CITY OF
MUKILTEO

REQUEST FOR COMMENTS

DATE: February 28, 2019

	Alderwood Water District – Dan Sheil /Lauren Balisky		Puget Sound Clean Air Agency (Beth Carper)
	Burlington Northern Santa Fe Railway (Marvinique Hill)	X	Puget Sound Energy (Dom Amor)
	City of Edmonds (Rob Chave)	X	Puget Sound Regional Council
	City of Everett (Allan Giffen)		Seattle Dist. Corps of Engineers (Dept. Army-Reg. Branch)
	City of Everett (Steve Ingalsbe)		Snohomish Co. Airport/Paine Field (A. Rardin/B. Dolan)
	City of Lynnwood (Paul Krauss)		Snohomish Co. Assessor's Office ***(Ordinances Only)***
	City of Mill Creek (Tom Rogers)		Snohomish Co. Conservation District
X	City of Mukilteo (Building Official)		Snohomish Co. Environmental (Cheryl Sullivan)
X	City of Mukilteo (Fire Chief)		Snohomish Co. Fire District #1 (Kevin Zweber)
X	City of Mukilteo (Fire Marshal)		Snohomish Co. Marine Res. Comm. (Kathleen Herrmann)
X	City of Mukilteo (Engineering "In-Box")		Snohomish Co. Planning & Dev. Srvc. (Darryl Easton)
X	City of Mukilteo (Com. Dev. Dir.)**(Postcard/Notice only)**		Snohomish Co. Public Works (Deb Werdal)
X	City of Mukilteo (Cheol Kang, Glen Koen)	X	Snohomish Co. PUD: Dist. Eng. Services (Mary Wicklund)
X	Comcast of Washington (Casey Brown)		Snohomish Health District (Bruce A. Straughn)
X	Community Transit (Kate Tourtellot)		Sound Transit Authority (Perry Weinberg)
X	Dept. of Commerce (Growth Mgmt. Svcs Rev. Team)	X	Tulalip Tribes
	Dept. of Natural Resources (James Taylor)	X	Tulalip Tribes – (Richard Young)
	FAA/Air Traffic Division, ANM-0520 (Daniel Shoemaker)		United States Postal Service (Soon H. Kim)
X	FEMA (John Graves)	X	Verizon Company of the NW, Inc. (Tim Rennick.)
	Island County MRC (Rex Porter) (*Shoreline Only)*	X	Washington Dept. of Ecology (Peg Plummer)
X	Master Builders King/Sno. Counties (Jennifer Anderson)	X	Washington Dept of Fish & Wildlife (Jamie Bails)
X	Mukilteo Beacon (Editor) **(Postcard/Notice only)**	X	WSDOT (Scott Rodman)
X	Mukilteo School District (Cindy Steigerwald)		WSDOT (Ramin Pazooki)
X	Mukilteo School District (Josette Fisher)		WSDOT Ferries(Kevin Bartoy) (*Shoreline Only)*
X	Mukilteo Tribune (Editor) **(Postcard/Notice only)*)***		WRIA 7 Water Resources
X	Mukilteo Water & Wastewater District (Jim Voetberg, Manager; Rick Matthews; Kendra Chapman)	X	Planning Commission ***(Postcard Only)***
	National Marine Fishery Service	X	Adjacent Property Owners
	Office of Archaeology & Historic Pres. (Allyson Brooks)	X	Applicant/Contact Person ***(Notice Only)***
	Ogden, Murphy, Wallace (Scott Snyder) ***(Ordinances Only)***	X	Parties of Interest
	Pilchuck Audubon Society (Karen Snyder)		Parties of Record
	Port of Everett (Graham Anderson)		Property Owners within 300' ***(Postcard/Notice Only)***
		X	Other: WRIA 8 Water Resources

FILE NO.: PPR-2019-002

PROPONENT: Randall Roberts on behalf of the City of Mukilteo

PROPOSAL NAME: 61st Place Retaining Wall Repair located near the intersection of 61st Place West and 91st Place SW

PROPOSAL DESCRIPTION: Repair and reinforce an existing 90-foot-long soldier pile retaining wall and roadway with associated grading, landscaping, and street improvements.

FILE NO.: PPR-2019-002 PROPONENT: City of Mukilteo

PROPOSAL NAME: 61st Place Retaining Wall Repair

ATTACHED IS:

X	Notice of Application	X	Project Narrative
X	Full Plan Set	X	Location Map
X	Application	X	NEPA Determination of Categorical Exclusion prepared by Northwest Environmental Consulting, LLC dated August 1, 2018
X	Environmental Checklist prepared by Randall Roberts dated January 14, 2019	X	Biological Evaluation prepared by Northwest Environmental Consulting, LLC dated May 2018
X	Stabilization Alternatives Feasibility and Evaluation prepared by GeoDesign dated April 27, 2018	X	Mukilteo 61st Place Retaining Wall Critical Areas Report prepared by Northwest Environmental Consulting, LLC dated August 2018
x	Stormwater Report 61st Place West Retaining Wall Project prepared by Tuttle Engineering dated July 12, 2018	X	Wetland Determination Technical Memo prepared by Northwest Environmental Consulting, LLC dated May 24, 2016

NOTE: ____

****

Please review this project as it relates to your area of concern and return your comments with this cover sheet by, Monday, March 18, 2019 to Linda Ritter, Senior Planner, City of Mukilteo, 11930 Cyrus Way, Mukilteo, WA 98275.

Linda Ritter
Linda Ritter
Senior Planner

2/27/19
Date

****

RESPONSE SECTION:

_____ Comments Attached _____ No Comments

COMMENTS: ____

____
Signature

____
Date

____
Company

DO YOU WANT A COPY OF OUR NOTICE OF DECISION ***YES __ NO __***

O:\Dev Review\2019\PROJECT PERMIT\PPR-2019-002 61st Place W\Noticing\Request for Comments.docx

CITY OF
MUKILTEO

11930 Cyrus Way
Mukilteo, WA 98275
(425) 263-8000

Notice of Application
for 61st Place Retaining Wall located near the intersection of 61st Place West and 91st Place SW

Randall Roberts, on the behalf of **City of Mukilteo**, applied for a Project Permit with the City of Mukilteo on **January 17, 2019**. The application was deemed complete on **February 14, 2019.** (File No. PPR-2019-002).

Description of Proposal: Repair and reinforce an existing 90-foot-long soldier pile retaining wall and roadway with associated grading, landscaping, and street improvements. The retaining wall will be extended by an additional 30-40 feet at each end. This project will also repair a segment of the existing roadway that has failed adjacent to the existing wall and install surface and subsurface stormwater management systems.

To strengthen the existing wall, tie-back anchors and walkers will be installed at the face of the wall and will extend under the roadway and uphill slope to an appropriate bonded length of approximately 55 feet. Additionally, subsurface drains will extend under the roadway and uphill slope to an approximate length of 80 feet to 120 feet. These subsurface anchors and drains will require a permanent subsurface slope easement from two (2) uphill property owners. A wetland was identified downslope of the retaining wall and was classified as a Category III, with a 60 foot wide buffer width. Any disturbed vegetated areas will be restored.

Location of Proposal: Near the intersection of 61st Place West and 91st Place SW, Mukilteo, Washington.

Environmental Documents Prepared for the Proposal:

- Environmental Checklist prepared by Randall Roberts dated January 14, 2019
- Biological Evaluation prepared by Northwest Environmental Consulting, LLC dated May 2018
- NEPA Determination of Categorical Exclusion prepared by Northwest Environmental Consulting, LLC dated August 1, 2018
- Wetland Determination prepared by Northwest Environmental Consulting, LLC dated May 24, 2016
- Stabilization Alternatives Feasibility and Evaluation prepared by GeoDesign dated April 27, 2018
- Mukilteo 61st Place Retaining Wall Critical Areas Report prepared by Northwest Environmental Consulting, LLC dated August 2018
- Stormwater Report 61st Place West Retaining Wall Project prepared by Tuttle Engineering dated July 12, 2018

List of Required Permits:

- Project Permit
- Building
- Engineering
- Any State and Federal Permits if applicable

Applicable Policies and Requirements

The project will be reviewed for consistency with the following policies, standards and regulations:

☐ Possession Shores Master Plan
☒ Comprehensive Plan, Shoreline Master Plan
☒ International Building Code (2015 Edition)
☒ International Fire Code (2015 Edition)
☐ Sector Plan & Amendments
☒ Mukilteo Municipal Code
☒ City of Mukilteo Development Standards

Comment Period

The application and supporting documents are available for review at the City of Mukilteo, 11930 Cyrus Way, Mukilteo, WA 98275. The public is invited to comment on the project by submitting written comments to the Community Development Department at the above address by 4:30 p.m. on the date noted below.

Notice of Application (NOA) Issued: Monday, March 4, 2019

End of Comment (NOA) Period: Monday, March 18, 2019

You may request receiving notice of and participate in any hearings (if applicable), request a copy of the decision once made, and be informed of appeal rights. The City will not act on this application until the end of the 14-day public comment period. Upon completion of project review the proposed application will be administratively approved, approved with conditions, or denied.

Public Hearing

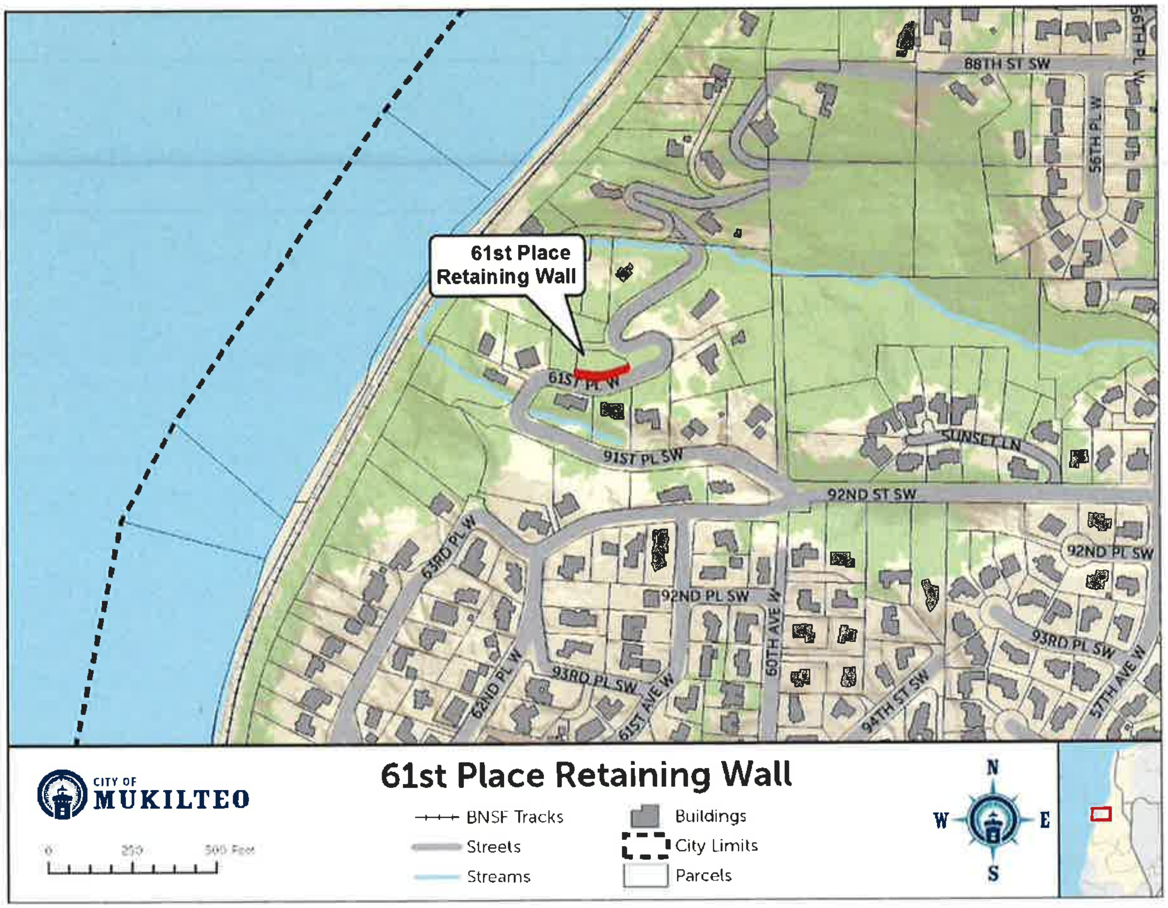
There will not be a public hearing conducted on this project.

Appeals

The final decision on this project is administratively appealable. An appeal must be filed within 14 days after the final decision on the project is issued. Only parties of record may appeal the administrative decision. A party of record is the applicant and/or any person who submitted written comments concerning the application.

Contact Person: Linda Ritter, Senior Planner (425) 263-8043

Signature: Linda Ritter Date: 2/27/19
Linda Ritter, Senior Planner



Location Map

Date Issued: Monday, March 4, 2019
Date Advertised: Monday, March 4, 2019
End Comment Period: Monday, March 18, 2019

pc:

Applicant/Representative
Reviewing Agencies
Interested Parties

CDD Director
Permit Services Supervisor
Permit Services Assistants (2)

Property File
Property Owners (300')

PPR · 2019-002

CITY OF
MUKILTEO

11930 Cyrus Way Mukilteo, WA 98275
(425) 263-8000

Date stamp

RECEIVED
JAN 17 2019
CITY OF MUKILTEO

PPR #
Misc #

Land Use Permit Application

OWNER

Name:

Address:

City: **State:** **Zip:**

Phone #: **Email Address:**

APPLICANT

Name: City of Mukilteo

Address: 11930 Cyrus Way

City: Mukilteo **State:** WA **Zip:** 98275

Phone #: 425-263-8084 **Email Address:** rroberts@mukilteowa.gov

Project Address: 61st PL W, between 91st PL SW and 88th Street SW

Legal Description of Property:
NE Quarter of Section 17, Township 28 N, Range 4 East, Willamette Meridian, Snohomish County, Washington

Key Contact Person: Randall Roberts

Phone: 425-263-8084

Email: rroberts@mukilteowa.gov

Fax: 425-290-1009

Project Type:

☐ Commercial
☐ Multi-Family
☐ Industrial
☐ Shoreline* (JARPA)
☐ Conditional Use*
☐ Variance*

☐ Preliminary Subdivision*
☐ Final Subdivision*
☐ Preliminary Short Plat*
☐ Final Short Plat*
☐ Sector Plan Amendment
☐ Waterfront Development
☐ Single Family Residence

☐ Special Use Permit*
☐ Reasonable Use
☐ Lot Line Adjustment*
☒ Grading*
☐ Binding Site Plan
☐ Project Rezone
☒ Other, Specify Environ

* Need to fill out supplemental application form with project.

Project Resume:

Existing Use: Residential Road

Proposed Use: Residential Road

Total Site Area: Approx. 1000 LF, LT & RT of Centerline

Water District: MWWD

Building Foot Print Area: N/A

Sewer District: MWWD

Lot Coverage: N/A

\# of Proposed Units: N/A

No. of Parking Stalls Provided: N/A

Building Height: N/A

Comp Plan Designation: Single Family Residential – Low Density

Zoning: Residential

Gross Floor Area by Uses: N/A

Electric Vehicle Charging Units Provided: Yes: ____ No: X

If Yes, How Many? N/A

Solar Panels being installed: Yes: _____ No: X

If Yes, How Many? N/A

Pre-application Meeting Held: (Y/N; date)

The information given is said to be true under the penalty of perjury by the laws of the State of Washington.

Applicant/Authorized Agent Signature

1/23/19
Date

Owners Signature

Date

V:\Public Works\CIP\Projects\Storm\ST110003 - 61st Place Retaining Wall\05 Permitting\Permit Applications\LandUse Permit - Draft.docxx

61st PL W RETAINING WALL REPAIRS
PROJECT NARRATIVE

PROJECT PROPONENT:	City of Mukilteo
PROJECT NAME:	61st Place West Retaining Wall Repairs, Mukilteo, Washington
PROJECT LOCATION:	This project is located within the western region of the City of Mukilteo overlooking Possession Sound. The location of the proposed work is near the south end of the 61st Place West roadway, in the Northwest Quarter of Section 17, Township 28 North, Range 4 East, Willamette Meridian, Snohomish County, Washington.
DATE:	January 4, 2019

BACKGROUND

In January 1997 a slide impacted approximately 65 feet of the northbound lane of the 61st PL W roadway. The subgrade under the north shoulder, and a portion of the roadway, dropped up to 2 feet. Following that event the City of Mukilteo hired a consultant to conduct a geotechnical investigation and provide recommendations for stabilizing the road. After considering several mitigation alternatives, the preferred solution was to construct a cantilever soldier pile wall, with timber lagging, coupled with MSE walls at the ends of the soldier pile wall. This wall was constructed in 1998.

Shortly after construction was completed, additional deformation of the slope in front of the wall occurred in the spring of 1999. This slope movement undermined the bottom row of lagging within a portion of the wall. Rather than installing additional lagging, a plywood bulkhead below the existing lagging was recommended to mitigate the deformation along with re-grading of the bench in front of the wall.

