Contphone:	(360) 724-5511	Contcity:	BURLINGTON
Contstate:	WA	Contzipcd:	98233
Sma:	Not Reported	Smaname:	Not Reported
Usecode:	Emergency		
Capacity:	25		
Treated:	Not Reported	Suscept:	Not Rated
Whpatype:	Not Reported	Doewellid:	Not Reported
Latitude:	48.552484		
Longitude:	-122.331378		
Llmethod:	GPS	Site id:	WA5000000019906

15
ENE
1/2 - 1 Mile
Higher

FED USGS USGS3260793

Agency cd:	USGS	Site no:	483400122192601
Site name:	36N/04E-32F01		
Latitude:	483400	EDR Site id:	USGS3260793
Longitude:	1221926	Dec lat:	48.5664973
Dec lon:	-122.32516109	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	SE NW S32 T36N R04E W
Location map:	ALGER	Map scale:	24000
Altitude:	260		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	19740117
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	184	Hole depth:	Not Reported
Source of depth data:	driller		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1974-01-17	Ground water data end date:	1974-01-17
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1974-01-17	164	

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID Direction Distance Elevation	Database	EDR ID Number
16 **ESE** **1/2 - 1 Mile** **Lower**	**FED USGS**	**USGS3260748**

Agency cd:	USGS	Site no:	483317122192901
Site name:	35N/04E-05F01		
Latitude:	483317	EDR Site id:	USGS3260748
Longitude:	1221929	Dec lat:	48.55455264
Dec lon:	-122.32599432	Coor meth:	M
Coor accr:	S	Latlong datum:	NAD27
Dec latlong datum:	NAD83	District:	53
State:	53	County:	057
Country:	US	Land net:	SE NW S05 T35N R04E W
Location map:	ALGER	Map scale:	24000
Altitude:	70		
Altitude method:	Interpolated from topographic map		
Altitude accuracy:	10		
Altitude datum:	National Geodetic Vertical Datum of 1929		
Hydrologic:	Strait of Georgia. Washington. Area = 955 sq.mi.		
Topographic:	Not Reported		
Site type:	Ground-water other than Spring	Date construction:	19661022
Date inventoried:	Not Reported	Mean greenwich time offset:	PST
Local standard time flag:	Y		
Type of ground water site:	Single well, other than collector or Ranney type		
Aquifer Type:	Not Reported		
Aquifer:	Not Reported		
Well depth:	42	Hole depth:	Not Reported
Source of depth data:	driller		
Project number:	Not Reported		
Real time data flag:	0	Daily flow data begin date:	0000-00-00
Daily flow data end date:	0000-00-00	Daily flow data count:	0
Peak flow data begin date:	0000-00-00	Peak flow data end date:	0000-00-00
Peak flow data count:	0	Water quality data begin date:	0000-00-00
Water quality data end date:	0000-00-00	Water quality data count:	0
Ground water data begin date:	1966-10-22	Ground water data end date:	1966-10-22
Ground water data count:	1		

Ground-water levels, Number of Measurements: 1

Date	Feet below Surface	Feet to Sealevel
1966-10-22	15	

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

Federal EPA Radon Zone for SKAGIT County: 3

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for SKAGIT COUNTY, WA

Number of sites tested: 8

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.350 pCi/L	100%	0%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	Not Reported	Not Reported	Not Reported	Not Reported

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2009 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

HYDROGEOLOGIC INFORMATION

AQUIFLOW^{R} Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Services, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Water Wells
Source: Department of Health
Telephone: 360-236-3148
Group A and B well locations.

OTHER STATE DATABASE INFORMATION

RADON

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

STREET AND ADDRESS INFORMATION

Skagit County Assessor Parcel Details

Parcel Number	XrefID	Quarter	Section	Township	Range
P119078	4777-000-001-0100	04	31	36	04

Owner Information
UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY
SEDRO WOOLLEY, WA 98284

Site Address(es)
BOW, WA 98232

Location Map
Locate this Parcel on iMap
Assessor's Parcel Map: PDF | DWF

2009 Values for 2010 Taxes

Building Market Value	$.00
Land Market Value	+$1,800.00
Total Market Value	$1,800.00
Assessed Value	$1,800.00
Taxable Value	$1,800.00

View Value History

Sale Information

Deed Type WARRANTY DEED
Sale Date 7/2/2003
Sale Price $457,000.00
View Sales History

2010 Property Tax Summary

2010 Taxable Value	$1,800.00
General Taxes	$17.71
Special Assessments/Fees	+$.33
Total Taxes	$18.04

View Tax Statement

Legal Description Definitions

RIVER VALLEY VIEW ESTATES, ACRES 0.59, ALL THAT PORTION OF LOT 1 AS SHOWN ON THE PLAT OF RIVER VALLEY VIEW ESTATES, RECORDED AS AUDITOR'S FILE NO. 200105070102, RECORDS OF SKAGIT COUNTY, WASHINGTON, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 1; THENCE NORTH 01-35-01 EAST, ALONG THE WEST LINE OF SAID LOT 1, A DISTANCE OF 448.00 FEET; THENCE SOUTH 57-45-27 EAST, A DISTANCE OF 36.70 FEET; THENCE SOUTH 20-34-51 EAST, A DISTANCE OF 36.70 FEET; THENCE SOUTH 02-00-00 EAST, A DISTANCE OF 345.00 FEET; THENCE SOUTH 29-58-52 EAST, A DISTANCE OF 63.00 FEET TO THE SOUTH LINE OF SAID LOT 1; THENCE NORTH 86-51-44 WEST, ALONG SAID SOUTH LINE, A DISTANCE OF 100.00 FEET TO THE POINT OF BEGINNING. SURVEY RECORDED UNDER AF#200308210041. SURVEY RECORDED AF#200508020064. ALL THAT PORTION OF LOT 1 AS SHOWN ON THE PLAT OF RIVER VALLEY VIEW ESTATES, RECORDED AS AUDITOR'S FILE NO. 200105070102, RECORDS OF SKAGIT COUNTY, WASHINGTON, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 1; THENCE NORTH 01-35-01 EAST, ALONG THE WEST LINE OF SAID LOT 1, A DISTANCE OF 448.00 FEET; THENCE SOUTH 57-45-27 EAST, A DISTANCE OF 36.70 FEET; THENCE SOUTH 20-34-51 EAST, A DISTANCE OF 36.70 FEET; THENCE SOUTH 02-00-00 EAST, A DISTANCE OF 345.00 FEET; THENCE SOUTH 29-58-52 EAST, A DISTANCE OF 63.00 FEET TO THE SOUTH LINE OF SAID LOT 1; THENCE NORTH 86-51-44 WEST, ALONG SAID SOUTH LINE, A DISTANCE OF 100.00 FEET TO THE POINT OF BEGINNING. SURVEY RECORDED UNDER AF#200308210041. SURVEY RECORDED AF#200508020064.

Land Use (110) HOUSEHOLD SFR OUTSIDE CITY — WAC 458-53-030
Neighborhood (110) PLATTED LOTS; NO IMPROVEMENTS
Utilities — Septic Information

Levy Code	1195	**Foundation**	
City District	Skagit County	**Construction Style**	
School District	SD100	**Exterior Walls**	
Fire District	F06	**Roof Style**	
Year Built		**Roof Covering**	
Acres	0.59	**Floor Construction**	
Living Area		**Plumbing**	
Bedrooms		**Heat-AirCond**	
Appliances		**Fireplace**	
Exemptions			

NO PHOTO AVAILABLE FOR THIS PARCEL

Skagit County Assessor Parcel Details

Parcel Number	XrefID	Quarter	Section	Township	Range
P50500	360432-3-004-0006	03	32	36	04

Owner Information
UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY
SEDRO WOOLLEY, WA 98284

Site Address(es)

Location Map
Locate this Parcel on iMap
Assessor's Parcel Map: PDF | DWF

2009 Values for 2010 Taxes Exemption

Building Market Value	$.00
Land Market Value	+$1,100.00
Total Market Value	$1,100.00
Assessed Value	$1,100.00
Taxable Value	$.00

Sale Information
Deed Type WARRANTY DEED
Sale Date 12/17/2004
Sale Price $1,110,000.00
View Sales History

2010 Property Tax Summary

2010 Taxable Value	$.00
General Taxes	$.00
Special Assessments/Fees	+$.20
Total Taxes	$.20

View Tax Statement

View Value History

Legal Description Definitions

THAT PORTION LOCATED IN SECTION 32, TOWNSHIP 36 NORTH, RANGE 4 EAST, W.M., OF THE FOLLOWING DESCRIBED PROPERTY: THE NORTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 31, AND THAT PORTION OF THE NORTHWEST 1/4 OF THE SOUTHWEST 1/4 OF SECTION 32 LYING WEST OF THE STATE HIGHWAY, ALL IN TOWNSHIP 36 NORTH, RANGE 4 EAST, W.M., EXCEPT THAT PORTION, IF ANY, CONVEYED TO THE STATE OF WASHINGTON, DEPARTMENT OF FISHERIES, INCLUDING THAT CONVEYED BY DEED DATED FEBRUARY 2, 1940, FILED FEBRUARY 15, 1940 AS FILE NO. 321913 AND RECORDED IN VOLUME 180 OF DEEDS AT PAGE 30, AND EXCEPT THAT PORTION DESCRIBED AS FOLLOWS: BEGINNING AT THE INTERSECTION OF THE WEST LINE OF HIGHWAY 99 AND THE SOUTH LINE OF THE NORTHWEST 1/4 OF THE SOUTHWEST 1/4 OF SAID SECTION 32; THENCE WEST ALONG SAID SOUTH LINE AND THE SOUTH LINE OF THE NORTHEAST 1/4 OF THE SOUTHEAST 1/4 OF SAID SECTION 31 TO THE SOUTHWEST CORNER OF SAID NORTHEAST 1/4 OF THE SOUTHEAST 1/4; THENCE NORTH ALONG THE WEST LINE OF SAID NORTHEAST 1/4 OF THE SOUTHEAST 1/4 660 FEET; THENCE EAST PARALLEL TO THE SOUTH LINE OF SAID NORTHEAST 1/4 OF THE SOUTHEAST 1/4 AND SAID NORTHWEST 1/4 OF THE SOUTHWEST 1/4 TO THE WEST LINE OF SAID HIGHWAY 99; THENCE SOUTHERLY ALONG SAID HIGHWAY TO THE POINT OF BEGINNING. SURVEY RECORDED AF#200508020064.

Land Use	(920) TREES	WAC 458-53-030
Neighborhood	(360) 40-79.99 ACRES; NO IMPROVEMENTS	
Utilities		Septic Information

Levy Code	1117	**Foundation**
City District	Skagit County	**Construction Style**
School District	SD100	**Exterior Walls**
Fire District		**Roof Style**
Year Built		**Roof Covering**
Acres	0.36	**Floor Construction**
Living Area		**Plumbing**
Bedrooms		**Heat-AirCond**
Appliances		**Fireplace**
Exemptions	Bureau of Indian Affairs	

NO PHOTO AVAILABLE FOR THIS PARCEL

APPENDIX B
Selected Historical Research Documents

The EDR-City Directory
Abstract

Upper Skagit Indian Tribe Site
5984 N. Darrk Lane
Bow, WA 98232

Inquiry Number: 2022828.6

Tuesday, September 11, 2007

EDR® Environmental Data Resources Inc

The Standard in Environmental Risk Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EDR City Directory Abstract

Environmental Data Resources, Inc.'s (EDR) City Directory Abstract is a screening report designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's City Directory Abstract includes a search and abstract of available city directory data. For each address, the directory lists the name of the corresponding occupant at five year intervals.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

SUMMARY

- ***City Directories:***

Business directories including city, cross reference and telephone directories were reviewed, if available, at approximately five year intervals for the years spanning 2000 through 2006. (These years are not necessarily inclusive.) A summary of the information obtained is provided in the text of this report.

Date EDR Searched Historical Sources: September 11, 2007

Target Property:
5984 N. Darrk Lane
Bow, WA 98232

Year	***Uses***	***Source***
2000	Upper Skagit Indian Tribe	Polk's City Directory
2006	Skagit Valley Casino Resort	Polk's City Directory

Adjoining Properties

SURROUNDING

Multiple Addresses
Bow, WA 98232

Year	***Uses***	***Source***
2000	**N DARRK LN**	Polk's City Directory
	Thousand Trails Trailer Park/Campsite (5409)	Polk's City Directory
	Address not listed in research source (5765)	Polk's City Directory
	No other addresses listed on street	Polk's City Directory
	BOW HILL RD	Polk's City Directory
	Not Verified (18031)	Polk's City Directory
	Residence (18107)	Polk's City Directory
	Residence (18111)	Polk's City Directory
2006	**N DARRK LN**	Polk's City Directory
	Thousand Trails Mount Vernon (5409)	Polk's City Directory
	Residence (5765)	Polk's City Directory
	No other addresses listed on street	Polk's City Directory
	BOW HILL RD	Polk's City Directory
	No current listing (18031)	Polk's City Directory
	Residence (18111)	Polk's City Directory

Certified Sanborn® Map Report

Sanborn® Library search results
Certification # 40A7-4A66-AA60

Upper Skagit Indian Tribe Site
5984 N. Darrk Lane
Bow, WA 98232

Inquiry Number 2022828.3s

September 07, 2007

EDR® Environmental Data Resources Inc

The Standard in Environmental Risk Information

440 Wheelers Farms Rd
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

Certified Sanborn® Map Report

9/07/07

Site Name:	Client Name:
Upper Skagit Indian Tribe Site	Geo Engineers, Inc.
5984 N. Darrk Lane	600 DuPont Street
Bow, WA 98232	Bellingham, WA 98225
EDR Inquiry # 2022828.3s	Contact: Ron Bek

EDR® Environmental Data Resources Inc

The complete Sanborn Library collection has been searched by EDR, and fire insurance maps covering the target property location provided by Geo Engineers, Inc. were identified for the years listed below. The certified Sanborn Library search results in this report can be authenticated by visiting www.edrnet.com/sanborn and entering the certification number. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by Sanborn Library LLC, the copyright holder for the collection.

Certified Sanborn Results:

Site Name:	Upper Skagit Indian Tribe Site
Address:	5984 N. Darrk Lane
City, State, Zip:	Bow, WA 98232
Cross Street:	
P.O. #	0829-021-00
Project:	0829-021-00
Certification #	40A7-4A66-AA60

Sanborn® Library search results
Certification # 40A7-4A66-AA60

UNMAPPED PROPERTY

This report certifies that the complete holdings of the Sanborn Library, LLC collection have been searched based on client supplied target property information, and fire insurance maps covering the target property were not found.

The Sanborn Library includes more than 1.2 million Sanborn fire insurance maps, which track historical property usage in approximately 12,000 American cities and towns. Collections searched:

- ✓ Library of Congress
- ✓ University Publications of America
- ✓ EDR Private Collection

Total Maps: 0

Limited Permission To Make Copies

Geo Engineers, Inc. (the client) is permitted to make up to THREE photocopies of this Sanborn Map transmittal and each fire insurance map accompanying this report solely for the limited use of its customer. No one other than the client is authorized to make copies. Upon request made directly to an EDR Account Executive, the client may be permitted to make a limited number of additional photocopies. This permission is conditioned upon compliance by the client, its customer and their agents with EDR's copyright policy; a copy of which is available upon request.

The EDR Aerial Photo Decade Package

Upper Skagit Indian Tribe Site
5984 N. Darrk Lane
Bow, WA 98232

Inquiry Number: 2022828.5

September 19, 2007

EDR® Environmental Data Resources Inc

The Standard in Environmental Risk Information

440 Wheelers Farms Road
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.

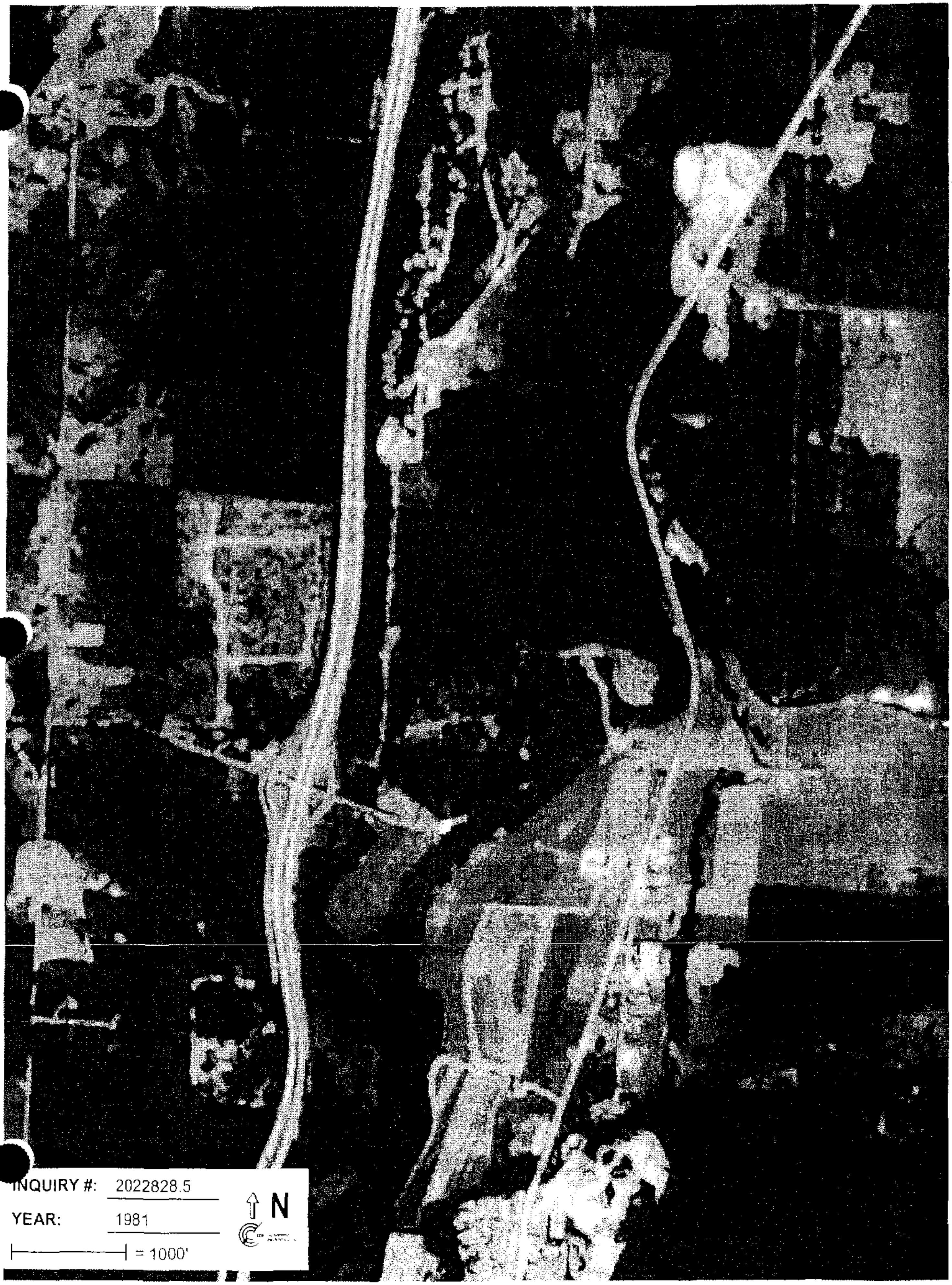
Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Date EDR Searched Historical Sources:
Aerial Photography September 19, 2007

Target Property:
5984 N. Darrk Lane
Bow, WA 98232

Year	***Scale***	***Details***	***Source***
1971	Aerial Photograph. Scale: 1"=1000'	Panel #: 2448122-E3/Flight Date: September 19, 1971	EDR
1981	Aerial Photograph. Scale: 1"=1000'	Panel #: 2448122-E3/Flight Date: August 08, 1981	EDR
1990	Aerial Photograph. Scale: 1"=750'	Panel #: 2448122-E3/Flight Date: July 10, 1990	EDR


YEAR: 1971
N
= 1000'


INQUIRY #: 2022828.5
YEAR: 1981
N
= 1000'

INQUIRY #:
YEAR:
N
= 750'

EDR Historical Topographic Map Report

Upper Skagit Indian Tribe Site
5984 N. Darrk Lane
Bow, WA 98232

Inquiry Number: 2022828.4

September 07, 2007

EDR® Environmental
Data Resources Inc

The Standard in Environmental Risk Information

440 Wheelers Farms Rd
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EDR Historical Topographic Map Report

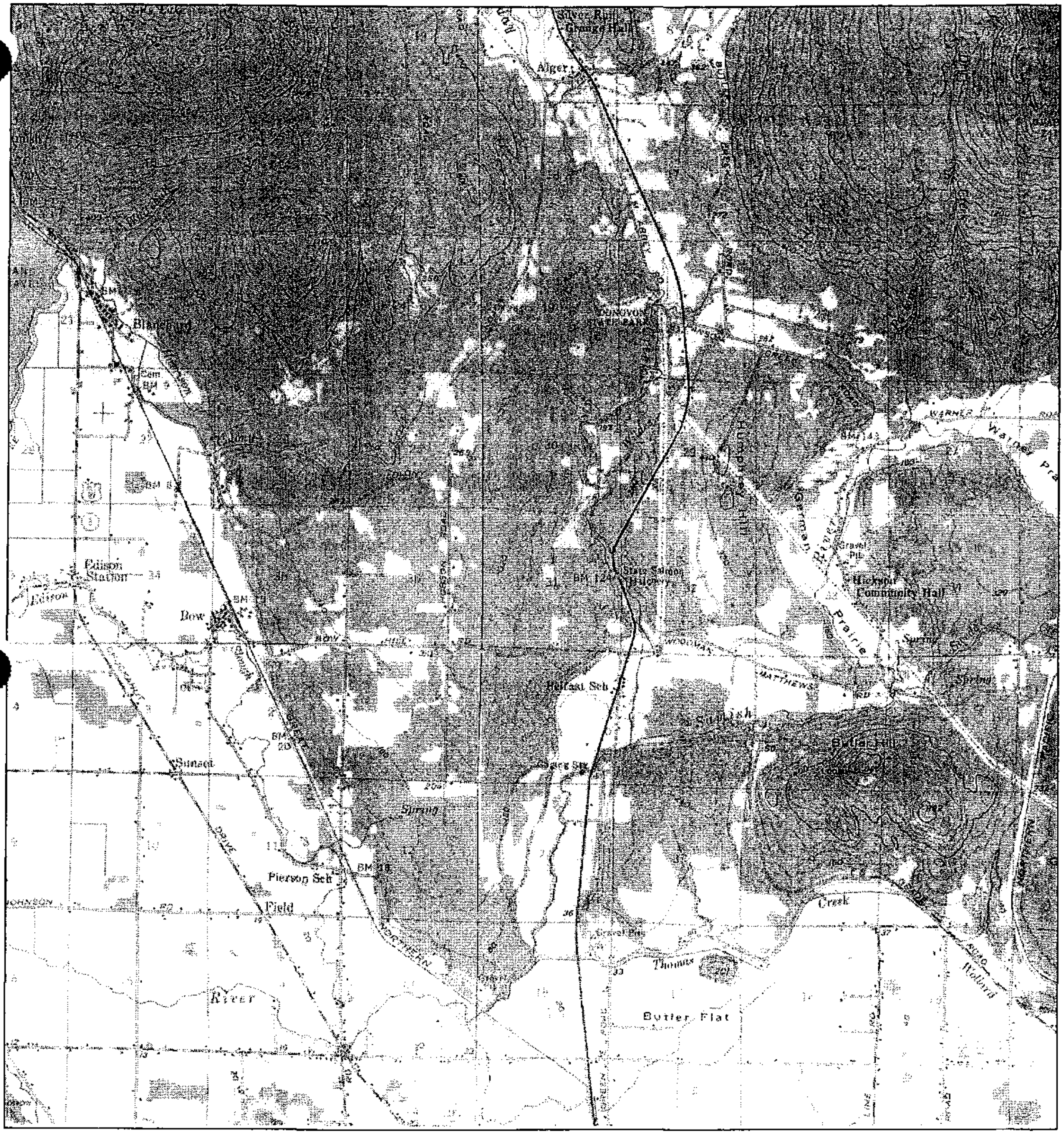
Environmental Data Resources, Inc.s (EDR) Historical Topographic Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topographic Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the early 1900s.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Historical Topographic Map

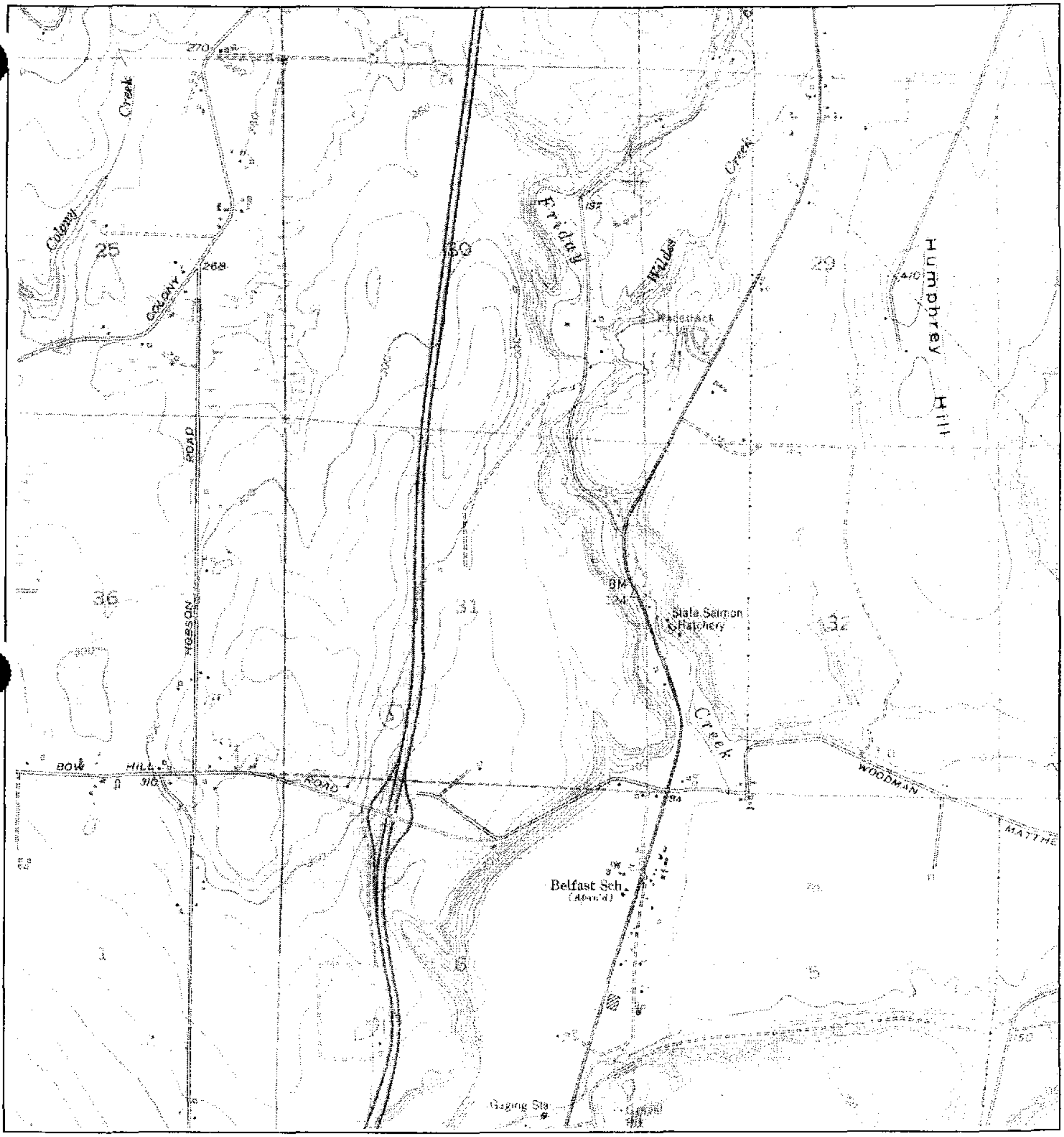
N	TARGET QUAD	SITE NAME:	Upper Skagit Indian Tribe Site	CLIENT:	Geo Engineers, Inc.
	NAME: Alger, WA			CONTACT:	Ron Bek
	MAP YEAR: 1952	ADDRESS:	5984 N. Darrk Lane Bow, WA 98232	INQUIRY#:	2022828.4
				RESEARCH DATE:	09/07/2007
	SERIES: 7.5	LAT/LONG:	48.562 / 122.3416		
	SCALE: 1:24,000				

Historical Topographic Map



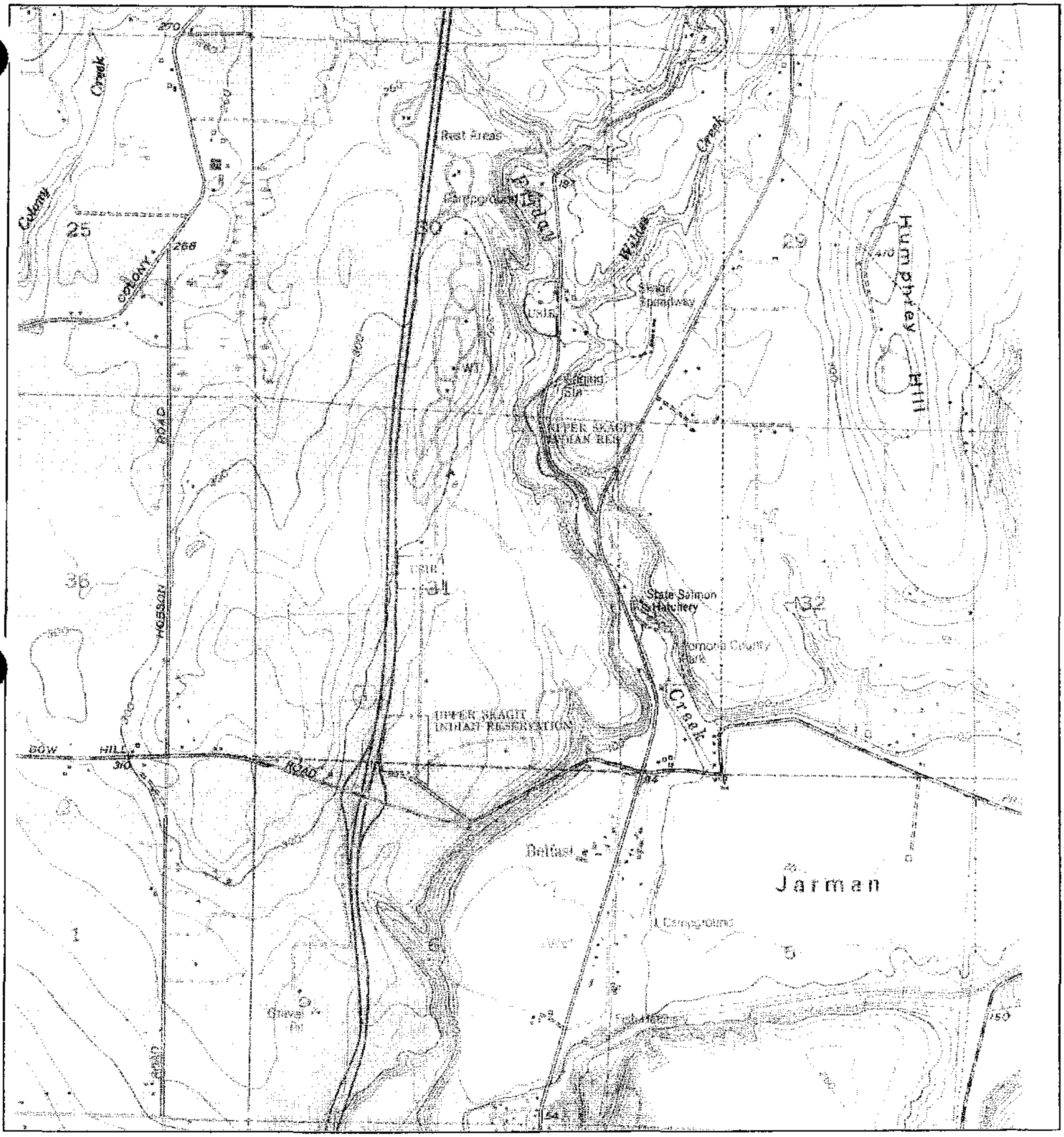
N ↑	TARGET QUAD NAME: Samish Lake, WA MAP YEAR: 1954 SERIES: 15 SCALE: 1:62,500	SITE NAME: Upper Skagit Indian Tribe Site ADDRESS: 5984 N. Darrk Lane Bow, WA 98232 LAT/LONG: 48.562 / 122.3416	CLIENT: Geo Engineers, Inc. CONTACT: Ron Bek INQUIRY#: 2022828.4 RESEARCH DATE: 09/07/2007

Historical Topographic Map



N	TARGET QUAD NAME: Alger, WA MAP YEAR: 1968 PHOTOREVISED FROM:1952 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Upper Skagit Indian Tribe Site ADDRESS: 5984 N. Darrk Lane Bow, WA 98232 LAT/LONG: 48.562 / 122.3416	CLIENT: Geo Engineers, Inc. CONTACT: Ron Bek INQUIRY#: 2022828.4 RESEARCH DATE: 09/07/2007

Historical Topographic Map



N ↑	TARGET QUAD NAME: Alger, WA MAP YEAR: 1994 REVISED FROM: 1952 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Upper Skagit Indian Tribe Site ADDRESS: 5984 N. Darrk Lane Bow, WA 98232 LAT/LONG: 48.562 / 122.3416	CLIENT: Geo Engineers, Inc. CONTACT: Ron Bek INQUIRY#: 2022828.4 RESEARCH DATE: 09/07/2007

APPENDIX C
Report Limitations and Guidelines for Use

REPORT LIMITATIONS AND GUIDELINES FOR USE[2]

This appendix provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering, geology and environmental science) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

Environmental Services Are Performed for Specific Purposes, Persons and Projects

GeoEngineers has performed this ESA of the subject property identified in this report in Bow, Washington in general accordance with the scope and limitations of our proposal dated January 11, 2010, ASTM E 1527-05, Standard Practice for Phase I ESAs, and EPA's Federal Standard 40 CFR Part 312 "Standards and Practices for All Appropriate Inquiries (AAI)." This report has been prepared for the exclusive use of Upper Skagit Indian Tribe. This report is not intended for use by others, and the information contained herein is not applicable to other properties.

GeoEngineers structures our services to meet the specific needs of our clients. For example, an environmental site assessment study conducted for a property owner may not fulfill the needs of a prospective purchaser of the same property. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and project property. This report should not be applied for any purpose or project except the one originally contemplated.

This Environmental Report Is Based on a Unique Set of Project-Specific Factors

This report has been prepared for the subject property identified in this report in Bow, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific property explored, or
- completed before important project changes were made.

---

[2] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org .

If important changes are made to the project or subject property after the date of this report, GeoEngineers should be retained to review our interpretations and recommendations and to provide written modifications or confirmation, as appropriate.

Reliance Conditions for Third Parties

Our report was prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted environmental practices in this area at the time this report was prepared.

Historical Information Provided by Others

GeoEngineers makes no warranties or guarantees regarding the accuracy or completeness of information provided or compiled by others. The information presented in this report is based on the above-described research and a single recent site visit. GeoEngineers has relied upon information provided by others in our description of historical conditions and in our review of regulatory databases and files. The available data do not provide definitive information with regard to all past uses, operations or incidents at the subject property or adjacent properties.

Uncertainty Remains Even After This ESA Study Is Completed

No ESA can wholly eliminate uncertainty regarding the potential for recognized environmental conditions (RECs) in connection with a property. Performance of an ESA study is intended to reduce, but not eliminate, uncertainty regarding the potential for RECs in connection with a property. There is always a potential that areas with contamination that were not identified during this Phase I ESA exist at the subject property or in the study area. Further evaluation of such potential would require additional research, subsurface exploration, sampling and/or testing.

Environmental Regulations Are Always Evolving

Some substances may be present in the vicinity of the subject property in quantities or under conditions that may have led, or may lead, to contamination of the subject property, but are not included in current local, state or federal regulatory definitions of hazardous substances or do not otherwise present current potential liability. GeoEngineers cannot be responsible if the standards for appropriate inquiry, or regulatory definitions of hazardous substance, change or if more stringent environmental standards are developed in the future.

Property Conditions Can Change

This environmental report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time (for example, a Phase I ESA report is typically applicable for 180 days), by events such as a change in property use or occupancy, or by natural events, such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying this report so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Geotechnical, Geologic and Environmental Reports Should Not Be Interchanged

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants and no conclusions or inferences should be drawn regarding Biological Pollutants, as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.

UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004

RECORD OF SURVEY

ALTA / ACSM LAND TITLE SURVEY

SITUATE IN A PORTION OF THE SE 1/4 OF SECTION 31 & SW 1/4 OF SECTION 32, TOWNSHIP 36 NORTH, AND GOV'T LOTS 1, 2 & 3 OF SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN, SKAGIT COUNTY, WASHINGTON

201006300037
Skagit County Auditor
6/30/2010 Page 1 of 7 10:22AM

PARCEL DESCRIPTIONS

(PER LAND TITLE COMPANY OF SKAGIT COUNTY ORDER NOS. 115163-S, 115164-P, 115165-S, 115166-P, 135468-S) (EFFECTIVE DATE: DECEMBER 31, 2009)

PARCEL P123324

THAT PORTION OF GOVERNMENT LOTS 1 AND 2, IN SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M., LYING NORTHERLY OF THE RIGHT OF WAY FOR THE BOW HILL COUNTY ROAD, AS SAID ROAD EXISTED ON APRIL 16, 1968;

EXCEPT THAT PORTION THEREOF LYING SOUTHERLY OF THE OLD BOW HILL COUNTY ROAD, AS SAID ROAD EXISTED ON JANUARY 18, 1963.

TOGETHER WITH THAT PORTION OF DARRK LANE (OLD BOW HILL, WARNER ROAD, COUNTY ROAD NO. 50010) AS VACATED PURSUANT TO SKAGIT COUNTY RESOLUTION R20070481 AND FINAL ORDER RECORDED NOVEMBER 9, 2007, UNDER AUDITOR'S FILE NO. 200711090143, A RE-RECORDING OF DOCUMENT RECORDED UNDER AUDITOR'S FILE NO. 200710090107, RECORDS OF SKAGIT COUNTY, WASHINGTON.

SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON.

PARCEL P50416

PARCEL "A":

THE SOUTHWEST ¼ OF THE SOUTHEAST ¼ OF SECTION 31, TOWNSHIP 36 NORTH, RANGE 4 EAST, W.M.

SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON.

PARCEL "B":

A NON-EXCLUSIVE EASEMENT FOR ROAD AND UTILITIES AS CONTAINED IN INSTRUMENT FROM NIELSEN BROTHERS INC. TO RICHMOND JPJ ENTERPRISES, INC., RECORDED JANUARY 4, 2002, UNDER AUDITOR'S FILE NO. 200201040067, RECORDS OF SKAGIT COUNTY, WASHINGTON.

SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON.

PARCEL P35839

THAT PORTION OF GOVERNMENT LOTS 2 AND 3 IN SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M., LYING SOUTHERLY OF THE OLD BOW HILL COUNTY ROAD, (AS LOCATED AND ESTABLISHED PRIOR TO JANUARY 18, 1963), NORTHERLY OF THE COUNTY ROAD AS CONVEYED TO SKAGIT COUNTY BY DEED DATED JANUARY 18, 1963, RECORDED JANUARY 18, 1963, AS AUDITOR'S FILE NO. 631052 AND EASTERLY OF P.S.H. #1, EXCEPT THAT PORTION, IF ANY, LYING WITHIN THE BOUNDARIES OF THE FOLLOWING DESCRIBED TRACT:

BEGINNING AT THE NORTHWEST CORNER OF SAID GOVERNMENT LOT 2;
THENCE SOUTH 2°35'28" WEST ALONG THE WEST LINE THEREOF A DISTANCE OF 1086.36 FEET;
THENCE SOUTH 87°24'32" EAST A DISTANCE OF 542.13 FEET TO A 3/4 INCH IRON PIPE AND THE TRUE POINT OF BEGINNING; THENCE NORTH 35°31'45" WEST A DISTANCE OF 123.81 FEET TO A 3/4 INCH IRON PIPE; THENCE NORTH 11°01'45" EAST A DISTANCE OF 68 FEET, MORE OR LESS, TO THE SOUTH LINE OF THE COUNTY ROAD (BOW HILL ROAD); THENCE EASTERLY ALONG THE SOUTH LINE OF SAID COUNTY ROAD A DISTANCE OF 220 FEET, MORE OR LESS, TO A POINT BEARING NORTH 48°04'10" EAST FROM THE TRUE POINT OF BEGINNING; THENCE SOUTH 48°04'10" WEST A DISTANCE OF 213 FEET, MORE OR LESS, TO THE TRUE POINT OF BEGINNING; EXCEPT COUNTY ROAD AND RIGHT OF WAY THEREFORE, IF ANY.

TOGETHER WITH THAT PORTION OF DARRK LANE (OLD BOW HILL, WARNER ROAD, COUNTY ROAD NO. 50010) AS VACATED PURSUANT TO SKAGIT COUNTY RESOLUTION R20070481 AND FINAL ORDER RECORDED NOVEMBER 9, 2007, UNDER AUDITOR'S FILE NO. 200711090143, A RE-RECORDING OF DOCUMENT RECORDED UNDER AUDITOR'S FILE NO. 200710090107, RECORDS OF SKAGIT COUNTY, WASHINGTON.

SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON.

PARCEL P50414 & P50500

THE NORTH ½ OF THE SOUTHEAST ¼ OF SECTION 31, AND THAT PORTION OF THE NORTHWEST ¼ OF THE SOUTHWEST ¼ OF SECTION 32 LYING WEST OF THE STATE HIGHWAY, ALL IN TOWNSHIP 36 NORTH, RANGE 4 EAST, W.M., EXCEPT THAT PORTION, IF ANY, CONVEYED TO THE STATE OF WASHINGTON, DEPARTMENT OF FISHERIES, INCLUDING THAT CONVEYED BY DEED DATED FEBRUARY 2, 1940, FILED FEBRUARY 15, 1940 AS FILE NO. 321913 AND RECORDED IN VOLUME 180 OF DEEDS AT PAGE 30, AND EXCEPT THAT PORTION DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE WEST LINE OF HIGHWAY 99 AND THE SOUTH LINE OF THE NORTHWEST ¼ OF THE SOUTHWEST ¼ OF SAID SECTION 32;
THENCE WEST ALONG SAID SOUTH LINE AND THE SOUTH LINE OF THE NORTHEAST ¼ OF THE SOUTHEAST ¼ OF SAID SECTION 31 TO THE SOUTHWEST CORNER OF SAID NORTHEAST ¼ OF THE SOUTHEAST ¼; THENCE NORTH ALONG THE WEST LINE OF SAID NORTHEAST ¼ OF THE SOUTHEAST ¼ 660 FEET; THENCE EAST PARALLEL TO THE SOUTH LINE OF SAID NORTHEAST ¼ OF THE SOUTHEAST ¼ AND SAID NORTHWEST ¼ OF THE SOUTHWEST ¼ TO THE WEST LINE OF SAID HIGHWAY 99; THENCE SOUTHERLY ALONG SAID HIGHWAY TO THE POINT OF BEGINNING.

SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON.

PARCEL P119078 - PARCEL "C" OF PARCEL P50416

ALL THAT PORTION OF LOT 1 AS SHOWN ON "RIVER VALLEY VIEW ESTATES," AS PER PLAT RECORDED ON MAY 7, 2001 UNDER AUDITOR'S FILE NO. 200105070102, RECORDS OF SKAGIT COUNTY, WASHINGTON, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:
BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 1;
THENCE NORTH 01°35'01" EAST, ALONG THE WEST LINE OF SAID LOT 1, A DISTANCE OF 448.00 FEET;
THENCE SOUTH 57°45'27" EAST, A DISTANCE OF 38.70 FEET;
THENCE SOUTH 20°34'51" EAST, A DISTANCE OF 36.70 FEET;
THENCE SOUTH 02°00'00" EAST, A DISTANCE OF 345.00 FEET;
THENCE SOUTH 29°58'52" EAST, A DISTANCE OF 63.00 FEET TO THE SOUTH LINE, A DISTANCE OF 100.00 FEET TO THE POINT OF BEGINNING.

TOGETHER WITH AND SUBJECT TO A 12.00 FOOT WIDE EASEMENT FOR INGRESS, EGRESS OVER A PORTION OF LOT 1, "RIVER VALLEY VIEW ESTATES," AS PER PLAT RECORDED ON MAY 7, 2001 UNDER AUDITOR'S FILE NO. 200105070102, RECORDS OF SKAGIT COUNTY, WASHINGTON, SAID EASEMENT BEING 6.00 FEET ON EACH SIDE, MEASURED AT RIGHT ANGLES, FROM THE FOLLOWING DESCRIBED CENTERLINE:

BEGINNING AT THE SOUTHWEST CORNER OF SAID LOT 1;
THENCE NORTH 01°35'01" EAST, ALONG THE WEST LINE OF SAID LOT 1, A DISTANCE OF 448.00 FEET TO THE TRUE POINT OF BEGINNING;
THENCE SOUTH 57°45'27" EAST, A DISTANCE OF 38.70 FEET;
THENCE SOUTH 20°34'51" EAST, A DISTANCE OF 36.70 FEET;
THENCE SOUTH 02°00'00" EAST, A DISTANCE OF 345.00 FEET TO THE TERMINUS.

THE SIDELINES OF THE ABOVE DESCRIBED EASEMENT SHALL BE LENGTHENED AND FORESHORTENED TO TERMINATE AT THE WEST LINE OF SAID LOT 1.

SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON.

EXCEPTIONS

(PER LAND TITLE COMPANY OF SKAGIT COUNTY ORDER NOS. 115163-S, 115164-P, 115165-S, 115166-P 135468-S) (EFFECTIVE DATE: DECEMBER 31, 2009)

AF#200105070102, PLAT OF RIVER VALLEY VIEW ESTATES
AF#200201040067, ACCESS EASEMENT CONTAINED IN DEED
AF#199907300085 & 199907300086, MOBILE HOME DEEDS
AF#672242, PSE UTILITY EASEMENT
AF#8709240061, PUGET SOUND ENERGY UTILITY EASEMENT
AF#9907160034, NON-FORESTRY LAND USE CONDITIONS
AF#200105070103, PLAT OF RIVER VALLEY VIEW ESTATES CCR'S
AF#8804190045, PUGET SOUND ENERGY UTILITY EASEMENT
AF#200106210005, AMENDMENT TO CCR'S
AF#200207190135, AMENDMENT TO PROTECTIVE COVENANTS
AF#200308210041, RECORD OF SURVEY
AF#199912230089, DEED OF TRUST
AF#200401130019, DEED OF TRUST MODIFICATION
AF#200009250066, SECURITY INTEREST
AF#9410310110, RECORD OF SURVEY
AF#9710170041, NON-FORESTRY LAND USE CONDITIONS
AF#9712160034, NON-FORESTRY LAND USE CONDITIONS
AF#199912200003, NON-FORESTRY LAND USE CONDITIONS
AF#8008110023, ROADWAY EASEMENT
AF#200508020064, RECORD OF SURVEY
R20070481, SKAGIT COUNTY VACATION RESOLUTION
AF#200711090143, VACATION AGREEMENT
AF#200707120046, ROADWAY EASEMENT
AF#200703210123, WETLAND MITIGATION EASEMENT

LAND TITLE & ESCROW COMPANY OF SKAGIT COUNTY & STEWART TITLE GUARANTY COMPANY OF SKAGIT COUNTY

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ACSM LAND TITLE SURVEYS," JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS IN 2005, AND INCLUDES ITEM NUMBER 1, 4, 8, 10 & 11a OF TABLE A' THEREOF. PURSUANT TO THE ACCURACY STANDARDS AS ADOPTED BY ALTA AND NSPS AND IN EFFECT ON THE DATE OF THIS CERTIFICATION, UNDERSIGNED FURTHER CERTIFIES THAT IN MY PROFESSIONAL OPINION, AS A LAND SURVEYOR REGISTERED IN THE STATE OF WASHINGTON, THE RELATIVE POSITIONAL ACCURACY OF THIS SURVEY DOES NOT EXCEED THAT WHICH IS SPECIFIED THEREIN.

DATE: 6-30-10

PETER K. BRANDS, PLS 35147

SURVEY NOTES

1) DATA FOR THIS SURVEY WAS GATHERED BY FIELD TRAVERSE UTILIZING ELECTRONIC DATA COLLECTION.

2) EQUIPMENT USED: THEOMAT 00'01.5"
EDM: ± 2 PPM, ± 3 MM

3) SOLAR OBSERVATION: THREE INDEPENDENT DIRECT AND REVERSE SETS OF SOLAR OBSERVATIONS WERE MEASURED AT THE SOUTHEAST CORNER OF SECTION 31, THE DATA REDUCED BY HOUR ANGLE METHOD. THE SOLAR BEARING OF THE EAST LINE OF THE SOUTHEAST QUARTER OF SECTION 31 IS NORTH 0°42'54" EAST. THE NAD83/91 GEODETIC BEARING OF THE EAST LINE OF THE SOUTHEAST QUARTER SECTION 31 IS NORTH 1°50'00" EAST. THE DIFFERENCE BETWEEN SOLAR BEARINGS AND GEODETIC BEARINGS IS -1°07'06".

4) PURPOSE OF SURVEY: TO PERFORM BOUNDARY AND ALTA/ACSM LAND TITLE SURVEYS OF THE SUBJECT PARCELS, INCLUDING ITEM NUMBER 1, 4, 8, 10 & 11a OF THE 2005 ALTA/ACSM TABLE A' CHECKLIST. (AN UPDATE OF 2005 SURVEY, RECORDED UNDER SKAGIT COUNTY AUDITOR'S FILE NO. 200508020064)

5) THIS SURVEY WAS PERFORMED WITH THE BENEFIT OF LAND TITLE COMPANY OF SKAGIT COUNTY ORDER NOS. 115163-S, 115464-P, 115165-S, 115166-P & 135468-S. PACIFIC SURVEYING & ENGINEERING, INC. ASSUMES NO LIABILITY FOR ANY EASEMENT, COVENANT, RESTRICTION OR EXCEPTION NOT CONTAINED THEREIN OR SHOWN HEREON.

6) PACIFIC SURVEYING AND ENGINEERING INC., ASSUMES NO LIABILITY FOR ANY SUBSURFACE CONDITIONS OR FEATURES THAT MAY EXIST THAT ARE UNDETECTABLE AND/OR NOT VISIBLE. (UNDERGROUND UTILITY LOCATES WERE NOT PERFORMED FOR THIS SURVEY)

7) OCCUPATIONAL INDICATOR NOTE:
IN ACCORDANCE WITH THE REVISED CODE OF WASHINGTON: 58.09 AND WASHINGTON AUTHORITY CODE CHAPTER 332-130, THIS RECORD OF SURVEY DEPICTS OCCUPATIONAL INDICATORS, SUCH AS FENCES. THESE INDICATORS REPRESENT A POTENTIAL FOR CLAIMS OF UNWRITTEN TITLE. THIS SURVEY DOES NOT RESOLVE ANY OF THE LEGAL OWNERSHIP ISSUES THAT MAY ARISE FROM THESE UNWRITTEN USES OR TITLE CLAIMS.

PARCEL NOTES

1) THE SURVEY CORRECTLY SHOWS THE LOCATION OF ALL BUILDINGS, STRUCTURES AND OTHER IMPROVEMENTS SITUATED ON THE PREMISES.

2) ALL UTILITIES SERVING THE PREMISES ENTER THROUGH ADJOINING PUBLIC STREETS AND/OR EASEMENTS OF RECORD; THAT EXCEPT AS SHOWN, THERE ARE NO VISIBLE EASEMENTS OR RIGHTS OF WAY ACROSS SAID PREMISES; THAT THE PROPERTY DESCRIBED HEREON IS THE SAME AS THE PROPERTY DESCRIBED IN LAND TITLE COMPANY ORDER NOS. 115163-S, 115164-P, 115165-S & 115166-P, AND 135468-S DATED DECEMBER 31, 2009, AT 8:00 A.M. AND THAT ALL EASEMENTS, COVENANTS AND RESTRICTIONS REFERENCED IN SAID TITLE COMMITMENTS, OR EASEMENTS WHICH THE UNDERSIGNED HAS BEEN ADVISED OR HAS KNOWLEDGE, HAVE BEEN PLOTTED HEREON OF OTHERWISE NOTED AS TO THEIR EFFECT ON THE SUBJECT PROPERTY.

3) THERE ARE NO VISIBLE ENCROACHMENTS ONTO THE ADJOINING PREMISES, STREETS OR ALLEYS BY ANY BUILDINGS, STRUCTURES, OR OTHER IMPROVEMENTS, AND NO ENCROACHMENTS ONTO SAID PREMISES BY BUILDINGS, STRUCTURES OR OTHER IMPROVEMENTS, SITUATED ON ADJOINING PREMISES; EXCEPT AS SHOWN HEREON.

4) THE SUBJECT PARCELS HAVE DIRECT PHYSICAL ACCESS TO BOW HILL RD. AND OLD HIGHWAY 99, BEING PUBLIC ROADS. ACCESS POINTS AS SHOWN HEREON.

5) ZONING DESIGNATION: 'RURAL RESERVE'
PER SKAGIT COUNTY COMPREHENSIVE PLAN

6) AREA OF SUBJECT PARCELS:
P50414 & P50500 = 61.965 ACRES
P50416 = 41.521 ACRES
P123324 = 21.107 ACRES
P35839 = 8.611 ACRES
P119078 = 0.581 ACRES

7) PARCELS P123324, P35839, P50414, P50500, P50416 & P119078 DO NOT CONTAIN ANY DIFFERENCES BETWEEN THE RECORD LEGAL DESCRIPTION AND THE ACTUAL MEASUREMENT ON SAID PARCELS. SAID PARCELS DO NOT CONTAIN ANY GAPS, GORES OR OVERLAPS.

CERTIFIED FEDERAL SURVEYOR 1037 PETER K. BRANDS

AUDITOR'S CERTIFICATE

Filed for record this 30 day of June 2010 at ___ in book ___ of surveys at page ___ at the request of PACIFIC SURVEYING AND ENGINEERING SERVICES INC.

J. Youngquist by: [illegible]
County Auditor

PACIFIC SURVEYING & ENGINEERING
1812 CORNWALL AVE, BELLINGHAM, WA 98225
360.671.7387, FAX: 360.671.4685
www.psesurvey.com

SURVEYOR'S CERTIFICATE

This map correctly represents a survey made by me or under my direction in conformance with the requirements of the Survey Recording Act at the request of UPPER SKAGIT INDIAN TRIBE in JANUARY 2010.

Certificate No.: 35147

PETER K. BRANDS STATE OF WASHINGTON 35147 REGISTERED PROFESSIONAL LAND SURVEYOR
EXPIRES: 02-04-11
6-30-10

DRAWN BY: JVD	CHECKED BY: PKB	F.B.# 200...	DATE: 06/29/10	JOB NO. 2005032	SHEET NO. 1 OF 7	DWG. NO. 2010_altaupdate_200x.dwg

UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004

RECORD OF SURVEY

ALTA/ACSM LAND TITLE SURVEY

SITUATE IN A PORTION OF THE SE 1/4 OF SECTION 31 & SW 1/4 OF SECTION 32,
TOWNSHIP 36 NORTH, AND GOV'T LOTS 1, 2 & 3 OF SECTION 6, TOWNSHIP 35 NORTH,
RANGE 4 EAST, WILLAMETTE MERIDIAN, SKAGIT COUNTY, WASHINGTON

201006300037
Skagit County Auditor
6/30/2010 Page 2 of 7 10:22AM

MONUMENT HISTORY

NOTE 1: CENTER – EAST ONE SIXTEENTH CORNER – SECTION 31

JUNE 30, 1993, A.F. NO. 9306300080, (CALCULATED POSITION).

MAY 7, 2001, A.F. NO. 200105070102, (CALCULATED POSITION).

AUGUST 21, 2003, A.F. NO. 200308210041, (CALCULATED POSITION).

AUGUST 2, 2005, A.F. NO. 200508020064, SET #4 REBAR AND CAP, PLS #40525.

JANUARY 2010, PSE FOUND AND ACCEPTED A #4 REBAR AND CAP, PLS #40525, FLUSH WITH GROUND; REPLACED WITH #5 REBAR AND 2" DIAMETER ALUMINUM CAP APPROPRIATELY MARKED AND STAMPED "UPPER SKAGIT INDIAN TRIBE PSE 2010 PLS 35147" WITH DRILL HOLE, FLUSH WITH GROUND.

NOTE 2: CENTER QUARTER CORNER – SECTION 31

NOVEMBER 21, 1979, A.F. NO. 7911210040, (CALCULATED POSITION).

JULY 7, 1980, A.F. NO. 8007070006, (CALCULATED POSITION).

MAY 8, 1992, A.F. NO. 9205080001. (CALCULATED POSITION).

MARCH 22, 1993, A.F. NO. 9303220004, CENTER OF SECTION 31 AS DETERMINED DURING SURVEY FILED VOLUME 4 OF SHORT PLATS AT PAGES 131 & 132. SET 1/2" X 18" REINFORCING ROD WITH YELLOW PLASTIC CAP MARKED "SKA SURV 17651" AND WHITE 2" X 2" WITNESS STAKE.

JUNE 30, 1993, A.F. NO. 9306300080, (CALCULATED POSITION).

MAY 7, 2001, A.F. NO. 200105070102, CALC. PER R.O.S. 9205080001.

AUGUST 21, 2003, A.F. NO. 200308210041, (CALCULATED POSITION).

AUGUST 2, 2005, A.F. NO. 200508020064, (CALCULATED POSITION) REF. R.O.S. A.F. 9303220004, 8007070006, 7911210040.

JANUARY 2010, PSE FOUND AND ACCEPTED A #4 REBAR AND CAP, PLS #17651, 1.0' BELOW GROUND; REPLACED WITH #5 REBAR AND 2" DIAMETER ALUMINUM CAP APPROPRIATELY MARKED AND STAMPED "UPPER SKAGIT INDIAN TRIBE PSE 2010 PLS 35147" WITH DRILL HOLE, FLUSH WITH GROUND.

NOTE 3: CENTER – SOUTH ONE SIXTEENTH CORNER – SECTION 31

NOVEMBER 21, 1979, A.F. NO. 7911210040, IRON ROD SET BY G.D. LEGRO AS SHOWN ON SURVEY DATED MAY, 1978.

MARCH 22, 1993, A.F. NO. 9303220004, FOUND REINFORCING ROD AND YELLOW PLASTIC CAP LS 7598.

JUNE 30, 1993, A.F. NO. 9306300080, (CALCULATED POSITION).

MAY 7, 2001, A.F. NO. 200105070102, (CALCULATED POSITION).

AUGUST 21, 2003, A.F. NO. 200308210041, (CALCULATED POSITION).

AUGUST 2, 2005, A.F. NO. 200508020064, EXISTING #5 REBAR AND CAP, PLS #7598, REF. R.O.S. A.F. 200308210041, 9303220004, 7911210040.

JANUARY 2010, PSE FOUND AND ACCEPTED A #5 REBAR AND CAP, PLS #7598; REPLACED WITH #5 REBAR AND 2" DIAMETER ALUMINUM CAP APPROPRIATELY MARKED AND STAMPED "UPPER SKAGIT INDIAN TRIBE PSE 2010 PLS 35147" WITH DRILL HOLE, 0.1' ABOVE GROUND.

NOTE 4: EAST ONE SIXTEENTH CORNER – SECTION 31 & SECTION 6

JUNE 30, 1993, A.F. NO. 9306300080, (CALCULATED POSITION).

MAY 7, 2001, A.F. NO. 200105070102, SET CONCRETE MONUMENT.

AUGUST 21, 2003, A.F. NO. 200308210041, EXISTING #5 REBAR AND CAP, PLS #7598 S68°W, 0.4' FROM ACCEPTED IRON PIPE.

AUGUST 2, 2005, A.F. NO. 200508020064, EXISTING 2" IRON PIPE, NO CAP, REF. R.O.S. A.F. 200105070102.

AUGUST 12, 2005, A.F. NO. 200508120104, (CALCULATED POSITION).

JANUARY 2010, PSE FOUND AND ACCEPTED A 2" IRON PIPE, NO CAP, FLUSH WITH GROUND; PLACED A 2" DIAMETER ALUMINUM CAP APPROPRIATELY MARKED AND STAMPED "UPPER SKAGIT INDIAN TRIBE PSE 2010 PLS 35147" WITH DRILL HOLE INSIDE PIPE, FLUSH WITH GROUND.

NOTE 5: QUARTER CORNER – SECTIONS 31 & 32

FEBRUARY 9, 1874, U. S. DEPUTY SURVEYOR JOSEPH M. SNOW UNDER CONTRACT NUMBER 185, SET A 4 INCH BY 4 FOOT POST FOR SECTION CORNER, APPROVED MAY 1, 1874.

AUGUST 30, 1974, A.F. NO. 805590, FOUND 1-1/4 IRON PIPE.

OCTOBER 11, 1974, A.F. NO. 808737, FOUND 1-1/4 IRON PIPE.

JULY 7, 1980, A.F. NO. 8007070006, FOUND 2" IRON PIPE, PLUG, AND TACK.

JULY 7, 1981, A.F. NO. 8107070003, FOUND 1-1/4 IRON PIPE.

MAY 8, 1992, A.F. NO. 9205080001, FOUND 2" OUTSIDE DIAMETER IRON PIPE WITH WOOD PLUG AND TACK.

JULY 17, 1992, A.F. NO. 9207170212, FOUND 2" IRON PIPE 12/4/79.

JUNE 30, 1993, A.F. NO. 9306300080, FOUND 2" IRON PIPE WITH WOOD PLUG AND TACK AT THE NORTH END OF HATCHERY, WEST OF FRIDAY CREEK, EAST OF HIGHWAY 99, 12/4/79.

MARCH 21, 1996, UNRECORDED SKAGIT COUNTY ENGINEER DRAWING "BOW HILL ROAD IMPROVEMENT PROJECT – DAARK LANE TO OLD 99 NORTH." JAN. 04, 1995 FOUND 1-1/4 IRON PIPE.

MAY 7, 2001, A.F. NO. 200105070102, FOUND 1-1/4" IRON PIPE AND PLUG JAN. 1996.

AUGUST 21, 2003, A.F. NO. 200308210041, 2" IRON PIPE WITH WOOD PLUG AND TACK PER R.O.S. A.F. NO. 9205080001.

AUGUST 2, 2005, A.F. NO. 200508020064, 2" IRON PIPE WITH WOOD PLUG AND TACK, REF. R.O.S. A.F. 200308210041, 200105070102, 9306300080, 8007070006.

MAY 12, 2005, A.F. NO. 200512050040, FOUND 1-1/2" IRON PIPE WITH WOOD PLUG AND TACK, APRIL 6, 1992.

FEBRUARY 21, 2008, A.F. NO. 200802210088, FOUND 1-1/2" IRON PIPE WITH WOOD PLUG AND TACK, APRIL 6, 1992.

JANUARY 2010, PSE FOUND A 2" IRON PIPE WITH WOOD PLUG AND TACK, 0.2' ABOVE GROUND. THIS MONUMENT PERPETUATES THE CORNER POSITION. ACCEPTED AS QUARTER CORNER.

NOTE 6: QUARTER CORNER – SECTIONS 32 & 33

FEBRUARY 4, 1874, U. S. DEPUTY SURVEYOR JOSEPH M. SNOW UNDER CONTRACT NUMBER 185, SET A 3-1/2 BY 4 FOOT POST FOR SECTION CORNER, APPROVED MAY 1, 1874.

MAY 1911, UNRECORDED SURVEY BY W.E. COSTELLO, COUNTY ENGINEER, 4' GAS PIPE GOVN'T BTS.

AUGUST 30, 1974, A.F. NO. 805590, ESTABLISHED BY SINGLE PROPORTION.

OCTOBER 11, 1974, A.F. NO. 808737, SEE RECORD OF SURVEY FILED IN BOOK 1, PAGE 82.

AUGUST 22, 1980, A.F. NO. 800822026, FOUND CONCRETE MONUMENT WITH BRASS CAP IN EAST-WEST FENCE LINE.

JULY 7, 1981, A.F. NO. 8107070003, FOUND CONCRETE MONUMENT WITH BRASS CAP.

JULY 31, 1985, A.F. NO. 8507310018, AS SHOWN ON HIDDEN MEADOWS SHORT PLAT.

DECEMBER 16, 2003, A.F. NO. 200312160116, SET 5/8" REBAR WITH CAP LS 28023, 4/1997.

DECEMBER 5, 2005, A.F. NO. 200512050040, FOUND CONCRETE MONUMENT DESTROYED; HELD POSITION OF SURVEY FILED IN VOL. 5 OF SHORT PLATS, PG. 91.

JULY 31, 2006, A.F. NO. 200607310190, CONCRETE MONUMENT DESTROYED. FOUND 5/8" REBAR/CAP SET BY LS 28023. SEE ROBIN HILL SHORT PLAT RECORDED UNDER AUDITOR'S FILE NUMBER 200312160116.

FEBRUARY 21, 2008, A.F. NO. 200802210088, FOUND CONCRETE MONUMENT DESTROYED; HELD POSITION OF SURVEY FILED IN VOL. 5 OF SHORT PLATS, PG. 91.

JANUARY 2010, PSE FOUND A #5 REBAR AND CAP, 0.3' ABOVE GROUND, MARKED "SCHWIND PLS #28023". THIS MONUMENT PERPETUATES THE CORNER POSITION. ACCEPTED AS QUARTER CORNER.

NOTE 7: QUARTER CORNER – SECTION 6 & 7

FEBRUARY 18, 1873, U. S. DEPUTY SURVEYOR JOHN A. CORNELIUS UNDER CONTRACT NUMBER 142, SET A POST FOR QUARTER SECTION CORNER, APPROVED JULY 16, 1873.

NOVEMBER 1974, UN-RECORDED SURVEY BY THE STATE OF WASHINGTON DEPARTMENT OF GAME, FOUND 1 INCH IRON PIPE WITH WOOD PLUG.

FEBRUARY 21, 1996, A.F. NO. 9602210029, FOUND 3/4 INCH IRON PIPE WITH TACK IN 3-WAY FENCE CORNER.

AUGUST 2, 2005, A.F. NO. 200508020064, CALCULATED POSITION PER RECORD OF SURVEY A.F. NO. 9602210029.

AUGUST 12, 2005, A.F. NO. 200508120104, CALCULATED POSITION PER RECORD OF SURVEY A.F. NO. 9602210029.

JANUARY 2010, PSE FOUND A 1" DIAMETER IRON PIPE WITH PLUG AND NAIL, FLUSH WITH GROUND, IN FENCE LINE. THIS MONUMENT PERPETUATES THE CORNER POSITION. ACCEPTED AS QUARTER CORNER.

NOTE 8: QUARTER CORNER – SECTIONS 30 & 31

FEBRUARY 10, 1874, U. S. DEPUTY SURVEYOR JOSEPH M. SNOW UNDER CONTRACT NUMBER 185, SET A 3-1/2 (INCH) BY 4 FOOT POST FOR SECTION CORNER, APPROVED MAY 1, 1874.

JULY 7, 1980, A.F. NO. 8007070006, FOUND CONCRETE MONUMENT, JUDY CAP, L.S. NO. 7598.

MAY 8, 1992, A.F. NO. 9205080001, ACCEPTED AS PER "THOUSAND TRAILS SHORT PLAT" VOL. 4, PAGE 132.

JUNE 30, 1993, A.F. NO. 9306300080, FOUND CONCRETE MONUMENT WITH JUDY CAP 11/20/79.

AUGUST 2, 2005, A.F. NO. 200508020064, CALCULATED POSITION PER R.O.S. A.F. NO. 9205080001, 9306300080.

JANUARY 2010, PSE FOUND A CONCRETE MONUMENT AND CAP WITH DRILL HOLE, MARKED "JUDY 7598" 0.2' ABOVE GROUND. THIS MONUMENT PERPETUATES THE CORNER POSITION. ACCEPTED AS QUARTER CORNER.

NOTE 9: QUARTER CORNER – SECTIONS 31 & 36

MARCH 18, 1872, U. S. DEPUTY SURVEYOR JOHN A. CORNELIUS UNDER CONTRACT NUMBER 125, SET A POST FOR SECTION CORNER, APPROVED JUNE 21, 1872.

JULY 7, 1980, A.F. NO. 8007070006, FOUND 1" IRON PIPE WITH R & L CAP, LS NO. 8992.

MAY 8, 1992, A.F. NO. 9205080001, FOUND 1" OUTSIDE DIAMETER IRON PIPE WITH PLASTIC CAP, PLS NO. 6702, 0.4' EAST OF BARBED WIRE FENCE CORNER.

MARCH 22, 1993, A.F. NO. 9303220004, FOUND 3/4" IRON PIPE MARKED "LS 6702" 0.5' EAST OF 12" CORNER FENCE POST ON 12/21/92. REPLACED IRON PIPE WITH DNR ALUMINUM PIPE MONUMENT AND 2 REFERENCES WITH ALUMINUM TAGS ON 12/29/92. FOUND DNR ALUMINUM MONUMENT 1/25/93.

APRIL 28, 1993, A.F. NO. 9304280051, FOUND 3/4" IRON PIPE WITH YELLOW PLASTIC CAP MARKED "R & L" 0.5' EAST OF ROUND 10" DIAMETER x 5' HIGH FENCE CORNER POST. FENCE LINE TO NORTH, WEST AND SOUTH 12/21/92. SET DNR ALUMINUM PIPE MONUMENT.

JUNE 30, 1993, A.F. NO. 9306300080, FOUND 1" IRON PIPE WITH R & L CAP, REPLACED WITH DNR ALUMINUM MONUMENT ON 12/92.

AUGUST 21, 2003, A.F. NO. 200308210041, 1" IRON PIPE WITH PLASTIC CAP, PLS NO. 6702 PER R.O.S. A.F. NO. 9205080001.

AUGUST 2, 2005, A.F. NO. 200508020064, CALCULATED POSITION PER R.O.S. A.F. NO. 9205080001, REF. 9312230061, 9306300080, 9104040014, 8007070006, 8005010030.

JANUARY 2010, PSE FOUND A 1" IRON PIPE WITH 3" DIAMETER DEPARTMENT OF NATURAL RESOURCES ALUMINUM CAP APPROPRIATELY MARKED AND STAMPED "1992 LS 17561" WITH DRILL HOLE, 0.1' ABOVE GROUND. THIS MONUMENT PERPETUATES THE CORNER POSITION. ACCEPTED AS QUARTER CORNER.

SURVEY SYMBOL LEGEND

- = EXISTING MONUMENT (SEE NOTE FOR DESCRIPTION)
- = EXISTING #4 REBAR & CAP, PLS #17651
- = EXISTING #5 REBAR & CAP, PLS #7598
- = EXISTING #4 REBAR & CAP, PLS #32560
- = EXISTING #4 REBAR & CAP, PLS #32560, REPLACED W/ #5 REBAR & ALUM. U.S.I.T. CAP, PLS #35147
- = EXISTING 2" IRON PIPE, NO CAP
- = EXISTING #4 REBAR & CAP, PLS #8992
- = EXISTING #4 REBAR & CAP, PLS #40525
- = EXISTING #4 REBAR & CAP, PLS #40525, REPLACED W/ #5 REBAR & ALUM. U.S.I.T. CAP, PLS #35147
- = SET #5 REBAR & ALUM. U.S.I.T. CAP, PLS #35147 (SEE DETAIL ON SHEET 2)
- = EXISTING SECTION CORNER
- = EXISTING QUARTER SECTION CORNER
- = EXISTING WATER WELL HOUSE
- = EXISTING FIRE HYDRANT
- = EXISTING GATE VALVE
- = EXISTING WATER METER
- E.M. = EXISTING ELECTRIC METER/SWITCH
- UP = EXISTING UTILITY POLE
- = EXISTING ELECTRICAL VAULT/MANHOLE
- = EXISTING TELEPHONE VAULT/MANHOLE
- = EXISTING LUMINAIRE ALIGNMENT
- = EXISTING POWER POLE
- = EXISTING POWER POLE W/DROP
- = EXISTING STORM DRAIN MANHOLE

PACIFIC SURVEYING & ENGINEERING
1812 CORNWALL AVE, BELLINGHAM, WA 98225
360.671.7387, FAX: 360.671.4685
www.psesurvey.com

CERTIFIED FEDERAL SURVEYOR
PETER K. BRANDS

PETER K. BRANDS
STATE OF WASHINGTON
35147
REGISTERED
PROFESSIONAL LAND SURVEYOR
EXPIRES: 02-04-11

6-30-10

RECORD OF SURVEY

ALTA/ACSM LAND TITLE SURVEY

SITUATE IN A PORTION OF THE SE 1/4 OF SECTION 31 & SW 1/4 OF SECTION 32,
TOWNSHIP 36 NORTH, AND GOV'T LOTS 1, 2 & 3 OF SECTION 6, TOWNSHIP 35 NORTH,
RANGE 4 EAST, WILLAMETTE MERIDIAN, SKAGIT COUNTY, WASHINGTON

UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004

MONUMENT HISTORY

NOTE 10: SOUTHEAST ONE SIXTEENTH CORNER – SECTION 31

JUNE 30, 1993, A.F. NO. 9306300080, SET 1/2" X 18" REINFORCING ROD WITH YELLOW PLASTIC CAP MARKED "SKA SURV 17651" AND WHITE 2" X 2" WITNESS STAKE.

MAY 7, 2001, A.F. NO. 200105070102, FOUND REBAR AND CAP 0.63' SOUTH AND 0.40' EAST OF CALC.. REBAR AND CAP "LS 32560" SET.

AUGUST 21, 2003, A.F. NO. 200308210041, EXISTING #4 REBAR AND CAP, PLS #32560.

AUGUST 2, 2005, A.F. NO. 200508020064, EXISTING #4 REBAR AND CAP, PLS #32560. REF. R.O.S. A.F. 200308210041, 200105070102, 9306300080.

JANUARY 2010, PSE FOUND AND ACCEPTED A #4 REBAR AND CAP, PLS #32560. FLUSH WITH GROUND; REPLACED WITH #5 REBAR AND 2" DIAMETER ALUMINUM CAP APPROPRIATELY MARKED AND STAMPED "UPPER SKAGIT INDIAN TRIBE PSE 2010 PLS 35147" WITH DRILL HOLE. FLUSH WITH GROUND.

NOTE 11: SECTION CORNER – SECTIONS 5, 6, 31 & 32

JANUARY 24, 1873, U. S. DEPUTY SURVEYOR JOHN A. CORNELIUS UNDER CONTRACT NUMBER 142, SET A POST FOR QUARTER SECTION CORNER, APPROVED JULY 16, 1873.

JUNE 26, 1962, LAND CORNER RECORD PREPARED BY R. L. JUDY, FOUND 1" SOLID ROD 8" DEEP.

JANUARY 7, 1974, A.F. NO. 795271, 1" AXLE IN ROADWAY.

AUGUST 30, 1974, A.F. NO. 805590, FOUND 1" AXLE IN ROAD.

NOVEMBER 21, 1979, A.F. NO. 7911210040, FOUND 1-1/2" IRON PIPE.

APRIL 15, 1992, A.F. NO. 9204150001, FOUND 1" ROD, 10" DOWN IN GRAVEL ROAD JAN. 15,1992.

MAY 8, 1992, A.F. NO. 9205080001, FOUND 1-1/2" SOLID IRON PIPE 0.8" BELOW GRADE IN GRAVEL ROAD.

JULY 17, 1992, A.F. NO. 9207170212, FOUND 1.5" IRON PIPE 11/12/79.

JUNE 30, 1993, A.F. NO. 9306300080, FOUND 1-1/2" IRON ROD 0.9' DEEP IN GRAVEL ROAD 4/21/93.

MARCH 23, 1995, UNRECORDED SKAGIT COUNTY PUBLIC WORKS SURVEY "BOW HILL ROAD – I-5 TO OLD HWY 99," AUG. 18, 1994 FOUND 1 INCH IRON ROD DOWN 10 INCHES IN GRAVEL AT NORTH END OF GREEN ROAD.

MARCH 21, 1996, UNRECORDED SKAGIT COUNTY ENGINEER DRAWING "BOW HILL ROAD IMPROVEMENT PROJECT – DAARK LANE TO OLD 99 NORTH," AUG. 18, 1994 FOUND 1 INCH IRON ROD DOWN 10 INCHES IN GRAVEL AT NORTH END OF GREEN ROAD.

MAY 7, 2001, A.F. NO. 200105070102, FOUND CASED 1-1/4" AXLE JAN. 1996.

AUGUST 21, 2003, A.F. NO. 200308210041, EXISTING 1-1/2" AXLE ROD IN CASE, 0.9' BELOW GROUND.

DECEMBER 16, 2003, A.F. NO. 200312160116, 1-1/4" DIAMETER AXLE IN MONUMENT CASE SOUTH OF PRAIRIE ROAD IN CENTERLINE OF NORTH GREEN ROAD, 4/2007.

AUGUST 2, 2005, A.F. NO. 200508020064, 2" AXLE ROD IN CASE PER R.O.S. A.F. 200308210041, REF. 200105070102, 9306300080, 7911210040.

AUGUST 12, 2005, A.F. NO. 200508120104, FOUND 1-1/2" IRON PIPE 0.8" DEEP IN GRAVEL ROAD.

JANUARY 2010, PSE FOUND A 2" AXLE ROD 0.8" BELOW ASPHALT GRADE IN MONUMENT CASE. THIS MONUMENT PERPETUATES THE CORNER POSITION. ACCEPTED AS QUARTER CORNER.

NOTE 12: SECTION CORNER – SECTIONS 1, 6, 31, & 36

SEPTEMBER 29, 1870, U. S. DEPUTY SURVEYOR JOHN A. CORNELIUS UNDER CONTRACT NUMBER 115, SET A POST FOR SECTION CORNER, APPROVED JUNE 27, 1871.

MARCH 18, 1872, U. S. DEPUTY SURVEYOR JOHN A. CORNELIUS UNDER CONTRACT NUMBER 125, FOUND A POST FOR SECTION CORNER. APPROVED JUNE 21, 1872.

NOVEMBER 21,1979, A.F. NO. 7911210040, FOUND CONCRETE MONUMENT.

APRIL 4, 1991, A.F. NO. 9104040014, FOUND CONCRETE MONUMENT WITH BRASS DISC STAMPED "RADER AND LEONARD" (NOV. 1990).

APRIL 15, 1992, A.F. NO. 9204150001, FOUND CONCRETE MONUMENT WITH BRASS DISC STAMPED "RADER AND LEONARD" JAN. 15, 1992.

MAY 8, 1992, A.F. NO. 9205080001, FOUND 4" SQUARE CONCRETE MONUMENT WITH BRASS CAP 1.5' WEST OF A BARBED WIRE FENCE. (MONUMENT IS APPROPRIATELY STAMPED AND WITH "RADER AND LEONARD 6702.")

MARCH 22, 1993, A.F. NO. 9303220004, FOUND CONCRETE MONUMENT WITH BRASS CAP MARKED "RADER AND LEONARD 6702" UP 0.2' AT THE EAST EDGE OF A SMALL CREEK. FENCE IS 3.1' EAST OF SECTION CORNER.

APRIL 28, 1993, A.F. NO. 9304280051, FOUND CONCRETE MONUMENT WITH BRASS CAP MARKED "RADER AND LEONARD 6702" UP 0.2' AT THE EAST EDGE OF A SMALL CREEK. ACCEPTED AS SECTION CORNER, ALSO FOUND PLUGGED 3/4" IRON PIPE IN CREEK 8.0' SOUTH OF CONCRETE MONUMENT 1/25/93.

AUGUST 24, 1994, A.F. NO. 9408240103, FOUND CONCRETE MONUMENT WITH BRASS DISC STAMPED "RADER AND LEONARD" (NOV. 1990).

OCTOBER 31, 1994, A.F. NO. 9410310110, FOUND CONCRETE MONUMENT WITH BRASS DISK STAMPED "RADER AND LEONARD" (NOV. 1990).