The slope in front of the wall slid again in March 2011. The slope appeared to drop an additional 3 to 5 feet exposing up to 14 feet of wall face in the central portion of the wall. The slide undermined the lower level of lagging that had been repaired in 1999 and also resulted in the failure of the MSE wall at the east end of the soldier pile wall. Deformation of the wall soldier piles was also reported. Evidence of surface water erosion was observed on the slope south of the road, below the residential houses. Recommendations were provided to improve short-term stability while long-term stabilization options were being developed.

In early 2016, the City of Mukilteo hired a geotechnical consultant to review and update the initial geotechnical analysis and the preferred stabilization alternative. Recommendations indicated that the option of reinforcing the existing pile wall with tiebacks and improving surface and subsurface drainage would provide adequate support for the roadway embankment and will provide a similar level of slope stability improvement as the previous mitigation recommendation (secant pile wall). Surface water infiltration and groundwater flow proved to be the primary causative factors resulting in the slope failure. Drainage improvements to reduce groundwater and control surface water drainage uphill and adjacent to the area were recommended to further stabilize the slope.

PROJECT DESCRIPTION

The retaining wall along the 61st Place West roadway has suffered damage, and the road is at risk of failure. This roadway serves as the only access to adjacent residential properties, as well as the Mukilteo Water and Wastewater District's regional sewer lift station located north and downhill of the wall system. The project's goal is to maintain this access by repairing existing damage and preventing future failure of the road.

This project proposes to repair and reinforce an existing 90-foot-long, soldier pile retaining wall and associated roadway. This project will be designed and constructed using FEMA's Severe Repetitive Loss Program Hazard Mitigation Grant funds.

In addition to repairing and reinforcing the existing soldier pile wall, the wall will be extended by an additional 30-40 feet at each end. This project will also repair a segment of the existing roadway that has failed adjacent to the existing wall and install surface and subsurface stormwater management systems to collect roadway runoff and groundwater, which will enhance stability to existing steep slopes. To strengthen the existing wall, tie-back anchors and walkers will be installed at the face of the wall and will extend under the roadway and uphill slope to an appropriate bonded length of approximately 55 feet. Additionally, subsurface drains will extend under the roadway and uphill slope to an approximate length of 80 feet to 120 feet. These subsurface anchors and drains will require a permanent subsurface slope easement from two (2) uphill property owners. Quarry spall slope armoring will be placed within 3 feet of the back of shoulder to stabilize the existing toe of cut-slopes.

CRITICAL AREAS

One wetland was identified downslope of the retaining wall. This wetland is classified as a Category III, with a 60 foot buffer width. No streams are present in the project area. For greater detail, refer to the Critical Areas Report, Wetland Determination Report, and the Biological Evaluation Report. After construction, disturbed vegetated areas will be restored, and areas within critical area (wetland) buffers will be restored with plantings to meet the City of Mukilteo critical areas regulations.

Prepared By:

Randall R. Roberts, P.E.
Mukilteo Project Manager
Capital Project Engineer

61ST PLACE WEST RETAINING WALL PROJECT

CITY OF MUKILTEO, SNOHOMISH COUNTY, WASHINGTON
CIVIL IMPROVEMENT PLANS

CITY OF MUKILTEO EXECUTIVE STAFF

MAYOR
JENNIFER GREGERSON

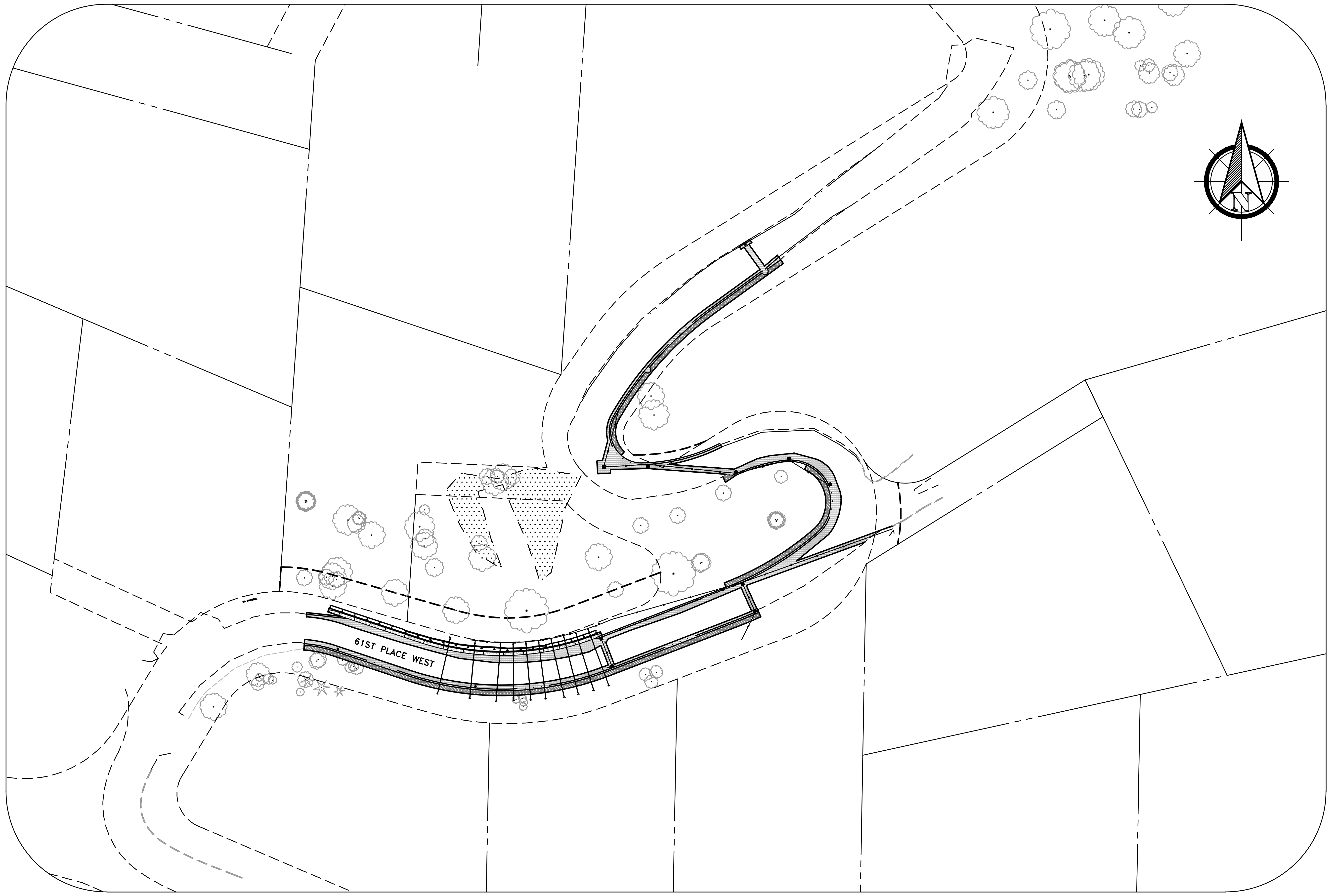
CITY COUNCIL
BOB CHAMPION – COUNCIL MEMBER
CHRISTINE COOK – COUNCIL MEMBER
RICHARD EMERY – COUNCIL MEMBER
SARAH KNELLER – COUNCIL MEMBER
ANNA ROHRBOUGH – COUNCIL MEMBER
STEVE SCHMALZ – COUNCIL MEMBER
SCOTT WHELPLEY – COUNCIL MEMBER

PUBLIC WORKS DIRECTOR
MICK MATHESON, P.E.

CITY CLERK
JANET KEEFE

SHEET INDEX

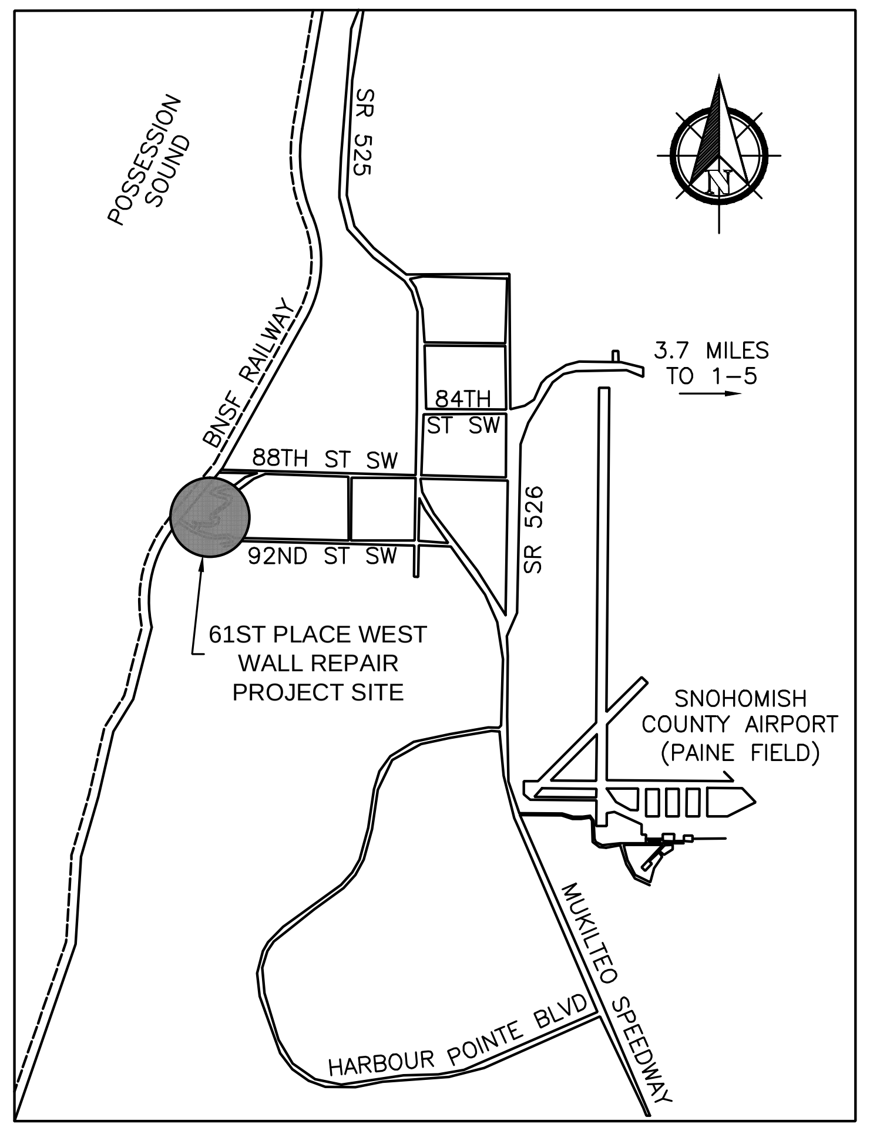
SHEET	DESCRIPTION
T1	TITLE SHEET, VICINITY MAP, AND SHEET INDEX
SQ1	SUMMARY OF QUANTITIES
DNL1	CITY DEVELOPMENT NOTES AND LEGENDS
RS1	ROADWAY SECTIONS
HAC1	HORIZONTAL ALIGNMENT AND CONTROL PLAN
EES1	EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN
EES2	EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN
EES3	EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN
EN1	EROSION CONTROL NOTES
RP1	ROAD AND STORM PLAN AND PROFILE
RP2	ROAD AND STORM PLAN AND PROFILE
RP3	ROAD AND STORM PLAN AND PROFILE
RP4	ROAD AND STORM PLAN AND PROFILE
W-1	PLAN AND ELEVATION
W-2	SOLDIER PILE DETAILS 1 OF 3
W-3	SOLDIER PILE DETAILS 2 OF 3
W-4	SOLDIER PILE DETAILS 3 OF 3
W-5	GROUND ANCHOR DETAILS
D1	PROJECT DETAILS
TCP1	TRAFFIC CONTROL PLAN
WM1	WETLAND BUFFER IMPACTS PLAN
WM2	WETLAND BUFFER ENHANCEMENT PLAN
WM3	WETLAND BUFFER PLANTING DETAILS



OVERVIEW MAP
NE 1/4, SECTION 17, TOWNSHIP 28 N., RANGE 4 E., W.M.
SNOHOMISH COUNTY, WASHINGTON
SCALE: 1"=50'

PROJECT DESCRIPTION

THIS CONTRACT PROVIDES FOR THE IMPROVEMENT OF 61ST PLACE WEST BY REPAIRING AN EXISTING SOLDIER PILE RETAINING WALL AND ADJACENT ROADWAY FEATURES LOCATED IN THE WESTERN PORTION OF THE CITY OF MUKILTEO. WORK CONSISTS OF PREPARING THE SITE; REINFORCING AN EXISTING SOLDIER PILE WALL; INSTALLING HORIZONTAL WALL DRAINS; INSTALLING A STORM DRAINAGE COLLECTION AND CONVEYANCE SYSTEM; REBUILDING EXISTING ROADWAY SHOULDERS; PAVING; INSTALLING CONCRETE BARRIERS; AND PLANTINGS FOR MITIGATION OF DISTURBANCES CREATED DURING CONSTRUCTION WITHIN EXISTING WETLAND BUFFERS; AND RESTORING OFF-ROADWAY VEGETATED AREAS. SOLE ACCESS TO THE PROPERTY WILL BE PROVIDED FROM 61ST PLACE WEST.



VICINITY MAP
NOT TO SCALE

SURVEYOR'S NOTES

HORIZONTAL DATUM:
BASIS OF BEARINGS: HELD OTAK POINTS 704 AND 700 PROVIDED BY THE CITY OF MUKILTEO.

POINT #700:	338071.42 NORTHING,	1277000.71 EASTING,	ELEV.=71.31	PK NAIL/WASHER
POINT #704:	337944.13 NORTHING,	1277024.77 EASTING,	ELEV.=68.82	PK NAIL/WASHER

VERTICAL DATUM:
N.A.V.D. 88

⊕ PROJECT CONTROL:

POINT #1:	337703.985 NORTHING,	1277011.377 EASTING,	ELEV.=138.15	MAG NAIL/WASHER
POINT #2:	337600.194 NORTHING,	1276545.835 EASTING,	ELEV.=164.99	GIN SPIKE
POINT #4:	337608.432 NORTHING,	1276803.753 EASTING,	ELEV.=161.28	MAG NAIL/WASHER
POINT #16:	337738.856 NORTHING,	1276799.437 EASTING,	ELEV.=108.40	MAG NAIL/WASHER

SURVEYOR'S NOTES:
1) SITE CONTROL ESTABLISHED BY STATIC GPS OBSERVATIONS, USING TRIMBLE R8 AND R6 GPS EQUIPMENT. TOPOGRAPHIC SURVEY PERFORMED USING A TRIMBLE S6 ROBOTIC TOTAL STATION.

CALL TWO BUSINESS
DAYS BEFORE YOU DIG

811 Know what's below. 811 before you dig.

APPROVED FOR CONSTRUCTION:

PUBLIC WORKS DIRECTOR DATE

TUTTLE ENGINEERING
AND MANAGEMENT
275 West Rio Vista Avenue, Suite 1 Burlington, WA 98233
O: (360) 899-5953 W: www.tuttle-team.com

P:\T16-009 Mukilteo 61st Place Wall\Eng\Drawings\Plan Sheets\01 - 61st Place Cover Sheet.dwg - T-1 - Matt - 7/12/2018 12:27 PM

XREF Filename:
Filename:
Drawn By: J. HOYER
Checked By: J. TUTTLE
Surveyed By:
Date:
Field Bk/Pg:
Datum:
Recorded Survey: SNOHOMISH COUNTY
AF-
Vol/Bk Page
Aerial Mapping & Control Survey
Firm:
Date: JUNE 29, 2018
GIS Cntl Pnts:
Firm:
Date: JUNE 29, 2018
Field BK/PG:
Constructed By:
Date:

NO.	DATE	BY	REVISION

Scale:
Horiz: 1"=50'
Vert: —
Designed By:
Inspected By:
W.O. No.:
Date:
JULY 12, 2018

CITY OF MUKILTEO

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT
11930 Cyrus Way Mukilteo, Washington 98275
425-263-8000 FAX 425-290-1009
http://mukilteowa.gov