MARCH 23, 1995, UNRECORDED SKAGIT COUNTY PUBLIC WORKS SURVEY "BOW HILL ROAD – I-5 TO OLD HWY 99," AUG. 18, 1994 FOUND CONCRETE MONUMENT WITH RADER AND LEONARD BRASS CAP.

AUGUST 21, 2003, A.F. NO. 200308210041, 4" SQUARE CONCRETE MONUMENT WITH BRASS DISK PER A.F. NO. 9205080001.

AUGUST 2, 2005, A.F. NO. 200508020064, CALCULATED POSITION PER A.F. NO. 9205080001, REF. 9410310110, 9312230061, 9104040014, 7911210040.

AUGUST 12, 2005, A.F. NO. 200508120104, FOUND CONCRETE MONUMENT WITH BRASS CAP MARKED "RADER AND LEONARD 6702" 1.5' WEST OF A BARBED WIRE FENCE.

JANUARY 2010, PSE FOUND A CONCRETE MONUMENT WITH BRASS CAP APPROPRIATELY MARKED AND STAMPED "RADER AND LEONARD 6702" WITH DRILL HOLE, 1.0' ABOVE GROUND. THIS MONUMENT PERPETUATES THE CORNER POSITION. ACCEPTED AS QUARTER CORNER.

NOTE 14: CENTER WEST 1/16 CORNER – SECTION 32

AUGUST 30, 1974, A.F. NO. 805590, SET 3/4" IRON PIPE.

OCTOBER 11, 1974, A.F. NO. 808737, SET 3/4" IRON PIPE.

JANUARY 2010 PSE FOUND AND ACCEPTED A REBAR AND CAP W/ TACK IN 3/4" IRON PIPE, "R&L 6702", 0.2' A.G.

NOTE 15 QUARTER CORNER – SECTIONS 6 & 31 (SEE DETAIL 'A')

JANUARY 24, 1873, U. S. DEPUTY SURVEYOR JOHN A. CORNELIUS UNDER CONTRACT NUMBER 142, SET A POST FOR QUARTER SECTION CORNER, APPROVED JULY 16, 1873.

NOVEMBER 1974, UN-RECORDED SURVEY BY THE STATE OF WASHINGTON DEPARTMENT OF GAME, FOUND AXLE AND 2" x 2" x 12" STAKE IN UPROOT OF CEDAR TREE.

NOVEMBER 21, 1979, A.F. NO. 7911210040, FOUND 2" IRON PIPE.

JULY 7, 1980, A.F. NO. 8007070006. FOUND 2" IRON PIPE

APRIL 4, 1991, A.F. NO. 9104040014, FOUND AXLE (FEB. 1991).

APRIL 15, 1992, A.F. NO. 9204150001, FOUND AXLE AT FENCE CORNER JAN. 15, 1992.

MAY 8, 1992, A.F. NO. 9205080001, FOUND STEEL AXLE 1.0' ABOVE GROUND AT NORTH AND EAST BARBED WIRE FENCE CORNER.

JULY 17, 1992, A.F. NO. 9207170212, FOUND 2" IRON PIPE 8/29/79.

MARCH 22, 1993, A.F. NO. 9303220004, FOUND 2" IRON PIPE 8/29/79 DURING SURVEY FILED IN VOLUME 4 OF SHORT PLATS AT PAGES 131 & 132.

JUNE 30, 1993, A.F. NO. 9306300080, FOUND 2" IRON PIPE 8/29/79.

OCTOBER 31, 1994, A.F. NO. 9410310110, FOUND CAR AXLE (FEB. 1991).

MARCH 23, 1995, UNRECORDED SKAGIT COUNTY PUBLIC WORKS SURVEY "BOW HILL ROAD – I-5 TO OLD HWY 99." AUG. 18, 1994 FOUND AXLE 1.4 FEET ABOVE GROUND 1.0 FEET FROM FENCE CORNER.

MARCH 21, 1996, UNRECORDED SKAGIT COUNTY ENGINEER DRAWING "BOW HILL ROAD IMPROVEMENT PROJECT – DAARK LANE TO OLD 99 NORTH," AUG. 18, 1994 FOUND AXLE 1.4 FEET ABOVE GROUND 1.0 FEET FROM FENCE CORNER.

MAY 7, 2001, A.F. NO. 200105070102, FOUND 1" IRON BAR UP 0.5' AT FENCE CORNER FEB. 2000.

AUGUST 21, 2003, A.F. NO. 200308210041, EXISTING 1-1/2" AXLE ROD 0.3' ABOVE GROUND.

AUGUST 2, 2005, A.F. NO. 200508020064, 1-1/2" AXLE ROD 0.3' ABOVE GROUND S72°W, 1.0' FROM FENCE CORNER, REF. A.F. NO. 200105070102, 9410310110, 9306300080, 8007070006, 7911210040.

AUGUST 12, 2005, A.F. NO. 200508120104, FOUND STEEL AXLE 1.0' ABOVE GROUND AT FENCE CORNER.

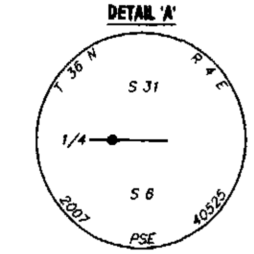
APRIL 2, 2008, A.F. NO. 200804020010, THE FOUND 1' DIAMETER AXLE ROD MONUMENTING THE SOUTH 1/4 CORNER OF SECTION 31, T36N, R4E AS DEPICTED ON RECORD OF SURVEY A.F. NO. 200508020064, RECORDS OF SKAGIT COUNTY, WAS PERMITTED TO BE REMOVED AS PART OF A CONSTRUCTION PROJECT. SET 2-1/2" DIAMETER ALUMINUM MONUMENT IN DRAINAGE SWALE. 4" ABOVE GRADE. THE MONUMENT IS 30" LONG, 1/2' DIAMETER (#4) REBAR INSIDE FOR FUTURE MAGNETIC LOCATING, IF NEEDED. (REFERENCE DNR PERMIT NO. 3402)

JANUARY 2010, PSE FOUND A 2-1/2" DIAMETER ALUMINUM MONUMENT AND CAP WITH DRILL HOLE APPROPRIATELY MARKED AND STAMPED "2007 PSE 40525" 0.3' ABOVE GRADE. THIS MONUMENT PERPETUATES THE CORNER POSITION. ACCEPTED AS QUARTER CORNER.

TYPICAL SET MONUMENT

(NOT TO SCALE)

DETAIL 'A'



MONUMENT DETAIL
NTS

PACIFIC SURVEYING & ENGINEERING
1812 CORNWALL AVE, BELLINGHAM, WA 98225
360.671.7387, FAX: 360.671.4685
www.psesurvey.com

RECORD OF SURVEY

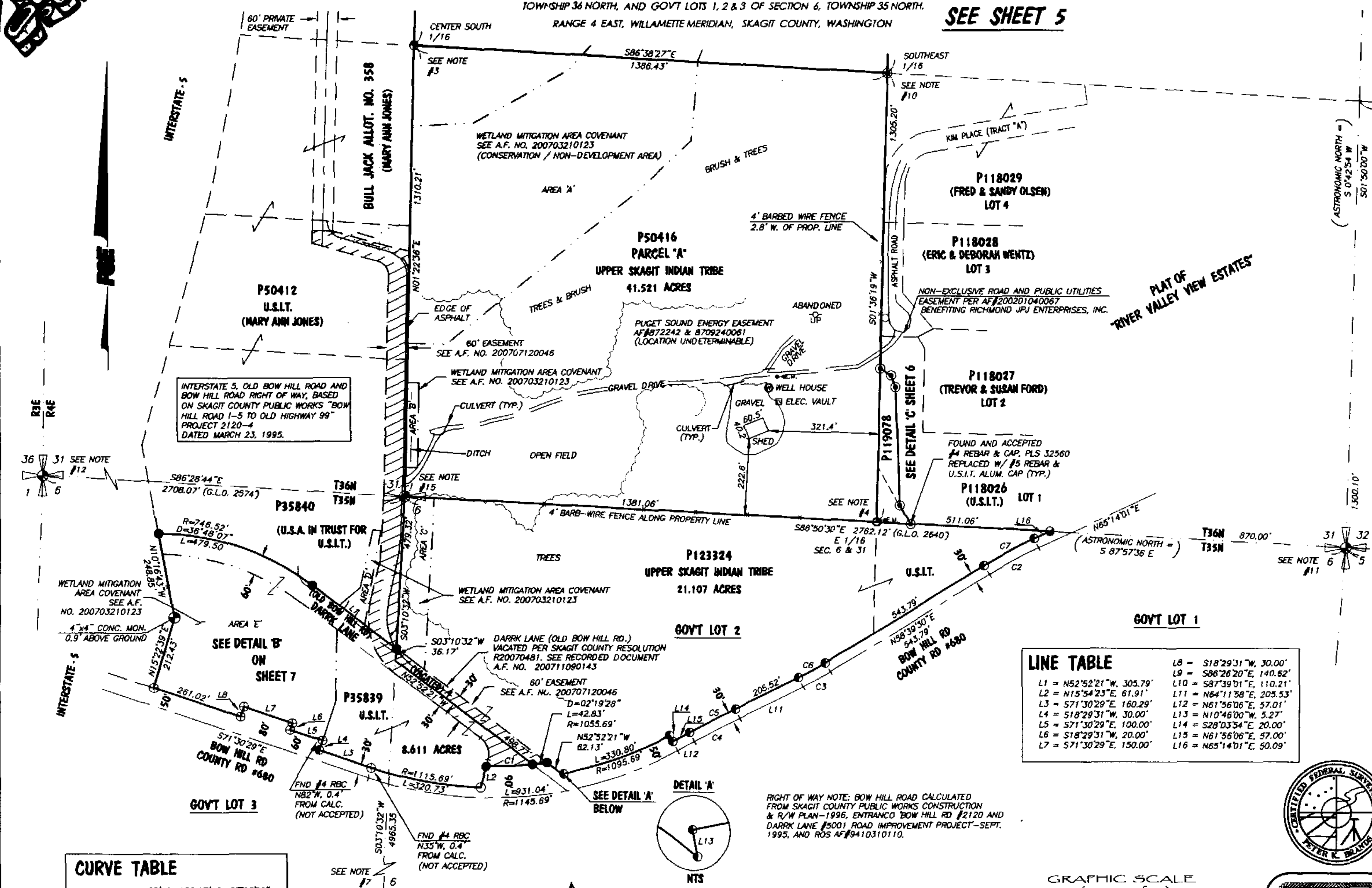
ALTA/ACSM LAND TITLE SURVEY

SITUATE IN A PORTION OF THE SE 1/4 OF SECTION 31 & SW 1/4 OF SECTION 32, TOWNSHIP 36 NORTH, AND GOV'T LOTS 1, 2 & 3 OF SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN, SKAGIT COUNTY, WASHINGTON

201006300037
Skagit County Auditor
6/30/2010 Page 4 of 7 10:22AM

SEE SHEET 5

UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004



RIGHT OF WAY NOTE: BOW HILL ROAD CALCULATED FROM SKAGIT COUNTY PUBLIC WORKS CONSTRUCTION & R/W PLAN-1996, ENTRANCO 'BOW HILL RD #2120 AND DARRK LANE #5001 ROAD IMPROVEMENT PROJECT-SEPT. 1995, AND ROS AF#9410310110.

LINE TABLE

L1 = N52°52'21"W, 305.79'	L8 = S18°29'31"W, 30.00'
L2 = N15°54'23"E, 61.91'	L9 = S86°26'20"E, 140.62'
L3 = S71°30'29"E, 160.29'	L10 = S87°39'01"E, 110.21'
L4 = S18°29'31"W, 30.00'	L11 = N64°11'58"E, 205.53'
L5 = S71°30'29"E, 100.00'	L12 = N61°56'06"E, 57.01'
L6 = S18°29'31"W, 20.00'	L13 = N10°46'00"W, 5.27'
L7 = S71°30'29"E, 150.00'	L14 = S28°03'54"E, 20.00'
	L15 = N61°56'06"E, 57.00'
	L16 = N65°14'01"E, 50.09'

CURVE TABLE

C1 = R=1055.69', L=136.17', D=07°23'26"
C2 = R=1432.78', L=164.42', D=06°34'31"
C3 = R=954.59', L=92.34', D=05°32'33"
C4 = R=3798.56', L=150.27', D=02°16'00"
C5 = R=3828.56', L=151.46', D=02°16'00"
C6 = R=924.59', L=89.45', D=05°32'35"
C7 = R=1462.78, L=167.87, D=06°34'31"

GRAPHIC SCALE
(us survey feet)
1 inch = 200 feet

PACIFIC SURVEYING & ENGINEERING
1812 CORNWALL AVE, BELLINGHAM, WA 98225
360.671.7387, FAX: 360.671.4685
www.psesurvey.com

CERTIFIED FEDERAL SURVEYOR
PETER K. BRANDS

PETER K. BRANDS
STATE OF WASHINGTON
35147
REGISTERED PROFESSIONAL LAND SURVEYOR
EXPIRES: 02-04-11
6-30-10

DRAWN BY: JVD CHECKED BY: PKB F.B.# 200... DATE: 06/29/10 JOB NO. 2005032 SHEET NO. 4 OF 7 DWG. NO. 2010_altaupdate_200x.dwg

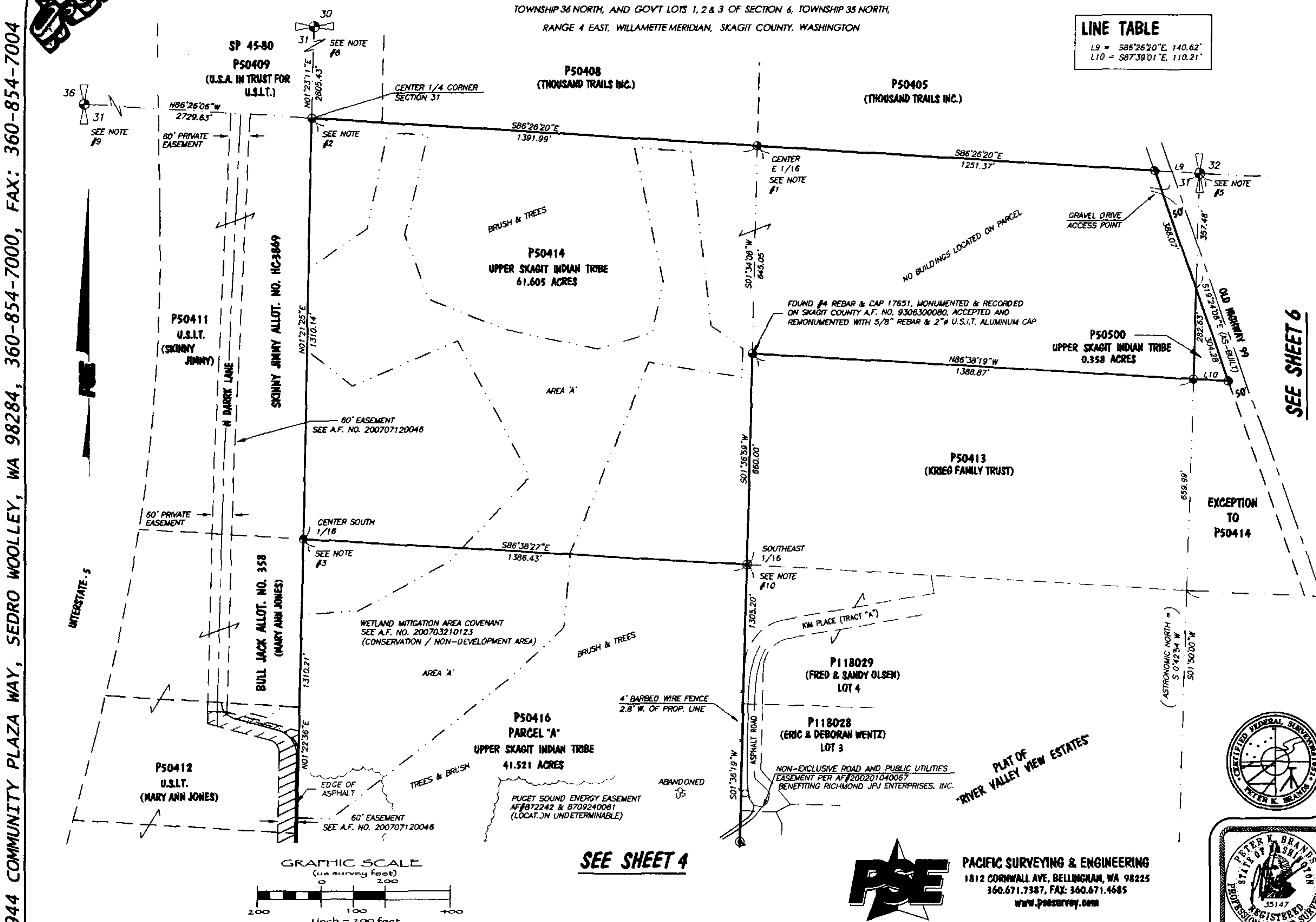
RECORD OF SURVEY

ALTA/ACSM LAND TITLE SURVEY

SITUATE IN A PORTION OF THE SE 1/4 OF SECTION 31 & SW 1/4 OF SECTION 32,
TOWNSHIP 36 NORTH, AND GOVT LOTS 1, 2 & 3 OF SECTION 6, TOWNSHIP 35 NORTH,
RANGE 4 EAST, WILLAMETTE MERIDIAN, SKAGIT COUNTY, WASHINGTON

LINE TABLE

L9 =	S85°26'20"E, 140.62'
L10 =	S87°39'01"E, 110.21'



SEE SHEET 4

UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004

PACIFIC SURVEYING & ENGINEERING
1812 CORNWALL AVE, BELLINGHAM, WA 98225
360.671.7387, FAX: 360.671.4685
www.psesurvey.com

PETER K. BRANDS — STATE OF WASHINGTON — REGISTERED PROFESSIONAL LAND SURVEYOR 35147 — EXPIRES: 02-04-11 — 6-30-10

CERTIFIED FEDERAL SURVEYOR — PETER K. BRANDS

DRAWN BY: JVD CHECKED BY: PKB F.B.# 200... DATE: 06/29/10 JOB NO. 2005032 SHEET NO. 5 OF 7 DWG. NO. 2010_altaupdate_200x.dwg

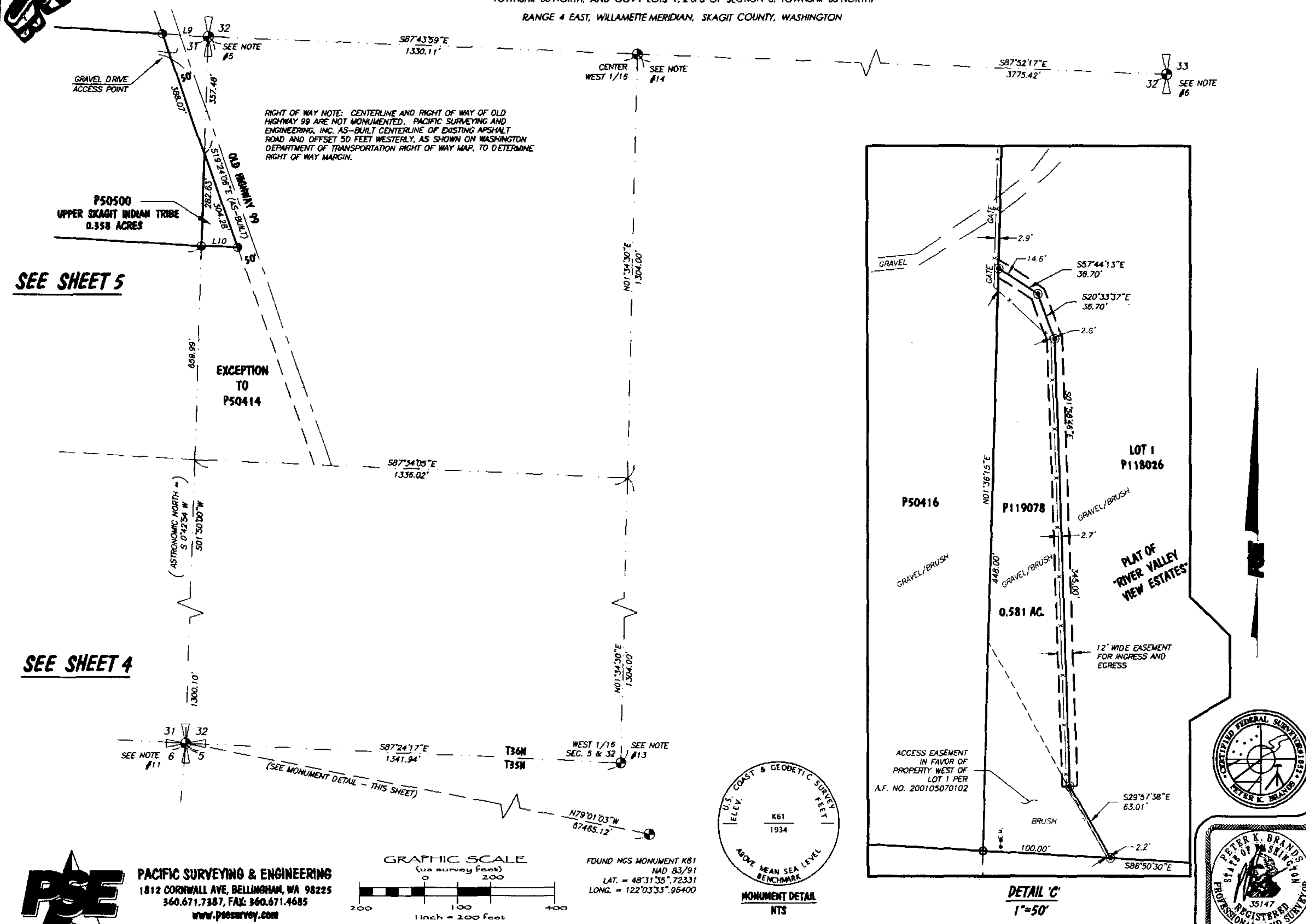
UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004

RECORD OF SURVEY

ALTA/ACSM LAND TITLE SURVEY

SITUATE IN A PORTION OF THE SE 1/4 OF SECTION 31 & SW 1/4 OF SECTION 32, TOWNSHIP 36 NORTH, AND GOV'T LOTS 1, 2 & 3 OF SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN, SKAGIT COUNTY, WASHINGTON

RIGHT OF WAY NOTE: CENTERLINE AND RIGHT OF WAY OF OLD HIGHWAY 99 ARE NOT MONUMENTED. PACIFIC SURVEYING AND ENGINEERING, INC. AS-BUILT CENTERLINE OF EXISTING APSHALT ROAD AND OFFSET 50 FEET WESTERLY, AS SHOWN ON WASHINGTON DEPARTMENT OF TRANSPORTATION RIGHT OF WAY MAP, TO DETERMINE RIGHT OF WAY MARGIN.



PACIFIC SURVEYING & ENGINEERING
1812 CORNWALL AVE, BELLINGHAM, WA 98225
360.671.7387, FAX: 360.671.4685
www.psesurvey.com

DRAWN BY: JVD | CHECKED BY: PKB | F.B.# 200... | DATE: 06/29/10 | JOB NO. 2005032 | SHEET NO. 6 OF 7 | DWG. NO. 2010_altaupdate_200x.dwg

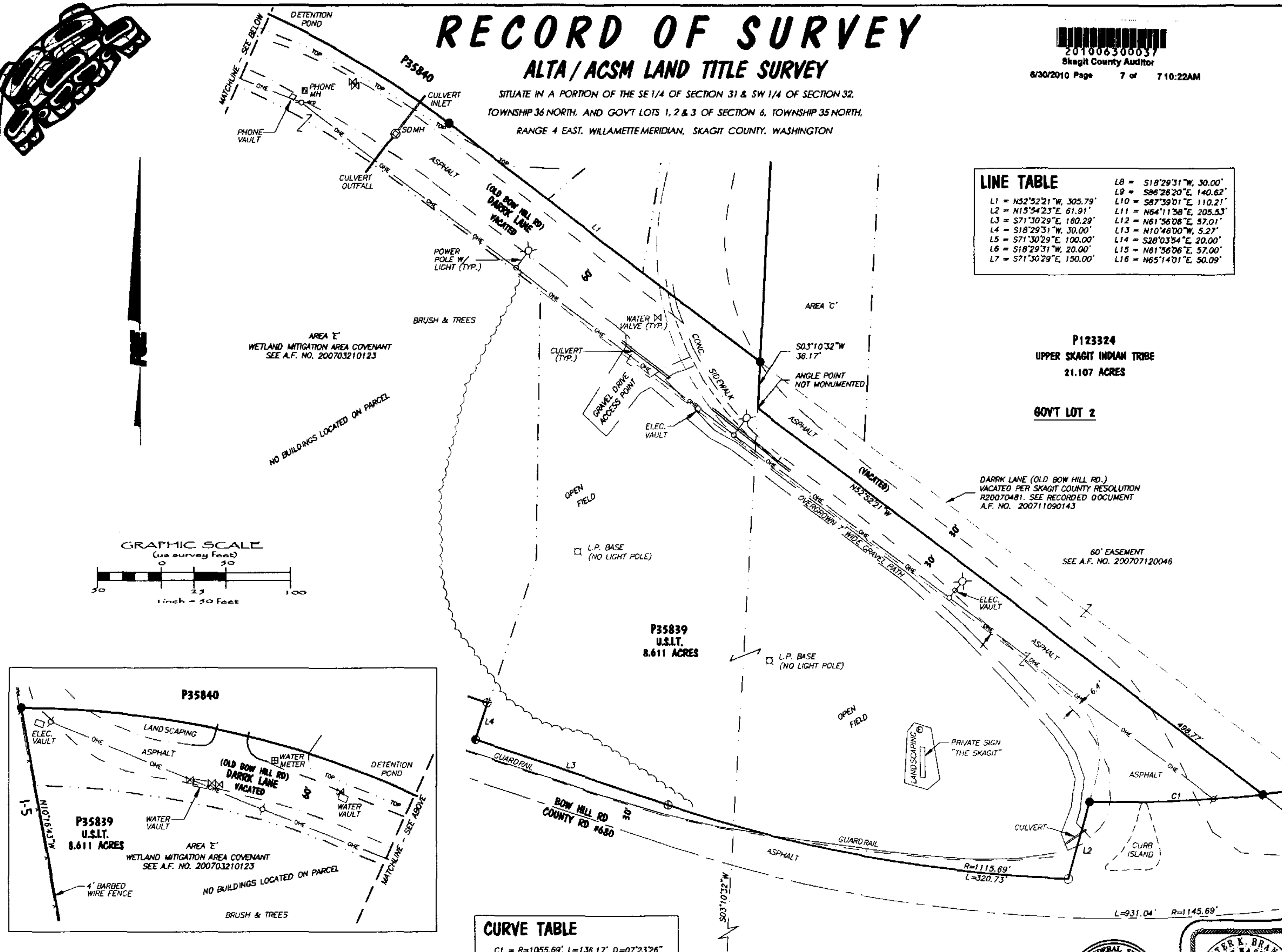
RECORD OF SURVEY

ALTA/ACSM LAND TITLE SURVEY

SITUATE IN A PORTION OF THE SE 1/4 OF SECTION 31 & SW 1/4 OF SECTION 32, TOWNSHIP 36 NORTH, AND GOV'T LOTS 1, 2 & 3 OF SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, WILLAMETTE MERIDIAN, SKAGIT COUNTY, WASHINGTON

201006300037
Skagit County Auditor
6/30/2010 Page 7 of 7 10:22AM

UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY, SEDRO WOOLLEY, WA 98284, 360-854-7000, FAX: 360-854-7004



LINE TABLE

L1 = N52°52'21"W, 305.79'	L8 = S18°29'31"W, 30.00'
L2 = N15°54'23"E, 61.91'	L9 = S86°28'20"E, 140.62'
L3 = S71°30'29"E, 180.29'	L10 = S87°39'01"E, 110.21'
L4 = S18°29'31"W, 30.00'	L11 = N64°11'38"E, 205.53'
L5 = S71°30'29"E, 100.00'	L12 = N61°56'06"E, 57.01'
L6 = S18°29'31"W, 20.00'	L13 = N10°46'00"W, 5.27'
L7 = S71°30'29"E, 150.00'	L14 = S28°03'54"E, 20.00'
	L15 = N61°56'06"E, 57.00'
	L16 = N65°14'01"E, 50.09'

CURVE TABLE

C1 = R=1055.69', L=136.17', D=07°23'26"
C2 = R=1432.78', L=164.42', D=06°34'31"
C3 = R=954.59', L=92.34', D=05°32'33"
C4 = R=3798.56', L=150.27', D=02°16'00"
C5 = R=3828.56', L=151.46', D=02°16'00"
C6 = R=924.59', L=89.45', D=05°32'35"
C7 = R=1462.78, L=167.87, D=06°34'31"

PACIFIC SURVEYING & ENGINEERING
1812 CORNWALL AVE, BELLINGHAM, WA 98225
360.671.7387, FAX: 360.671.4685
www.psesurvey.com

CERTIFIED FEDERAL SURVEYOR 1052 PETER K. BRANDS

PETER K. BRANDS STATE OF WASHINGTON REGISTERED PROFESSIONAL LAND SURVEYOR 35147
EXPIRES: 02-04-11
6-30-10

DRAWN BY: JVD CHECKED BY: PKB F.B.# 200... DATE: 06/29/10 JOB NO. 2005032 SHEET NO. 7 OF 7 DWG. NO. 2010_altaupdate_200x.dwg

STORMWATER MANAGEMENT REPORT

SKAGIT RESORT

Bow, Washington

Prepared For:

Upper Skagit Indian Tribe
25944 Community Plaza Way
Sedro Woolley, WA 98248
(360) 854-7000

March 26, 2009

Prepared By:

1812 Cornwall Avenue
Bellingham, Washington 98225

PSE

Phone: (360) 671-7387 www.psesurvey.com
Fax: (360) 671-4685 Email: pse@psesurvey.com

Pacific Surveying & Engineering

1 TABLE OF CONTENTS

2 LIST OF TABLES

3 CERTIFICATION

ENGINEER'S DECLARATION

I, Jeffrey Vander Yacht, a Professional Engineer registered in the State of Washington as a Civil Engineer, do hereby declare that the Stormwater Design Report titled "Stormwater Management Report-Skagit Resort Project", dated March 26, 2009, was prepared by me, or under my personal supervision, and that said Report was prepared in accordance with generally accepted engineering practices.

Respectfully,

Jeffery A. Vander Yacht, P.E.
Registration No. 37432
Pacific Surveying & Engineering

3-27-09

4 EXECUTIVE SUMMARY

4.1 PURPOSE AND OBJECTIVES

This stormwater design report has been prepared for the Upper Skagit Indian Tribe, the owner of the Skagit Valley Casino and Resort in the City of Bow Washington. This study is presented to discuss, analyze, and propose ways to mitigate the effects upon the surrounding environment of the changes to the existing stormwater runoff patterns resulting from the proposed construction of the water park, hotel, conference center, parking lot, roadways, and drainage improvements.

4.2 EXISTING CONDITIONS

The subject property is located on the east side of N. Darrk Lane, east of Interstate 5 and approximately six miles north of Burlington Washington and sixteen miles south of Bellingham, Washington, see Appendix 8.1, Vicinity Map.

Existing conditions within the approximate 28 acre area of proposed new construction include an existing maintenance shed and gravel access road in the middle of the site surrounded by approximately 4.7 acres of undeveloped partially cleared land. The proposed development is bounded on the west by N. Darrk Lane and the existing Skagit Casino. Property to the north and south is undeveloped with trees, brush, and wetlands. Property to the east is currently developed for two homes. See Appendix 8.5, Pre-development Stormwater Basin Diagram.

The site generally slopes from the southeast to northwest. Soils at the subject site are classified as soil unit 124-Skipopa Silt Loams, listed as hydrologic group D, per the Soil Survey of Skagit County, US Department of Agriculture, Natural Resource Conservation Service, See Appendix 8.6, NRCS Soil Classification Map.

The entire project site is located within a single drainage basin, which currently confluences in an existing roadside drainage channel along N. Darrk Lane. The drainage channel terminates into an existing 30" diameter culvert crossing under N. Darrk Lane, where stormwater is routed around the existing stormwater management facility serving the casino facilities prior to discharging to an unnamed tributary of Bob Smith Creek. Stormwater then travels nearly 1 mile southerly via drainage courses to Bob Smith Creek and then approximately 1100 LF into the Samish River, see Appendix 8.2 Regional Stormwater Flow Path Diagram.

4.3 PROPOSED ALTERATIONS

The proposed 28.0 acres of new construction includes removal of the existing maintenance building and construction of a new 216,420 SF resort building, parking lot, parking garage, stormwater management facilities, and landscaping. See Appendix 8.5, Post-Development Stormwater Basin Diagram. The proposed stormwater management facilities include a detention pond located along N. Darrk Lane (Pond 1) and another detention pond located on the north side of the project site (Pond 2). Each pond will provide basic water quality treatment, as defined by the 2005 Washington State Department of Ecology Stormwater Management Manual (DOE Manual) by means of a wetpond.

The new stormwater management facilities shall be sized and constructed to accommodate and safely convey storm events for the proposed improvement areas. Stormwater management facilities shall be designed and constructed to attenuate developed flow rates prior to discharging to the point of confluence, the upstream side of the 30" diameter culver crossing N. Darrk Lane.

Stormwater runoff from all areas of the proposed development shall be detained per the DOE Manual requirements.

Off-site stormwater shall be conveyed to the same point of confluence at the upstream side of the existing 30" diameter culvert crossing N. Darrk Lane. The project will route the off-site runoff contribution through the proposed stormwater management facilities. Therefore, control structures in the proposed stormwater management facilities will be sized accordingly.

Wetlands fill and disturbance associated with construction of the project shall require mitigation in the form of wetlands creation and/or enhancement. Wetland mitigation for this project shall be address by others.

Temporary erosion and sediment controls will be implemented during the construction of the project as further discussed in this document. The U.S. Environmental Projection Agency is the National Pollutant Discharge Elimination System (NPDES) stormwater program permitting authority for tribal land in Washington State, and therefore, application for coverage under the Construction General Permit shall be submitted to EPA Region 10.

4.4 PRINCIPAL FINDINGS AND RECOMMENDATIONS

Analysis documented in this report demonstrates that all drainage requirements can be met for the proposed project site. The proposed wetpond stormwater management facilities shall be designed and constructed to safely detain stormwater to meet flow control requirements, provide basic water quality treatment, and convey stormwater events for proposed site improvements. Stomwater management associated with the improvements will be based on the DOE Manual as listed in Section 7 of this report.

5 INTRODUCTION

5.1 PROJECT BACKGROUND

General information for this project is as follows:

PROJECT NAME:	Skagit Resort Project
LOCATION:	The subject property is located immediately east of N. Darrk Lane, north of Bow Hill Road at the Skagit Valley Casino Resort, approximately six miles north of Burlington Washington.
LEGAL DESCRIPTION:	Situate in portions of the Southwest Quarter of Section 31, Township 36 North, Range 4 East & the Northwest Quarter of Section 6, Township 35 North, Range 4 East, Willamette Meridian, Skagit County, State of Washington.
DEVELOPER & CONTACT:	Upper Skagit Indian Tribe Bob Hayden, Project Manager 25944 Community Plaza Way, Sedro Woolley, WA 98284 (360) 854-7000
ENGINEER & CONTACT:	Jeffrey A. Vander Yacht, P.E. Pacific Surveying & Engineering 1812 Cornwall Avenue, Bellingham, WA. 98225 Ph: (360) 671-7387, Fax: (360) 671-4685
SWPPP CONTACT:	Bob Hayden, Project Manager Upper Skagit Indian Tribe 25944 Community Plaza Way, Sedro Woolley, WA 98248 (360) 854-7000

5.2 SCOPE OF STUDY

The purpose of this report is to evaluate the effects and consequences of the stormwater surface runoff resulting from the proposed development of the subject property and to detail the methods and assumptions used for this evaluation. This report will also provide mitigation design recommendations to provide flow attenuation to the developed runoff and basic treatment for developed runoff water quality.

5.3 METHOD OF APPROACH

The analyses utilized to create this report are based on computer aided modeling of rainfall runoff. Specifically, the continuous modeling software program "Western Washington Hydrology

Model" (WWHM2), developed by Clear Creek Solutions, was used for runoff simulations. WWHM2 uses actual hourly historic rainfall data collected over a 43-year to 50-year period from long-term rain gages in the western Washington counties to simulate runoff based on soil and land use conditions. Precipitation to each site is scaled using rainfall map data provided by NOAA. From the site-specific data input, WWHM2 calculates flow frequencies and durations for the pre-developed, post-developed unmitigated, and the post-developed mitigated site. This runoff data is summarized in a statistical report. According to the Washington State Department of Ecology flow control standards, there are three criteria that govern flow duration values.

1. If the post-development flow duration values exceed any of the predevelopment flow levels between 50% and 100% of the two-year predevelopment peak flow values (100 Percent Threshold), then the flow control standard requirement has not been met.
2. If the post-development flow duration values exceed any of the predevelopment flow levels between 100% of the two-year and 100% of the 50-year predevelopment peak flow values more than 10 percent of the time (110 Percent Threshold), then the flow control standard has not been met.
3. If more than 50 percent of the flow duration levels exceed the 100 percent threshold, then the flow control standard has not been met.

Pre-development basin characteristics were assumed to be old growth forested conditions. Post-development basin characteristics were determined by utilizing the design plans for the proposed project to estimate impervious surfaces, open spaces, and landscape corridors within the analysis area. These characteristics were input into the computer hydrologic simulation model to estimate the pre-development and post-development runoff rates and required detention volumes associated with the design storm events noted above. The proposed detention facilities have been designed to attenuate the post-development peak flows and to store the runoff volumes according to the flow control standards listed above.

Wet ponds, or permanent pools of water, are proposed to serve the water quality treatment requirements for the project area. These wet pond facilities were sized to treat 91% of the total anticipated runoff volume per the basic treatment requirements in the DOE Manual.

6 STORMWATER SYSTEM EVALUATION

6.1 PRE-DEVELOPMENT BASIN ANALYSIS

The pre-development hydrologic quantities were estimated based on site topographic survey data, field reconnaissance observations, and assumptions pertaining to vegetative cover conditions.

The pre-developed basin has been divided into two separate basins that will be conveyed to two separate ponds in the post-development condition. The pre-development basin for the proposed pond along N. Darrk Lane (Pond 1) encompasses 5.7 acres while the proposed northern pond (Pond 2) basin encompasses 25.6 acres. The pre-development condition is illustrated on the "Pre-Development Stormwater Basin Diagram" map located in Appendix 8.5. The analysis summary of the basin characteristics and runoff calculations are presented in Appendix 8.7 of this report.

The estimated pre-development runoff volumes and peak flow rates occurring at the downstream end of the pre-development basins are summarized in Table 1 below.

TABLE 1: RUNOFF VOLUME AND PEAK FLOW RATE SUMMARY FOR THE PRE-DEVELOPMENT CONDITION

Storm Event	Peak Rate (cfs)
PRE-DEV BASIN 1	
2 Year	0.1097
10 Year	0.2753
100 Year	0.5662
PRE-DEV BASIN 2	
2 Year	0.5510
10 Year	1.3807
100 Year	3.0053

6.2 POST-DEVELOPMENT BASIN ANALYSIS

The post-development hydrologic condition was modeled based on the improvement and grading plans for the proposed project construction that define new impervious surface areas, converted vegetative cover, and ultimate site grading.

Two drainage basins were defined for post-development runoff analysis, corresponding to the predevelopment basins. The post-development condition is illustrated on the "Post-Development Stormwater Basin Diagram" located in Appendix 8.5. The analysis summary of the basin characteristics, runoff calculations are presented in Appendix 8.7

Stormwater runoff will generally sheet flow to curb and gutter or pavement valleys to storm drain catch basins and a pipe conveyance system. Additional flow from rooftops will be conveyed via a pipe to the conveyance system prior to entering the stormwater detention facilities. Two new stormwater detention facilities complete with stormwater control release structures will provide runoff control.

The post-development calculations of flow occurring at the analysis point of concentration for each design frequency storm are included in Appendix 8.7. The runoff volumes and peak flow rates for the both basins in the proposed development condition are summarized below in Table 2. Downstream from the pond control structure outlet, the detained developed runoff is conveyed to an existing roadside drainage channel along N. Darrk Lane. The conveyance channel terminates at a 30" diameter culvert crossing under N. Darrk Lane where stormwater is routed around an existing stormwater management facility prior to discharging to a tributary of Bob Smith Creek.

TABLE 2: RUNOFF VOLUME AND PEAK FLOW RATE SUMMARY FOR THE POST-DEVELOPMENT CONDITION

Storm Event	Undetained Peak Rate (cfs)	Detained Peak Rate (cfs)
POST-DEV BASIN 1		
2 Year	1.2131	0.0552
10 Year	2.0760	0.1611
100 Year	3.4379	0.4848
POST-DEV BASIN 2		
2 Year	4.3597	0.2814
10 Year	7.5237	0.7957
100 Year	12.5582	2.3914

7 TEN MINIMUM STORMWATER MANAGEMENT REQUIREMENTS

This project will address the ten minimum requirements outlined in the DOE Manual. The ten minimum requirements have each been addressed as follows:

7.1 REQUIREMENT NO. 1 – PREPARATION OF STORMWATER SITE PLANS

We have completed the requirements of a stormwater site plan per the DOE Manual The required steps have been performed as follows:

7.1.1 COLLECT AND ANALYZE EXISTING CONDITIONS INFORMATION

Site visits and topographic mapping were performed to determine the existing on-site and off-site drainage conditions. A stormwater hydrologic model was developed to estimate the pre-development runoff conditions. Downstream conveyance was investigated utilizing field surveyed topographic maps as well as site visit observations.

7.1.2 PREPARE PRELIMINARY DEVELOPMENT LAYOUT

A site development plan has been prepared which shows the proposed buildings, parking lot improvements, and stormwater management facilities.

7.1.3 PERFORM OFF-SITE ANALYSIS

We have performed an off-site drainage investigation limited to defining the flow routing and major features.

7.1.4 DETERMINE APPLICABLE MINIMUM REQUIREMENTS

This project will address the ten minimum requirements outlined in the DOE Manual.

7.1.5 PREPARE A PERMANENT STORMWATER CONTROL PLAN

The permanent stormwater control proposed for this project consists of two wet ponds equipped with discharge release control structures located to safely convey stormwater runoff flow from the developed project.

7.1.6 CHECK COMPLIANCE WITH ALL APPLICABLE MINIMUM REQUIREMENTS

The stormwater management facilities proposed in this report comply with the applicable standards per the DOE Manual and basic treatment requirements.

7.2 REQUIREMENT NO. 2 – CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

The Erosion and Sediment Control Plan consists of two parts: a narrative and a set of site plan drawings. The narrative portion consists of the twelve SWPPP elements described below in addition to other components of this stormwater report including descriptions of existing site conditions, proposed project, critical areas, soils, etcetera. The site plan drawings depict implementation of BMPs and are a portion of the civil construction plan drawings, attached in Appendix 8.4, sheets C2.1 and C2.2 titled "Temporary Erosion and Sedimentation Control Plan" and Erosion Control Notes and Details" respectively.

7.2.1 ELEMENT #1 ~ MARK CLEARING LIMITS

Prior to the commencement of construction activities, the limits of the clearing area, as shown on the Construction Phase Erosion and Sedimentation Control Plan, will be marked in the field per applicable BMPs. Existing vegetation removal will be minimized per BMP C101: Preserving Natural Vegetation.

7.2.2 ELEMENT #2 ~ ESTABLISH CONSTRUCTION ACCESS

Access to the site shall be via N. Darrk Lane, located along the western boundary of the project site. A Stabilized Construction Entrance will be constructed at this the connection points to minimize the tracking of sediment onto private and public roadways. Wheel washes or tire baths may be implemented if the stabilized construction entrance does not adequately manage sediment track-out. N. Darrk Lane shall be cleaned thoroughly at the end of each day that sediment is tracked onto the existing roadway.

7.2.3 ELEMENT #3 ~ CONTROL FLOW RATES

The proposed detention facilities shall be constructed as one of the first steps in grading and shall be functional prior to construction of site improvements. The facilities will provide flow control as well as temporary sedimentation during site construction.

7.2.4 ELEMENT #4 ~ INSTALL SEDIMENT CONTROLS

Stormwater runoff from the disturbed portions of the site shall be routed to the temporary stilling basins via stormwater piping systems or drainage channels with check dams, at the time of initial grading. These facilities will provide sediment removal prior to stormwater release. Silt fencing shall also be erected around the perimeter of the area to be cleared to trap sediment on site. Sediment control BMPs shall be installed and functional prior to other land disturbing activities on site.

At a minimum, the following construction site runoff conveyance Best Management Practices (BMP's) shall be implemented to control stormwater runoff and prevent erosion and sedimentation. The following BMPs are obtained from the WSDOE Stormwater Management Manual for Western Washington, 2005 publication, Volume 2:

- ❑ BMP C207: Check Dams
- ❑ BMP C220: Storm Drain Inlet Protection
- ❑ BMP C232: Gravel Filter Berm
- ❑ BMP C233: Silt Fence
- ❑ BMP C241: Temporary Sedimentation Pond

If the minimum BMPs do not maintain appropriate water quality standards, then additional BMPs may be necessary. Additional BMPs may include, but are not limited to:

- ❑ BMP C240: Sediment Traps
- ❑ BMP C250: Construction Stormwater Chemical Treatment
- ❑ BMP C251: Construction Stormwater Filtration

Detailed descriptions of each of the above Pollution Source-Specific BMPs are included in Appendix 8.13. The above construction runoff conveyance BMPs are the minimum requirements for anticipated site conditions during the construction period. Additional BMPs may be needed for unexpected storm events or site conditions encountered during construction.

7.2.5 ELEMENT #5 ~ STABILIZE SOILS

Following grading activities, the site soils shall be stabilized by the establishment of temporary or permanent plantings or the placement of straw mulching to protect soil from the erosive forces of rainfall, runoff, and wind. Plastic coverings shall cover soil stockpiles. Between October 1 and April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. Selected BMPs included:

- BMP C120: Temporary & Permanent Seeding
- BMP C121: Mulching
- BMP C123: Plastic Covering

Optional or additional BMPs may include, but are not limited to:

- BMP C122: Nets and Blankets
- BMP C124: Sodding
- BMP C126: Polyacrylamide for Soil Erosion Protection
- BMP C130: Surface Roughening
- BMP C131: Gradient Terraces

7.2.6 ELEMENT #6 ~ PROTECT SLOPES

Protective measures will include temporary mulching, erosion control nets or blankets, and by permanent plantings. Surface roughening, gradient terraces, and/or pipe slope drains may be required if slope scour, channeling, or other form of erosion is observed.

7.2.7 ELEMENT #7 ~ PROTECT DRAIN INLETS

Drainage inlets in the proposed development as well as affected inlets in N. Darrk shall be protected and provided with filter covers. Inlet protection shall be inspected weekly at a minimum and maintained as necessary.

7.2.8 ELEMENT #8 ~ STABILIZE CHANNELS AND OUTLETS

The proposed stormwater outlet channel from Pond 1 will be will be protected from erosive damage by the use of check dams and silt barriers. The new channel will be armored and spalls will be provided where both of the proposed stormwater facilities discharge to the existing drainage channel along N. Darrk Lane.

7.2.9 ELEMENT #9 ~ CONTROL POLLUTANTS

All pollutants, including waste materials and demolition debris, that occur on-site during construction shall be handled and disposed of in a manner that does not cause contamination of stormwater. Maintenance and repair of heavy equipment and vehicles must be conducted using spill prevention measures, such as drip pans or plastic coverings. Wheel wash or tire bath wastewater, if used, shall be discharged to a separate on-site treatment system or to the sanitary sewer.

7.2.10 ELEMENT #10 ~ CONTROL DE-WATERING

The retention/detention pond shall be de-watered via the permanent discharge control structure to release flows at the required pre-development rates. Foundation and/or trench de-watering, if necessary, will be discharged into a controlled conveyance system prior to discharge to a sediment pond.

7.2.11 ELEMENT #11 ~ MAINTAIN BMPS

All temporary and permanent erosion and sediment control BMPs shall be inspected weekly, maintained and repaired as required to assure continued performance. All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site.

7.2.12 ELEMENT #12 ~ MANAGE THE PROJECT

Construction phasing is not applicable, as this project will be developed in a single phase. However, a sequencing of construction activities shall be implemented to maintain the functions of the existing roadways and drainage channels.

7.3 REQUIREMENT NO. 3 – SOURCE CONTROL OF POLLUTION

The following construction site source control Best Management Practices (BMP's) have been selected for consideration on this project, obtained from the DOE Manual, Volume 2:

- BMP C101: Preserving Natural Vegetation
- BMP C105: Stabilized Construction Entrance
- BMP C107 : Construction Road/Parking Area Stabilization
- BMP C120: Temporary & Permanent Seeding
- BMP C121: Mulching
- BMP C123: Plastic Covering
- BMP C140: Dust Control
- BMP C152: Sawcutting and Surfacing Pollution Prevention

Detailed descriptions of each of the above Pollution Source-Specific BMPs are included in the Appendix 8.13. The above construction source control BMPs are the minimum requirements for anticipated site conditions during the construction period. Additional BMPs may be needed for unexpected storm events or site conditions encountered during construction. These additional BMPs may include, but are not limited to:

- BMP C122: Nets and Blankets
- BMP C124: Sodding

Upon completion of construction the following pollutant source control BMPs shall be implemented associated management and maintenance of the development, obtained from the DOE Manual, Volume 4:

- BMPs for Illicit Connections to Storm Drains
- BMPs for Landscaping and Lawn/Vegetation Management
- BMPs for Maintenance of Public and Private Utility Corridors and Facilities
- BMPs for Maintenance of Roadside Ditches
- BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Detailed descriptions of each of the above Pollution Source-Specific BMPs are included in the Appendix 8.12.

No approved or issued Total Maximum Daily Load (Water Quality Cleanup Plan) has been established for waters receiving discharge from the proposed project. See Minimum Requirement No. 9 below for more information.

7.4 REQUIREMENT NO. 4 – PRESERVATION OF NATURAL DRAINAGE SYSTEMS AND OUTFALLS

Stormwater runoff from the developed site will be released into the existing drainage channels without significant diversions.

7.5 REQUIREMENT NO. 5 – ON-SITE STORMWATER MANAGEMENT

All stormwater runoff generated from the completed project shall be routed to the proposed detention/retention pond for release control structure. Stormwater infiltration is not suitable due to soil conditions on site.

7.6 REQUIREMENT NO. 6 – RUNOFF TREATMENT

Post-development construction water quality for this project is achieved by providing permanent wetpools for the project. All of the runoff from pollution generating portions of the developed area is conveyed to the stormwater management facilities. The WWHM2 computer model was used to determine the required volume of the wetpool treatment portion of the combined detention/treatment ponds. The wetpool storage volumes were established to be equal to or greater than the runoff volume that will be generated by the 91st percentile, 24-hour rainfall event. The wetpool storage volume calculation summaries are presented in Appendix 8.8.

7.7 REQUIREMENT NO. 7 – FLOW CONTROL

Stormwater peak flow rate attenuation will be achieved by constructing two stormwater detention facilities designed to control the runoff from the post-development basins. Both facilities were designed to detain stormwater in accordance with the requirements provided in the DOE Manual.

The control structure within the Pond 2 detention facility will consist of a Type 2, 72-inch diameter catch basin housing a 24-inch diameter riser standpipe. A single orifice at the base of the standpipe will allow stormwater release for the minor storms (up to the 2-year event). A second and third orifice in the standpipe will allow stormwater release for 10-year and 100-year storms. Also, a rectangular weir notched in the top of the 24-inch riser will operate in conjunction with the orifices to safely discharge higher flow rates. The top of the open 24-inch standpipe will serve as the primary overflow, functioning as a weir within the control catch basin. The Pond 2 control structure will discharge to the existing drainage channel along N. Darrk Lane via a new piping system. An emergency spillway is provided for Pond 2 in the form of a Type 2, 72-inch catch basin fitted with a "birdcage" type grate. The rim of the emergency spillway catch basin was set by determining the peak stage elevation associated with 100% of the 100-year design storm runoff being routed through the primary overflow weir located at the top of the Pond 1 riser standpipe. The emergency spillway structure will connect to the proposed storm drain system downstream from the Pond 2 control structure.

The control structure within the Pond 1 detention facility will consist of a Type 2, 72-inch diameter catch basin housing a 24-inch diameter riser standpipe. A single orifice at the base of the standpipe will allow stormwater release for the minor storms (up to the 2-year event) and a second orifice in the standpipe will allow stormwater release for 10-year storms. A concrete weir will be constructed outside of the control structure catch basin to allow release for 100-year design storms. An additional notch in the concrete weir will serve as the primary and secondary overflow for Pond 1. The weir will discharge to an armored, open channel that is sized to safely convey runoff to the existing drainage channel along N. Darrk Lane. The overflow weir has been designed to convey the 100-year design storm through the dam/freeboard zone to provide safe conveyance from the site to the downstream drainage course in case the discharge release structure becomes blocked. The spillway, modeled as a rectangular weir (see Appendix 8.9), is designed to safely convey the 100-year, developed peak flow at a depth not exceeding six inches across the weir while maintaining a minimum of six inches of freeboard in the pond.

Information for the control structures was entered into the StormShed computer program to acquire stage, storage, and discharge tables for each control structure. These tables were then entered into the WWHM2 computer program to determine stormwater release flow rates from the developed project site. The resultant, detailed StormShed and WWHM2 reports can be found in Appendix 8.7.

Pond 1 will provide 2.54 acre-feet of active storage, while Pond 2 will provide 8.90 acre-feet of active storage. See Table 2 in Section 6.2: Post-Development Basin Analysis for developed unmitigated and developed mitigated flow rates from each basin.

7.8 REQUIREMENT NO. 8 – WETLANDS PROTECTION

Existing wetlands on the project site were identified by Aqua-Terr Systems Incorporated (ATSI). Wetlands fill and disturbance associated with construction of the project shall require permitting and mitigation in the form of wetlands creation and/or enhancement, which shall be addressed by ATSI.

7.9 REQUIREMENT NO. 9 – BASIN/ WATERSHED PLANNING

No specific watershed basin planning requirements exist for this project site.

No approved or issued Total Maximum Daily Load (Water Quality Cleanup Plan) has been established, by either the Washington State Department of Ecology or Region 10 of the U.S. Environmental Projection Agency, for waters receiving discharge from the proposed project. This determination was made per consultation with EPA staff and reference to the WSDOE Water Quality Program and EPA Region 10 websites during the course of completing the Notice of Intent, associated with the NPDES Construction General Permit.

7.10 REQUIREMENT NO. 10 – OPERATION AND MAINTENANCE

Operation and maintenance of the proposed stormwater management facilities will be perfomed by the Upper Skagit Indian Tribe.

A schedule for the operation and maintenance of the proposed stormwater management facility is included in the Appendix. This Schedule has been reproduced from the WSDOE stormwater manual.

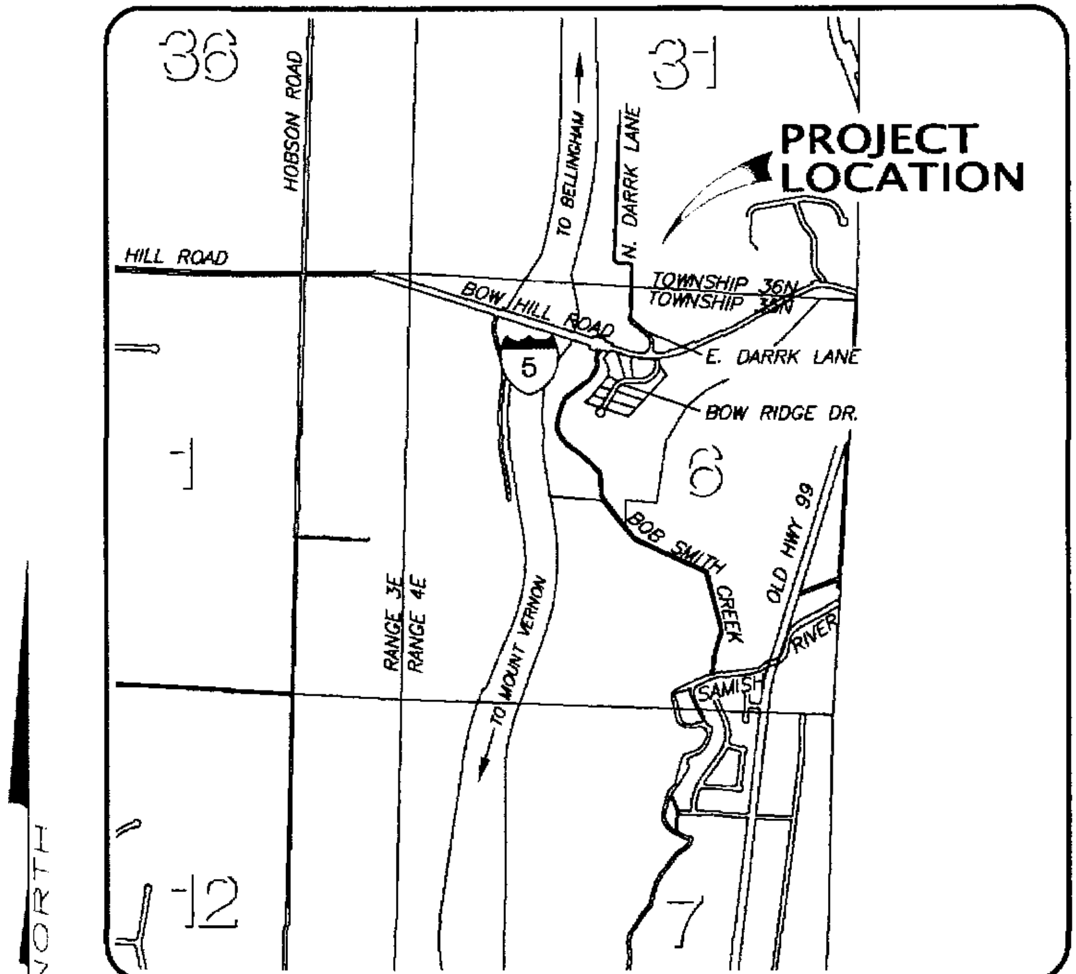
8 APPENDIX

APPENDIX

8.1 VICINITY MAP

UPPER SKAGIT INDIAN TRIBE ~ SKAGIT RESORT

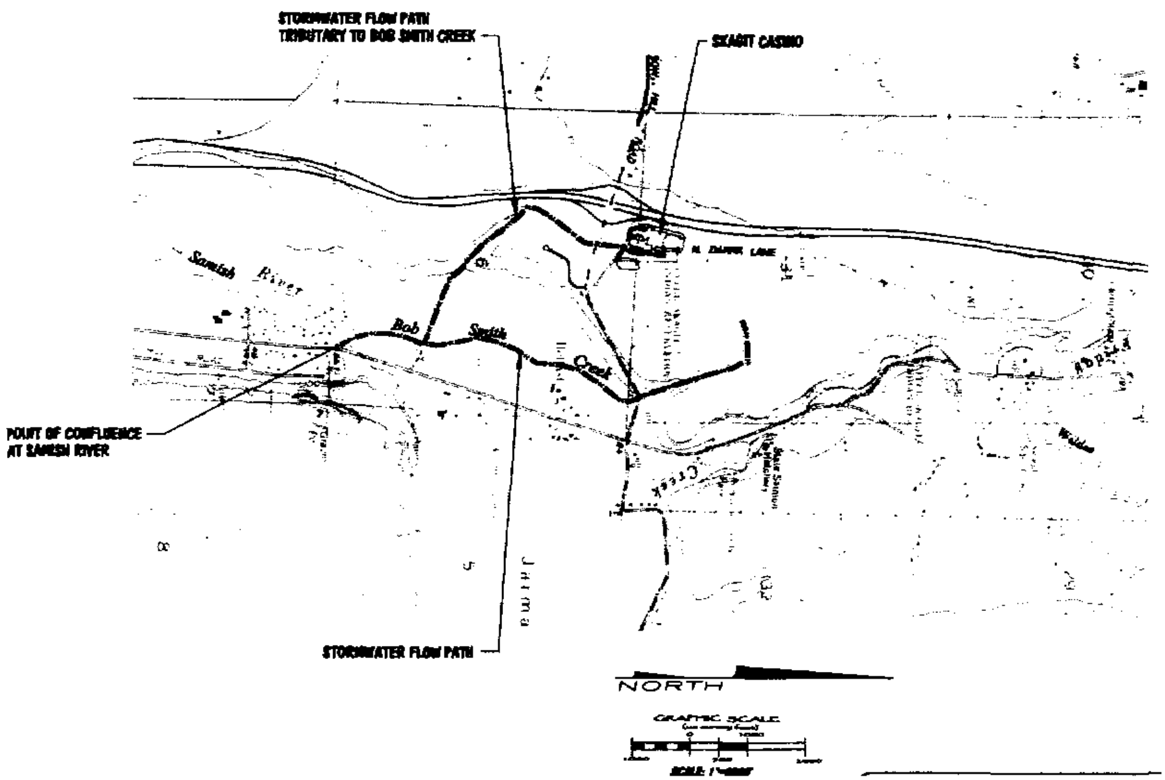
SITUATE IN A PORTIONS OF THE SW 1/4 OF SECTION 31, TOWNSHIP 36 NORTH, RANGE 4 EAST & NW 1/4 OF SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M., SKAGIT COUNTY, WASHINGTON
LATITUDE: 48°33'32" N, LONGITUDE: -122°20'47" W



NOT TO SCALE

APPENDIX

8.2 REGIONAL STORMWATER FLOW PATH DIAGRAM



APPENDIX

8.3 PROJECT DRAWINGS

Please refer to the set of Project Drawings titled "Skagit Resort Site Improvement Plans" dated November 2007, reduced set attached herein, and subsequent revisions.

PACIFIC SURVEY & ENGINEERING, INC.

SKAGIT RESORT
SITE IMPROVEMENT PLANS
UPPER SKAGIT INDIAN TRIBE
BOW, WASHINGTON

EXISTING FEATURE SYMBOL LEGEND

- = EXISTING 1 1/2" AXEL ROD, 0.5' ABOVE GROUND
- = EXISTING PSE RANDOM CONTROL POINT
- = SET TEMPORARY BENCHMARK ON-SITE
- = EXISTING STORM DRAIN MANHOLE
- = EXISTING STORM DRAIN CATCH BASIN MANHOLE
- = EXISTING AREA DRAIN
- = EXISTING CATCH BASIN
- = EXISTING SANITARY SEWER MANHOLE
- = EXISTING SANITARY SEWER CLEANOUT
- = EXISTING SANITARY SEWER VENT
- = EXISTING GATE VALVE
- = EXISTING WATER METER
- = EXISTING WATER WELL
- = EXISTING FIRE HYDRANT
- = EXISTING WATER CHECK VALVE
- = EXISTING HOSE BIB
- = EXISTING FIRE STANDPIPE
- = EXISTING IRRIGATION BOX
- = EXISTING BOLLARD
- = EXISTING STOP SIGN
- = EXISTING MAILBOX
- = EXISTING POWER POLE
- = EXISTING POWER POLE W/DROP
- = EXISTING STREET LIGHT POLE
- = EXISTING LUMINAIRE ALIGNMENT
- = EXISTING UTILITY POLE
- = EXISTING GROUND GUY
- = EXISTING ELECTRIC HANDHOLD
- = EXISTING FIBER OPTIC HANDHOLD
- = EXISTING ELECTRICAL TRANSFORMER
- = EXISTING ELECTRICAL PEDESTAL/RISER
- = EXISTING ELECTRIC SWITCH BOX
- = EXISTING TELEPHONE PEDESTAL/RISER
- = EXISTING COMMUNICATIONS PEDESTAL/RISER
- = EXISTING GAS METER
- = EXISTING YARD LIGHT
- = EXISTING BIRCH TREE
- = EXISTING PINE/SPRUCE TREE
- = EXISTING LANDSCAPE TREE/UNKNOWN SPECIES TREE
- = EXISTING CEDAR TREE
- x500.0 CL = SPOT ELEVATION ON EXISTING CENTERLINE
- x500.0 EP = SPOT ELEVATION ON EXISTING EDGE OF PAVEMENT
- x500.0 TP = SPOT ELEVATION ON EXISTING ASPHALT
- x500.0 TW = SPOT ELEVATION ON TOP OF EXISTING RETAINING WALL

EXISTING LINE LEGEND

- = EXISTING ROADWAY CENTERLINE
- = EXISTING RIGHT OF WAY LINE
- = EXISTING EDGE OF ASPHALT
- = EXISTING EDGE OF CONCRETE
- = EXISTING CONCRETE PAD
- = EXISTING EDGE OF GRAVEL ROAD
- = EXISTING EDGE OF DIRT ROAD
- = EXISTING CURB
- = EXISTING SIDEWALK
- = EXISTING STRIPE (1 YELLOW)
- = EXISTING STRIPE (2 YELLOW)
- = EXISTING BUTTON STRIPE
- = EXISTING WHITE STRIPE
- = EXISTING STORM CULVERT
- = EXISTING STORM DRAIN LINE
- SS = EXISTING SANITARY SEWER LINE
- = EXISTING SANITARY SEWER FORCEMAIN LINE
- = EXISTING WATER LINE
- UT = EXISTING UNDERGROUND UTILITIES
- OHE = EXISTING OVERHEAD ELECTRIC LINES
- UE = EXISTING UNDERGROUND POWER
- UTV = EXISTING UNDERGROUND TV CABLE LINE
- OTV = EXISTING OVERHEAD TV CABLE LINE
- UCM = EXISTING UNDERGROUND COMMUNICATIONS LINE
- OCM = EXISTING OVERHEAD COMMUNICATIONS LINE
- UPH = EXISTING UNDERGROUND TELEPHONE LINE
- OPH = EXISTING OVERHEAD TELEPHONE LINE
- UFO = EXISTING UNDERGROUND FIBER OPTIC LINE
- OFO = EXISTING OVERHEAD FIBER OPTIC LINE
- G = EXISTING UNDERGROUND GAS LINE
- UFL = EXISTING UNDERGROUND FUEL LINE
- = EXISTING TOP OF SLOPE LINE
- = EXISTING TOE OF SLOPE LINE
- = EXISTING FLOW LINE
- = EXISTING EDGE OF TREES & BRUSH
- = EXISTING EDGE OF LANDSCAPED AREA
- = EXISTING CHAINLINK FENCE
- = EXISTING BARBED WIRE FENCE
- = EXISTING WOOD FENCE

PROPOSED FEATURE SYMBOL LEGEND

- = PROPOSED STORM DRAIN MANHOLE
- = PROPOSED STORM DRAIN CATCH BASIN MANHOLE
- = PROPOSED CATCH BASIN
- = PROPOSED CAP
- = PROPOSED SANITARY SEWER MANHOLE
- = PROPOSED CHECK VALVE
- = PROPOSED GATE VALVE
- = PROPOSED WATER METER
- = PROPOSED FIRE HYDRANT
- = PROPOSED BLOWOFF
- = PROPOSED SLEEVE
- = PROPOSED STOP/STREET SIGN
- = PROPOSED CONC. RETAINING WALL BLOCK
- = PROPOSED CONC. WHEEL STOP
- = PROPOSED SLOPE GRADE SYMBOL
- = DETAIL
  UPPER MARK DENOTES DETAIL NUMBER
  LOWER MARK DENOTES SHEET LOCATION

PROPOSED LINE LEGEND

- = PROPOSED ROADWAY CENTERLINE
- = PROPOSED EDGE OF ASPHALT
- = PROPOSED EDGE OF CONCRETE
- = PROPOSED CONCRETE PAD
- = PROPOSED CURB
- = PROPOSED SIDEWALK
- = PROPOSED PARKING STALL STRIPE
- SD = PROPOSED STORM DRAIN LINE
- = PROPOSED SWALE/DITCH LINE
- FM = PROPOSED SANITARY SEWER FORCEMAIN LINE
- SS = PROPOSED SANITARY SEWER GRAVITY LINE
- W = PROPOSED WATER LINE
- = PROPOSED TOP OF SLOPE LINE
- = PROPOSED TOE OF SLOPE LINE
- = PROPOSED CONSTRUCTION LIMITS
- = PROPOSED ACP SAWCUT LINE

TOPOGRAPHIC SURVEY NOTES

1) DATA FOR THIS SURVEY WAS GATHERED BY FIELD TRAVERSE UTILIZING ELECTRONIC DATA COLLECTION FROM 2003 TO 2005.
2) EQUIPMENT USED: THEODOLITE 00'01.5" EDM: ± 1 PPM, ± 2 MM
3) HORIZONTAL DATUM: NAD 83/91 (PSE CONTROL AS SHOWN)
4) VERTICAL DATUM: NAVD 88 (PSE BENCHMARKS AS SHOWN)
5) CONTOUR INTERVALS ARE ONE FOOT AND ARE COMPUTER GENERATED FROM GROUND FIELD TOPOGRAPHY GATHERED FOR THIS SURVEY UTILIZING ELECTRONIC DATA COLLECTION.
6) UNDERGROUND UTILITIES ARE SHOWN AS MARKED BY APS LOCATING, INC. IN 2003, AND THE UTILITIES UNDERGROUND LOCATION CENTER IN 2005
7) PACIFIC SURVEYING AND ENGINEERING INC., ASSUMES NO LIABILITY FOR ANY SUBSURFACE CONDITIONS OR FEATURES THAT MAY EXIST THAT ARE UNDETECTABLE AND/OR NOT VISIBLE.
8) THIS TOPOGRAPHY MAP WAS DONE WITHOUT BENEFIT OF A TITLE REPORT AND PACIFIC SURVEYING AND ENGINEERING SERVICES, INC. IS NOT RESPONSIBLE FOR ANY EASEMENTS, COVENANTS, AND RESTRICTIONS NOT SHOWN HEREON.
9) NO BOUNDARY SURVEY WAS PERFORMED DURING THIS SURVEY. PARCEL AND RIGHT OF WAY LINES ARE SHOWN PER RECORD INFORMATION AND MAY NOT MEET THE MINIMUM STANDARD FOR RURAL PROPERTY SURVEYS.

ABBREVIATIONS

ADA	AMERICAN DISABILITIES ACT
ACP	ASPHALT CONCRETE PAVING
B/C	BACK OF CURB
B/W	BOTTOM OF WALL
C&G	CURB AND GUTTER
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CONC.	CONCRETE
CP	CONCRETE PIPE
CPP	CORRUGATED POLYETHYLENE PIPE
DCDA	DOUBLE CHECK DETECTOR ASSEMBLY
DCVA	DOUBLE CHECK VALVE ASSEMBLY
EG	EXISTING GRADE
EOP	EDGE OF PAVEMENT
EX.	EXISTING
F&G	FRAME AND GRATE
F.HYD.	FIRE HYDRANT
F/C	FACE OF CURB
FF	FINISH FLOOR
FG	FINISH GRADE
FL	FLOWLINE
FS	FINISH SURFACE
H.C	HANDICAP
I.E.	INVERT ELEVATION
INV	INVERT
L	LEFT
LSCP	LANDSCAPING
PUD	PUBLIC UTILITY DISTRICT No. 1 OF SKAGIT COUNTY
R=	CURVE RADIUS
R	RIGHT
RPBA	REDUCED PRESSURE BACKFLOW ASSEMBLY
SD	STORM DRAIN
SDCB	STORM DRAIN CATCH BASIN
SDMH	STORM DRAIN MANHOLE
SVC	SERVICE
SSCO	SANITARY SEWER CLEAN-OUT
SSMH	SANITARY SEWER MANHOLE
STD	STANDARD
S/W	SIDEWALK
T/W	TOP OF WALL
TBOC	TOP BACK OF CURB
TC	TOP OF CURB
TF	TOP OF FOOTING
TP	TOP OF PIPE
TYP	TYPICAL
WSDOT	WASHINGTON STATE DEPT OF TRANSPORTATION

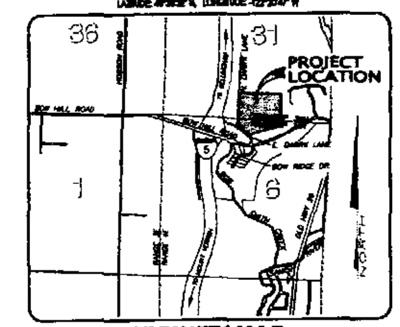
PROJECT CONTACTS

OWNER:
UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY
SEDRO WOOLLEY, WA 98284
(360) 854-7000
CONTACT: BOB HAYDEN

PROJECT ENGINEER/SURVEYOR:
PACIFIC SURVEYING AND ENGINEERING, INC.
1812 CORNWALL AVE.
BELLINGHAM, WA 98225
(360) 671-7387
CONTACTS:
JEFF VANDER YACHT, PE
ADAM MORROW, PLS

ARCHITECT
PLANNING DESIGN BUILD, INC.
901 DEMING WAY, SUITE 102
MADISON, WI 53717
(608) 664-3610
CONTACT: SHAWN HOCHREIN, AIA

PUBLIC UTILITY DISTRICT NO. 1 OF SKAGIT COUNTY
1415 FREEWAY DRIVE
MOUNT VERNON, WA 98273
(360) 424-7104



VICINITY MAP
NOT TO SCALE

SHEET INDEX

C.O. ____________
W.O. ____________

PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8065
planningdesignbuild.com

COVER SHEET
SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232
UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

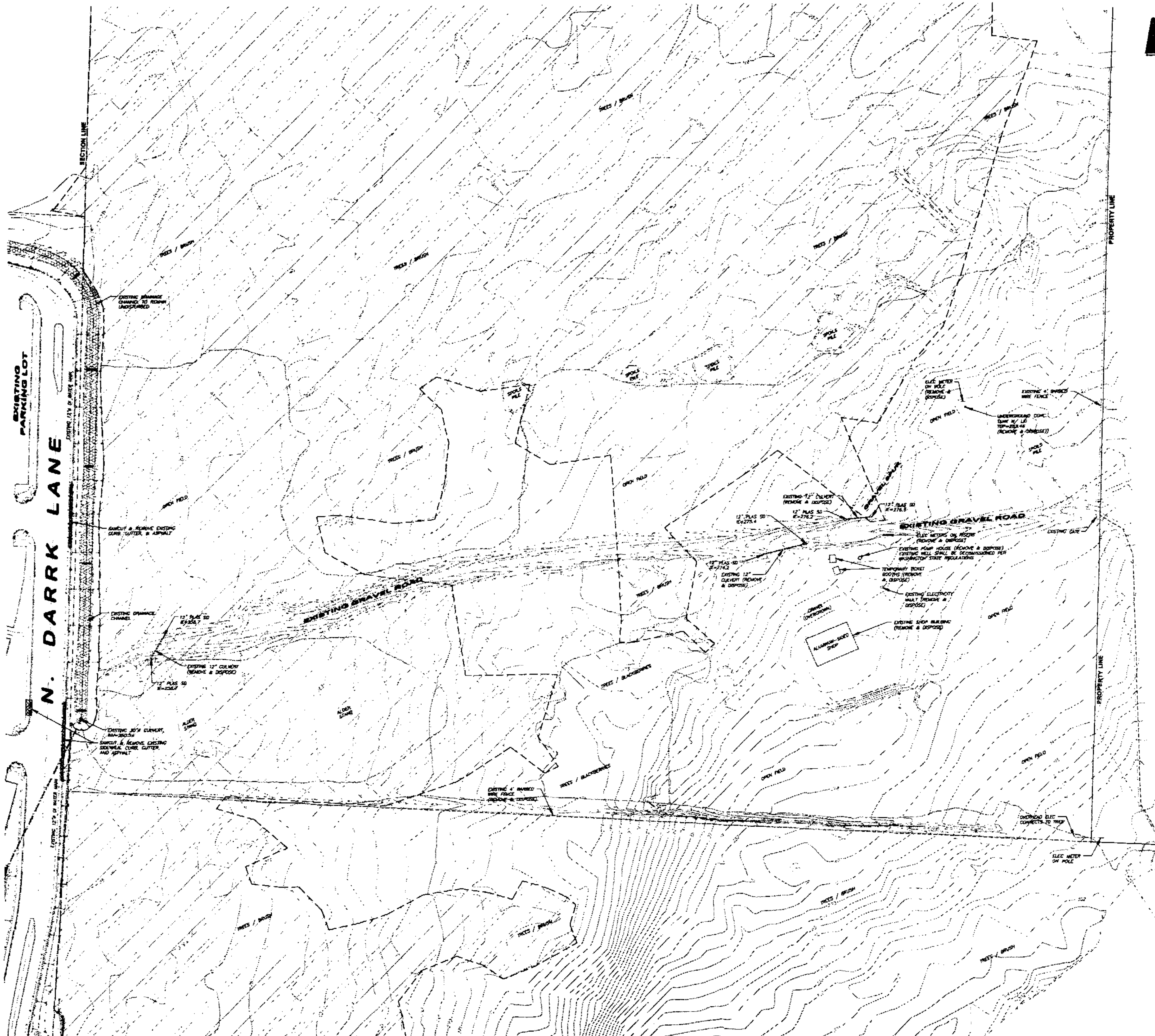
REVISED DATES:

ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase:
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20060021
PSE (CIVIL) PROJECT #: 2006176

SHEET NUMBER
C1.0
80% DESIGN



EXISTING SITE CONDITIONS & DEMOLITION PLAN

PACIFIC SURVEY & ENGINEERING, INC.

LEGEND

EXISTING WETLAND.
SEE WETLAND DELINEATION & WETLAND MITIGATION REPORTS FOR WETLAND AREAS, IMPACTS & PROPOSED MITIGATION

GRAPHIC SCALE

PLANNING
DESIGN BUILD TEAM

PLANNING Design Build, Inc.
801 Deming Way, Suite 102
Madison, WI 53717
608.836.8085
608.836.5818
planningdesignbuild.com

EXISTING SITE CONDITIONS & DEMOLITION PLAN

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase:

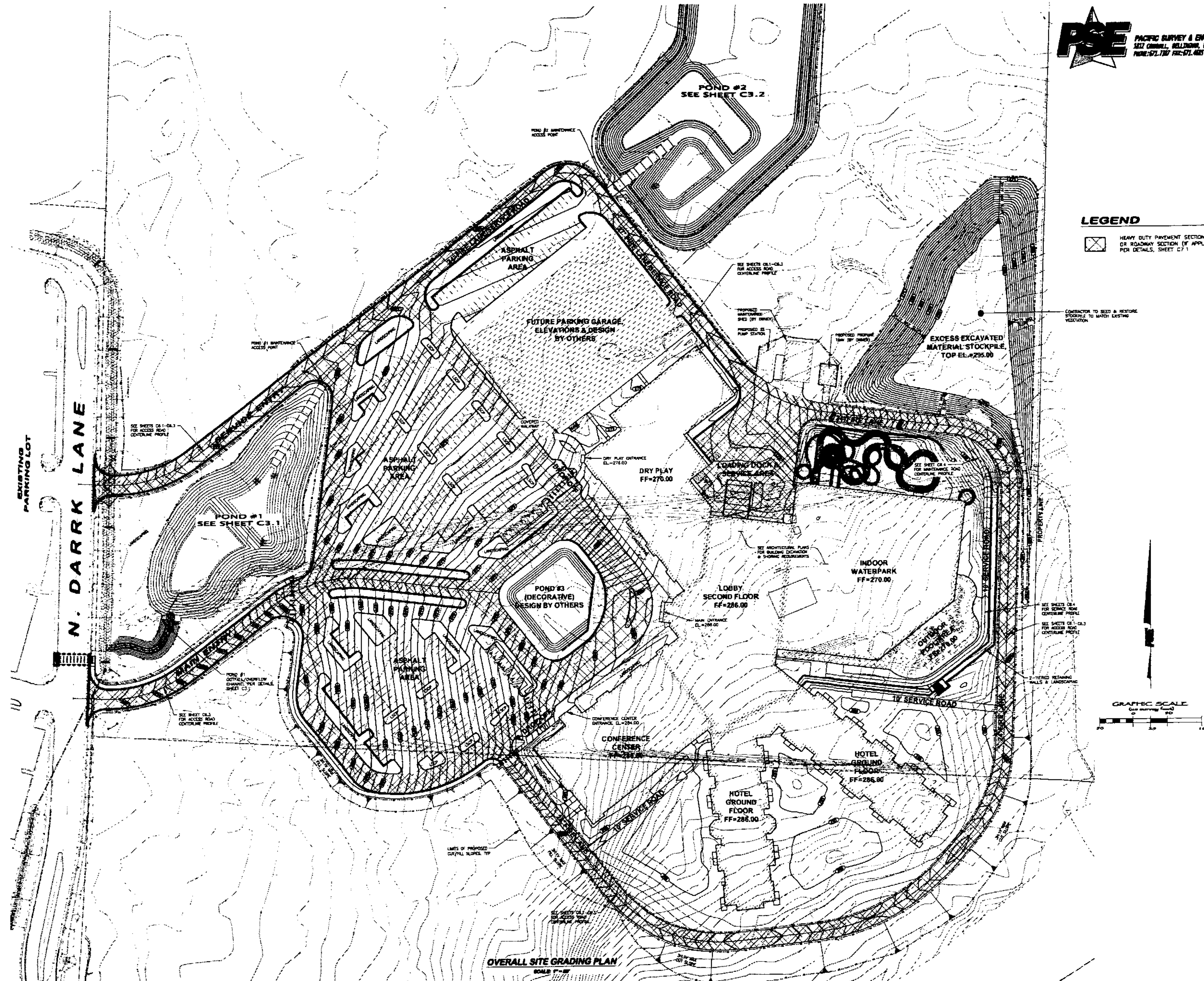
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20060021
PSE (CIVIL) PROJECT #: 2006176

SHEET NUMBER

C1.1

80% DESIGN



PSE PACIFIC SURVEY & ENGINEERING, INC.