JOHN RAYMOND TUTTLE 43718

61st Place West
Retaining Wall Project
99% Design - Not For Construction

TITLE SHEET, VICINITY
MAP, AND SHEET INDEX

T1

SUMMARY OF QUANTITIES

61st Place West Retaining Wall
Sta 11+10 to Sta 18+48

Item No.	Total Quantity	Unit	Sub-Total * Section 1-07.2(1)	Sub-Total * Section 1-07.2(2)	Item Description	City of Mukilteo Group 1 Quantity
SECTION 1: PREPARATION						
1	1	LS	1		MOBILIZATION	1
2	1	LS	1		CLEARING AND GRUBBING	1
3	1	EA	1		REMOVING DRAINAGE STRUCTURE	1
4	1	LS	1		REMOVAL OF STRUCTURES AND OBSTRUCTIONS	1
5	1	EST	1		REMOVING SOILDER PILE SHAFT OBSTRUCTIONS	1
6	165	LF	165		REMOVING GUARDRAIL	165
7	2	EA	2		REMOVING GUARDRAIL ANCHOR	2
SECTION 2: GRADING						
8	170	CY	170		ROADWAY EXCAVATION INCL. HAUL	170
9	615	TON	615		GRAVEL BORROW INCL. HAUL	615
SECTION 4: DRAINAGE						
10	70	CY	70		QUARRY SPALLS	70
11	40	LF	40		DRAIN PIPE 8 IN. DIAM.	40
SECTION 5: STORM SEWER						
12	10	EA	10		CATCH BASIN TYPE 1	10
13	434	LF	434		TESTING STORM SEWER PIPE	434
14	394	LF	394		SCHEDULE A STORM SEWER PIPE 12 IN. DIAM.	394
15	174	LF	174		ROADWAY CURTAIN DRAIN	174
SECTION 8: STRUCTURE						
16	460	CY	460		STRUCTURE EXCAVATION CLASS A INCL. HAUL	460
17	1	LS	1		SHORING OR EXTRA EXCAVATION CLASS A	1
18	150	CY	150		GRAVEL BACKFILL FOR WALL	150
19	356	LF	356		SHAFT - 24 IN. DIAMETER	356
20	380	LF	380		FURNISHING SOLDIER PILE	380
21	2,400	SF	2400		LAGGING	2400
22	37	EA	37		PERMANENT GROUND ANCHOR	37
23	3	EA	3		PERMANENT GROUND ANCHOR PERFORMANCE TEST	3
24	1	LS	1		PERMANENT GROUND ANCHOR VERIFICATION TEST	1
25	1	LS	1		STRUCTURAL CARBON STEEL	1
26	640	LF	640		HORIZONTALLY DRILLED PVC DRAINS	640
27	185	LF	185		MANIFOLD WALL DRAIN	185
SECTION 9: SURFACING						
28	300	TON	300		CRUSHED SURFACING BASE COURSE	300
SECTION 10: LIQUID ASPHALT						
29	1	TON	1		EMULSIFIED ASPHALT CSS-1	1
SECTION 14: HOT MIX ASPHALT						
30	130	TON	130		HMA CL. 1/2 IN. PG 64-22	130
31	1,320	LF	1320		LONGITUDINAL JOINT SEAL	1320
32	800	LF	800		THICKENED ASPHALT EDGE	800
SECTION 17: EROSION CONTROL AND ROADSIDE PLANTING						
33	10	DAY	10		ESC LEAD	10
34	15	EA	15		INLET PROTECTION	15
35	55	SY	55		STABILIZED CONSTRUCTION ENTRANCE	55
36	40	HR	40		STREET CLEANING	40
37	140	LF	140		WATTLE	140
38	1	EST	1		EROSION/WATER POLLUTION CONTROL	1
39	0	AC	0.2		SEEDING, FERTILIZING, AND MULCHING	0.2
40	350	LF	350		HIGH VISIBILITY SILT FENCE	350
SECTION 18: TRAFFIC						
41	174	LF	174		PRECAST CONC. BARRIER TYPE 2	174
42	13	EA	13		BARRIER DELINEATOR	13
43	1	LS	1		PROJECT TEMPORARY TRAFFIC CONTROL	1
44	1	LS	1		OTHER TEMPORARY TRAFFIC CONTROL	1
45	1	LS	1		TRAFFIC CONTROL SUPERVISOR	1
46	36	SF	36		CONSTRUCTION SIGNS CLASS A	36
SECTION 19: OTHER ITEMS						
47	200	CY	200		STRUCTURE EXCAVATION CLASS B INCL. HAUL	200
48	2	EA	2		PLUGGING EXISTING PIPE	2
49	1	LS	1		STRUCTURE SURVEYING	1
50	1	LS	1		ROADWAY SURVEYING	1
51	1	LS	1		LICENSED SURVEYING	1
52	3	EA	3		CONNECTION TO DRAINAGE STRUCTURE	3
53	3	EA	3		ADJUST CATCH BASIN	3
54	1	EA	1		LOCKING SOLID METAL COVER AND FRAME FOR CATCH BASIN	1
55	1	EST	1		FORCE ACCOUNT UNEXPECTED SITE CHANGES	1
56	1	EST	1		ROADSIDE CLEANUP	1
57	1	LS	1		SPCC PLAN	1
58	500	SY	500		CONSTRUCTION GEOTEXTILE FABRIC FOR SOIL STABILIZATION	500
59	1	LS	1		WETLAND BUFFER ENHANCEMENT	1
60	1	LS	1		RECORD DRAWINGS	1

TUTTLE ENGINEERING
AND MANAGEMENT
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P:\T16-009 Mukilteo 61st Place Wall\Eng\Drawings\Plan Sheets\02 - 61st Place Summary of Quantities.dwg - SOQ1 - Matt - 7/12/2018 12:34 PM

NO.	DATE	BY	REVISION

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Inspected By:
W.O. No.:
Date: JULY 12, 2018

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT

11930 Cyrus Way Mukilteo, Washington 98275
425-263-8000 FAX 425-290-1009
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JOHN RAYMOND TUTTLE
43718

61st Place West
Retaining Wall Project
99% Design - Not For Construction

SUMMARY OF QUANTITIES

SOQ1

XREF Filename:
Filename:
Drawn By: J. HOYER
Checked By: J. TUTTLE
Surveyed By:
Date:
Field Bk/Pg:
Datum:
Recorded Survey: SNOHOMISH COUNTY
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Vol/Bk Page
Aerial Mapping & Control Survey
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Firm:
Date:
Field BK/PG:
Constructed By:
Date:

APPENDIX B - CONSTRUCTION NOTES

B.1 GENERAL NOTES

1. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH CURRENT CITY OF MUKILTEO DEVELOPMENT STANDARDS; THE CURRENT EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION; AND THE ADOPTED EDITION OF THE WASHINGTON STATE DEPARTMENT OF ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON.
2. ALL WORK WITHIN THE CITY RIGHT-OF-WAY SHALL BE SUBJECT TO THE INSPECTION OF THE CITY.
3. THE CONTRACTOR IS RESPONSIBLE FOR WATER QUALITY AS DETERMINED BY THE MONITORING PROGRAM ESTABLISHED BY THE CITY. FOR INFORMATION, THE CONTRACTOR SHALL CONTACT THE PROJECT MANAGER (RANDALL ROBERTS, P.E., 425-263-8084) OR THE PROJECT BIOLOGIST (BRAD THIELE, 206-234-2520).
4. PRIOR TO ANY SITE WORK, THE CONTRACTOR SHALL CONTACT THE CITY OF MUKILTEO PLANNING & COMMUNITY DEVELOPMENT AT 425-263-8000 TO SCHEDULE A PRECONSTRUCTION CONFERENCE.
5. DATA TO SUPPORT CREATION OF AS-BUILT DRAWINGS WILL BE COLLECTED BY THE CONTRACTOR TO DOCUMENT INSTALLATION AND ANY PLAN CHANGES MADE DURING CONSTRUCTION.
6. THE CONTRACTOR SHALL KEEP A SET OF PLANS ON-SITE AT ALL TIMES FOR RECORDING AS-BUILT INFORMATION. THIS SET SHALL BE SUBMITTED TO THE PROJECT MANAGER AT COMPLETION OF CONSTRUCTION AND PRIOR TO FINAL ACCEPTANCE OF WORK
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS FOR UTILITY, ROAD, AND RIGHT-OF-WAY CONSTRUCTION.
8. THE CONSTRUCTION STORMWATER POLLUTION PREVENTION (SWPP) FACILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPROVED SWPPP PLANS PRIOR TO ANY GRADING OR LAND CLEARING ACTIVITIES. AN INSPECTION BY THE CITY OF THESE FACILITIES SHALL BE ARRANGED FOR BY THE CONTRACTOR PRIOR TO ANY GRADING. THESE FACILITIES MUST BE SATISFACTORILY MAINTAINED UNTIL CONSTRUCTION AND MITIGATION PLANTINGS ARE COMPLETE AND THE POTENTIAL FOR EROSION HAS PASSED.
9. SEDIMENT-LADEN WATER SHALL NOT ENTER THE NATURAL DRAINAGE SYSTEM.
10. A CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (CESCL) OR SWPPP SUPERVISOR SHALL BE RESPONSIBLE FOR MAINTAINING THE CONSTRUCTION SWPP FACILITIES, AS OUTLINED IN THE APPROVED SWPPP, OR AS MODIFIED FROM TIME TO TIME. CONTACT INFORMATION FOR THE CESCL (OR SWPPP SUPERVISOR) FOR THE PROJECT SHALL BE GIVEN TO THE CITY BY THE CONTRACTOR AT THE PRECONSTRUCTION CONFERENCE.
11. NONCOMPLIANCE WITH THE REQUIREMENTS FOR EROSION CONTROLS, WATER QUALITY, AND CLEARING LIMITS MAY RESULT IN REVOCATION OF PROJECT PERMITS, PLAN APPROVALS, AND BOND FORECLOSURES.
12. TRENCH BACKFILL OF NEW UTILITIES AND STORM DRAINAGE FACILITIES SHALL BE COMPACTED TO 95% MAXIMUM DENSITY (MODIFIED PROCTOR) UNDER ROADWAYS AND 90% MAXIMUM DENSITY (MODIFIED PROCTOR) OFF ROADWAYS. COMPACTION SHALL BE PERFORMED IN ACCORDANCE WITH SECTIONS 7-08.3(3) AND 2-03.3(14)D OF THE WSDOT STANDARD SPECIFICATIONS.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UTILITIES PRIOR TO AND DURING CONSTRUCTION. LOCATION OF UTILITIES SHOWN ON CONSTRUCTION PLANS ARE BASED ON BEST RECORDS AVAILABLE AND ARE SUBJECT TO VARIATION. FOR ASSISTANCE IN UTILITY LOCATION, CALL 811.
14. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE PROJECT MANAGER WHEN CONFLICTS EXIST BETWEEN THE PLANS AND FIELD CONDITIONS. CONFLICTS SHALL BE RESOLVED (INCLUDING PLAN AND PROFILE REVISIONS) AND RESUBMITTED FOR APPROVAL PRIOR TO PROCEEDING WITH CONSTRUCTION.
15. A RIGHT-OF-WAY PERMIT AND APPROVAL OF THE TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE OBTAINED FROM THE CITY PRIOR TO ANY ON-SITE GRADING.

B.2 SITE GRADING AND CONSTRUCTION SWPPP NOTES

1. PRIOR TO ANY SITE CONSTRUCTION INCLUDING CLEARING/LOGGING OR GRADING, THE SITE CLEARING LIMITS SHALL BE LOCATED AND FIELD IDENTIFIED BY THE PROJECT SURVEYOR (OR PROJECT ENGINEER OR PROJECT BIOLOGIST) AS REQUIRED BY THESE PLANS. THE CONTRACTOR SHALL CONTACT THE CITY TO OBTAIN THE NAME AND PHONE NUMBER OF THE PROJECT SURVEYOR RESPONSIBLE FOR DELINEATING THESE LIMITS .
2. SOILS IN MUKILTEO OFTEN CONTAIN FINER PARTICLES WHICH WILL PASS THROUGH SEDIMENT TRAPS UNTREATED AND HAVE EXTREMELY LONG SETTLING TIMES. THEREFORE, THE NEED TO CONTROL EROSION FROM THE SITE IS THE FIRST PRIORITY AND IS EMPHASIZED BY THESE NOTES.
3. STOCKPILES ARE TO BE LOCATED IN SAFE AREAS AND ADEQUATELY PROTECTED BY TEMPORARY SEEDING AND MULCHING, PERIMETER BMPS, OR TEMPORARY SEEDING.
4. ALL EARTH WORK SHALL BE PERFORMED IN ACCORDANCE WITH CITY STANDARDS. A PRECONSTRUCTION SOILS INVESTIGATION MAY BE REQUIRED TO EVALUATE SOIL STABILITY.
5. THE SURFACE OF ALL SLOPES SHALL BE COMPACTED. THIS MAY BE ACCOMPLISHED BY OVER-BUILDING THE SLOPES, THEN CUTTING BACK TO FINAL GRADES; OR BY COMPACTING EACH LIFT AS THE SLOPE IS BEING CONSTRUCTED. ALL SLOPES SHALL BE COMPACTED BY THE END OF EACH WORKING DAY.
6. ALL STRUCTURAL FILLS SHALL BE COMPACTED TO A MINIMUM OF 95% MAXIMUM DENSITY IN THE UPPER FOUR FEET AND 90% MAXIMUM DENSITY BELOW FOUR FEET AS DETERMINED BY MODIFIED PROCTOR METHODS.
7. A WET WEATHER EROSION CONTROL PLAN MUST BE SUBMITTED TO THE CITY FOR REVIEW AND APPROVAL ON OR BEFORE SEPTEMBER 1, IF THE PROJECT IS PROPOSING TO ACTIVELY CLEAR, GRADE, OR OTHERWISE DISTURB 1,000 SQUARE FEET OR MORE OF SOIL DURING THE PERIOD BETWEEN OCTOBER 1 AND APRIL 30. OTHER THRESHOLDS FOR A WET WEATHER EROSION CONTROL PLAN INCLUDE PROJECTS THAT:
   - A. HAVE AN AREA OR AREAS THAT DRAIN, BY PIPE, OPEN DITCH, SHEET FLOW, OR A COMBINATION OF THESE TO A TRIBUTARY WATER, AND THE TRIBUTARY WATER IS ONE-QUARTER MILE OR LESS DOWNSTREAM; OR
   - B. HAVE SLOPES STEEPER THAN 15 PERCENT ADJACENT OR ON-SITE; OR
   - C. HAVE HIGH POTENTIAL FOR SEDIMENT TRANSPORT; OR
   - D. HAVE A CRITICAL AREA OR CRITICAL AREA BUFFER ON-SITE, OR WITHIN 50 FEET OF THE SITE;
   - E. OR HAVE HIGH GROUNDWATER TABLE OR SPRINGS.

B.3 TEMPORARY SEEDING GENERAL NOTES

1. USE SEEDING THROUGHOUT THE PROJECT ON DISTURBED AREAS THAT HAVE REACHED FINAL GRADE OR THAT WILL REMAIN UNWORKED FOR MORE THAN 30 DAYS.
2. THE OPTIMUM SEEDING WINDOWS ARE APRIL 1 THROUGH JUNE 30 AND SEPTEMBER 1 THROUGH OCTOBER 1.
3. BETWEEN OCTOBER 1 AND MARCH 30 SEEDING REQUIRES A COVER OF MULCH WITH STRAW OR AN EROSION CONTROL BLANKET UNTIL 75 PERCENT GRASS COVER IS ESTABLISHED.
4. REVIEW ALL DISTURBED AREAS IN LATE AUGUST TO EARLY SEPTEMBER AND COMPLETE ALL SEEDING BY THE END OF SEPTEMBER.
   - A. MULCH IS REQUIRED AT ALL TIMES FOR SEEDING. MULCH CAN BE APPLIED ON TOP OF THE SEED OR SIMULTANEOUSLY BY HYDROSEEDING (SEE ECOLOGY BMP C121 MULCHING FOR SPECIFICATIONS).
   - B. SEED AND MULCH ALL DISTURBED AREAS NOT OTHERWISE VEGETATED AT FINAL SITE STABILIZATION.

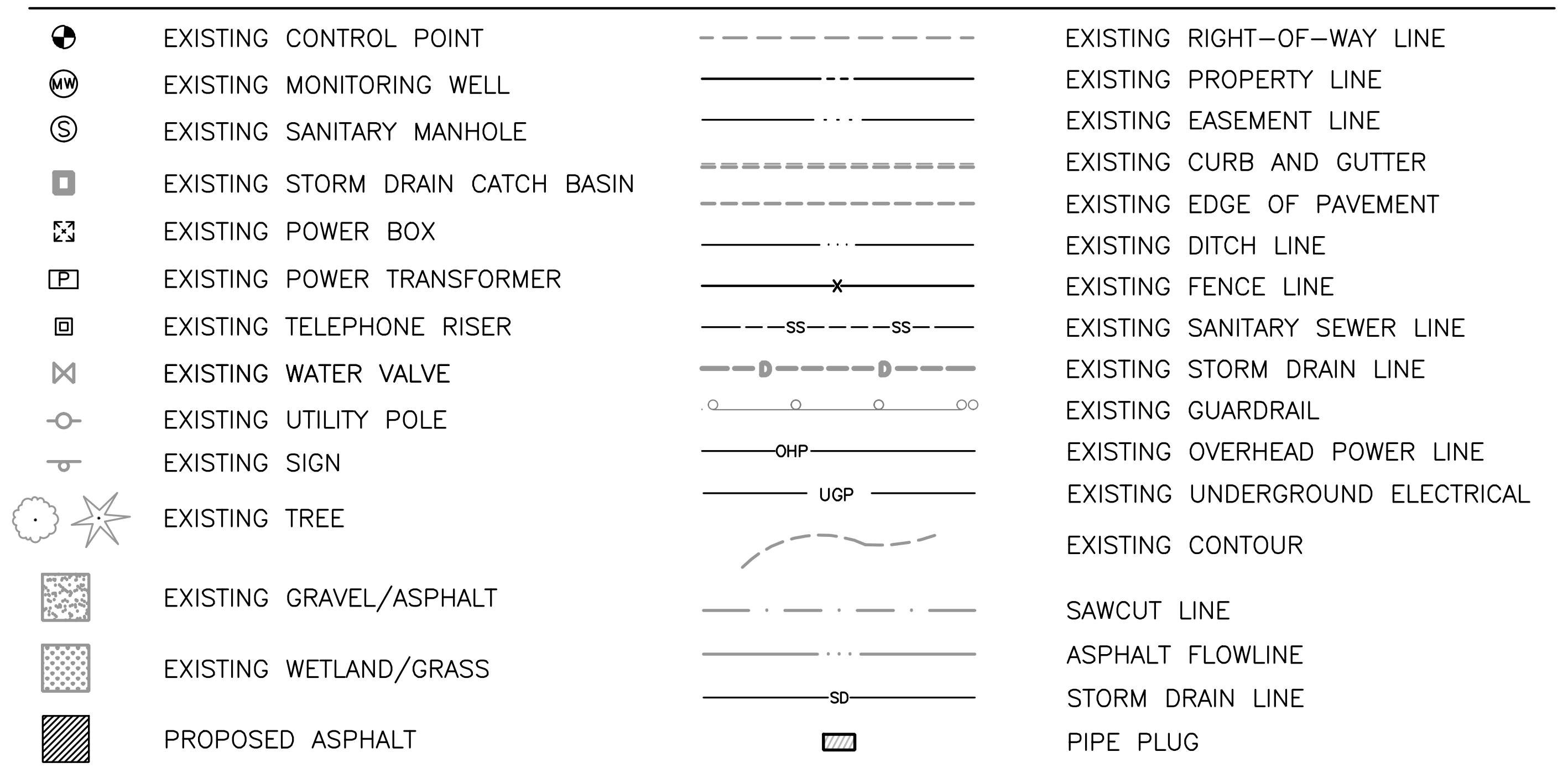
B.4 MAINTENANCE OF SILTATION BARRIERS

1. SILTATION BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. CLOSE ATTENTION SHALL BE PAID TO THE REPAIR OF DAMAGED EROSION CONTROL ELEMENTS, ESPECIALLY END-RUNS AND SEDIMENT BUILD-UP. NECESSARY REPAIRS TO BARRIERS SHALL BE ACCOMPLISHED THE SAME DAY.
2. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH RAINFALL. SEDIMENT DEPOSITS MUST BE REMOVED WHEN THE SEDIMENT LEVEL REACHES APPROXIMATELY ONE-HALF THE SILTATION BARRIER HEIGHT.
3. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE CHECK DAM IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM TO THE EXISTING GRADE, PREPARED AND SEEDED.

B.5 STORM DRAINAGE GENERAL NOTES

1. ALL PIPE SHALL BE PLACED ACCORDING DIVISION 7 OF THE WSDOT STANDARD SPECIFICATIONS.
2. BACKFILL SHALL BE PLACED EQUALLY ON BOTH SIDES OF THE PIPE. EACH LIFT SHALL BE THOROUGHLY COMPACTED. COMPACTED LIFTS MUST EXTEND TO THE SIDE OF THE TRENCH. BACKFILL OVER THE PIPE SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 7-08.3(3) THE WSDOT STANDARD SPECIFICATIONS.
3. ALL GRATES LOCATED IN THE GUTTER FLOW LINE (INLET AND CATCH BASIN) SHALL BE DEPRESSED 0.1 FEET BELOW A PROJECTED FLOW LINE ELEVATION, EXCEPT FOR STRUCTURES REQUIRING SOLID LIDS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING ALL MANHOLE, INLET AND CATCH BASIN FRAMES AND GRATES TO GRADE JUST PRIOR TO CURB INSTALLATION AND/OR PAVING.
5. ALL CATCH BASINS WITH A DEPTH OF 5 FEET OR GREATER TO THE FLOW LINE SHALL BE TYPE 2 CATCH BASINS.
6. VANED GRATES ARE REQUIRED ON ALL STORM STRUCTURES. ALL CATCH BASINS AND MANHOLES SHALL HAVE LOCKING LIDS. ROLLED GRATES ARE NOT APPROVED FOR USE.
7. POLYPROPYLENE SAFETY STEPS AND LADDER STEPS SHALL BE PROVIDED IN ALL MANHOLES AND SHALL BE POSITIONED CORRECTLY WITH THE BOLT AREAS ON THE RIM.
8. CATCH BASIN FRAMES AND GRATES SHALL BE OLYMPIC FOUNDRY MODEL SM60, SM52, OR SM44, LOCKING TYPE OR EQUIVALENT. MODEL SM52 SHALL BE REFERRED TO AS A “THRU-CURB INLET” ON THE PLANS.
9. PRIOR TO SIDEWALK CONSTRUCTION; BACK OF WALL DRAIN LINES MUST BE INSTALLED AS REQUIRED. PIPE SHALL BE PVC 3034, OR SDR-35. LOCATIONS OF THESE INSTALLATIONS SHALL BE SHOWN ON THE AS-BUILT CONSTRUCTION PLANS SUBMITTED TO THE CITY.
10. STORM PIPING AND CATCH BASINS SHALL BE FLUSHED AND CLEANED BY THE CONTRACTOR PRIOR TO:
    - A. CITY OF MUKILTEO FINAL ACCEPTANCE OF THE PROJECT AND;
    - B. UPON COMMENCEMENT AND COMPLETION OF THE WARRANTY PERIOD. AN INVOICE DETAILING THE FLUSHING AND CLEANING SHALL BE PROVIDED TO THE CITY.
11. ALL PIPES SHALL BE INSTALLED WITH RUBBER GASKETS AS PER MANUFACTURER'S RECOMMENDATIONS.
12. UPON REQUEST BY THE CITY INSPECTOR, ALL PIPE RUNS SHALL PASS THE LOW PRESSURE AIR TEST REQUIREMENTS OF SECTION 7-04.3(1) E AND F OF THE WSDOT STANDARD SPECIFICATIONS. PIPE RUNS SHALL BE TESTED WITH PIPE LOADED AND COMPACTED TO FINISH GRADE.
13. UPON REQUEST BY THE CITY INSPECTOR, PIPE SHALL BE SUBJECT TO MANDREL TESTING (MANDREL SIZE = 90% OF NOMINAL PIPE DIAMETER).
14. PIPE SHALL BE STORED ON-SITE IN SHIPPING BUNKS ON A FLAT LEVEL SURFACE. THIS REQUIREMENT WILL BE STRICTLY ENFORCED. FAILURE TO COMPLY MAY RESULT IN REJECTION OF THE PIPE AND/OR FUTURE RESTRICTION ON USE OF MATERIAL.
15. COUPLINGS SHALL BE INTEGRAL BELL AND SPIGOT OR DOUBLE BELL SEPARATE COUPLINGS. SPLIT COUPLINGS WILL NOT BE ALLOWED.
16. ALL NON-PERFORATED METAL PIPE SHALL HAVE NEOPRENE GASKETS AT THE JOINTS. O-RING GASKETS MAY BE USED FOR TYPE-F COUPLING BANDS.
17. CULVERT ENDS SHALL BE BEVELED TO MATCH SIDE SLOPES. FIELD CUTTING OF CULVERT ENDS IS PERMITTED WHEN APPROVED BY THE CITY.
18. ALL FIELD CUT CULVERT PIPE SHALL BE TREATED AS REQUIRED IN THE STANDARD SPECIFICATIONS OR GENERAL SPECIAL PROVISIONS.

SYMBOL AND LINE LEGEND



ABBREVIATIONS

ASPH	ASPHALT	EXCB	EXISTING CATCH BASIN	MPH	MILES PER HOUR	SC	SERVICE CABINET
ADS	ADVANCED DRAINAGE SYSTEMS	EVCE	END VERTICAL CURVE ELEVATION	N	NORTHING	SD	STORM DRAIN
APPROX.	APPROXIMATE	EVCS	END VERTICAL CURVE STATION	NAD	NORTH AMERICAN DATUM	SDCO	STORM DRAIN CLEANOUT
BLK	BLOCK	EX/EXST	EXISTING	NAVD	NORTH AMERICAN VERTICAL DATUM	SDMH	STORM DRAIN MANHOLE
BLVD	BOULEVARD	EXT	EXTRUDED	NE	NORTHEAST	SE	SOUTHEAST
BMP	BEST MANAGEMENT PRACTICE	FDC	FIRE DEPARTMENT CONNECTION	NGVD	NATIONAL GEODETIC VERTICAL DATUM	SF	SQUARE FEET
BO	BLOW–OFF	FH	FIRE HYDRANT	NO	NUMBER	SHDR	SHOULDER
BVCE	BEGIN VERTICAL CURVE ELEVATION	FL	FLOW LINE	NTS	NOT TO SCALE	SPEC.	SPECIFICATION
BVCS	BEGIN VERTICAL CURVE STATION	FND	FOUND	NW	NORTHWEST	SR	STATE ROUTE
C	CONIFEROUS	GA	GUY ANCHOR	OC	ON CENTER	SSCO	SANITARY SEWER CLEANOUT
CB	CATCH BASIN	GRAV	GRAVEL	PB	POWER BOX	SSMH	SANITARY SEWER MANHOLE
CL/C–L	CENTERLINE	GV	GATE VALVE	PC	POINT OF CURVATURE	STA	STATION
CMP	CORRUGATED METAL PIPE	HMA	HOT MIX ASPHALT	PCC	POINT OF COMPOUND CURVATURE	STD	STANDARD
COM	CITY OF MUKILTEO	HORIZ	HORIZONTAL	PERF.	PERFORATED	SW	SOUTHWEST
COMB	COMBINATION	ICB	IRRIGATION CONTROL BOX	PM	POWER METER	SY	SQUARE YARDS
CONC	CONCRETE	IE	INVERT ELEVATION	PP	POWER POLE	TAE	THICKENED ASPHALT EDGE
CONST.	CONSTRUCTION	INCL.	INCLUDING	PROP	PROPOSED	TF	TRANSFORMER
CP	CONTROL POINT	JB	JUNCTION BOX	PT	POINT OF TANGENCY	TYP	TYPICAL
CTRL	CONTROL	LAND	LANDSCAPING	PVC	POLYVINYL CHLORIDE	UP	UTILITY POLE
D	DECIDUOUS	LF	LINEAR FEET	PV	POWER VAULT	VERT	VERTICAL
DI	DUCTILE IRON	LP	LIGHT POLE	PVI	POINT OF VERTICAL INTERSECTION	WAC	WASHINGTON ADMINISTRATIVE CODE
DIA	DIAMETER	LT	LEFT	PX	PEDESTRIAN PUSHBUTTON	WM	WATER METER
DR	DRIVE	LVC	LENGTH OF VERTICAL CURVE	ROW	RIGHT–OF–WAY	WMS	WATER METERS
E	EAST, EASTING	MAX.	MAXIMUM	RD	ROAD	WR	WATER RISER
EA	EACH	MH	MANHOLE	RR	RAILROAD	WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
ELEV	ELEVATION	MB	MAILBOX	RT	RIGHT	WV	WATER VALVE
EST	ESTIMATE	MIN	MINIMUM	S	SLOPE	WVS	WATER VALVES

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P:\T16–009 Mukilteo 61st Place Wall\Eng\Drawings\Plan Sheets\03 – 61st Place General Notes and Legends.dwg – DNL1 – Matt – 7/12/2018 12:52 PM

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CITY OF MUKILTEO

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CITY DEVELOPMENT NOTES AND LEGENDS

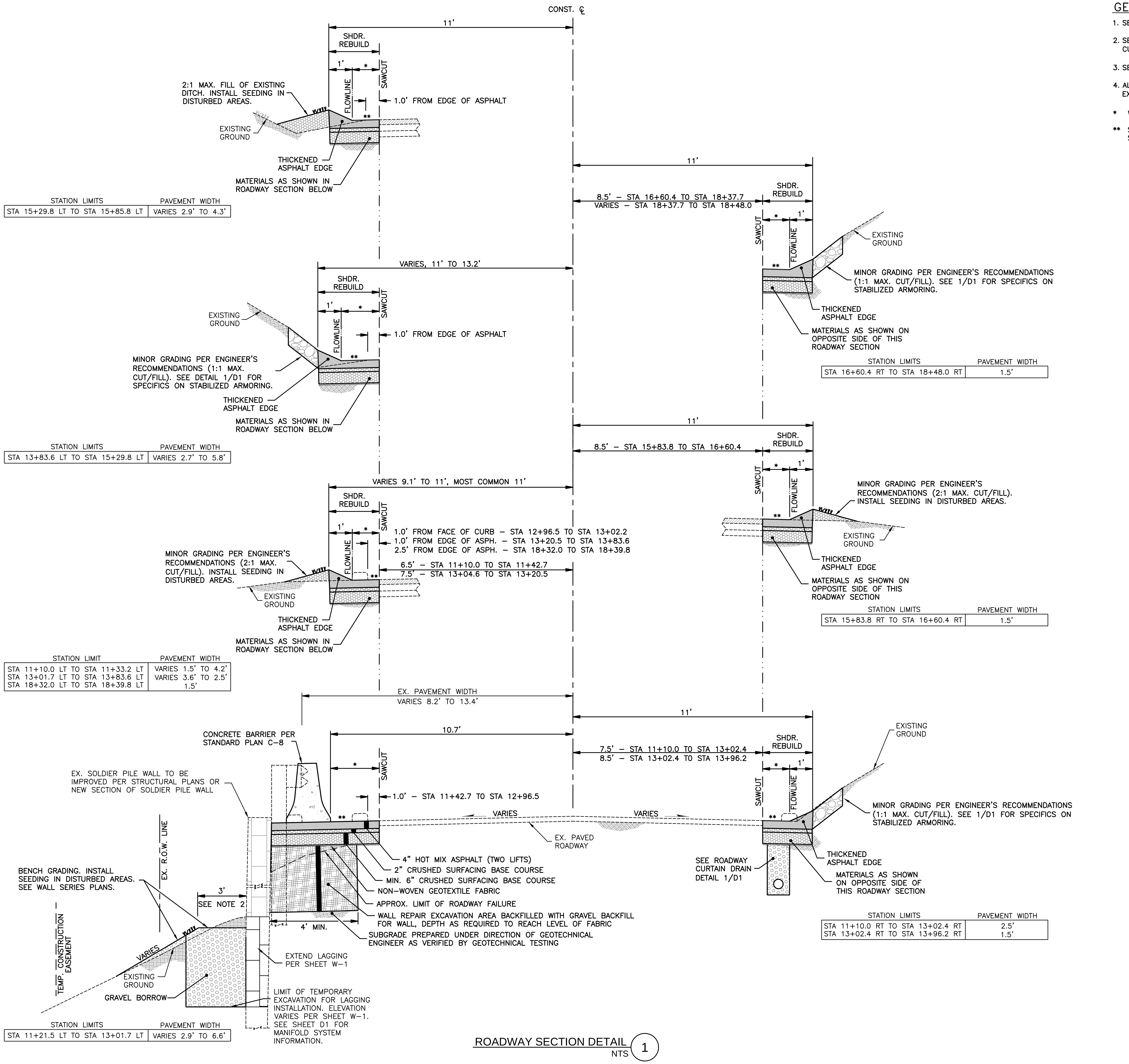
DNL1

GENERAL NOTES

1. SEE STRUCTURAL PLAN SHEETS FOR WALL RECONSTRUCTION LIMITS.
2. SEE THE ROAD AND STORM PLAN AND PROFILE SHEETS FOR THE LIMITS OF ROADWAY CURTAIN DRAIN, HORIZONTAL WALL DRAIN, AND MANIFOLD STORM SYSTEM INSTALLATIONS.
3. SEE DETAIL 1/D1 FOR INSTALLATION SPECIFICS FOR THICKENED ASPHALT EDGE.
4. ALL PAVING DEPTHS SHOWN ARE COMPACTED DEPTHS, AND COURSES SHALL NOT EXCEED THE DEPTHS DEFINED IN THE STANDARD SPECIFICATIONS.