LEGEND

HEAVY DUTY PAVEMENT SECTION OR ROADWAY SECTION (IF APPLICABLE) PER DETAILS, SHEET C7.1

PLANNING Design Build, Inc.
801 Deming Way, Suite 102
Madison, WI 53717

OVERALL SITE GRADING PLAN

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

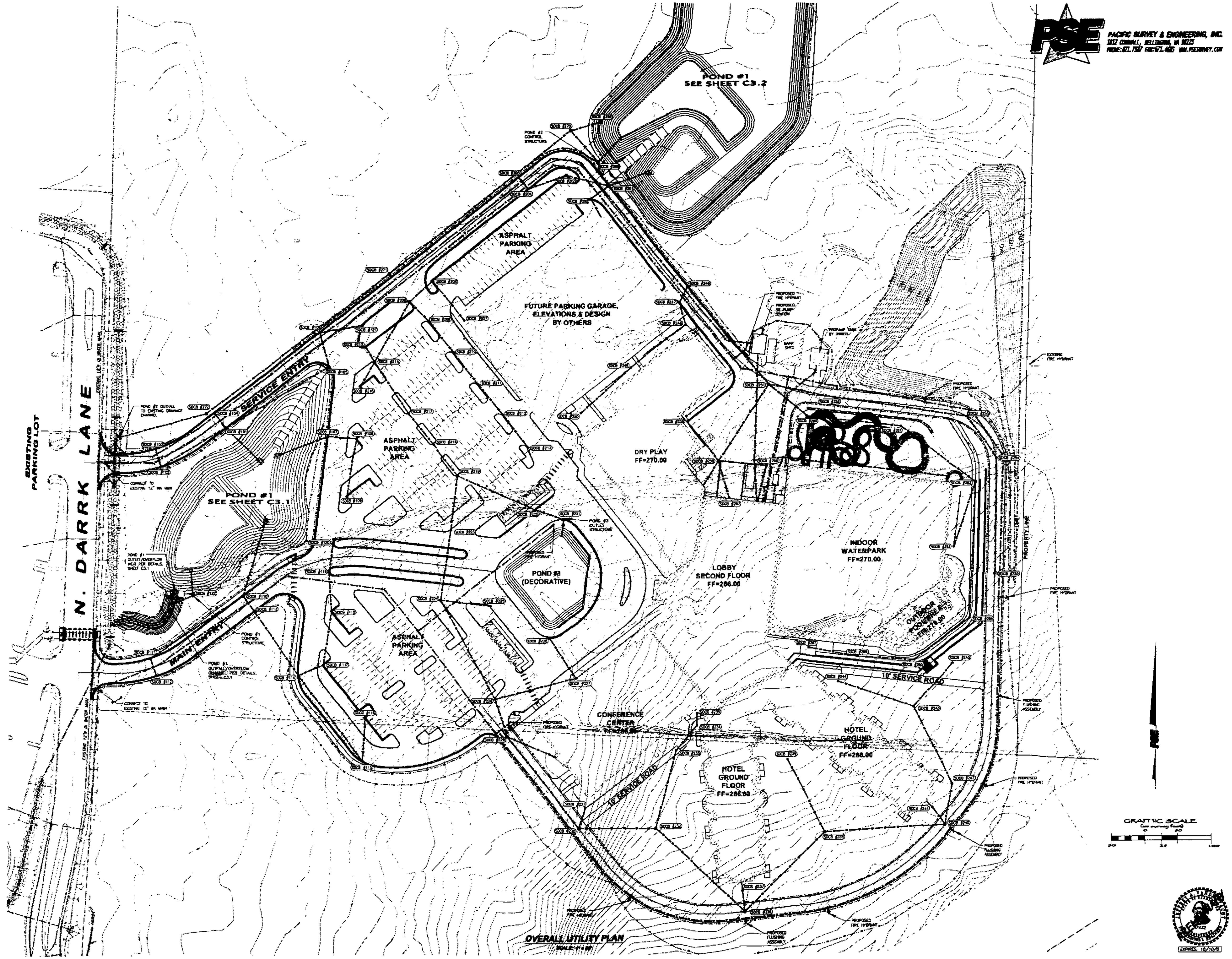
REVISED DATES:

ISSUE DATES:
Oct. 3, 2007
Nov. 26, 2007

Schematic Design Phase:
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER
C1.2
80% DESIGN



PLANNING DESIGN BUILD TEAM

PLANNING Design Build, Inc.
801 Deming Way, Suite 102
Madison, WI 53717

OVERALL UTILITY PLAN

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

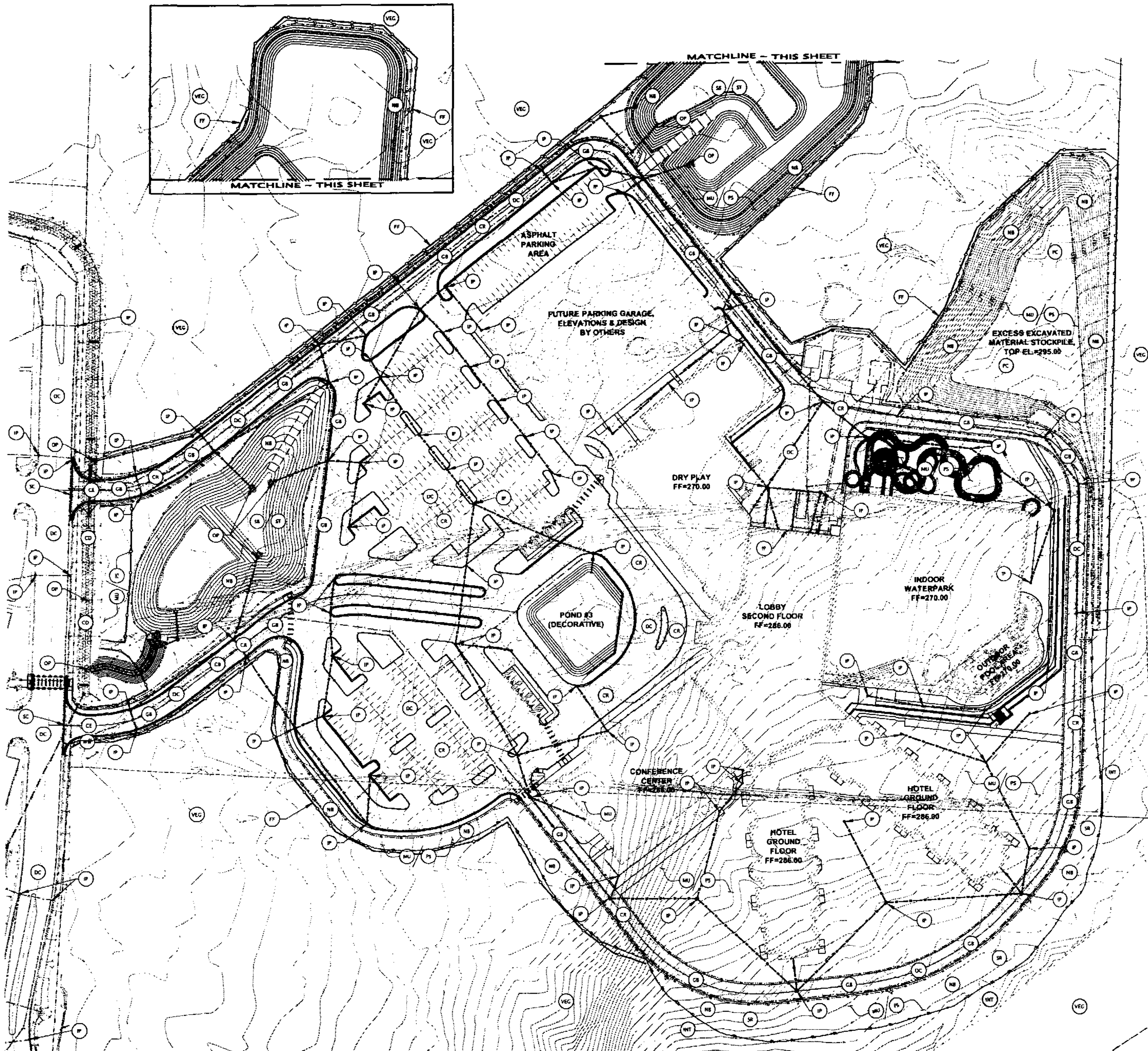
ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase:
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2005175

SHEET NUMBER
C1.3
80% DESIGN

PACIFIC SURVEY & ENGINEERING, INC.



TEMPORARY EROSION & SEDIMENTATION CONTROL PLAN

EROSION CONTROL NOTES

1) COVER ALL DIRT/GRAVEL PILES WITH PLASTIC SHEETING DURING CONSTRUCTION WHEN NOT IN USE.
2) CONSTRUCTION SCHEDULE– BEGINNING SUMMER 2008.
3) INLET PROTECTION SHALL BE PROVIDED FOR ALL NEW DRAINAGE STRUCTURES IN ADDITION TO WHERE INDICATED ON PLANS.
4) SILT FENCING SHALL BE INSTALLED ALONG PROJECT BOUNDARY IN ADDITION TO WHERE INDICATED ON PLANS.
5) SEE SHEET C2.2 FOR ADDITIONAL EROSION CONTROL NOTES & DETAILS.

EROSION CONTROL LEGEND

MINIMUM BMPs:

- VEG — WSDOE BMP C101 PRESERVING NATURAL VEGETATION
- CE — WSDOE BMP C105 STABILIZED CONSTRUCTION ENTRANCE
- CR — WSDOE BMP C107 CONSTRUCTION ROAD/PARKING AREA STABILIZATION
- PS — WSDOE BMP C120 TEMPORARY AND PERMANENT SEEDING
- MU — WSDOE BMP C121 MULCHING
- DC — WSDOE BMP C140 DUST CONTROL
- SC — WSDOE BMP C152 SAWCUTTING & SURFACE POLLUTION PREVENTION
- OP — WSDOE BMP C207/208 CHECK DAMS/TRIANGULAR SILT DIKES
- OP — WSDOE BMP C209 OUTLET PROTECTION
- IP — WSDOE BMP C220 STORM DRAIN INLET PROTECTION (SEE NOTE 4)
- GB — WSDOE BMP C232 GRAVEL FILTER BERM
- FF — WSDOE BMP C233 SILT FENCE (SEE NOTE 5)
- INDICATES CLEARING LIMITS
- DRAINAGE FLOW DIRECTION ARROWS (SHEET FLOW OR SHALLOW CHANNEL FLOW)

OPTIONAL BMPs:

- WW — WSDOE BMP C106 WHEEL WASH
- NB — WSDOE BMP C122 NETS & BLANKETS
- PC — WSDOE BMP C123 PLASTIC COVERING
- SR — WSDOE BMP C130 SURFACE ROUGHENING
- INT — WSDOE BMP C200 INTERCEPTOR DIKE AND SWALE
- SW — WSDOE BMP C235 STRAW WATTLES
- ST — WSDOE BMP C240 SEDIMENT TRAP
- SB — WSDOE BMP C241 TEMPORARY SEDIMENT POND

PLANNING

PLANNING Design Build, Inc.
801 Deming Way, Suite 102
Madison, WI 53717
608.836.8065
608.836.5616
planningdesignbuild.com

TEMPORARY EROSION & SEDIMENTATION CONTROL PLAN

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase:

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

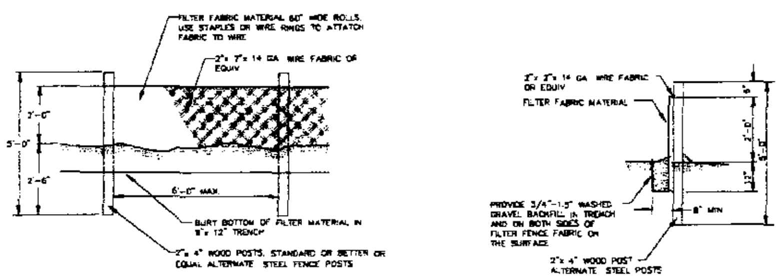
PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006176

SHEET NUMBER

C2.1

80% DESIGN

PSE
PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE:671.7387 FAX:671.4685 WWW.PSESURVEY.COM



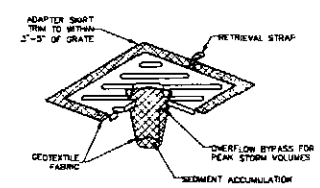
SILT FILTER FENCE DETAIL

NOT TO SCALE

FILTER FENCE NOTES

1. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST WITH A MINIMUM 6-INCH OVERLAP AND BOTH ENDS SECURELY FASTENED TO THE POST.
2. THE FILTER FABRIC FENCE SHALL BE INSTALLED TO FOLLOW THE CONTOURS (WHERE FEASIBLE). THE FENCE POSTS SHALL BE SPACED AT A MAXIMUM OF 6 FEET APART AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 30 INCHES).
3. A TRENCH SHALL BE EXCAVATED, ROUGHLY 8 INCHES WIDE AND 12 INCHES DEEP, UPSLOPE AND ADJACENT TO THE WOOD POST TO ALLOW THE FILTER FABRIC TO BE BURIED.
4. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 1 INCH LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 4 INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
5. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE AND 20 INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
6. WHEN EXTRA STRENGTH FILTER FABRIC AND CLOSER POST SPACING ARE USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OF STANDARD NOTE 5 APPLYING.
7. THE TRENCH SHALL BE BACKFILLED WITH 3/4-INCH MINIMUM DIAMETER WASHED GRAVEL.
8. FILTER FABRIC FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
9. FILTER FABRIC FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.

MULCH SPECIFICATIONS			
Mulch Material	Quality Standards	Application Rates	Remarks
Straw	Air-dried; free from undesirable seed and coarse material	2"-3" thick; 2-3 bales per 1000 sq. ft. or 2-3 tons per acre	Cost-effective protection when applied with adequate thickness. Hand-application generally requires greater thickness than blown straw. Straw should be crimped to avoid wind blow. The thickness of straw may be reduced by half when used in conjunction with seeding.
Wood Fiber Cellulose	No growth inhibiting factors	Approx. 25-30 lbs. per 1000 sq. ft. or 1000-1500 lbs per acre	Shall be applied with hydromulcher. Shall not be used without seed and tackifier unless the application rate is at least doubled. Some wood fiber with very long fibers can be effective at lower application rates and without seed or tackifier.
Compost	No visible water or dust during handling. Must be purchased from supplier with Solid Waste Handling Permit.	2" thick min.; approx. 100 tons per acre (approx. 800 lbs per yard)	More effective control can be obtained by increasing thickness to 3". Excellent mulch for protecting final grades until landscaping because it can be directly seeded or tilled into soil as an amendment. Sources for compost are available from the King County Commission for Marketing Recyclable Materials at 296-4439.
Chipped Site Vegetation	Average size shall be several inches	2" minimum thickness	This is a cost-effective way to dispose of debris from clearing and grubbing and eliminates the problems associated with burning. It should generally not be used on slopes above approx. 10% because of its tendency to be transported by runoff. It is not recommended within 200 feet of surface waters. If seeding is expected shortly after mulch, the decomposition of the chipped vegetation may tie up nutrients important to grass establishment.

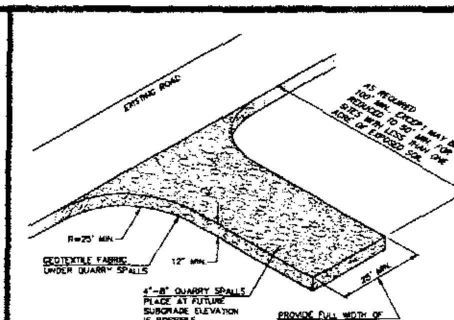


NOTES

1. INSERT SHALL BE INSTALLED PRIOR TO CLEARING AND GRADING ACTIVITY, OR UPON PLACEMENT OF A NEW CATCH BASIN.
2. SEDIMENT SHALL BE REMOVED FROM THE UNIT WHEN IT BECOMES HALF FULL.
3. SEDIMENT REMOVAL SHALL BE ACCOMPLISHED BY REMOVING THE INSERT, EMPTYING AND RE-INSERTING IT INTO THE CATCH BASIN.

CATCH BASIN INSERT

NOT TO SCALE



ROCK STABILIZATION CONSTRUCTION ROAD ENTRANCE

NOT TO SCALE

MAINTENANCE:

THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH 4 TO 6-INCH STONE, AS CONDITIONS DEMAND, AND REPAIR AND/OR CLEANOUT OF ANY STRUCTURES USED TO TRAP SEDIMENT. ALL MATERIALS SPILLED, DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.

TEMPORARY EROSION/SEDIMENTATION CONTROL

1. A COPY OF THESE APPROVED PLANS MUST BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
2. APPROVAL OF THESE TEMPORARY EROSION/SEDIMENTATION CONTROL (TESC) PLANS DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G., SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.)
3. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT AND UPGRADING OF THESE TESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS APPROVED.
4. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION.
5. THE TESC FACILITIES SHOWN ON THE PLANS MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO INSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM OR VIOLATE APPLICABLE WATER STANDARDS.
6. THE TESC FACILITIES SHOWN ON THE PLANS ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED (E.G., ADDITIONAL SUMPS, RELOCATION OF DITCHES AND SILT FENCES, ETC.) AS NEEDED FOR UNEXPECTED STORM EVENTS.
7. THE TESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.
8. ANY AREA STRIPPED OF VEGETATION, INCLUDING ROADWAY EMBANKMENTS, WHERE NO FURTHER WORK IS ANTICIPATED FOR A PERIOD OF 7 DAYS, SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED TESC METHODS (E.G., SEEDING, MULCHING, NETTING, EROSION BLANKETS, ETC.)
9. ANY AREA NEEDING TESC MEASURES, NOT REQUIRING IMMEDIATE ATTENTION, SHALL BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
10. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN THE 24 HOURS FOLLOWING A STORM EVENT.
11. AT NO TIME SHALL MORE THAN ONE FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT LADEN WATER INTO THE DOWNSTREAM SYSTEM.
12. STABILIZED CONSTRUCTION ENTRANCES AND WASH PADS SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO INSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
13. DURING THE TIME PERIOD OF OCTOBER 1 THROUGH APRIL 30, ALL PROJECT DISTURBED AREAS GREATER THAN 5,000 SQUARE FEET, THAT ARE TO BE LEFT UNWORKED FOR MORE THAN 12 HOURS, SHALL BE COVERED BY ONE OF THE FOLLOWING COVER MEASURES: MULCH, SODDING OR PLASTIC COVERING.
14. ANY PERMANENT RETENTION/DETENTION FACILITY USED AS A TEMPORARY SETTLING BASIN SHALL BE MODIFIED WITH THE NECESSARY EROSION CONTROL MEASURES AND SHALL PROVIDE ADEQUATE STORAGE CAPACITY. IF THE PERMANENT FACILITY IS TO FUNCTION ULTIMATELY AS AN INFILTRATION OR DISPERSION SYSTEM, THE FACILITY SHALL NOT BE USED AS A TEMPORARY SETTLING BASIN. NO UNDERGROUND DETENTION TANK, DETENTION VAULT, OR SYSTEM WHICH BACKS UNDER OR INTO A POND SHALL BE USED AS A TEMPORARY SETTLING BASIN.
15. WHERE SEEDING FOR TEMPORARY EROSION CONTROL IS REQUIRED, FAST GERMINATING GRASSES SHALL BE APPLIED AT AN APPROPRIATE RATE (E.G. ANNUAL OR PERENNIAL RYE APPLIED AT APPROXIMATELY 80 POUNDS PER ACRE).
16. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF TWO INCHES.
17. ALL EROSION/SEDIMENTATION CONTROL PONDS WITH A DEAD STORAGE DEPTH EXCEEDING 6 INCHES MUST HAVE SLOPES NOT STEEPER THAN 3H:1V.
18. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARDS AND SPECIFICATIONS.
19. EROSION/SEDIMENTATION CONTROL FACILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAILS IN THESE PLANS. LOCATIONS MAY BE MOVED TO SUIT FIELD CONDITIONS, SUBJECT TO APPROVAL BY THE ENGINEER AND THE CITY INSPECTOR.

SEEDING NOTES

1. SEEDBED PREPARATION MAY INCLUDE THE FOLLOWING.
   - A. IF INFERTILE OR COURSE TEXTURED SUBSOIL WILL BE EXPOSED DURING GRADING, STOCKPILE TOPSOIL AND RE-SPREAD IT OVER THE FINISHED SLOPE AND ROLL IT TO PROVIDE A FIRM BASE.
   - B. IF CONSTRUCTION FILLS HAVE LEFT SOIL EXPOSED WITH A LOOSE, ROUGH OR IRREGULAR SURFACE, TRACK WALK UP SLOPE.
   - C. IF CUTS OR CONSTRUCTION EQUIPMENT HAVE LEFT A FIRMLY COMPACTED SURFACE, BREAK WITH CHISEL PLOW OR OTHER SUITABLE EQUIPMENT.
   - D. PERFORM ALL CULTURAL OPERATIONS ACROSS OR AT RIGHT ANGLES TO THE SLOPES (CONTOURED). THE SEEDBED SHOULD BE FIRM WITH A FAIRLY FINE SURFACE AFTER ROUGHENING.
2. FERTILIZATION - AS PER SUPPLIER'S RECOMMENDATIONS. DEVELOPMENTS ADJACENT TO WATER BODIES MUST USE NON-PHOSPHOROUS FERTILIZER.
3. HYDROSEEDING APPLICATIONS WITH APPROVED SEED-MULCH-FERTILIZER MIXTURES MAY ALSO BE USED.
4. SEEDING - APPLY APPROPRIATE MIXTURE TO THE PREPARED SEEDBED AT A RATE OF 120 LBS/ACRE. COVER THE SEED WITH TOPSOIL OR MULCH NO DEEPER THAN ONE-HALF INCH.

TEMPORARY EROSION CONTROL SEED MIX	PROPORTIONS BY WEIGHT	PERCENT PURITY	PERCENT GERMINATION
CHEWINGS OR RED FESCUE	40%	98	90
ANNUAL OR PERENNIAL RYE	40%	98	90
REDTOP OR COLONIAL BENTGRASS	10%	92	85
WHITE DUTCH CLOVER	10%	98	90

NPDES NOTES

1. THE CONTRACTOR SHALL KEEP A RECORD OF THE DATES WHEN MAJOR GRADING ACTIVITIES OCCUR, WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A PORTION OF THE SITE, AND WHEN STABILIZATION MEASURES ARE IMPLEMENTED.
2. ALL EROSION CONTROL FACILITIES SHALL BE INSPECTED, MAINTAINED AND REPAIRED BY THE CONTRACTOR AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL ON SITE EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT OF GREATER THAN 0.5 INCHES PER 24 HOUR PERIOD. AN INSPECTION REPORT FILE SHALL BE MAINTAINED BY THE CONTRACTOR.

C.O. ______
W.O. ______

EXPIRES: 10/19/0?

PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.8615
planningdesignbuild.com

TEMPORARY EROSION & SEDEMENTATION CONTROL DETAILS AND NOTES

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE

5984 NORTH DARK LANE
BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase:
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2005175

SHEET NUMBER
C2.2
80% DESIGN

PACIFIC SURVEY & ENGINEERING, INC.

STORM DRAINAGE NOTES

SDCB #139
POND 1 CONTROL STRUCTURE
TYPE 2, 60" W/ LOCKING LID
STA. 32+27.30, 69.07' LT @ CTR
RIM=256.00
18" I.E. (E)=253.00
18" I.E. (W)=253.00

POND DESIGN INFORMATION:

DETENTION ACTIVE STORAGE:
VOLUME (253.00 to 257.00) = 110,527 CF
BOTTOM ELEV. = 253.00
TOP ELEV. = 257.00
PRIMARY OVERFLOW ELEV. = 257.00
EMERGENCY OVERFLOW ELEV. = 257.00

WATER QUALITY STORAGE:
VOLUME (250.00 to 253.00) = 48,166 CF
BOTTOM (1st CELL) ELEV. = 249.00
BOTTOM (2nd CELL) ELEV. = 249.50
TOP ELEV = 253.00

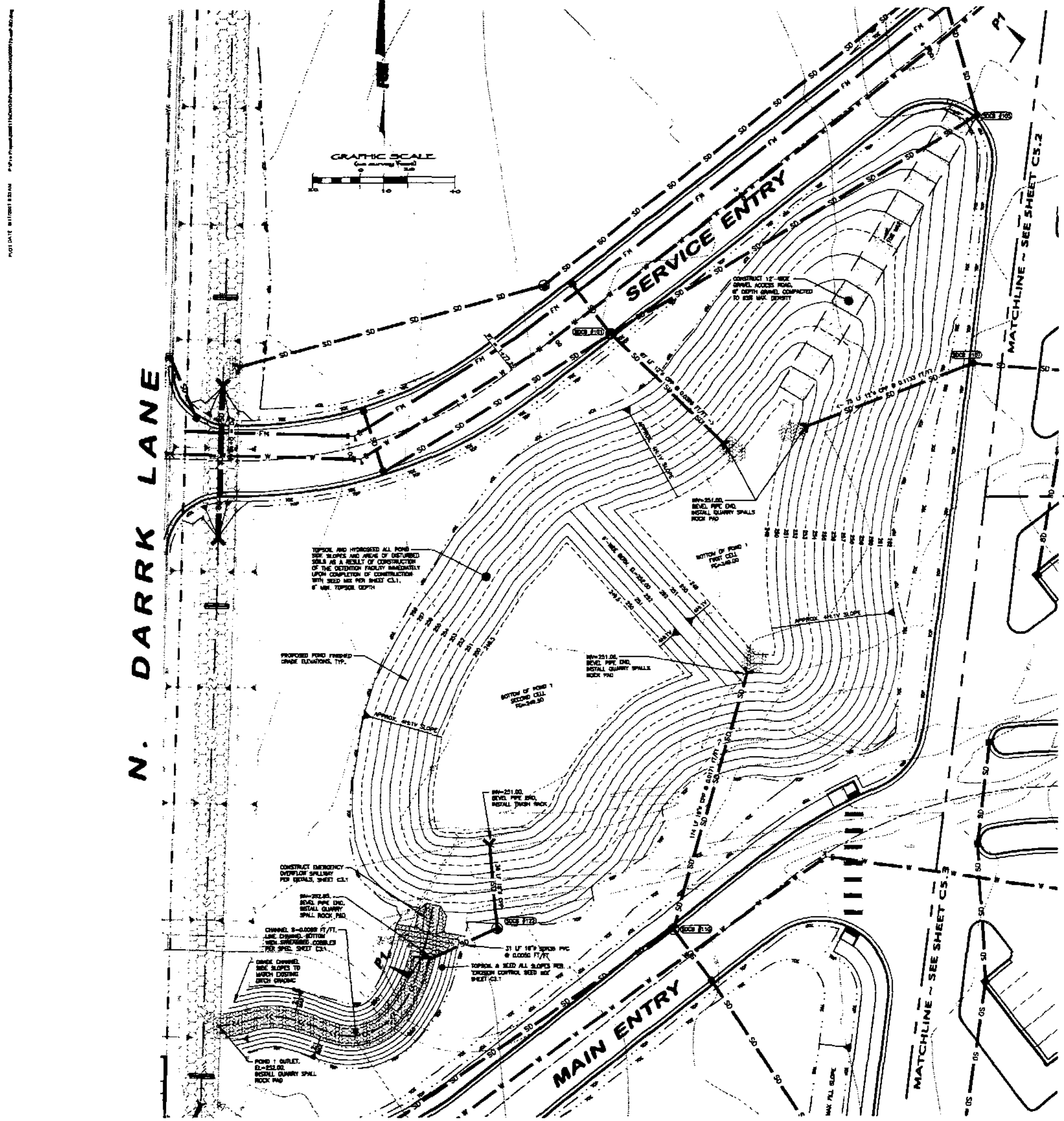
STORM DETENTION POND SLOPES SEED MIX CONSTITUENTS

ALL POND SIDE SLOPES AND AREAS DISTURBED AS A RESULT OF CONSTRUCTION OF THE DETENTION POND FACILITY SHALL BE HYDOSEEDED WITH THE FOLLOWING "LOW GROW" SEED MIX AT A RATE OF 2.5# PER 1000 SF

SEED NAME	% OF MIX
DWARF TALL FESCUE	40%
DWARF PERENNIAL RYE "BARCLAY"	30%
RED FESCUE	25%
COLONIAL BENTGRASS	5%

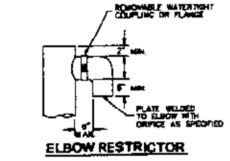
NOTES:

1. PIPE SUPPORT BRACKETS AND THE RESTRICTOR/SEPARATOR SHALL BE OF THE SAME MATERIAL, AND BE ANCHORED AT 3' MAXIMUM SPACING.
2. ALL METAL PARTS SHALL BE CORROSION RESISTANT. ALL GALVANIZED STEEL PARTS SHALL BE ASPHALT TREATMENT 1 COATED.
3. THE RESTRICTOR/SEPARATOR STANDPIPE SHALL BE FABRICATED FROM 0.060" ALUMINUM, 0.064" ALUMINIZED STEEL, OR 0.064" GALVANIZED STEEL IN ACCORDANCE WITH AASHTO M36, M196, M197 AND M274. GALVANIZED STEEL SHALL BE ASPHALT TREATMENT 1 COATED.
4. IF A METAL OUTLET PIPE CONNECTS TO A CEMENT CONCRETE PIPE, THE OUTLET PIPE SHALL HAVE A SMOOTH OUTSIDE DIAMETER EQUAL TO THE INSIDE DIAMETER OF THE CONCRETE PIPE LESS 1/4".
5. THE FRAME AND LADDER (OR STEPS) SHALL OFFSET SO THAT:
   A: THE CLEANOUT GATE IS VISIBLE FROM THE TOP.
   B: THE CLIMB DOWN CLEAR SPACE OF 2 FEET IS BETWEEN THE RISER AND CLEANOUT GATE
   C: THE FRAME IS CLEAR OF THE CURB. (IF APPLICABLE)

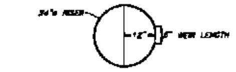


STORMWATER MANAGEMENT FACILITY ~ POND #1 PLAN

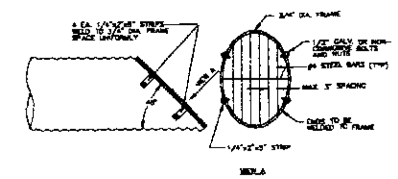
SCALE: 1" = 20'



ELBOW RESTRICTOR

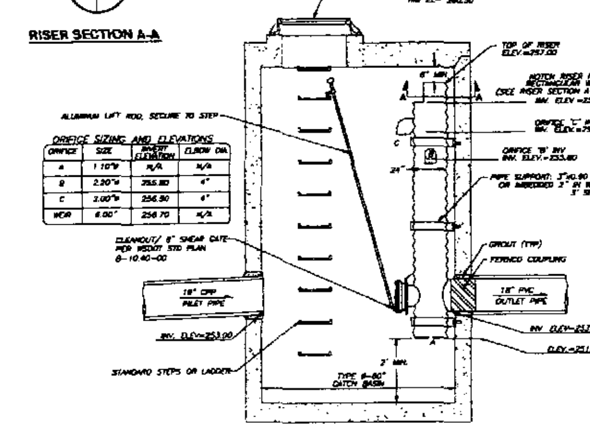


RISER SECTION A-A



TRASH RACK

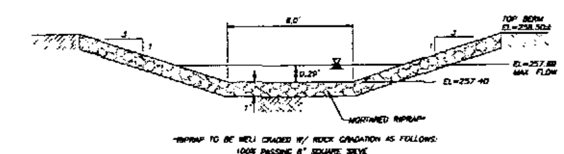
NOT TO SCALE



SECTION VIEW

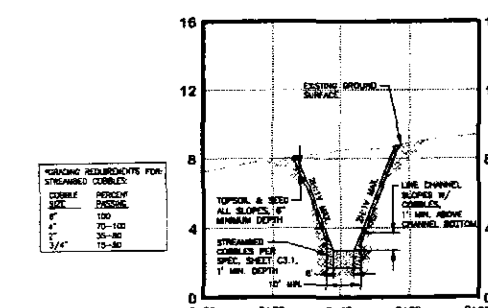
POND #1 CONTROL STRUCTURE (TYPE II-60" MAHOLE)

NOT TO SCALE



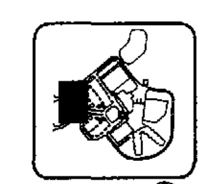
POND #1 EMERGENCY OVERFLOW SPILLWAY DETAIL

NOT TO SCALE



POND #1 TYPICAL OUTLET CHANNEL SECTION

NOT TO SCALE



SHEET KEY

N.T.S.

PLANNING DESIGN BUILD TEAM

PLANNING Design Build, Inc.
801 Deming Way, Suite 102
Madison, WI 53717
608.836.8056
608.836.5819
planningdesignbuild.com

STORMWATER MANAGEMENT FACILITY ~ POND No. 1 PLAN & DETAILS

SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase:

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

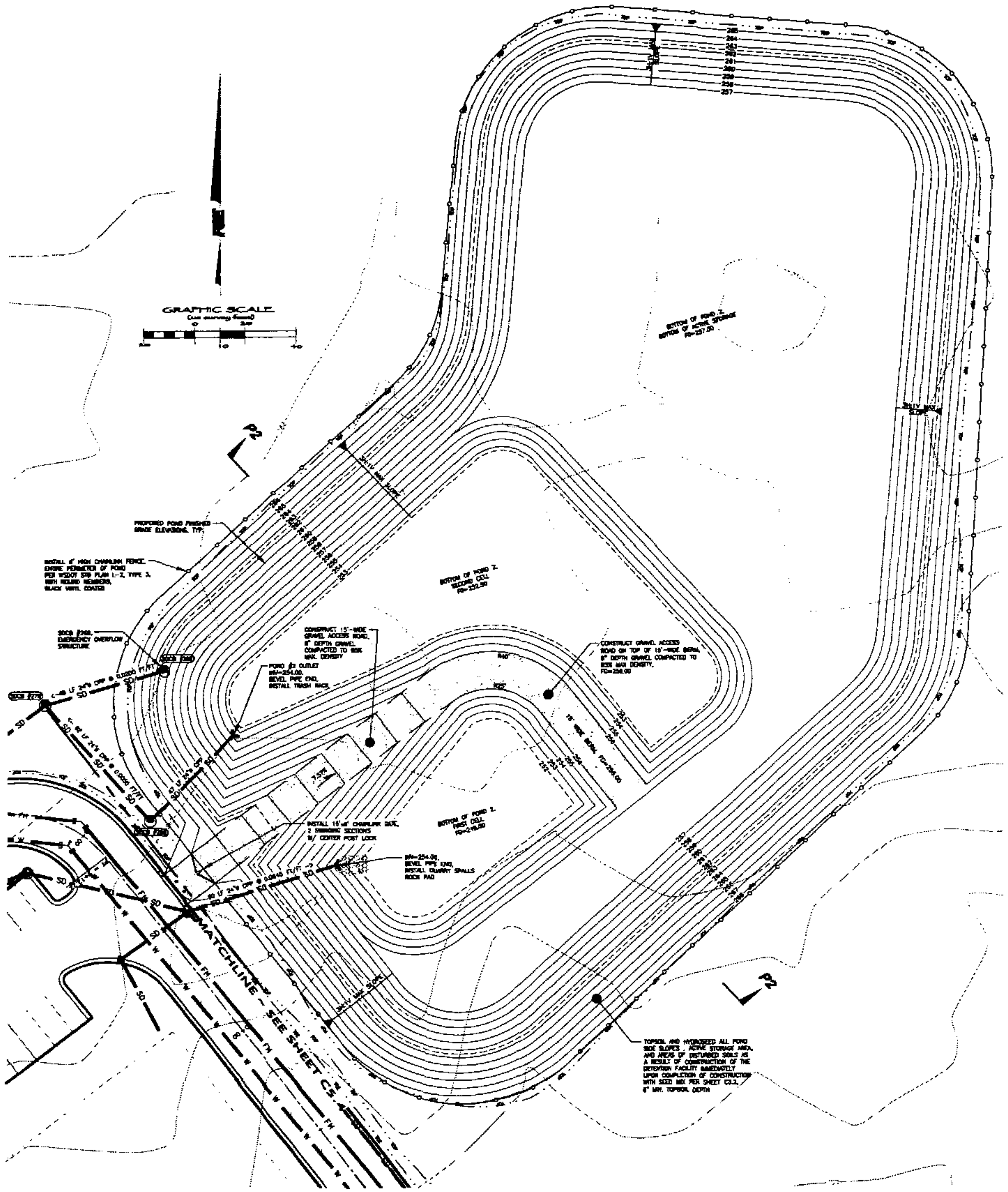
PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER

C3.1

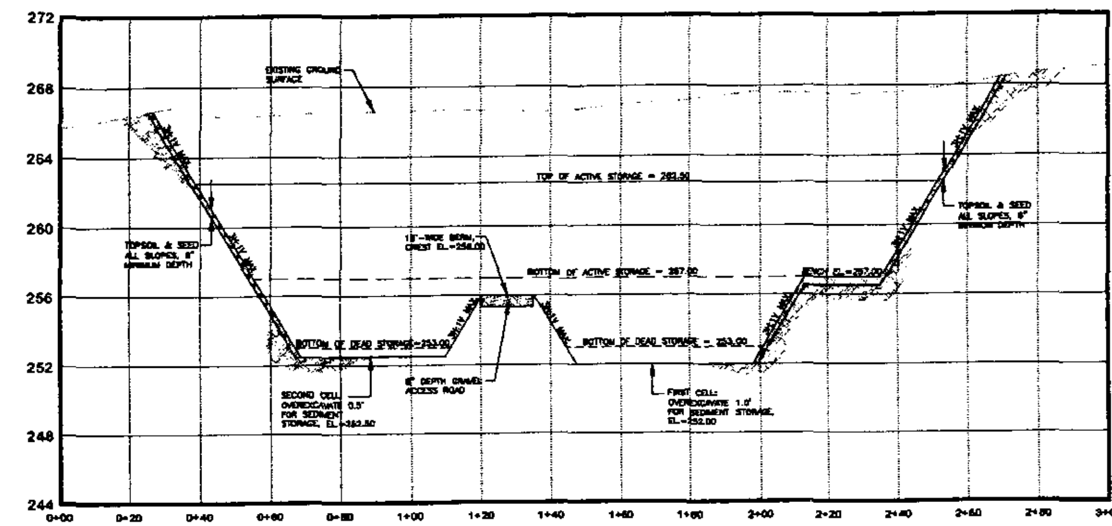
80% DESIGN

PSE
PACIFIC SURVEY & ENGINEERING, INC.



STORMWATER MANAGEMENT FACILITY - POND #2 PLAN

SCALE: 1" = 20'



POND #2 SECTION VIEW

SCALE: HORIZ 1"=20' VERT 1"=4'

STORM DRAINAGE NOTES

SDCB #288

POND 2 CONTROL STRUCTURE
TYPE 2-72" W/FRAME & SOLID LID
STA. 0+12.00, 22.00' LT @ CTR
RIM=267.00
24" I.E. (NE)=257.00
24" I.E. (NW)=257.00

SDCB #289

TYPE 2-48" W/ RING & BIRDCAGE
STA. 0+85.00, 72.00' LT
@ CENTER OF STRUCTURE
RIM=263.30
24" I.E. (SW)=257.65

POND DESIGN INFORMATION:

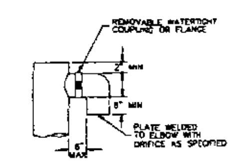
DETENTION ACTIVE STORAGE
VOLUME (257.00 to 262.50) = 387,750 CF
BOTTOM ELEV. = 257.00
TOP ELEV. = 262.50
PRIMARY OVERFLOW SPILLWAY ELEV. = 262.50
EMERGENCY OVERFLOW ELEV. = 263.30

WATER QUALITY STORAGE
VOLUME (253.00 to 257.00) = 79,480 CF
BOTTOM (1st CELL) ELEV. = 252.00
BOTTOM (2nd CELL) ELEV. = 252.50
TOP ELEV. = 257.00

STORM DETENTION POND SLOPES SEED MIX CONSTITUENTS

ALL POND SIDE SLOPES AND AREAS DISTURBED AS A RESULT OF CONSTRUCTION OF THE DETENTION POND FACILITY SHALL BE HYDOSEEDED WITH THE FOLLOWING "LOW GROW" SEED MIX AT A RATE OF 2.5# PER 1000 SF:

SEED NAME	% OF MIX
DWARF TALL FESCUE	40%
DWARF PERENNIAL RYE "BARCLAY"	30%
RED FESCUE	25%
COLONIAL BENTGRASS	5%

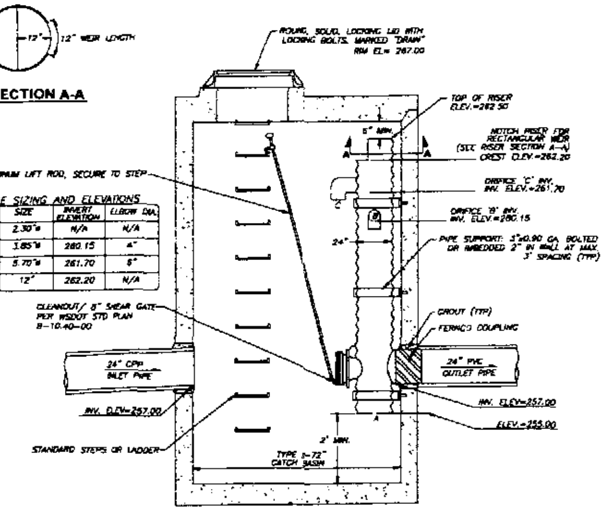


ELBOW RESTRICTOR

NOTES:

1. PIPE SUPPORT BRACKETS AND THE RESTRICTOR/SEPARATOR SHALL BE OF THE SAME MATERIAL AND BE ANCHORED AT 3' MAXIMUM SPACING.
2. ALL METAL PARTS SHALL BE CORROSION RESISTANT. ALL GALVANIZED STEEL PARTS SHALL BE ASPHALT TREATMENT 1 COATED.
3. THE RESTRICTOR/SEPARATOR STANDPIPE SHALL BE FABRICATED FROM 0.060" ALUMINUM, 0.064" ALUMINIZED STEEL, OR 0.064" GALVANIZED STEEL, IN ACCORDANCE WITH AASHTO M36, M196, M197 AND M274. GALVANIZED STEEL SHALL BE ASPHALT TREATMENT 1 COATED.
4. IF A METAL OUTLET PIPE CONNECTS TO A CEMENT CONCRETE PIPE, THE OUTLET PIPE SHALL HAVE A SMOOTH OUTSIDE DIAMETER EQUAL TO THE INSIDE DIAMETER OF THE CONCRETE PIPE LESS 1/4".
5. THE FRAME AND LADDER (OR STEPS) SHALL OFFSET SO THAT:
   A: THE CLEANOUT GATE IS VISIBLE FROM THE TOP.
   B: THE CLIMB DOWN CLEAR SPACE OF 2 FEET IS BETWEEN THE RISER AND CLEANOUT GATE.
   C: THE FRAME IS CLEAR OF THE CURB. (IF APPLICABLE)

RISER SECTION A-A



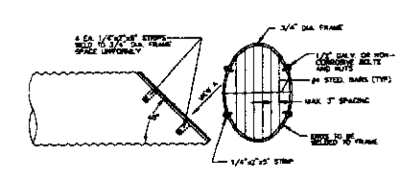
ORIFICE SIZING AND ELEVATIONS

ORIFICE	SIZE	INVERT ELEVATION	ELBOW DIA.
A	2.30"ø	N/A	N/A
B	3.85"ø	260.15	4"
C	5.70"ø	261.70	6"
WEIR	12"	262.20	N/A

SECTION VIEW

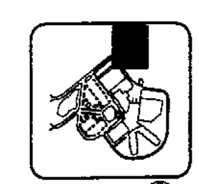
POND #2 CONTROL STRUCTURE (TYPE II-72" MAHOLE)

NOT TO SCALE



TRASH RACK

NOT TO SCALE



SHEET KEY

PLANNING DESIGN BUILD TEAM
PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.8816
planningdesignbuild.com

STORMWATER MANAGEMENT FACILITY ~ POND No. 2 PLAN & DETAILS

SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

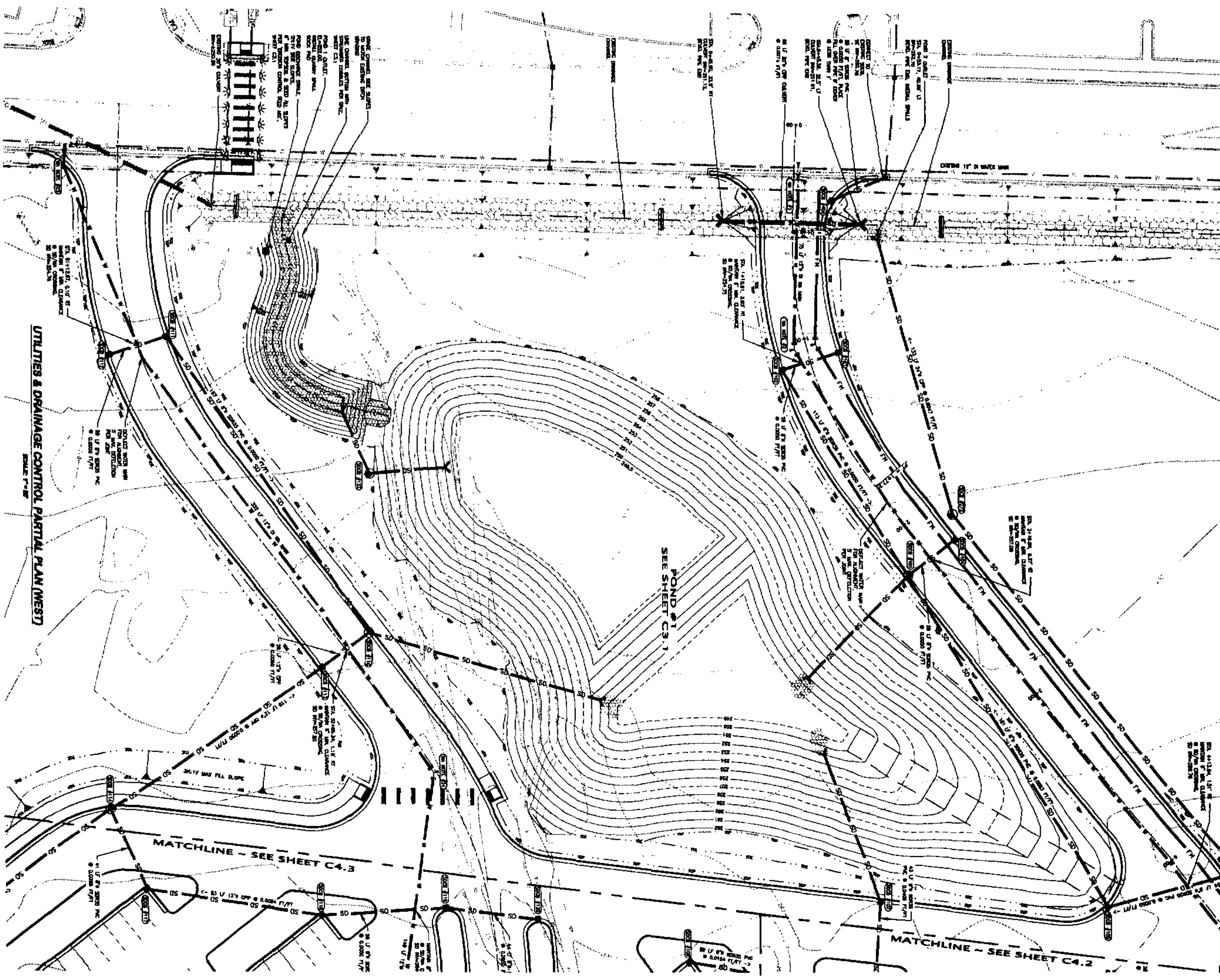
ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase:

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20060021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER
C3.2
80% DESIGN



UTILITIES & DRAINAGE CONTROL PARTIAL PLAN (WEST)

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE

5984 NORTH DARRK LANE

BOW, WASHINGTON 98232

REVISED DATES

ISSUE DATES:

Oct 3, 2007

Nov 29, 2007

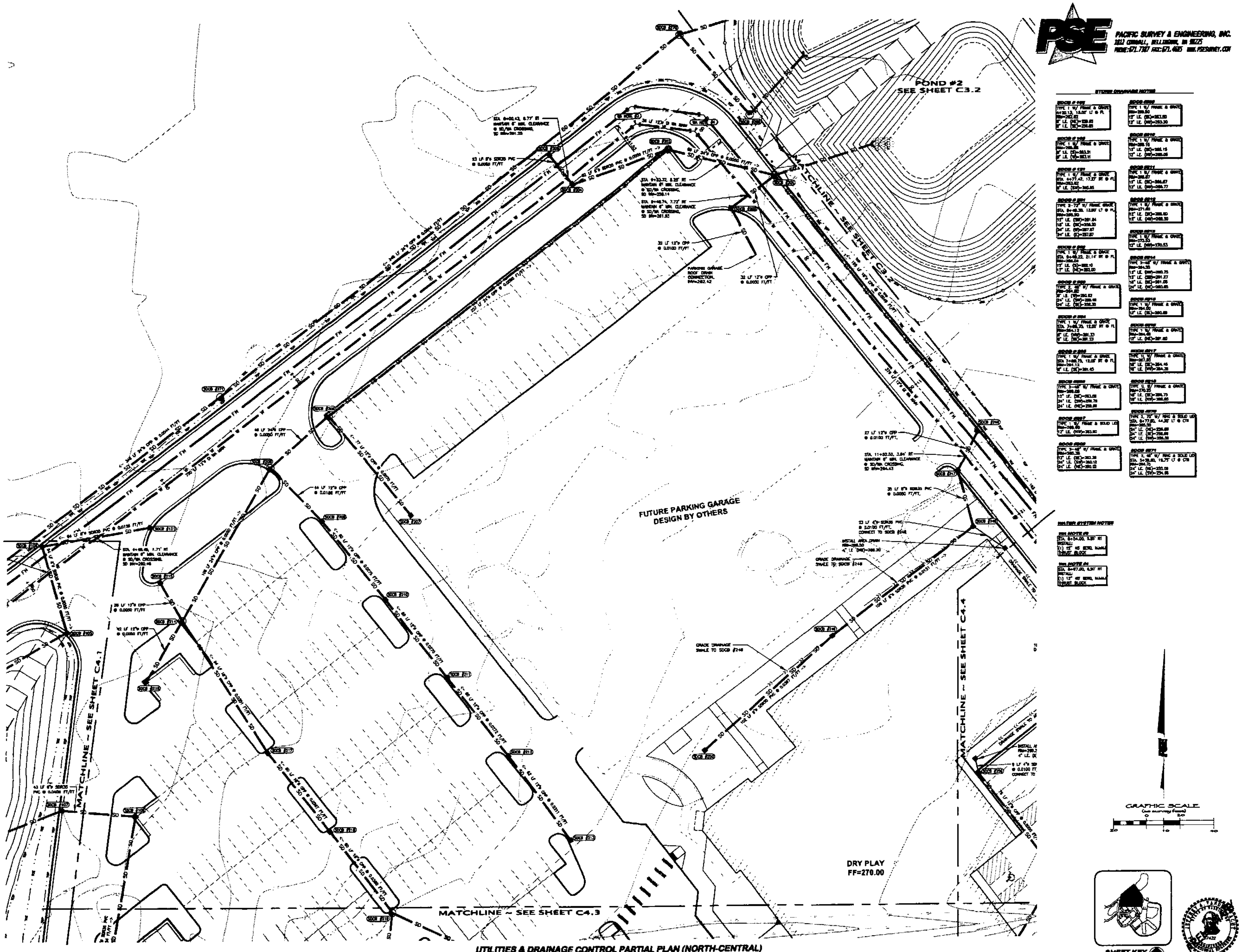
Schematic Design Phase:

This drawing indicates the size and relationship of the project components. This drawing is not for construction.

SHEET NUMBER

C4.1

80% DESIGN



UTILITIES & DRAINAGE CONTROL PARTIAL PLAN (NORTH-CENTRAL)

SCALE: 1" = 20'

PSE
PACIFIC SURVEY & ENGINEERING, INC.
1813 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 WWW.PSESURVEY.COM

PLANNING
DESIGN BUILD TEAM
PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.5818
planningdesignbuild.com

UTILITIES & DRAINAGE CONTROL PARTIAL PLAN (NORTH-CENTRAL)

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARKLANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE

5984 NORTH DARK LANE
BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:
Oct. 3, 2007
Nov. 26, 2007

Schematic Design Phase:

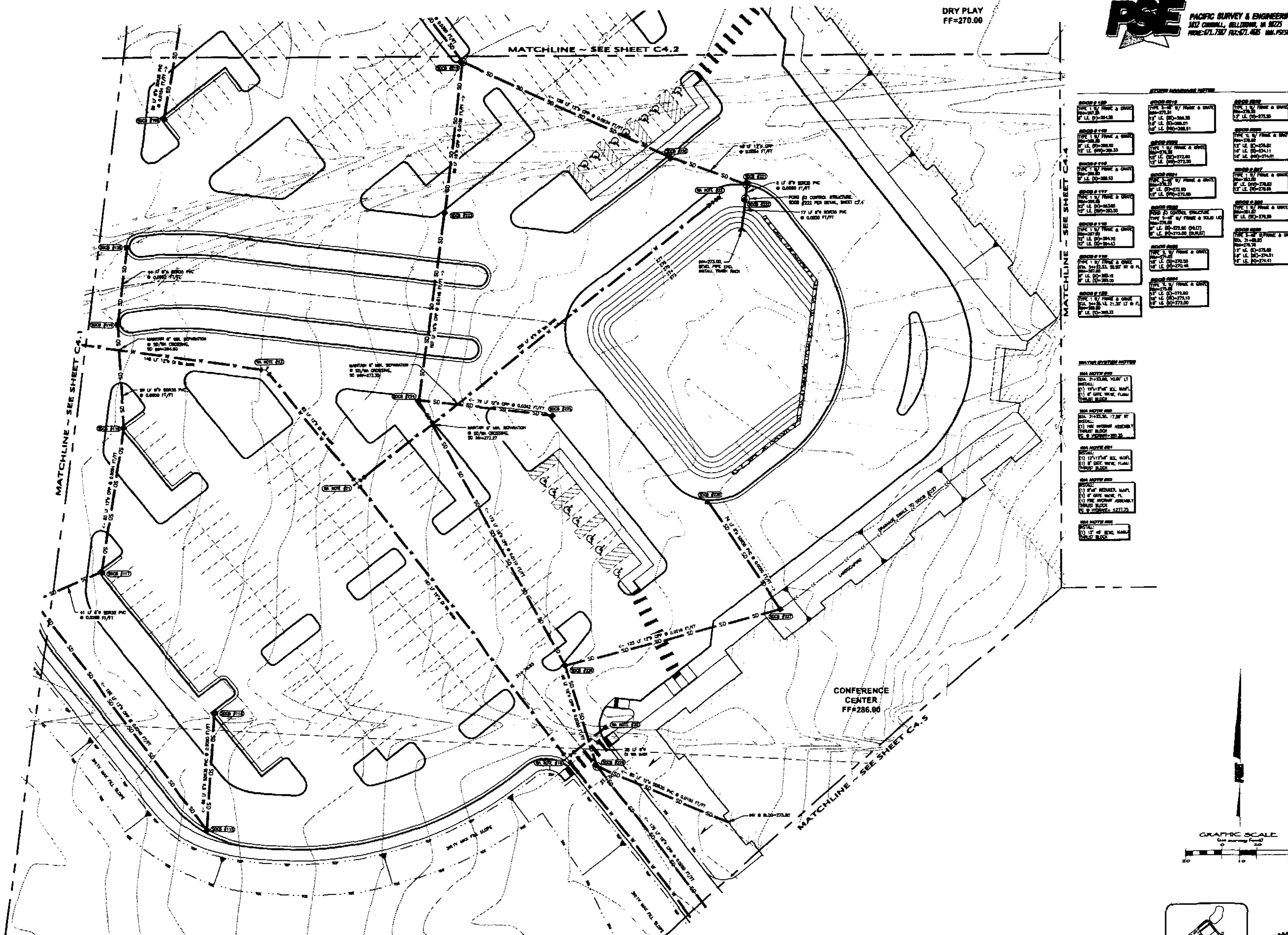
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER

C4.2

80% DESIGN



UTILITIES & DRAINAGE CONTROL PARTIAL PLAN (SOUTH-CENTRAL)

SCALE: 1"=30'

PSE
PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE:671.7387 FAX:671.4685 WWW.PSESURVEY.COM

PLANNING
DESIGN BUILD TEAM
PLANNING Design Build, Inc.
801 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.8818
planningdesignbuild.com

UTILITIES & DRAINAGE CONTROL PARTIAL PLAN (SOUTH-CENTRAL)

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

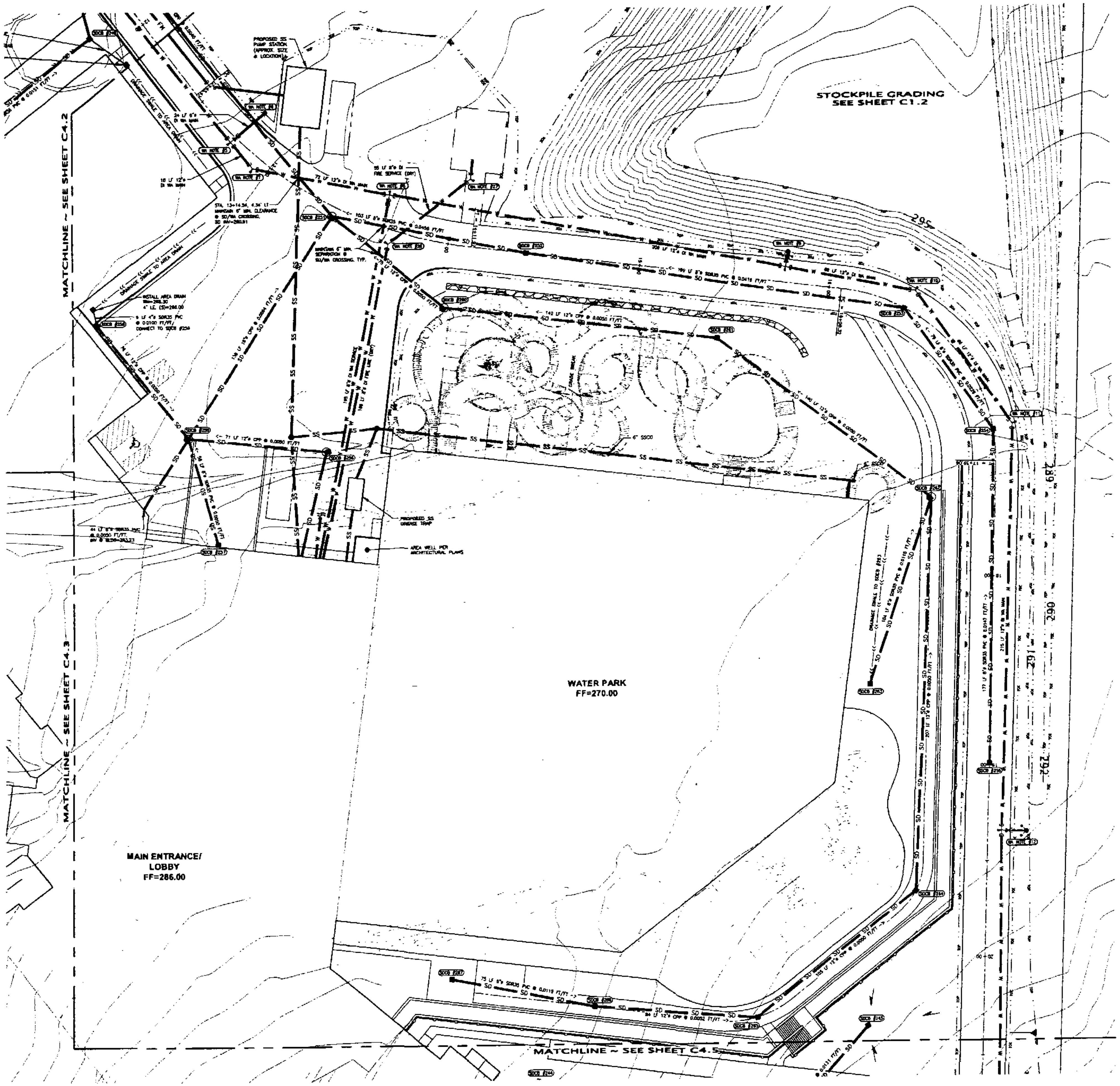
ISSUE DATES:
Oct 3, 2007
Nov. 28, 2007

Schematic Design Phase:

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20060021
PSE (CIVIL) PROJECT #: 2006176

SHEET NUMBER
C4.3
80% DESIGN



UTILITIES & DRAINAGE CONTROL PARTIAL PLAN (NORTHEAST)

SCALE: 1" = 30'

STORM DRAINAGE NOTES

WATER SYSTEM NOTES

GRAPHIC SCALE

SHEET KEY

PSE
PACIFIC SURVEY & ENGINEERING, INC.

PLANNING
DESIGN BUILD TEAM
PLANNING Design Build, Inc.
801 Deming Way, Suite 102
Madison, WI 53717
608 836 8056
608 836 9818
planningdesignbuild.com

UTILITIES & DRAINAGE CONTROL PARTIAL PLAN (NORTHEAST)

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE

5984 NORTH DARRK LANE

BOW, WASHINGTON 98232

REVISED DATES

ISSUE DATES:

Oct. 3, 2007

Nov. 28, 2007

Schematic Design Phase

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021

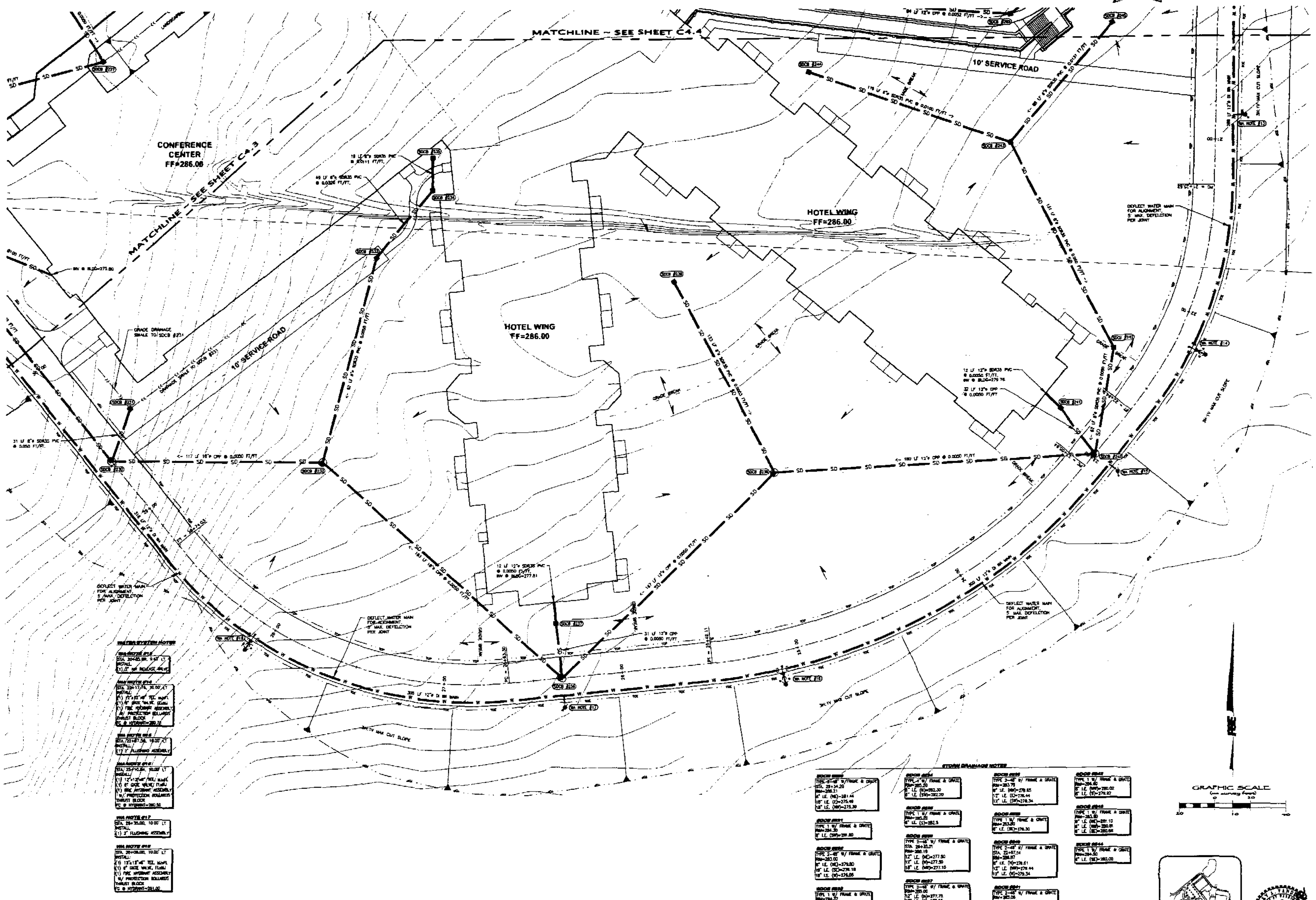
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER

C4.4

80% DESIGN

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 WWW.PSESURVEY.COM



UTILITIES & DRAINAGE CONTROL PARTIAL PLAN (SOUTHEAST)

SCALE: 1" = 20'

PLANNING DESIGN BUILD TEAM
PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.5818
planningdesignbuild.com

UTILITIES & DRAINAGE CONTROL PARTIAL PLAN (SOUTHEAST)

SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

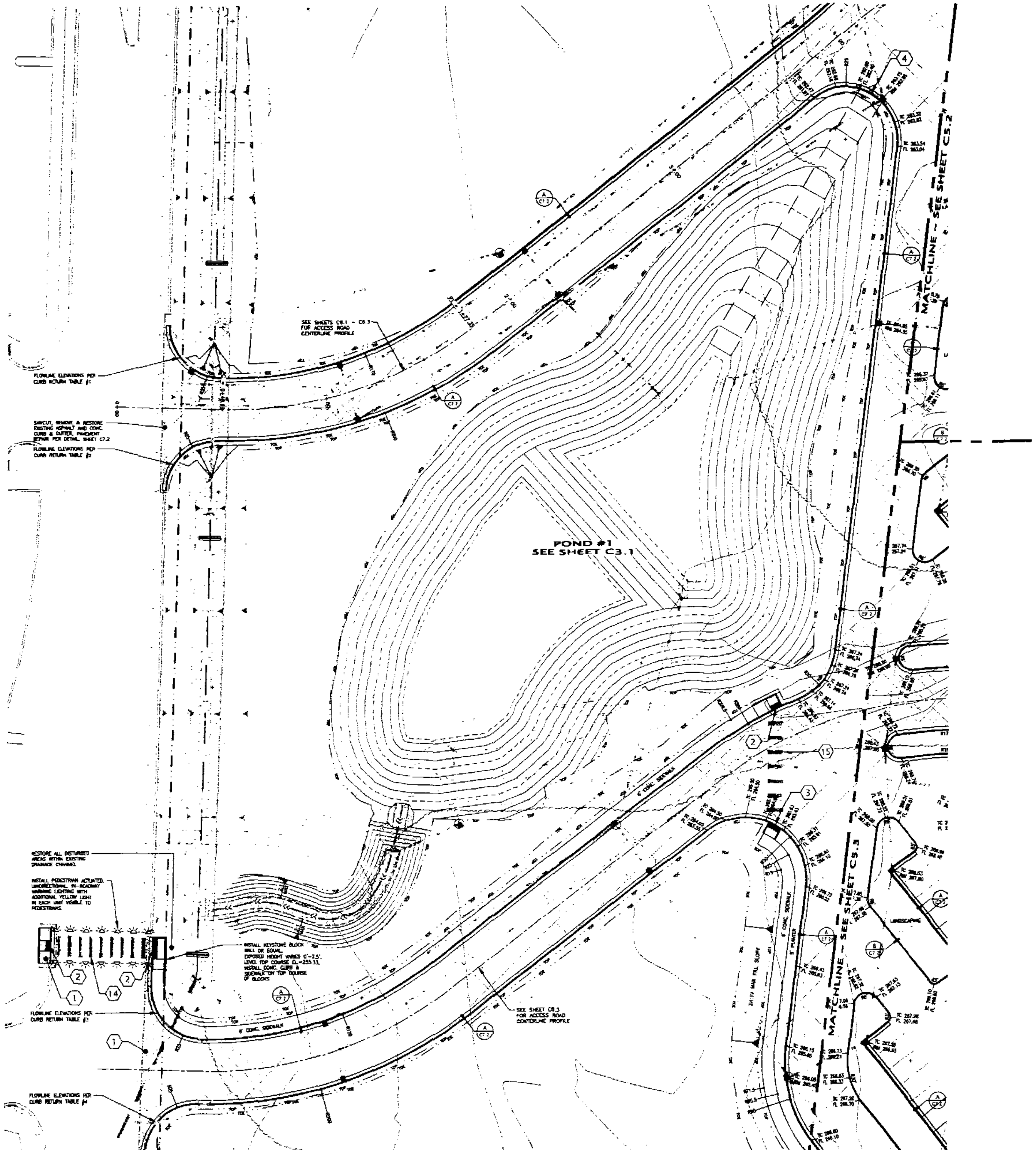
ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER
C4.5
80% DESIGN



GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (WEST)
SCALE: 1"=20'

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 WWW.PSESURVEY.COM

LEGEND

HEAVY DUTY PAVEMENT SECTION OR ROADWAY SECTION (IF APPLICABLE) PER DETAILS, SHEET C7.1

GRADING PLAN CONSTRUCTION NOTES

1. SAWCUT, REMOVE & RESTORE EXISTING ASPHALT AND CONC SIDEWALK, CURB & GUTTER, PAVEMENT REPAIR PER DETAIL SHEET C7.2
2. INSTALL SIDEWALK RAMP TYPE 2, PER WSDOT STD. PLAN F-40.12-00
3. INSTALL SIDEWALK RAMP TYPE 36 PER WSDOT STD. PLAN F-40.15-00
4. DEPRESS CURB FOR POND ACCESS INSTALL REMOVABLE BOLLARDS PER DETAIL SHEET C7.2
14. 10' WIDE CROSSWALK STRIPING
15. 8' WIDE CROSSWALK STRIPING

CURB RETURN TABLES

CURB RETURN #1

STATION	OFFSET	ELEVATION @ FL
0+24.00	40.00' LT	256.84
0+25.88	30.48' LT	256.77
0+31.25	22.39' LT	255.73
0+39.30	16.69' LT	255.74
0+48.69	15.00' LT	255.83

CURB RETURN #2

STATION	OFFSET	ELEVATION @ FL
0+24.00	40.00' RT	255.18
0+25.91	30.41' RT	255.30
0+31.37	22.28' RT	255.47
0+39.52	16.87' RT	255.64
0+49.20	15.00' RT	255.83

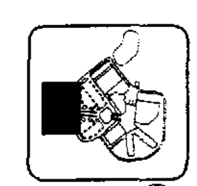
CURB RETURN #3

STATION	OFFSET	ELEVATION @ FL
50+24.00	40.00' LT	256.19
50+25.91	30.42' LT	256.26
50+31.34	22.30' LT	256.32
50+39.48	16.88' LT	256.39
50+49.08	15.00' LT	256.45

CURB RETURN #4

STATION	OFFSET	ELEVATION @ FL
50+23.15	39.38' RT	256.19
50+25.23	29.88' RT	256.34
50+30.70	22.08' RT	256.40
50+38.75	16.83' RT	256.45
50+48.19	15.00' RT	256.51

GRAPHIC SCALE
(IN FEET)



SHEET KEY

PLANNING DESIGN BUILD TEAM
PLANNING Design Build, Inc.
801 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.5818
planningdesignbuild.com

GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (WEST)

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARK LANE
BOW, WASHINGTON 98232

REVISED DATES:

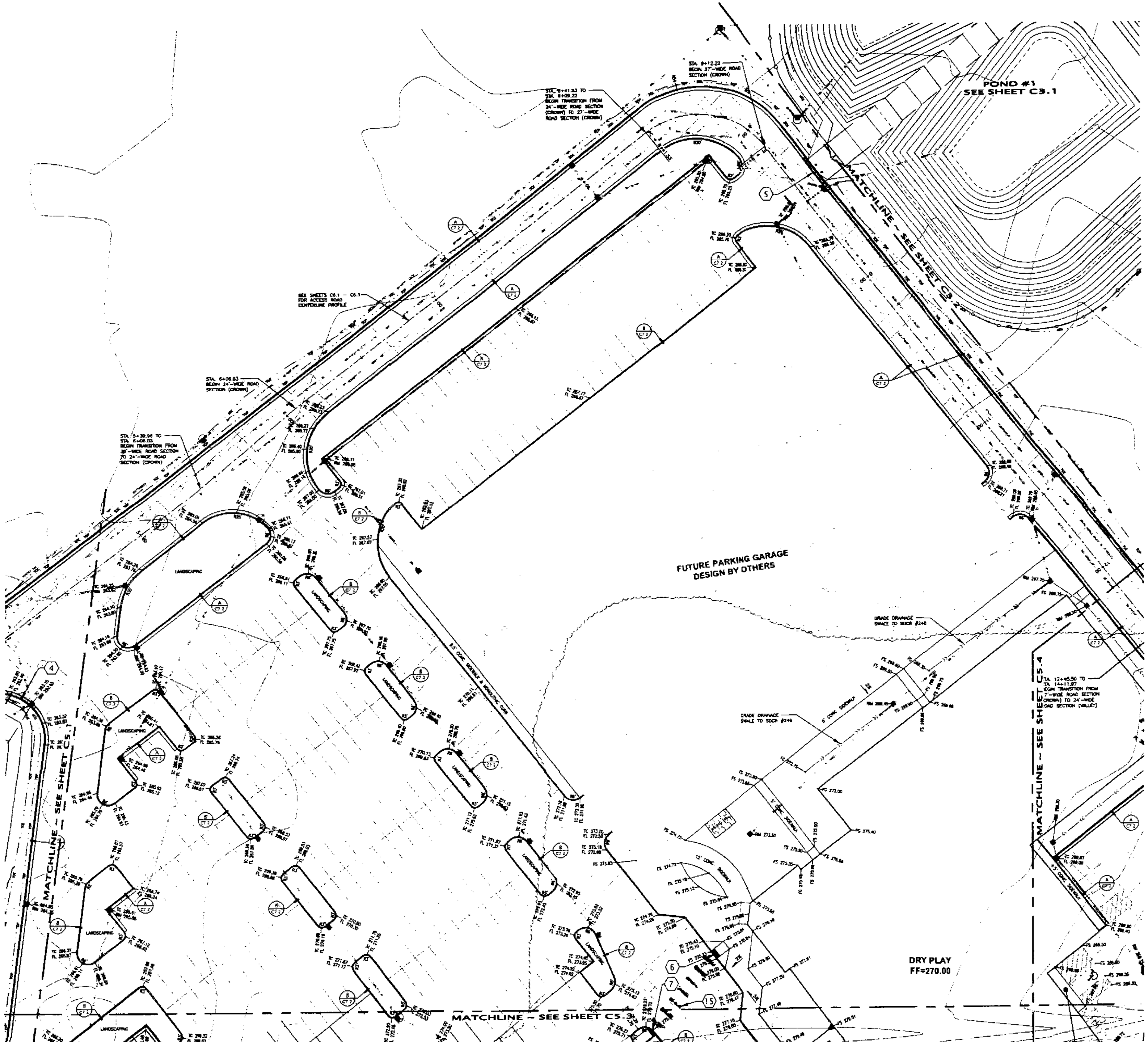
ISSUE DATES:
Oct 3, 2007
Nov 28, 2007

Schematic Design Phase

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER
C5.1
80% DESIGN



GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (NORTH-CENTRAL)

SCALE: 1"=20'

PSE
PACIFIC SURVEY & ENGINEERING, INC.
1917 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4605 WWW.PSESURVEY.COM

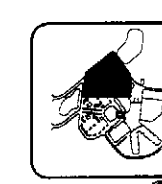
LEGEND

HEAVY DUTY PAVEMENT SECTION OR ROADWAY SECTION (IF APPLICABLE) PER DETAILS, SHEET C7.1

GRADING PLAN CONSTRUCTION NOTES

5. DEPRESS CURB FOR POND ACCESS. INSTALL REMOVABLE BOLLARDS PER DETAIL, SHEET C7.2
6. INSTALL SIDEWALK RAMP TYPE 1 PER WSDOT STD. PLAN F-40.10-00
7. INSTALL SIDEWALK RAMP TYPE 4B PER WSDOT STD. PLAN F-40.18-02
15. 8' WIDE CROSSWALK STRIPING

GRAPHIC SCALE
(in survey feet)



SHEET KEY

PLANNING
DESIGN BUILD TEAM
PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.5814
planningdesignbuild.com

GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (NORTH-CENTRAL)

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

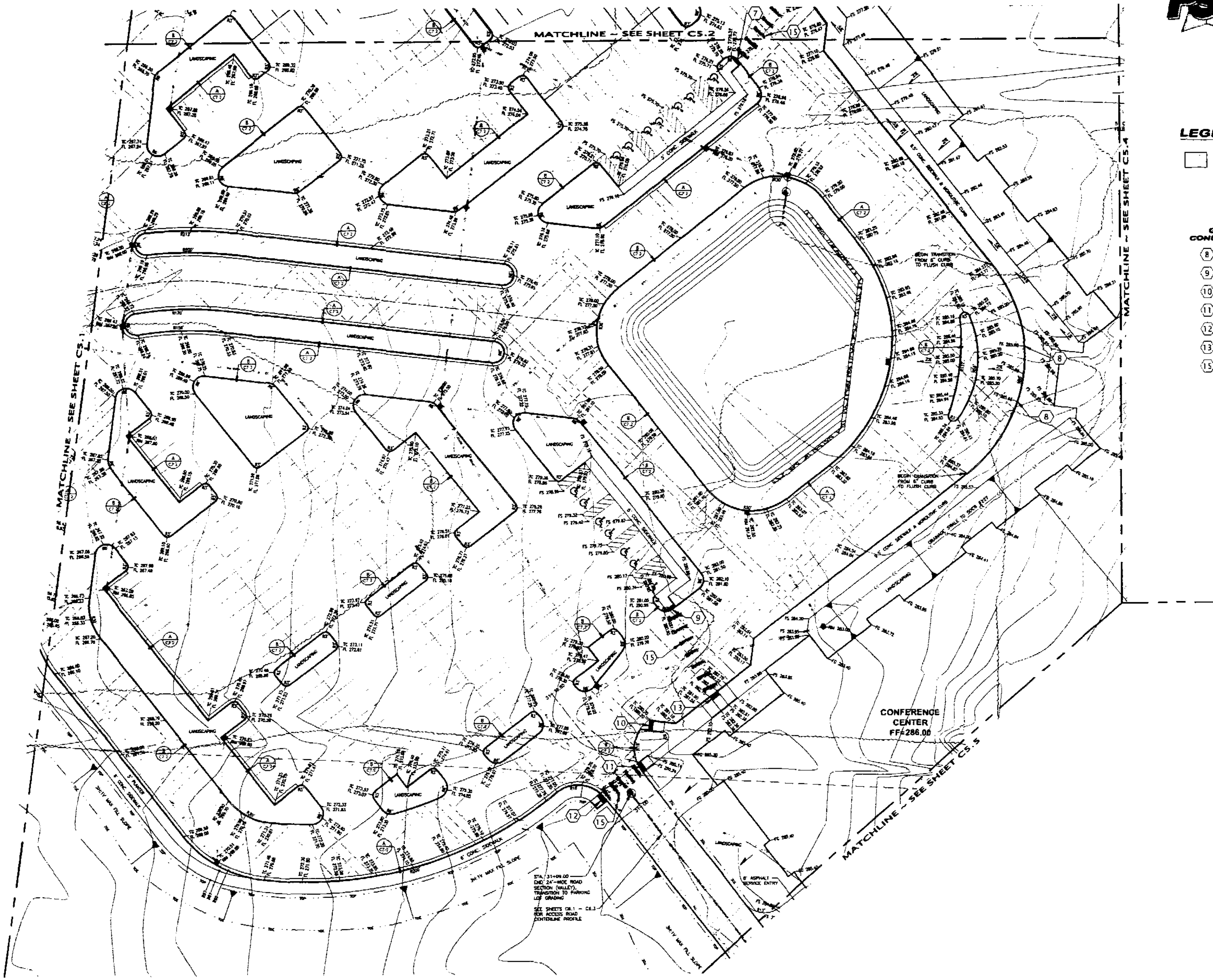
Schematic Design Phase:

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER
C5.2
80% DESIGN

PSE
PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 WWW.PSESURVEY.COM



GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (SOUTH-CENTRAL)

SCALE: 1"=20'

LEGEND

HEAVY DUTY PAVEMENT SECTION OR ROADWAY SECTION (IF APPLICABLE) PER DETAILS, SHEET C7.1

GRADING PLAN CONSTRUCTION NOTES

- (8) BEGIN SIDEWALK FLUSH W/ PAVEMENT
- (9) INSTALL SIDEWALK RAMP TYPE 4B PER WSDOT STD PLAN F-40.18-00
- (10) INSTALL SIDEWALK RAMP TYPE 4B PER WSDOT STD PLAN F-40.18-00
- (11) INSTALL SIDEWALK RAMP TYPE 4B PER WSDOT STD PLAN F-40.18-00
- (12) INSTALL SIDEWALK RAMP TYPE 2 PER WSDOT STD PLAN F-40.12-00
- (13) INSTALL SIDEWALK RAMP TYPE 2 PER WSDOT STD PLAN F-40.12-00
- (15) 8' WIDE CROSSWALK STRIPING

GRAPHIC SCALE
20 0 10 20 40

SHEET KEY

PLANNING DESIGN BUILD TEAM
PLANNING Design Build, Inc
901 Deming Way, Suite 102
Madison, WI 53717
608 836.8055
608 836.5818
planningdesignbuild.com

GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (SOUTH-CENTRAL)

SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES

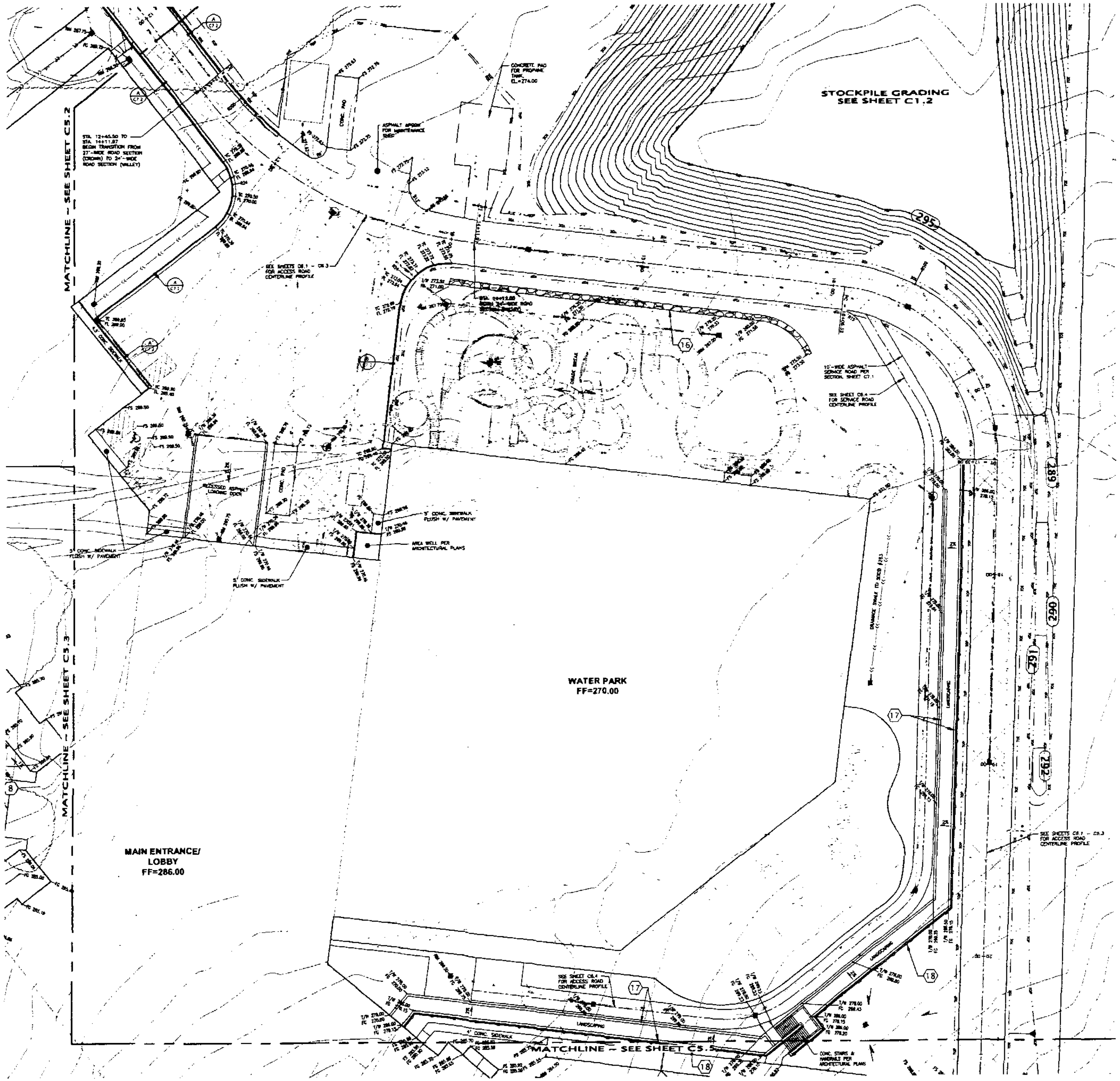
ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase:

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER
C5.3
80% DESIGN



GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (NORTHEAST)

PACIFIC SURVEY & ENGINEERING, INC.