* WIDTH PER STATION TABLE

** SLOPE TO MATCH ADJACENT ROAD CROSS SLOPE



STATION LIMITS	PAVEMENT WIDTH
STA 15+29.8 LT TO STA 15+85.8 LT	VARIES 2.9' TO 4.3'

STATION LIMITS	PAVEMENT WIDTH
STA 13+83.6 LT TO STA 15+29.8 LT	VARIES 2.7' TO 5.8'

STATION LIMIT	PAVEMENT WIDTH
STA 11+10.0 LT TO STA 11+33.2 LT	VARIES 1.5' TO 4.2'
STA 13+01.7 LT TO STA 13+83.6 LT	VARIES 3.6' TO 2.5'
STA 18+32.0 LT TO STA 18+39.8 LT	1.5'

STATION LIMITS	PAVEMENT WIDTH
STA 11+21.5 LT TO STA 13+01.7 LT	VARIES 2.9' TO 6.6'

STATION LIMITS	PAVEMENT WIDTH
STA 16+60.4 RT TO STA 18+48.0 RT	1.5'

STATION LIMITS	PAVEMENT WIDTH
STA 15+83.8 RT TO STA 16+60.4 RT	1.5'

STATION LIMITS	PAVEMENT WIDTH
STA 11+10.0 RT TO STA 13+02.4 RT	2.5'
STA 13+02.4 RT TO STA 13+96.2 RT	1.5'

ROADWAY SECTION DETAIL ① NTS

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P:\T16-009 Mukilteo 61st Place Wall\Eng\Drawings\Plan Sheets\04 – 61st Place Roadway Sections.dwg – RS1 – Matt – 7/12/2018 12:55 PM

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NO.	DATE	BY	REVISION

PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

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Horiz: –
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Inspected By:
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Date: JULY 12, 2018

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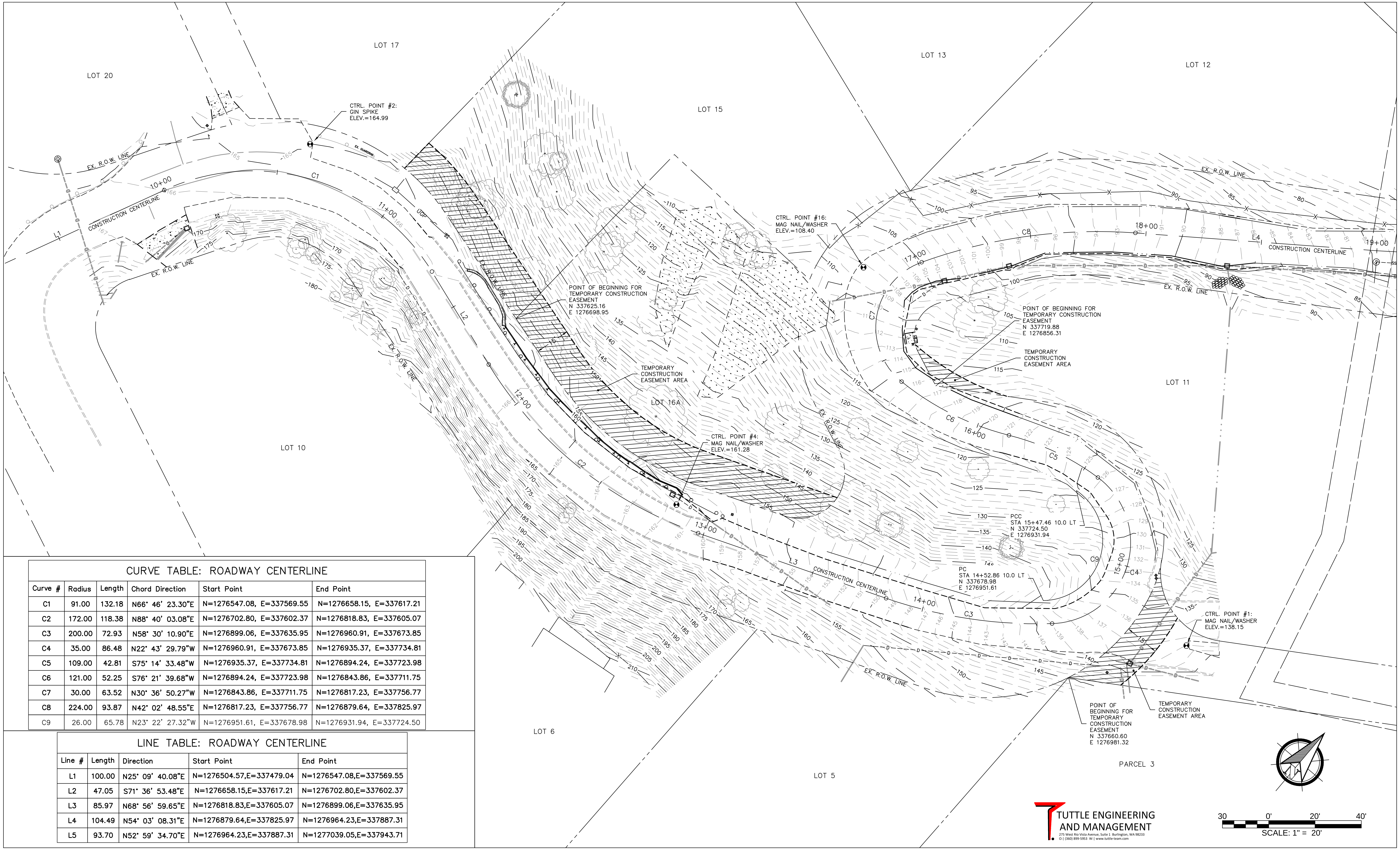
ROADWAY SECTIONS

RS1



CURVE TABLE: ROADWAY CENTERLINE					
Curve #	Radius	Length	Chord Direction	Start Point	End Point
C1	91.00	132.18	N66° 46' 23.30"E	N=1276547.08, E=337569.55	N=1276658.15, E=337617.21
C2	172.00	118.38	N88° 40' 03.08"E	N=1276702.80, E=337602.37	N=1276818.83, E=337605.07
C3	200.00	72.93	N58° 30' 10.90"E	N=1276899.06, E=337635.95	N=1276960.91, E=337673.85
C4	35.00	86.48	N22° 43' 29.79"W	N=1276960.91, E=337673.85	N=1276935.37, E=337734.81
C5	109.00	42.81	S75° 14' 33.48"W	N=1276935.37, E=337734.81	N=1276894.24, E=337723.98
C6	121.00	52.25	S76° 21' 39.68"W	N=1276894.24, E=337723.98	N=1276843.86, E=337711.75
C7	30.00	63.52	N30° 36' 50.27"W	N=1276843.86, E=337711.75	N=1276817.23, E=337756.77
C8	224.00	93.87	N42° 02' 48.55"E	N=1276817.23, E=337756.77	N=1276879.64, E=337825.97
C9	26.00	65.78	N23° 22' 27.32"W	N=1276951.61, E=337678.98	N=1276931.94, E=337724.50

LINE TABLE: ROADWAY CENTERLINE				
Line #	Length	Direction	Start Point	End Point
L1	100.00	N25° 09' 40.08"E	N=1276504.57,E=337479.04	N=1276547.08,E=337569.55
L2	47.05	S71° 36' 53.48"E	N=1276658.15,E=337617.21	N=1276702.80,E=337602.37
L3	85.97	N68° 56' 59.65"E	N=1276818.83,E=337605.07	N=1276899.06,E=337635.95
L4	104.49	N54° 03' 08.31"E	N=1276879.64,E=337825.97	N=1276964.23,E=337887.31
L5	93.70	N52° 59' 34.70"E	N=1276964.23,E=337887.31	N=1277039.05,E=337943.71

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PLAN PRINTED AT
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SCALE RATIO
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HORIZONTAL
ALIGNMENT AND
CONTROL PLAN

HAC1

SITE PREPARATION NOTES

A. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT IN PREPARATION FOR CONSTRUCTION OF ROADWAY IMPROVEMENTS AS DESCRIBED WITHIN THE ROADWAY EXCAVATION INCL. HAUL SPECIAL PROVISION. REMOVAL TIMELINE DEPENDANT UPON PHASED TRAFFIC CONTROL STRATEGIES AND CONSTRUCTION ACTIVITIES. CLEAN AND TACK ALL ASPHALT EDGES PRIOR TO PAVING. SEAL ALL JOINTS AFTER PAVING WITH PG 64–22 BINDER.

B. NOTE NOT USED ON THIS SHEET.

C. REMOVE EXISTING CONCRETE CURB AS DESCRIBED WITHIN THE ROADWAY EXCAVATION INCL. HAUL SPECIAL PROVISION.

D. REMOVE LIMITS OF EXISTING ROCKERY WALL IN PREPARATION FOR PROJECT IMPROVEMENTS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. MATERIALS TO BE SALVAGED FOR REUSE BY THE CITY.

E. REMOVE LIMITS OF EXISTING MODULAR BLOCK WALL IN PREPARATION FOR PROJECT IMPROVEMENTS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. MATERIALS TO BE SALVAGED FOR REUSE BY THE CITY.

F. REMOVE ALL ELEMENTS OF EXISTING GUARDRAIL INCLUDING RAIL, BLOCKING, POSTS, AND ANCHORS.

G. TO THE LARGEST EXTENT PRACTICAL, PROVIDE PROTECTION AND RETAINAGE OF EXISTING TREES, BUSHES, AND ROOT SYSTEMS THAT WILL REMAIN AFTER CONSTRUCTION.

H. MAINTAIN FULL ACCESS TO EXISTING POWER AND COMMUNICATIONS STRUCTURES AND SYSTEMS THROUGHOUT CONSTRUCTION AND PROVIDE FULL FUNCTION OF SAME STRUCTURES AND SYSTEMS AFTER CONSTRUCTION.

I. BACKFILL AND ABANDON EXISTING DITCH AS PART OF CORRIDOR IMPROVEMENTS.

J. NOTE NOT USED ON THIS SHEET.

K. REMOVE EXISTING STORM PIPING OR SLOPE DRAINS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. SEE THE ROAD AND STORM PLAN AND PROFILE PLANS FOR THE EXTENT OF STORM IMPROVEMENTS.

L. NOTE NOT USED ON THIS SHEET.

EROSION CONTROL NOTES

1. NOTE NOT USED ON THIS SHEET.
2. NOTE NOT USED ON THIS SHEET.
3. INSTALL HIGH VISIBILITY SILT FENCE TO INTERCEPT AND MITIGATE UPSLOPE RUNOFF, TO PROTECT DOWNSTREAM PROPERTIES, CRITICAL AREAS, AND DRAINAGE SYSTEMS, AND TO DELINEATE AREAS NEEDING PROTECTION FROM CONSTRUCTION ACTIVITIES. SEE WSDOT STANDARD PLAN I–30.17–00.
4. CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE AS SHOWN PER COM STANDARD PLAN EC–006.
5. INSTALL BIODEGRADABLE CHECK DAMS IN EXISTING OR TEMPORARY CONVEYANCE DITCH AS SHOWN TO PREVENT RUNOFF FROM ENTERING ADJACENT PROPERTIES AND DOWNSTREAM CONVEYANCES. ASSUME CHECK DAM WILL REQUIRE RESETTING/RELOCATING AS PART OF INSTALLATION OF IMPROVEMENTS. ANY POINTS OF CONCENTRATED DISCHARGE WILL BE REDIRECTED TO AN ADJACENT CATCH BASIN OR CONVEYANCE SYSTEM. SEE WSDOT STANDARD PLAN I–50.20–01.
6. NOTE NOT USED ON THIS SHEET.

EXISTING STRUCTURES TABLE

SDMH A	EXCB A
RIM=156.26	RIM=167.41
18" CMP E, IE=152.36	4" PVC E, IE=164.30
12" ADS S, IE=152.56	4" PVC S, IE=166.21
24" PVC W, IE=150.96	12" CMP S, IE=164.11

RECOMMENDED EROSION CONTROL CONSTRUCTION SEQUENCE

1. CONDUCT PRE–CONSTRUCTION MEETING WITH CITY AND ENGINEER.
2. FLAG OR FENCE LIMITS OF DISTURBANCE/CONSTRUCTION.
3. INSTALL STORM DRAIN INLET PROTECTION IN EXISTING CATCH BASINS, AS REQUIRED.
4. INSTALL PERIMETER SITE AND CRITICAL AREA PROTECTION (HIGH VISIBILITY) FENCING.
5. GRADE AND INSTALL CONSTRUCTION ACCESSES/CONSTRUCTION STAGING AREAS.
6. INSTALL AND MAINTAIN EROSION CONTROL MEASURES IN ACCORDANCE WITH ECOLOGY'S STORMWATER MANAGEMENT MANUAL, THE PROJECT'S STORMWATER POLLUTION PREVENTION PLAN, AND PER THE MANUFACTURER'S RECOMMENDATIONS.
7. RELOCATE EROSION CONTROL MEASURES AS SITE CONDITIONS CHANGE TO ENSURE EROSION AND SEDIMENT CONTROL IS ALWAYS IN ACCORDANCE WITH ECOLOGY'S EROSION AND SEDIMENT CONTROL STANDARDS.
8. COVER ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN SEVEN DAYS DURING THE DRY SEASON OR TWO DAYS DURING THE WET SEASON WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING, OR EQUIVALENT.
9. STABILIZE PER SWPPP ALL AREAS THAT REACH FINAL GRADE WITHIN SEVEN DAYS.
10. SEED OR SOD ANY AREAS TO REMAIN UNWORKED FOR MORE THAN 30 DAYS.
11. UPON COMPLETION OF THE PROJECT, STABILIZE PER SWPPP ALL DISTURBED AREAS AND REMOVE ALL TEMPORARY BMPS.

GENERAL NOTES

1. THE CONTRACTOR SHALL INSTALL ALL NECESSARY BEST MANAGEMENT PRACTICES TO PROTECT DOWNSTREAM PROPERTIES AND WATER BODIES.
2. CARE SHALL BE TAKEN DURING INSTALLATION OF BEST MANAGEMENT PRACTICES NEAR EXISTING UTILITY LINES.
3. AS APPLICABLE, POSITION BMPS WITHIN PUBLIC RIGHT–OF–WAY SO AS NOT TO DISTURB PRIVATE PROPERTY.
4. CONTOURS ARE SHOWN AT A ONE–FOOT INTERVAL.
5. LOCATIONS OF UTILITIES ARE SHOWN FOR DISPLAY PURPOSES ONLY. THE CONTRACTOR SHALL TO VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION OF IMPROVEMENTS ADJACENT TO UTILITIES WITHIN WORK AREAS.

LEGEND

⊕	INLET PROTECTION
—HVF—	HIGH VISIBILITY SILT FENCE
═	WATTLE/WATTLE AS CHECK DAM
☒	ROADWAY DEMOLITION AREA
▨	GRUBBING AREA

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NO.	DATE	BY	REVISION

PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

Scale:
Horiz: 1"=10'
Vert: —
Designed By:
Inspected By:
W.O. No.:
Date:
JULY 12, 2018

CITY OF MUKILTEO

CITY OF MUKILTEO

PUBLIC WORKS DEPARTMENT

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425–263–8000 FAX 425–290–1009
http://mukilteowa.gov

JOHN RAYMOND TUTTLE
43718

61st Place West Retaining Wall Project

99% Design - Not For Construction

EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN

EES1

XREF Filename:
Filename:
Drawn By: J. HOYER
Checked By: J. TUTTLE
Surveyed By:
Date:
Field Bk/Pg:
Datum:
Recorded Survey:
SNOHOMISH COUNTY
AF–
Vol/Bk Page
Aerial Mapping & Control Survey
Firm:
Date: JUNE 29, 2018
GIS Cntl Pnts:
Firm:
Date: JUNE 29, 2018
Field BK/PG:
Constructed By:
Date:

⬠ EROSION CONTROL NOTES

1. INSTALL STORM DRAIN INLET PROTECTION IN EACH EXISTING CATCH BASIN PER COM STANDARD PLAN EC–007.
2. INSTALL STORM DRAIN INLET PROTECTION IN EACH NEW CATCH BASIN AFTER IT HAS BEEN INSTALLED PER COM STANDARD PLAN EC–007.
3. INSTALL HIGH VISIBILITY SILT FENCE TO INTERCEPT AND MITIGATE UPSLOPE RUNOFF, TO PROTECT DOWNSTREAM PROPERTIES, CRITICAL AREAS, AND DRAINAGE SYSTEMS, AND TO DELINEATE AREAS NEEDING PROTECTION FROM CONSTRUCTION ACTIVITIES. SEE WSDOT STANDARD PLAN I–30.17–00.
4. NOTE NOT USED ON THIS SHEET.
5. INSTALL BIODEGRADABLE CHECK DAMS IN EXISTING OR TEMPORARY CONVEYANCE DITCH AS SHOWN TO PREVENT RUNOFF FROM ENTERING ADJACENT PROPERTIES AND DOWNSTREAM CONVEYANCES. ASSUME CHECK DAM WILL REQUIRE RESETTING/RELOCATING AS PART OF INSTALLATION OF IMPROVEMENTS. ANY POINTS OF CONCENTRATED DISCHARGE WILL BE REDIRECTED TO AN ADJACENT CATCH BASIN OR CONVEYANCE SYSTEM. SEE WSDOT STANDARD PLAN I–50.20–01.
6. INSTALL WATTLE TO REDIRECT UP–SLOPE RUNOFF AWAY FROM WORK AREAS AND TO PROTECT DOWNSTREAM SYSTEMS. WATTLES INSTALLED ON IMPERVIOUS SURFACES SHALL BE SECURED WITH SAND BAGS. RESET AS CONSTRUCTION ACTIVITIES OR PRESERVATION OF ACCESS MANDATE. SEE WSDOT STANDARD PLAN I–30.40–01.

○ SITE PREPARATION NOTES

A. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT IN PREPARATION FOR CONSTRUCTION OF ROADWAY IMPROVEMENTS AS DESCRIBED WITHIN THE ROADWAY EXCAVATION INCL. HAUL SPECIAL PROVISION. REMOVAL TIMELINE DEPENDANT UPON PHASED TRAFFIC CONTROL STRATEGIES AND CONSTRUCTION ACTIVITIES. CLEAN AND TACK ALL ASPHALT EDGES PRIOR TO PAVING. SEAL ALL JOINTS AFTER PAVING WITH PG 64–22 BINDER.

B. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT AS PART OF STORM SYSTEM INSTALLATION. WIDTH VARIES PER DETAIL 3/D1.

C. REMOVE EXISTING CONCRETE CURB AS DESCRIBED WITHIN THE ROADWAY EXCAVATION INCL. HAUL SPECIAL PROVISION.

D. REMOVE LIMITS OF EXISTING ROCKERY WALL IN PREPARATION FOR PROJECT IMPROVEMENTS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. MATERIALS TO BE SALVAGED FOR REUSE BY THE CITY.

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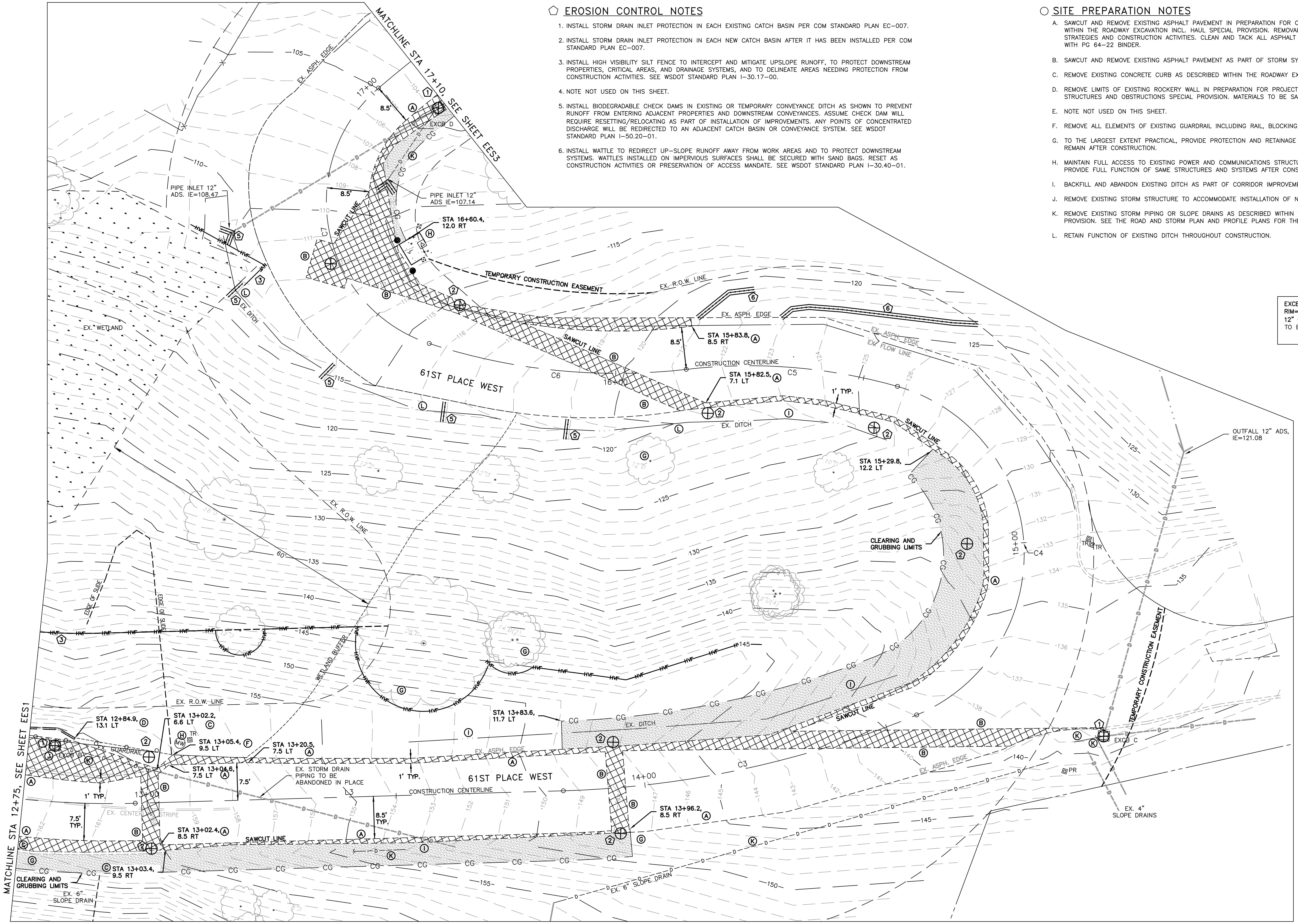
H. MAINTAIN FULL ACCESS TO EXISTING POWER AND COMMUNICATIONS STRUCTURES AND SYSTEMS THROUGHOUT CONSTRUCTION AND PROVIDE FULL FUNCTION OF SAME STRUCTURES AND SYSTEMS AFTER CONSTRUCTION.

I. BACKFILL AND ABANDON EXISTING DITCH AS PART OF CORRIDOR IMPROVEMENTS.

J. REMOVE EXISTING STORM STRUCTURE TO ACCOMMODATE INSTALLATION OF NEW STORM SYSTEM.

K. REMOVE EXISTING STORM PIPING OR SLOPE DRAINS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. SEE THE ROAD AND STORM PLAN AND PROFILE PLANS FOR THE EXTENT OF STORM IMPROVEMENTS.

L. RETAIN FUNCTION OF EXISTING DITCH THROUGHOUT CONSTRUCTION.



EXISTING STRUCTURES TABLE

EXCB B RIM=161.60 12" CMP E, IE=159.80 TO BE REMOVED	EXCB C RIM=137.59 12" CMP NE, IE=135.79 12" CMP SW, IE=135.79 12" CMP N, IE=135.79	EXCB D RIM=103.74 12" ADS S, IE=100.59 12" ADS SW, IE=99.34 12" ADS NE, IE=99.49

LEGEND

⊕	INLET PROTECTION
—HVF—	HIGH VISIBILITY SILT FENCE
═══	WATTLE/WATTLE AS CHECK DAM
⊠	ROADWAY DEMOLITION AREA
▨	GRUBBING AREA

10' 0' 10' 20'
SCALE: 1" = 10'

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61st Place West
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EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN

EES2

XREF Filename:

Filename:

Drawn By:
J. HOYER

Checked By:
J. TUTTLE

Surveyed By:

Date:
Field Bk/Pg:
Datum:

Recorded Survey:
SNOHOMISH COUNTY
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Aerial Mapping & Control Survey
Firm:
Date: JUNE 29, 2018
GIS Cntl Pnts:
Firm:
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Field BK/PG:

Constructed By:
Date:

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SITE PREPARATION NOTES

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B. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT AS PART OF STORM SYSTEM INSTALLATION. WIDTH VARIES PER DETAIL 3/D1.

C. NOTE NOT USED ON THIS SHEET.

D. NOTE NOT USED ON THIS SHEET.

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EXISTING STRUCTURES TABLE

EXCB E RIM=98.65 12" ADS NE, IE=95.20 12" ADS SW, IE=94.70	SSMH A RIM=79.63 6" DI OUT NE AND SW CENTER OF CHANNEL=75.03
EXCB F RIM=87.52 12" ADS SE, IE=84.77 12" ADS SW, IE=84.72 12" ADS NE, IE=83.87	SSMH B RIM=68.10 6" DI NE AND SW CENTER OF CHANNEL=61.40

LEGEND

⊕	INLET PROTECTION
—HVF—	HIGH VISIBILITY SILT FENCE
═	WATTLE/WATTLE AS CHECK DAM
☒	ROADWAY DEMOLITION AREA
▨	GRUBBING AREA

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10' 0' 10' 20'
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XREF Filename:
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Recorded Survey: SNOHOMISH COUNTY
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EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN

EES3

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

ELEMENT 1 - MARK CLEARING LIMITS

PRIOR TO BEGINNING LAND DISTURBING ACTIVITIES, INCLUDING CLEARING AND GRADING, ALL CLEARING LIMITS, SENSITIVE AREAS AND THEIR BUFFERS, AND TREES THAT ARE TO BE PRESERVED WITHIN THE CONSTRUCTION AREA SHALL BE CLEARLY MARKED, BOTH IN THE FIELD AND ON THE PLANS, TO PREVENT DAMAGE AND OFFSET IMPACTS. PLASTIC, METAL, OR STAKE WIRE FENCE MAY BE USED TO MARK THE LIMITS. CLEARING LIMITS ARE LOCATED WITHIN THE PARCEL LIMITS AND IMMEDIATELY SURROUNDING THE ROADWAY PRISM AS INDICATED ON THE SITE PREPARATION PLANS. LIMITS WILL BE MARKED IN THE FIELD BY THE CONTRACTOR.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C101: PRESERVING NATURAL VEGETATION**
- **BMP C103: HIGH VISIBILITY PLASTIC OR METAL FENCE**

ELEMENT 2 - ESTABLISH CONSTRUCTION ACCESS

(A) CONSTRUCTION VEHICLE ACCESS AND EXIT SHALL BE LIMITED TO ONE ROUTE, IF POSSIBLE.

(B) ACCESS POINTS SHALL BE STABILIZED WITH QUARRY SPALL OR CRUSHED ROCK TO MINIMIZE THE TRACKING OF SEDIMENT ONTO PUBLIC ROADS.

(C) WHEEL WASH OR TIRE BATHS SHALL BE LOCATED ON-SITE, IF APPLICABLE.

(D) PUBLIC ROADS SHALL AT A MINIMUM BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM ROADS BY SHOVELING, SWEEPING, OR PICKUP AND SHALL BE TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA. STREET WASHING IS PROHIBITED UNLESS SPECIAL PERMISSION IS GRANTED BY THE CITY OF MUKILTEO (CITY).

(E) IF STREET WASHING IS ALLOWED, WASTEWATER SHALL BE CONTROLLED BY PUMPING BACK ONTO THE PARCEL, OR OTHERWISE BE PREVENTED FROM DISCHARGING INTO SYSTEMS TRIBUTARY TO STATE SURFACE WATERS.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C105: STABILIZED CONSTRUCTION ENTRANCE/EXIT**
- **BMP C107: CONSTRUCTION ROAD/PARKING AREA STABILIZATION**

ELEMENT 3 - CONTROL FLOW RATES

(A) PROPERTIES AND WATERWAYS DOWNSTREAM FROM CONSTRUCTION ACTIVITIES SHALL BE PROTECTED FROM EROSION DUE TO INCREASES IN THE VOLUME, VELOCITY, AND PEAK FLOW RATE OF STORMWATER RUNOFF FROM THE PROJECT SITE. PROPERTIES SUBJECT TO MINIMUM REQUIREMENT #5 AND/OR #7 SHALL IMPLEMENT CONTROLS AS EARLY IN THE DEVELOPMENT AS IS PRACTICABLE TO MITIGATE FOR FLOW RATES.

(B) A DOWNSTREAM ANALYSIS HAS BEEN PREPARED FOR THIS PROJECT. FURTHER ANALYSIS WILL BE NECESSARY IF CHANGES IN FLOWS COULD IMPAIR OR ALTER CONVEYANCE SYSTEMS, STREAM BANKS, BED SEDIMENT, OR AQUATIC HABITAT. SEE THE WASHINGTON STATE DEPARTMENT OF ECOLOGY (ECOLOGY) MANUAL FOR OFF-SITE ANALYSIS GUIDANCE.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C207: CHECK DAMS**
- **BMP C209: OUTLET PROTECTION**
- **BMP C235: WATTLES**
- **BMP C241: TEMPORARY SEDIMENT POND**

ELEMENT 4 - INSTALL SEDIMENT CONTROLS

(A) THE DUFF LAYER, NATIVE TOPSOIL, AND NATURAL VEGETATION SHALL BE RETAINED IN AN UNDISTURBED STATE TO THE MAXIMUM EXTENT PRACTICABLE.

(B) SEDIMENT PONDS, VEGETATED BUFFER STRIPS, SEDIMENT BARRIERS OR FILTERS, DIKES, AND OTHER BMPS INTENDED TO TRAP SEDIMENT SHALL BE CONSTRUCTED AS ONE OF THE FIRST STEPS IN GRADING. THESE BMPS SHALL BE FULLY FUNCTIONAL BEFORE OTHER LAND DISTURBING ACTIVITIES TAKE PLACE.

(C) PRIOR TO LEAVING A CONSTRUCTION SITE, OR PRIOR TO DISCHARGE TO AN INFILTRATION OR BIORETENTION FACILITY, STORMWATER RUNOFF FROM DISTURBED AREAS SHALL PASS THROUGH A SEDIMENT POND OR OTHER APPROPRIATE SEDIMENT REMOVAL BMP. RUNOFF FROM FULLY STABILIZED AREAS MAY BE DISCHARGED WITHOUT A SEDIMENT REMOVAL BMP, BUT MUST MEET THE FLOW CONTROL PERFORMANCE STANDARD IDENTIFIED IN THE PROJECT'S STORMWATER DOCUMENTATION. FULL STABILIZATION MEANS CONCRETE OR ASPHALT PAVING; QUARRY SPALLS USED AS DITCH LINING; OR THE USE OF ROLLED EROSION PRODUCTS, A BONDED FIBER MATRIX PRODUCT, OR VEGETATIVE COVER IN A MANNER THAT WILL FULLY PREVENT SOIL EROSION.

(D) EARTHEN STRUCTURES SUCH AS DAMS, DIKES, AND DIVERSIONS SHALL BE SEEDED AND MULCHED ACCORDING TO THE TIMING INDICATED IN ELEMENT 5 BELOW.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C101: PRESERVING NATURAL VEGETATION**
- **BMP C220: INLET PROTECTION**
- **BMP C235: WATTLES**
- **BMP C241: TEMPORARY SEDIMENT POND**

ELEMENT 5 - STABILIZE SOILS

(A) ALL EXPOSED AND UNWORKED SOILS SHALL BE STABILIZED BY APPLICATION OF EFFECTIVE BMPS THAT PROTECT THE SOIL FROM THE EROSIVE FORCES OF RAINDROP IMPACT, FLOWING WATER, AND WIND EROSION.

(B) FROM OCTOBER 1 THROUGH APRIL 30 OF EACH YEAR, NO SOILS SHALL REMAIN EXPOSED AND UNWORKED FOR MORE THAN 2 DAYS. FROM MAY 1 TO SEPTEMBER 30 OF EACH YEAR, NO SOILS SHALL REMAIN EXPOSED AND UNWORKED FOR MORE THAN 7 DAYS. THIS CONDITION APPLIES TO ALL ON-SITE SOILS, WHETHER AT FINAL GRADE OR NOT.

(C) STOCKPILES MUST BE STABILIZED/PROTECTED WITH SEDIMENT TRAPPING MEASURES. LOCATE AWAY FROM STORM DRAIN INLETS, WATERWAYS, AND DRAINAGE CHANNELS.

(D) SOIL STABILIZATION MEASURES SELECTED SHOULD BE APPROPRIATE FOR THE TIME OF YEAR, SITE CONDITIONS, ESTIMATED DURATION OF USE, AND POTENTIAL WATER QUALITY IMPACTS THAT STABILIZATION AGENTS MAY HAVE ON DOWNSTREAM WATERS OR GROUND WATER.

(E) WORK ON LINEAR CONSTRUCTION SITES AND ACTIVITIES, INCLUDING RIGHT-OF-WAY AND EASEMENT CLEARING, ROADWAY DEVELOPMENT, PIPELINES, AND TRENCHING FOR UTILITIES, SHALL NOT EXCEED THE CAPABILITY OF THE INDIVIDUAL CONTRACTOR FOR HIS PORTION OF THE PROJECT TO INSTALL THE BEDDING MATERIALS, ROADBEDS, STRUCTURES, PIPELINES, AND/OR UTILITIES, AND TO RE-STABILIZE THE DISTURBED SOILS, MEETING THE TIMING CONDITIONS LISTED ABOVE.

(F) IN ADDITION, AT THE DISCRETION OF THE CITY, THOSE SITES UNABLE TO MAINTAIN THE QUALITY OF THEIR STORMWATER DISCHARGE MAY BE REQUIRED TO PROVIDE SOIL STABILIZATION TO ALL EXPOSED SOIL AREAS REGARDLESS OF THE WORKING STATUS OF THE AREA. UPON WRITTEN NOTIFICATION, THE CONTRACTOR SHALL PROVIDE FULL STABILIZATION OF ALL EXPOSED SOIL AREAS WITHIN 24 HOURS.

(G) UTILIZE APPROPRIATE BMPS TO CONTROL STORMWATER VOLUME AND VELOCITY WITHIN THE SITE, TO MINIMIZE SOIL EROSION, TO CONTROL STORMWATER DISCHARGES INCLUDING BOTH FLOW RATES AND TOTAL STORMWATER VOLUME, TO MINIMIZE EROSION AT OUTLETS, AND TO MINIMIZE DOWNSTREAM CHANNEL AND STREAM BANK EROSION.

(H) ALL EXPOSED SOILS SHALL BE STABILIZED AT THE END OF THE SHIFT AND BEFORE A HOLIDAY OR WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C120: TEMPORARY AND PERMANENT SEEDING**
- **BMP C121: MULCHING**
- **BMP C122: NETS AND BLANKETS**
- **BMP C123: PLASTIC COVERING**
- **BMP C124: SODDING**
- **BMP C125: TOPSOILING/COMPOSTING**
- **BMP C130: SURFACE ROUGHENING**
- **BMP C140: DUST CONTROL**
- **BMP C235: WATTLES**

ELEMENT 6 - PROTECT SLOPES

(A) CUT AND FILL SLOPES SHALL BE DESIGNED AND CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION.