LEGEND

HEAVY DUTY PAVEMENT SECTION OR ROADWAY SECTION (IF APPLICABLE) PER DETAILS, SHEET C7.1

GRADING PLAN CONSTRUCTION NOTES

16. INSTALL SINGLE KEYSTONE BLOCK WALL WITH GEOGRID REINFORCEMENT PER GEOTECHNICAL RECOMMENDATIONS
17. INSTALL TERRACED KEYSTONE BLOCK WALLS WITH GEOGRID REINFORCEMENT PER GEOTECHNICAL RECOMMENDATIONS
18. INSTALL PEDESTRIAN HANDRAIL ALONG TOP OF RETAINING WALL PER DETAIL SHEET C7.2

GRAPHIC SCALE

SHEET KEY

PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.5618
planningdesignbuild.com

GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (NORTHEAST)

SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES

ISSUE DATES:
Oct 3, 2007
Nov 28, 2007

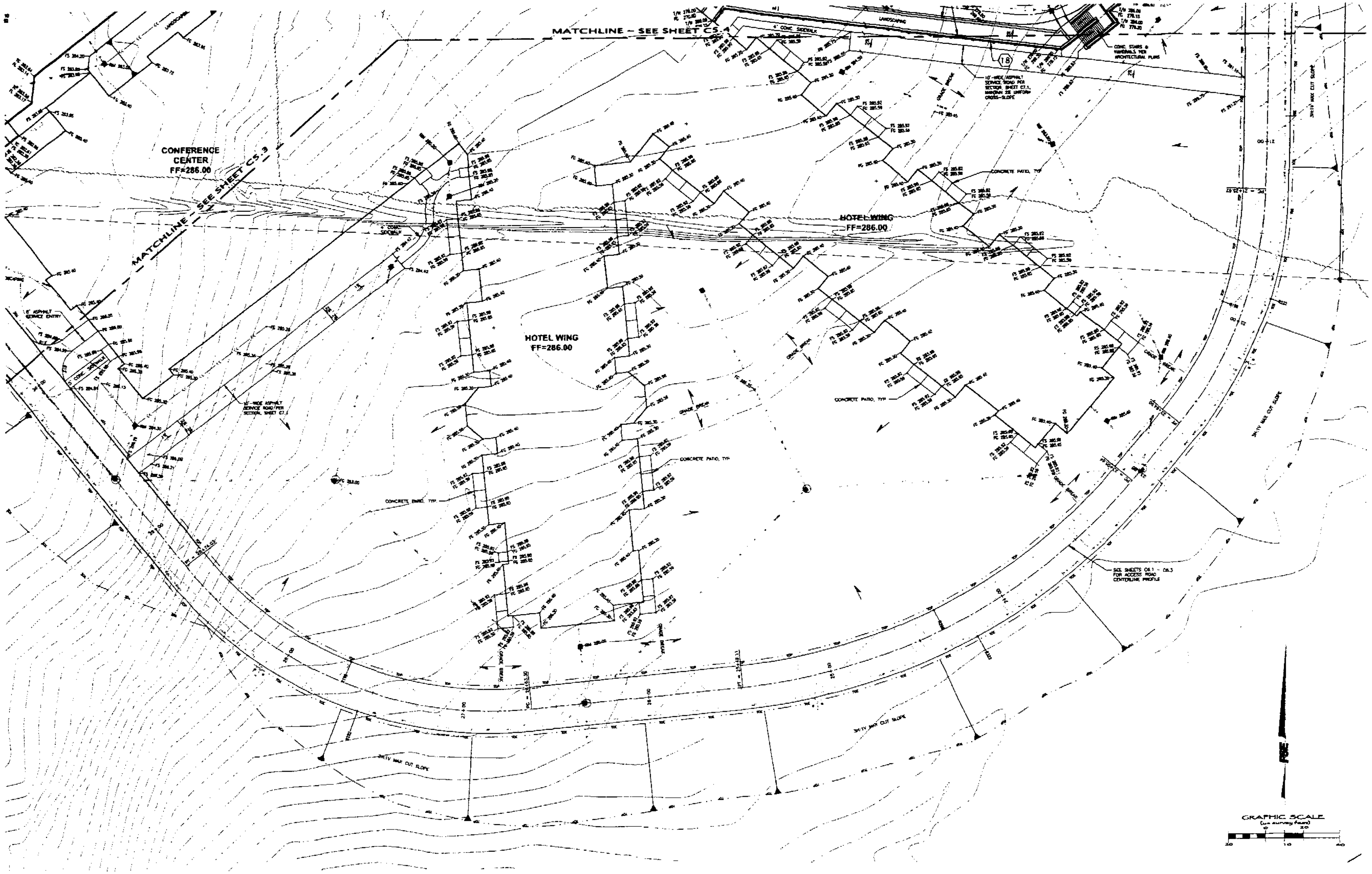
Schematic Design Phase.

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2005175

SHEET NUMBER
C5.4
80% DESIGN

PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 WWW.PSESURVEY.COM

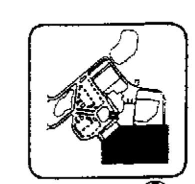


GRADING PLAN CONSTRUCTION NOTES

18 — INSTALL PEDESTRIAN HANDRAIL ALONG TOP OF RETAINING WALL PER DETAIL SHEET C7.2

LEGEND

HEAVY DUTY PAVEMENT SECTION OR ROADWAY SECTION (IF APPLICABLE) PER DETAILS, SHEET C7.1



GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (SOUTHEAST)

SCALE: 1" = 20'

PLANNING DESIGN BUILD TEAM

PLANNING Design Build, Inc
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.9618
planningdesignbuild.com

GRADING & SURFACE IMPROVEMENTS PARTIAL PLAN (SOUTHEAST)

SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES

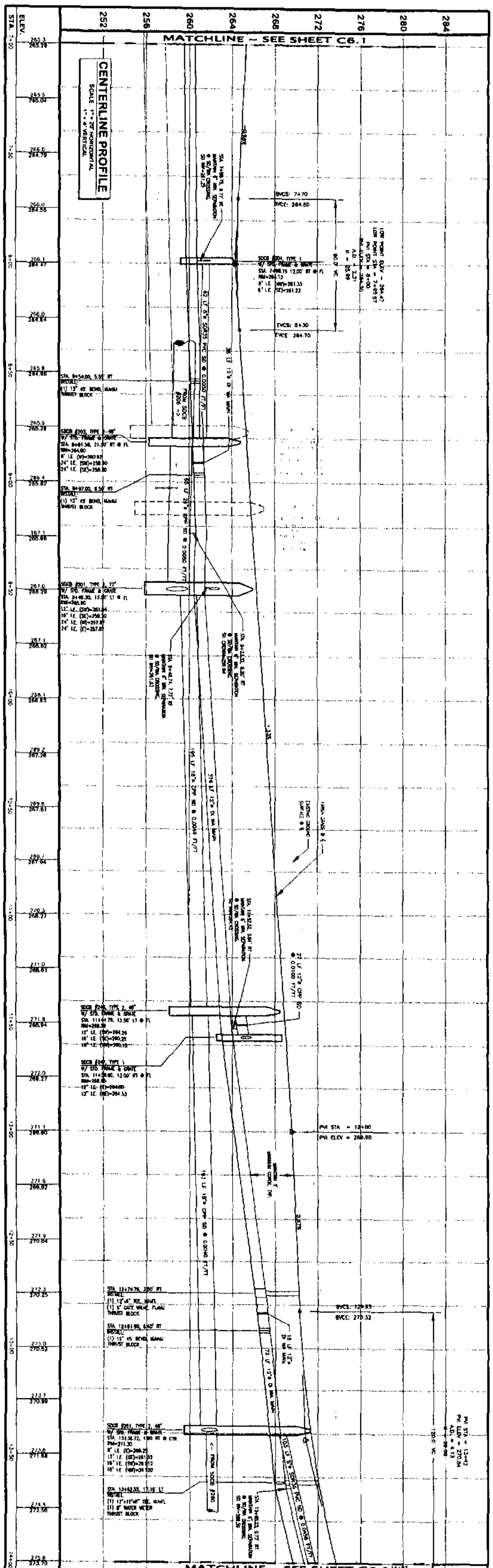
ISSUE DATES:
Oct 3, 2007
Nov 28, 2007

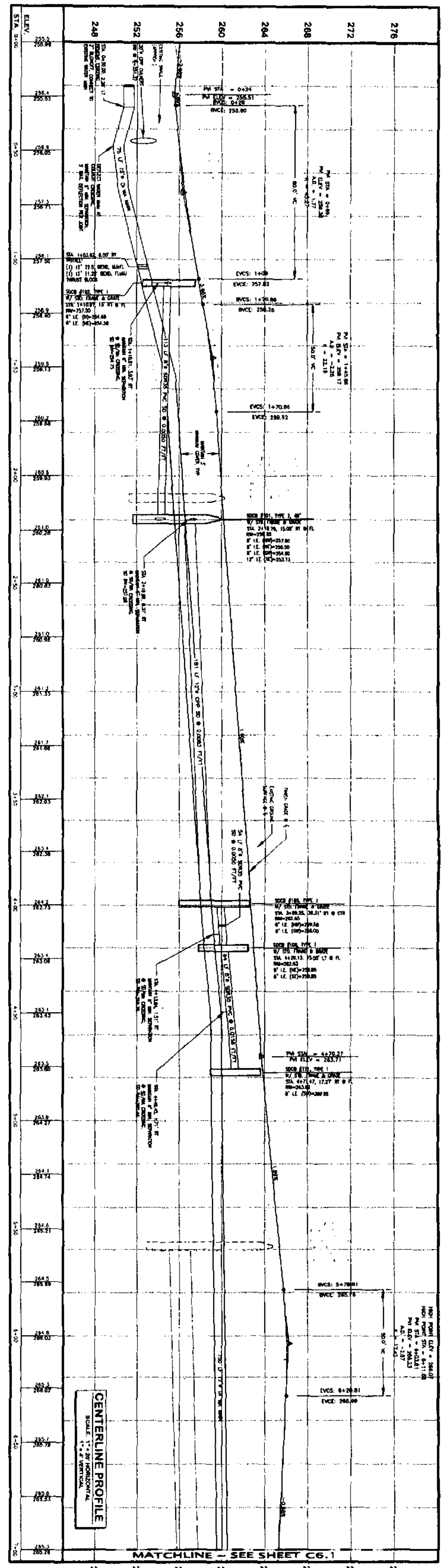
Schematic Design Phase

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER
C5.5
80% DESIGN





PACIFIC SURVEY & ENGINEERING, INC.

SERVICE ROAD CORRIDOR ROADWAY & UTILITIES PROFILE

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE

5984 NORTH DARRK LANE

BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:

Oct 3, 2007

Nov 28, 2007

Schematic Design Phase

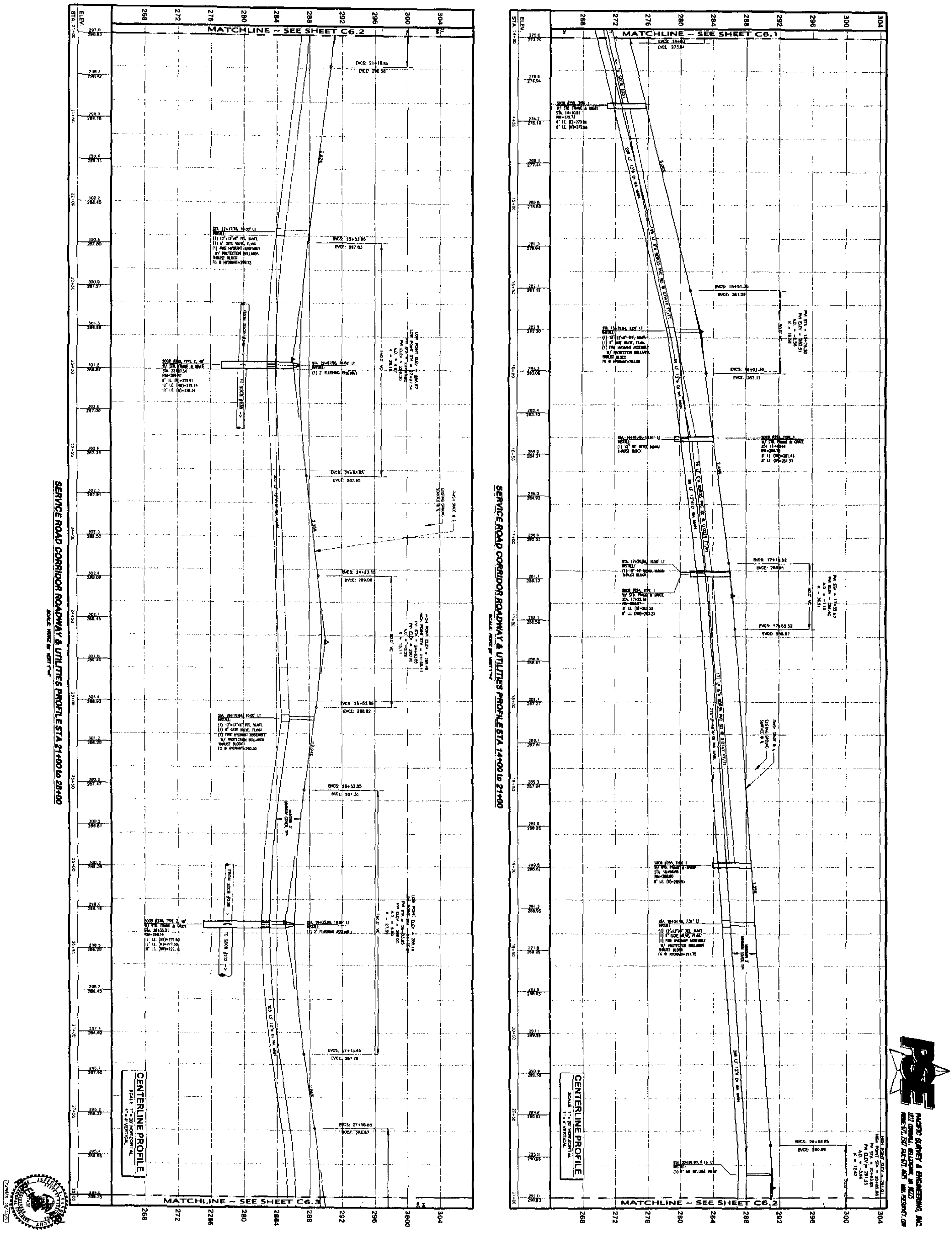
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021

SHEET NUMBER

C6.1

80% DESIGN



SERVICE ROAD CORRIDOR ROADWAY & UTILITIES PROFILE

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

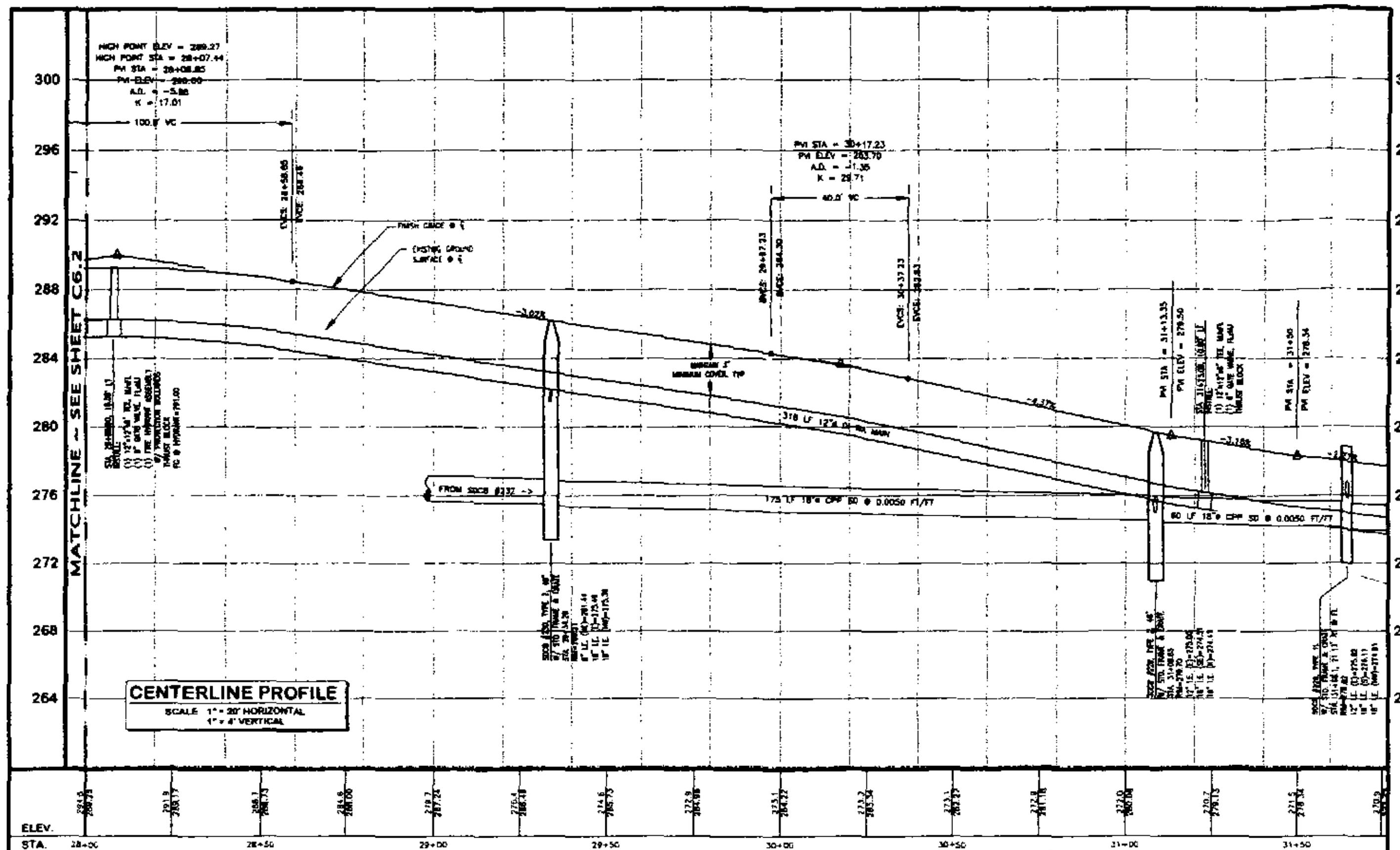
ISSUE DATES:
Oct 3, 2007
Nov 28, 2007

Schematic Design Phase
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

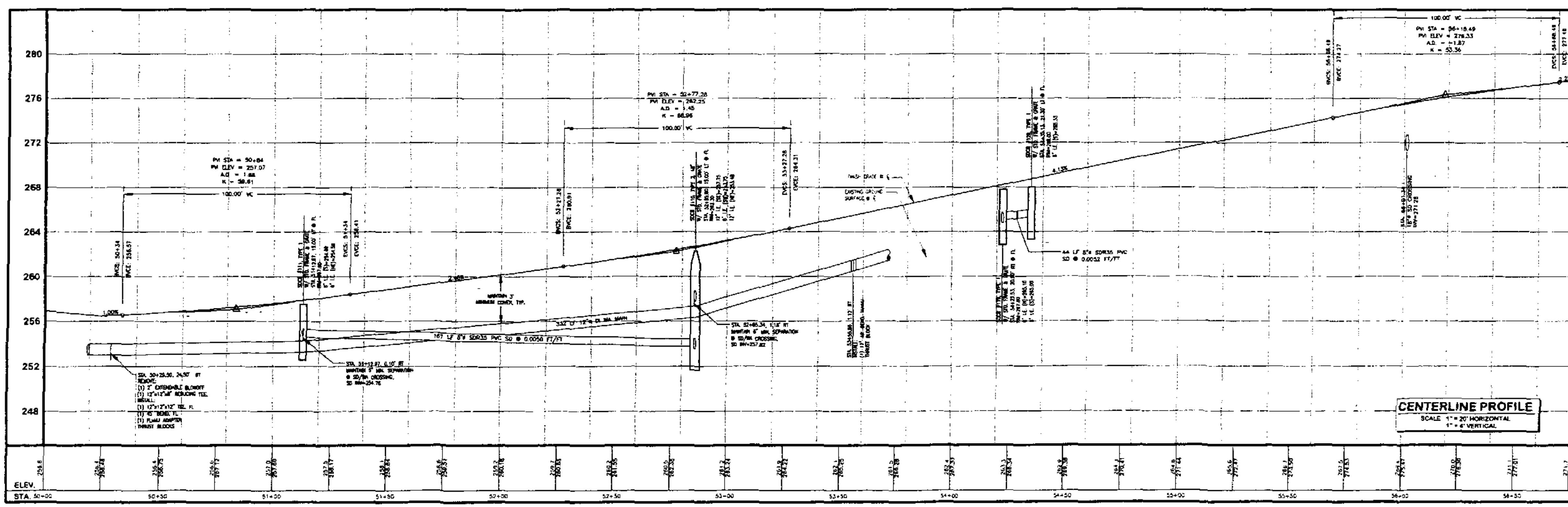
SHEET NUMBER
C6.2
80% DESIGN

PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.5616
planningdesignbuild.com



SERVICE ROAD CORRIDOR ROADWAY & UTILITIES PROFILE STA 21+00 to 28+00

SCALE: HORIZ 20' VERT 1"=4'



MAIN ENTRANCE CORRIDOR ROADWAY & UTILITIES PROFILE STA 28+00 to 31+75

SCALE: HORIZ 20' VERT 1"=4'

PSE
PACIFIC SURVEY & ENGINEERING, INC.

PLANNING DESIGN BUILD TEAM
PLANNING Design Build, Inc.

MAIN ENTRANCE CORRIDOR ROADWAY & UTILITIES PROFILE

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE

5984 NORTH DARK LANE
BOW, WASHINGTON 98232

REVISED DATES

ISSUE DATES
Oct 3, 2007
Nov 28, 2007

Schematic Design Phase:

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

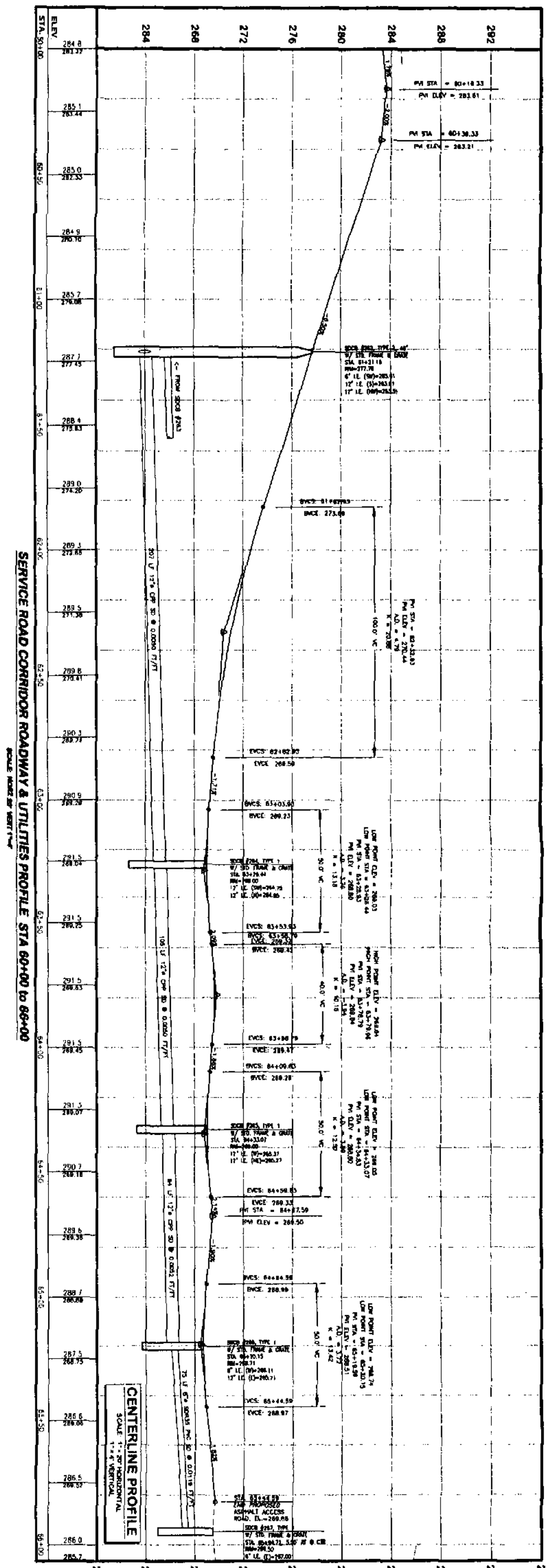
PLANNING PROJECT #: 20050021

PSE (CIVIL) PROJECT #: 2005175

SHEET NUMBER

C6.3

80% DESIGN



PACIFIC SURVEY & ENGINEERING, INC.

MAINTENANCE CORRIDOR ROADWAY & UTILITIES PROFILE (2)

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

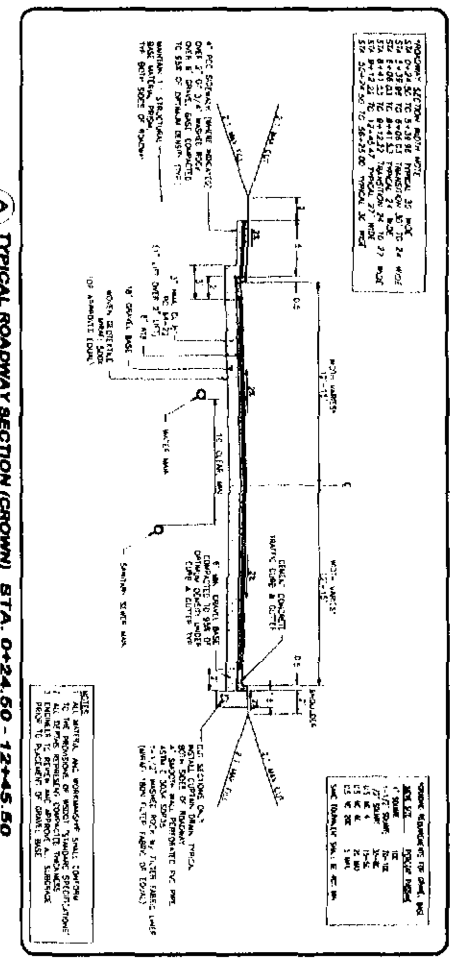
ISSUE DATES:
Oct 3, 2007
Nov 28, 2007

Schematic Design Phase.

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

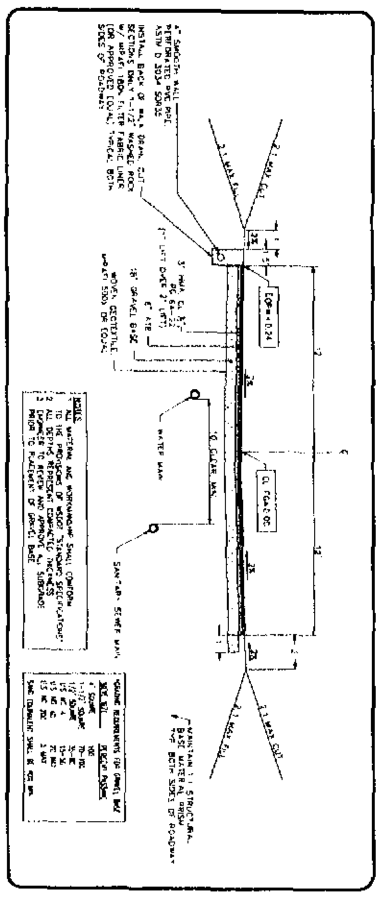
PLANNING PROJECT #: 2005021
PSE (ENG) PROJECT #: 2006175

SHEET NUMBER
C6.4
80% DESIGN



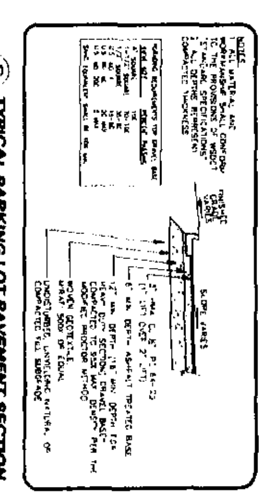
A TYPICAL ROADWAY SECTION (CROWN) STA. 0+24.50 - 12+45.50

NOT TO SCALE



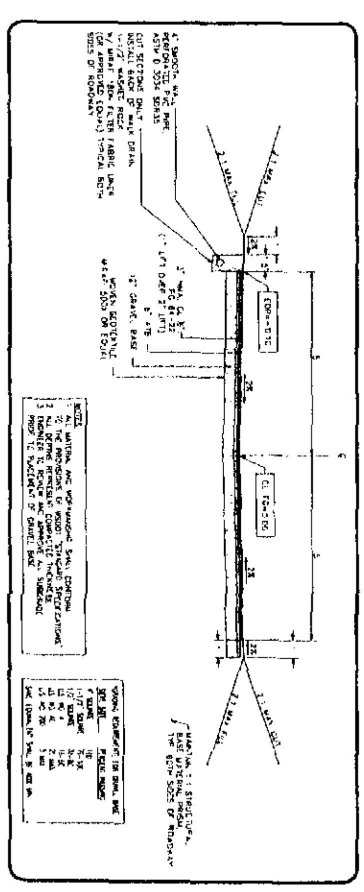
B TYPICAL ROAD SECTION (VALLEY) STA. 14+12.00 - 31+09.00

NOT TO SCALE



C TYPICAL PARKING LOT PAVEMENT SECTION

NOT TO SCALE



D TYPICAL 10' SERVICE ROADWAY SECTION

NOT TO SCALE

C.O. ______
W.O. ______

PACIFIC SURVEY & ENGINEERING, INC.

TYPICAL SECTIONS ~ ROADWAY AND SURFACE IMPROVEMENTS

SKAGIT RESORT SITE IMPROVEMENT PLANS

NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES

ISSUE DATES
Oct 3, 2007
Nov 28, 2007

Schematic Design Phase

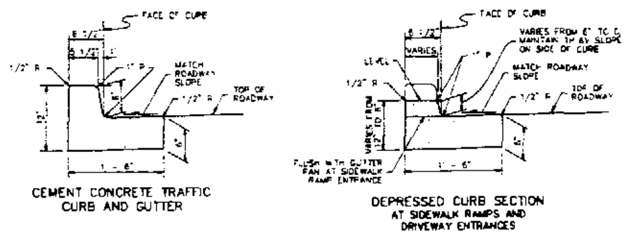
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 2005021
PSE (CIVIL) PROJECT #: 2006175

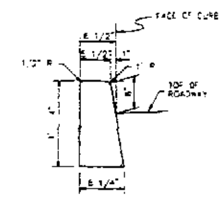
SHEET NUMBER
C7.1
80% DESIGN

PLANNING Design Build Inc
801 Deming Way, Suite 102
Madison, WI 53717
608.836.8095
608.836.5815

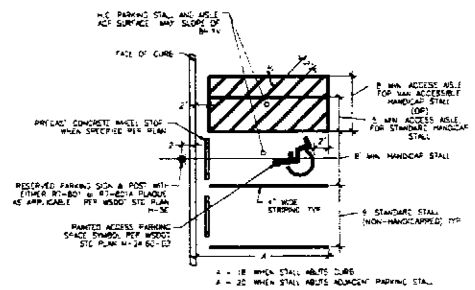
PACIFIC SURVEY & ENGINEERING, INC.
PHONE:671.7387 FAX:671.4685 WWW.PSESURVEY.COM



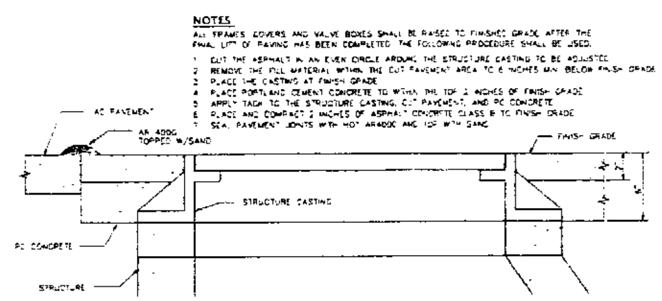
A CEMENT CONCRETE TRAFFIC CURB & GUTTER
NOT TO SCALE



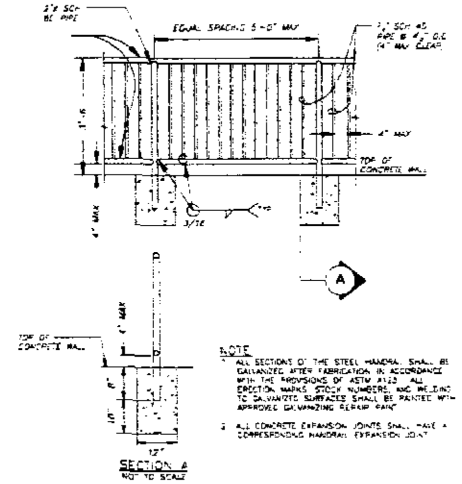
B CEMENT CONCRETE TRAFFIC CURB
NOT TO SCALE



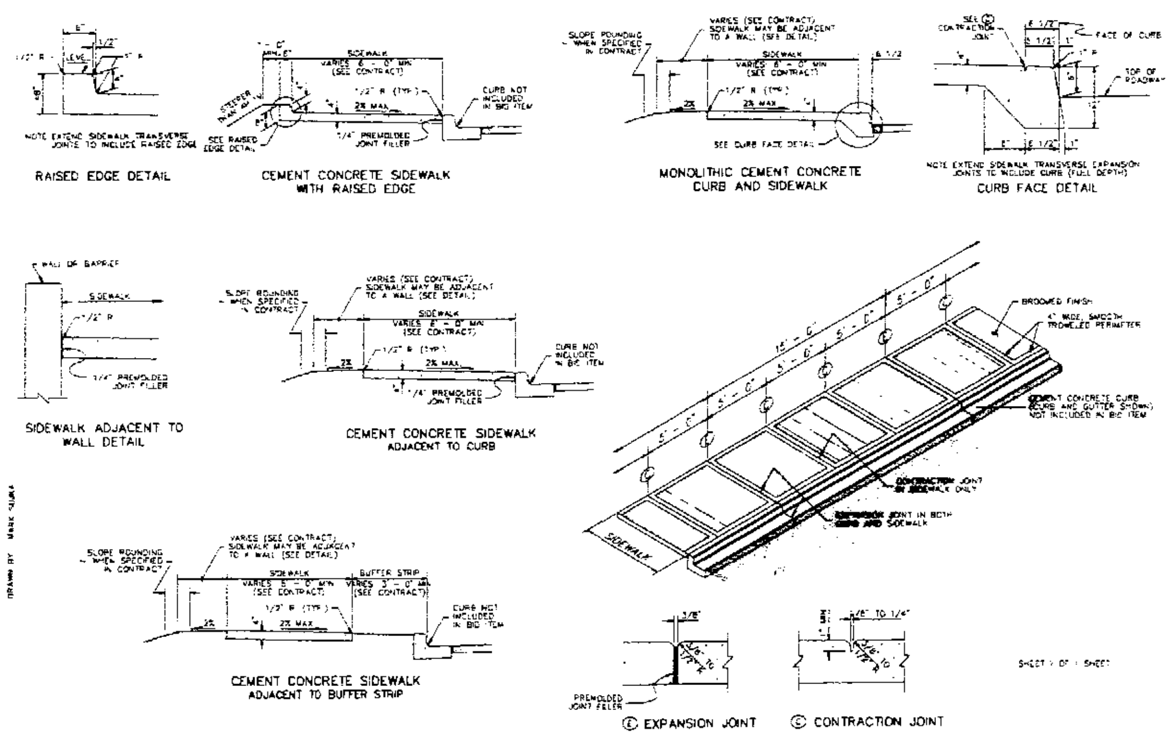
C TYPICAL HANDICAPPED PARKING STALL DETAIL
NOT TO SCALE



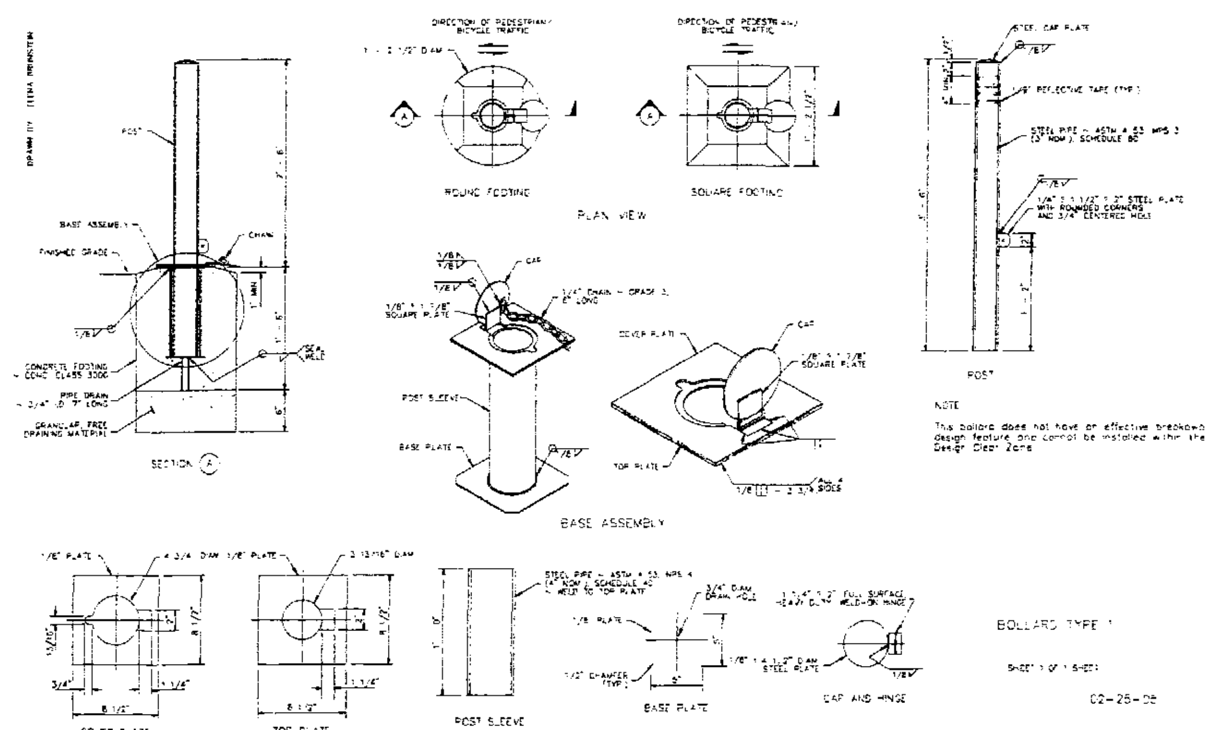
D ADJUSTING CASTINGS TO FINISHED GRADE
NOT TO SCALE



E PEDESTRIAN HANDRAIL DETAIL
NOT TO SCALE



F SIDEWALK DETAILS
NOT TO SCALE



G REMOVABLE BOLLARD DETAILS
NOT TO SCALE

C.O. ____________
W.O. ____________

PLANNING
DESIGN BUILD TEAM
PLANNING Design Build Inc
901 Deming Way, Suite 102
Madison WI 53717
608.836.8055
608.836.5818
planningdesignbuild.com

DETAILS ~ ROADWAY & SURFACE IMPROVEMENTS
SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

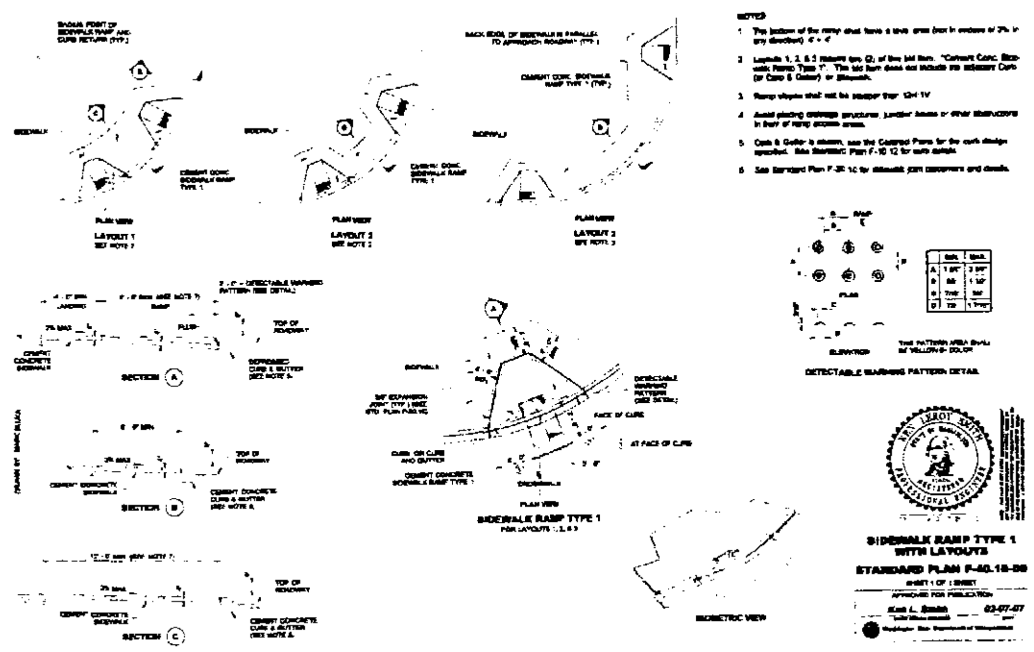
ISSUE DATES:
Oct. 3, 2007
Nov. 28, 2007

Schematic Design Phase:

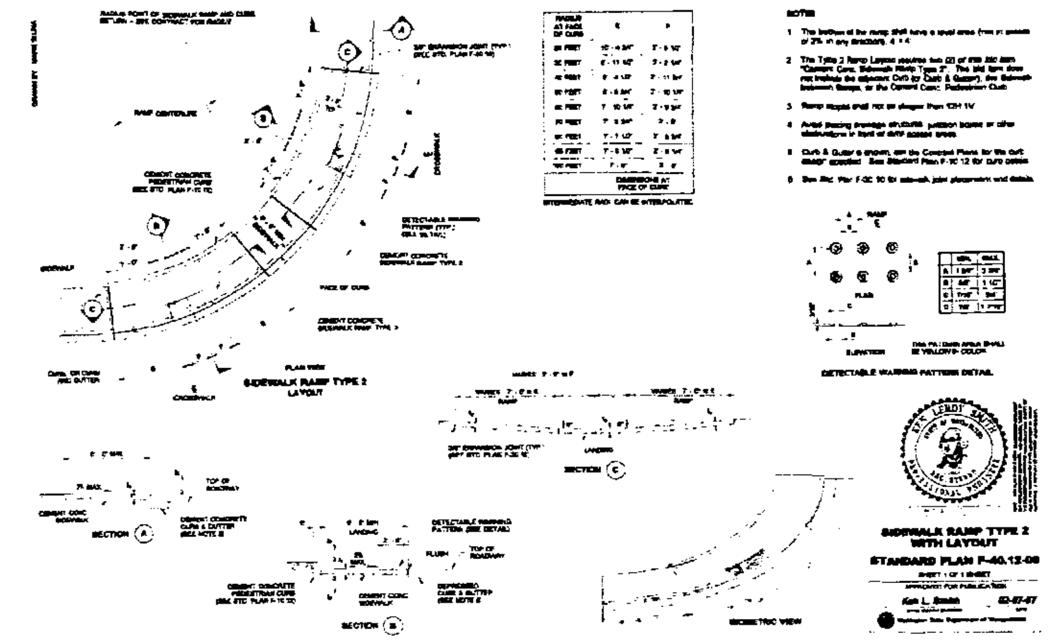
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

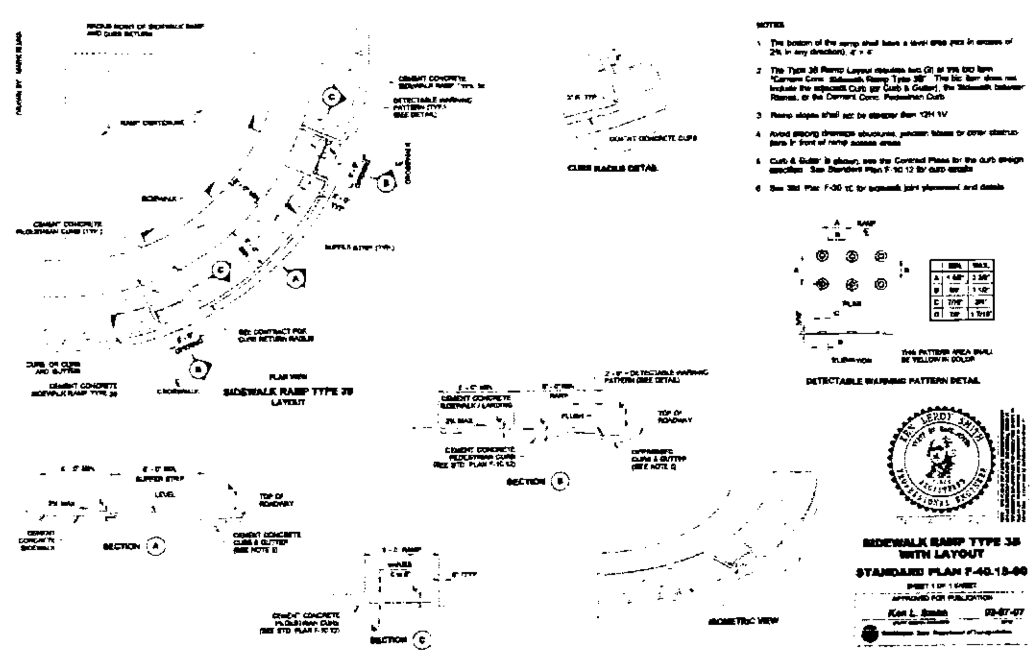
SHEET NUMBER
C7.2
80% DESIGN



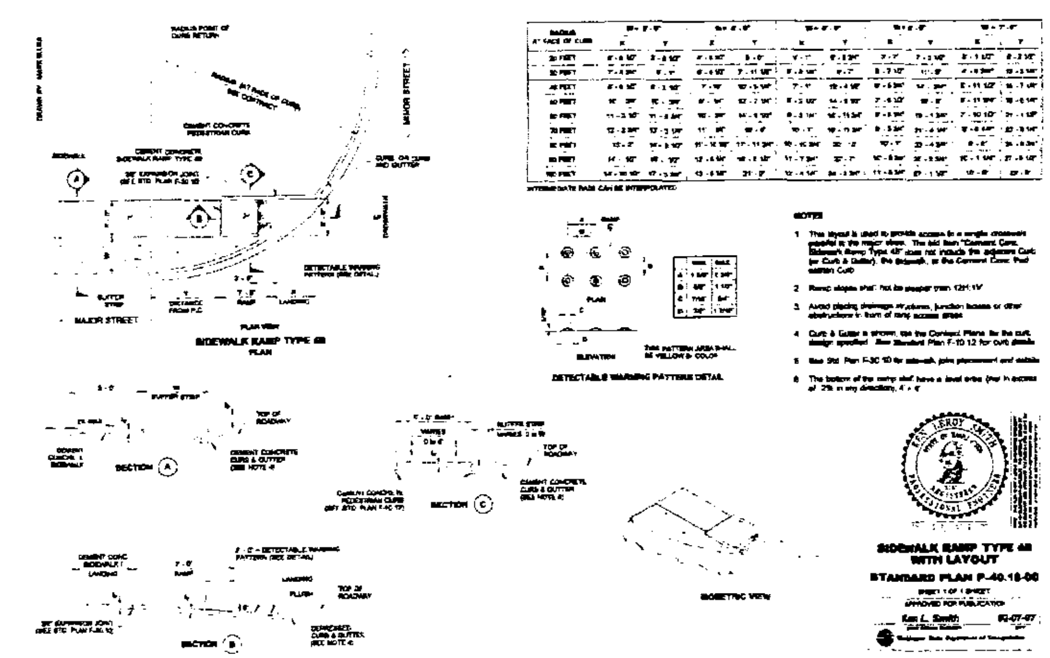
A SIDEWALK RAMP, TYPE 1 DETAILS
NOT TO SCALE



B SIDEWALK RAMP, TYPE 2 DETAILS
NOT TO SCALE



C SIDEWALK RAMP, TYPE 3B DETAILS
NOT TO SCALE



D SIDEWALK RAMP, TYPE 4B DETAILS
NOT TO SCALE

PSE
PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 WWW.PSESURVEY.COM

PLANNING
DESIGN BUILD TEAM
PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.5816
planning@designbuild.com

DETAILS ~ ROADWAY & SURFACE IMPROVEMENTS (2)

SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:
Oct. 3, 2007
Nov. 26, 2007

Schematic Design Phase:

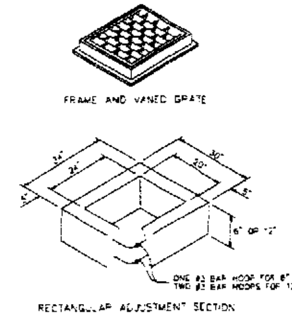
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 2005002 1
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER
C7.3
80% DESIGN

C.O. ______
W.O. ______

PSE
PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE: 671.7387 FAX: 671.4685 WWW.PSESURVEY.COM

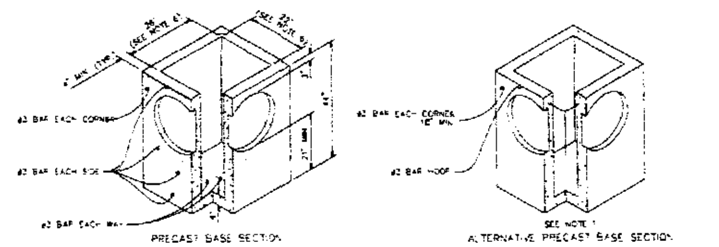


PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER
REINFORCED OR PLAIN CONCRETE	12"
ALL METAL PIPE	15"
CPSSP* (STD. SPEC. 9-05.20)	12"
SOLID WALL PVC (STD. SPEC. 9-05.12(1))	15"
PROFILE WALL PVC (STD. SPEC. 9-05.12(2))	15"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

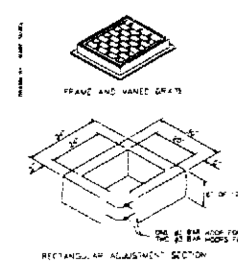
1. As acceptable alternatives to the rebar shown in the PRECAST BASE SECTION, fibers (placed according to the Standard Specifications) or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE PRECAST BASE SECTION. Wire mesh shall not be placed in the knockouts.
2. The knockout diameter shall not be greater than 20". Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification 9-04.3.
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5'.
4. The frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1:24 or steeper.
6. The opening shall be measured at the top of the precast base section.
7. All pickup holes shall be grouted full after the basin has been placed.



CATCH BASIN TYPE 1

06-01-06

A TYPE 1 CATCH BASIN DETAIL
NOT TO SCALE

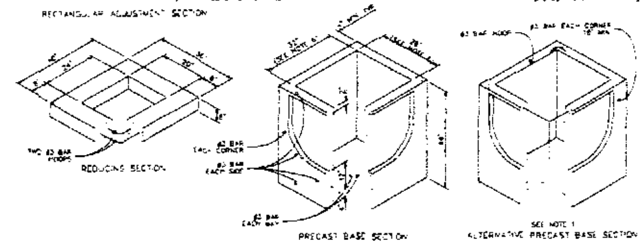


PIPE ALLOWANCES	
PIPE MATERIAL	MAXIMUM INSIDE DIAMETER
REINFORCED OR PLAIN CONCRETE	18"
ALL METAL PIPE	21"
CPSSP* (STD. SPEC. 9-05.20)	18"
SOLID WALL PVC (STD. SPEC. 9-05.12(1))	21"
PROFILE WALL PVC (STD. SPEC. 9-05.12(2))	21"

* CORRUGATED POLYETHYLENE STORM SEWER PIPE

NOTES

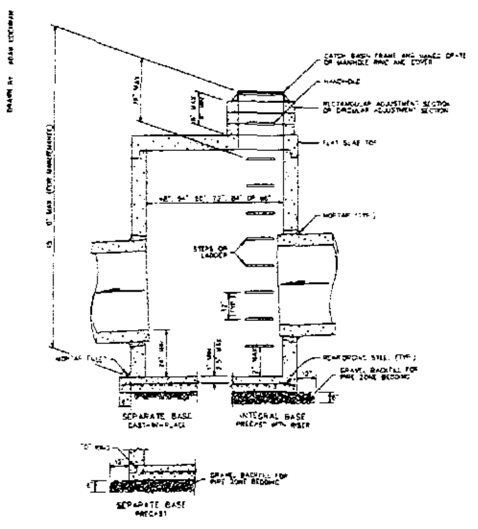
1. As acceptable alternatives to the rebar shown in the PRECAST BASE SECTION, fibers (placed according to the Standard Specifications), or wire mesh having a minimum area of 0.12 square inches per foot shall be used with the minimum required rebar shown in the ALTERNATIVE PRECAST BASE SECTION. Wire mesh shall not be placed in the knockouts.
2. The knockout diameter shall not be greater than 26". Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification 9-04.3.
3. The maximum depth from the finished grade to the lowest pipe invert shall be 5'.
4. The frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
5. The Precast Base Section may have a rounded floor, and the walls may be sloped at a rate of 1:24 or steeper.
6. The opening shall be measured at the top of the precast base section.
7. All pickup holes shall be grouted full after the basin has been placed.



CATCH BASIN TYPE 1L

06-01-06

B TYPE 1L CATCH BASIN DETAIL
NOT TO SCALE



NOTES

1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. The rectangular frame and grate may be installed with the flange up or down. The frame may be cast into the adjustment section.
4. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Standard Specification 9-04.3.

CATCH BASIN DIMENSIONS						
CATCH BASIN DIAMETER	WALL THICKNESS	BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS	BASE REINFORCING STEEL in²/ft IN EACH DIRECTION SEPARATE BASE	INTEGRAL BASE
48"	4"	6"	36"	8"	0.23	0.15
54"	4.5"	8"	42"	8"	0.19	0.19
60"	5"	8"	48"	8"	0.25	0.25
72"	6"	8"	60"	12"	0.35	0.24
84"	8"	12"	72"	12"	0.39	0.29
96"	8"	12"	84"	12"	0.39	0.26

PIPE ALLOWANCES					
CATCH BASIN DIAMETER	PIPE MATERIAL WITH MAXIMUM INSIDE DIAMETER CONCRETE	ALL METAL	CPSSP ①	SOLID WALL PVC ②	PROFILE WALL PVC ③
48"	24"	30"	24"	27"	30"
54"	30"	36"	30"	27"	36"
60"	36"	42"	36"	36"	42"
72"	42"	54"	42"	36"	48"
84"	54"	60"	54"	36"	48"
96"	60"	72"	60"	36"	48"

① Corrugated Polyethylene Storm Sewer Pipe (Std. Spec. 9-05.20)
② (Std. Spec. 9-05.12(1))
③ (Std. Spec. 9-05.12(2))

CATCH BASIN TYPE 2

06-01-06

C TYPE 2 CATCH BASIN DETAIL
NOT TO SCALE

BEDDING SPECIFICATIONS FOR PLASTIC PIPE

THE FOLLOWING SUPPLEMENTAL SPECIFICATIONS ARE TO BE USED IN CONJUNCTION WITH THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, CURRENT EDITION.

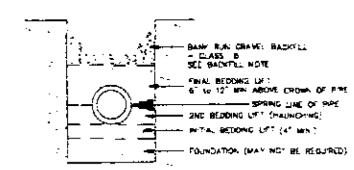
BEDDING FOR SEWERS, DRAINS AND CULVERTS FOR PLASTIC PIPE-

BEDDING MATERIAL FOR PLASTIC PIPE SHALL BE PEA GRAVEL CONFORMING TO THE FOLLOWING SPECIFICATIONS:

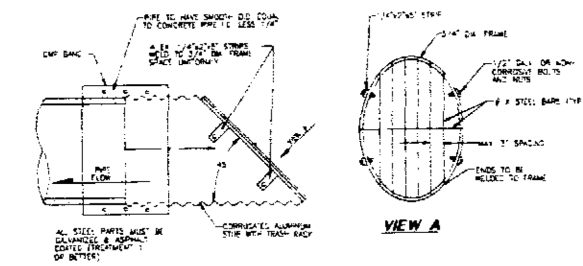
PEA GRAVEL - PEA GRAVEL BEDDING SHALL BE A CLEAN MIXTURE FREE FROM ORGANIC MATTER AND CONFORMING TO THE FOLLOWING GRADATION WHEN TESTED IN ACCORDANCE WITH ASTM D422.

U.S. STANDARD SIEVE SIZE	PERCENT PASSING BY WT
3/4"	100
3/8"	95-100
#8	0-10
#200	0-3

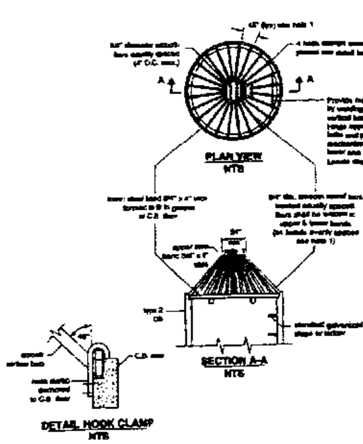
BACKFILL NOTE: WHEREVER A TRENCH IS EXCAVATED IN THE EXISTING OR PROPOSED ROADWAY, SIDEWALK OR OTHER AREAS WHERE SETTLEMENT WOULD BE DETRIMENTAL, THE ENTIRE TRENCH SHALL BE BACKFILLED WITH IMPORTED GRAVEL AND COMPACTED TO 95% OF MAXIMUM DENSITY.



D PLASTIC PIPE BEDDING DETAIL
NOT TO SCALE



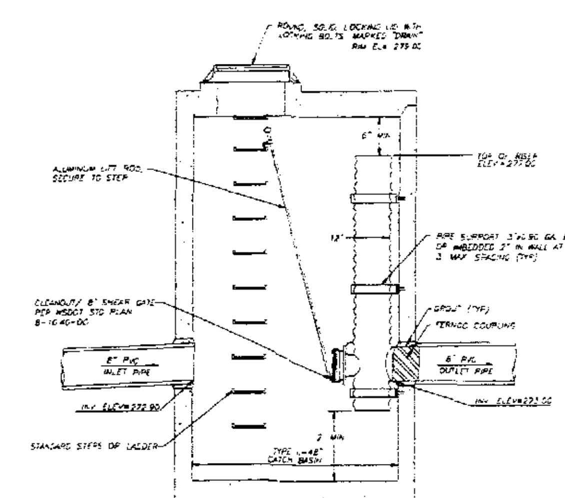
E TRASH RACK DETAIL
NOT TO SCALE



F BIRDCAGE GRATE DETAIL
NOT TO SCALE

NOTES

1. PIPE SUPPORT BRACKETS AND THE RESTRICTOR/SEPARATOR SHALL BE OF THE SAME MATERIAL AND BE ANCHORED AT 3' MAXIMUM SPACING.
2. ALL METAL PARTS SHALL BE CORROSION RESISTANT. ALL GALVANIZED STEEL PARTS SHALL BE ASPHALT TREATMENT 1 COATED.
3. THE RESTRICTOR/SEPARATOR STANDPIPE SHALL BE FABRICATED FROM 0.060" ALUMINUM, 0.064" ALUMINIZED STEEL, OR 0.064" GALVANIZED STEEL IN ACCORDANCE WITH AASHTO M36, M196, M197 AND M274. GALVANIZED STEEL SHALL BE ASPHALT TREATMENT 1 COATED.
4. IF A METAL OUTLET PIPE CONNECTS TO A CEMENT CONCRETE PIPE, THE OUTLET PIPE SHALL HAVE A SMOOTH OUTSIDE DIAMETER EQUAL TO THE INSIDE DIAMETER OF THE CONCRETE PIPE LESS 1/4".
5. THE FRAME AND LADDER (OR STEPS) SHALL OFFSET SO THAT:
   A. THE CLEANOUT GATE IS VISIBLE FROM THE TOP
   B. THE CLIMB DOWN CLEAR SPACE OF 2 FEET IS BETWEEN THE RISER AND CLEANOUT GATE
   C. THE FRAME IS CLEAR OF THE CURB (IF APPLICABLE)



G POND #3 CONTROL STRUCTURE
NOT TO SCALE

C.O. ______
W.O. ______

PLANNING
DESIGN BUILD TEAM
PLANNING Design Build, Inc.
901 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.5616
planningdesignbuild.com

DETAILS ~ DRAINAGE CONTROL IMPROVEMENTS
SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

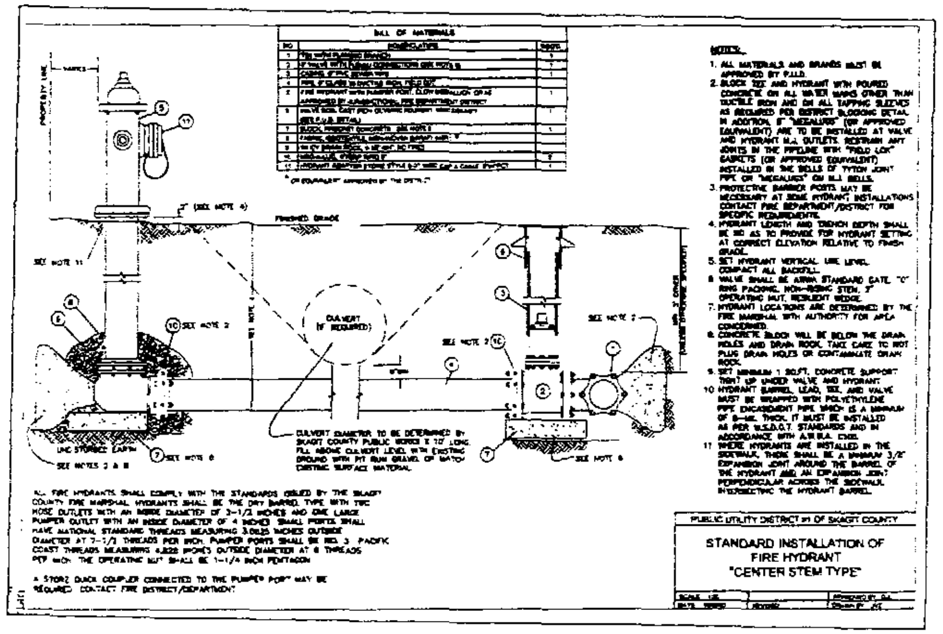
ISSUE DATES:
Oct 3, 2007
Nov 28, 2007

Schematic Design Phase

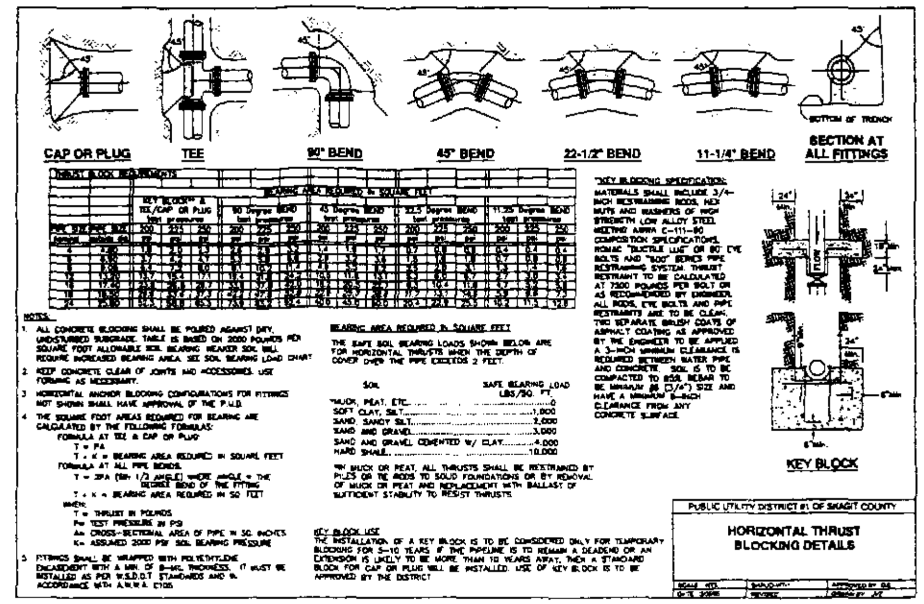
This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175

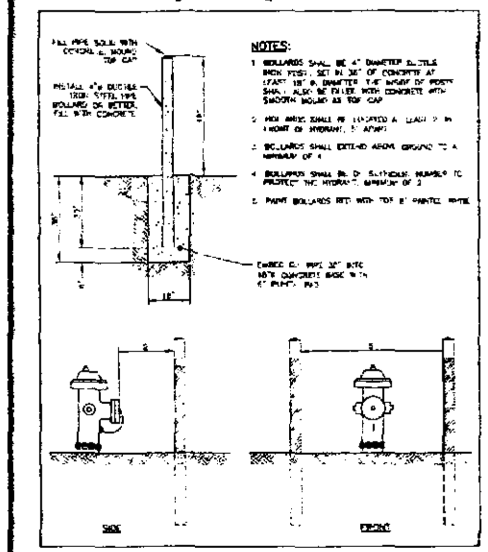
SHEET NUMBER
C7.4
80% DESIGN



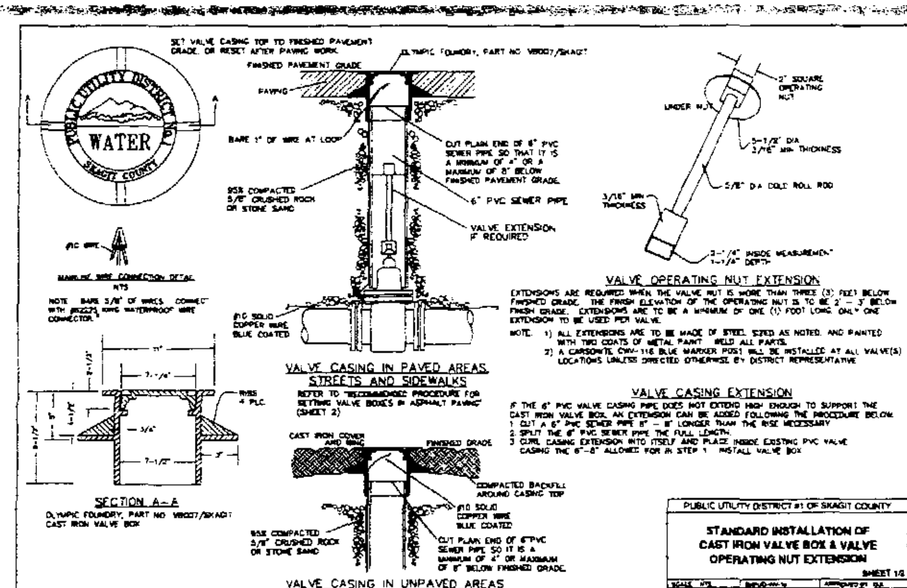
(A) TYPICAL FIRE HYDRANT DETAIL
NOT TO SCALE



(B) HORIZONTAL THRUST BLOCKING DETAILS
NOT TO SCALE



(C) HYDRANT PROTECTION BOLLARDS DETAIL
NOT TO SCALE



RECOMMENDED PROCEDURE FOR RAISING AND SETTING CAST IRON VALVE BOX IN ASPHALT PAVING

1. Locate buried valve box using reference measurements and/or ~~electronic or magnetic locator. Mark location with white paint.~~
2. Break out small hole in pavement and locate the valve box cover.
3. Carefully break out an 18-inch diameter hole with 9-inch radius from the center of the valve box. A circle template 18 inches in diameter is handy to mark out the perimeter of this hole. Use a curved spade with a jackhammer to cut a neat vertical face hole in the asphaltic concrete pavement. Do not crack or damage the pavement beyond this hole.

   If it is suspected the valve casing is not vertical or centered over the valve operating nut, remove just enough pavement to allow removal of the valve box lid so it can be determined if casing adjustment is needed. It is very important to not remove any more finished pavement than absolutely necessary.
4. Completely remove the whole valve box. Do not disturb the surrounding earth any more than necessary.

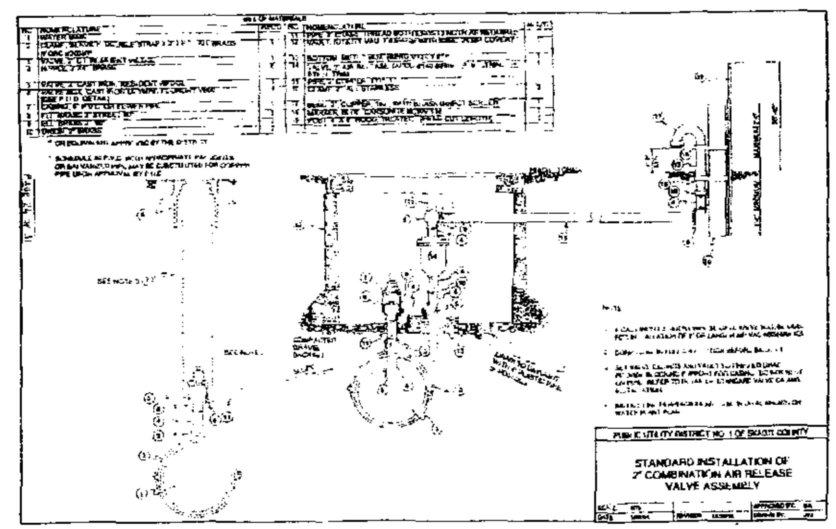
   Examine the casing pipe. Make sure it is vertical, symmetrical around the valve nut and clean of all rocks, debris and dirt. Clean and correct as necessary. Check with a valve wrench to verify operation is smooth.
5. Trim or add to the casing pipe (6-inch PVC plastic or concrete) as needed so the top of the casing pipe is a minimum of 4 inches to maximum of 8 inches below the finished pavement grade. The lid will not fit tight if the casing is higher. Valve box will have poor support if the casing pipe is lower.

   To add casing pipe, use a piece of 6-inch PVC plastic sewer pipe cut 12 inches longer than needed. Saw-cut this piece along one side in a straight line the full length. Fold the pipe over the saw-cut and insert it inside the casing pipe in the ground. Slide up or down to achieve desired level.
6. If the valve operating nut is over 3 feet below finish pavement grade, install a standard valve operating extension, per standard specifications.
7. Using a 1-inch rod or capped 3/4-inch pipe, thoroughly pound the earth all around the casing pipe to obtain maximum earth compaction.
8. Fill the void between the casing pipe and earth wall up to exactly 12 inches (1 foot) below finish pavement grade with 5/8-inch minus crushed rock and thoroughly compact using rod or pipe as in Step 7. Keep adding and compacting crushed rock until hard, tight level surface is exactly 12 inches below pavement grade.
9. Insert the valve box. Using a straight board or rod, check that ~~the top rim of the valve box is exactly level with the~~ finished pavement. The box must set evenly on the crushed rock base. It must not rock or wiggle. Remove the box and adjust the crushed rock as often as necessary to achieve exact grade with pavement and uniform box support. Put cast iron lid on the box. Make sure it fits correctly and is flush with the box rim. Replace lid if incorrect fit. Replace entire valve box if box rim prevents a snug fit of the lid.
10. Add 5/8-inch minus crushed rock uniformly in the space between the valve box and outside earth wall in maximum 4-inch lifts. Compact each lift completely with 1-inch rod or pipe as before. Fill and compact the space up to 2 inches below finished pavement grade.
11. Add hot mix asphaltic concrete material and thoroughly compact with rod or pipe to the finish pavement grade. Smooth off the surface as much as possible.
12. Using a brush, paint the surface of the patch with asphalt tack material, extending minimum of 1 inch over pavement and onto edge of valve box metal rim. Do not allow any tack material to flow into metal rim or on box cover. Use a brush to control application of this tack coat and provide a neat seal surface.
13. Check again that valve casing is clear, that valve wrench can be put on operating nut and valve can be operated properly.
14. Spread clean fine sand over the tack coat so that vehicle tires will not lift the tack material before it cures and sets up.
15. Each valve box in a cluster of two to four valves must be adjusted independently as outlined above. Cutting out triangles or squares of finished pavement results in valve boxes that do not remain even with pavement, lean together, and break out under traffic beating.