(B) CONSIDER SOIL TYPE AND ITS POTENTIAL FOR EROSION DURING BMP SELECTION, INSTALLATION, AND MAINTENANCE.

(C) REDUCE SLOPE RUNOFF VELOCITIES BY REDUCING THE CONTINUOUS LENGTH OF SLOPE WITH TERRACING AND DIVERSIONS, REDUCING SLOPE STEEPNESS, AND ROUGHENING SLOPE SURFACES.

(D) DIVERT UPSLOPE DRAINAGE AND RUN-ON WATERS FROM OFF-SITE SOURCES WITH INTERCEPTORS AT TOP OF SLOPES. OFF-SITE STORMWATER SHOULD BE HANDLED SEPARATELY FROM STORMWATER GENERATED ON THE SITE. DIVERSION OF OFF-SITE STORMWATER AROUND THE SITE MAY BE A VIABLE OPTION. DIVERTED FLOWS SHALL BE REDIRECTED TO THE NATURAL DRAINAGE LOCATION AT OR BEFORE PROJECT LIMITS OR PROPERTY BOUNDARIES.

(E) CONTAIN DOWNSLOPE COLLECTED FLOWS IN PIPES, SLOPE DRAINS, OR PROTECTED CHANNELS.

(F) PROVIDE DRAINAGE TO REMOVE GROUNDWATER INTERSECTING THE SLOPE SURFACE OF EXPOSED SOIL AREAS.

(G) EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES, CONSISTENT WITH SAFETY AND SPACE CONSIDERATIONS.

(H) CHECK DAMS SHALL BE PLACED AT REGULAR INTERVALS WITHIN TRENCHES THAT ARE CUT DOWN A SLOPE OR AS INSTALLED FOR TEMPORARY STORMWATER CONVEYANCE.

(I) STABILIZE SOILS ON SLOPES, AS SPECIFIED IN ELEMENT 5.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C120: TEMPORARY AND PERMANENT SEEDING**
- **BMP C121: MULCHING**
- **BMP C122: NETS AND BLANKETS**
- **BMP C127: PLASTIC COVERING**
- **BMP C130: SURFACE ROUGHENING**
- **BMP C201: GRASS-LINED CHANNELS**
- **BMP C204: PIPE SLOPE DRAINS**
- **BMP C207: CHECK DAMS**
- **BMP C233: SILT FENCE (HIGH VISIBILITY)**

ELEMENT 7: PROTECT DRAIN INLETS

(A) ALL STORM DRAIN INLETS, WHETHER EXISTING OR MADE OPERABLE DURING CONSTRUCTION, SHALL BE PROTECTED SO THAT STORMWATER RUNOFF SHALL NOT ENTER CONVEYANCE SYSTEMS WITHOUT FIRST BEING FILTERED OR TREATED TO REMOVE SEDIMENT.

(B) ALL APPROACH ROADS SHALL BE KEPT CLEAN, AND ALL SEDIMENT AND STREET WASH WATER SHALL NOT BE ALLOWED TO ENTER STORM DRAINS WITHOUT PRIOR AND ADEQUATE TREATMENT UNLESS TREATMENT IS PROVIDED BEFORE THE STORM DRAIN DISCHARGES TO WATERS OF THE STATE.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C220: STORM DRAIN INLET PROTECTION**
- **BMP C235: WATTLES**

ELEMENT 8: STABILIZE CHANNELS AND OUTLETS

(A) ALL TEMPORARY ON-SITE CONVEYANCE CHANNELS SHALL BE DESIGNED, CONSTRUCTED, AND STABILIZED TO PREVENT EROSION FROM THE EXPECTED VELOCITY OF FLOW FROM A 10-YEAR, 24-HOUR FREQUENCY STORM FOR THE DEVELOPED CONDITION.

(B) STABILIZATION, INCLUDING ARMORING MATERIAL, ADEQUATE TO PREVENT EROSION OF OUTLETS, ADJACENT STREAM BANKS, SLOPES AND DOWNSTREAM REACHES SHALL BE PROVIDED AT THE OUTLETS OF ALL CONVEYANCE SYSTEMS.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C122: NETS AND BLANKETS**
- **BMP C202: CHANNEL LINING**
- **BMP C207: CHECK DAMS**
- **BMP C209: OUTLET PROTECTION**
- **BMP C235: WATTLES**

ELEMENT 9: CONTROL POLLUTANTS

(A) 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.

(B) COVER, CONTAINMENT, AND PROTECTION FROM VANDALISM SHALL BE PROVIDED FOR ALL CHEMICALS, LIQUID PRODUCTS, PETROLEUM PRODUCTS, AND NON-INERT WASTES PRESENT ON THE SITE (SEE CHAPTER 173-304 WAC, AS CURRENTLY ENACTED OR HEREAFTER MODIFIED, FOR THE DEFINITION OF INERT WASTE, WHICH IS INCORPORATED HEREIN BY THIS REFERENCE). ON-SITE FUELING TANKS MUST INCLUDE SECONDARY CONTAINMENT.

(C) MAINTENANCE AND REPAIR OF HEAVY EQUIPMENT AND VEHICLES INVOLVING OIL CHANGES, HYDRAULIC SYSTEM DRAIN DOWN, SOLVENT AND DE-GREASING CLEANING OPERATIONS, FUEL TANK DRAIN DOWN AND REMOVAL, AND OTHER ACTIVITIES WHICH MAY RESULT IN DISCHARGE OR SPILLAGE OF POLLUTANTS TO THE GROUND OR INTO STORMWATER RUNOFF MUST BE CONDUCTED USING SPILL PREVENTION MEASURES, SUCH AS DRIP PANS. CONTAMINATED SURFACES SHALL BE CLEANED IMMEDIATELY FOLLOWING ANY DISCHARGE OR SPILL INCIDENT. EMERGENCY REPAIRS MAY BE PERFORMED ON-SITE USING TEMPORARY PLASTIC PLACED BENEATH AND, IF RAINING, OVER THE VEHICLE.

(D) WHEEL WASH, OR TIRE BATH WASTEWATER, SHALL BE DISCHARGED TO A SEPARATE ON-SITE TREATMENT SYSTEM OR TO A FULLY-FUNCTIONING SANITARY SEWER SYSTEM.

(E) APPLICATION OF ANY AGRICULTURAL CHEMICALS, INCLUDING FERTILIZERS AND PESTICIDES, SHALL BE CONDUCTED IN A MANNER AND AT APPLICATION RATES THAT WILL NOT RESULT IN LOSS OF CHEMICAL TO STORMWATER RUNOFF. MANUFACTURER RECOMMENDATIONS SHALL BE FOLLOWED FOR APPLICATION RATES AND PROCEDURES.

(F) MANAGEMENT OF PH-MODIFYING SOURCES SHALL PREVENT CONTAMINATION OF RUNOFF AND STORMWATER COLLECTED ON THE SITE. THESE SOURCES INCLUDE, BUT ARE NOT LIMITED TO, BULK CEMENT, CEMENT KILN DUST, FLY ASH, NEW CONCRETE WASHING AND CURING WATERS, WASTE STREAMS GENERATED FROM ASPHALT AND CONCRETE GRINDING AND SAWING, EXPOSED AGGREGATE PROCESSES, AND CONCRETE PUMPING AND MIXER WASHOUT WATERS.

SUGGESTED BMP/BMPS TO BE USED:
- **BMP C123: PLASTIC COVERING**
- **BMP C151: CONCRETE HANDLING**
- **BMP C152: SAWCUTTING AND SURFACING POLLUTION PREVENTION**
- **BMP C153: MATERIALS DELIVERY, STORAGE, AND CONTAINMENT AREA**
- **BMP C154: CONCRETE WASHOUT AREA**
- **BMP C235: WATTLES**

ELEMENT 10: CONTROL DE-WATERING

(A) ALL FOUNDATION, VAULT, AND TRENCH DE-WATERING WATER, WHICH HAS SIMILAR CHARACTERISTICS TO STORMWATER RUNOFF AT THE SITE, SHALL BE DISCHARGED INTO A CONTROLLED CONVEYANCE SYSTEM PRIOR TO DISCHARGE TO A TEMPORARY SEDIMENT TRAPPING FACILITY. CHANNELS MUST BE STABILIZED, AS SPECIFIED IN ELEMENT 8.

(B) CLEAN, NON-TURBID DE-WATERING WATER, SUCH AS WELL-POINT GROUND WATER, CAN BE DISCHARGED TO SYSTEMS TRIBUTARY TO STATE SURFACE WATERS, AS SPECIFIED IN ELEMENT 8, PROVIDED THE DE-WATERING FLOW DOES NOT CAUSE EROSION OR FLOODING OF THE RECEIVING WATERS. THESE CLEAN WATERS SHOULD NOT BE ROUTED THROUGH SEDIMENT PONDS IN ASSOCIATION WITH STORMWATER.

(C) HIGHLY TURBID OR OTHERWISE CONTAMINATED DEWATERING WATER, SUCH AS FROM CONSTRUCTION EQUIPMENT OPERATION, CLAMSHELL DIGGING, CONCRETE TREMIE POUR, OR WORK INSIDE A COFFERDAM SHALL BE HANDLED SEPARATELY FROM STORMWATER AT THE SITE.

(D) OTHER DISPOSAL OPTIONS, DEPENDING ON SITE CONSTRAINTS, MAY INCLUDE, BY WAY OF EXAMPLE: 1) INFILTRATION, 2) TRANSPORT OFF-SITE IN VEHICLE, SUCH AS A VACUUM FLUSH TRUCK, FOR LEGAL DISPOSAL IN A MANNER THAT DOES NOT POLLUTE STATE WATERS, 3) ON-SITE TREATMENT USING CHEMICAL TREATMENT OR OTHER SUITABLE TREATMENT TECHNOLOGIES.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C126: POLYACRYLAMIDE FOR SOIL EROSION PROTECTION**
- **BMP C152: SAWCUTTING AND SURFACING POLLUTION PREVENTION**
- **BMP C201: GRASS-LINED CHANNELS**

ELEMENT 11: MAINTAIN BMPS

(A) ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL BMPS SHALL BE MAINTAINED AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL MAINTENANCE AND REPAIR SHALL BE CONDUCTED IN ACCORDANCE WITH BMPS.

(B) SEDIMENT CONTROL BMPS SHALL BE INSPECTED WEEKLY OR AFTER A RUNOFF PRODUCING STORM EVENT DURING THE DRY SEASON AND DAILY DURING THE WET SEASON. ALL PROJECTS THAT DISTURB AN AREA GREATER THAN ONE ACRE SHALL HAVE A CERTIFIED EROSION CONTROL LEAD AVAILABLE TO THE SITE. THIS EROSION CONTROL LEAD SHALL BE RESPONSIBLE TO PROVIDE OVERVIEW OF ONGOING DAY TO DAY EROSION CONTROL REQUIREMENTS. THE EROSION CONTROL LEAD SHALL (WITHIN 24 HOURS) REPORT TO THE CITY ANY SITE DISCHARGES THAT EXCEED STATE WATER QUALITY STANDARDS THAT HAVE OR ARE LIKELY TO HAVE ENTERED WATERS OF THE STATE.

(C) 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. DISTURBED SOIL AREAS RESULTING FROM REMOVAL OF BMPS OR VEGETATION SHALL BE PERMANENTLY STABILIZED.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C120: TEMPORARY AND PERMANENT SEEDING**
- **BMP C150: MATERIALS ON HAND**
- **BMP C160: CERTIFIED EROSION AND SEDIMENT CONTROL LEAD**

ELEMENT 12: MANAGE THE PROJECT

(A) CONSTRUCTION PROJECTS SHALL BE PHASED WHERE FEASIBLE IN ORDER TO PREVENT, TO THE MAXIMUM EXTENT PRACTICABLE, THE TRANSPORT OF SEDIMENT FROM ALL AREAS DURING CONSTRUCTION. REVEGETATION OF EXPOSED AREAS, WHETHER TEMPORARY OR PERMANENT, AND MAINTENANCE OF THAT VEGETATION SHALL BE AN INTEGRAL PART OF THE CLEARING ACTIVITIES FOR ANY PHASE.

(B) COORDINATION WITH UTILITY COMPANIES AND OTHER CONTRACTORS - THE CONTRACTOR SHALL EVALUATE, WITH INPUT FROM UTILITIES AND OTHER CONTRACTORS, THE STORMWATER MANAGEMENT REQUIREMENTS FOR THE ENTIRE PROJECT, INCLUDING THE UTILITIES, WHEN PREPARING THE CONSTRUCTION SWPPP.

(C) INSPECTION AND MONITORING - ALL BMPS SHALL BE INSPECTED, MAINTAINED, AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. PROJECTS REGULATED UNDER THE CONSTRUCTION STORMWATER GENERAL PERMIT SHALL CONDUCT SITE INSPECTIONS AND MONITORING IN ACCORDANCE WITH SPECIAL CONDITION S4 OF THE CONSTRUCTION STORMWATER GENERAL PERMIT.

(D) FOR ANY PROJECT DISTURBING MORE THAN ONE ACRE, A CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (CESCL) SHALL BE IDENTIFIED IN THE CONSTRUCTION SWPPP AND SHALL BE ON-SITE OR ON-CALL AT ALL TIMES. CERTIFICATION MAY BE THROUGH THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION/ASSOCIATION OF GENERAL CONTRACTORS (WSDOT/AGC) CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL CERTIFICATION PROGRAM OR ANY EQUIVALENT LOCAL OR NATIONAL CERTIFICATION AND/OR TRAINING PROGRAM, IN THE CITY'S DISCRETION.

(E) WHENEVER INSPECTION AND/OR MONITORING REVEALS THAT THE BMPS IDENTIFIED IN THE CONSTRUCTION SWPPP ARE INADEQUATE, DUE TO THE ACTUAL DISCHARGE OF OR POTENTIAL TO DISCHARGE A SIGNIFICANT AMOUNT OF ANY POLLUTANT, THE SWPPP SHALL BE MODIFIED, AS APPROPRIATE, IN A TIMELY MANNER.

(F) MAINTENANCE OF THE CONSTRUCTION SWPPP - THE CONSTRUCTION SWPPP SHALL BE RETAINED ON-SITE. THE CONSTRUCTION SWPPP SHALL BE MODIFIED WHENEVER THERE IS A SIGNIFICANT CHANGE IN THE DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE OF ANY BMP.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C150: MATERIALS ON HAND**
- **BMP C160: CERTIFIED EROSION AND SEDIMENT CONTROL LEAD**
- **BMP C162: SCHEDULING**

ELEMENT 13: PROTECT LOW IMPACT DEVELOPMENT BMPS

(A) PROTECT ALL LOW IMPACT DEVELOPMENT BMPS (BIORETENTION CELLS AND PERVIOUS PAVEMENTS) FROM SEDIMENTATION PRODUCED FROM THE SITE BY INSTALLING AND MAINTAINING EROSION AND SEDIMENT CONTROL BMPS ON PORTIONS OF THE SITE THAT DRAIN TO THESE FACILITIES.

(B) RESTORE THE BMPS TO THEIR FULLY FUNCTIONING CONDITION IF THEY ACCUMULATE SEDIMENT DURING CONSTRUCTION. RESTORING THE BMP MUST INCLUDE REMOVAL OF SEDIMENT AND ANY SEDIMENT-LADEN SOILS, AND REPLACING THE REMOVED SOILS WITH SOILS MEETING THE DESIGN SPECIFICATIONS.

(C) PREVENT COMPACTING BIORETENTION BMPS BY RESTRICTING CONSTRUCTION EQUIPMENT AND FOOT TRAFFIC. PROTECT COMPLETED LAWN AND LANDSCAPED AREAS FROM COMPACTION DUE TO CONSTRUCTION EQUIPMENT.

(D) KEEP ALL HEAVY EQUIPMENT OFF EXISTING SOILS UNDER LID FACILITIES THAT HAVE BEEN EXCAVATED TO FINAL GRADE TO RETAIN THE INFILTRATION RATE OF THE SOILS.