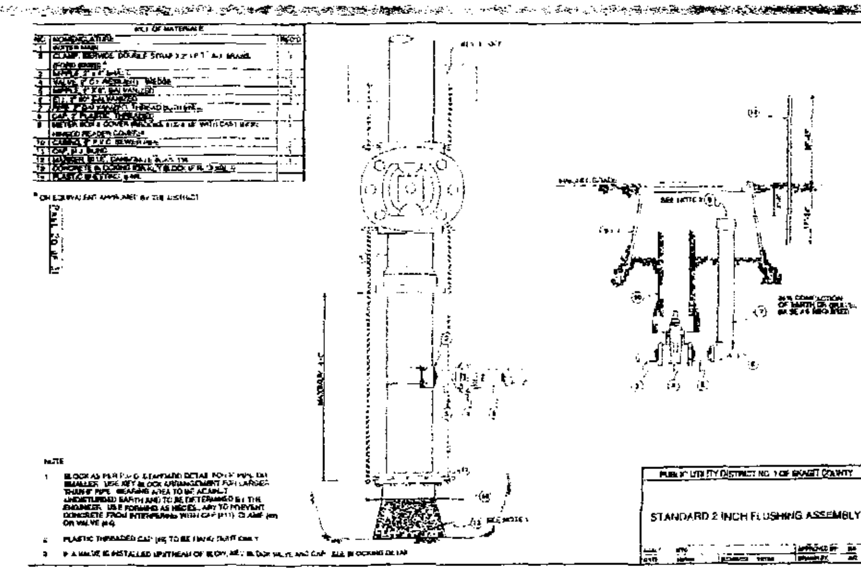
Carefully following this outlined procedure results in valve box settings that will remain firm and in place, and are virtually unnoticed by the public passing over them in their vehicles.

PUBLIC UTILITY DISTRICT #1 OF SKAGIT COUNTY
STANDARD INSTALLATION OF CAST IRON VALVE BOX & VALVE OPERATING NUT EXTENSION
SHEET 2/2

(D) WATER VALVE BOX INSTALLATION DETAILS
NOT TO SCALE



(E) 2" AIR RELEASE VALVE ASSEMBLY DETAIL
NOT TO SCALE



(F) 2" FLUSHING ASSEMBLY DETAIL
NOT TO SCALE

PSE
PACIFIC SURVEY & ENGINEERING, INC.
PLANNING DESIGN BUILD TEAM
PLANNING Design Build Inc.
801 Deming Way, Suite 102
Madison WI 53717
608.836.8066
608 836 5818
planningdesignbuild.com

DETAILS ~ WATER IMPROVEMENTS
SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:
Oct 3, 2007
Nov. 28, 2007

Schematic Design Phase

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20050021
PSE (CIVIL) PROJECT #: 2006175
SHEET NUMBER
C7.6
80% DESIGN

C.O. ______
W.O. ______

EXPIRES 10/10/0?

PACIFIC SURVEY & ENGINEERING, INC.
PHONE:671.7387 FAX:671.6835 WWW.PSESURVEY.COM

GENERAL REQUIREMENTS

1. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE MOST CURRENT EDITION OF THE STATE OF WASHINGTON, DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, SKAGIT COUNTY ROAD STANDARDS AND PUBLIC UTILITY DISTRICT STANDARDS
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING SUBSURFACE CONDITIONS AND SOILS TYPES
3. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES
4. THE CONTRACTOR SHALL LAY OUT AND SET ANY CONSTRUCTION STAKES AND MARKS NEEDED TO ESTABLISH THE LINES, GRADES, SLOPES OR CROSS-SECTIONS AS SHOWN ON THE PLANS OR AS STAKED BY THE ENGINEER
5. THROUGHOUT THE WORK, THE CONTRACTOR SHALL COMPLY WITH ALL PERMITS
6. THE CONTRACTOR SHALL PROTECT ALL PRIVATE AND PUBLIC UTILITIES FROM DAMAGE RESULTING FROM THE WORK
7. WHEN THE CONTRACTOR CONSIDERS THE WORK PHYSICALLY COMPLETE AND READY FOR FINAL INSPECTION, THE CONTRACTOR SHALL REQUEST THE COUNTY AND DISTRICT INSPECTORS SCHEDULE FINAL INSPECTIONS. THE INSPECTOR WILL MAKE A FINAL INSPECTION AND NOTIFY THE CONTRACTOR IN WRITING OF ALL PARTICULARS IN WHICH THE FINAL INSPECTION REVEALS THE WORK TO BE INCOMPLETE OR UNACCEPTABLE. THE CONTRACTOR SHALL IMMEDIATELY TAKE SUCH CORRECTIVE MEASURES AS ARE NECESSARY TO REMEDY THE LISTED DEFICIENCIES
8. BEFORE ANY CONSTRUCTION OR DEVELOPMENT ACTIVITY, A PRE-CONSTRUCTION MEETING MUST BE HELD BETWEEN THE CONTRACTOR, OWNER, COUNTY, DISTRICT, AND PROJECT ENGINEER
9. A COPY OF THESE APPROVED PLANS MUST BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS
10. THE CONTRACTOR SHALL INFORM THE ENGINEER AND OBTAIN APPROVAL FROM OWNER OF ANY PROPOSED DEVIATIONS FROM THE APPROVED PLANS PRIOR TO CONSTRUCTION OF THE REVISED IMPROVEMENTS. THE CONTRACTOR SHALL KEEP RECORDS OF ALL DEVIATIONS AND SHALL FORWARD THEM TO THE ENGINEER
11. ALL DIMENSIONS AND GRADES SHOWN ON THE PLANS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER IF ANY DISCREPANCIES EXIST BETWEEN ACTUAL FIELD CONDITIONS AND THE ASSUMED CONDITIONS SHOWN ON THE APPROVED PLANS PRIOR TO PROCEEDING WITH CONSTRUCTION, SO THAT NECESSARY PLAN OR DESIGN CHANGES CAN BE MADE. NO EXTRA COMPENSATION SHALL BE PAID TO THE CONTRACTOR FOR EXTRA WORK, INCLUDING REMOVAL AND RECONSTRUCTION OF NEWLY BUILT IMPROVEMENTS, MADE NECESSARY BY ERRORS OF DIMENSION OR GRADE ON THE APPROVED PLANS, UNLESS SUCH NOTIFICATION WAS GIVEN
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23- TRAFFIC CONTROL, SHALL APPLY
13. ALL HARD SURFACED PAVEMENTS MUST BE REPAIRED AT THE CLOSE OF EACH WORK DAY. THE REPAIRS CAN BE TEMPORARY WITH ASPHALT COLD MIX OR PERMANENT WITH HOT MIX ASPHALT OR CONCRETE. ALL REPAIRS SHALL BE ACCORDING TO SKAGIT COUNTY SPECIFICATIONS
14. ALL APPLICABLE WORK MUST BE INSPECTED BY REPRESENTATIVES OF SKAGIT COUNTY ENGINEERING DIVISION, PUBLIC UTILITY DISTRICT No.1, OR SAMISH WATER & SEWER DISTRICT. MINIMUM 24 HOURS NOTICE MUST BE GIVEN PRIOR TO STARTING WORK OR TO SCHEDULE INSPECTIONS
15. BACKFILLING FOR ALL NEW CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 2-09.3(1)E OF THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION
16. ANY REVISIONS TO PLANS MUST BE MADE BY THE PROJECT ENGINEER AND APPROVED BY THE ENGINEER PRIOR TO ANY IMPLEMENTATION IN THE FIELD
17. ALL PIPE LINEAR FOOT DISTANCES DEPICTED ON PLANS REPRESENT HORIZONTAL DISTANCES
18. ALL PORTLAND CEMENT CONCRETE SHALL BE APWA CLASS 3000 PER APWA STANDARD SPECIFICATIONS, SECTION 6-02.3(2)B

STORM DRAINAGE

1. ALL PIPE AND APPURTENANCES SHALL BE LAID ON A PROPERLY PREPARED FOUNDATION IN ACCORDANCE WITH WSDOT 7-08.3. THIS SHALL INCLUDE LEVELING AND COMPACTING THE TRENCH BOTTOM, THE TOP OF THE FOUNDATION MATERIAL AND ANY REQUIRED PIPE BEDDING, TO A UNIFORM GRADE SO THAT THE ENTIRE PIPE IS SUPPORTED BY A UNIFORMLY DENSE UNYIELDING BASE. DRAINAGE MATERIALS SHALL CONFORM TO SEC. 9-05
2. CATCH BASINS SHALL BE TYPE 1 OR TYPE 2, WSDOT STANDARD PLANS, FRAME AND GRATE UNLESS OTHERWISE NOTED. THE OUTSIDE EDGE OF THE CATCH BASIN SHALL BE PLACED AT THE INTERSECTION OF THE CURB AND GUTTER AND 0.010' BELOW FINISHED GRADE
3. INSPECTION OF THE STORM DRAIN SYSTEM MUST BE CALLED FOR BEFORE ANY BACKFILL IS PLACED FOR THE DRAIN SYSTEM
4. ALL CATCH BASIN GRATES SHALL INCLUDE THE STAMPING "OUTFALL TO STREAM, DUMP NO POLLUTANTS"
5. UNLESS OTHERWISE SPECIFIED, CAST IRON PRODUCTS SHALL CONFORM TO ASTM DESIGNATION "A 48 CLASS 30" AND DUCTILE IRON PRODUCTS TO ASTM DESIGNATION "A 536 GRADE 80-55-06"

EARTHWORK

1. THE CONTRACTOR SHALL CLEAR, GRUB AND CLEAN UP THOSE AREAS SHOWN ON THE PLANS
2. THE CONTRACTOR SHALL RAZE, REMOVE AND DISPOSE OF ALL BUILDINGS AND FOUNDATIONS, STRUCTURES, FENCES AND OTHER OBSTRUCTIONS THAT LIE WHOLLY OR PARTIALLY WITHIN THE PROJECT LIMITS
3. THE CONTRACTOR SHALL EXCAVATE AND GRADE TO THE ALIGNMENT, GRADE AND CROSS-SECTIONS SHOWN IN THE PLANS OR ESTABLISHED BY THE ENGINEER
4. MAXIMUM DENSITY AND OPTIMUM MOISTURE FOR GRANULAR MATERIALS WILL BE DETERMINED USING ASTM D-1557 TEST METHOD
5. UNSUITABLE MATERIAL NOT FIT FOR A SUB-GRADE SHALL BE EXCAVATED TO THE BOUNDARIES SET BY THE ENGINEER AND REPLACED WITH A SUITABLE BACKFILL MATERIAL

PAVEMENTS

1. SOIL RESIDUAL HERBICIDE SHALL BE PLACED WITHIN 24 HOURS OF PAVING
2. WHERE NEWLY CONSTRUCTED PAVING MEETS EXISTING PAVING, THE APPLICANT SHALL OVERLAY AND FEATHER NEW PAVEMENT TO PROVIDE A SMOOTH TRANSITION FROM EXISTING TO PROPOSED PAVING. APPLICATION OF A THIN PAINT COAT OF EMULSIFIED ASPHALT SHALL BE APPLIED TO INSURE PROPER BONDING
3. ALL PAVEMENT REPAIR SHALL BE SAW-CUT BEFORE REMOVAL. AR-4000A SHALL BE APPLIED TO ALL EDGES OF EXISTING PAVEMENT
4. THE COMPLETED SURFACE OF ALL COURSES SHALL BE OF UNIFORM TEXTURE, SMOOTH, UNIFORM AS TO CROWN AND GRADE, AND FREE FROM DEFECTS OF ALL KINDS

BASES

1. BALLAST, GRAVEL BASE AND CRUSHED SURFACING SHALL BE COMPACTED TO AT LEAST 95% OF ITS MAXIMUM DRY DENSITY PER THE MODIFIED PROCTOR METHOD
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COMPACTION TESTING

UTILITIES

1. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE ENGINEER TO ASSURE ACCURATE AND TIMELY COLLECTION OF ALL REQUIRED AS-BUILT DATA. THIS DATA MUST ACCURATELY REFLECT THE EXACT LOCATION OF ALL UNDERGROUND UTILITIES, BOTTOM OF PIPE ELEVATIONS, INVERT ELEVATIONS, MANHOLE LOCATIONS, BLOW-OFF LOCATIONS AND INVERTS OF SERVICE CONNECTION (BOTH AT PIPE AND AT PROPERTY LINE), VERTICAL AND HORIZONTAL BENDS, SERVICE BOXES AND METERS, VALVES AND HYDRANTS. CALL AT LEAST 48-HOURS BEFORE BURYING UNDERGROUND PIPE TO ASSURE AND FACILITATE REQUIRED AS-BUILT SURVEY. THE ENGINEER WILL PROVIDE CERTIFIED AS-BUILT MYLARS TO PUBLIC WORKS UPON PROVISIONAL ACCEPTANCE OF ROAD AND UTILITY IMPROVEMENTS
2. THE CONSTRUCTION OF UNDERGROUND UTILITY LINES SHALL BE SUBJECT TO THE FOLLOWING CRITERIA:
   A. NO MORE THAN 500 FEET OF TRENCH SHALL BE OPENED AT ONE TIME
   B. WHERE CONSISTENT WITH SAFETY AND SPACE CONSIDERATIONS, EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF DITCHES
   C. TRENCH DEWATERING DEVICES SHALL DISCHARGE INTO SEDIMENT TRAPS OR SEDIMENT PONDS
   D. WHERE PRACTICAL, INSTALL GRAVITY PIPE UTILITIES PRIOR TO INSTALLATION OF OTHER UTILITIES
3. UTILITY CONSTRUCTION SHALL BE DONE IN ACCORDANCE WITH APPLICABLE PUBLIC UTILITY DISTRICT AND SAMISH WATER & SEWER DISTRICT
4. TESTING OF NEW WATER LINES, SANITARY SEWER LINES, AND STORM SEWER SYSTEMS SHALL NOT BE PERFORMED UNTIL ALL OTHER ADJACENT UTILITIES HAVE BEEN INSTALLED

EROSION/SEDIMENTATION CONTROL & ROADSIDE PLANTING

1. REFER TO THE EROSION CONTROL PLAN SHEETS FOR EROSION CONTROL SPECIFICATIONS
2. ONSITE EROSION CONTROL MEASURES SHALL BE THE RESPONSIBILITY OF THE APPLICANT AND BE IN PLACE PRIOR TO CONSTRUCTION. ANY PROBLEMS OCCURRING BEFORE FINAL ACCEPTANCE BY THE OWNER'S ENGINEER AND WITHIN 24 MONTHS THEREAFTER SHALL BE CORRECTED BY THE APPLICANT
3. SLOPES SHALL BE STABILIZED TO PREVENT EROSION. IN CASE EROSION OCCURS IN DITCHES, DITCH LINING IS TO BE PROVIDED AS REQUESTED AND SPECIFIED BY THE COUNTY

SANITARY SEWER

1. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATIONS SECTIONS 7-17, 7-16, AND 7-15
2. SANITARY SEWER PIPE BEDDING SHALL BE PEA GRAVEL. ALL TRENCHES SHALL BE BACKFILLED WITH CLASS B BANK RUN GRAVEL OR SUITABLE NATURAL MATERIAL AS DIRECTED BY THE ENGINEER, AND COMPACTED TO 95% MODIFIED PROCTOR DENSITY

WATER SUPPLY SYSTEM

PUD NO. 1 OF SKAGIT COUNTY – DISTRICT PLANS GENERAL NOTES (MINIMUM REQUIREMENTS)

1. UNLESS STATED OTHERWISE, ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH THE MOST CURRENT WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) 2006 STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION AND THE DISTRICT REQUIREMENTS AS OUTLINED IN DISTRICT RESOLUTION NO 1626-94
2. THE CONTRACTOR SHALL SCHEDULE A PRE-CONSTRUCTION CONFERENCE WITH THE DISTRICT ENGINEERING DEPARTMENT [(360)424-7104]. A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION
3. ALL PERMITS NECESSARY FOR THE INSTALLATION OF THE PROPOSED WATER SYSTEM IMPROVEMENTS WILL BE THE RESPONSIBILITY OF THE DEVELOPER, ENGINEER, OR CONTRACTOR TO ACQUIRE. A COPY OF THE PERMIT WILL BE SUBMITTED TO THE DISTRICT, PRIOR TO CONSTRUCTION. ALL RIGHTS SHALL BE GRANTED TO OR TRANSFERRED TO THE DISTRICT
4. ALL TIE-INS, SHUTDOWN, FLUSHING AND HEALTH SAMPLES SHALL BE COORDINATED WITH THE DISTRICT. THE CONTRACTOR SHALL NOT OPERATE ANY VALVES WITHOUT DISTRICT APPROVAL. THE CONTRACTOR IS RESPONSIBLE FOR RETURNING THE VALVES TO THEIR PROPER POSITIONS AS DIRECTED BY THE DISTRICT
5. ALL MATERIALS ARE TO BE APPROVED BY THE DISTRICT PRIOR TO CONSTRUCTION. A LIST OF MATERIALS, INDICATING THE MANUFACTURER, MODEL, AND SIZE, FOR THE WATER SYSTEM IMPROVEMENTS WILL BE SUBMITTED TO THE DISTRICT AND APPROVED BEFORE ANY CONSTRUCTION
6. DUCTILE IRON PIPE WILL BE MINIMUM CLASS 50 AWWA C151 PER WSDOT STANDARD SPECIFICATIONS 9-30.1 AND 9-30.1(1). ALL DUCTILE IRON WATER PIPE AND FITTINGS SHALL BE COMPLETELY WRAPPED WITH A MINIMUM OF EIGHT-MIL POLYETHYLENE PIPE ENCASEMENT AND INSTALLED IN ACCORDANCE WITH AWWA C105 AND WSDOT STANDARD SPECIFICATIONS 7-09.3(7) AND 9-30.1(2)
7. ALL VALVES TO BE RESILIENT SEATED GATE VALVES, AWWA C509 OR C515
8. RESTRAINED JOINTS MAY BE USED IN PLACE OF CONCRETE BLOCKING AS DIRECTED BY THE PROJECT'S DESIGN ENGINEER AND ACCEPTED BY THE DISTRICT
9. CONTACT THE MUNICIPAL FIRE DEPARTMENT OR SKAGIT COUNTY FIRE MARSHAL FOR ACCEPTABLE FIRE HYDRANTS AND STORZ ADAPTOR FITTING REQUIREMENTS
10. A #10 SOLID COPPER WIRE WITH BLUE INSULATION IS TO BE INSTALLED WITH/AND ATTACHED TO ALL NEW WATER PIPELINES AND SERVICE PIPELINES. REFER TO DISTRICT DETAILS FOR INSTALLATION REQUIREMENTS
11. UNLESS OTHERWISE SPECIFIED, ALL WATER PIPELINE INSTALLATIONS REQUIRE A 36-INCH MINIMUM COVER AND 48-INCH MAXIMUM TRENCH DEPTH TO EXISTING OR FUTURE FINISH GRADE AND A MINIMUM OF 1-FOOT VERTICAL AND 5-FOOT HORIZONTAL CLEARANCE BETWEEN WATER PIPELINE AND ALL OTHER UTILITIES UNLESS OTHERWISE SPECIFIED. WATER PIPELINE HORIZONTAL AND VERTICAL ALIGNMENTS ARE REQUIRED TO BE STAKED ON A MAXIMUM 50-FOOT INTERVAL, OR AS REQUIRED BY THE DISTRICT
12. WHEN INSTALLING WATER PIPELINE ACROSS EXISTING OR PROPOSED SANITARY SEWER, A FULL LENGTH OF PIPE SHALL BE INSTALLED WITH MID-SPAN OF THE WATER PIPE OVER THE SEWER. A MINIMUM 10-FOOT HORIZONTAL SEPARATION BETWEEN WATER PIPELINES AND SANITARY SEWER PIPELINES IS REQUIRED, UNLESS AN ALTERNATIVE PROPOSAL FROM THE DESIGN ENGINEER IS SUBMITTED TO AND APPROVED BY THE DISTRICT
13. BEDDING MATERIAL FOR THE DUCTILE IRON PIPE SHALL BE SELECT, NATIVE, GRANULAR MATERIAL FREE FROM WOOD WASTE, ORGANIC MATERIAL, OR OTHER EXTRANEOUS OR OBJECTIONABLE MATERIALS AND SHALL BE A MAXIMUM SIZE OF 1-1/2-INCHES OR APPROVED PIPE BEDDING PER WSDOT SPECIFICATION 7-09.3(9) AND 9-03.12(3). PEA GRAVEL AND BUCKSHOT ARE NOT ACCEPTABLE
14. BACKFILL TRENCHES IN PAVEMENT AREAS WITH PIT-RUN GRAVEL COMPACTED TO AT LEAST 95 PERCENT MINIMUM DENSITY PER WSDOT SPECIFICATION 7-09.3(11). THE CONTRACTOR SHALL MAKE ALL PAVEMENT REPAIRS AND PERFORM ALL RESTORATION
15. DISINFECTION AND FLUSHING OF THE WATER PIPELINES ARE TO BE PER WSDOT SPECIFICATIONS. USE DECHLORINATION EQUIPMENT WHEN FLUSHING OR, WITH PERMISSION OF THE APPROPRIATE SEWER UTILITY, FLUSH INTO SANITARY SEWER MANHOLES. DO NOT FLUSH INTO OR ALLOW CHLORINATED WATER TO DRAIN INTO ANY CREEK, WETLAND, OR CATCH BASIN. THE TOTAL ESTIMATED AMOUNT OF WATER USED FOR FILLING AND FLUSHING OF THE WATER PIPELINE IS ____________
16. PRESSURE TEST NEW PIPELINE, INCLUDING FIRE HYDRANTS AND SERVICE LINES AS PER WSDOT STANDARDS

    TEST DATE ____________ TEST PRESSURE ____________

    TIME START ____________ TIME END ____________

    PRESSURE DROP ____________ MAKE-UP WATER ____________
17. ALL SALVAGED USABLE DISTRICT OWNED MATERIALS ARE TO BE DELIVERED TO THE DISTRICT OFFICE AT 1415 FREEWAY DRIVE, MOUNT VERNON, OR AS DIRECTED BY THE DISTRICT
18. THE UTILITY LOCATIONS MARKED ON THIS MAP ARE APPROXIMATE. THE CONTRACTOR IS TO VERIFY ACTUAL LOCATION AND DEPTH PRIOR TO CONSTRUCTION. CALL THE UNDERGROUND UTILITY LOCATE CENTER AT 1(800) 424-5555
19. ALL PRIVATE FIRE SPRINKLERS OR PRIVATE FIRE HYDRANT PIPELINES ARE REQUIRED TO BE INSTALLED WITH A WASHINGTON STATE DEPARTMENT OF HEALTH (WSDOH) APPROVED DOUBLE CHECK DETECTOR ASSEMBLY(IES) OR REDUCED PRESSURE DETECTOR ASSEMBLY(IES), WITH A BADGER RECORDALL METER WITH A REMOTE TOUCH-READ PAD INSTALLED WITHIN 6-INCHES OF THE VAULT LID'S HINGE AND BRASS PLUGS IN THE TEST PORTS. THE METER WILL BE SUPPLIED BY THE DISTRICT AND WILL BE INCLUDED WITH THE CHARGES IN THE WORK ORDER
20. A WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY SHALL BE INSTALLED AT TEMPORARY PIPELINE CONNECTIONS BETWEEN THE EXISTING PIPELINES AND NEW WATER PIPELINE FOR FILLING AND FLUSHING OF THE IMPROVEMENTS. THE ASSEMBLY SHALL HAVE BEEN TESTED AND APPROVED A MAXIMUM OF EVERY SIX MONTHS AND THE TEST REPORT PROVIDED TO THE DISTRICT BEFORE CONNECTION TO THE EXISTING WATER SYSTEM. ALL NEW WATER PIPELINES AND REPAIRED PORTIONS OF/OR EXTENSION TO EXISTING PIPELINES SHALL BE ADEQUATELY CHLORINATED AND A SATISFACTORY BACTERIOLOGICAL REPORT OBTAINED. THE DISTRICT WILL CONNECT ALL NEW PIPELINES TO THE EXISTING SYSTEM, UNLESS THE CONNECTIONS BY THE CONTRACTOR ARE APPROVED BY THE DISTRICT
21. THE CONTRACTOR IS TO PERFORM ALL EXCAVATION, BLOCKING, BACKFILL AND COMPACTION FOR THE DISTRICT'S TIE-IN WORK AND MAKE ANY NECESSARY ASPHALT, CEMENT AND SIDEWALK REPAIRS AND PERFORM ALL CLEANUP AND RESTORATION

C.O. ____________
W.O. ____________

EXPIRES 10/10/___

PLANNING DESIGN BUILD TEAM

PLANNING Design Build Inc
801 Deming Way, Suite 102
Madison, WI 53717
608.836.8055
608.836.5818
planning@pdbteam.com

GENERAL CONSTRUCTION NOTES
SKAGIT RESORT SITE IMPROVEMENT PLANS
NORTH DARRK LANE, BOW, WASHINGTON 98232

UPPER SKAGIT INDIAN TRIBE
5984 NORTH DARRK LANE
BOW, WASHINGTON 98232

REVISED DATES:

ISSUE DATES:
Oct 3, 2007
Nov 28, 2007

Schematic Design Phase

This drawing indicates the scale and relationship of the project components. This drawing is not for construction.

PLANNING PROJECT #: 20060021
PSE (CIVIL) PROJECT #: 2006175

SHEET NUMBER
C7.7
80% DESIGN

APPENDIX

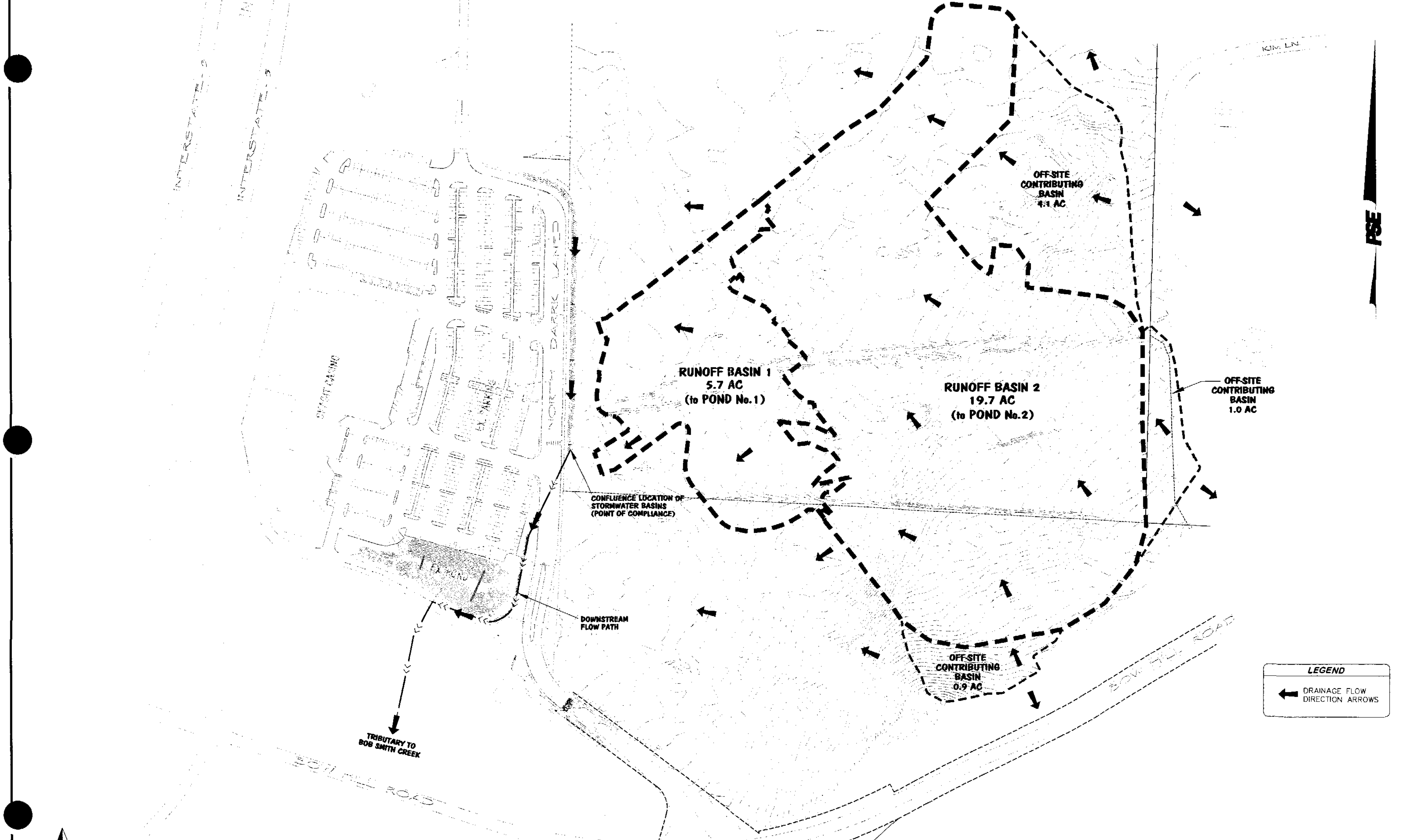
8.4 CONSTRUCTION STORMWATER POLLUTION PREVENTION

See sheets C2.1 and C2.2 in Appendix 8.3

APPENDIX

8.5 DRAINAGE BASIN MAPS

SITUATE IN A PORTIONS OF SECTION 31, TOWNSHIP 36 NORTH, RANGE 4 EAST & SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M., SKAGIT COUNTY, WASHINGTON



PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE:671.7387 FAX:671.4685 WWW.PSESURVEY.COM

GRAPHIC SCALE (us survey feet) 0 50 100 200

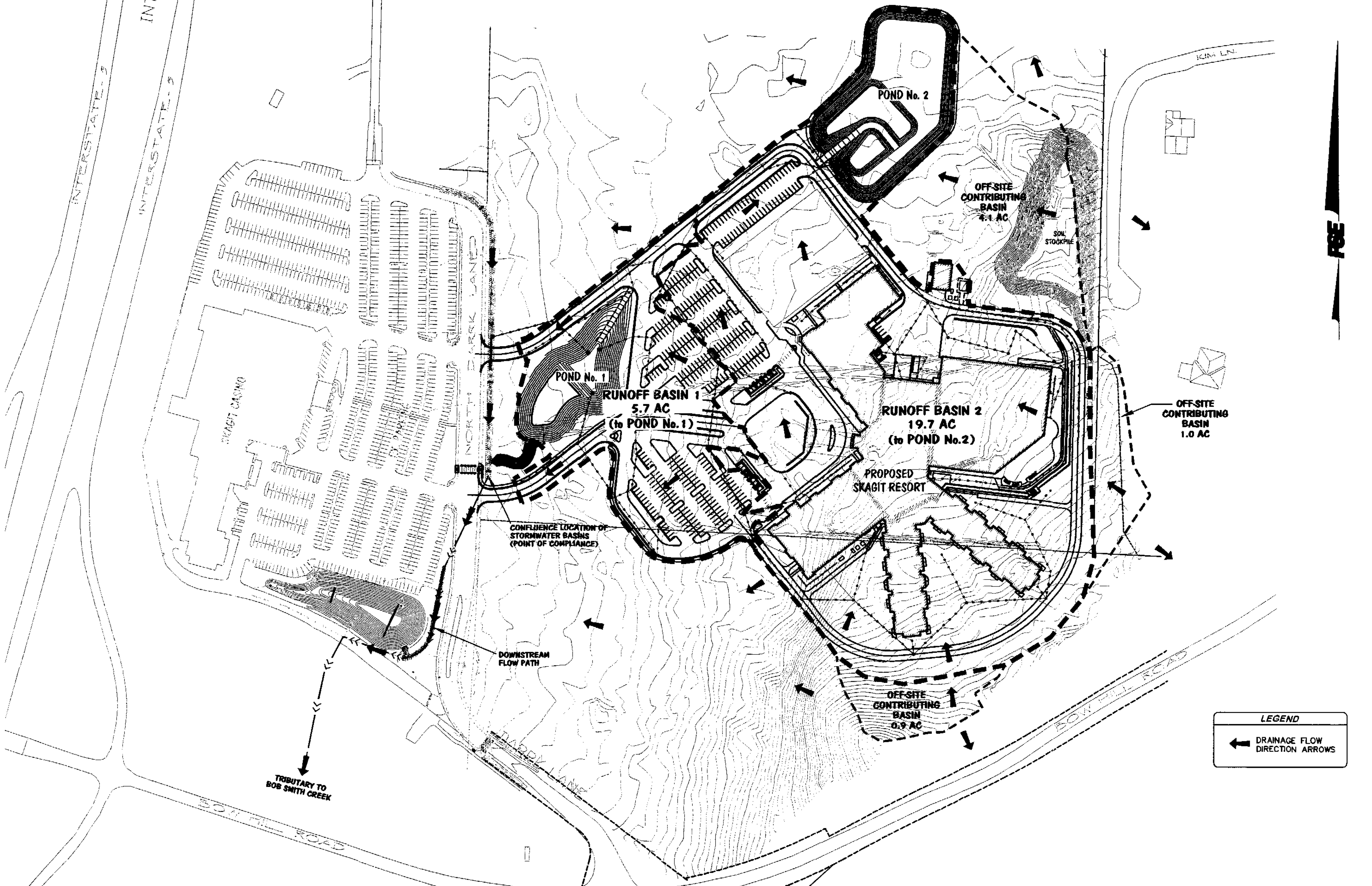
FOR: **UPPER SKAGIT INDIAN TRIBE**
25944 COMMUNITY PLAZA WAY
SEDRO WOOLLEY, WASHINGTON 98284
(360) 854-7000

PRE-DEVELOPMENT STORMWATER BASIN DIAGRAM

DATE: NOVEMBER 7, 2007

SHEET: 1 OF 1

SITUATE IN A PORTIONS OF SECTION 31, TOWNSHIP 36 NORTH, RANGE 4 EAST & SECTION 6, TOWNSHIP 35 NORTH, RANGE 4 EAST, W.M., SKAGIT COUNTY, WASHINGTON



PACIFIC SURVEY & ENGINEERING, INC.
1812 CORNWALL, BELLINGHAM, WA 98225
PHONE:671.7387 FAX:671.4685 WWW.PSESURVEY.COM

GRAPHIC SCALE (in survey feet)

FOR: UPPER SKAGIT INDIAN TRIBE
25944 COMMUNITY PLAZA WAY
SEDRO WOOLLEY, WASHINGTON 98284
(360) 854-7000

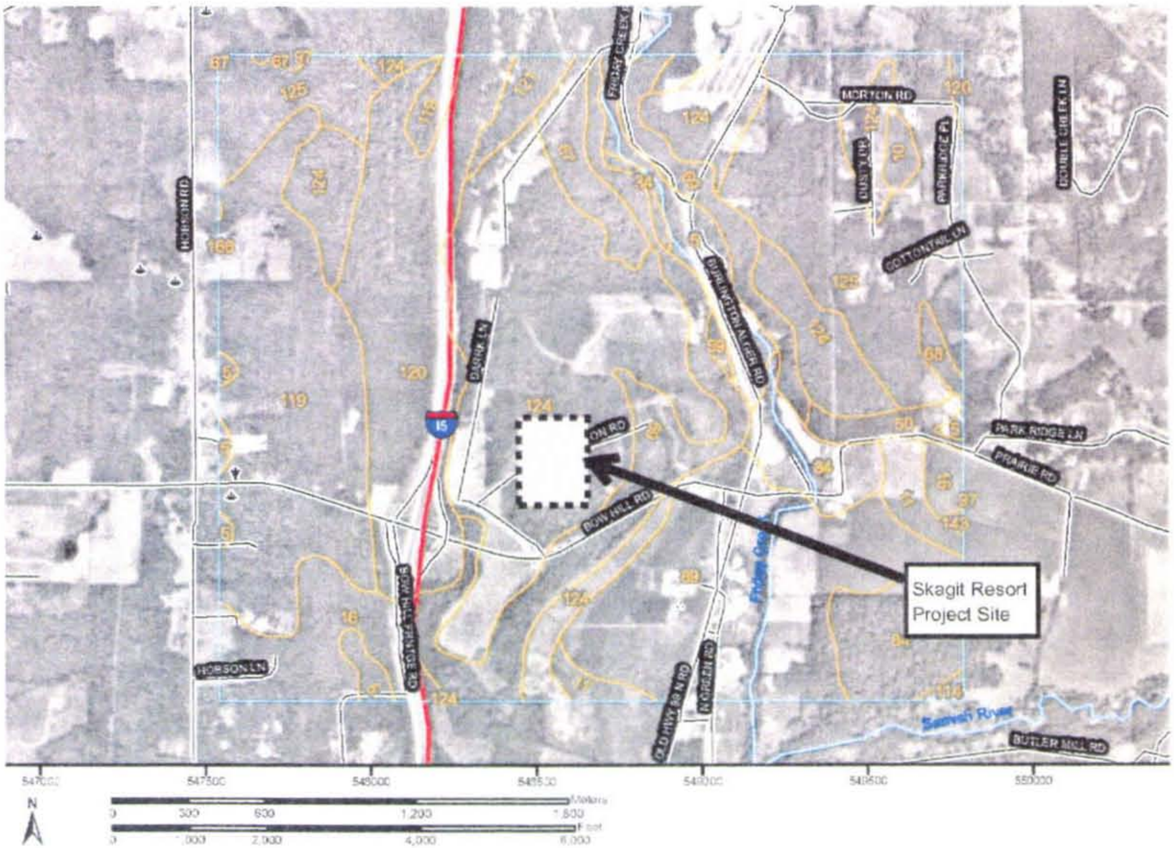
POST-DEVELOPMENT STORMWATER BASIN DIAGRAM

DATE: NOVEMBER 7, 2007

SHEET: 1 OF 1

APPENDIX

8.6 NRCS SOIL CLASSIFICATION



Soil Unit 124: Skipopa Silt Loams (Hydrologic Group 'D')

APPENDIX

8.7 HYDROLOGIC COMPUTER MODELING REPORT

Upper Skagit Indian Tribe – Skagit Resort
On-site Stormwater Analysis – Pond 1
November 8, 2007

****Note: Elevation 0.00 in the WWHM2 model (Pond 1 only) corresponds to elevation 253.00 in the civil drawings and StormShed computer modeling****

WESTERN WASHINGTON HYDROLOGY MODEL V2
PROJECT REPORT

Project Name: 2006175_USIT_South_Pond_WEIR
Site Address:
City :
Report Date : 11/8/2007
Gage : Burlington
Data Start : 1948
Data End : 1999
Precip Scale: 1.00

PREDEVELOPED LAND USE

Basin : South Pond
Flows To : Point of Compliance
GroundWater: No

Land Use	Acres
TILL FOREST:	5.665

DEVELOPED LAND USE
Basin : South Pond
Flows To : USIT_Pond_South_weir
GroundWater: No

Land Use	Acres
TILL GRASS:	1.657
IMPERVIOUS:	4.008

RCHRES (POND) INFORMATION
Pond Name: USIT_Pond_South_weir
Pond Type: Table
Pond Flows to : Point of Compliance
Pond Rain / Evap is not activated.
Dimensions
Depth: 0ft.

Pond Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dschrg(cfs)	Infilt(cfs)
0.000	0.492	0.000	0.000	0.000
0.100	0.499	0.053	0.010	0.000
0.200	0.506	0.105	0.015	0.000
0.300	0.513	0.158	0.018	0.000
0.400	0.519	0.210	0.021	0.000
0.500	0.526	0.263	0.023	0.000
0.600	0.533	0.316	0.025	0.000
0.700	0.540	0.368	0.028	0.000
0.800	0.547	0.421	0.029	0.000
0.900	0.553	0.474	0.031	0.000
1.000	0.560	0.526	0.033	0.000
1.100	0.567	0.586	0.034	0.000
1.200	0.575	0.645	0.036	0.000

1.300	0.582	0.705	0.037	0.000
1.400	0.589	0.765	0.039	0.000
1.500	0.596	0.824	0.040	0.000
1.600	0.603	0.884	0.042	0.000
1.700	0.610	0.943	0.043	0.000
1.800	0.617	1.003	0.044	0.000
1.900	0.625	1.063	0.045	0.000
2.000	0.632	1.122	0.046	0.000
2.100	0.639	1.189	0.048	0.000
2.200	0.647	1.256	0.049	0.000
2.300	0.654	1.323	0.050	0.000
2.400	0.662	1.390	0.051	0.000
2.500	0.669	1.457	0.052	0.000
2.600	0.677	1.524	0.053	0.000
2.700	0.684	1.591	0.054	0.000
2.800	0.692	1.657	0.055	0.000
2.900	0.699	1.724	0.098	0.000
3.000	0.707	1.791	0.116	0.000
3.100	0.714	1.866	0.130	0.000
3.200	0.722	1.940	0.142	0.000
3.300	0.730	2.015	0.153	0.000
3.400	0.738	2.090	0.162	0.000
3.500	0.746	2.164	0.171	0.000
3.600	0.754	2.239	0.180	0.000
3.700	0.762	2.314	0.188	0.000
3.800	0.770	2.388	0.249	0.000
3.900	0.778	2.463	0.483	0.000
4.000	0.786	2.537	0.813	0.000
4.100	0.786	2.620	4.000	0.000

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped

Return Period	Flow(cfs)
2 year	0.109659
5 year	0.201612
10 year	0.275286
25 year	0.381771
50 year	0.470251
100 year	0.56617

Flow Frequency Return Periods for Developed Unmitigated

Return Period	Flow(cfs)
2 year	1.213086
5 year	1.709323
10 year	2.075981
25 year	2.584099
50 year	2.996188
100 year	3.43791

Flow Frequency Return Periods for Developed Mitigated

Return Period	Flow(cfs)
2 year	0.05519
5 year	0.107815
10 year	0.161061
25 year	0.257298
50 year	0.356235
100 year	0.484824

Yearly Peaks for Predeveloped and Developed-Mitigated

Year	Predeveloped	Developed
1949	0.283	0.079
1950	0.183	0.146
1951	0.183	0.053
1952	0.137	0.048
1953	0.065	0.051
1954	0.080	0.048
1955	0.100	0.037

1956	0.088	0.046
1957	0.157	0.085
1958	0.068	0.036
1959	0.165	0.053
1960	0.107	0.055
1961	0.069	0.049
1962	0.013	0.039
1963	0.072	0.035
1964	0.080	0.038
1965	0.144	0.055
1966	0.072	0.035
1967	0.094	0.044
1968	0.200	0.053
1969	0.056	0.045
1970	0.037	0.035
1971	0.194	0.178
1972	0.093	0.048
1973	0.091	0.050
1974	0.187	0.109
1975	0.772	2.155
1976	0.058	0.049
1977	0.074	0.038
1978	0.118	0.052
1979	0.066	0.035
1980	0.187	0.130
1981	0.108	0.039
1982	0.222	0.119
1983	0.110	0.054
1984	0.220	0.054
1985	0.045	0.037
1986	0.144	0.118
1987	0.108	0.054
1988	0.299	0.044
1989	0.063	0.043
1990	0.163	0.183
1991	0.279	0.488
1992	0.118	0.045
1993	0.105	0.038
1994	0.021	0.034
1995	0.031	0.043
1996	0.130	0.041
1997	0.593	0.072
1998	0.119	0.042
1999	0.068	0.040

Ranked Yearly Peaks for Predeveloped and Developed-Mitigated

Rank	Predeveloped	Developed
1	0.7720	2.1546
2	0.5927	0.4885
3	0.2987	0.1831
4	0.2828	0.1783
5	0.2786	0.1461
6	0.2224	0.1304
7	0.2197	0.1189
8	0.2005	0.1181
9	0.1936	0.1093
10	0.1867	0.0851
11	0.1865	0.0792
12	0.1829	0.0717
13	0.1828	0.0549
14	0.1646	0.0545
15	0.1629	0.0543
16	0.1570	0.0543
17	0.1436	0.0539
18	0.1436	0.0528
19	0.1374	0.0527
20	0.1300	0.0526
21	0.1195	0.0520
22	0.1182	0.0511
23	0.1179	0.0504

24	0.1101	0.0488
25	0.1079	0.0485
26	0.1077	0.0483
27	0.1075	0.0482
28	0.1052	0.0475
29	0.1000	0.0459
30	0.0941	0.0446
31	0.0927	0.0446
32	0.0908	0.0444
33	0.0877	0.0435
34	0.0805	0.0435
35	0.0798	0.0427
36	0.0740	0.0418
37	0.0719	0.0413
38	0.0716	0.0395
39	0.0689	0.0394
40	0.0683	0.0390
41	0.0679	0.0384
42	0.0657	0.0378
43	0.0650	0.0376
44	0.0626	0.0372
45	0.0579	0.0369
46	0.0564	0.0357
47	0.0448	0.0351
48	0.0375	0.0351
49	0.0306	0.0347
50	0.0210	0.0345
51	0.0130	0.0336

1/2 2 year to 50 year

Flow(CFS)	Predev	Final	Percentage	Pass/Fail
0.0548	4090	2623	64.0	Pass
0.0590	3455	1548	44.0	Pass
0.0632	3033	1470	48.0	Pass
0.0674	2706	1390	51.0	Pass
0.0716	2421	1320	54.0	Pass
0.0758	2184	1251	57.0	Pass
0.0800	1919	1175	61.0	Pass
0.0842	1705	1121	65.0	Pass
0.0884	1523	1066	69.0	Pass
0.0926	1358	1020	75.0	Pass
0.0968	1228	968	78.0	Pass
0.1010	1096	902	82.0	Pass
0.1052	949	830	87.0	Pass
0.1094	860	776	90.0	Pass
0.1136	789	727	92.0	Pass
0.1178	729	680	93.0	Pass
0.1220	662	624	94.0	Pass
0.1262	591	566	95.0	Pass
0.1304	526	516	98.0	Pass
0.1346	480	459	95.0	Pass
0.1388	446	428	95.0	Pass
0.1429	411	393	95.0	Pass
0.1471	365	331	90.0	Pass
0.1513	334	298	89.0	Pass
0.1555	307	261	85.0	Pass
0.1597	282	238	84.0	Pass
0.1639	265	218	82.0	Pass
0.1681	234	179	76.0	Pass
0.1723	206	155	75.0	Pass
0.1765	189	123	65.0	Pass
0.1807	165	100	60.0	Pass
0.1849	147	85	57.0	Pass
0.1891	135	69	51.0	Pass
0.1933	125	62	49.0	Pass
0.1975	118	59	50.0	Pass
0.2017	112	56	50.0	Pass
0.2059	106	56	52.0	Pass
0.2101	102	53	51.0	Pass
0.2143	96	53	55.0	Pass

0.2185	90	52	57.0	Pass
0.2227	86	51	59.0	Pass
0.2269	82	50	60.0	Pass
0.2311	79	49	62.0	Pass
0.2353	75	48	64.0	Pass
0.2395	72	47	65.0	Pass
0.2437	70	46	65.0	Pass
0.2479	68	45	66.0	Pass
0.2520	64	44	68.0	Pass
0.2562	59	44	74.0	Pass
0.2604	57	43	75.0	Pass
0.2646	55	43	78.0	Pass
0.2688	52	43	82.0	Pass
0.2730	50	41	82.0	Pass
0.2772	49	39	79.0	Pass
0.2814	46	38	82.0	Pass
0.2856	43	37	86.0	Pass
0.2898	42	37	88.0	Pass
0.2940	41	36	87.0	Pass
0.2982	40	35	87.0	Pass
0.3024	38	34	89.0	Pass
0.3066	37	33	89.0	Pass
0.3108	37	31	83.0	Pass
0.3150	36	30	83.0	Pass
0.3192	36	29	80.0	Pass
0.3234	35	29	82.0	Pass
0.3276	35	28	80.0	Pass
0.3318	34	26	76.0	Pass
0.3360	33	26	78.0	Pass
0.3402	33	25	75.0	Pass
0.3444	32	25	78.0	Pass
0.3486	31	23	74.0	Pass
0.3528	30	23	76.0	Pass
0.3570	29	23	79.0	Pass
0.3612	29	23	79.0	Pass
0.3653	28	22	78.0	Pass
0.3695	28	20	71.0	Pass
0.3737	27	20	74.0	Pass
0.3779	25	17	68.0	Pass
0.3821	25	16	64.0	Pass
0.3863	25	15	60.0	Pass
0.3905	24	15	62.0	Pass
0.3947	23	15	65.0	Pass
0.3989	22	15	68.0	Pass
0.4031	20	15	75.0	Pass
0.4073	20	14	70.0	Pass
0.4115	19	14	73.0	Pass
0.4157	18	14	77.0	Pass
0.4199	17	14	82.0	Pass
0.4241	16	14	87.0	Pass
0.4283	14	13	92.0	Pass
0.4325	14	13	92.0	Pass
0.4367	13	13	100.0	Pass
0.4409	13	13	100.0	Pass
0.4451	13	13	100.0	Pass
0.4493	12	12	100.0	Pass
0.4535	12	12	100.0	Pass
0.4577	12	11	91.0	Pass
0.4619	11	11	100.0	Pass
0.4661	11	10	90.0	Pass
0.4703	10	10	100.0	Pass

Water Quality BMP Flow and Volume.
On-line facility volume: 0.4738 acre-feet
On-line facility target flow: 0.573 **cfs.**
Adjusted for 15 min: 0.6257 **cfs.**
Off-line facility target flow: 0.3346 **cfs.**
Adjusted for 15 min: 0.3653 **cfs.**
This program and accompanying documentation is provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed

by the user. Clear Creek Solutions and the Washington State Department of Ecology disclaims all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions and/or the Washington State Department of Ecology be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions or the Washington State Department of Ecology has been advised of the possibility of such damages.

POND 1 – SOUTH POND
STAGE-STORAGE-DISCHARGE TABLE GENERATION
(From StormShed 2G)

****Note: Elevation 0.00 in the WWHM2 model is set at elevation 253.00 in the StormShed model (Pond 1 only)*****

Record Id: SOUTH-STREAM-COMBO

Descrip:	Prototype Structure	Increment	0.10 ft
Start El.	253.0000 ft	Max El.	257.0000 ft
List of Discharge Structures:		SOUTH-STREAM-OR1 SOUTH-STREAM-WEIR1	

Record Id: SOUTH-STREAM-OR1

Descrip:	Prototype Structure	Increment	0.10 ft
Start El.	253.0000 ft	Max El.	257.0000 ft
Orif Coeff	0.62	Lowest Orif El.	251.00
Lowest Diam	1.1000 in	Dist to next	2.8000 ft
D2	2.2000 in	Dist to next	0.0000 ft

Record Id: SOUTH-STREAM-WEIR1

Descrip:	Prototype Structure	Increment	0.10 ft
Start El.	256.7500 ft	Max El.	257.0000 ft
Length	1.5000 ft	cd	3.22

Stage Discharge Rating Curve			
253.0000 ft	0.0000 cfs	**255.1000 ft**	0.0476 cfs
253.1000 ft	0.0104 cfs	**255.2000 ft**	0.0487 cfs
253.2000 ft	0.0147 cfs	**255.3000 ft**	0.0498 cfs
253.3000 ft	0.0180 cfs	**255.4000 ft**	0.0509 cfs
253.4000 ft	0.0208 cfs	**255.5000 ft**	0.0519 cfs
253.5000 ft	0.0232 cfs	**255.6000 ft**	0.0529 cfs
253.6000 ft	0.0254 cfs	**255.7000 ft**	0.0540 cfs
253.7000 ft	0.0275 cfs	**255.8000 ft**	0.0550 cfs
253.8000 ft	0.0294 cfs	**255.9000 ft**	0.0975 cfs
253.9000 ft	0.0312 cfs	**256.0000 ft**	0.1156 cfs
254.0000 ft	0.0328 cfs	**256.1000 ft**	0.1298 cfs
254.1000 ft	0.0344 cfs	**256.2000 ft**	0.1418 cfs
254.2000 ft	0.0360 cfs	**256.3000 ft**	0.1525 cfs
254.3000 ft	0.0374 cfs	**256.4000 ft**	0.1623 cfs
254.4000 ft	0.0389 cfs	**256.5000 ft**	0.1713 cfs
254.5000 ft	0.0402 cfs	**256.6000 ft**	0.1798 cfs
254.6000 ft	0.0415 cfs	**256.7000 ft**	0.1878 cfs

254.7000 ft	0.0428 cfs	**256.8000 ft**	0.2493 cfs
254.8000 ft	0.0441 cfs	**256.9000 ft**	0.4828 cfs
254.9000 ft	0.0453 cfs	**257.0000 ft**	0.8126 cfs
255.0000 ft	0.0464 cfs	**257.1000 ft**	1.2151 cfs
		257.0000 ft	0.8126 cfs

Upper Skagit Indian Tribe – Skagit Resort
On-site Stormwater Analysis – Pond 2
November 8, 2007

Note: Elevation 0.00 in the WWHM2 model (Pond 2 only) corresponds to elevation 257.00 in the civil drawings and StormShed computer modeling

WESTERN WASHINGTON HYDROLOGY MODEL V2
PROJECT REPORT

Project Name: 2006175_USIT_North_Pond
Site Address:
City :
Report Date : 11/8/2007
Gage : Burlington
Data Start : 1948
Data End : 1999
Precip Scale: 1.00

PREDEVELOPED LAND USE

Basin : Off-Site Basin
Flows To : North Pond
GroundWater: No

Land Use	Acres
TILL PASTURE:	5.787
IMPERVIOUS:	0.156

Basin : North Pond
Flows To : Point of Compliance
GroundWater: No

Land Use	Acres
TILL FOREST:	19.679

DEVELOPED LAND USE
Basin : Off-Site Basin
Flows To : North Pond
GroundWater: No

Land Use	Acres
TILL PASTURE:	5.787
IMPERVIOUS:	0.156

Basin : North Pond
Flows To : USIT_Pond_North
GroundWater: No

Land Use	Acres
TILL GRASS:	5.741
IMPERVIOUS:	13.938

RCHRES (POND) INFORMATION
Pond Name: USIT_Pond_North
Pond Type: Table
Pond Flows to : Point of Compliance
Pond Rain / Evap is not activated.
Dimensions
Depth: 0ft.

Pond Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dschrg(cfs)	Infilt(cfs)
0.000	1.392	0.000	0.000	0.000
0.100	1.400	0.143	0.045	0.000
0.200	1.409	0.287	0.064	0.000
0.300	1.417	0.430	0.079	0.000
0.400	1.425	0.573	0.091	0.000
0.500	1.433	0.717	0.102	0.000
0.600	1.441	0.860	0.111	0.000
0.700	1.450	1.003	0.120	0.000
0.800	1.458	1.147	0.128	0.000
0.900	1.466	1.290	0.136	0.000
1.000	1.474	1.433	0.144	0.000
1.100	1.482	1.585	0.151	0.000
1.200	1.491	1.736	0.157	0.000
1.300	1.499	1.888	0.164	0.000
1.400	1.507	2.039	0.170	0.000
1.500	1.515	2.191	0.176	0.000
1.600	1.524	2.342	0.182	0.000
1.700	1.532	2.494	0.187	0.000
1.800	1.540	2.645	0.193	0.000
1.900	1.548	2.797	0.198	0.000
2.000	1.556	2.948	0.203	0.000
2.100	1.565	3.108	0.208	0.000
2.200	1.573	3.268	0.213	0.000
2.300	1.581	3.428	0.218	0.000
2.400	1.589	3.588	0.222	0.000
2.500	1.598	3.747	0.227	0.000
2.600	1.606	3.907	0.232	0.000
2.700	1.614	4.067	0.236	0.000
2.800	1.622	4.227	0.240	0.000
2.900	1.631	4.386	0.245	0.000
3.000	1.639	4.550	0.249	0.000
3.100	1.647	4.714	0.253	0.000
3.200	1.655	4.882	0.347	0.000
3.300	1.664	5.050	0.417	0.000
3.400	1.672	5.218	0.466	0.000
3.500	1.680	5.386	0.507	0.000
3.600	1.688	5.554	0.542	0.000
3.700	1.697	5.722	0.574	0.000
3.800	1.705	5.890	0.604	0.000
3.900	1.713	6.058	0.632	0.000
4.000	1.721	6.226	0.658	0.000
4.100	1.730	6.403	0.683	0.000
4.200	1.738	6.579	0.706	0.000
4.300	1.746	6.755	0.729	0.000
4.400	1.755	6.931	0.751	0.000
4.500	1.763	7.108	0.772	0.000
4.600	1.771	7.284	0.792	0.000
4.700	1.779	7.460	0.812	0.000
4.800	1.788	7.637	1.110	0.000
4.900	1.796	7.813	1.244	0.000
5.000	1.804	7.989	1.351	0.000
5.100	1.812	8.172	1.444	0.000
5.200	1.821	8.354	1.527	0.000
5.300	1.829	8.537	1.705	0.000
5.400	1.837	8.719	1.957	0.000
5.500	1.846	8.902	2.251	0.000
5.510	1.850	9.000	20.00	0.000

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped

Return Period	Flow(cfs)
2 year	0.551031
5 year	1.002911
10 year	1.380742
25 year	1.951557
50 year	2.447186
100 year	3.005342

Flow Frequency Return Periods for Developed Unmitigated

Return Period	Flow(cfs)
2 year	4.359703
5 year	6.176124
10 year	7.523741
25 year	9.397342
50 year	10.921158
100 year	12.558195

Flow Frequency Return Periods for Developed Mitigated

Return Period	Flow(cfs)
2 year	0.281446
5 year	0.536654
10 year	0.795744
25 year	1.266615
50 year	1.75391
100 year	2.391424

Yearly Peaks for Predeveloped and Developed-Mitigated

Year	Predeveloped	Developed
1949	1.358	0.473
1950	0.869	0.680
1951	0.990	0.342
1952	0.677	0.246
1953	0.441	0.239
1954	0.427	0.219
1955	0.494	0.184
1956	0.444	0.214
1957	0.795	0.488
1958	0.375	0.168
1959	0.780	0.378
1960	0.524	0.539
1961	0.346	0.233
1962	0.084	0.189
1963	0.378	0.173
1964	0.404	0.176
1965	0.683	0.496
1966	0.375	0.162
1967	0.453	0.198
1968	0.963	0.446
1969	0.290	0.211
1970	0.195	0.162
1971	0.974	0.747
1972	0.447	0.219
1973	0.468	0.251
1974	0.888	0.551
1975	3.754	7.997
1976	0.356	0.231
1977	0.408	0.188
1978	0.609	0.245
1979	0.320	0.165
1980	1.038	0.520
1981	0.572	0.192
1982	1.064	0.614
1983	0.541	0.544
1984	1.052	0.410
1985	0.231	0.173
1986	0.680	0.529
1987	0.564	0.457

1988	1.602	0.212
1989	0.303	0.202
1990	0.811	0.799
1991	1.440	1.324
1992	0.632	0.199
1993	0.518	0.191
1994	0.118	0.151
1995	0.171	0.195
1996	0.714	0.196
1997	3.146	0.484
1998	0.601	0.200
1999	0.330	0.185

Ranked Yearly Peaks for Predeveloped and Developed-Mitigated

Rank	**Predeveloped**	**Developed**
1	3.7540	7.9974
2	3.1459	1.3238
3	1.6017	0.7991
4	1.4397	0.7472
5	1.3583	0.6800
6	1.0637	0.6137
7	1.0520	0.5513
8	1.0377	0.5445
9	0.9902	0.5387
10	0.9741	0.5292
11	0.9628	0.5205
12	0.8878	0.4961
13	0.8693	0.4878
14	0.8113	0.4844
15	0.7947	0.4734
16	0.7800	0.4565
17	0.7137	0.4462
18	0.6828	0.4102
19	0.6799	0.3782
20	0.6770	0.3420
21	0.6320	0.2511
22	0.6094	0.2462
23	0.6008	0.2452
24	0.5719	0.2386
25	0.5637	0.2333
26	0.5412	0.2311
27	0.5236	0.2190
28	0.5177	0.2186
29	0.4945	0.2140
30	0.4684	0.2118
31	0.4534	0.2108
32	0.4473	0.2018
33	0.4439	0.2002
34	0.4410	0.1991
35	0.4270	0.1977
36	0.4076	0.1958
37	0.4039	0.1954
38	0.3777	0.1923
39	0.3754	0.1907
40	0.3746	0.1894
41	0.3564	0.1878
42	0.3455	0.1846
43	0.3302	0.1838
44	0.3201	0.1757
45	0.3027	0.1734
46	0.2900	0.1728
47	0.2313	0.1677
48	0.1951	0.1647
49	0.1712	0.1620
50	0.1178	0.1619
51	0.0843	0.1508

1/2 2 year to 50 year
Flow(CFS) Predev Final Percentage Pass/Fail

0.2755	3714	2338	62.0	Pass
0.2975	3165	2184	69.0	Pass
0.3194	2772	2024	73.0	Pass
0.3413	2432	1898	78.0	Pass
0.3633	2163	1726	79.0	Pass
0.3852	1909	1582	82.0	Pass
0.4071	1664	1451	87.0	Pass
0.4291	1459	1326	90.0	Pass
0.4510	1266	1185	93.0	Pass
0.4729	1135	1044	91.0	Pass
0.4949	990	905	91.0	Pass
0.5168	889	775	87.0	Pass
0.5387	781	635	81.0	Pass
0.5607	705	563	79.0	Pass
0.5826	638	505	79.0	Pass
0.6046	565	453	80.0	Pass
0.6265	499	398	79.0	Pass
0.6484	454	350	77.0	Pass
0.6704	414	301	72.0	Pass
0.6923	377	241	63.0	Pass
0.7142	344	216	62.0	Pass
0.7362	314	163	51.0	Pass
0.7581	275	133	48.0	Pass
0.7800	246	113	45.0	Pass
0.8020	214	88	41.0	Pass
0.8239	189	78	41.0	Pass
0.8459	164	76	46.0	Pass
0.8678	147	72	48.0	Pass
0.8897	137	67	48.0	Pass
0.9117	124	65	52.0	Pass
0.9336	116	63	54.0	Pass
0.9555	109	61	55.0	Pass
0.9775	100	61	61.0	Pass
0.9994	97	61	62.0	Pass
1.0213	89	59	66.0	Pass
1.0433	84	59	70.0	Pass
1.0652	79	58	73.0	Pass
1.0871	76	55	72.0	Pass
1.1091	72	55	76.0	Pass
1.1310	68	55	80.0	Pass
1.1530	68	53	77.0	Pass
1.1749	64	52	81.0	Pass
1.1968	58	51	87.0	Pass
1.2188	57	49	85.0	Pass
1.2407	55	48	87.0	Pass
1.2626	51	46	90.0	Pass
1.2846	49	42	85.0	Pass
1.3065	46	41	89.0	Pass
1.3284	45	38	84.0	Pass
1.3504	44	37	84.0	Pass
1.3723	43	36	83.0	Pass
1.3943	42	36	85.0	Pass
1.4162	42	35	83.0	Pass
1.4381	41	33	80.0	Pass
1.4601	38	33	86.0	Pass
1.4820	37	32	86.0	Pass
1.5039	36	31	86.0	Pass
1.5259	34	29	85.0	Pass
1.5478	34	28	82.0	Pass
1.5697	33	27	81.0	Pass
1.5917	32	24	75.0	Pass
1.6136	29	24	82.0	Pass
1.6356	29	23	79.0	Pass
1.6575	28	22	78.0	Pass
1.6794	28	22	78.0	Pass
1.7014	27	21	77.0	Pass
1.7233	26	21	80.0	Pass
1.7452	26	19	73.0	Pass
1.7672	25	16	64.0	Pass
1.7891	25	14	56.0	Pass
1.8110	24	11	45.0	Pass

1.8330	22	11	50.0	Pass
1.8549	21	11	52.0	Pass
1.8768	20	11	55.0	Pass
1.8988	19	11	57.0	Pass
1.9207	18	10	55.0	Pass
1.9427	15	10	66.0	Pass
1.9646	14	10	71.0	Pass
1.9865	14	9	64.0	Pass
2.0085	13	9	69.0	Pass
2.0304	12	9	75.0	Pass
2.0523	12	8	66.0	Pass
2.0743	12	8	66.0	Pass
2.0962	11	7	63.0	Pass
2.1181	11	7	63.0	Pass
2.1401	10	7	70.0	Pass
2.1620	10	6	60.0	Pass
2.1840	9	6	66.0	Pass
2.2059	9	6	66.0	Pass
2.2278	8	6	75.0	Pass
2.2498	8	6	75.0	Pass
2.2717	7	6	85.0	Pass
2.2936	7	6	85.0	Pass
2.3156	7	6	85.0	Pass
2.3375	6	6	100.0	Pass
2.3594	5	5	100.0	Pass
2.3814	5	5	100.0	Pass
2.4033	5	5	100.0	Pass
2.4252	5	5	100.0	Pass
2.4472	5	5	100.0	Pass

Water Quality BMP Flow and Volume.
On-line facility volume: 1.8002 acre-feet
On-line facility target flow: 2.0155 **cfs.**
Adjusted for 15 min: 2.1596 **cfs.**
Off-line facility target flow: 1.1755 **cfs.**
Adjusted for 15 min: 1.2596 **cfs.**

POND 2 – SOUTH POND
STAGE-STORAGE-DISCHARGE TABLE GENERATION
(From StormShed 2G)

****Note: Elevation 0.00 in the WWHM2 model is set at elevation 257.00 in the StormShed model (Pond 2 only)*****

Record Id: NORTH-COMBO

Descrip:	Prototype Structure	Increment	0.10 ft
Start El.	257.0000 ft	Max El.	262.5000 ft
List of Discharge Structures:		NORTH-ORIFICE NORTH-WEIR	

Record Id: NORTH-ORIFICE

Descrip:	Prototype Structure	Increment	0.10 ft
Start El.	257.0000 ft	Max El.	262.5000 ft
Orif Coeff	0.62	Lowest Orif El.	255.00
Lowest Diam	2.3000 in	Dist to next	3.1500 ft
D2	3.8500 in	Dist to next	1.5500 ft
D3	5.7000 in	Dist to next	0.0000 ft

Record Id: NORTH-WEIR

Descrip:	Prototype Structure	Increment	0.10 ft
Start El.	262.2000 ft	Max El.	262.5000 ft
Length		1.00 ft	
Cd	3.1300	Use variable Cd based on head for calcs	

Stage Discharge Rating Curve			
257.0000 ft	0.0000 cfs	259.8000 ft	0.2402 cfs
257.1000 ft	0.0454 cfs	259.9000 ft	0.2445 cfs
257.2000 ft	0.0642 cfs	260.0000 ft	0.2486 cfs
257.3000 ft	0.0786 cfs	260.1000 ft	0.2528 cfs
257.4000 ft	0.0908 cfs	260.2000 ft	0.3467 cfs
257.5000 ft	0.1015 cfs	260.3000 ft	0.4166 cfs
257.6000 ft	0.1112 cfs	260.4000 ft	0.4658 cfs
257.7000 ft	0.1201 cfs	260.5000 ft	0.5065 cfs
257.8000 ft	0.1284 cfs	260.6000 ft	0.5422 cfs
257.9000 ft	0.1362 cfs	260.7000 ft	0.5744 cfs
258.0000 ft	0.1436 cfs	260.8000 ft	0.6041 cfs
258.1000 ft	0.1506 cfs	260.9000 ft	0.6318 cfs
258.2000 ft	0.1573 cfs	261.0000 ft	0.6580 cfs
258.3000 ft	0.1637 cfs	261.1000 ft	0.6827 cfs

258.4000 ft	0.1699 cfs	261.2000 ft	0.7064 cfs
258.5000 ft	0.1758 cfs	261.3000 ft	0.7290 cfs
258.6000 ft	0.1816 cfs	261.4000 ft	0.7508 cfs
258.7000 ft	0.1872 cfs	261.5000 ft	0.7719 cfs
258.8000 ft	0.1926 cfs	261.6000 ft	0.7922 cfs
258.9000 ft	0.1979 cfs	261.7000 ft	0.8120 cfs
259.0000 ft	0.2030 cfs	261.8000 ft	1.1100 cfs
259.1000 ft	0.2080 cfs	261.9000 ft	1.2442 cfs
259.2000 ft	0.2129 cfs	262.0000 ft	1.3510 cfs
259.3000 ft	0.2177 cfs	262.1000 ft	1.4435 cfs
259.4000 ft	0.2224 cfs	262.2000 ft	1.5267 cfs
259.5000 ft	0.2270 cfs	262.3000 ft	1.7048 cfs
259.6000 ft	0.2315 cfs	262.4000 ft	1.9567 cfs
		262.5000 ft	2.2505 cfs

APPENDIX

8.8 WATER QUALITY STORAGE VOLUME CALCULATIONS

Pond 1 Water Quality Storage Calculations

Required dead storage volume for the proposed wetpond treatment facility in Pond 1 is 91% of the total simulated runoff volume as calculated by the WWHM2 computer model. The target water quality volume for Pond 1 is 0.4738 acre-feet.

Required dead storage volume = 0.4738 acre-feet x 43,560 CF/acre = 20,639 CF

Wetpool Storage Volume Stage Storage Table

Contour Elevation (FT)		*Contour Area (SF)*	*Volume (CF)*	*Cumulative Volume (CF)*
250	POND BOTTOM	11,783		
			13,259	13,259
251		14,734		
			16,702	29,961
252		18,670		
			20,036	**49,997**
253	POND OUTLET	21,402		

Total Proposed Wetpool Storage Volume = 49,997 CF

Therefore the resulting proposed wetpool volume of 49,997 CF exceeds the required 20,639 CF by 29,358 CF. This volume does not include the volume of over-excavation for sediment storage required by the DOE as specified in Volume V of the Washington State Department of Ecology Stormwater Management Manual for Western Washington (DOE Manual).

Pond 2 Water Quality Storage Calculations

Required dead storage volume for the proposed wetpond treatment facility in Pond 2 is 91% of the total simulated runoff volume as calculated by the WWHM2 computer model. The target water quality volume for Pond 2 is 1.8002 acre-feet.

Required dead storage volume = 1.8002 acre-feet x 43,560 CF/acre = 78,417 CF

Wetpool Storage Volume Stage Storage Table

Contour Elevation (FT)		*Contour Area (SF)*	*Volume (CF)*	*Cumulative Volume (CF)*
253	POND BOTTOM	14,455		
			15,670	15,670
254		16,884		
			18,161	33,831
255		19,438		
			20,778	54,608
256		22,117		
			24,063	**78,671**
257	POND OUTLET	26,009		

Total Proposed Wetpool Storage Volume = 78,671 CF

Therefore the resulting proposed wetpool volume of 78,671 CF exceeds the required 78,417 CF by 254 CF. This volume does not include the volume of over-excavation for sediment storage required by the DOE as specified in Volume V of the Washington State Department of Ecology Stormwater Management Manual for Western Washington (DOE Manual).

APPENDIX

8.9 EMERGENCY SPILLWAY CALCULATIONS

Pond 1 – Overflow Spillway

Design Goal: Design the spillway to convey the post development 100-year storm, Q_{100}=3.44 cfs (assuming no detention or flow reduction effects).

Spillway acts as a rectangular weir.

Design overflow weir dimensions:

Width = 10 feet = 120 inches

Height = 0.75 feet = 9 inches

From Land Desktop Weir Calculator:

```
                    Weir Calculator

Given Input Data:
     Weir Type ......................... Rectangular
     Equation .......................... Suppressed
     Solving for ....................... Depth of Flow
     Flowrate .......................... 3.4400 cfs
     Coefficient ....................... 0.6500
     Height ............................ 9.0000 in

Computed Results:
     Depth of Flow ..................... 2.5674 in
     Full Flow ......................... 22.5778 cfs
     Velocity .......................... 1.6079 fps
     Width ............................. 120.0000 in
     Area .............................. 7.5000 ft2
     Perimeter ......................... 138.0000 in
     Wet Perimeter ..................... 125.1348 in
     Wet Area .......................... 2.1395 ft2
     Percent Full ...................... 28.5267 %
```

Therefore, the undetained, 100-year flow rate from Pond 1 will be conveyed through the overflow weir at a depth of 2.6 inches with 6.4 inches freeboard in the weir.

Pond 2 – Overflow Spillway

Design Goal: Design the spillway to convey the post development 100-year storm, Q_{100}=12.56 cfs (assuming no detention or flow reduction effects).

The emergency overflow spillway in Pond 2 is a Type 2, 48-inch catch basin fitted with a "birdcage" type grate. The birdcage rim elevation must be set above the peak stage when the undetained, 100-year flow rate spills through the primary overflow (top of the control structure riser standpipe).

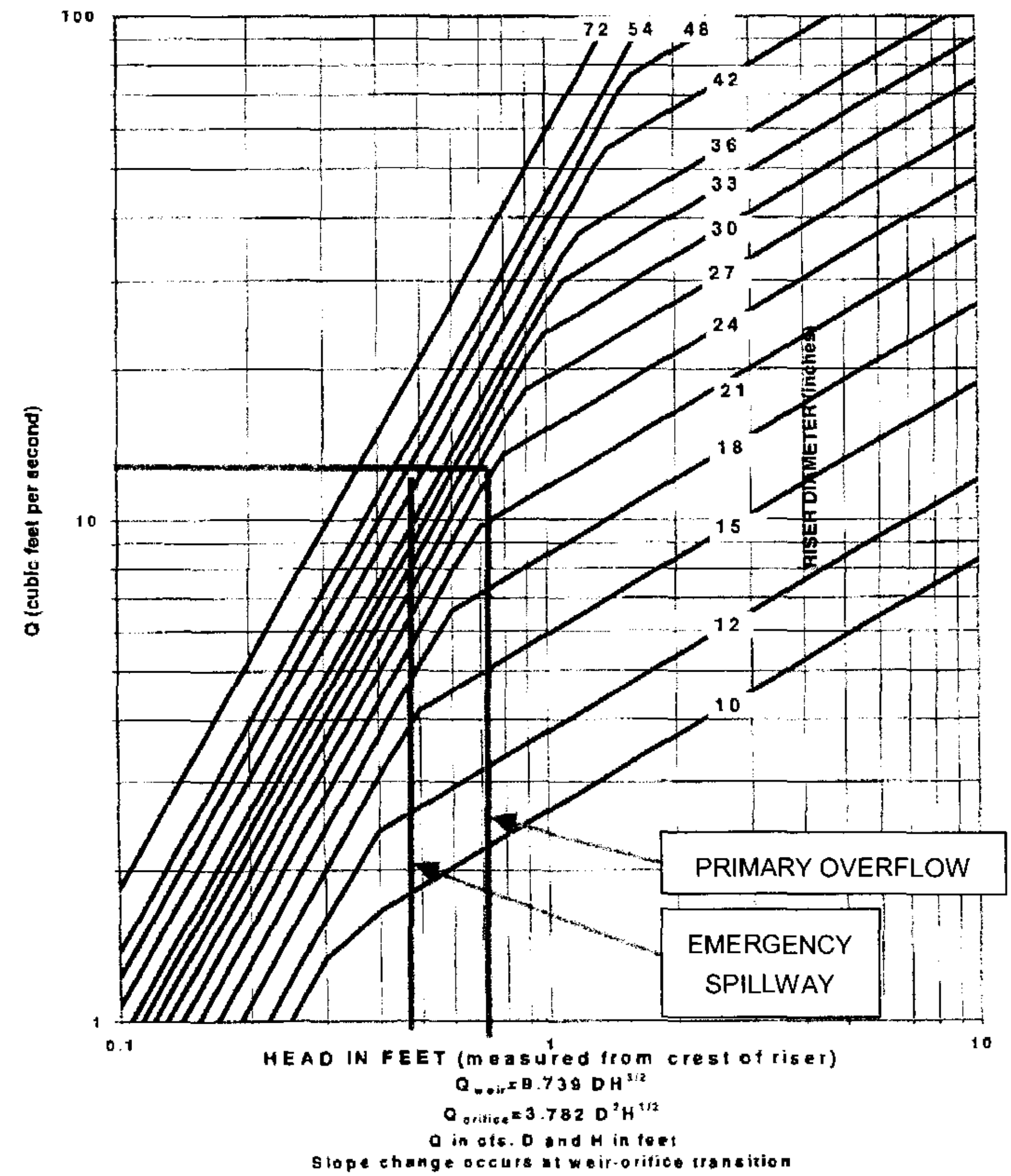


Figure 4.28 – Riser Inflow Curves

Peak 100-year stage through primary overflow (riser standpipe) = 0.71 ft

Primary overflow elevation = 262.50

Therefore, the emergency overflow rim must be set higher than 263.21

Lowest top of pond excavation ≈ 265.50

Design overflow rim elevation = 263.30

Freeboard ≈ 1.7'

APPENDIX

8.10 STORM DRAIN SYSTEM CONVEYANCE CALCULATIONS

Pond 1 Conveyance Calculations

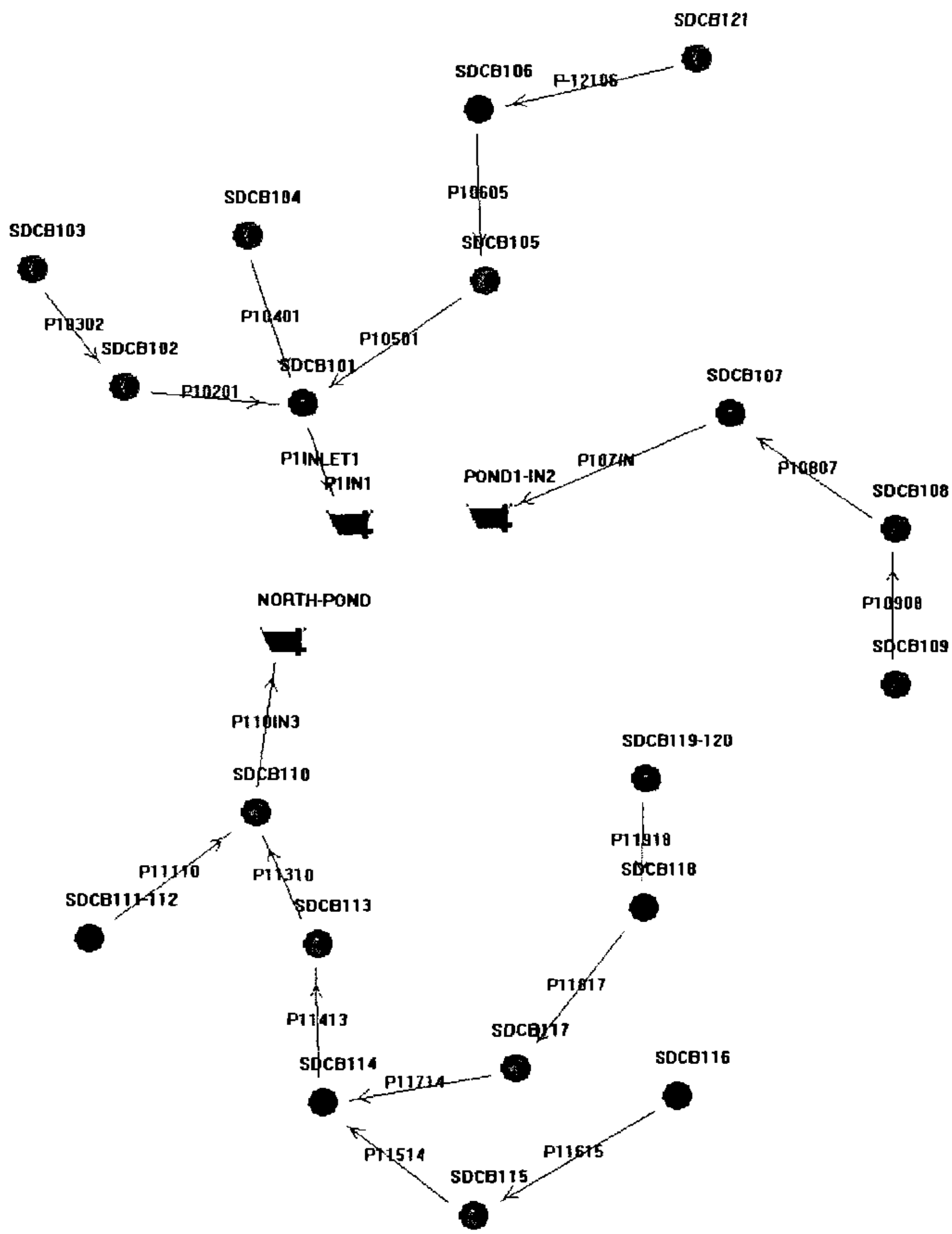


Figure 8.10a: Pond 1 Layout For Conveyance Computer Modeling

To simulate full pond conditions, the conveyance calculations assume a tail water elevation of 257.00. Design rim elevations for each catch basin are provided in the "Max El (ft)" column. The 100-year water surface elevation in each catch basin is provided in the "HW Loss Elev (ft)"

ROUTEHYD [] THRU [Untitled] USING TYPE1A AND [100 Year] NOTZERO RELATIVE SCS/SBUH

Reach ID	Area (ac)	Flow (cfs)	Full Q (cfs)	Full ratio	nDepth (ft)	Size	nVel (ft/s)	fVel (ft/s)	CBasin / Hyd
P-12106	0.1010	0.0967	1.5146	0.06	0.1143	8" Diam	2.4285	4.3390	BASIN121
P10605	0.1620	0.1548	0.8568	0.18	0.1917	8" Diam	1.8636	2.4545	BASIN106
P10501	0.3960	0.3783	1.1030	0.34	0.2692	8" Diam	2.8647	3.1600	BASIN105
P10401	0.0690	0.0649	0.8790	0.07	0.1227	8" Diam	1.4712	2.5182	BASIN104
P10302	0.0360	0.0345	0.8790	0.04	0.0902	8" Diam	1.2206	2.5182	BASIN103
P10201	0.0730	0.0699	0.8681	0.08	0.1279	8" Diam	1.4928	2.4869	BASIN102
P1INLET1	0.6980	0.6630	7.2111	0.09	0.2046	12" Diam	5.7395	9.1815	BASIN101
P10908	0.1850	0.1772	1.5033	0.12	0.1546	8" Diam	2.8880	4.3067	BASIN109
P10807	0.2960	0.2836	2.4514	0.12	0.1533	8" Diam	4.6761	7.0226	BASIN108
P107IN	0.7380	0.7054	12.0265	0.06	0.1646	12" Diam	8.3508	15.3126	BASIN107
P11918	0.2970	0.2809	0.8640	0.33	0.2614	8" Diam	2.2130	2.4752	BASIN119-120
P11817	0.4610	0.4381	3.4631	0.13	0.2397	12" Diam	3.0269	4.4094	BASIN118
P11714	1.0510	0.9982	5.8515	0.17	0.2798	12" Diam	5.5510	7.4503	BASIN117
P11615	0.2600	0.2476	0.8568	0.29	0.2454	8" Diam	2.1232	2.4545	BASIN116
P11514	0.3360	0.3200	5.5286	0.06	0.1636	12" Diam	3.8212	7.0393	BASIN115
P11413	1.8930	1.7966	2.5367	0.71	0.6216	12" Diam	3.5016	3.2298	BASIN114
P11310	2.3710	2.2448	2.5692	0.87	0.7241	12" Diam	3.6856	3.2713	BASIN113
P11110	0.1330	0.1272	0.8593	0.15	0.1735	8" Diam	1.7609	2.4618	BASIN111-112
P110IN3	2.5550	2.4208	13.7753	0.18	0.4259	18" Diam	5.8614	7.7952	BASIN110

From Node	To Node	Rch Loss (ft)	App (ft)	Bend (ft)	Junct Loss (ft)	HW Loss Elev (ft)	Max El (ft)
							257.0000
No approach losses at node SDCB105 because inverts and/or crowns are offset.							
SDCB101	P1IN1	257.0363	------	------	------	257.0363	259.8500
No approach losses at node SDCB106 because inverts and/or crowns are offset.							
SDCB105	SDCB101	258.4009	------	------	------	258.4009	262.6500
SDCB106	SDCB105	260.1065	0.0916	0.0953	------	260.1101	262.6200
SDCB121	SDCB106	261.1367	------	------	------	261.1367	263.6200
SDCB104	SDCB101	257.3130	------	------	------	257.3130	259.8200
SDCB102	SDCB101	257.0409	0.0002	0.0001	------	257.0408	257.5000
SDCB103	SDCB102	257.0412	------	------	------	257.0412	257.5000
No approach losses at node SDCB108 because inverts and/or crowns are offset.							
SDCB107	POND1-IN2	259.9284	------	------	------	259.9284	264.3500
SDCB108	SDCB107	263.4388	0.1295	0.0695	------	263.3787	265.8800
SDCB109	SDCB108	264.8395	------	------	------	264.8395	267.2500

No approach losses at node SDCB113 because inverts and/or crowns are offset.							
SDCB110	NORTH-POND	257.0952	-----	-----	-----	257.0952	262.3000
SDCB113	SDCB110	258.8774	0.1904	0.0256	-----	258.7125	262.3000
No approach losses at node SDCB117 because inverts and/or crowns are offset.							
SDCB114	SDCB113	259.4503	-----	-----	-----	259.4503	265.4500
SDCB117	SDCB114	264.1271	0.1423	0.0490	-----	264.0338	266.6500
No approach losses at node SDCB119-120 because inverts and/or crowns are offset.							
SDCB118	SDCB117	264.7994	-----	-----	-----	264.7994	267.9000
SDCB119-120	SDCB118	265.3526	-----	-----	-----	265.3527	267.8000
No approach losses at node SDCB116 because inverts and/or crowns are offset.							
SDCB115	SDCB114	266.6346	-----	-----	-----	266.6346	269.8800
SDCB116	SDCB115	267.2594	-----	-----	-----	267.2594	269.6000
SDCB111-112	SDCB110	257.1160	-----	-----	-----	257.1161	257.5000

Based on the results of the computer modeling, each pipe in the Pond 1 network is sized to adequately convey the anticipated stormwater flows. Also, rim elevations for each catch basin are higher than the maximum anticipated water level in each catch basin.

<u>**Pond 2 Conveyance Calculations**</u>

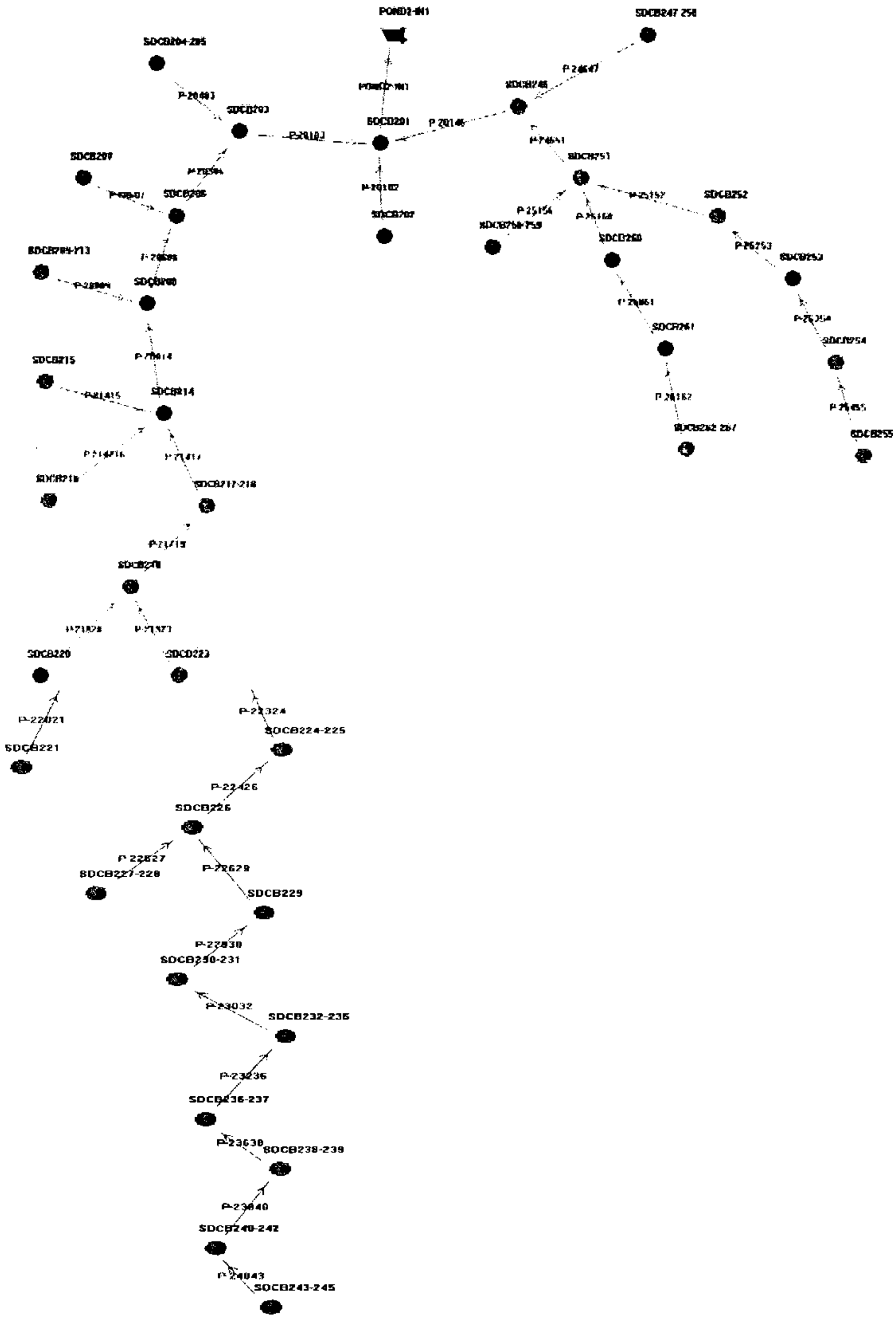


Figure 8.10b: Pond 2 Layout For Conveyance Computer Modeling

To simulate full pond conditions, the conveyance calculations assume a tail water elevation of 262.50. Design rim elevations for each catch basin are provided in the "Max El (ft)" column. The 100-year water surface elevation in each catch basin is provided in the "HW Loss Elev (ft)"

ROUTEHYD [] THRU [Untitled] USING TYPE1A AND [100 Year] NOTZERO RELATIVE SCS/SBUH

Reach ID	Area (ac)	Flow (cfs)	Full Q (cfs)	Full ratio	nDepth (ft)	Size	nVel (ft/s)	fVel (ft/s)	CBasin / Hyd
P-24647	0.2450	0.1547	3.5724	0.04	0.1421	12" Diam	2.2652	4.5485	SDCB-247-250
P-25455	0.1510	0.1201	1.4685	0.08	0.1289	8" Diam	2.5353	4.2070	SDCB-255
P-25354	0.3130	0.2457	1.8290	0.13	0.1650	8" Diam	3.6501	5.2396	SDCB-254
P-25253	0.4040	0.3013	2.4701	0.12	0.1572	8" Diam	4.7937	7.0762	SDCB-253
P-25152	0.8370	0.5674	2.5910	0.22	0.2119	8" Diam	5.9471	7.4228	SDCB-252
P-25156	1.6920	1.5840	8.4108	0.19	0.4413	18" Diam	3.6503	4.7595	SDCB-256-259
P-26162	2.1060	1.8569	2.6014	0.71	0.6245	12" Diam	3.5993	3.3122	SDCB-262-267
P-26061	2.4820	2.0794	2.5261	0.82	0.6909	12" Diam	3.5922	3.2163	SDCB-261
P-25160	2.6930	2.2041	2.5429	0.87	0.7192	12" Diam	3.6449	3.2377	SDCB-260
P-24651	5.2220	4.2623	6.6528	0.64	0.8727	18" Diam	3.9955	3.7647	
P-20146	5.5390	4.4793	7.3896	0.61	0.8427	18" Diam	4.3820	4.1816	SDCB-246
P-20102	0.7780	0.7200	2.5261	0.29	0.3657	12" Diam	2.7688	3.2163	SDCB-202
P-20403	0.2120	0.2024	7.4477	0.03	0.1703	18" Diam	1.8276	4.2145	SDCB-204-205
P-20607	0.6810	0.6303	2.9917	0.21	0.3120	12" Diam	3.0122	3.8091	SDCB-207
P-20809	0.6840	0.6383	4.8769	0.13	0.2446	12" Diam	4.2867	6.2094	SDCB-209-213
P-214216	0.1230	0.1172	2.5261	0.05	0.1470	12" Diam	1.6336	3.2163	SDCB-216
P-21415	0.3220	0.3076	2.5261	0.12	0.2358	12" Diam	2.1757	3.2163	SDCB-215
P-22021	0.2930	0.2809	2.6336	0.11	0.2202	12" Diam	2.1892	3.3532	SDCB-221
P-21920	0.3800	0.3642	5.4691	0.07	0.1753	12" Diam	3.9361	6.9635	SDCB-220
P-22627	0.4820	0.4620	5.2891	0.09	0.1997	12" Diam	4.1403	6.7343	SDCB-227-228
P-24043	0.7210	0.4095	0.9022	0.45	0.3151	8" Diam	2.5216	2.5846	SDCB-243-245
P-23840	1.9330	1.3941	2.5261	0.55	0.5308	12" Diam	3.2923	3.2163	SDCB-240-242

P-23638	2.8870	1.8930	2.5336	0.75	0.6440	12" Diam	3.5401	3.2259	SDCB-238-239
P-23236	4.0250	2.8959	7.4680	0.39	0.6486	18" Diam	3.9568	4.2260	SDCB-236-237
P-23032	4.7820	3.3074	7.4794	0.44	0.6984	18" Diam	4.1026	4.2325	SDCB-232-235
P-22930	4.9420	3.4448	7.4689	0.46	0.7152	18" Diam	4.1433	4.2266	SDCB-230-231
P-22629	6.3790	4.7864	7.4477	0.64	0.8749	18" Diam	4.4732	4.2145	SDCB-229
P-22426	6.8850	5.2712	11.0670	0.48	0.7291	18" Diam	6.1850	6.2626	SDCB-226
P-22324	7.1380	5.5136	12.2611	0.45	0.7050	18" Diam	6.7565	6.9383	SDCB-224-225
P-21923	7.2490	5.6194	13.7091	0.41	0.6691	18" Diam	7.3705	7.7577	SDCB-223
P-21719	7.6290	5.9836	19.9842	0.30	0.5629	18" Diam	9.8770	11.3088	
P-21417	7.8230	6.1682	20.0849	0.31	0.5702	18" Diam	10.0058	11.3657	SDCB-217-218
P-20814	8.5810	6.8875	16.0395	0.43	0.9155	24" Diam	4.9124	5.1055	SDCB-214
P-20608	9.2870	7.5468	16.0395	0.47	0.9653	24" Diam	5.0263	5.1055	SDCB-208
P-20306	9.9730	8.1818	16.0707	0.51	1.0103	24" Diam	5.1416	5.1155	SDCB-206
P-20103	10.6590	8.8114	16.1624	0.55	1.0532	24" Diam	5.2537	5.1447	SDCB-203
POND2-IN1	17.0390	14.0638	57.6084	0.24	0.6733	24" Diam	15.1339	18.3373	SDCB-201

From Node	To Node	Rch Loss (ft)	App (ft)	Bend (ft)	Junct Loss (ft)	HW Loss Elev (ft)	Max El (ft)
							262.5000
SDCB201	POND2-IN1	263.1040	0.1222	0.1574	0.0464	263.1857	265.9000
SDCB246	SDCB201	263.6544	0.0903	0.0628	0.0027	263.6296	268.5000
SDCB247-250	SDCB246	264.7420	------	------	------	264.7420	268.6500
No approach losses at node SDCB260 because inverts and/or crowns are offset.							
SDCB251	SDCB246	264.0540	------	------	------	264.0540	271.3000
SDCB252	SDCB251	273.4604	0.3568	0.0509	------	273.1544	275.7300
SDCB253	SDCB252	281.6704	0.2069	0.0285	------	281.4920	284.1000
SDCB254	SDCB253	283.5385	0.0998	0.0044	------	283.4431	286.0700
SDCB255	SDCB254	286.1399	------	------	------	286.1400	288.6000
SDCB256-259	SDCB251	264.1002	------	------	------	264.1002	265.7500
SDCB260	SDCB251	264.4862	0.1088	0.0049	------	264.3822	269.0000

SDCB261	SDCB260	264.9938	0.0868	0.0087	------	264.9157	267.0000
SDCB262-267	SDCB261	265.9572	------	------	------	265.9572	268.7100
SDCB202	SDCB201	263.2144	------	------	------	263.2144	266.0400
SDCB203	SDCB201	263.4303	0.1053	0.0622	0.0022	263.3894	264.8000
SDCB204-205	SDCB203	263.3898	------	------	------	263.3899	264.1200
SDCB206	SDCB203	263.8500	0.0896	0.0094	0.0061	263.7758	266.0800
SDCB207	SDCB206	264.0523	------	------	------	264.0522	268.6000
SDCB208	SDCB206	263.9343	0.0746	0.0123	0.0056	263.8775	270.0200
SDCB209-213	SDCB208	263.9039	------	------	------	263.9039	266.5000
SDCB214	SDCB208	264.0648	0.1892	0.0155	0.0107	263.9017	264.5500
SDCB216	SDCB214	263.9026	------	------	------	263.9026	264.6000
SDCB215	SDCB214	263.9065	------	------	------	263.9065	264.0000
SDCB217-218	SDCB214	268.0919	1.5148	1.1845	------	267.7615	267.9500
SDCB219	SDCB217-218	270.3217	0.8436	0.7197	0.0448	270.2426	272.5100
SDCB220	SDCB219	272.8274	0.0744	0.0118	------	272.7647	276.2000
SDCB221	SDCB220	273.1594	------	------	------	273.1594	278.2700
SDCB223	SDCB219	271.8158	0.7089	0.0353	------	271.1422	274.0500
SDCB224-225	SDCB223	273.3508	0.5940	0.3282	------	273.0850	275.6000
SDCB226	SDCB224-225	275.3227	0.3107	0.2482	0.0242	275.2843	278.8200
SDCB227-228	SDCB226	278.9340	------	------	------	278.9340	279.2000
SDCB229	SDCB226	275.7283	0.2666	0.2327	------	275.6944	279.7000
SDCB230-231	SDCB229	276.4249	0.2614	0.3790	------	276.5425	286.2100
SDCB232-235	SDCB230-231	277.0917	0.2431	0.2958	------	277.1444	283.0000
No approach losses at node SDCB238-239 because inverts and/or crowns are offset.							
SDCB236-237	SDCB232-235	278.0402	------	------	------	278.0402	286.1600
SDCB238-239	SDCB236-237	279.2179	0.1683	0.1617	------	279.2113	283.7500
No approach losses at node SDCB243-245 because inverts and/or crowns are offset.							
SDCB240-242	SDCB238-239	280.0727	------	------	------	280.0727	286.8700
SDCB243-245	SDCB240-242	281.1136	------	------	------	281.1136	283.6000

Based on the results of the computer modeling, each pipe in the Pond 2 network is sized to adequately convey the anticipated stormwater flows. Also, rim elevations for each catch basin are higher than the maximum anticipated water level in each catch basin.

APPENDIX

8.11 OPERATIONS AND MAINTENANCE SCHEDULE

4.6 Maintenance Standards for Drainage Facilities

The facility-specific maintenance standards contained in this section are intended to be conditions for determining if maintenance actions are required as identified through inspection. They are not intended to be measures of the facility's required condition at all times between inspections. In other words, exceedence of these conditions at any time between inspections and/or maintenance does not automatically constitute a violation of these standards. However, based upon inspection observations, the inspection and maintenance schedules shall be adjusted to minimize the length of time that a facility is in a condition that requires a maintenance action.

Table 4.5 – Maintenance Standards

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
	Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with local health department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	~~No contaminants or pollutants present.~~
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted IPM policies
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard Trees
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner (If Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Pond Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway and Berms over 4 feet in height.	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway	Emergency Overflow/ Spillway	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	See "Side Slopes of Pond"	

No. 4 – Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes–other than designed holes–in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).
Catch Basin	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
	Contamination and Pollution	See "Detention Ponds" (No. 1).	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

No. 6 – Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

No. 7 – Energy Dissipaters

Maintenance Components	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance is Performed
External:			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
	Perforations Plugged.	Over 1/2 of perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
	Water Flows Out Top of "Distributor" Catch Basin.	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.	Facility rebuilt or redesigned to standards.
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal:			
Manhole/Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.
	Other Defects	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).

No. 11 – Wetponds

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Water level	First cell is empty, doesn't hold water.	Line the first cell to maintain at least 4 feet of water. Although the second cell may drain, the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.
	Trash and Debris	Accumulation that exceeds 1 CF per 1000-SF of pond area.	Trash and debris removed from pond.
	Inlet/Outlet Pipe	Inlet/Outlet pipe clogged with sediment and/or debris material.	No clogging or blockage in the inlet and outlet piping.
	Sediment Accumulation in Pond Bottom	Sediment accumulations in pond bottom that exceeds the depth of sediment zone plus 6-inches, usually in the first cell.	Sediment removed from pond bottom.
	Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil-absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant wetland plants such as Juncus effusus (soft rush) which can uptake small concentrations of oil.
	Erosion	Erosion of the pond's side slopes and/or scouring of the pond bottom, that exceeds 6-inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4-inches or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications.
	Internal Berm	Berm dividing cells should be level.	Berm surface is leveled so that water flows evenly over entire length of berm.
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.

APPENDIX

8.12 SOURCE CONTROL OF POLLUTANTS WSDOE BMPS

BMPs for Illicit Connections to Storm Drains

Description of Pollutant Sources: Illicit connections are unpermitted sanitary or process wastewater discharges to a storm drain or to a surface water, rather than to a sanitary sewer, industrial process wastewater or other appropriate treatment. They can also include swimming pool water, filter backwash, cleaning solutions/washwaters, cooling water, etc. Experience has shown that illicit connections are common, particularly in older buildings.

Pollutant Control Approach: Identify and eliminate unpermitted discharges or obtain an NPDES permit, where necessary, particularly at industrial and commercial facilities.

Applicable Operational BMPs:

- Eliminate unpermitted wastewater discharges to storm drains, ground water, or surface water; and,
- Convey unpermitted discharges to a sanitary sewer if allowed by the local sewer authority, or to other approved treatment; and,
- Obtain appropriate permits for these discharges.

Recommended Additional Operational BMPs: At commercial and industrial facilities conduct a survey of wastewater discharge connections to storm drains and to surface water as follows:

- Conduct a field survey of buildings, particularly older buildings, and other industrial areas to locate storm drains from buildings and paved surfaces. Note where these join the public storm drain(s).
- During non-stormwater conditions inspect each storm drain for non-stormwater discharges. Record the locations of all non-stormwater discharges. Include all permitted discharges.
- If useful, prepare a map of each area as it is to be surveyed. Show on the map the known location of storm drains, sanitary sewers, and permitted and unpermitted discharges. Aerial photos may be useful. Check records such as piping schematics to identify known side sewer connections and show these on the map. Consider using smoke, dye or chemical analysis tests to detect connections between two conveyance systems (e.g., process water and stormwater). If desirable, conduct TV inspections of the storm drains and record the footage on videotape.
- Compare the observed locations of connections with the information on the map and revise the map accordingly. Note suspect connections that are inconsistent with the field survey.
- Identify all connections to storm drains or to surface water and take the actions specified above as applicable BMPs.

BMPs for Landscaping and Lawn/ Vegetation Management

Description of Pollutant Sources: Landscaping can include grading, soil transfer, vegetation removal, pesticide and fertilizer applications, and watering. Stormwater contaminants include toxic organic compounds, heavy metals, oils, total suspended solids, coliform bacteria, fertilizers, and pesticides.

Lawn and vegetation management can include control of objectionable weeds, insects, mold, bacteria and other pests with chemical pesticides and is conducted commercially at commercial, industrial, and residential sites. Examples include weed control on golf course lawns, access roads, and utility corridors and during landscaping; sap stain and insect control on lumber and logs; rooftop moss removal; killing nuisance rodents; fungicide application to patio decks, and residential lawn/plant care. Toxic pesticides such as pentachlorophenol, carbamates, and organometallics can be released to the environment by leaching and dripping from treated parts, container leaks, product misuse, and outside storage of pesticide contaminated materials and equipment. Poor management of the vegetation and poor application of pesticides or fertilizers can cause appreciable stormwater contamination.

Pollutant Control Approach: Control of fertilizer and pesticide applications, soil erosion, and site debris to prevent contamination of stormwater.

Develop and implement an Integrated Pest Management Plan (IPM) and use pesticides only as a last resort. If pesticides/herbicides are used they must be carefully applied in accordance with label instructions on U.S. Environmental Protection Agency (EPA) registered materials. Maintain appropriate vegetation, with proper fertilizer application where practicable, to control erosion and the discharge of stormwater pollutants. Where practicable grow plant species appropriate for the site, or adjust the soil properties of the subject site to grow desired plant species.

Applicable Operational BMPs for Landscaping:

- Install engineered soil/landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.
- Do not dispose of collected vegetation into waterways or storm drainage systems.

Recommended Additional Operational BMPs for Landscaping:

- Conduct mulch-mowing whenever practicable
- Dispose of grass clippings, leaves, sticks, or other collected vegetation, by composting, if feasible.

- Use mulch or other erosion control measures when soils are exposed for more than one week during the dry season or two days during the rainy season.
- If oil or other chemicals are handled, store and maintain appropriate oil and chemical spill cleanup materials in readily accessible locations. Ensure that employees are familiar with proper spill cleanup procedures.
- Till fertilizers into the soil rather than dumping or broadcasting onto the surface. Determine the proper fertilizer application for the types of soil and vegetation encountered.
- Till a topsoil mix or composted organic material into the soil to create a well-mixed transition layer that encourages deeper root systems and drought-resistant plants.
- Use manual and/or mechanical methods of vegetation removal rather than applying herbicides, where practical.

Applicable Operational BMPs for the Use of Pesticides:

- Develop and implement an IPM (See section on IPM at end of BMP) and use pesticides only as a last resort.
- Implement a pesticide-use plan and include at a minimum: a list of selected pesticides and their specific uses; brands, formulations, application methods and quantities to be used; equipment use and maintenance procedures; safety, storage, and disposal methods; and monitoring, record keeping, and public notice procedures. All procedures shall conform to the requirements of Chapter 17.21 RCW and Chapter 16-228 WAC (Appendix IV-D R.7).
- Choose the least toxic pesticide available that is capable of reducing the infestation to acceptable levels. The pesticide should readily degrade in the environment and/or have properties that strongly bind it to the soil. Any pest control used should be conducted at the life stage when the pest is most vulnerable. For example, if it is necessary to use a Bacillus thuringiens is application to control tent caterpillars, it must be applied before the caterpillars cocoon or it will be ineffective. Any method used should be site-specific and not used wholesale over a wide area.
- Apply the pesticide according to label directions. Under no conditions shall pesticides be applied in quantities that exceed manufacturer's instructions.
- Mix the pesticides and clean the application equipment in an area where accidental spills will not enter surface or ground waters, and will not contaminate the soil.

- Store pesticides in enclosed areas or in covered impervious containment. Ensure that pesticide contaminated stormwater or spills/leaks of pesticides are not discharged to storm drains. Do not hose down the paved areas to a storm drain or conveyance ditch. Store and maintain appropriate spill cleanup materials in a location known to all near the storage area.
- Clean up any spilled pesticides and ensure that the pesticide contaminated waste materials are kept in designated covered and contained areas.
- The pesticide application equipment must be capable of immediate shutoff in the event of an emergency.
- Do not spray pesticides within 100 feet of open waters including wetlands, ponds, and streams, sloughs and any drainage ditch or channel that leads to open water except when approved by Ecology or the local jurisdiction. All sensitive areas including wells, creeks and wetlands must be flagged prior to spraying.
- As required by the local government or by Ecology, complete public posting of the area to be sprayed prior to the application.
- Spray applications should only be conducted during weather conditions as specified in the label direction and applicable local and state regulations. Do not apply during rain or immediately before expected rain.

Recommended Additional Operational BMPs for the use of pesticides:

- Consider alternatives to the use of pesticides such as covering or harvesting weeds, substitute vegetative growth, and manual weed control/moss removal.
- Consider the use of soil amendments, such as compost, that are known to control some common diseases in plants, such as Pythium root rot, ashy stem blight, and parasitic nematodes. The following are three possible mechanisms for disease control by compost addition (USEPA Publication 530-F-9-044):
  1. Successful competition for nutrients by antibiotic production;
  2. Successful predation against pathogens by beneficial microorganism; and
  3. Activation of disease-resistant genes in plants by composts.

Installing an amended soil/landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil/landscape system with adequate depth, permeability, and organic matter to sustain itself and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle.

- Once a pesticide is applied, its effectiveness should be evaluated for possible improvement. Records should be kept showing the applicability and inapplicability of the pesticides considered.
- An annual evaluation procedure should be developed including a review of the effectiveness of pesticide applications, impact on buffers and sensitive areas (including potable wells), public concerns, and recent toxicological information on pesticides used/proposed for use. If individual or public potable wells are located in the proximity of commercial pesticide applications contact the regional Ecology hydrogeologist to determine if additional pesticide application control measures are necessary.
- Rinseate from equipment cleaning and/or triple-rinsing of pesticide containers should be used as product or recycled into product.
- The application equipment used should be capable of immediate shutoff in the event of an emergency.

For more information, contact the WSU Extension Home-Assist Program, (253) 445-4556, or Bio-Integral Resource Center (BIRC), P.O. Box 7414, Berkeley, CA.94707, or the Washington Department of Ecology to obtain "Hazardous Waste Pesticides" (Publication #89-41); and/or EPA to obtain a publication entitled "Suspended, Canceled and Restricted Pesticides" which lists all restricted pesticides and the specific uses that are allowed. Valuable information from these sources may also be available on the internet.

Applicable Operational BMPs for Vegetation Management:

- Use at least an eight-inch "topsoil" layer with at least 8 percent organic matter to provide a sufficient vegetation-growing medium. Amending existing landscapes and turf systems by increasing the percent organic matter and depth of topsoil can substantially improve the permeability of the soil, the disease and drought resistance of the vegetation, and reduce fertilizer demand. This reduces the demand for fertilizers, herbicides, and pesticides. Organic matter is the least water-soluble form of nutrients that can be added to the soil. Composted organic matter generally releases only between 2 and 10 percent of its total nitrogen annually, and this release corresponds closely to the plant growth cycle. If natural plant debris and mulch are returned to the soil, this system can continue recycling nutrients indefinitely.
- Select the appropriate turfgrass mixture for your climate and soil type. Certain tall fescues and rye grasses resist insect attack because the symbiotic endophytic fungi found naturally in their tissues repel or kill common leaf and stem-eating lawn insects. They do not, however, repel root-feeding lawn pests such as Crane Fly larvae, and are toxic to ruminants such as cattle and sheep. The fungus causes no known adverse effects to the host plant or to humans. Endophytic grasses are commercially available and can be used in areas such as parks or golf courses where grazing does not occur. The local Cooperative Extension office can offer advice on which types of grass are best suited to the area and soil type.

- Use the following seeding and planting BMPs, or equivalent BMPs to obtain information on grass mixtures, temporary and permanent seeding procedures, maintenance of a recently planted area, and fertilizer application rates: Temporary Seeding, Mulching and Matting, Clear Plastic Covering, Permanent Seeding and Planting, and Sodding as described in Volume II).
- Selection of desired plant species can be made by adjusting the soil properties of the subject site. For example, a constructed wetland can be designed to resist the invasion of reed canary grass by layering specific strata of organic matters (e.g., compost forest product residuals) and creating a mildly acidic pH and carbon-rich soil medium. Consult a soil restoration specialist for site-specific conditions.
- Aerate lawns regularly in areas of heavy use where the soil tends to become compacted. Aeration should be conducted while the grasses in the lawn are growing most vigorously. Remove layers of thatch greater than ¾-inch deep.
- Mowing is a stress-creating activity for turfgrass. When grass is mowed too short its productivity is decreased and there is less growth of roots and rhizomes. The turf becomes less tolerant of environmental stresses, more disease prone and more reliant on outside means such as pesticides, fertilizers and irrigation to remain healthy. Set the mowing height at the highest acceptable level and mow at times and intervals designed to minimize stress on the turf. Generally mowing only 1/3 of the grass blade height will prevent stressing the turf.

Irrigation:

- The depth from which a plant normally extracts water depends on the rooting depth of the plant. Appropriately irrigated lawn grasses normally root in the top 6 to 12 inches of soil; lawns irrigated on a daily basis often root only in the top 1 inch of soil. Improper irrigation can encourage pest problems, leach nutrients, and make a lawn completely dependent on artificial watering. The amount of water applied depends on the normal rooting depth of the turfgrass species used, the available water holding capacity of the soil, and the efficiency of the irrigation system. Consult with the local water utility, Conservation District, or Cooperative Extension office to help determine optimum irrigation practices.

Fertilizer Management:

- Turfgrass is most responsive to nitrogen fertilization, followed by potassium and phosphorus. Fertilization needs vary by site depending on plant, soil and climatic conditions. Evaluation of soil nutrient levels through regular testing ensures the best possible efficiency and economy of fertilization. For details on soils testing, contact the local Conservation District or Cooperative Extension Service.
- Fertilizers should be applied in amounts appropriate for the target vegetation and at the time of year that minimizes losses to surface and ground waters. Do not fertilize during a drought or when the soil is dry. Alternatively, do not apply fertilizers within three days prior to predicted rainfall. The longer the period between fertilizer application and either rainfall or irrigation, the less fertilizer runoff occurs.
- Use slow release fertilizers such as methylene urea, IDBU, or resin coated fertilizers when appropriate, generally in the spring. Use of slow release fertilizers is especially important in areas with sandy or gravelly soils.
- Time the fertilizer application to periods of maximum plant uptake. Generally fall and spring applications are recommended, although WSU turf specialists recommend four fertilizer applications per year.
- Properly trained persons should apply all fertilizers. At commercial and industrial facilities fertilizers should not be applied to grass swales, filter strips, or buffer areas that drain to sensitive water bodies unless approved by the local jurisdiction.

Integrated Pest Management

An IPM program might consist of the following steps:

Step 1: Correctly identify problem pests and understand their life cycle

Step 2: Establish tolerance thresholds for pests.

Step 3: Monitor to detect and prevent pest problems.

Step 4: Modify the maintenance program to promote healthy plants and discourage pests.

Step 5: Use cultural, physical, mechanical, or biological controls first if pests exceed the tolerance thresholds.

Step 6: Evaluate and record the effectiveness of the control and modify maintenance practices to support lawn or landscape recovery and prevent recurrence.

For an elaboration of these steps refer to Appendix IV-F.

BMPs for Maintenance of Public and Private Utility Corridors and Facilities

Description of Pollutant Sources: Passageways and equipment at petroleum product, natural gas, and water pipelines, and electrical power transmission corridors and rights-of-way can be sources of pollutants such as herbicides used for vegetation management, and eroded soil particles from unpaved access roads. At pump stations waste materials generated during maintenance activities may be temporarily stored outside. Additional potential pollutant sources include the leaching of preservatives from wood utility poles, PCBs in older transformers, water that is removed from underground transformer vaults, and leaks/spills from petroleum pipelines. The following are potential pollutants: oil and grease, TSS, BOD, organics, PCB, pesticides, and heavy metals.

Pollutant Control Approach: Control of fertilizer and pesticide applications, soil erosion, and site debris that can contaminate stormwater.

Applicable Operational BMPs:

- Implement BMPs for Landscaping and Lawn/Vegetation Management and R.7 in Appendix IV-D on Pesticide Regulations.
- When water or sediments are removed from electric transformer vaults, determine whether contaminants might be present before disposing of the water and sediments. This includes inspecting for the presence of oil or sheen, and determining from records or testing if the transformers contain PCBs. If records or tests indicate that the sediment or water are contaminated above applicable levels, manage these media in accordance with applicable federal and state regulations, including the federal PCB rules (40 CFR 761) and the state MTCA cleanup regulations (Chapter 173-340 WAC). Water removed from the vaults can be discharged in accordance with the federal 40 CFR 761.79, and state regulations (Chapter 173-201A WAC and Chapter 173-200 WAC), or via the sanitary sewer if the requirements, including applicable permits, for such a discharge are met. (See also Appendix IV-D R.1 and R.3).
- Within utility corridors, consider preparing maintenance procedures and an implementation schedule that provides for a vegetative, gravel, or equivalent cover that minimizes bare or thinly vegetated ground surfaces within the corridor, to prevent the erosion of soil.
- Provide maintenance practices to prevent stormwater from accumulating and draining across and/or onto roadways. Stormwater should be conveyed through roadside ditches and culverts. The road should be crowned, outsloped, water barred or otherwise left in a condition not conducive to erosion. Appropriately maintaining grassy roadside ditches discharging to surface waters is an effective way of removing some pollutants associated with sediments carried by stormwater.

- Maintain ditches and culverts at an appropriate frequency to ensure that plugging and flooding across the roadbed, with resulting overflow erosion, does not occur.
- Apply the appropriate BMPs in this Volume for the storage of waste materials that can contaminate stormwater.

Recommended Operational BMPs

- When selecting utility poles for a specific location, consideration should be given to the potential environmental effects of the pole or poles during storage, handling, and end-use, as well as its cost, safety, efficacy and expected life. If a wood product treated with chemical preservatives is used, it should be made in accordance with generally accepted industry standards such as the American Wood Preservers Association Standards. If the pole or poles will be placed in or near an environmentally sensitive area, such as a wetland or a drinking water well, alternative materials or technologies should be considered. These include poles constructed with material(s) other than wood such as fiberglass composites, metal, or concrete. Other technologies and materials, such as sleeves or caissons for wood poles, may also be considered when they are determined to be practicable and available.
- As soon as practicable remove all litter from wire cutting/replacing operations, etc.
- Implement temporary erosion and sediment control in areas where clear-cuts are conducted and new roads are constructed.

BMPs for Maintenance of Roadside Ditches

Description of Pollutant Sources: Common road debris including eroded soil, oils, vegetative particles, and heavy metals can be sources of stormwater pollutants.

Pollutant Control Approach: Roadside ditches should be maintained to preserve the condition and capacity for which they were originally constructed, and to minimize bare or thinly vegetated ground surfaces. Maintenance practices should provide for erosion and sediment control (Refer to BMP Landscaping and Lawn/Vegetation Management).

Applicable Operational BMPs:

- Inspect roadside ditches regularly, as needed, to identify sediment accumulations and localized erosion.
- Clean ditches on a regular basis, as needed. Ditches should be kept free of rubbish and debris.
- Vegetation in ditches often prevents erosion and cleanses runoff waters. Remove vegetation only when flow is blocked or excess sediments have accumulated. Conduct ditch maintenance (seeding, fertilizer application, harvesting) in late spring and/or early fall, where possible. This allows vegetative cover to be re-established by the next wet season thereby minimizing erosion of the ditch as well as making the ditch effective as a biofilter.
- In the area between the edge of the pavement and the bottom of the ditch, commonly known as the "bare earth zone," use grass vegetation, wherever possible. Vegetation should be established from the edge of the pavement if possible, or at least from the top of the slope of the ditch.
- Diversion ditches on top of cut slopes that are constructed to prevent slope erosion by intercepting surface drainage must be maintained to retain their diversion shape and capability.
- Ditch cleanings are not to be left on the roadway surfaces. Sweep dirt and debris remaining on the pavement at the completion of ditch cleaning operations.
- Roadside ditch cleanings, not contaminated by spills or other releases and not associated with a stormwater treatment system such as a bioswale, may be screened to remove litter and separated into soil and vegetative matter (leaves, grass, needles, branches, etc.). The soil fraction may be handled as 'clean soils' and the vegetative matter can be composted or disposed of in a municipal waste landfill. For more information, please see "Recommendations for Management of Street Wastes," in Appendix IV-G of this volume.
- Roadside ditch cleanings contaminated by spills or other releases known or suspected to contain dangerous waste must be handled

following the Dangerous Waste Regulations (Chapter 173-303 WAC) unless testing determines it is not dangerous waste.

- Examine culverts on a regular basis for scour or sedimentation at the inlet and outlet, and repair as necessary. Give priority to those culverts conveying perennial and/or salmon-bearing streams and culverts near streams in areas of high sediment load, such as those near subdivisions during construction.

Recommended Treatment BMPs:

Install biofiltration swales and filter strips –See Chapter 9, Volume V) to treat roadside runoff wherever practicable and use engineered topsoils wherever necessary to maintain adequate vegetation (CH2M Hill, 2000). These systems can improve infiltration and stormwater pollutant control upstream of roadside ditches.

BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Description of Pollutant Sources: Facilities include roadside catch basins on arterials and within residential areas, conveyance systems, detention facilities such as ponds and vaults, oil and water separators, biofilters, settling basins, infiltration systems, and all other types of stormwater treatment systems presented in Volume V. Roadside catch basins can remove from 5 to 15 percent of the pollutants present in stormwater. When catch basins are about 60 percent full of sediment, they cease removing sediments. Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water are found in catch basins, oil and water separators, settling basins, etc.

Pollutant Control Approach: Provide maintenance and cleaning of debris, sediments, and oil from stormwater collection, conveyance, and treatment systems to obtain proper operation.

Applicable Operational BMPs:

Maintain stormwater treatment facilities according to the O & M procedures presented in Section 4.6 of Volume V in addition to the following BMPs:

- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine whether improvements in O & M are needed.
- Promptly repair any deterioration threatening the structural integrity of the facilities. These include replacement of clean-out gates, catch basin lids, and rock in emergency spillways.
- Ensure that storm sewer capacities are not exceeded and that heavy sediment discharges to the sewer system are prevented.
- Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, etc. and discharge to a sanitary sewer if approved by the sewer authority, or truck to a local or state government approved disposal site.
- Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of basin to the invert of the lowest pipe into or out of the basin. However, in no case should there be less than six inches clearance from the debris surface to the invert of the lowest pipe. Some catch basins (for example, WSDOT Type 1L basins) may have as little as 12 inches sediment storage below the invert. These catch basins will need more frequent inspection and cleaning to prevent scouring. Where these catcb basins are part of a stormwater collection and treatment system, the system owner/operator may choose to concentrate maintenance efforts on downstream control devices as part of a systems approach.

- Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catcbbasin.
- Post warning signs; "Dump No Waste - Drains to Ground Water," "Streams," "Lakes," or emboss on or adjacent to all storm drain inlets *where practical.*
- Disposal of sediments and liquids from the catch basins must comply with "Recommendations for Management of Street Wastes" described in Appendix IV-G of this volume.

Additional Applicable BMPs: Select additional applicable BMPs from this chapter depending on the pollutant sources and activities conducted at the facility. Those BMPs include:

- BMPs for Soil Erosion and Sediment Control at Industrial Sites
- BMPs for Storage of Liquid, Food Waste, or Dangerous Waste Containers
- BMPs for Spills of Oil and Hazardous Substances
- BMPs for Illicit Connections to Storm Drains
- BMPs for Urban Streets.

APPENDIX

8.13 CONSTRUCTION SITE SOURCE CONTROL OF POLLUTANTS & STORMWATER RUNOFF CONVEYANCE BMPS

4.1 Source Control BMPs

BMP C101: Preserving Natural Vegetation

Purpose

The purpose of preserving natural vegetation is to reduce erosion wherever practicable. Limiting site disturbance is the single most effective method for reducing erosion. For example, conifers can hold up to about 50 percent of all rain that falls during a storm. Up to 20-30 percent of this rain may never reach the ground but is taken up by the tree or evaporates. Another benefit is that the rain held in the tree can be released slowly to the ground after the storm.

Conditions of Use

- Natural vegetation should be preserved on steep slopes, near perennial and intermittent watercourses or swales, and on building sites in wooded areas.
- As required by local governments.

Design and Installation Specifications

Natural vegetation can be preserved in natural clumps or as individual trees, shrubs and vines.

The preservation of individual plants is more difficult because heavy equipment is generally used to remove unwanted vegetation. The points to remember when attempting to save individual plants are:

- Is the plant worth saving? Consider the location, species, size, age, vigor, and the work involved. Local governments may also have ordinances to save natural vegetation and trees.
- Fence or clearly mark areas around trees that are to be saved. It is preferable to keep ground disturbance away from the trees at least as far out as the dripline.

Plants need protection from three kinds of injuries:

- *Construction Equipment* - This injury can be above or below the ground level. Damage results from scarring, cutting of roots, and compaction of the soil. Placing a fenced buffer zone around plants to be saved prior to construction can prevent construction equipment injuries.
- *Grade Changes* - Changing the natural ground level will alter grades, which affects the plant's ability to obtain the necessary air, water, and minerals. Minor fills usually do not cause problems although sensitivity between species does vary and should be checked. Trees can tolerate fill of 6 inches or less. For shrubs and other plants, the fill should be less.

  When there are major changes in grade, it may become necessary to supply air to the roots of plants. This can be done by placing a layer of gravel and a tile system over the roots before the fill is made. A tile

system protects a tree from a raised grade. The tile system should be laid out on the original grade leading from a dry well around the tree trunk. The system should then be covered with small stones to allow air to circulate over the root area.

  Lowering the natural ground level can seriously damage trees and shrubs. The highest percentage of the plant roots are in the upper 12 inches of the soil and cuts of only 2-3 inches can cause serious injury. To protect the roots it may be necessary to terrace the immediate area around the plants to be saved. If roots are exposed, construction of retaining walls may be needed to keep the soil in place. Plants can also be preserved by leaving them on an undisturbed, gently sloping mound. To increase the chances for survival, it is best to limit grade changes and other soil disturbances to areas outside the dripline of the plant.

- *Excavations* - Protect trees and other plants when excavating for drainfields, power, water, and sewer lines. Where possible, the trenches should be routed around trees and large shrubs. When this is not possible, it is best to tunnel under them. This can be done with hand tools or with power augers. If it is not possible to route the trench around plants to be saved, then the following should be observed:

  Cut as few roots as possible. When you have to cut, cut clean. Paint cut root ends with a wood dressing like asphalt base paint.

  Backfill the trench as soon as possible.

  Tunnel beneath root systems as close to the center of the main trunk to preserve most of the important feeder roots.

Some problems that can be encountered with a few specific trees are:

- Maple, Dogwood, Red alder, Western hemlock, Western red cedar, and Douglas fir do not readily adjust to changes in environment and special care should be taken to protect these trees.
- The windthrow hazard of Pacific silver fir and madronna is high, while that of Western hemlock is moderate. The danger of windthrow increases where dense stands have been thinned. Other species (unless they are on shallow, wet soils less than 20 inches deep) have a low windthrow hazard.
- Cottonwoods, maples, and willows have water-seeking roots. These can cause trouble in sewer lines and infiltration fields. On the other hand, they thrive in high moisture conditions that other trees would not.
- Thinning operations in pure or mixed stands of Grand fir, Pacific silver fir, Noble fir, Sitka spruce, Western red cedar, Western hemlock,

Pacific dogwood, and Red alder can cause serious disease problems. Disease can become established through damaged limbs, trunks, roots, and freshly cut stumps. Diseased and weakened trees are also susceptible to insect attack.

Maintenance Standards

- Inspect flagged and/or fenced areas regularly to make sure flagging or fencing has not been removed or damaged. If the flagging or fencing has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.
- If tree roots have been exposed or injured, "prune" cleanly with an appropriate pruning saw or lopers directly above the damaged roots and recover with native soils. Treatment of sap flowing trees (fir, hemlock, pine, soft maples) is not advised as sap forms a natural healing barrier.

BMP C105: Stabilized Construction Entrance

Purpose

Construction entrances are stabilized to reduce the amount of sediment transported onto paved roads by vehicles or equipment by constructing a stabilized pad of quarry spalls at entrances to construction sites.

Conditions of Use

Construction entrances shall be stabilized wherever traffic will be leaving a construction site and traveling on paved roads or other paved areas within 1,000 feet of the site.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized entrances not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

- See Figure 4.2 for details. Note: the 100' minimum length of the entrance shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').
- A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the following standards:

Grab Tensile Strength (ASTM D4751)	200 psi min.
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will paved; this can be used as a stabilized entrance. Also consider the installation of excess concrete as a stabilized entrance. During large concrete pours, excess concrete is often available for this purpose.
- Hog fuel (wood-based mulch) may be substituted for or combined with quarry spalls in areas that will not be used for permanent roads. Hog fuel is generally less effective at stabilizing construction entrances and should be used only at sites where the amount of traffic is very limited. Hog fuel is not recommended for entrance stabilization in urban areas. The effectiveness of hog fuel is highly variable and it generally requires more maintenance than quarry spalls. The inspector may at any time require the use of quarry spalls if the hog fuel is not preventing sediment from being tracked onto pavement or if the hog fuel is being carried onto pavement. Hog fuel is prohibited in permanent roadbeds because organics in the subgrade soils cause degradation of the subgrade support over time.
- Fencing (see BMPs C103 and C104) shall be installed as necessary to restrict traffic to the construction entrance.

- Whenever possible, the entrance shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.

Maintenance Standards

- Quarry spalls (or hog fuel) shall be added if the pad is no longer in accordance with the specifications.
- If the entrance is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include street sweeping, an increase in the dimensions of the entrance, or the installation of a wheel wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction entrance(s), fencing (see BMPs C103 and C104) shall be installed to control traffic.
- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

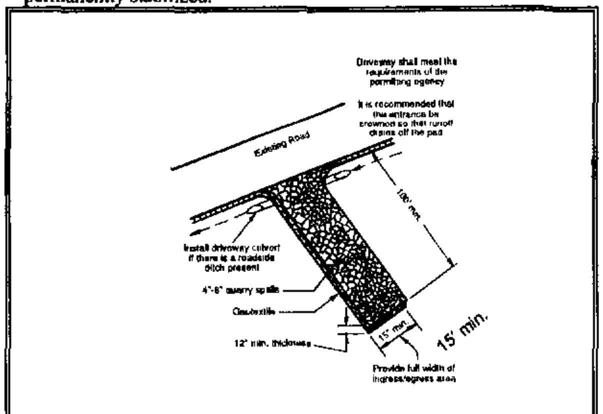


Figure 4.2 – Stabilized Construction Entrance

BMP C106: Wheel Wash

Purpose

Wheel washes reduce the amount of sediment transported onto paved roads by motor vehicles.

Conditions of Use

When a stabilized construction entrance (see BMP C105) is not preventing sediment from being tracked onto pavement.

- Wheel washing is generally an effective BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck can run unimpeded into the street.
- Pressure washing combined with an adequately sized and surfaced pad with direct drainage to a large 10-foot x 10-foot sump can be very effective.

Design and Installation Specifications

Suggested details are shown in Figure 4.3. The Local Permitting Authority may allow other designs. A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash.

Use a low clearance truck to test the wheel wash before paving. Either a belly dump or lowboy will work well to test clearance.

Keep the water level from 12 to 14 inches deep to avoid damage to truck hubs and filling the truck tongues with water.

Midpoint spray nozzles are only needed in extremely muddy conditions.

Wheel wash systems should be designed with a small grade change, 6 to 12 inches for a 10-foot-wide pond, to allow sediment to flow to the low side of pond to help prevent re-suspension of sediment. A drainpipe with a 2- to 3-foot riser should be installed on the low side of the pond to allow for easy cleaning and refilling. Polymers may be used to promote coagulation and flocculation in a closed-loop system. Polyacrylamide (PAM) added to the wheel wash water at a rate of 0.25 - 0.5 pounds per 1,000 gallons of water increases effectiveness and reduces cleanup time. If PAM is already being used for dust or erosion control and is being applied by a water truck, the same truck can be used to change the wash water.

Maintenance Standards

The wheel wash should start out the day with fresh water.

The wash water should be changed a minimum of once per day. On large earthwork jobs where more than 10-20 trucks per hour are expected, the wash water will need to be changed more often.

Wheel wash or tire bath wastewater shall be discharged to a separate on-site treatment system, such as closed-loop recirculation or land application, or to the sanitary sewer with proper local sewer district approval.

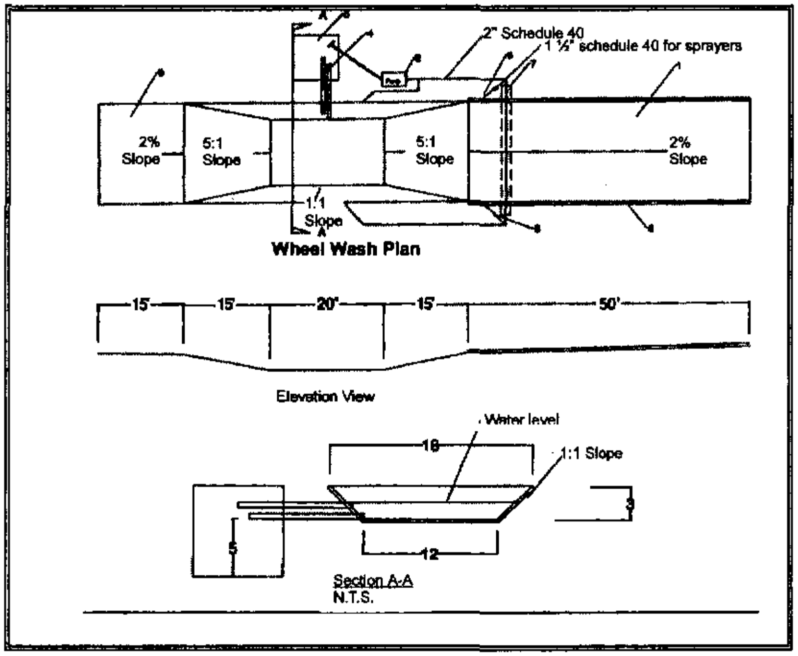


Figure 4.3 Wheel Wash

Notes:

1. Asphalt construction entrance 6 in. asphalt treated base (ATB).
2. 3-inch trash pump with floats on the suction hose.
3. Midpoint spray nozzles, if needed.
4. 6-inch sewer pipe with butterfly valves. Bottom one is a drain. Locate top pipe's invert 1 foot above bottom of wheel wash.
5. 8 foot x 8 foot sump with 5 feet of catch. Build so can be cleaned with trackhoe.
6. Asphalt curb on the low road side to direct water back to pond.
7. 6-inch sleeve under road.
8. Ball valves.
9. 15 foot. ATB apron to protect ground from splashing water.

BMP C107: Construction Road/Parking Area Stabilization

Purpose

Stabilizing subdivision roads, parking areas, and other onsite vehicle transportation routes immediately after grading reduces erosion caused by construction traffic or runoff.

Conditions of Use

- Roads or parking areas shall be stabilized wherever they are constructed, whether permanent or temporary, for use by construction traffic.
- Fencing (see BMPs C103 and C104) shall he installed, if necessary, to limit the access of vehicles to only those roads and parking areas that are stabilized.

Design and Installation Specifications

- On areas that will receive asphalt as part of the project, install the first lift as soon as possible.
- A 6-inch depth of 2- to 4-inch crushed rock, gravel base, or crushed surfacing base course shall be applied immediately after grading or utility installation. A 4-inch course of asphalt treated base (ATB) may also be used, or the road/parking area may be paved. It may also be possible to use cement or calcium chloride for soil stabilization. If cement or cement kiln dust is used for roadbase stabilization, pH monitoring and BMPs are necessary to evaluate and minimize the effects on stormwater. If the area will not be used for permanent roads, parking areas, or structures, a 6-inch depth of hog fuel may also be used, but this is likely to require more maintenance. Whenever possible, construction roads and parking areas shall be placed on a firm, compacted subgrade.
- Temporary road gradients shall not exceed 15 percent. Roadways shall be carefully graded to drain. Drainage ditches shall be provided on each side of the roadway in the case of a crowned section, or on one side in the case of a super-elevated section. Drainage ditches shall be directed to a sediment control BMP.
- Rather than relying on ditches, it may also be possible to grade the road so that runoff sheet-flows into a heavily vegetated area with a well-developed topsoil. Landscaped areas are not adequate. If this area has at least 50 feet of vegetation, then it is generally preferable to use the vegetation to treat runoff, rather than a sediment pond or trap. The 50 feet shall not include wetlands. If runoff is allowed to sheetflow through adjacent vegetated areas, it is vital to design the roadways and parking areas so that no concentrated runoff is created.
- Storm drain inlets shall be protected to prevent sediment-laden water entering the storm drain system (see BMP C220).

Maintenance Standards

- Inspect stabilized areas regularly, especially after large storm events.
- Crushed rock, gravel base, hog fuel, etc. shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.
- Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding is intended to reduce erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

- Seeding may be used throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.
- Channels that will be vegetated should be installed before major earthwork and hydroseeded with a Bonded Fiber Matrix. The vegetation should be well established (i.e., 75 percent cover) before water is allowed to flow in the ditch. With channels that will have high flows, erosion control blankets should be installed over the hydroseed. If vegetation cannot be established from seed before water is allowed in the ditch, sod should be installed in the bottom of the ditch over hydromulch and blankets.
- Retention/detention ponds should be seeded as required.
- Mulch is required at all times because it protects seeds from heat, moisture loss, and transport due to runoff.
- All disturbed areas shall be reviewed in late August to early September and all seeding should be completed by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.
- At final site stabilization, all disturbed areas not otherwise vegetated or stabilized shall be seeded and mulched. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions or geotextiles) which will prevent erosion.

Design and Installation Specifications

- Seeding should be done during those seasons most conducive to growth and will vary with the climate conditions of the region. Local experience should be used to determine the appropriate seeding periods.
- The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1. Seeding that occurs between July 1 and August 30 will require irrigation until 75 percent grass cover is established. Seeding that occurs between October 1 and March 30 will require a mulch or plastic cover until 75 percent grass cover is established.
- To prevent seed from being washed away, confirm that all required surface water control measures have been installed.

- The seedbed should be firm and rough. All soil should be roughened no matter what the slope. If compaction is required for engineering purposes, slopes must be track walked before seeding. Backblading or smoothing of slopes greater than 4:1 is not allowed if they are to be seeded.
- New and more effective restoration-based landscape practices rely on deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical the subgrade should be initially ripped to improve long-term permeability, infiltration, and water inflow qualities. At a minimum, permanent areas shall use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches the rototilling process should be done in multiple lifts, or the prepared soil system shall be prepared properly and then placed to achieve the specified depth.
- Organic matter is the most appropriate form of "fertilizer" because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form. A natural system typically releases 2-10 percent of its nutrients annually. Chemical fertilizers have since been formulated to simulate what organic matter does naturally.
- In general, 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer can be used at a rate of 90 pounds per acre. Slow-release fertilizers should always be used because they are more efficient and have fewer environmental impacts. It is recommended that areas being seeded for final landscaping conduct soil tests to determine the exact type and quantity of fertilizer needed. This will prevent the over-application of fertilizer. Fertilizer should not be added to the hydromulch machine and agitated more than 20 minutes before it is to be used. If agitated too much, the slow-release coating is destroyed.
- There are numerous products available on the market that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal is a good source of long-term, slow-release, available nitrogen.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. Mulch may be made up of 100 percent: cottonseed meal; fibers made of wood, recycled cellulose, hemp, and kenaf; compost; or blends of these. Tackifier shall be plant-based, such as guar or alpha plantago, or chemical-based such as polyacrylamide or polymers. Any mulch or tackifier product used shall be installed per manufacturer's instructions. Generally, mulches come in 40-50 pound bags. Seed and fertilizer are added at time of application.

- Mulch is always required for seeding. Mulch can be applied on top of the seed or simultaneously by hydroseeding.
- On steep slopes, Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products should be used. BFM/MBFM products are applied at a minimum rate of 3,000 pounds per acre of mulch with approximately 10 percent tackifier. Application is made so that a minimum of 95 percent soil coverage is achieved. Numerous products are available commercially and should be installed per manufacturer's instructions. Most products require 24-36 hours to cure before a rainfall and cannot be installed on wet or saturated soils. Generally, these products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.

BFMs and MBFMs have some advantages over blankets:

- No surface preparation required;
- Can be installed via helicopter in remote areas;
- On slopes steeper than 2.5:1, blanket installers may need to be roped and harnessed for safety;
- They are at least $1,000 per acre cheaper installed.

In most cases, the shear strength of blankets is not a factor when used on slopes, only when used in channels. BFMs and MBFMs are good alternatives to blankets in most situations where vegetation establishment is the goal.

- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. One way to overcome this is to increase seed quantities by up to 50 percent.
- Vegetation establishment can also be enhanced by dividing the hydromulch operation into two phases:
  1. Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift;
  2. Phase 2- Install the rest of the mulch and tackifier over the first lift.

An alternative is to install the mulch, seed, fertilizer, and tackifier in one lift. Then, spread or blow straw over the top of the hydromulch at a rate of about 800-1000 pounds per acre. Hold straw in place with a standard tackifier. Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:

1. Irrigation
2. Reapplication of mulch
3. Repair of failed slope surfaces

This technique works with standard hydromulch (1,500 pounds per acre minimum) and BFM/MBFMs (3,000 pounds per acre minimum).

- Areas to be permanently landscaped shall provide a healthy topsoil that reduces the need for fertilizers, improves overall topsoil quality, provides for better vegetal health and vitality, improves hydrologic characteristics, and reduces the need for irrigation. This can be accomplished in a number of ways:

  Recent research has shown that the best method to improve till soils is to amend these soils with compost. The optimum mixture is approximately two parts soil to one part compost. This equates to 4 inches of compost mixed to a depth of 12 inches in till soils. Increasing the concentration of compost beyond this level can have negative effects on vegetal health, while decreasing the concentrations can reduce the benefits of amended soils. Please note: The compost should meet specifications for Grade A quality compost in Ecology Publication 94-038.

  Other soils, such as gravel or cobble outwash soils, may require different approaches. Organics and fines easily migrate through the loose structure of these soils. Therefore, the importation of at least 6 inches of quality topsoil, underlain by some type of filter fabric to prevent the migration of fines, may be more appropriate for these soils.

  Areas that already have good topsoil, such as undisturbed areas, do not require soil amendments.

- Areas that will be seeded only and not landscaped may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Native topsoil should be re-installed on the disturbed soil surface before application.
- Seed that is installed as a temporary measure may be installed by hand if it will be covered by straw, mulch, or topsoil. Seed that is installed as a permanent measure may be installed by hand on small areas (usually less than 1 acre) that will be covered with mulch, topsoil, or erosion blankets. The seed mixes listed below include recommended mixes for both temporary and permanent seeding. These mixes, with the exception of the wetland mix, shall be applied at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Local suppliers or the local conservation district should be consulted for their recommendations because the appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used.

Table 4.1 represents the standard mix for those areas where just a temporary vegetative cover is required.

Table 4.1
Temporary Erosion Control Seed Mix

	% Weight	% Purity	% Germination
Chewings or annual blue grass *Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye - *Lolium perenne*	50	98	90
Redtop or colonial bentgrass *Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover *Trifolium repens*	5	98	90

Table 4.2 provides just one recommended possibility for landscaping seed.

Table 4.2
Landscaping Seed Mix

	% Weight	% Purity	% Germination
Perennial rye blend *Lolium perenne*	70	98	90
Chewings and red fescue blend *Festuca rubra var. commutata* or *Festuca rubra*	30	98	90

This turf seed mix in Table 4.3 is for dry situations where there is no need for much water. The advantage is that this mix requires very little maintenance.

Table 4.3
Low-Growing Turf Seed Mix

	% Weight	% Purity	% Germination
Dwarf tall fescue (several varieties) *Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay) *Lolium perenne var. barclay*	30	98	90
Red fescue *Festuca rubra*	20	98	90
Colonial bentgrass *Agrostis tenuis*	5	98	90

Table 4.4 presents a mix recommended for bioswales and other intermittently wet areas.

Table 4.4
Bioswale Seed Mix*

	% Weight	% Purity	% Germination
Tall or meadow fescue *Festuca arundinacea* or *Festuca elatior*	75-80	98	90
Seaside/Creeping bentgrass *Agrostis palustris*	10-15	92	85
Redtop bentgrass *Agrostis alba* or *Agrostis gigantea*	5-10	90	80

* *Modified Briargreen, Inc. Hydroseeding Guide Wetlands Seed Mix*

The seed mix shown in Table 4.5 is a recommended low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Other mixes may be appropriate, depending on the soil type and hydrology of the area. Recent research suggests that bentgrass (agrostis sp.) should be emphasized in wet-area seed mixes. Apply this mixture at a rate of 60 pounds per acre.

Table 4.5
Wet Area Seed Mix*

	% Weight	% Purity	% Germination
Tall or meadow fescue *Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass *Agrostis palustris*	10-15	98	85
Meadow foxtail *Alepocurus pratensis*	10-15	90	80
Alsike clover *Trifolium hybridum*	1-6	98	90
Redtop bentgrass *Agrostis alba*	1-6	92	85

* *Modified Briargreen, Inc. Hydroseeding Guide Wetlands Seed Mix*

The meadow seed mix in Table 4.6 is recommended for areas that will be maintained infrequently or not at all and where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. The appropriateness of clover in the mix may need to be considered, as this can be a fairly invasive species. If the soil is amended, the addition of clover may not be necessary.

Table 4.6
Meadow Seed Mix

	% Weight	% Purity	% Germination
Redtop or Oregon bentgrass *Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue *Festuca rubra*	70	98	90
White dutch clover *Trifolium repens*	10	98	90

Maintenance Standards

- Any seeded areas that fail to establish at least 80 percent cover (100 percent cover for areas that receive sheet or concentrated flows) shall be reseeded. If reseeding is ineffective, an alternate method, such as sodding, mulching, or nets/blankets, shall be used. If winter weather prevents adequate grass growth, this time limit may be relaxed at the discretion of the local authority when sensitive areas would otherwise be protected.

- After adequate cover is achieved, any areas that experience erosion shall be reseeded and protected by mulch. If the erosion problem is drainage related, the problem shall be fixed and the eroded area reseeded and protected by mulch.
- Seeded areas shall be supplied with adequate moisture, but not watered to the extent that it causes runoff.

BMP C121: Mulching

Purpose

The purpose of mulching soils is to provide immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture, holding fertilizer, seed, and topsoil in place, and moderating soil temperatures. There is an enormous variety of mulches that can be used. Only the most common types are discussed in this section.

Conditions of Use

As a temporary cover measure, mulch should be used:

- On disturbed areas that require cover measures for less than 30 days.
- As a cover for seed during the wet season and during the hot summer months.
- During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.
- Mulch may be applied at any time of the year and must be refreshed periodically.

Design and Installation Specifications

For mulch materials, application rates, and specifications, see Table 4.7. Note: Thicknesses may be increased for disturbed areas in or near sensitive areas or other areas highly susceptible to erosion.

Mulch used within the ordinary high-water mark of surface waters should be selected to minimize potential flotation of organic matter. Composted organic materials have higher specific gravities (densities) than straw, wood, or chipped material.

Maintenance Standards

- The thickness of the cover must be maintained.
- Any areas that experience erosion shall be remulched and/or protected with a net or blanket. If the erosion problem is drainage related, then the problem shall be fixed and the eroded area remulched.

Table 4.7
Mulch Standards and Guidelines

Mulch Material	Quality Standards	Application Rates	Remarks
Straw	Air-dried; free from undesirable seed and coarse material.	2"-3" thick; 5 bales per 1000 sf or 2-3 tons per acre	Cost-effective protection when applied with adequate thickness. Hand-application generally requires greater thickness than blown straw. The thickness of straw may be reduced by half when used in conjunction with seeding. In windy areas straw must be held in place by crimping, using a tackifier, or covering with netting. Blown straw always has to be held in place with a tackifier as even light winds will blow it away. Straw, however, has several deficiencies that should be considered when selecting mulch materials. It often introduces and/or encourages the propagation of weed species and it has no significant long-term benefits. Straw should be used only if mulches with long-term benefits are unavailable locally. It should also not be used within the ordinary high-water elevation of surface waters (due to flotation).
Hydromulch	No growth inhibiting factors.	Approx. 25-30 lbs per 1000 sf or 1500 - 2000 lbs per acre	Shall be applied with hydromulcher. Shall not be used without seed and tackifier unless the application rate is at least doubled. Fibers longer than about ¾-1 inch clog hydromulch equipment. Fibers should be kept to less than ¾ inch.
Composted Mulch and Compost	No visible water or dust during handling. Must be purchased from supplier with Solid Waste Handling Permit (unless exempt).	2" thick min.; approx. 100 tons per acre (approx. 800 lbs per yard)	More effective control can be obtained by increasing thickness to 3". Excellent mulch for protecting final grades until landscaping because it can be directly seeded or tilled into soil as an amendment. Composted mulch has a coarser size gradation than compost. It is more stable and practical to use in wet areas and during rainy weather conditions.
Chipped Site Vegetation	Average size shall be several inches. Gradations from fines to 6 inches in length for texture, variation, and interlocking properties.	2" minimum thickness	This is a cost-effective way to dispose of debris from clearing and grubbing, and it eliminates the problems associated with burning. Generally, it should not be used on slopes above approx. 10% because of its tendency to be transported by runoff. It is not recommended within 200 feet of surface waters. If seeding is expected shortly after mulch, the decomposition of the chipped vegetation may tie up nutrients important to grass establishment.
Wood-based Mulch	No visible water or dust during handling. Must be purchased from a supplier with a Solid Waste Handling Permit or one exempt from solid waste regulations.	2" thick; approx. 100 tons per acre (approx. 800 lbs. per cubic yard)	This material is often called "hog or hogged fuel." It is usable as a material for Stabilized Construction Entrances (BMP C105) and as a mulch. The use of mulch ultimately improves the organic matter in the soil. Special caution is advised regarding the source and composition of wood-based mulches. Its preparation typically does not provide any weed seed control, so evidence of residual vegetation in its composition or known inclusion of weed plants or seeds should be monitored and prevented (or minimized).

BMP C122: Nets and Blankets

Purpose Erosion control nets and blankets are intended to prevent erosion and hold seed and mulch in place on steep slopes and in channels so that vegetation can become well established. In addition, some nets and blankets can be used to permanently reinforce turf to protect drainage ways during high flows. Nets (commonly called matting) are strands of material woven into an open, but high-tensile strength net (for example, coconut fiber matting). Blankets are strands of material that are not tightly woven, but instead form a layer of interlocking fibers, typically held together by a biodegradable or photodegradable netting (for example, excelsior or straw blankets). They generally have lower tensile strength than nets, but cover the ground more completely. Coir (coconut fiber) fabric comes as both nets and blankets.

Conditions of Use Erosion control nets and blankets should be used:

- To aid permanent vegetated stabilization of slopes 2H:1V or greater and with more than 10 feet of vertical relief.
- For drainage ditches and swales (highly recommended). The application of appropriate netting or blanket to drainage ditches and swales can protect bare soil from channelized runoff while vegetation is established. Nets and blankets also can capture a great deal of sediment due to their open, porous structure. Synthetic nets and blankets can be used to permanently stabilize channels and may provide a cost-effective, environmentally preferable alternative to riprap. 100 percent synthetic blankets manufactured for use in ditches may be easily reused as temporary ditch liners.

Disadvantages of blankets include:

- Surface preparation required;
- On slopes steeper than 2.5:1, blanket installers may need to be roped and harnessed for safety;
- They cost at least $4,000-6,000 per acre installed.

Advantages of blankets include:

- Can be installed without mobilizing special equipment;
- Can be installed by anyone with minimal training;
- Can be installed in stages or phases as the project progresses;
- Seed and fertilizer can be hand-placed by the installers as they progress down the slope;
- Can be installed in any weather;
- There are numerous types of blankets that can be designed with various parameters in mind. Those parameters include: fiber blend, mesh strength, longevity, biodegradability, cost, and availability.

Design and Installation Specifications

- See Figure 4.4 and Figure 4.5 for typical orientation and installation of blankets used in channels and as slope protection. Note: these are typical only; all blankets must be installed per manufacturer's installation instructions.
- Installation is critical to the effectiveness of these products. If good ground contact is not achieved, runoff can concentrate under the product, resulting in significant erosion.
- Installation of Blankets on Slopes:
  1. Complete final grade and track walk up and down the slope.
  2. Install hydromulch with seed and fertilizer.
  3. Dig a small trench, approximately 12 inches wide by 6 inches deep along the top of the slope.
  4. Install the leading edge of the blanket into the small trench and staple approximately every 18 inches. NOTE: Staples are metal,"U"-shaped, and a minimum of 6 inches long. Longer staples are used in sandy soils. Biodegradable stakes are also available.
  5. Roll the blanket slowly down the slope as installer walks backwards. NOTE: The blanket rests against the installer's legs. Staples are installed as the blanket is unrolled. It is critical that the proper staple pattern is used for the blanket being installed. The blanket is not to be allowed to roll down the slope on its own as this stretches the blanket making it impossible to maintain soil contact. In addition, no one is allowed to walk on the blanket after it is in place.
  6. If the blanket is not long enough to cover the entire slope length, the trailing edge of the upper blanket should overlap the leading edge of the lower blanket and be stapled. On steeper slopes, this overlap should be installed in a small trench, stapled, and covered with soil.
- With the variety of products available, it is impossible to cover all the details of appropriate use and installation. Therefore, it is critical that the design engineer consults the manufacturer's information and that a site visit takes place in order to insure that the product specified is appropriate. Information is also available at the following web sites:
  1. WSDOT: http://www.wsdot.wa.gov/eesc/environmental/
  2. Texas Transportation Institute: http://www.dot.state.tx.us/insdtdot/orgchart/cmd/erosion/contents.htm

- *Jute matting must be used in conjunction with mulch (BMP C121).* Excelsior, woven straw blankets and coir (coconut fiber) blankets may be installed without mulch. There are many other types of erosion control nets and blankets on the market that may be appropriate in certain circumstances.
- In general, most nets (e.g., jute matting) require mulch in order to prevent erosion because they have a fairly open structure. Blankets typically do not require mulch because they usually provide complete protection of the surface.
- *Extremely steep, unstable, wet, or rocky slopes* are often appropriate candidates for use of synthetic blankets, as are riverbanks, beaches and other high-energy environments. If synthetic blankets are used, the soil should be hydromulched first.
- 100 percent biodegradable blankets are available for use in sensitive areas. These organic blankets are usually held together with a paper or fiber mesh and stitching which may last up to a year.
- Most netting used with blankets is photodegradable, meaning they break down under sunlight (not UV stabilized). However, this process can take months or years even under bright sun. Once vegetation is established, sunlight does not reach the mesh. It is not uncommon to find non-degraded netting still in place several years after installation. This can be a problem if maintenance requires the use of mowers or ditch cleaning equipment. In addition, birds and small animals can become trapped in the netting.

Maintenance Standards

- Good contact with the ground must be maintained, and erosion must not occur beneath the net or blanket.
- Any areas of the net or blanket that are damaged or not in close contact with the ground shall be repaired and stapled.
- If erosion occurs due to poorly controlled drainage, the problem shall be fixed and the eroded area protected.

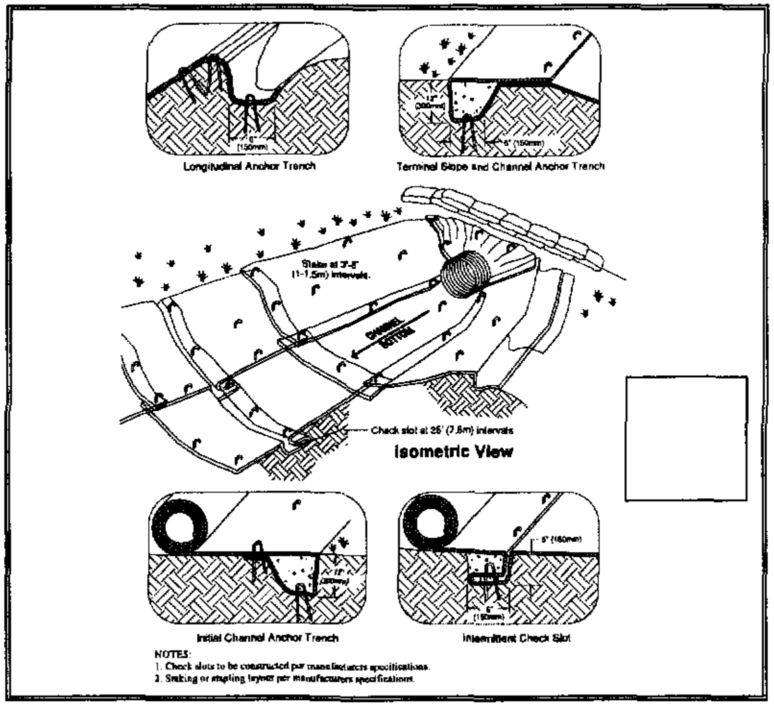


Figure 4.4 – Channel Installation

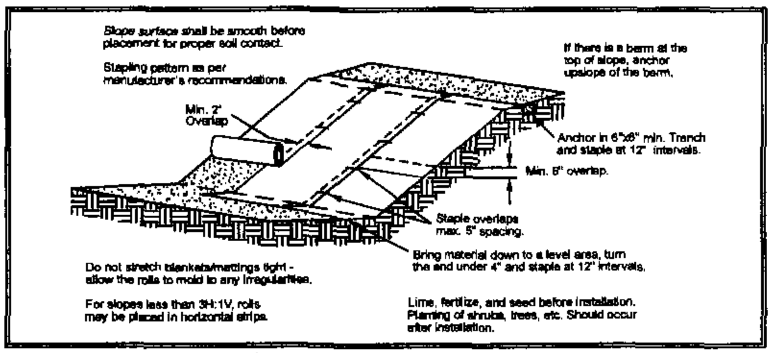


Figure 4.5 – Slope Installation

BMP C123: Plastic Covering

Purpose

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

Conditions of Use

- Plastic covering may be used on disturbed areas that require cover measures for less than 30 days, except as stated below.
- Plastic is particularly useful for protecting cut and fill slopes and stockpiles. Note: The relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for long-term (greater than six months) applications.
- Clear plastic sheeting can be used over newly-seeded areas to create a greenhouse effect and encourage grass growth if the hydroseed was installed too late in the season to establish 75 percent grass cover, or if the wet season started earlier than normal. Clear plastic should not be used for this purpose during the summer months because the resulting high temperatures can kill the grass.
- Due to rapid runoff caused by plastic sheeting, this method shall not be used upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- While plastic is inexpensive to purchase, the added cost of installation, maintenance, removal, and disposal make this an expensive material, up to \$1.50-2.00 per square yard.
- Whenever plastic is used to protect slopes, water collection measures must be installed at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to covey clean rainwater away from bare soil and disturbed areas. At no time is clean runoff from a plastic covered slope to be mixed with dirty runoff from a project.
- Other uses for plastic include:
  1. Temporary ditch liner;
  2. Pond liner in temporary sediment pond;
  3. Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored;
  4. Emergency slope protection during heavy rains; and,
  5. Temporary drainpipe ("elephant trunk") used to direct water.

Design and Installation Specifications

- Plastic slope cover must be installed as follows:
  1. Run plastic up and down slope, not across slope;
  2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet;
  3. Minimum of 8-inch overlap at seams;
  4. On long or wide slopes, or slopes subject to wind, all seams should be taped;
  5. Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath;
  6. Place sand filled burlap or geotextile bags every 3 to 6 feet along seams and pound a wooden stake through each to hold them in place;
  7. Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high velocity runoff from contacting bare soil which causes extreme erosion;
  8. Sandbags may be lowered into place tied to ropes. However, all sandbags must be staked in place.
- Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
- If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

Maintenance Standards

- Torn sheets must be replaced and open seams repaired.
- If the plastic begins to deteriorate due to ultraviolet radiation, it must be completely removed and replaced.
- When the plastic is no longer needed, it shall be completely removed.
- Dispose of old tires appropriately.

BMP C124: Sodding

Purpose

The purpose of sodding is to establish permanent turf for immediate erosion protection and to stabilize drainage ways where concentrated overland flow will occur.

Conditions of Use

Sodding may be used in the following areas:

- Disturbed areas that require short-term or long-term cover.
- Disturbed areas that require immediate vegetative cover.
- All waterways that require vegetative lining. Waterways may also be seeded rather than sodded, and protected with a net or blanket.

Design and Installation Specifications

Sod shall be free of weeds, of uniform thickness (approximately 1-inch thick), and shall have a dense root mat for mechanical strength.

The following steps are recommended for sod installation:

- Shape and smooth the surface to final grade in accordance with the approved grading plan. The swale needs to be overexcavated 4 to 6 inches below design elevation to allow room for placing soil amendment and sod.
- Amend 4 inches (minimum) of compost into the top 8 inches of the soil if the organic content of the soil is less than ten percent or the permeability is less than 0.6 inches per hour. Compost used should meet Ecology publication 94-038 specifications for Grade A quality compost.
- Fertilize according to the supplier's recommendations.
- Work lime and fertilizer 1 to 2 inches into the soil, and smooth the surface.
- Lay strips of sod beginning at the lowest area to be sodded and perpendicular to the direction of water flow. Wedge strips securely into place. Square the ends of each strip to provide for a close, tight fit. Stagger joints at least 12 inches. Staple on slopes steeper than 3H:1V. Staple the upstream edge of each sod strip.
- Roll the sodded area and irrigate.
- When sodding is carried out in alternating strips or other patterns, seed the areas between the sod immediately after sodding.

Maintenance Standards

If the grass is unhealthy, the cause shall be determined and appropriate action taken to reestablish a healthy groundcover. If it is impossible to establish a healthy groundcover due to frequent saturation, instability, or some other cause, the sod shall be removed, the area seeded with an appropriate mix, and protected with a net or blanket.

BMP C130: Surface Roughening

Purpose

Surface roughening aids in the establishment of vegetative cover, reduces runoff velocity, increases infiltration, and provides for sediment trapping through the provision of a rough soil surface. Horizontal depressions are created by operating a tiller or other suitable equipment on the contour or by leaving slopes in a roughened condition by not fine grading them.

Conditions for Use

- All slopes steeper than 3:1 and greater than 5 vertical feet require surface roughening.
- Areas with grades steeper than 3:1 should be roughened to a depth of 2 to 4 inches prior to seeding.
- Areas that will not be stabilized immediately may be roughened to reduce runoff velocity until seeding takes place.
- Slopes with a stable rock face do not require roughening.
- Slopes where mowing is planned should not be excessively roughened.

Design and Installation Specifications

There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends upon the type of slope. Roughening methods include stair-step grading, grooving, contour furrows, and tracking. See Figure 4.6 for tracking and contour furrows. Factors to be considered in choosing a method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.

- Disturbed areas that will not require mowing may be stair-step graded, grooved, or left rough after filling.
- Stair-step grading is particularly appropriate in soils containing large amounts of soft rock. Each "step" catches material that sloughs from above, and provides a level site where vegetation can become established. Stairs should be wide enough to work with standard earth moving equipment. Stair steps must be on contour or gullies will form on the slope.
- Areas that will be mowed (these areas should have slopes less steep than 3:1) may have small furrows left by disking, harrowing, raking, or seed-planting machinery operated on the contour.
- Graded areas with slopes greater than 3:1 but less than 2:1 should be roughened before seeding. This can be accomplished in a variety of ways, including "track walking," or driving a crawler tractor up and down the slope, leaving a pattern of cleat imprints parallel to slope contours.
- Tracking is done by operating equipment up and down the slope to leave horizontal depressions in the soil.

Maintenance Standards

- Areas that are graded in this manner should be seeded as quickly as possible.
- Regular inspections should be made of the area. If rills appear, they should be re-graded and re-seeded immediately.

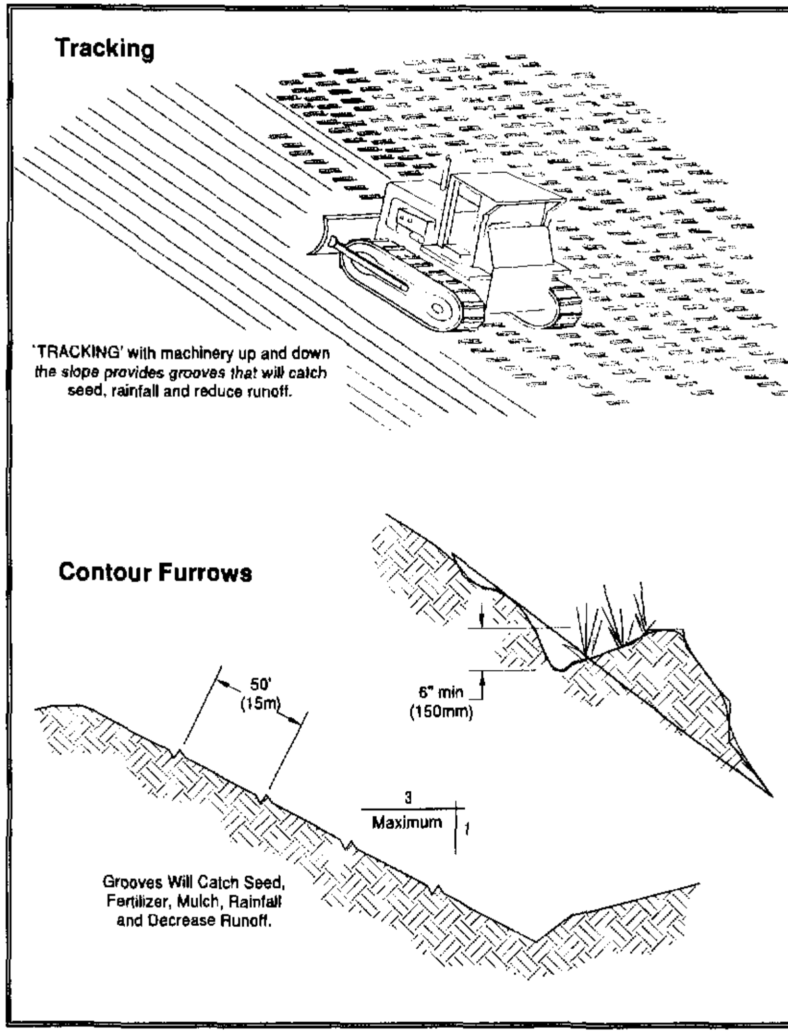


Figure 4.6 – Surface Roughening by Tracking and Contour Furrows

BMP C131: Gradient Terraces

Purpose

Gradient terraces reduce erosion damage by intercepting surface runoff and conducting it to a stable outlet at a non-erosive velocity.

Conditions of Use

- Gradient terraces normally are limited to denuded land having a water erosion problem. They should not be constructed on deep sands or on soils that are too stony, steep, or shallow to permit practical and economical installation and maintenance. Gradient terraces may be used only where suitable outlets are or will be made available. See Figure 4.7 for gradient terraces.

Design and Installation Specifications

- The maximum spacing of gradient terraces should be determined by the following method:

  VI = (0.8)s + y

  Where: VI = vertical interval in feet

  s = land rise per 100 feet, expressed in feet

  y = a soil and cover variable with values from 1.0 to 4.0

  Values of "y" are influenced by soil erodibility and cover practices. The lower values are applicable to erosive soils where little to no residue is left on the surface. The higher value is applicable only to erosion-resistant soils where a large amount of residue (1½ tons of straw/acre equivalent) is on the surface.

- The minimum constructed cross-section should meet the design dimensions.
- The top of the constructed ridge should not be lower at any point than the design elevation plus the specified overfill for settlement. The opening at the outlet end of the terrace should have a cross section equal to that specified for the terrace channel.
- Channel grades may be either uniform or variable with a maximum grade of 0.6 feet per 100 feet length. For short distances, terrace grades may be increased to improve alignment. The channel velocity should not exceed that which is nonerosive for the soil type with the planned treatment.
- All gradient terraces should have adequate outlets. Such an outlet may be a grassed waterway, vegetated area, or tile outlet. In all cases the outlet must convey runoff from the terrace or terrace system to a point where the outflow will not cause damage. Vegetative cover should be used in the outlet channel.
- The design elevation of the water surface of the terrace should not be lower than tbe design elevation of the water surface in the outlet at their junction, when both are operating at design flow.

- Vertical spacing determined by the above methods may be increased as much as 0.5 feet or 10 percent, whichever is greater, to provide better alignment or location, to avoid obstacles, to adjust for equipment size, or to reach a satisfactory outlet.
- The drainage area above the top should not exceed the area that would be drained by a terrace with normal spacing.
- The terrace should have enough capacity to handle the peak runoff expected from a 2-year, 24-hour design storm without overtopping.
- The terrace cross-section should be proportioned to fit the land slope. The ridge height should include a reasonable settlement factor. The ridge should have a minimum top width of 3 feet at the design height. The minimum cross-sectional area of the terrace channel should be 8 square feet for land slopes of 5 percent or less, 7 square feet for slopes from 5 to 8 percent, and 6 square feet for slopes steeper than 8 percent. The terrace can be constructed wide enough to be maintained using a small cat.

Maintenance Standards

- Maintenance should be performed as needed. Terraces should be inspected regularly; at least once a year, and after large storm events.

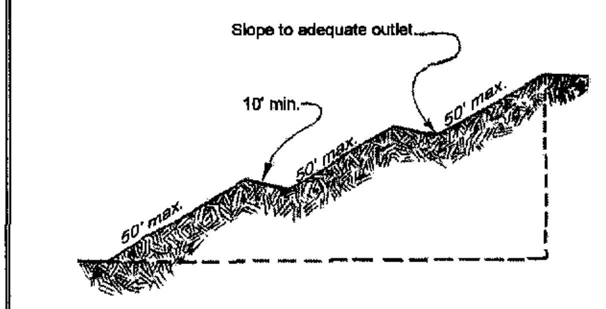


Figure 4.7 - Gradient Terraces

BMP C140: Dust Control

Purpose Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

- In areas (including roadways) subject to surface and air movement of dust where on-site and off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition, if stable. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until surface is wet. Repeat as needed. To prevent carryout of mud onto street, refer to Stabilized Construction Entrance (BMP C105).
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM (BMP C126) added to water at a rate of 0.5 lbs. per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to the increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may actually reduce the quantity of water needed for dust control, especially in eastern Washington. Since the wholesale cost of PAM is about $ 4.00 per pound, this is an extremely cost-effective dust control method.

Techniques that can be used for unpaved roads and lots include:

- Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
- Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.

- Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
- Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
- Encourage the use of alternate, paved routes, if available.
- Restrict use by tracked vehicles and heavy trucks to prevent damage to road surface and base.
- Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
- Pave unpaved permanent roads and other trafficked areas.
- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Limit dust-causing work on windy days.
- Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes compliance with this BMP.

Maintenance Standards Respray area as necessary to keep dust to a minimum.

BMP C152: Sawcutting and Surfacing Pollution Prevention

Purpose Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. This BMP is intended to minimize and eliminate process water and slurry from entering waters of the State.

Conditions of Use Anytime sawcutting or surfacing operations take place, these management practices shall be utilized. Sawcutting and surfacing operations include, but are not limited to, the following:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Design and Installation Specifications

- Slurry and cuttings shall be vacuumed during cutting and surfacing operations.
- Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
- Slurry and cuttings shall not drain to any natural or constructed drainage conveyance.
- Collected slurry and cuttings shall be disposed of in a manner that does not violate groundwater or surface water quality standards.
- Process water that is generated during hydro-demolition, surface roughening or similar operations shall not drain to any natural or constructed drainage conveyance and shall be disposed of in a manner that does not violate groundwater or surface water quality standards.
- Cleaning waste material and demolition debris shall be handled and disposed of in a manner that does not cause contamination of water. If the area is swept with a pick-up sweeper, the material must be hauled out of the area to an appropriate disposal site.

Maintenance Standards Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and vacuum trucks.

4.2 Runoff Conveyance and Treatment BMPs

BMP C200: Interceptor Dike and Swale

Purpose Provide a ridge of compacted soil, or a ridge with an upslope swale, at the top or base of a disturbed slope or along the perimeter of a disturbed construction area to convey stormwater. Use the dike and/or swale to intercept the runoff from unprotected areas and direct it to areas where erosion can be controlled. This can prevent storm runoff from entering the work area or sediment-laden runoff from leaving the construction site.

Conditions of Use Where the runoff from an exposed site or disturbed slope must be conveyed to an erosion control facility which can safely convey the stormwater.

- Locate upslope of a construction site to prevent runoff from entering disturbed area.
- When placed horizontally across a disturbed slope, it reduces the amount and velocity of runoff flowing down the slope.
- Locate downslope to collect runoff from a disturbed area and direct it to a sediment basin.

Design and Installation Specifications

- Dike and/or swale and channel must be stabilized with temporary or permanent vegetation or other channel protection during construction.
- Channel requires a positive grade for drainage; steeper grades require channel protection and check dams.
- Review construction for areas where overtopping may occur.
- Can be used at top of new fill before vegetation is established.
- May be used as a permanent diversion channel to carry the runoff.
- Sub-basin tributary area should be one acre or less.
- Design capacity for the peak flow from a 10-year, 24-hour storm, assuming a Type 1A rainfall distribution, for temporary facilities. Alternatively, use 1.6 times the 10-year, 1-hour flow indicated by an approved continuous runoff model. For facilities that will also serve on a permanent basis, consult the local government's drainage requirements.

Interceptor dikes shall meet the following criteria:

Top Width	2 feet minimum.
Height	1.5 feet minimum on berm.
Side Slope	2:1 or flatter.
Grade	Depends on topography, however, dike system minimum is 0.5%, maximum is 1%.
Compaction	Minimum of 90 percent ASTM D698 standard proctor.

Horizontal Spacing of Interceptor Dikes:

Average Slope	Slope Percent	Flowpath Length
20H:1V or less	3-5%	300 feet
(10 to 20)H:1V	5-10%	200 feet
(4 to 10)H:1V	10-25%	100 feet
(2 to 4)H:1V	25-50%	50 feet

Stabilization depends on velocity and reach

Slopes <5% Seed and mulch applied within 5 days of dike construction (*see BMP C121, Mulching*).

Slopes 5 - 40% Dependent on runoff velocities and dike materials. Stabilization should be done immediately using either sod or riprap or other measures to avoid erosion.

- The upslope side of the dike shall provide positive drainage to the dike outlet. No erosion shall occur at the outlet. Provide energy dissipation measures as necessary. Sediment-laden runoff must be released through a sediment trapping facility.
- Minimize construction traffic over temporary dikes. Use temporary cross culverts for channel crossing.

Interceptor swales shall meet the following criteria:

Bottom Width	2 feet minimum; the bottom shall be level.
Depth	1-foot minimum.
Side Slope	2:1 or flatter.
Grade	Maximum 5 percent, with positive drainage to a suitable outlet (such as a sediment pond).
Stabilization	Seed as per *BMP C120, Temporary and Permanent Seeding*, or *BMP C202, Channel Lining*, 12 inches thick of riprap pressed into the bank and extending at least 8 inches vertical from the bottom.

- Inspect diversion dikes and interceptor swales once a week and after every rainfall. Immediately remove sediment from the flow area.
- Damage caused by construction traffic or other activity must be repaired before the end of each working day.

Check outlets and make timely repairs as needed to avoid gully formation. When the area below the temporary diversion dike is permanently stabilized, remove the dike and fill and stabilize the channel to blend with the natural surface.

BMP C202: Channel Lining

Purpose To protect erodible channels by providing a channel liner using either blankets or riprap.

Conditions of Use When natural soils or vegetated stabilized soils in a channel are not adequate to prevent channel erosion.

- When a permanent ditch or pipe system is to be installed and a temporary measure is needed.
- In almost all cases, synthetic and organic coconut blankets are more effective than riprap for protecting channels from erosion. Blankets can be used with and without vegetation. Blanketed channels can be designed to handle any expected flow and longevity requirement. Some synthetic blankets have a predicted life span of 50 years or more, even in sunlight.
- Other reasons why blankets are better than rock include the availability of blankets over rock. In many areas of the state, rock is not easily obtainable or is very expensive to haul to a site. Blankets can be delivered anywhere. Rock requires the use of dump trucks to haul and heavy equipment to place. Blankets usually only require laborers with hand tools, and sometimes a backhoe.
- The Federal Highway Administration recommends not using flexible liners whenever the slope exceeds 10 percent or the shear stress exceeds 8 lbs/ft^2.

Design and Installation Specifications See BMP C122 for information on blankets.

Since riprap is used where erosion potential is high, construction must be sequenced so that the riprap is put in place with the minimum possible delay.

- Disturbance of areas where riprap is to be placed should be undertaken only when final preparation and placement of the riprap can follow immediately behind the initial disturbance. Where riprap is used for outlet protection, the riprap should be placed before or in conjunction with the construction of the pipe or channel so that it is in place when the pipe or channel begins to operate.
- The designer, after determining the riprap size that will be stable under the flow conditions, shall consider that size to be a minimum size and then, based on riprap gradations actually available in the area, select the size or sizes that equal or exceed the minimum size. The possibility of drainage structure damage by children shall be considered in selecting a riprap size, especially if there is nearby water or a gully in which to toss the stones.
- Stone for riprap shall consist of field stone or quarry stone of approximately rectangular shape. The stone shall be hard and angular and of such quality that it will not disintegrate on exposure to water or

weathering and it shall be suitable in all respects for the purpose intended.

- Rubble concrete may be used provided it has a density of at least 150 pounds per cubic foot, and otherwise meets the requirement of this standard and specification.
- A lining of engineering filter fabric (geotextile) shall be placed between the riprap and the underlying soil surface to prevent soil movement into or through the riprap. The geotextile should be keyed in at the top of the bank.
- Filter fabric shall not be used on slopes greater than 1-1/2:1 as slippage may occur. It should be used in conjunction with a layer of coarse aggregate (granular filter blanket) when the riprap to be placed is 12 inches and larger.

BMP C204: Pipe Slope Drains

Purpose To use a pipe to convey stormwater anytime water needs to be diverted away from or over bare soil to prevent gullies, channel erosion, and saturation of slide-prone soils.

Conditions of Use Pipe slope drains should be used when a temporary or permanent stormwater conveyance is needed to move the water down a steep slope to avoid erosion (Figure 4.10).

On highway projects, they should be used at bridge ends to collect runoff and pipe it to the base of the fill slopes along bridge approaches. These can be designed into a project and included as bid items. Another use on road projects is to collect runoff from pavement and pipe it away from side slopes. These are useful because there is generally a time lag between having the first lift of asphalt installed and the curbs, gutters, and permanent drainage installed. Used in conjunction with sand bags, or other temporary diversion devices, these will prevent massive amounts of sediment from leaving a project.

Water can be collected, channeled with sand bags, Triangular Silt Dikes, berms, or other material, and piped to temporary sediment ponds.

Pipe slope drains can be:

- Connected to new catch basins and used temporarily until all permanent piping is installed;
- Used to drain water collected from aquifers exposed on cut slopes and take it to the base of the slope;
- Used to collect clean runoff from plastic sheeting and direct it away from exposed soil;
- Installed in conjunction with silt fence to drain collected water to a controlled area;
- Used to divert small seasonal streams away from construction. They have been used successfully on culvert replacement and extension jobs. Large flex pipe can be used on larger streams during culvert removal, repair, or replacement; and,
- Connected to existing down spouts and roof drains and used to divert water away from work areas during building renovation, demolition, and construction projects.

There are now several commercially available collectors that are attached to the pipe inlet and help prevent erosion at the inlet.

Design and Installation Specifications

Size the pipe to convey the flow. The capacity for temporary drains shall be sufficient to handle the peak flow from a 10-year, 24-hour storm event, assuming a Type 1A rainfall distribution. Alternatively, use 1.6 times the 10-year, 1-hour flow indicated by an approved continuous runoff model. Consult local drainage requirements for sizing permanent pipe slope drains.

- Use care in clearing vegetated slopes for installation.
- Re-establish cover immediately on areas disturbed by installation.
- Use temporary drains on new cut or fill slopes.
- Use diversion dikes or swales to collect water at the top of the slope.
- Ensure that the entrance area is stable and large enough to direct flow into the pipe.
- Piping of water through the berm at the entrance area is a common failure mode.
- The entrance shall consist of a standard flared end section for culverts 12 inches and larger with a minimum 6-inch metal toe plate to prevent runoff from undercutting the pipe inlet. The slope of the entrance shall be at least 3 percent. Sand bags may also be used at pipe entrances as a temporary measure.
- The soil around and under the pipe and entrance section shall be thoroughly compacted to prevent undercutting.
- The flared inlet section shall be securely connected to the slope drain and have watertight connecting bands.
- Slope drain sections shall be securely fastened together, fused or have gasketed watertight fittings, and shall be securely anchored into the soil.
- Thrust blocks should be installed anytime 90 degree bends are utilized. Depending on size of pipe and flow, these can be constructed with sand bags, straw bales staked in place, "t" posts and wire, or ecology blocks.
- Pipe needs to be secured along its full length to prevent movement. This can be done with steel "t" posts and wire. A post is installed on each side of the pipe and the pipe is wired to them. This should be done every 10-20 feet of pipe length or so, depending on the size of the pipe and quantity of water to diverted.
- Interceptor dikes shall be used to direct runoff into a slope drain. The height of the dike shall be at least 1 foot higher at all points than the top of the inlet pipe.
- The area below the outlet must be stabilized with a riprap apron (see BMP C209 Outlet Protection, for the appropriate outlet material).

- If the pipe slope drain is conveying sediment-laden water, direct all flows into the sediment trapping facility.
- Materials specifications for any permanent piped system shall be set by the local government.

Maintenance Standards

Check inlet and outlet points regularly, especially after storms.

The inlet should be free of undercutting, and no water should be going around the point of entry. If there are problems, the headwall should be reinforced with compacted earth or sand bags.

- The outlet point should be free of erosion and installed with appropriate outlet protection.
- For permanent installations, inspect pipe periodically for vandalism and physical distress such as slides and wind-throw.
- Normally the pipe slope is so steep that clogging is not a problem with smooth wall pipe, however, debris may become lodged in the pipe.

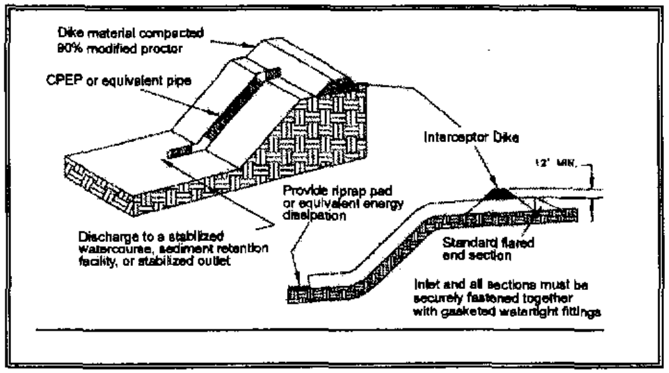


Figure 4.10 - Pipe Slope Drain

BMP C207: Check Dams

Purpose

Construction of small dams across a swale or ditch reduces the velocity of concentrated flow and dissipates energy at the check dam.

Conditions of Use

Where temporary channels or permanent channels are not yet vegetated, channel lining is infeasible, and velocity checks are required.

- Check dams may not be placed in streams unless approved by the State Department of Fish and Wildlife. Check dams may not be placed in wetlands without approval from a permitting agency.
- Check dams shall not be placed below the expected backwater from any salmonid bearing water between October 1 and May 31 to ensure that there is no loss of high flow refuge habitat for overwintering juvenile salmonids and emergent salmonid fry.

Design and Installation Specifications

Whatever material is used, the dam should form a triangle when viewed from the side. This prevents undercutting as water flows over the face of the dam rather than falling directly onto the ditch bottom.

Check dams in association with sumps work more effectively at slowing flow and retaining sediment than just a check dam alone. A deep sump should be provided immediately upstream of the check dam.

- In some cases, if carefully located and designed, check dams can remain as permanent installations with very minor regrading. They may be left as either spillways, in which case accumulated sediment would be graded and seeded, or as check dams to prevent further sediment from leaving the site.
- Check dams can be constructed of either rock or pea-gravel filled bags. Numerous new products are also available for this purpose. They tend to be re-usable, quick and easy to install, effective, and cost efficient.
- Check dams should be placed perpendicular to the flow of water.
- The maximum spacing between the dams shall be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
- Keep the maximum height at 2 feet at the center of the dam.
- Keep the center of the check dam at least 12 inches lower than the outer edges at natural ground elevation.
- Keep the side slopes of the check dam at 2:1 or flatter.
- Key the stone into the ditch banks and extend it beyond the abutments a minimum of 18 inches to avoid washouts from overflow around the dam.

- Use filter fabric foundation under a rock or sand bag check dam. If a blanket ditch liner is used, this is not necessary. A piece of organic or synthetic blanket cut to fit will also work for this purpose.
- Rock check dams shall be constructed of appropriately sized rock. The rock must be placed by hand or by mechanical means (no dumping of rock to form dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges. The rock used must be large enough to stay in place given the expected design flow through the channel.
- In the case of grass-lined ditches and swales, all check dams and accumulated sediment shall be removed when the grass has matured sufficiently to protect the ditch or swale - unless the slope of the swale is greater than 4 percent. The area beneath the check dams shall be seeded and mulched immediately after dam removal.
- Ensure that channel appurtenances, such as culvert entrances below check dams, are not subject to damage or blockage from displaced stones. Figure 4.13 depicts a typical rock check dam.

Maintenance Standards

Check dams shall be monitored for performance and sediment accumulation during and after each runoff producing rainfall. Sediment shall be removed when it reaches one half the sump depth.

- Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam.
- If significant erosion occurs between dams, install a protective riprap liner in that portion of the channel.

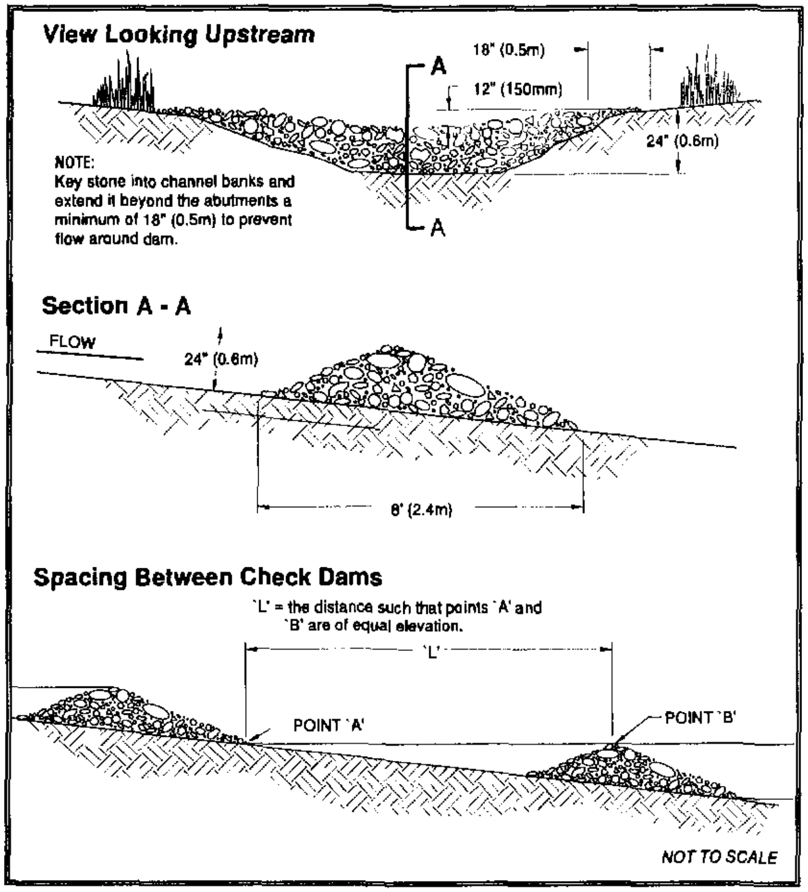


Figure 4.13 – Check Dams

BMP C208: Triangular Silt Dike (Geotextile-Encased Check Dam)

Purpose

Triangular silt dikes may be used as check dams, for perimeter protection, for temporary soil stockpile protection, for drop inlet protection, or as a temporary interceptor dike.

Conditions of use

May be used in place of straw bales for temporary check dams in ditches of any dimension.

- May be used on soil or pavement with adhesive or staples.
- TSDs have been used to build temporary:
  1. sediment ponds;
  2. diversion ditches;
  3. concrete wash out facilities;
  4. curbing;
  5. water bars;
  6. level spreaders; and,
  7. berms.

Design and Installation Specifications

Made of urethane foam sewn into a woven geosynthetic fabric.

It is triangular, 10 inches to 14 inches high in the center, with a 20-inch to 28-inch base. A 2–foot apron extends beyond both sides of the triangle along its standard section of 7 feet. A sleeve at one end allows attachment of additional sections as needed.

- Install with ends curved up to prevent water from flowing around the ends.
- The fabric flaps and check dam units are attached to the ground with wire staples. Wire staples should be No. 11 gauge wire and should be 200 mm to 300 mm in length.
- When multiple units are installed, the sleeve of fabric at the end of the unit shall overlap the abutting unit and be stapled.
- Check dams should be located and installed as soon as construction will allow.
- Check dams should be placed perpendicular to the flow of water.
- When used as check dams, the leading edge must be secured with rocks, sandbags, or a small key slot and staples.
- In the case of grass-lined ditches and swales, check dams and accumulated sediment shall be removed when the grass has matured sufficiently to protect the ditch or swale unless the slope of the swale is greater than 4 percent. The area beneath the check dams shall be seeded and mulched immediately after dam removal.

Maintenance Standards

- Triangular silt dams shall be monitored for performance and sediment accumulation during and after each runoff producing rainfall.

Sediment shall be removed when it reaches one half the height of the dam.

- Anticipate submergence and deposition above the triangular silt dam and erosion from high flows around the edges of the dam. Immediately repair any damage or any undercutting of the dam.

BMP C209: Outlet Protection

Purpose Outlet protection prevents scour at conveyance outlets and minimizes the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Conditions of use Outlet protection is required at the outlets of all ponds, pipes, ditches, or other conveyances, and where runoff is conveyed to a natural or manmade drainage feature such as a stream, wetland, lake, or ditch.

Design and Installation Specifications

The receiving channel at the outlet of a culvert shall be protected from erosion by rock lining a minimum of 6 feet downstream and extending up the channel sides a minimum of 1–foot above the maximum tailwater elevation or 1-foot above the crown, whichever is higher. For large pipes (more than 18 inches in diameter), the outlet protection lining of the channel is lengthened to four times the diameter of the culvert.

- Standard wingwalls, and tapered outlets and paved channels should also be considered when appropriate for permanent culvert outlet protection. (See WSDOT Hydraulic Manual, available through WSDOT Engineering Publications).
- Organic or synthetic erosion blankets, with or without vegetation, are usually more effective than rock, cheaper, and easier to install. Materials can be chosen using manufacturer product specifications. ASTM test results are available for most products and the designer can choose the correct material for the expected flow.
- With low flows, vegetation (including sod) can be effective.
- The following guidelines shall be used for riprap outlet protection:
  1. If the discharge velocity at the outlet is less than 5 fps (pipe slope less than 1 percent), use 2-inch to 8-inch riprap. Minimum thickness is 1-foot.
  2. For 5 to 10 fps discharge velocity at the outlet (pipe slope less than 3 percent), use 24-inch to 4-foot riprap. Minimum thickness is 2 feet.
  3. For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), an engineered energy dissipater shall be used.
- Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion.
- New pipe outfalls can provide an opportunity for low-cost fish habitat improvements. For example, an alcove of low-velocity water can be created by constructing the pipe outfall and associated energy dissipater back from the stream edge and digging a channel, over-widened to the upstream side, from the outfall. Overwintering juvenile and migrating adult salmonids may use the alcove as shelter during

high flows. Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. See Volume V for more information on outfall system design.

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipater if sediment builds up.

BMP C220: Storm Drain Inlet Protection

Purpose To prevent coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use Where storm drain inlets are to be made operational before permanent stabilization of the disturbed drainage area. Protection should be provided for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless the runoff that enters the catch basin will be conveyed to a sediment pond or trap. Inlet protection may be used anywhere to protect the drainage system. It is likely that the drainage system will still require cleaning.

Table 4.9 lists several options for inlet protection. All of the methods for storm drain inlet protection are prone to plugging and require a high frequency of maintenance. Drainage areas should be limited to 1 acre or less. Emergency overflows may be required where stormwater ponding would cause a hazard. If an emergency overflow is provided, additional end-of-pipe treatment may be required.

Table 4.9
Storm Drain Inlet Protetion

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding will occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area Requirement: 30' X 30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No		Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with a wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap			18 month expected life.

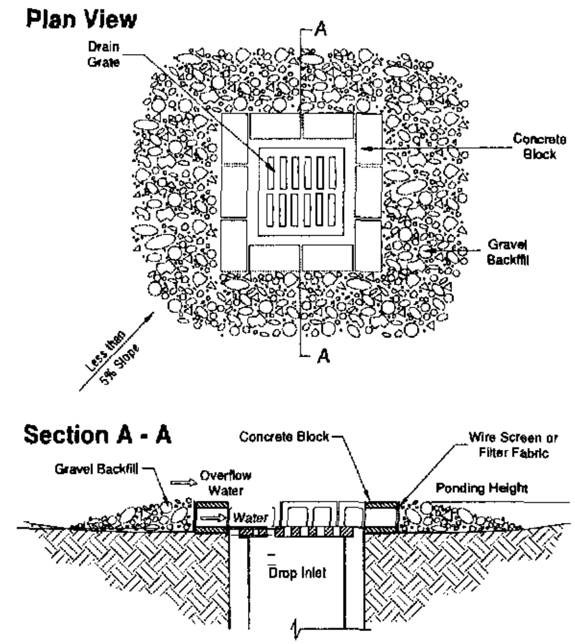
Design and Installation Specifications

Excavated Drop Inlet Protection - An excavated impoundment around the storm drain. Sediment settles out of the stormwater prior to entering the storm drain.

- Depth 1-2 ft as measured from the crest of the inlet structure.
- Side Slopes of excavation no steeper than 2:1.
- Minimum volume of excavation 35 cubic yards.
- Shape basin to fit site with longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water problems.
- Clear the area of all debris.
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- It may be necessary to build a temporary dike to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter - A barrier formed around the storm drain inlet with standard concrete blocks and gravel. See Figure 4.14.

- Height 1 to 2 feet above inlet.
- Recess the first row 2 inches into the ground for stability.
- Support subsequent courses by placing a 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel just below the top of blocks on slopes of 2:1 or flatter.
- An alternative design is a gravel donut.
- Inlet slope of 3:1.
- Outlet slope of 2:1.
- 1-foot wide level stone area between the structure and the inlet.
- Inlet slope stones 3 inches in diameter or larger.
- Outlet slope use gravel ½- to ¾-inch at a minimum thickness of 1-foot.



Notes:
1. Drop Inlet sediment barriers are to be used for small, nearly level drainage areas. (less than 5%)
2. *Excavate a basin of sufficient size adjacent to the drop inlet.*
3. The top of the structure (ponding height) must be well below the ground elevation downslope to prevent runoff from bypassing the inlet. A temporary dike may be necessary on the dowslope side of the structure.

Figure 4.14 – Block and Gravel Filter

Gravel and Wire Mesh Filter - A gravel barrier placed over the top of the inlet. This structure does not provide an overflow.

- Hardware cloth or comparable wire mesh with ½-inch openings.
- Coarse aggregate.
- Height 1-foot or more, 18 inches wider than inlet on all sides.
- Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
- If more than one strip of mesh is necessary, overlap the strips.
- Place coarse aggregate over the wire mesh.
- The depth of the gravel should be at least 12 inches over the entire inlet opening and extend at least 18 inches on all sides.

Catchbasin Filters - Inserts should be designed by the manufacturer for use at construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. The maintenance requirements can be reduced by combining a catchbasin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way.

- 5 cubic feet of storage.
- Dewatering provisions.
- High-flow bypass that will not clog under normal use at a construction site.
- The catchbasin filter is inserted in the catchbasin just below the grating.

Curb Inlet Protection with Wooden Weir – Barrier formed around a curb inlet with a wooden frame and gravel.

- Wire mesh with ½-inch openings.
- Extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against wire/fabric.
- Place weight on frame anchors.

Block and Gravel Curb Inlet Protection – Barrier formed around an inlet with concrete blocks and gravel. See Figure 4.14.

- Wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

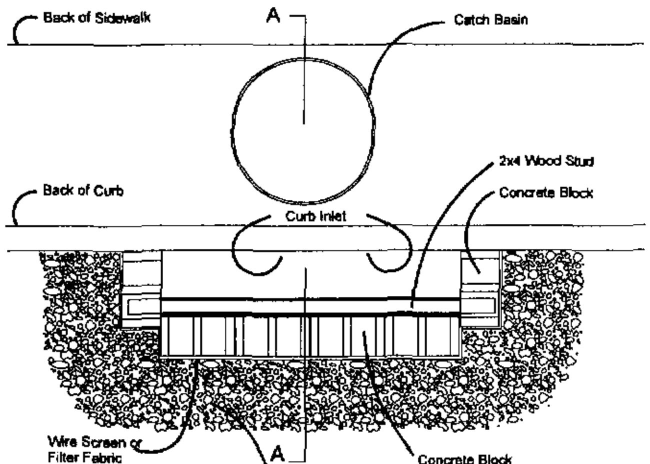
Curb and Gutter Sediment Barrier – Sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure 4.16.

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the outside of the berm sized to sediment trap standards for protecting a culvert inlet.

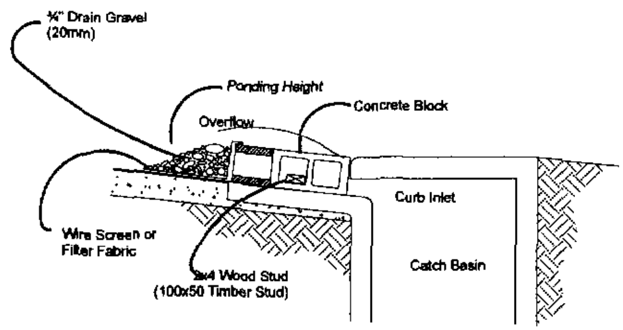
Maintenance Standards

- Catch basin filters should be inspected frequently, especially after storm events. If the insert becomes clogged, it should be cleaned or replaced.
- For systems using stone filters: If the stone filter becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced. Since cleaning of gravel at a construction site may be difficult, an alternative approach would be to use the clogged stone as fill and put fresh stone around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Plan View



Section A - A

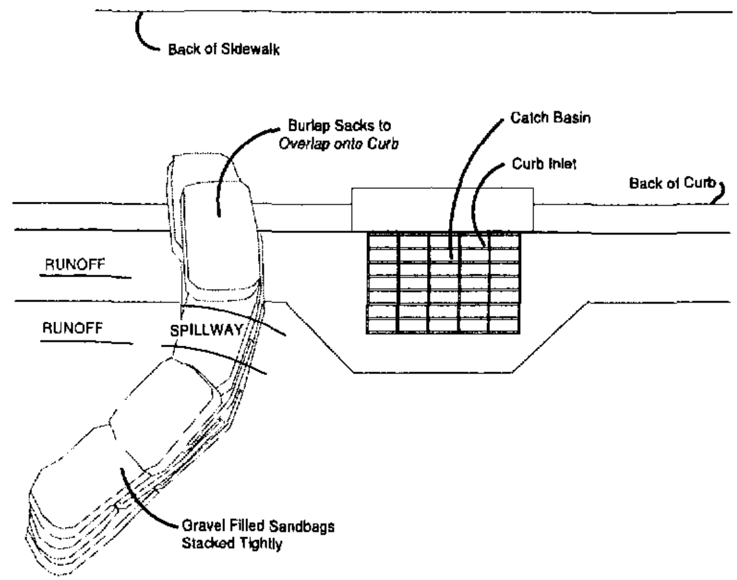


NOTES:

1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

Figure 4.15 – Block and Gravel Curb Inlet Protection

Plan View



NOTES:

1. *Place curb type sediment barriers on gently sloping street segments, where water can pond and allow* sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

Figure 4.16 – Curb and Gutter Barrier

BMP C232: Gravel Filter Berm

Purpose A gravel filter berm is constructed on rights-of-way or traffic areas within a construction site to retain sediment by using a filter berm of gravel or crushed rock.

Conditions of Use Where a temporary measure is needed to retain sediment from rights-of-way or in traffic areas on construction sites.

Design and Installation Specifications

- Berm material shall be ¾ to 3 inches in size, washed well-grade gravel or crushed rock with less than 5 percent fines.
- Spacing of berms:
  - Every 300 feet on slopes less than 5 percent
  - Every 200 feet on slopes between 5 percent and 10 percent
  - Every 100 feet on slopes greater than 10 percent
- Berm dimensions:
  - 1 foot high with 3:1 side slopes
  - 8 linear feet per 1 cfs runoff based on the 10-year, 24-hour design storm

Maintenance Standards

- Regular inspection is required. Sediment shall be removed and filter material replaced as needed.

BMP C233: Silt Fence

Purpose Use of a silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow. See Figure 4.19 for details on silt fence construction.

Conditions of Use Silt fence may be used downslope of all disturbed areas.

- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to a sediment pond. The only circumstance in which overland flow can be treated solely by a silt fence, rather than by a sediment pond, is when the area draining to the fence is one acre or less and flow rates are less than 0.5 cfs.
- Silt fences should not be constructed in streams or used in V-shaped ditches. They are not an adequate metbod of silt control for anything deeper than sheet or overland flow.

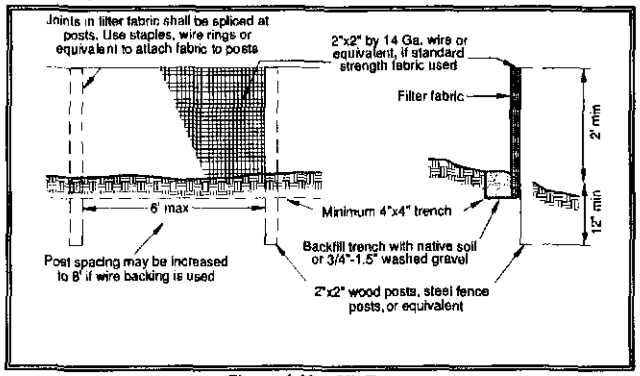


Figure 4.19 – Silt Fence

Design and Installation Specifications

- Drainage area of 1 acre or less or in combination with sediment basin in a larger site.
- Maximum slope steepness (normal (perpendicular) to fence line) 1:1.
- Maximum sheet or overland flow path length to the fence of 100 feet.
- No flows greater than 0.5 cfs.
- The geotextile used shall meet the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table 4.10):

Table 4.10 Geotextile Standards	
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film wovens (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Standard strength fabrics shall be supported with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the fabric. Silt fence materials are available that have synthetic mesh backing attached.
- Filter fabric material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F. to 120°F.
- 100 percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by local regulations.
- Standard Notes for construction plans and specifications follow. Refer to Figure 4.19 for standard silt fence details.

  The contractor shall install and maintain temporary silt fences at the locations shown in the Plans. The silt fences shall be constructed in the areas of clearing, grading, or drainage prior to starting those activities. A silt fence shall not be considered temporary if the silt fence must function beyond the life of the contract. The silt fence shall prevent soil carried by runoff water from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.

  The minimum height of the top of silt fence shall be 2 feet and the maximum height shall be 2½ feet above the original ground surface.

  The geotextile shall be sewn together at the point of manufacture, or at an approved location as determined by the Engineer, to form geotextile lengths as required. All sewn seams shall be located at a support post. Alternatively, two sections of silt fence can be overlapped, provided the Contractor can demonstrate, to the satisfaction of the Engineer, that the overlap is long enough and that the adjacent fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.

The geotextile shall be attached on the up-slope side of the posts and support system with staples, wire, or in accordance with the manufacturer's recommendations. The geotextile shall be attached to the posts in a manner that reduces the potential for geotextile tearing at the staples, wire, or other connection device. Silt fence back-up support for the geotextile in the form of a wire or plastic mesh is dependent on the properties of the geotextile selected for use. If wire or plastic back-up mesh is used, the mesh shall be fastened securely to the up-slope of the posts with the geotextile being up-slope of the mesh back-up support.

The geotextile at the bottom of the fence shall be buried in a trench to a minimum depth of 4 inches below the ground surface. The trench shall be backfilled and the soil tamped in place over the buried portion of the geotextile, such that no flow can pass beneath the fence and scouring can not occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the trench a minimum of 3 inches.

The fence posts shall be placed or driven a minimum of 18 inches. A minimum depth of 12 inches is allowed if topsoil or other soft subgrade soil is not present and a minimum depth of 18 inches cannot be reached. Fence post depths shall be increased by 6 inches if the fence is located on slopes of 3:1 or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.

Silt fences shall be located on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

If the fence must cross contours, with the exception of the ends of the fence, gravel check dams placed perpendicular to the back of the fence shall be used to minimize concentrated flow and erosion along the back of the fence. The gravel check dams shall be approximately 1-foot deep at the back of the fence. It shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence. The gravel check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. The gravel check dams shall be located every 10 feet along the fence where the fence must cross contours. The slope of the fence line where contours must be crossed shall not be steeper than 3:1.

Wood, steel or equivalent posts shall be used. Wood posts shall have minimum dimensions of 2 inches by 2 inches by 3 feet minimum length, and shall be free of defects such as knots, splits, or gouges.

Steel posts shall consist of either size No. 6 rebar or larger, ASTM A 120 steel pipe with a minimum diameter of 1-inch, U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft. or other steel posts having equivalent strength and bending resistance to the post sizes listed. The spacing of the support posts shall be a maximum of 6 feet.

Fence back-up support, if used, shall consist of steel wire with a maximum mesh spacing of 2 inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to ultraviolet radiation as the geotextile it supports.

- Silt fence installation using the slicing method specification details follow. Refer to Figure 4.20 for slicing method details.

The base of both end posts must be at least 2 to 4 inches above the top of the silt fence fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.

Install posts 3 to 4 feet apart in critical retention areas and 6 to 7 feet apart in standard applications.

Install posts 24 inches deep on the downstream side of the silt fence, and as close as possible to the fabric, enabling posts to support the fabric from upstream water pressure.

Install posts with the nipples facing away from the silt fence fabric.

Attach the fabric to each post with three ties, all spaced within the top 8 inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1 inch vertically apart. In addition, each tie should be positioned to hang on a post nipple when tightening to prevent sagging.

Wrap approximately 6 inches of fabric around the end posts and secure with 3 ties.

No more than 24 inches of a 36-inch fabric is allowed above ground level.

The rope lock system must be used in all ditch check applications.

The installation should be checked and corrected for any deviation before compaction. Use a flat-bladed shovel to tuck fabric deeper into the ground if necessary.

Compaction is vitally important for effective results. Compact the soil immediately next to the silt fence fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips.

Maintenance Standards

- Any damage shall be repaired immediately.
- If concentrated flows are evident uphill of the fence, they must be intercepted and conveyed to a sediment pond.
- It is important to check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.
- Sediment deposits shall either be removed when the deposit reaches approximately one-third the height of the silt fence, or a second silt fence shall be installed.
- If the filter fabric (geotextile) has deteriorated due to ultraviolet breakdown, it shall be replaced.

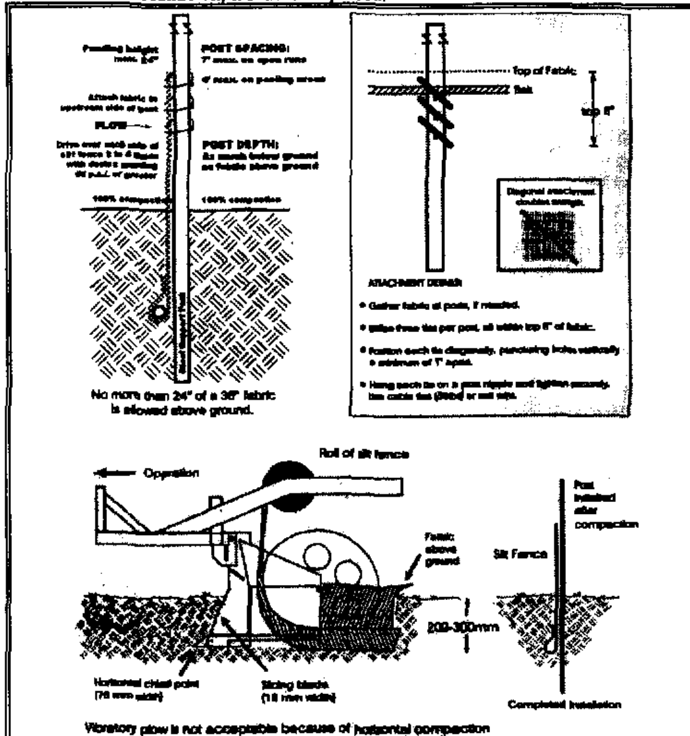


Figure 4.20 – Silt Fence Installation by Slicing Method

BMP C240: Sediment Trap

Purpose

A sediment trap is a small temporary ponding area with a gravel outlet used to collect and store sediment from sites cleared and/or graded during construction. Sediment traps, along with other perimeter controls, shall be installed before any land disturbance takes place in the drainage area.

Conditions of Use

Prior to leaving a construction site, stormwater runoff must pass through a sediment pond or trap or other appropriate sediment removal best management practice. Non-engineered sediment traps may be used on-site prior to an engineered sediment trap or sediment pond to provide additional sediment removal capacity.

It is intended for use on sites where the tributary drainage area is less than 3 acres, with no unusual drainage features, and a projected build-out time of six months or less. The sediment trap is a temporary measure (with a design life of approximately 6 months) and shall be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps and ponds are only effective in removing sediment down to about the medium silt size fraction. Runoff with sediment of finer grades (fine silt and clay) will pass through untreated, emphasizing the need to control erosion to the maximum extent first.

Whenever possible, sediment-laden water shall be discharged into onsite, relatively level, vegetated areas (see BMP C234 – Vegetated Strip). This is the only way to effectively remove fine particles from runoff unless chemical treatment or filtration is used. This can be particularly useful after initial treatment in a sediment trap or pond. The areas of release must be evaluated on a site-by-site basis in order to determine appropriate locations for and methods of releasing runoff. Vegetated wetlands shall not be used for this purpose. Frequently, it may be possible to pump water from the collection point at the downhill end of the site to an upslope vegetated area. Pumping shall only augment the treatment system, not replace it, because of the possibility of pump failure or runoff volume in excess of pump capacity.

All projects that are constructing permanent facilities for runoff quantity control should use the rough-graded or final-graded permanent facilities for traps and ponds. This includes combined facilities and infiltration facilities. When permanent facilities are used as temporary sedimentation facilities, the surface area requirement of a sediment trap or pond must be met. If the surface area requirements are larger than the surface area of the permanent facility, then the trap or pond shall be enlarged to comply with the surface area requirement. The permanent pond shall also be divided into two cells as required for sediment ponds.

Either a permanent control structure or the temporary control structure (described in BMP C241, Temporary Sediment Pond) can be used. If a permanent control structure is used, it may be advisable to partially restrict the lower orifice with gravel to increase residence time while still allowing dewatering of the pond. A shut-off valve may be added to the control structure to allow complete retention of stormwater in emergency situations. In this case, an emergency overflow weir must be added.

A skimmer may be used for the sediment trap outlet if approved by the Local Permitting Authority.

Design and Installation Specifications

- See Figures 4.22 and 4.23 for details.
- If permanent runoff control facilities are part of the project, they should be used for sediment retention.
- To determine the sediment trap geometry, first calculate the design surface area (SA) of the trap, measured at the invert of the weir. Use the following equation:

  $SA = FS(Q_2/V_S)$

  where

  Q_2 = Design inflow based on the peak discharge from the developed 2-year runoff event from the contributing drainage area as computed in the hydrologic analysis. The 10-year peak flow shall be used if the project size, expected timing and duration of construction, or downstream conditions warrant a higher level of protection. If no hydrologic analysis is required, the Rational Method may be used.

  V_S = The settling velocity of the soil particle of interest. The 0.02 mm (medium silt) particle with an assumed density of 2.65 g/cm^3 has been selected as the particle of interest and has a settling velocity (V_S) of 0.00096 ft/sec.

  FS = A safety factor of 2 to account for non-ideal settling.

  Therefore, the equation for computing surface area becomes:

  $SA = 2 \times Q_2/0.00096$ or

  2080 square feet per cfs of inflow

  Note: Even if permanent facilities are used, they must still have a surface area that is at least as large as that derived from the above formula. If they do not, the pond must be enlarged.

- To aid in determining sediment depth, all sediment traps shall have a staff gauge with a prominent mark 1-foot above the bottom of the trap.

- Sediment traps may not be feasible on utility projects due to the limited work space or the short-term nature of the work. Portable tanks may be used in place of sediment traps for utility projects.

Maintenance Standards

- Sediment shall be removed from the trap when it reaches 1-foot in depth.
- Any damage to the pond embankments or slopes shall be repaired.

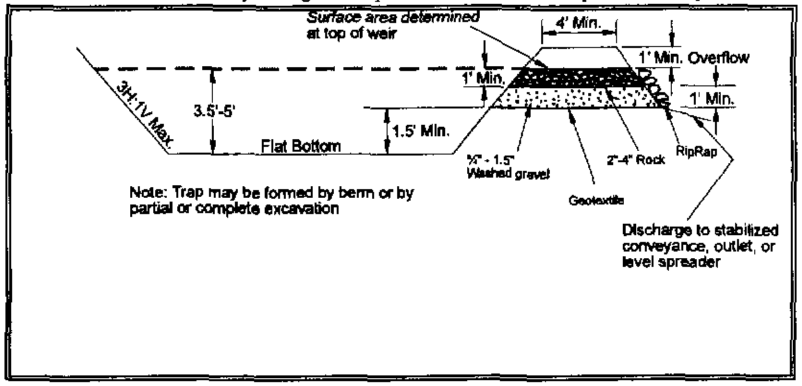


Figure 4.22 Cross Section of Sediment Trap

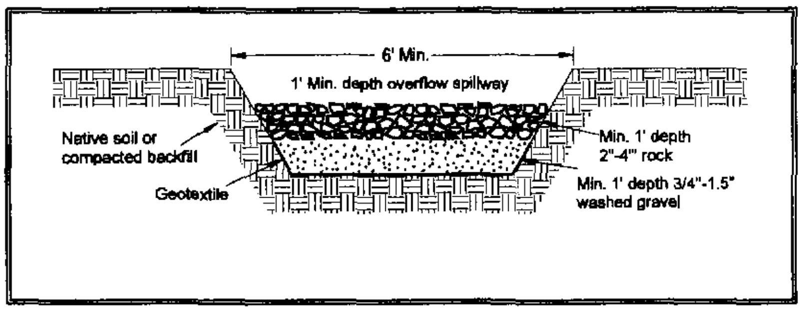


Figure 4.23 Sediment Trap Outlet

BMP C241: Temporary Sediment Pond

Purpose

Sediment ponds remove sediment from runoff originating from disturbed areas of the site. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). Consequently, they usually reduce turbidity only slightly.

Conditions of Use

Prior to leaving a construction site, stormwater runoff must pass through a sediment pond or other appropriate sediment removal best management practice.

A sediment pond shall be used where the contributing drainage area is 3 acres or more. Ponds must be used in conjunction with erosion control practices to reduce the amount of sediment flowing into the basin.

Design and Installation Specifications

- Sediment basins must be installed only on sites where failure of the structure would not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. Also, sediment traps and ponds are attractive to children and can be very dangerous. Compliance with local ordinances regarding health and safety must be addressed. If fencing of the pond is required, the type of fence and its location shall be shown on the ESC plan.
- Structures having a maximum storage capacity at the top of the dam of 10 acre-ft (435,600 ft^3) or more are subject to the Washington Dam Safety Regulations (Chapter 173-175 WAC).
- See Figure 4.24, Figure 4.25, and Figure 4.26 for details.
- If permanent runoff control facilities are part of the project, they should be used for sediment retention. The surface area requirements of the sediment basin must be met. This may require enlarging the permanent basin to comply with the surface area requirements. If a permanent control structure is used, it may be advisable to partially restrict the lower orifice with gravel to increase residence time while still allowing dewatering of the basin.
- Use of infiltration facilities for sedimentation basins during construction tends to clog the soils and reduce their capacity to infiltrate. If infiltration facilities are to be used, the sides and bottom of the facility must only be rough excavated to a minimum of 2 feet above final grade. Final grading of the infiltration facility shall occur only when all contributing drainage areas are fully stabilized. The infiltration pretreatment facility should be fully constructed and used with the sedimentation basin to help prevent clogging.
- Determining Pond Geometry

  Obtain the discharge from the hydrologic calculations of the peak flow for the 2-year runoff event (Q_2). The 10-year peak flow shall be used if the project size, expected timing and duration of construction, or downstream conditions warrant a higher level of protection. If no hydrologic analysis is required, the Rational Method may be used.

this provision are allowed as long as the divider is permeable, structurally sound, and designed to prevent erosion under or around the barrier.

To aid in determining sediment depth, **one-foot intervals** shall be prominently marked on the riser.

If an **embankment** of more than 6 feet is proposed, the pond must comply with the criteria contained in Volume III regarding dam safety for detention BMPs.

- The most common structural failure of sedimentation basins is caused by piping. Piping refers to two phenomena: (1) water seeping through fine-grained soil, eroding the soil grain by grain and forming pipes or tunnels; and, (2) water under pressure flowing upward through a granular soil with a head of sufficient magnitude to cause soil grains to lose contact and capability for support.

  The most critical construction sequences to prevent piping will be:

  1. Tight connections between riser and barrel and other pipe connections.
  2. Adequate anchoring of riser.
  3. Proper soil compaction of the embankment and riser footing.
  4. Proper construction of anti-seep devices.

Maintenance Standards

- Sediment shall be removed from the pond when it reaches 1-foot in depth.
- Any damage to the pond embankments or slopes shall be repaired.

BMP C250: Construction Stormwater Chemical Treatment

Purpose

Turbidity is difficult to control once fine particles are suspended in stormwater runoff from a construction site. Sedimentation ponds are effective at removing larger particulate matter by gravity settling, but are ineffective at removing smaller particulates such as clay and fine silt. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). Chemical treatment may be used to reduce the turbidity of stormwater runoff.

Conditions of Use

Chemical treatment can reliably provide exceptional reductions of turbidity and associated pollutants. Very high turbidities can be reduced to levels comparable to what is found in streams during dry weather. Traditional BMPs used to control soil erosion and sediment loss from sites under development may not be adequate to ensure compliance with the water quality standard for turbidity in the receiving water. Chemical treatment may be required to protect streams from the impact of turbid stormwater discharges, especially when construction is to proceed through the wet season.

Formal written approval from Ecology and the Local Permitting Authority is required for the use of chemical treatment regardless of site size. The intention to use Chemical Treatment shall be indicated on the Notice of Intent for coverage under the General Construction Permit. Chemical treatment systems should be designed as part of the Construction SWPPP, not after the fact. Chemical treatment may be used to correct problem sites in limited circumstances with formal written approval from Ecology and the Local Permitting Authority.

The SEPA review authority must be notified at the application phase of the project review (or the time that the SEPA determination on the project is performed) that chemical treatment is proposed. If it is added after this stage, an addendum will be necessary and may result in project approval delay.

Design and Installation Specifications

See Appendix II-B for background information on chemical treatment.

Criteria for Chemical Treatment Product Use: Chemically treated stormwater discharged from construction sites must be nontoxic to aquatic organisms. The following protocol shall be used to evaluate chemicals proposed for stormwater treatment at construction sites. Authorization to use a chemical in the field based on this protocol does not relieve the applicant from responsibility for meeting all discharge and receiving water criteria applicable to a site.

- Treatment chemicals must be approved by EPA for potable water use.
- Petroleum-based polymers are prohibited.

- Prior to authorization for field use, jar tests shall be conducted to demonstrate that turbidity reduction necessary to meet the receiving water criteria can be achieved. Test conditions, including but not limited to raw water quality and jar test procedures, should be indicative of field conditions. Although these small-scale tests cannot be expected to reproduce performance under field conditions, they are indicative of treatment capability.
- Prior to authorization for field use, the chemically treated stormwater shall be tested for aquatic toxicity. Applicable procedures defined in Chapter 173-205 WAC, Whole Effluent Toxicity Testing and Limits, shall be used. Testing shall use stormwater from the construction site at which the treatment chemical is proposed for use or a water solution using soil from the proposed site.
- The proposed maximum dosage shall be at least a factor of five lower than the no observed effects concentration (NOEC).
- The approval of a proposed treatment chemical shall be conditional, subject to full-scale bioassay monitoring of treated stormwater at the construction site where the proposed treatment chemical is to be used.
- Treatment chemicals that have already passed the above testing protocol do not need to be reevaluated. Contact the Department of Ecology Regional Office for a list of treatment chemicals that have been evaluated and are currently approved for use.

Treatment System Design Considerations: The design and operation of a chemical treatment system should take into consideration the factors that determine optimum, cost-effective performance. It may not be possible to fully incorporate all of the classic concepts into the design because of practical limitations at construction sites. Nonetheless, it is important to recognize the following:

- The right chemical must be used at the right dosage. A dosage that is either too low or too high will not produce the lowest turbidity. There is an optimum dosage rate. This is a situation where the adage "adding more is always better" is not the case.
- The coagulant must be mixed rapidly into the water to insure proper dispersion.
- A flocculation step is important to increase the rate of settling, to produce the lowest turbidity, and to keep the dosage rate as low as possible.
- Too little energy input into the water during the flocculation phase results in flocs that are too small and/or insufficiently dense. Too much energy can rapidly destroy floc as it is formed.

- Since the volume of the basin is a determinant in the amount of energy per unit volume, the size of the energy input system can be too small relative to the volume of the basin.
- Care must be taken in the design of the withdrawal system to minimize outflow velocities and to prevent floc discharge. The discharge should be directed through a physical filter such as a vegetated swale that would catch any unintended floc discharge.

Treatment System Design: Chemical treatment systems shall be designed as batch treatment systems using either ponds or portable trailer-mounted tanks. Flow-through continuous treatment systems are not allowed at this time.

A chemical treatment system consists of the stormwater collection system (either temporary diversion or the permanent site drainage system), a storage pond, pumps, a chemical feed system, treatment cells, and interconnecting piping.

The treatment system shall use a minimum of two lined treatment cells. Multiple treatment cells allow for clarification of treated water while other cells are being filled or emptied. Treatment cells may be ponds or tanks. Ponds with constructed earthen embankments greater than six feet high require special engineering analyses. Portable tanks may also be suitable for some sites.

The following equipment should be located in an operations shed:

- the chemical injector;
- secondary containment for acid, caustic, buffering compound, and treatment chemical;
- emergency shower and eyewash, and
- monitoring equipment which consists of a pH meter and a turbidimeter.

Sizing Criteria: The combination of the storage pond or other holding area and treatment capacity should be large enough to treat stormwater during multiple day storm events. It is recommended that at a minimum the storage pond or other holding area should be sized to hold 1.5 times the runoff volume of the 10-year, 24-hour storm event. Bypass should be provided around the chemical treatment system to accommodate extreme storm events. Runoff volume shall be calculated using the methods presented in Volume 3, Chapter 2. If no hydrologic analysis is required for the site, the Rational Method may be used.

Primary settling should be encouraged in the storage pond. A forebay with access for maintenance may be beneficial.

There are two opposing considerations in sizing the treatment cells. A larger cell is able to treat a larger volume of water each time a batch is processed. However, the larger the cell the longer the time required to empty the cell. A larger cell may also be less effective at flocculation and therefore require a longer settling time. The simplest approach to sizing the treatment cell is to multiply the allowable discharge flow rate times the desired drawdown time. A 4-hour drawdown time allows one batch per cell per 8-hour work period, given 1 hour of flocculation followed by two hours of settling.

The permissible discharge rate governed by potential downstream effect can be used to calculate the recommended size of the treatment cells. The following discharge flow rate limits shall apply:

- If the discharge is directly or indirectly to a stream, the discharge flow rate shall not exceed 50 percent of the peak flow rate of the 2-year, 24-hour event for all storm events up to the 10-year, 24-hour event.
- If discharge is occurring during a storm event equal to or greater than the 10-year, 24-hour event, the allowable discharge rate is the peak flow rate of the 10-year, 24-hour event.
- Discharge to a stream should not increase the stream flow rate by more than 10 percent.
- If the discharge is directly to a lake, a major receiving water listed in Appendix C of Volume I, or to an infiltration system, there is no discharge flow limit.
- If the discharge is to a municipal storm drainage system, the allowable discharge rate may be limited by the capacity of the public system. It may be necessary to clean the municipal storm drainage system prior to the start of the discharge to prevent scouring solids from the drainage system.
- Runoff rates shall be calculated using the methods presented in Volume 3, Chapter 2 for the predeveloped condition. If no hydrologic analysis is required for the site, the Rational Method may be used.

Maintenance Standards

Monitoring: The following monitoring shall be conducted. Test results shall be recorded on a daily log kept on site:

Operational Monitoring

- pH, conductivity (as a surrogate for alkalinity), turbidity and temperature of the untreated stormwater
- Total volume treated and discharged
- Discharge time and flow rate
- Type and amount of chemical used for pH adjustment
- Amount of polymer used for treatment
- Settling time

Compliance Monitoring

- pH and turbidity of the treated stormwater
- pH and turbidity of the receiving water

Biomonitoring

Treated stormwater shall be tested for acute (lethal) toxicity. Bioassays shall be conducted by a laboratory accredited by Ecology, unless otherwise approved by Ecology. **The performance standard for acute toxicity is no statistically significant difference in survival between the control and 100 percent chemically treated stormwater.**

Acute toxicity tests shall be conducted with the following species and protocols:

- Fathead minnow, Pimephales *promelas* (96 hour static-renewal test, method: EPA/600/4-90/027F). Rainbow trout, Oncorhynchus mykiss (96 hour static-renewal test, method: EPA/600/4-90/027F) may be used as a substitute for fathead minnow.
- Daphnid, *Ceriodaphnia* dubia, *Daphnia pulex*, or *Daphnia magna* (48 hour static test, method: EPA/600/4-90/027F).

All toxicity tests shall meet quality assurance criteria and test conditions in the most recent versions of the EPA test method and Ecology Publication # WQ-R-95-80, Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria.

Bioassays shall be performed on the first five batches and on every tenth batch thereafter, or as otherwise approved by Ecology. Failure to meet the performance standard shall be immediately reported to Ecology.

Discharge Compliance: Prior to discharge, each batch of treated stormwater must be sampled and tested for compliance with pH and turbidity limits. These limits may be established by the water quality standards or a site-specific discharge permit. Sampling and testing for other pollutants may also be necessary at some sites. Turbidity must be within 5 NTUs of the background turbidity. Background is measured in the receiving water, upstream from the treatment process discharge point. pH must be within the range of 6.5 to 8.5 standard units and not cause a change in the pH of the receiving water of more than 0.2 standard units. It is often possible to discharge treated stormwater that has a lower turbidity than the receiving water and that matches the pH.

Treated stormwater samples and measurements shall be taken from the discharge pipe or another location representative of the nature of the treated stormwater discharge. Samples used for determining compliance with the water quality standards in the receiving water shall not be taken from the treatment pond prior to decanting. Compliance with the water quality standards is determined in the receiving water.

Operator Training: Each contractor who intends to use chemical treatment shall be trained by an experienced contractor on an active site for at least 40 hours.

Standard BMPs: Surface stabilization BMPs should be implemented on site to prevent significant erosion. All sites shall use a truck wheel wash to prevent tracking of sediment off site.

Sediment Removal And Disposal:

- Sediment shall be removed from the storage or treatment cells as necessary. Typically, sediment removal is required at least once during a wet season and at the decommissioning of the cells. Sediment remaining in the cells between batches may enhance the settling process and reduce the required chemical dosage.
- Sediment may be incorporated into the site away from drainages.

BMP C251: Construction Stormwater Filtration

Purpose

Filtration removes sediment from runoff originating from disturbed areas of the site.

Conditions of Use

Traditional BMPs used to control soil erosion and sediment loss from sites under development may not be adequate to ensure compliance with the water quality standard for turbidity in the receiving water. Filtration may be used in conjunction with gravity settling to remove sediment as small as fine silt (0.5 μm). The reduction in turbidity will be dependent on the particle size distribution of the sediment in the stormwater. In some circumstances, sedimentation and filtration may achieve compliance with the water quality standard for turbidity.

Unlike chemical treatment, the use of construction stormwater filtration does not require approval from Ecology.

Filtration may also be used in conjunction with polymer treatment in a portable system to assure capture of the flocculated solids.

Design and Installation Specifications

Background Information

Filtration with sand media has been used for over a century to treat water and wastewater. The use of sand filtration for treatment of stormwater has developed recently, generally to treat runoff from streets, parking lots, and residential areas. The application of filtration to construction stormwater treatment is currently under development.

Two types of filtration systems may be applied to construction stormwater treatment: rapid and slow. Rapid sand filters are the typical system used for water and wastewater treatment. They can achieve relatively high hydraulic flow rates, on the order of 2 to 20 gpm/sf, because they have automatic backwash systems to remove accumulated solids. In contrast, slow sand filters have very low hydraulic rates, on the order of 0.02 gpm/sf, because they do not have backwash systems. To date, slow sand filtration has generally been used to treat stormwater. Slow sand filtration is mechanically simple in comparison to rapid sand filtration but requires a much larger filter area.

Filtration Equipment. Sand media filters are available with automatic backwashing features that can filter to 50 μm particle size. Screen or bag filters can filter down to 5 μm. Fiber wound filters can remove particles down to 0.5 μm. Filters should be sequenced from the largest to the smallest pore opening. Sediment removal efficiency will be related to particle size distribution in the stormwater.

Treatment Process Description. Stormwater is collected at interception point(s) on the site and is diverted to a sediment pond or tank for removal of large sediment and storage of the stormwater before it is treated by the filtration system. The stormwater is pumped from the trap, pond, or tank through the filtration system in a rapid sand filtration system. Slow sand filtration systems are designed as flow through systems using gravity.

If large volumes of concrete are being poured, pH adjustment may be necessary.

Maintenance Standards

Rapid sand filters typically have automatic backwash systems that are triggered by a pre-set pressure drop across the filter. If the backwash water volume is not large or substantially more turbid than the stormwater stored in the holding pond or tank, backwash return to the pond or tank may be appropriate. However, land application or another means of treatment and disposal may be necessary.

- Screen, bag, and fiber filters must be cleaned and/or replaced when they become clogged.
- Sediment shall be removed from the storage and/or treatment ponds as necessary. Typically, sediment removal is required once or twice during a wet season and at the decommissioning of the ponds.

8.14 NOTICE OF INTENT (NOI) & NPDES GENERAL PERMIT FOR STORMWATER DISCHARGE FROM CONSTRUCTION ACTIVITIES

NOTE: NOI DOCUMENTATION NOT YET SUBMITTED TO ENVIRONMENT PROTECTION AGENCY AS OF DATE OF THIS REPORT.

Professional Home Inspection
Pillar To Post®

Authorized Independent Franchisee
PO Box 29658
Bellingham, WA 98228 (360) 733-7678

Lead Based Paint/ Asbestos Review

☒ INITIAL REPORT
☐ REINSPECTION
Original Inspection Date 6/14/2010

DATE: 6/14/2010
ADDRESS: Parcel # P50416
CITY, STATE, Bow, WA
INSPECTION # 43702- 205331
Washington State License Home Inspector #394

This inspection was completed to determine if there were any signs of potential for lead based paint or asbestos in the structure.
In my professional opinion it appears the structure was built after 1978 which would greatly lessen the chance of the use of these materials. Upon further review it does not appear that any paint was used as the structures is comprised of metal siding without paint. Both in & out of the structure no materials were noted that could be tested for the presence of either asbestos or lead paint.

5) INSPECTOR:

Jefferson Livingston

TSI
Transportation Solutions, Inc.
8250 - 165th Avenue NE
Suite 100
Redmond, WA 98052-6628
T 425-883-4134
F 425-867-0898
www.tsinw.com

UPPER SKAGIT HOTEL & WATER PARK

Bow, Washington

Transportation Impact Analysis

July 2010

Prepared for:
Upper Skagit Tribe

Prepared by:
Transportation Solutions, Inc.
8250 - 165th Avenue NE, Suite 100
Redmond, Washington 98052
(425) 883-4134

TSI
Transportation Solutions, Inc.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

TSI
Transportation Solutions, Inc.

EXECUTIVE SUMMARY

The *Upper Skagit Tribe* proposes to construct a hotel and water park on N Darrk Lane in Bow, Washington. The project would include approximately 300 hotel rooms, conference facilities for 1,200 people, and a water park. The water park would be open to hotel guests only. Given the distance between the hotel and major population centers, most conference attendees would also be hotel guests. This development would be complete and occupied by 2012.

The project is forecasted to generate 988 vehicle trips on a weekday and 99 trips during the PM peak hour. Intersections near the site were analyzed during the PM peak hour to evaluate their existing performance and determine if they would be adversely affected by the proposed hotel development.

The study finds that all of the analyzed intersections are forecasted to operate at acceptable levels of service with the project complete and occupied. The study concludes that off-site traffic mitigation or roadway improvements are not needed.

INTRODUCTION

This report documents the traffic conditions associated with the construction and occupation of the proposed Upper Skagit Hotel and Water Park. The purpose of this report is to identify potential traffic related impacts generated by occupancy of the proposed project and, where appropriate, outline programmatic and/or physical improvements to minimize or eliminate such impacts.

DEVELOPMENT LOCATION AND DESCRIPTION

The proposed project is located on N Darrk Lane in Bow, Washington near the existing *Skagit Valley Casino Resort.* Access to the site will be off Bow Hill Road at its existing intersection with Darrk Lane E. A vicinity map is included as Figure 1.

The project would include 308 new hotel rooms, conference facilities for 1,200 people, and a water park for hotel guests. The distance from the resort to local population areas makes it reasonable to assume that the majority of people attending conferences are likely to spend at least a night at the hotel. It is anticipated that the development will be complete and occupied by 2012. A site plan is included as Figure 2.

This study follows the general format of Skagit County's Level II Traffic Impact Analysis.

EXISTING CONDITIONS

This section of the report describes existing transportation conditions near the proposed development and includes a description of the street network, traffic controls, traffic volumes, and intersection levels of service. This section serves as a basis for subsequent analysis of forecasted transportation conditions with the project complete and occupied.

STUDY AREA

The study area for this analysis includes three off-site intersections: Bow Hill Road/ I-5 southbound ramps, Bow Hill Road/ I-5 northbound ramps, and Bow Hill Road/ Darrk Lane E. A new on-site intersection created by modifications to the internal road network will separate internal site traffic traveling to the existing hotel/casino from traffic traveling to the proposed hotel/water park/conference center is also analyzed. This intersection is identified as N Darrk Lane/ Harrington Lane in this report.

At the Bow Hill Road/ I-5 southbound ramps intersection, the southbound off-ramp is controlled by a stop sign and the eastbound/westbound approaches on Bow Hill Road are fee flowing. The intersection is channelized with separate left turn and a shared through and right turn lane on the southbound approach. The eastbound and westbound approaches have one lane in each direction.

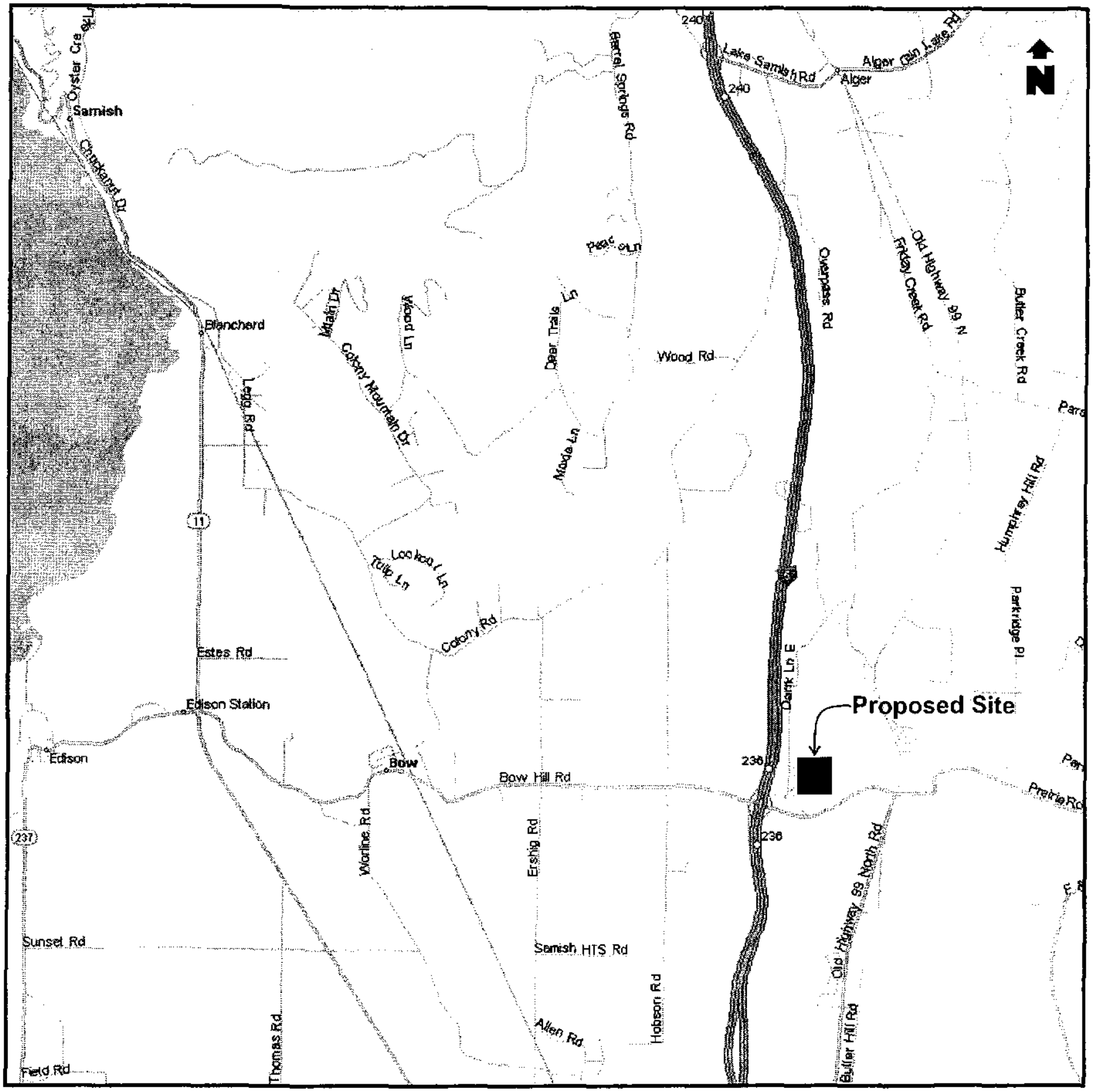
At the Bow Hill Road/ I-5 northbound ramps intersection, the northbound approach is controlled by a stop sign and the eastbound and westbound movements on Bow Hill Road are fee moving. Bow Hill Road is a two-lane roadway as it crosses over I-5. The intersection is channelized with separate left turn and a shared through and right turn lane on the northbound approach. The eastbound and westbound approaches have one lane in each direction.

The Bow Hill Road/ Darrk Lane E intersection is controlled by a traffic signal. The eastbound approach is channelized with separate left, through, and right turn lanes while the southbound approach is channelized with a right-turn lane and shared left and through lane. Both the westbound and northbound approaches are channelized with a single lane for all turning movements. The south leg of this intersection serves commercial businesses, including a gasoline station/ food market that is located in the southwest corner of the intersection.

EXISTING TRAFFIC VOLUMES

TSI evaluated the traffic impacts for this development during the afternoon (PM) peak hour period. The traditional PM peak hour occurs between 4:00 and 6:00 PM and is typically associated as the time-period when the combination of background and development-generated traffic volumes are highest. The peak hour within this two-hour period is identified as the 60-minute interval associated with the greatest four consecutive 15-minute traffic volumes.

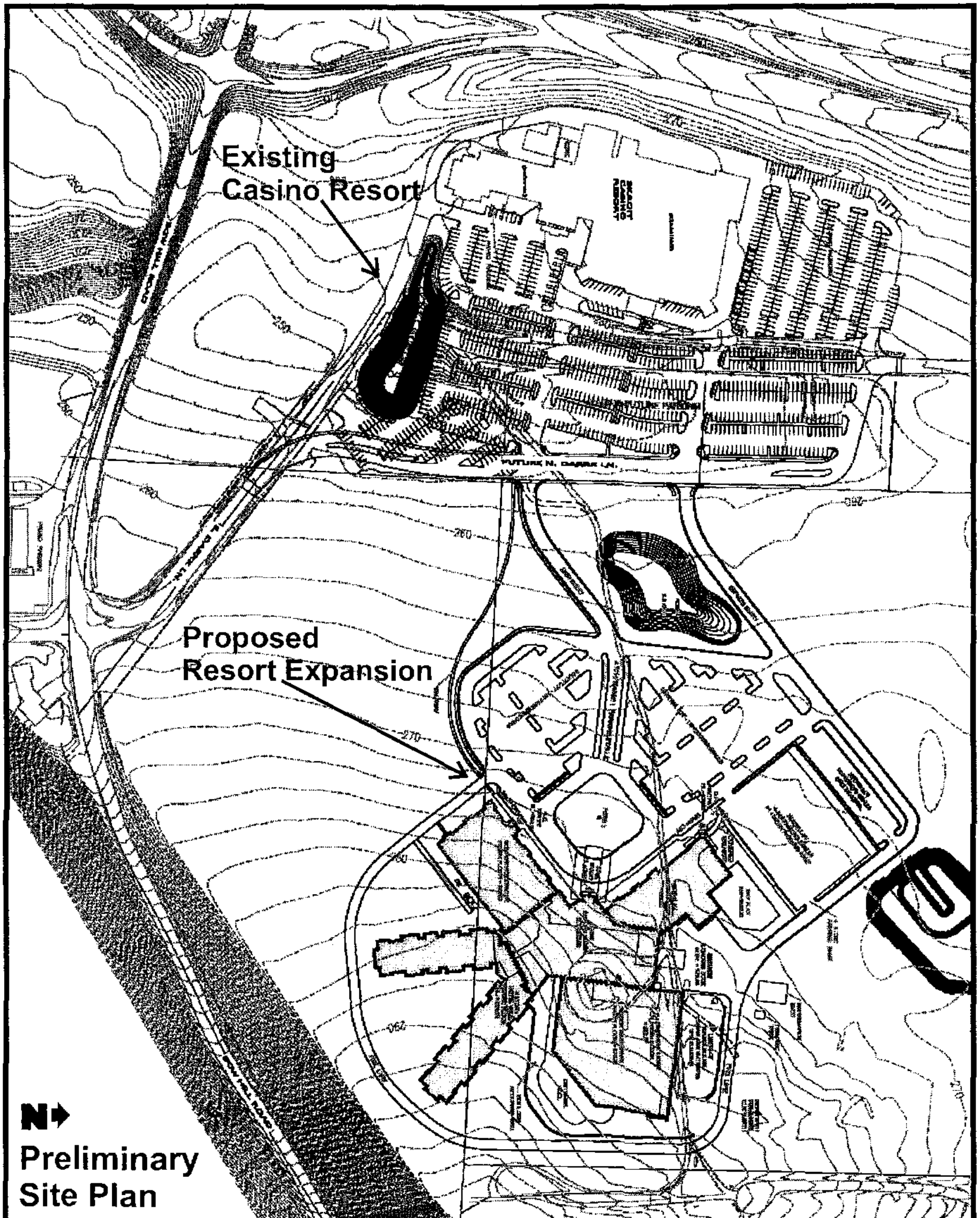
Traffic Data Gathering Services collected PM peak hour traffic volumes on Tuesday, July 27, 2010 at the three off-site intersections and one on-site intersection. A comparison of current traffic volumes with those made in 2007 shows that the volume of vehicles entering the intersection at Bow Hill Rd/ I-5 southbound ramps increased by12% (3% per year), Bow Hill Rd/ I-5 northbound ramps increased by 27% (7% per year), and Bow Hill Rd/ Darrk Lane decreased by 5% (-0.8% per year). PM peak hour volumes are illustrated in Figure 3.



Transportation Solutions, Inc.

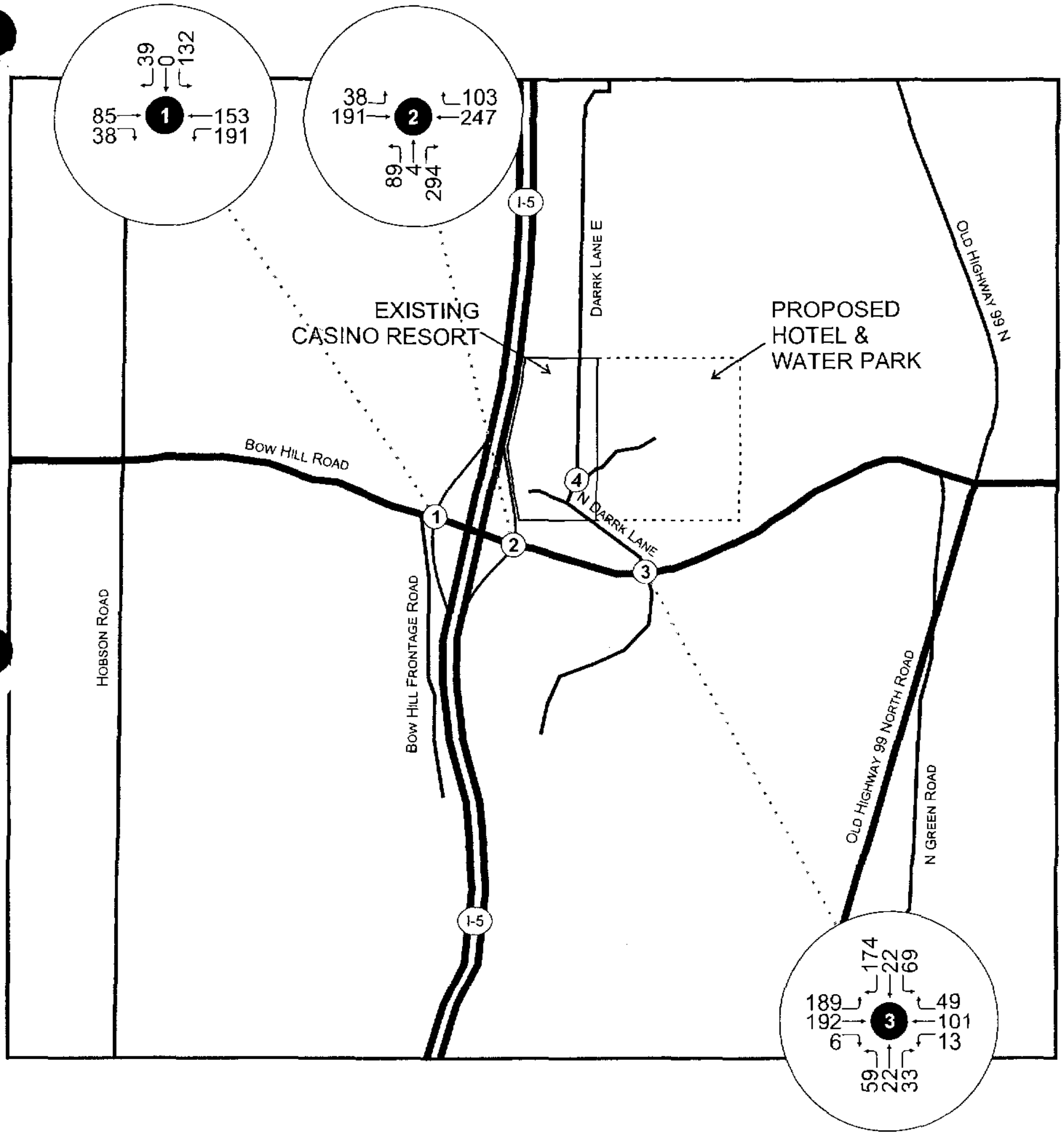
FIGURE 1:
VICINITY MAP

Upper Skagit Hotel & Water Park
Transportation Impact Analysis



TSI
Transportation Solutions, Inc.

FIGURE 2:
SITE PLAN



TSI Transportation Solutions, Inc.

FIGURE 3:
2010 EXISTING PM PEAK HOUR TRAFFIC VOLUMES

Upper Skagit Hotel & Water Park
Transportation Impact Analysis

EXISTING LEVELS OF SERVICE

TSI examined the existing PM peak hour levels of service (LOS) at the study intersections. Level of service is a measure of the ability of a given intersection to serve the traffic volumes using the street network. The Transportation Research Board developed the LOS methodology used in making this evaluation, and it is described in the *Highway Capacity Manual* (HCM), 2000 update. Intersection LOS calculations were performed using the Synchro, version 7, computer program.

For signalized and all-way stop controlled intersections, LOS is based on the average vehicle delay for all movements. For two-way stop-sign controlled intersections, LOS is typically based on the vehicle delay of the most congested approach. Vehicular delays, expressed as seconds of delay, for both signalized and unsignalized intersections are divided into grade levels ranging from LOS-A, which indicates little, or no congestion and delay, to LOS-F, which reflects overcapacity conditions with long delays. Although these letter designations provide a simple basis for comparison, seconds of control delay should be used as the exact measure of comparison. Table 1 summarizes the weekday and Friday peak hour LOS at the study intersections. Level of service is calculated using 2000 HCM methodology and the summary reports are provided in Appendix A.

TABLE 1: EXISTING (2010) PM PEAK HOUR LEVEL OF SERVICE AND DELAY (SEC)

Intersection	Control	App.[1]	2010 Existing	
			LOS	Delay
Bow Hill Road at I-5 SB Ramps	free	WB	A	4.9
	TWSC[2]	SB	C	20.7
Bow Hill Road at I-5 NB Ramps	free	EB	A	1.6
	TWSC[3]	NB	B	14.8
Bow Hill Road at Darrk Lane E	Signal	Avg.	A	8.7

1. App. = Approach (EB = eastbound, WB = westbound, NB = northbound, SB = southbound); Avg. = Average
2. TWSC = two-way stop-sign controlled – stop-sign controlled at the southbound approach
3. TWSC = two-way stop-sign controlled – stop-sign controlled at the northbound approach

The analyzed intersections and approaches operate well at LOS-C or better under existing conditions.

Along with Synchro, SimTraffic computer software was used to evaluate and determine if long vehicle queues developed at intersections within the study area. SimTraffic takes the Synchro input, applies vehicle and driver performance characteristics developed by the Federal Highway Administration, and simulates arterial and intersection performance. The design car length used in the simulation analysis (queue length calculation) is 20 feet and spacing between cars is 5 feet.

SimTraffic queue length output is in the form of maximum, average and 95th-percentile queues. Table 2 summarizes weekday and Friday peak hour queuing at the study intersections. Queuing reports are included in Appendix B.

Maximum queue lengths, identified in Table 2 as "Max," are the maximum back of queue observed for the entire analysis period. Typically the maximum queue length is noticed though may only be present during peak congested hours/periods on a weekday. Average queue lengths identified in Table 2 as "Avg.," are average length of all queues observed during the analysis period. Typically, the average queue length is most prevalent during a weekday. The 95^{th} percentile queue lengths, which are not necessarily ever observed, identified in Table 2 as "95^{th}," are based on statistical calculations using average queue length and standard deviation.

TABLE 2: EXISTING (2010) PM PEAK HOUR QUEUES (IN FEET)

Intersection	App.-Mvmt.	2010 Existing Max	Avg.	95^{th}
Bow Hill Road at I-5 SB Ramps	WB L-T	51	23	59
	SB L	72	43	76
	SB T-R	40	28	55
Bow Hill Road at I-5 NB Ramps	EB L-T	40	19	47
	NB L	52	38	59
	NB T-R	86	58	90
Bow Hill Road at Darrk Lane E	EB L	83	55	96
	EB T	60	31	66
	WB L-T-R	94	54	104
	NB L-T-R	64	38	76
	SB L-T	70	41	76

- App. = Approach; Mvmt. = Movement
- Max = maximum queue length observed during the simulation
- Avg. = average queue length observed during the simulation
- 95th = 95th-percentile queue length observed during the simulation
- Movement (xx x-x) = approach turning movement (left-turn, through, or" right-turn movements; shared turning movements are delineated with a dash ["-"])

Queues at the southbound approach from the existing casino at Bow Hill Road and Darrk Lane E intersection are on average two car lengths and at most three car lengths. Queues at the highway ramps are on average one to two car lengths and at most three car lengths on the southbound off-ramp and are on average two car lengths and at most four car lengths on the northbound off-ramp. Queues do not back across the I-5 overpass. There are no queue length deficiencies identified within the study area.

FUTURE (2012) WITHOUT THE HOTEL AND WATER PARK

This section outlines the assumptions and steps taken to forecast future 2012 traffic volumes without the proposed project. It discusses the potential impacts of additional vehicle traffic in the site vicinity generated by the growth in the area and the impacts associated with various transportation issues unrelated to this development.

BACKGROUND TRAFFIC VOLUMES

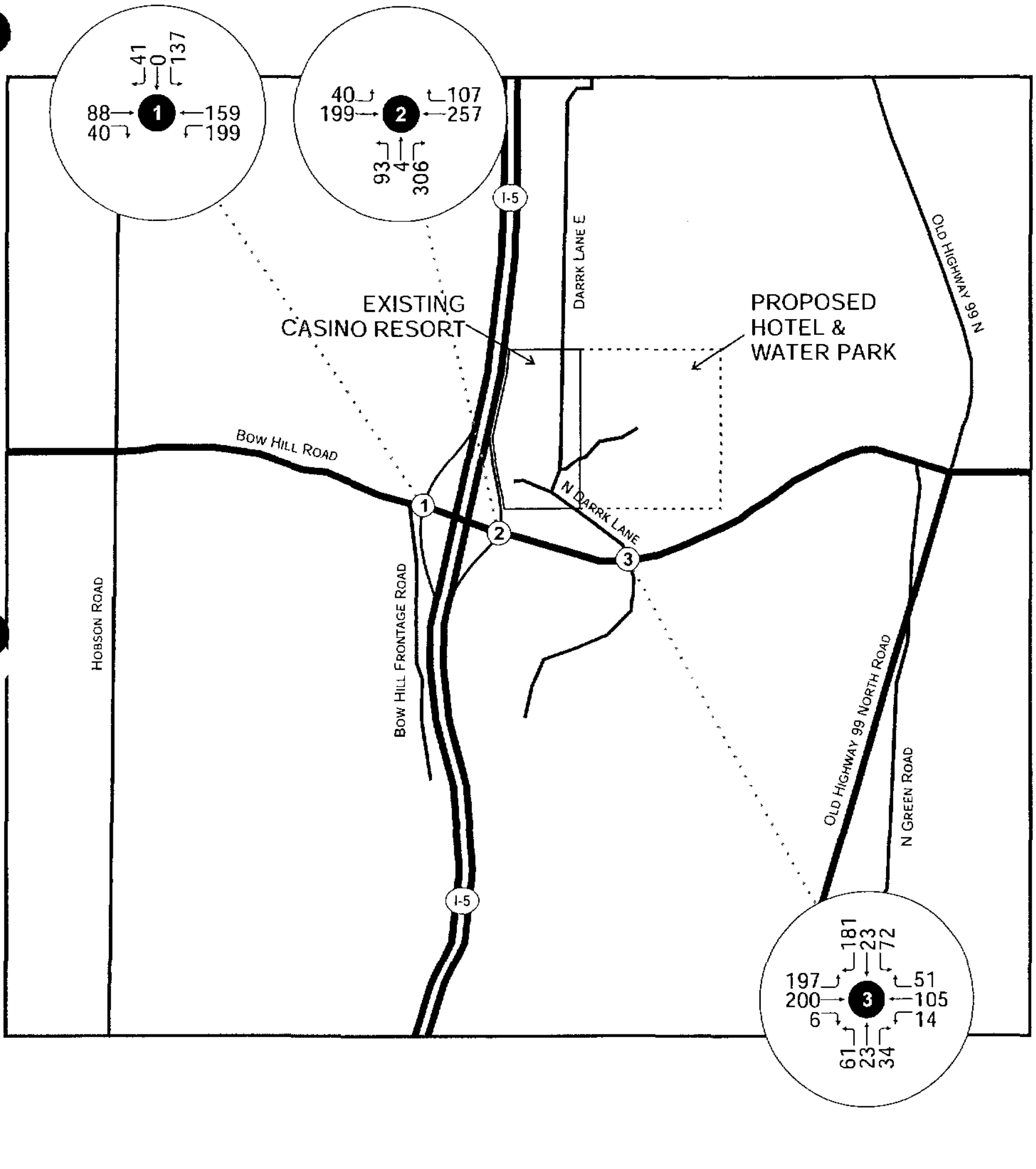
Year 2012 'without' the proposed hotel (background) traffic volumes are made up of regional traffic growth and pipeline development traffic. Pipeline development traffic volumes are the trips generated by other development applications approved though not yet constructed. For this study, a 2% annual traffic growth rate was used to forecast future background traffic growth. There were no identified pipeline projects that would affect the study intersections prior to 2012.

BACKGROUND LEVEL OF SERVICE

Table 3 summarizes the peak hour weekday and Friday LOS at the study intersections without the proposed hotel. The existing conditions LOS analysis is included for comparison.

TABLE 3: FUTURE (2012) PM PEAK HOUR LEVEL OF SERVICE AND DELAY (SEC) WITHOUT THE PROJECT

Intersection	Control	App.	2010 Existing		2012 w/o Project	
			LOS	Delay	LOS	Delay
Bow Hill Road at I-5 SB Ramps	free	WB	A	4.9	A	5.0
	stop	SB	C	20.7	C	22.4
Bow Hill Road at I-5 NB Ramps	free	EB	A	1.6	A	1.7
	stop	NB	B	14.8	C	15.5
Bow Hill Road at Darrk Lane E	Signal	Avg.	A	8.7	A	8.8



TSI Transportation Solutions, Inc.

FIGURE 4:
2012 WITHOUT PROPOSED HOTEL/ WATERPARK
PM PEAK HOUR TRAFFIC VOLUMES

Intersection delay increases slightly with the growth in background traffic but intersection LOS categories are unchanged except for the northbound approach of the intersection of Bow Hill Road/ Northbound I-5 ramps where delay increases by less than a second but crosses the threshold to LOS-C.

Table 4 summarizes peak hour weekday queuing at the study intersections without the new hotel. The existing peak queuing analysis is included for comparison.

TABLE 4: FUTURE 2012 PM PEAK HOUR QUEUES (IN FEET) WITHOUT PROJECT

Intersection	App.-Mvmt.	2010 Existing			2012 w/o Project		
		Max	Avg.	95th	Max	Avg.	95th
Bow Hill Road at I-5 SB Ramps	WB L-T	51	23	59	54	21	61
	SB L	72	43	76	70	47	88
	SB T-R	40	28	55	40	29	51
Bow Hill Road at I-5 NB Ramps	EB L-T	40	19	47	30	10	34
	NB L	52	38	59	68	41	70
	NB T-R	86	58	90	102	69	113
Bow Hill Road at Darrk Lane E	EB L	83	55	96	105	60	111
	EB T	60	31	66	52	32	65
	WB L-T-R	94	54	104	104	65	119
	NB L-T-R	64	38	76	72	46	89
	SB L-T	70	41	76	74	49	82

Queue lengths at most increase by one or two car lengths between the existing and future without project conditions and are still not anticipated to cause any operational concerns.

FUTURE (2012) WITH THE HOTEL AND WATER PARK

This section of the report analyzes the forecasted traffic volumes associated with the proposed project and discusses the potential impacts associated with additional vehicular traffic generated near the site. The forecasted conditions with the proposed hotel will be compared with the background traffic conditions to determine the incremental impact of the additional trips generated by the project.

DEVELOPMENT-GENERATED TRAFFIC VOLUMES

TSI uses a generally accepted transportation planning approach that includes the following steps for forecasting travel demand:

- *Trip Generation:* Trips produced by the occupancy of the development.
- *Mode Split:* Proportion of trips by travel mode (automobile, transit, other).
- *Trip Distribution:* Origins/destinations and routes of trips.
- *Travel Assignment:* Number of new trips using the street network by route.

Trip Generation and Mode Split

The trip generation rate for the proposed hotel is based on trip generation rates contained in the *8th edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual*. For this project, the ITE land use for a resort hotel was used (LUC 330). The trip generation calculations in Table 5 are based on the proposed 308-room hotel. It should be noted that the water park is open to hotel guests only and would not generate additional trips.

TABLE 5: TRIP GENERATION – ITE (LUC 330) – RESORT HOTEL

Time Period	Trip Rate	Distribution in-%	Distribution out-%	Trips Generated total	Trips Generated in	Trips Generated out
AM Peak Hour	0.26 [a]	72%	28%	79	57	22
PM Peak Hour	0.33 [a]	43%	57%	99	42	56
Weekday Daily	3.29 [b]	50%	50%	988	494	494

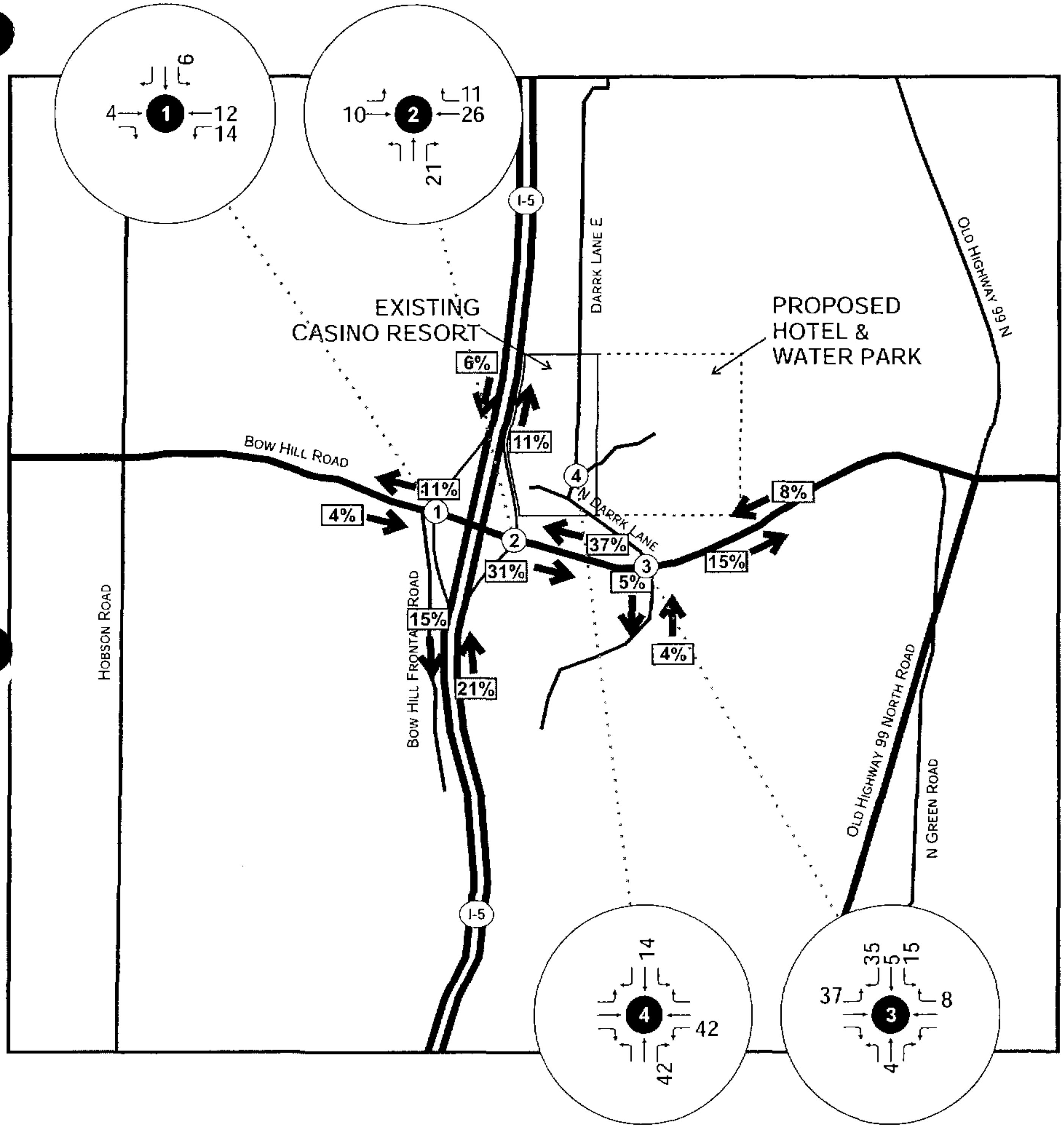
a. calculated using the fitted curve equation
b. no ITE data; assumed to be approximately 10 times the PM Peak Hour Trip Rate

The proposed hotel would generate approximately 79 AM peak hour, 99 PM peak hour, and 988 new daily trips.

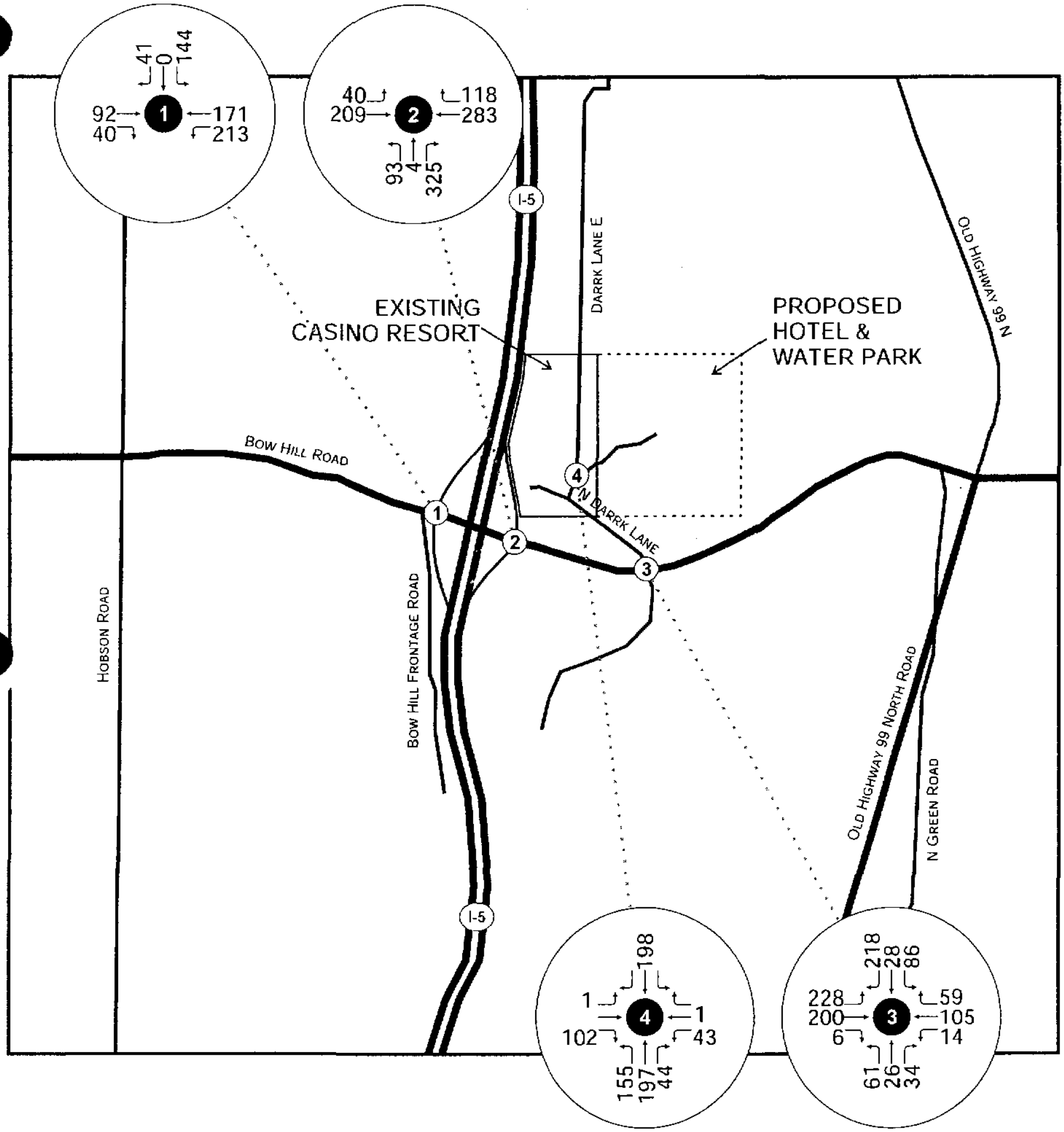
For this analysis, it is assumed that all project-generated trips are vehicle trips and there are no deductions made for pedestrian, bicycle, or transit trips.

Trip Distribution and Travel Assignment

The peak hour trip distribution is based on 2010 traffic volumes and turning movement distribution patterns and is illustrated in Figure 5. Peak hour hotel generated trips are multiplied by the distribution percentages to illustrate the travel assignment for the development, also shown in Figure 5. The new PM peak hour trips generated by the proposed development were superimposed onto the background traffic volumes (Figure 4) to forecast the future 2012 traffic conditions with the hotel complete and occupied. Future 2012 traffic conditions with the hotel in place are shown in Figure 6.



6
4
12
14
11
10
26
21
I-5
DARRK LANE E
OLD HIGHWAY 99 N
EXISTING
CASINO RESORT
PROPOSED
HOTEL &
WATER PARK
6%
11%
BOW HILL ROAD
11%
4%
4
N DARRK LANE
8%
37%
15%
31%
5%
HOBSON ROAD
BOW HILL FRONTAGE ROAD
15%
4%
21%
OLD HIGHWAY 99 NORTH ROAD
N GREEN ROAD
I-5
14
42
42
35
5
15
37
8
4



Transportation Solutions, Inc.

FIGURE 6:
2012 WITH HOTEL/ WATER PARK
PM PEAK HOUR TRAFFIC VOLUMES

Future Levels of Service with the Hotel and Water Park

Level of service analysis under '2012 with project' conditions was performed for the study intersections as well as the on-site intersection of N Darrk Lane/ Harrington Lane, which would be the primary access serving the hotel. A summary of LOS at the study intersections is shown in Table 6 with the 2010 existing and 2012 without project conditions LOS analyses included for comparison.

TABLE 6: FUTURE (2012) PM PEAK HOUR LEVEL OF SERVICE AND DELAY (SEC) WITH THE PROPOSED PROJECT

Intersection	Control	App.	2010 Existing		2012 w/o Project		2012 w/ Project	
			LOS	Delay	LOS	Delay	LOS	Delay
Bow Hill Road at I-5 SB Ramps	free	WB	A	4.9	A	5.0	A	5.1
	stop	SB	C	20.7	C	22.4	D	25.7
Bow Hill Road at I-5 NB Ramps	free	EB	A	1.6	A	1.7	A	1.7
	stop	NB	B	14.8	C	15.5	C	16.5
Bow Hill Road at Darrk Lane E	Signal	Avg.	A	8.7	A	8.8	A	8.9
Internal Road at N Darrk Lane	TWSC	EB	-	-	-	-	B	10.2
		WB					D	27.8

The PM peak hour traffic volumes generated by the proposed hotel do not adversely affect any of the study intersections. At the Bow Hill Road at I-5 southbound ramps the southbound approach (off-ramp) increases delay by 3.2 seconds and drops from LOS-C to LOS-D. There are 35 project generated peak hour trips forecasted to travel through this intersection with only six of these at the southbound off-ramp of the intersection. It is perfectly acceptable to have an approach to a two-way stop-controlled intersection operate at LOS-D during the peak hour and the 3 second increase in delay would not be noticeable to the typical motorist.

At the intersection of Bow Hill Road and the I-5 northbound ramps, the northbound approach (off-ramp) continues to operate at LOS-C with one second of additional delay. Level of service 'C' indicates that this intersection would operate very well under future conditions.

The signalized intersection of Bow Hill Road and Darrk Lane E continues to operate at LOS-A during the PM peak hour. The additional trips generated by the proposed hotel would add less than a second of delay to the intersection.

It is assumed that the on-site intersection of Harrington Lane and N Darrk Lane would be controlled by stop signs on the minor approaches. If this is the case, the eastbound approach from the existing casino/ hotel, which has predominantly right turn movements, is forecast to operate at LOS-B during the peak hour. The westbound approach, which is the primary access for the hotel/ water park is forecasted to operate at LOS-D due to the predominance of left turn movements exiting the hotel parking area and traveling south on Darrk Lane. The uncontrolled through movements would operate at LOS-A due to the presence of left turn lanes on Darrk Lane. This on-site intersection is the location where existing hotel/casino traffic and future hotel/water park/conference center traffic split to access the two areas of the resort. A planned secondary access to the north of this intersection would likely carry a small portion of the outbound hotel/water park traffic and could slightly decrease the calculated delay on the westbound approach. If the intersection were all-way stop controlled, it would operate at LOS-B.

A summary of queuing at the study intersections is shown in Table 7 with the 2010 existing and 2012 without project conditions queuing analyses included for comparison.

TABLE 7: FUTURE (2012) PM PEAK HOUR QUEUES (IN FEET) WITH THE HOTEL

Intersection	App.-Mvmt.	2010 Existing			2012 w/o Project			2012 w/ Project		
		Max	Avg.	95th	Max	Avg.	95th	Max	Avg.	95th
Bow Hill Road at I-5 SB Ramps	WB L-T	51	23	59	54	21	61	49	19	52
	SB L	72	43	76	70	47	88	68	40	67
	SB T-R	40	28	55	40	29	51	44	26	51
Bow Hill Road at I-5 NB Ramps	EB L-T	40	19	47	30	10	34	41	16	47
	NB L	52	38	59	68	41	70	74	41	73
	NB T-R	86	58	90	102	69	113	125	76	143
Bow Hill Road at Darrk Lane E	EB L	83	55	96	105	60	111	98	61	103
	EB T	60	31	66	52	32	65	67	40	79
	WB L-T-R	94	54	104	104	65	119	80	45	92
	NB L-T-R	64	38	76	72	46	89	77	43	81
	SB L-T	70	41	76	74	49	82	68	46	77
Harrington Lane at N Darrk Lane	EB L-R	-	-	-	-	-	-	63	42	69
	WB L							48	28	60
	NB L	-	-	-	-	-	-	37	22	54

The maximum queue lengths, during the weekday PM peak period, at the intersections along Bow Hill Road are at the northbound I-5 off-ramp (158-feet). Such queue lengths represent about six car lengths each. At the on-site intersection of Harrington Lane/ N Darrk Lane, the westbound queue making a left turn out of the hotel parking area would only be one or two vehicles. While the westbound approach is forecasted to operate at LOS-D, that delay would only affect a small number of vehicles and the larger volume of vehicles on Darrk Lane would not be delayed.

In summary, the analyzed intersections would not experience significant drops in level of service or unacceptable vehicle queues with proposed hotel complete and occupied.

CONCLUSIONS

The proposed hotel and water park would not result in any foreseeable significant adverse impacts to the local road system that would require mitigation.

Transportation Solutions, Inc.

APPENDIX A:
TRAFFIC VOLUME AND LEVEL OF SERVICE REPORTS

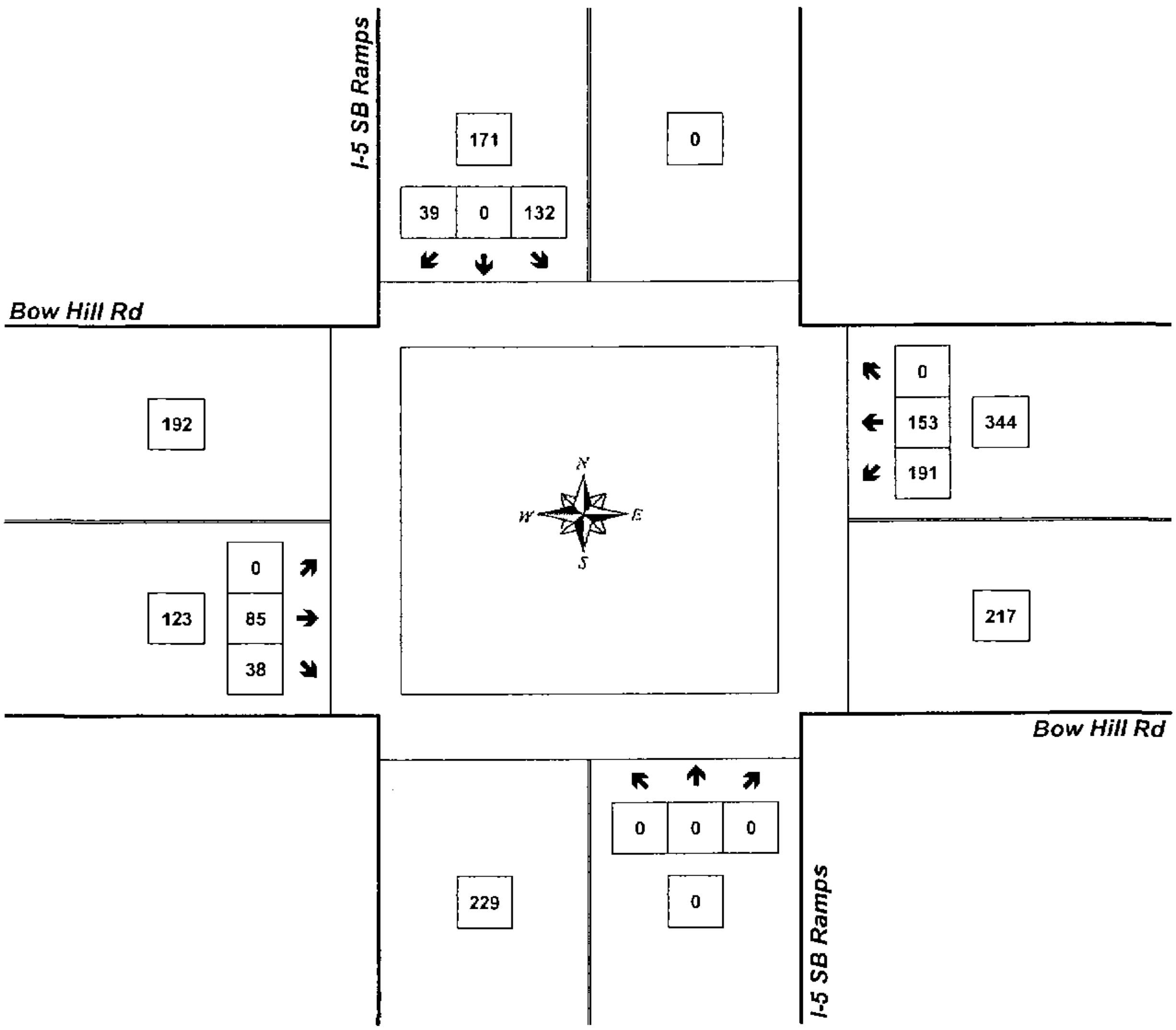
Peak Hour Summary

All Traffic Data Services Inc.
Mark Skaggs
(206) 251-0300

I-5 SB Ramps & Bow Hill Rd

4:30 PM to 5:30 PM

Tuesday, July 27, 2010

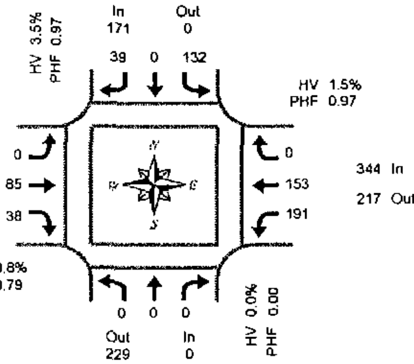


Approach	PHF	HV%	Volume
EB	0.79	0.8%	123
WB	0.97	1.5%	344
NB	0.00	0.0%	0
SB	0.97	3.5%	171
Intersection	0.97	1.9%	638

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Mark Skaggs
(206) 251-0300



Peak Hour Summary
4:30 PM to 5:30 PM

I-5 SB Ramps & Bow Hill Rd

Tuesday, July 27, 2010
4:00 PM to 6:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound I-5 SB Ramps				Southbound I-5 SB Ramps				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Interval Total
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV	
4:00 PM	0	0	0	0	30	0	11	1	0	25	10	1	42	32	0	2	150
4:15 PM	0	0	0	0	25	0	8	3	0	25	9	3	47	29	0	1	143
4:30 PM	0	0	0	0	33	0	11	1	0	20	12	1	53	28	0	2	157
4:45 PM	0	0	0	0	36	0	8	3	0	23	4	0	45	44	0	3	160
5:00 PM	0	0	0	0	28	0	11	1	0	24	15	0	46	41	0	0	165
5:15 PM	0	0	0	0	35	0	9	1	0	18	7	0	47	40	0	0	156
5:30 PM	0	0	0	0	35	0	10	1	0	30	7	1	45	24	0	1	151
5:45 PM	0	0	0	0	38	0	4	3	0	21	5	0	46	27	0	0	141
Total Survey	0	0	0	0	260	0	72	14	0	186	69	6	371	265	0	9	1,223

Peak Hour Summary
4:30 PM to 5:30 PM

By Approach	Northbound I-5 SB Ramps				Southbound I-5 SB Ramps				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Total
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	
Volume	0	229	229	0	171	0	171	6	123	192	315	1	344	217	561	5	638
%HV	0.0%				3.5%				0.8%				1.5%				1.9%
PHF	0.00				0.97				0.79				0.97				0.97

By Movement	Northbound I-5 SB Ramps				Southbound I-5 SB Ramps				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	0	0	0	132	0	39	171	0	85	38	123	191	153	0	344	638
PHF	0.00	0.00	0.00	0.00	0.92	0.00	0.89	0.97	0.00	0.89	0.63	0.79	0.90	0.87	0.00	0.97	0.97

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound I-5 SB Ramps				Southbound I-5 SB Ramps				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Interval Total
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV	
4:00 PM	0	0	0	0	124	0	38	8	0	93	35	5	187	133	0	8	610
4:15 PM	0	0	0	0	122	0	38	8	0	92	40	4	191	142	0	6	625
4:30 PM	0	0	0	0	132	0	39	6	0	85	38	1	191	153	0	5	638
4:45 PM	0	0	0	0	134	0	38	6	0	95	33	1	183	149	0	4	632
5:00 PM	0	0	0	0	136	0	34	6	0	93	34	1	184	132	0	1	613

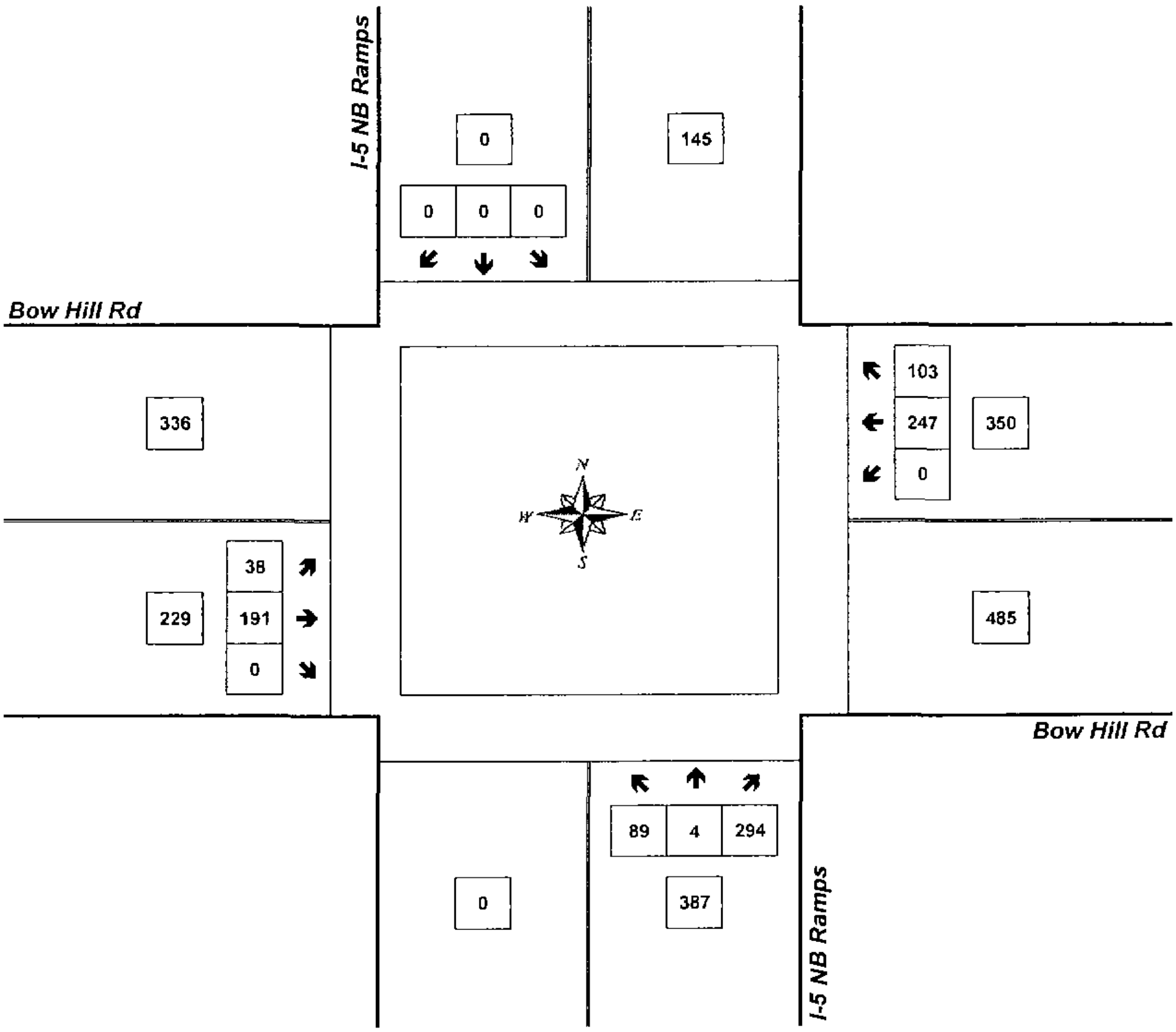
Peak Hour Summary

All Traffic Data Services Inc.

Mark Skaggs
(206) 251-0300

I-5 NB Ramps & Bow Hill Rd

4:45 PM to 5:45 PM
Tuesday, July 27, 2010

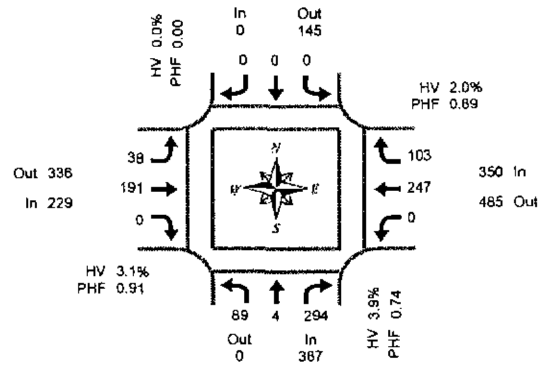


Approach	PHF	HV%	Volume
EB	0.91	3.1%	229
WB	0.89	2.0%	350
NB	0.74	3.9%	387
SB	0.00	0.0%	0
Intersection	0.87	3.0%	966

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

All Traffic Data Services Inc.
Mark Skaggs
(206) 251-0300



Peak Hour Summary
4:45 PM to 5:45 PM

I-5 NB Ramps & Bow Hill Rd

Tuesday, July 27, 2010
4:00 PM to 6:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start	Northbound I-5 NB Ramps				Southbound I-5 NB Ramps				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Interval
Time	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV	Total
4:00 PM	19	1	61	2	0	0	0	0	5	53	0	3	0	55	25	1	219
4:15 PM	17	1	45	3	0	0	0	0	6	43	0	4	0	59	18	1	189
4:30 PM	15	2	63	4	0	0	0	0	12	40	0	2	0	64	23	3	219
4:45 PM	26	1	63	7	0	0	0	0	9	51	0	4	0	61	21	2	232
5:00 PM	17	1	60	0	0	0	0	0	11	42	0	2	0	71	27	1	229
5:15 PM	31	1	99	4	0	0	0	0	6	47	0	0	0	63	32	2	279
5:30 PM	15	1	72	4	0	0	0	0	12	51	0	1	0	52	23	2	226
5:45 PM	20	0	63	1	0	0	0	0	5	52	0	3	0	54	31	0	225
Total Survey	160	8	526	25	0	0	0	0	66	379	0	19	0	479	200	12	1,818

Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound I-5 NB Ramps				Southbound I-5 NB Ramps				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Total
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	
Volume	387	0	387	15	0	145	145	0	229	336	565	7	350	485	835	7	966
%HV	3.9%				0.0%				3.1%				2.0%				3.0%
PHF	0.74				0.00				0.91				0.89				0.87

By Movement	Northbound I-5 NB Ramps				Southbound I-5 NB Ramps				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	89	4	294	387	0	0	0	0	38	191	0	229	0	247	103	350	966
PHF	0.72	1.00	0.74	0.74	0.00	0.00	0.00	0.00	0.79	0.94	0.00	0.91	0.00	0.87	0.80	0.89	0.87

Rolling Hour Summary
4:00 PM to 6:00 PM

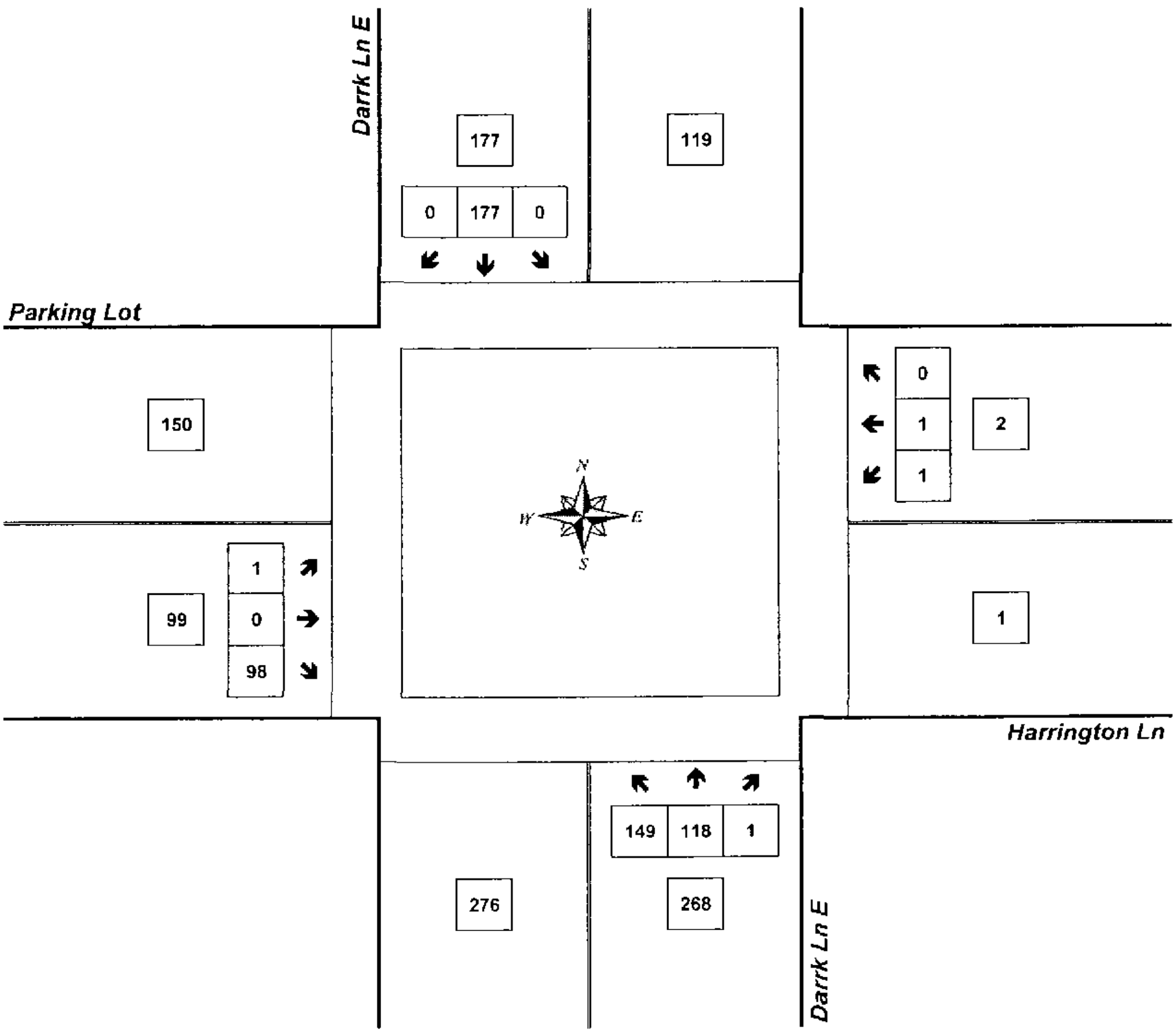
Interval Start	Northbound I-5 NB Ramps				Southbound I-5 NB Ramps				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Interval
Time	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV	Total
4:00 PM	77	5	232	16	0	0	0	0	32	187	0	13	0	239	87	7	859
4:15 PM	75	5	231	14	0	0	0	0	38	176	0	12	0	255	89	7	869
4:30 PM	89	5	285	15	0	0	0	0	38	180	0	8	0	259	103	8	959
4:45 PM	89	4	294	15	0	0	0	0	38	191	0	7	0	247	103	7	966
5:00 PM	83	3	294	9	0	0	0	0	34	192	0	6	0	240	113	5	959

Peak Hour Summary

All Traffic Data Services Inc.
Mark Skaggs
(206) 251-0300

Darrk Ln E & Harrington Ln

4:00 PM to 5:00 PM
Tuesday, July 27, 2010

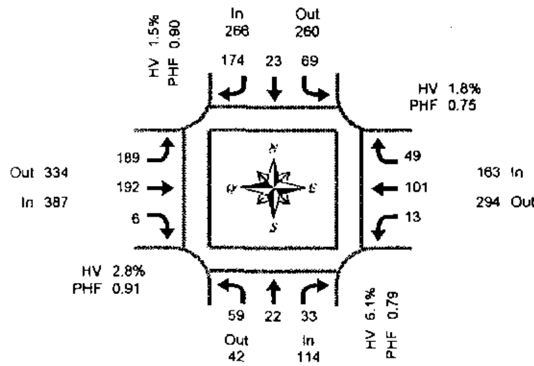


Approach	PHF	HV%	Volume
EB	0.95	0.0%	99
WB	0.50	0.0%	2
NB	0.88	2.6%	268
SB	0.90	3.4%	177
Intersection	0.94	2.4%	546

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

All Traffic Data Services Inc.
Mark Skaggs
(206) 251-0300



Peak Hour Summary
5:00 PM to 6:00 PM

Darrk Ln E & Bow Hill Rd

Tuesday, July 27, 2010
4:00 PM to 6:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Bow Ridge Dr				Southbound Darrk Ln E				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Interval Total
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV	
4:00 PM	18	5	13	2	10	7	42	3	45	38	0	6	4	16	19	3	217
4:15 PM	7	7	15	1	16	3	39	2	46	31	2	3	5	20	15	2	206
4:30 PM	7	5	4	1	19	5	52	3	49	39	0	3	2	24	16	3	222
4:45 PM	12	6	12	2	17	8	43	2	41	54	0	6	8	24	8	1	233
5:00 PM	12	5	7	1	20	5	49	1	44	42	1	2	3	28	4	1	220
5:15 PM	20	7	9	2	19	4	48	1	52	47	5	3	3	21	13	0	248
5:30 PM	15	6	12	3	7	4	41	1	47	59	0	2	5	18	14	0	228
5:45 PM	12	4	5	1	23	10	36	1	46	44	0	4	2	34	18	2	234
Total Survey	103	45	77	13	131	46	350	14	370	354	8	29	32	185	107	12	1,808

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound Bow Ridge Dr				Southbound Darrk Ln E				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Total
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	
Volume	114	42	156	7	266	260	526	4	387	334	721	11	163	294	457	3	930
%HV	6.1%				1.5%				2.8%				1.8%				2.7%
PHF	0.79				0.90				0.91				0.75				0.94

By Movement	Northbound Bow Ridge Dr				Southbound Darrk Ln E				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	59	22	33	114	69	23	174	266	189	192	6	387	13	101	49	163	930
PHF	0.74	0.79	0.69	0.79	0.75	0.58	0.89	0.90	0.91	0.81	0.30	0.91	0.65	0.74	0.68	0.75	0.94

Rolling Hour Summary
4:00 PM to 6:00 PM

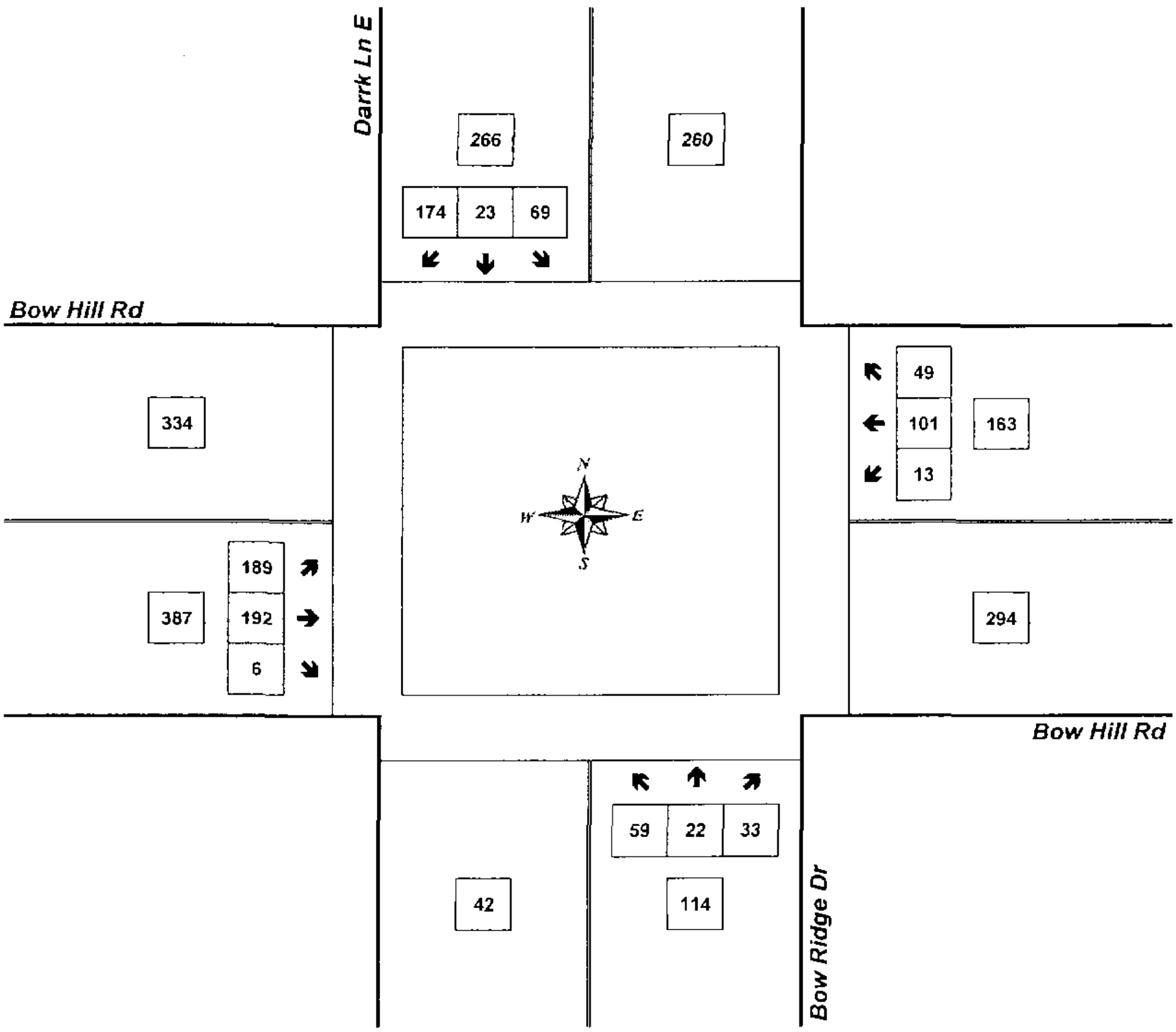
Interval Start Time	Northbound Bow Ridge Dr				Southbound Darrk Ln E				Eastbound Bow Hill Rd				Westbound Bow Hill Rd				Interval Total
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV	
4:00 PM	44	23	44	6	62	23	176	10	181	162	2	18	19	84	58	9	878
4:15 PM	38	23	38	5	72	21	183	8	180	166	3	14	18	96	43	7	881
4:30 PM	51	23	32	6	75	22	192	7	186	182	6	14	16	97	41	5	923
4:45 PM	59	24	40	8	63	21	181	5	184	202	6	13	19	91	39	2	929
5:00 PM	59	22	33	7	69	23	174	4	189	192	6	11	13	101	49	3	930

Peak Hour Summary

All Traffic Data Services Inc.
Mark Skaggs
(206) 251-0300

Darrk Ln E & Bow Hill Rd

5:00 PM to 6:00 PM
Tuesday, July 27, 2010



Approach	PHF	HV%	Volume
EB	0.91	2.8%	387
WB	0.75	1.8%	163
NB	0.79	6.1%	114
SB	0.90	1.5%	266
Intersection	0.94	2.7%	930

Count Period: 4:00 PM to 6:00 PM

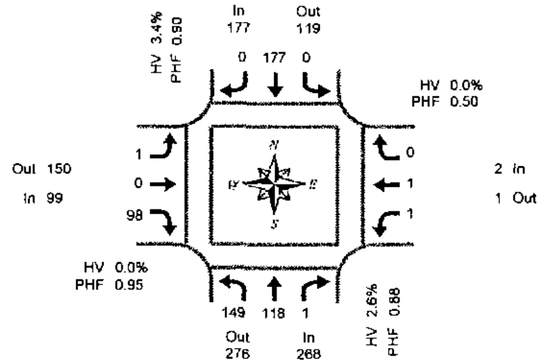
Total Vehicle Summary

All Traffic Data Services Inc.

Mark Skaggs
(208) 251-0300

Darrk Ln E & Harrington Ln

Tuesday, July 27, 2010
4:00 PM to 6:00 PM



Peak Hour Summary
4:00 PM to 5:00 PM

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Darrk Ln E				Southbound Darrk Ln E				Eastbound Parking Lot				Westbound Harrington Ln				Interval Total
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV	
4:00 PM	41	35	0	2	0	36	0	1	0	0	24	0	0	1	0	0	137
4:15 PM	31	34	1	2	0	44	0	2	1	0	24	0	0	0	0	0	135
4:30 PM	41	28	0	1	0	49	0	2	0	0	26	0	1	0	0	0	145
4:45 PM	36	21	0	2	0	48	0	1	0	0	24	0	0	0	0	0	129
5:00 PM	35	19	0	0	0	56	0	0	0	0	14	0	0	0	0	0	124
5:15 PM	38	30	0	0	0	54	1	1	0	0	18	0	0	0	0	0	141
5:30 PM	46	21	0	0	0	29	0	0	0	0	19	0	0	0	0	0	115
5:45 PM	34	36	0	3	0	45	1	1	0	0	18	0	0	0	0	0	134
Total Survey	302	224	1	10	0	361	2	8	1	0	167	0	1	1	0	0	1,060

Peak Hour Summary
4:00 PM to 5:00 PM

By Approach	Northbound Darrk Ln E				Southbound Darrk Ln E				Eastbound Parking Lot				Westbound Harrington Ln				Total
	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	In	Out	Total	HV	
Volume	268	276	544	7	177	119	296	6	99	150	249	0	2	1	3	0	546
%HV	2.6%				3.4%				0.0%				0.0%				2.4%
PHF	0.88				0.90				0.95				0.50				0.94

By Movement	Northbound Darrk Ln E				Southbound Darrk Ln E				Eastbound Parking Lot				Westbound Harrington Ln				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	149	118	1	268	0	177	0	177	1	0	98	99	1	1	0	2	546
PHF	0.91	0.84	0.25	0.88	0.00	0.90	0.00	0.90	0.25	0.00	0.94	0.95	0.25	0.25	0.00	0.50	0.94

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound Darrk Ln E				Southbound Darrk Ln E				Eastbound Parking Lot				Westbound Harrington Ln				Interval Total
	L	T	R	HV	L	T	R	HV	L	T	R	HV	L	T	R	HV	
4:00 PM	149	118	1	7	0	177	0	6	1	0	98	0	1	1	0	0	546
4:15 PM	143	102	1	5	0	197	0	5	1	0	88	0	1	0	0	0	533
4:30 PM	150	98	0	3	0	207	1	4	0	0	82	0	1	0	0	0	539
4:45 PM	155	91	0	2	0	187	1	2	0	0	75	0	0	0	0	0	509
5:00 PM	153	106	0	3	0	184	2	2	0	0	69	0	0	0	0	0	514

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	85	38	191	153	0	0	0	0	132	0	39
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.97	0.97	0.97	0.92	0.92	0.92	0.97	0.97	0.97
Hourly flow rate (vph)	0	108	48	197	158	0	0	0	0	136	0	40
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	158			156			723	683	132	683	707	158
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	158			156			723	683	132	683	707	158
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			86			100	100	100	58	100	95
cM capacity (veh/h)	1428			1424			293	322	923	322	308	882

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	156	355	136	40
Volume Left	0	197	136	0
Volume Right	48	0	0	40
cSH	1700	1424	322	882
Volume to Capacity	0.09	0.14	0.42	0.05
Queue Length 95th (ft)	0	12	50	4
Control Delay (s)	0.0	4.9	24.1	9.3
Lane LOS		A	C	A
Approach Delay (s)	0.0	4.9	20.7	
Approach LOS			C	

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	42.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰			↱		↰	↱				
Volume (veh/h)	38	191	0	0	247	103	89	4	294	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.89	0.89	0.89	0.74	0.74	0.74	0.95	0.95	0.95
Hourly flow rate (vph)	42	210	0	0	278	116	120	5	397	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1163							
pX, platoon unblocked												
vC, conflicting volume	393			210			629	687	210	1029	629	335
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	393			210			629	687	210	1029	629	335
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			69	98	52	100	100	100
cM capacity (veh/h)	1160			1349			384	357	830	107	387	711

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	252	393	120	403
Volume Left	42	0	120	0
Volume Right	0	116	0	397
cSH	1160	1700	384	816
Volume to Capacity	0.04	0.23	0.31	0.49
Queue Length 95th (ft)	3	0	33	69
Control Delay (s)	1.6	0.0	18.6	13.6
Lane LOS	A		C	B
Approach Delay (s)	1.6	0.0	14.8	
Approach LOS			B	

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱		✥			✥			↰↑	↱
Volume (vph)	189	192	6	13	101	49	59	22	33	69	22	174
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00			1.00			1.00	1.00
Frt	1.00	1.00	0.85		0.96			0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00			0.97			0.96	1.00
Satd. Flow (prot)	1736	1827	1553		1682			1728			1743	1538
Flt Permitted	0.55	1.00	1.00		0.97			0.78			0.80	1.00
Satd. Flow (perm)	1000	1827	1553		1639			1390			1439	1538
Peak-hour factor, PHF	0.91	0.91	0.91	0.75	0.75	0.75	0.79	0.79	0.79	0.90	0.90	0.90
Adj. Flow (vph)	208	211	7	17	135	65	75	28	42	77	24	193
RTOR Reduction (vph)	0	0	3	0	28	0	0	34	0	0	0	158
Lane Group Flow (vph)	208	211	4	0	189	0	0	111	0	0	101	35
Heavy Vehicles (%)	4%	4%	4%	8%	8%	8%	3%	3%	3%	5%	5%	5%
Turn Type	pm+pt		Perm	Perm			Perm			Perm		Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	22.0	22.0	22.0		13.5			6.7			6.7	6.7
Effective Green, g (s)	22.0	22.0	22.0		13.5			6.7			6.7	6.7
Actuated g/C Ratio	0.60	0.60	0.60		0.37			0.18			0.18	0.18
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	690	1095	931		603			254			263	281
v/s Ratio Prot	c0.04	0.12										
v/s Ratio Perm	c0.14		0.00		0.12			c0.08			0.07	0.02
v/c Ratio	0.30	0.19	0.00		0.31			0.44			0.38	0.13
Uniform Delay, d1	3.8	3.3	3.0		8.3			13.3			13.2	12.5
Progression Factor	1.00	1.00	1.00		1.00			1.00			1.00	1.00
Incremental Delay, d2	0.2	0.1	0.0		0.3			1.2			0.9	0.2
Delay (s)	4.1	3.4	3.0		8.6			14.5			14.1	12.8
Level of Service	A	A	A		A			B			B	B
Approach Delay (s)		3.7			8.6			14.5			13.2	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	36.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱			↰					↰	↱	
Volume (veh/h)	0	88	40	199	159	0	0	0	0	137	0	41
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.97	0.97	0.97	0.92	0.92	0.92	0.97	0.97	0.97
Hourly flow rate (vph)	0	111	51	205	164	0	0	0	0	141	0	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	164			162			753	711	137	711	736	164
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	164			162			753	711	137	711	736	164
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			86			100	100	100	54	100	95
cM capacity (veh/h)	1421			1417			278	308	917	307	294	875

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	162	369	141	42
Volume Left	0	205	141	0
Volume Right	51	0	0	42
cSH	1700	1417	307	875
Volume to Capacity	0.10	0.14	0.46	0.05
Queue Length 95th (ft)	0	13	58	4
Control Delay (s)	0.0	5.0	26.3	9.3
Lane LOS		A	D	A
Approach Delay (s)	0.0	5.0	22.4	
Approach LOS			C	

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	40	199	0	0	257	107	93	4	306	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.89	0.89	0.89	0.74	0.74	0.74	0.95	0.95	0.95
Hourly flow rate (vph)	44	219	0	0	289	120	126	5	414	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1163							
pX, platoon unblocked												
vC, conflicting volume	409			219			655	716	219	1072	655	349
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	409			219			655	716	219	1072	655	349
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			66	98	50	100	100	100
cM capacity (veh/h)	1144			1339			368	342	821	95	373	699

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	263	409	126	419
Volume Left	44	0	126	0
Volume Right	0	120	0	414
cSH	1144	1700	368	806
Volume to Capacity	0.04	0.24	0.34	0.52
Queue Length 95th (ft)	3	0	37	76
Control Delay (s)	1.7	0.0	19.8	14.2
Lane LOS	A		C	B
Approach Delay (s)	1.7	0.0	15.5	
Approach LOS			C	

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱		✥			✥			↰↑	↱
Volume (vph)	197	200	6	14	105	51	61	23	34	72	23	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00			1.00			1.00	1.00
Frt	1.00	1.00	0.85		0.96			0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00			0.97			0.96	1.00
Satd. Flow (prot)	1736	1827	1553		1681			1728			1744	1538
Flt Permitted	0.54	1.00	1.00		0.97			0.78			0.79	1.00
Satd. Flow (perm)	983	1827	1553		1634			1386			1426	1538
Peak-hour factor, PHF	0.91	0.91	0.91	0.75	0.75	0.75	0.79	0.79	0.79	0.90	0.90	0.90
Adj. Flow (vph)	216	220	7	19	140	68	77	29	43	80	26	201
RTOR Reduction (vph)	0	0	3	0	28	0	0	35	0	0	0	164
Lane Group Flow (vph)	216	220	4	0	199	0	0	114	0	0	106	37
Heavy Vehicles (%)	4%	4%	4%	8%	8%	8%	3%	3%	3%	5%	5%	5%
Turn Type	pm+pt		Perm	Perm			Perm			Perm		Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	22.3	22.3	22.3		13.8			6.9			6.9	6.9
Effective Green, g (s)	22.3	22.3	22.3		13.8			6.9			6.9	6.9
Actuated g/C Ratio	0.60	0.60	0.60		0.37			0.19			0.19	0.19
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	680	1095	931		606			257			265	285
v/s Ratio Prot	c0.04	0.12										
v/s Ratio Perm	c0.15		0.00		0.12			c0.08			0.07	0.02
v/c Ratio	0.32	0.20	0.00		0.33			0.44			0.40	0.13
Uniform Delay, d1	3.9	3.4	3.0		8.4			13.4			13.3	12.6
Progression Factor	1.00	1.00	1.00		1.00			1.00			1.00	1.00
Incremental Delay, d2	0.3	0.1	0.0		0.3			1.2			1.0	0.2
Delay (s)	4.2	3.5	3.0		8.7			14.7			14.3	12.9
Level of Service	A	A	A		A			B			B	B
Approach Delay (s)		3.8			8.7			14.7			13.4	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	37.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	92	40	213	171	0	0	0	0	141	0	41
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.97	0.97	0.97	0.92	0.92	0.92	0.97	0.97	0.97
Hourly flow rate (vph)	0	116	51	220	176	0	0	0	0	145	0	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	176			167			800	757	142	757	783	176
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	176			167			800	757	142	757	783	176
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			84			100	100	100	49	100	95
cM capacity (veh/h)	1406			1411			256	286	911	283	273	862

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	167	396	145	42
Volume Left	0	220	145	0
Volume Right	51	0	0	42
cSH	1700	1411	283	862
Volume to Capacity	0.10	0.16	0.51	0.05
Queue Length 95th (ft)	0	14	68	4
Control Delay (s)	0.0	5.1	30.4	9.4
Lane LOS		A	D	A
Approach Delay (s)	0.0	5.1	25.7	
Approach LOS			D	

Intersection Summary			
Average Delay	9.1		
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	40	209	0	0	283	118	93	4	325	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.91	0.91	0.91	0.89	0.89	0.89	0.74	0.74	0.74	0.95	0.95	0.95
Hourly flow rate (vph)	44	230	0	0	318	133	126	5	439	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)					1163							
pX, platoon unblocked												
vC, conflicting volume	451			230			702	768	230	1144	702	384
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	451			230			702	768	230	1144	702	384
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			63	98	46	100	100	100
cM capacity (veh/h)	1105			1327			342	319	810	78	350	668

Direction, Lane #	EB 1	WB 1	NB 1	NB 2
Volume Total	274	451	126	445
Volume Left	44	0	126	0
Volume Right	0	133	0	439
cSH	1105	1700	342	795
Volume to Capacity	0.04	0.27	0.37	0.56
Queue Length 95th (ft)	3	0	41	88
Control Delay (s)	1.7	0.0	21.5	15.1
Lane LOS	A		C	C
Approach Delay (s)	1.7	0.0	16.5	
Approach LOS			C	

Intersection Summary			
Average Delay	7.6		
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	228	200	6	14	105	51	61	26	34	86	28	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0		4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		1.00			1.00			1.00	1.00
Frt	1.00	1.00	0.85		0.96			0.96			1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00			0.98			0.96	1.00
Satd. Flow (prot)	1736	1827	1553		1681			1731			1744	1538
Flt Permitted	0.53	1.00	1.00		0.97			0.78			0.78	1.00
Satd. Flow (perm)	977	1827	1553		1633			1377			1414	1538
Peak-hour factor, PHF	0.91	0.91	0.91	0.75	0.75	0.75	0.79	0.79	0.79	0.90	0.90	0.90
Adj. Flow (vph)	251	220	7	19	140	68	77	33	43	96	31	201
RTOR Reduction (vph)	0	0	3	0	29	0	0	33	0	0	0	162
Lane Group Flow (vph)	251	220	4	0	198	0	0	120	0	0	127	39
Heavy Vehicles (%)	4%	4%	4%	8%	8%	8%	3%	3%	3%	5%	5%	5%
Turn Type	pm+pt		Perm	Perm			Perm			Perm		Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	21.9	21.9	21.9		13.5			7.2			7.2	7.2
Effective Green, g (s)	21.9	21.9	21.9		13.5			7.2			7.2	7.2
Actuated g/C Ratio	0.59	0.59	0.59		0.36			0.19			0.19	0.19
Clearance Time (s)	4.0	4.0	4.0		4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	667	1078	917		594			267			274	298
v/s Ratio Prot	c0.04	0.12										
v/s Ratio Perm	c0.18		0.00		0.12			0.09			c0.09	0.03
v/c Ratio	0.38	0.20	0.00		0.33			0.45			0.46	0.13
Uniform Delay, d1	4.2	3.5	3.1		8.5			13.2			13.2	12.4
Progression Factor	1.00	1.00	1.00		1.00			1.00			1.00	1.00
Incremental Delay, d2	0.4	0.1	0.0		0.3			1.2			1.2	0.2
Delay (s)	4.6	3.6	3.1		8.9			14.4			14.5	12.6
Level of Service	A	A	A		A			B			B	B
Approach Delay (s)		4.1			8.9			14.4			13.3	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	37.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣		↰	↱		↰	↱			✣	
Volume (veh/h)	1	0	102	43	1	0	155	197	44	0	198	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	0	111	47	1	0	168	214	48	0	215	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1154				
pX, platoon unblocked												
vC, conflicting volume	767	814	215	901	790	238	215			262		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	767	814	215	901	790	238	215			262		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	87	77	100	100	88			100		
cM capacity (veh/h)	288	273	825	203	282	801	1355			1302		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total	112	47	1	168	262	215
Volume Left	1	47	0	168	0	0
Volume Right	111	0	0	0	48	0
cSH	810	203	282	1355	1700	1302
Volume to Capacity	0.14	0.23	0.00	0.12	0.15	0.00
Queue Length 95th (ft)	12	22	0	11	0	0
Control Delay (s)	10.2	28.0	17.8	8.0	0.0	0.0
Lane LOS	B	D	C	A		
Approach Delay (s)	10.2	27.8		3.1		0.0
Approach LOS	B	D				

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX B:
QUEUING REPORTS

Intersection: 1: Bow Hill Road & I-5 SB Ramps - Weekday

Movement	WB	SB	SB
Directions Served	LT	L	TR
Maximum Queue (ft)	51	72	40
Average Queue (ft)	23	43	28
95th Queue (ft)	59	76	55
Link Distance (ft)	639		462
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)		2	0
Queuing Penalty (veh)		1	0

Intersection: 2: Bow Hill Road & I-5 NB Ramps - Weekday

Movement	EB	NB	NB
Directions Served	LT	L	TR
Maximum Queue (ft)	40	52	86
Average Queue (ft)	19	38	58
95th Queue (ft)	47	59	90
Link Distance (ft)	639		367
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)		0	2
Queuing Penalty (veh)		1	1

Intersection: 3: Bow Hill Road & Dark Lane E

Movement	EB	EB	EB	WB	NB	SB
Directions Served	L	T	R	LTR	LTR	LT
Maximum Queue (ft)	83	60	6	94	64	70
Average Queue (ft)	55	31	1	54	38	41
95th Queue (ft)	96	66	11	104	76	76
Link Distance (ft)		1095		421	79	132
Upstream Blk Time (%)					1	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)	200		100			
Storage Blk Time (%)						0
Queuing Penalty (veh)						1

Network Summary

Network wide Queuing Penalty: 4

Queuing and Blocking Report
2012 Without Project

7/30/2010

Intersection: 1: Bow Hill Road & I-5 SB Ramps - Weekday

Movement	WB	SB	SB
Directions Served	LT	L	TR
Maximum Queue (ft)	54	70	40
Average Queue (ft)	21	47	29
95th Queue (ft)	61	77	51
Link Distance (ft)	639		462
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)		1	0
Queuing Penalty (veh)		0	0

Intersection: 2: Bow Hill Road & I-5 NB Ramps - Weekday

Movement	EB	NB	NB
Directions Served	LT	L	TR
Maximum Queue (ft)	30	68	102
Average Queue (ft)	10	41	69
95th Queue (ft)	34	70	113
Link Distance (ft)	639		367
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)		0	4
Queuing Penalty (veh)		0	3

Intersection: 3: Bow Hill Road & Dark Lane E

Movement	EB	EB	EB	WB	NB	SB	SB
Directions Served	L	T	R	LTR	LTR	LT	R
Maximum Queue (ft)	105	52	14	104	72	74	19
Average Queue (ft)	60	32	4	65	46	49	4
95th Queue (ft)	111	65	20	119	89	82	37
Link Distance (ft)		1095		421	79	132	
Upstream Blk Time (%)					2		
Queuing Penalty (veh)					0		
Storage Bay Dist (ft)	200		100				100
Storage Blk Time (%)						0	
Queuing Penalty (veh)						0	

Network Summary

Network wide Queuing Penalty: 5

Intersection: 1: Bow Hill Road & I-5 SB Ramps - Weekday

Movement	WB	SB	SB
Directions Served	LT	L	TR
Maximum Queue (ft)	49	68	44
Average Queue (ft)	19	40	26
95th Queue (ft)	52	67	51
Link Distance (ft)	639		462
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)		1	
Queuing Penalty (veh)		0	

Intersection: 2: Bow Hill Road & I-5 NB Ramps - Weekday

Movement	EB	NB	NB
Directions Served	LT	L	TR
Maximum Queue (ft)	41	74	125
Average Queue (ft)	16	41	76
95th Queue (ft)	47	73	143
Link Distance (ft)	639		367
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		75	
Storage Blk Time (%)		0	5
Queuing Penalty (veh)		1	4

Intersection: 3: Bow Hill Road & Dark Lane E

Movement	EB	EB	EB	WB	NB	SB	SB
Directions Served	L	T	R	LTR	LTR	LT	R
Maximum Queue (ft)	98	67	5	80	77	68	29
Average Queue (ft)	61	40	1	45	43	46	11
95th Queue (ft)	103	79	10	92	81	77	57
Link Distance (ft)		1095		408	79	108	
Upstream Blk Time (%)					1		
Queuing Penalty (veh)					0		
Storage Bay Dist (ft)	200		100				100
Storage Blk Time (%)		0				0	
Queuing Penalty (veh)		0				0	

Intersection: 6: Harrington Lane & Dark Lane

Movement	EB	WB	WB	NB
Directions Served	LR	L	TR	L
Maximum Queue (ft)	63	48	5	37
Average Queue (ft)	42	28	1	22
95th Queue (ft)	69	60	10	54
Link Distance (ft)	93	139	139	178
Upstream Blk Time (%)	0			
Queuing Penalty (veh)	0			
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 6