- **BMP C103: HIGH VISIBILITY FENCE**
- **BMP C204: PIPE SLOPE DRAINS**
- **BMP C233: SILT FENCE (HIGH VISIBILITY)**
- **BMP C235: WATTLES**

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Date: JUNE 29, 2018
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Drawn By:
J. HOYER
Checked By:
J. TUTTLE

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PLAN PRINTED AT
11"x17" DEPICTS A 1:2
SCALE RATIO
(I.E. 1"=10' TO 1"=20')

Scale:
Horiz: 1"=10'
Vert: 1"=5'
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Inspected By:
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Date:
JULY 12, 2018

CITY OF MUKILTEO
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43718

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EROSION CONTROL NOTES

EN1

☐ CONSTRUCTION NOTES

1. SEE ROADWAY SECTIONS, RS1, FOR PAVING DEPTHS AND GENERAL ROADWAY IMPROVEMENTS LEFT AND RIGHT OF CENTERLINE.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. INSTALL CONCRETE BARRIER, TYPE 2 SECTION WITH BARRIER TERMINALS PER STANDARD PLANS C–8 AND C–8E. INSTALL THREE (3) TEN–FOOT BARRIER SECTIONS ADJACENT TO EACH TERMINAL END, THEN COMPLETE INSTALLATION USING 12.5–FOOT BARRIER SECTIONS. INSTALL A TWO–SIDED, RECTANGULAR BARRIER DELINEATOR WITH REFLECTIVE SHEETING AT EACH BARRIER JOINT PER STANDARD PLAN M–40.10–03. PROVIDE ASPHALT PATCH TO PLUG EACH BEVELED BOTTOM OPENING TO PREVENT ROAD RUNOFF FROM PASSING THROUGH THE SECTIONS OF BARRIER.
4. INSTALL SOLDIER PILE WALL PER STRUCTURAL PLANS.
5. INSTALL MANIFOLD WALL DRAIN SYSTEM PER PROFILE SHOWN BELOW, AS STATIONED ON THE STRUCTURAL PLANS, AND AS SHOWN ON DETAIL 6/D1.
6. INSTALL ROADWAY CURTAIN DRAIN PER DETAIL 1/D1.
7. INSTALL STORM DRAIN CLEANOUT PER DETAIL 4/D1 OR DETAIL 5/D1.
8. NOTE NOT USED TO THIS SHEET.
9. NOTE NOT USED TO THIS SHEET.
10. NOTE NOT USED TO THIS SHEET.
11. NOTE NOT USED TO THIS SHEET.
12. NOTE NOT USED TO THIS SHEET.
13. TRANSITION IMPROVEMENTS INTO EXISTING GRAVEL WITH CRUSHED SURFACING BASE COURSE PER ROADWAY SECTION ON SHEET RS1.
14. NOTE NOT USED TO THIS SHEET.
15. INSTALL HORIZONTAL WALL DRAINS PER STRUCTURAL PLANS.
16. NOTE NOT USED TO THIS SHEET.

TUTTLE ENGINEERING
AND MANAGEMENT

GENERAL NOTES

1. RIM ELEVATION OF CATCH BASIN FRAME AND GRATE SHALL BE SET 0.1' LOWER THAN FLOWLINE PER CITY OF MUKILTEO DEVELOPMENT STANDARDS EXCEPT FOR STRUCTURES WITH SOLID LIDS.
2. INVERT ELEVATION INFORMATION PROVIDED FOR PROPOSED STORM SEWER IMPROVEMENTS IS MEASURED TO THE CENTER OF THE STRUCTURE.
3. LENGTH INFORMATION FOR PROPOSED STORM PIPING IS MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE

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SNOHOMISH COUNTY
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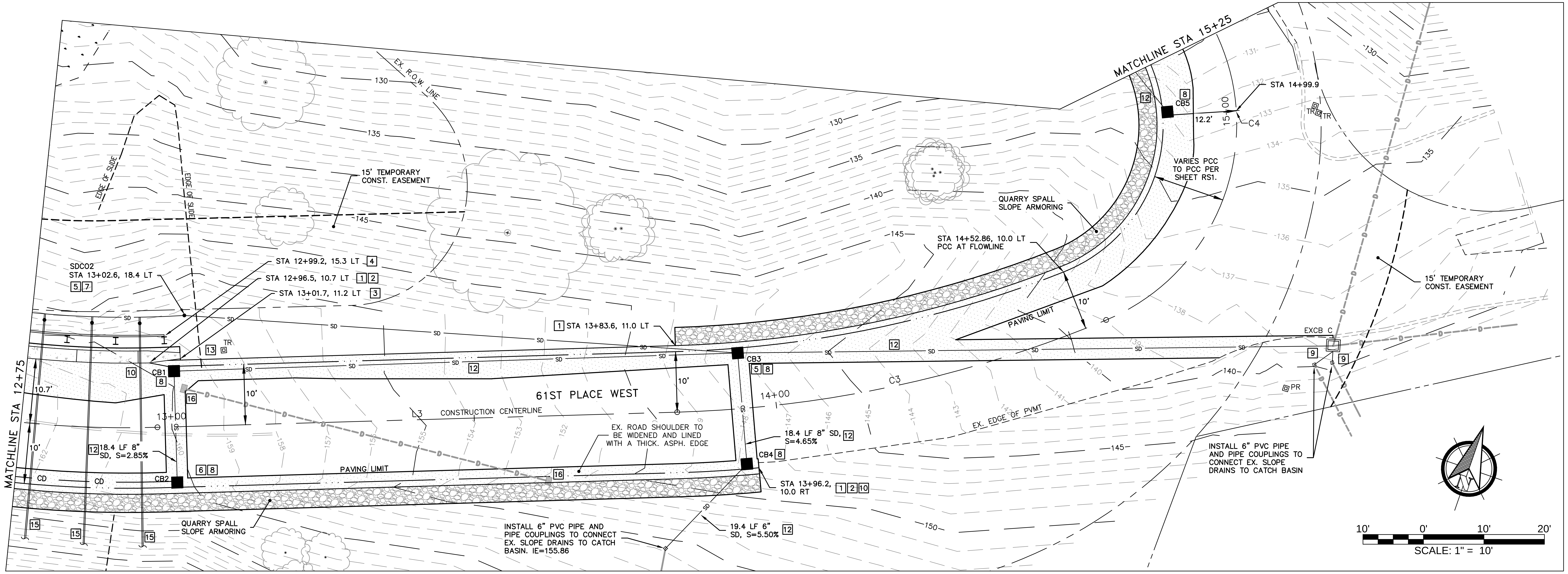
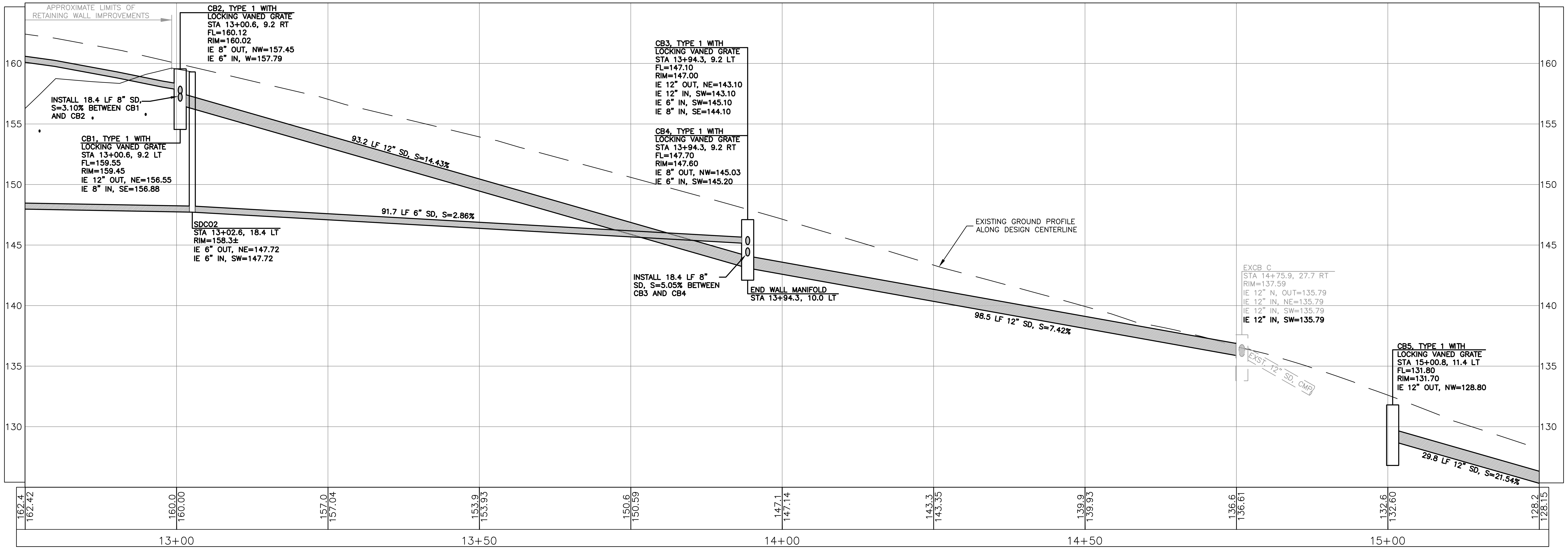
ROAD AND STORM
PLAN AND PROFILE

RP1





☐ CONSTRUCTION NOTES

1. SEE ROADWAY SECTIONS, RS1, FOR PAVING DEPTHS AND GENERAL ROADWAY IMPROVEMENTS LEFT AND RIGHT OF CENTERLINE.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. INSTALL CONCRETE BARRIER, TYPE 2 SECTION WITH BARRIER TERMINALS PER STANDARD PLANS C–8 AND C–8E. INSTALL THREE (3) TEN–FOOT BARRIER SECTIONS ADJACENT TO EACH TERMINAL END, THEN COMPLETE INSTALLATION USING 12.5–FOOT BARRIER SECTIONS. INSTALL A TWO–SIDED, RECTANGULAR BARRIER DELINEATOR WITH REFLECTIVE SHEETING AT EACH BARRIER JOINT PER STANDARD PLAN M–40.10–03. PROVIDE ASPHALT PATCH AT EACH JOINT TO PREVENT ROAD RUNOFF FROM PASSING THROUGH THE SECTIONS OF BARRIER.
4. INSTALL SOLDIER PILE WALL PER STRUCTURAL PLANS.
5. INSTALL MANIFOLD WALL DRAIN SYSTEM PER PROFILE SHOWN BELOW, AS STATIONED ON THE STRUCTURAL PLANS, AND AS SHOWN ON DETAIL 6/D1.
6. INSTALL ROADWAY CURTAIN DRAIN PER DETAIL 1/D1.
7. INSTALL STORM DRAIN CLEANOUT PER DETAIL 4/D1 OR DETAIL 5/D1.
8. INSTALL TYPE 1 CATCH BASIN PER COM STANDARD PLANS SW–001, SW–003, SW–005, AND SW–007.
9. CONNECT TO EXISTING STORM STRUCTURE.
10. PROVIDE GRADING THAT ALLOWS POSITIVE SURFACE FLOWS TOWARD STORMWATER FACILITIES AS PART OF STORM SYSTEM INSTALLATION.
11. NOTE NOT USED TO THIS SHEET.
12. INSTALL STORM DRAIN PIPE. AS APPLICABLE, REPAIR EXISTING ROADWAY DISTURBED BY THIS WORK PER DETAIL 3/D1.
13. TRANSITION IMPROVEMENTS INTO EXISTING GRAVEL WITH CRUSHED SURFACING BASE COURSE PER ROADWAY SECTION ON RS1.
14. NOTE NOT USED TO THIS SHEET.
15. INSTALL HORIZONTAL WALL DRAINS PER STRUCTURAL PLANS.
16. PLUG EXISTING PIPE AS PART OF STORM SYSTEM INSTALLATION

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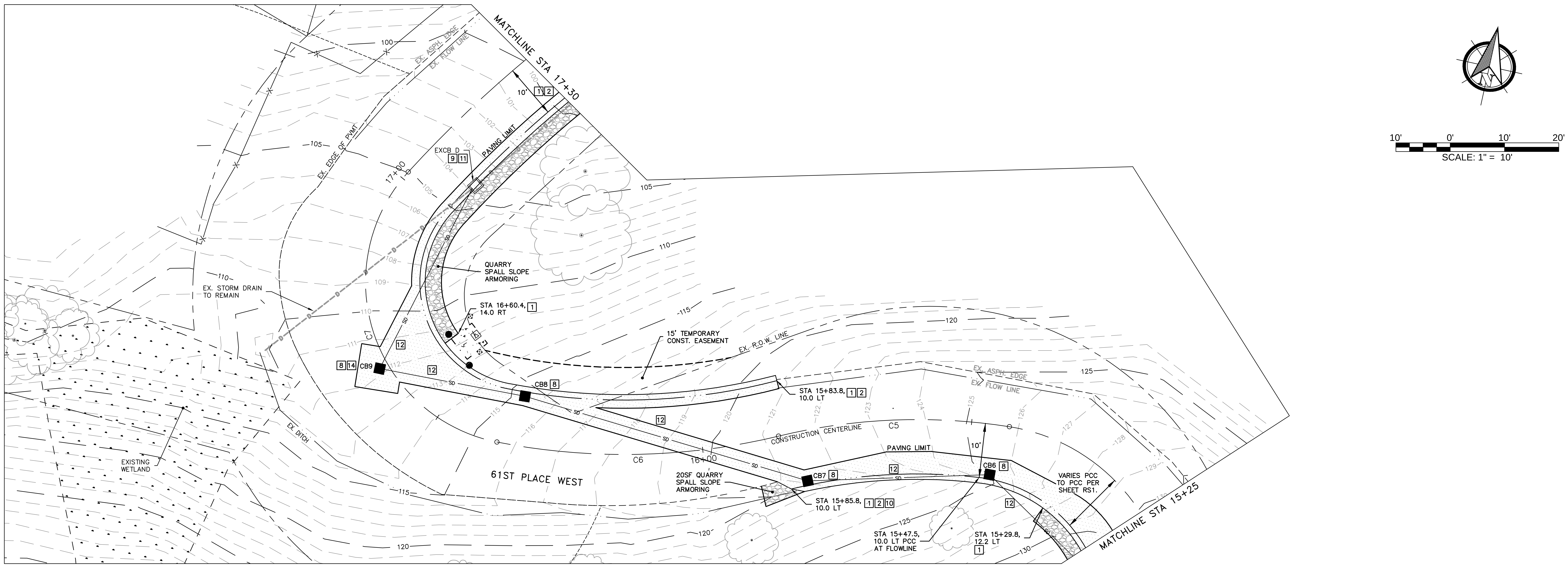
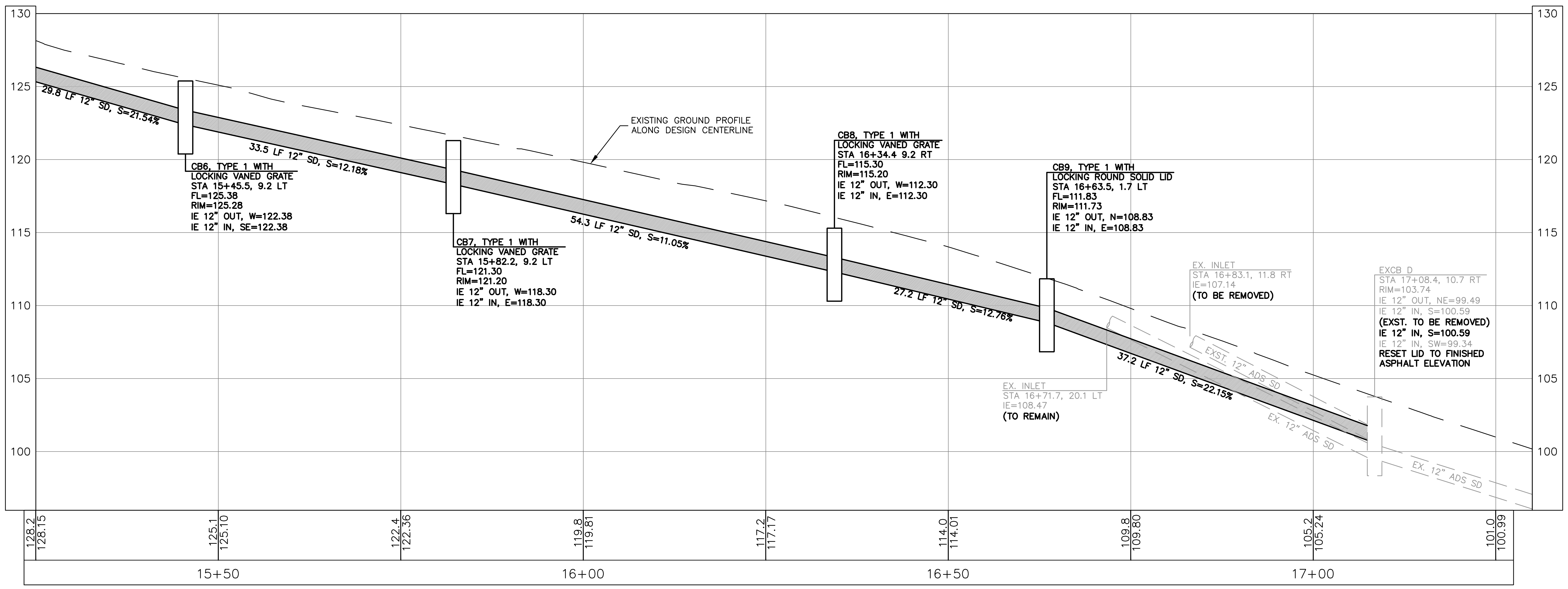
ROAD AND STORM PLAN AND PROFILE

RP2





☐ CONSTRUCTION NOTES

1. SEE ROADWAY SECTIONS, RS1, FOR PAVING DEPTHS AND GENERAL ROADWAY IMPROVEMENTS LEFT AND RIGHT OF CENTERLINE.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. NOTE NOT USED TO THIS SHEET.
4. NOTE NOT USED TO THIS SHEET.
5. NOTE NOT USED TO THIS SHEET.
6. NOTE NOT USED TO THIS SHEET.
7. NOTE NOT USED TO THIS SHEET.
8. INSTALL TYPE 1 CATCH BASIN PER COM STANDARD PLANS SW–001, SW–003, SW–005, AND SW–007.
9. CONNECT TO EXISTING STORM STRUCTURE.
10. TRANSITION ASPHALT FLOW LINE TO ENSURE POSITIVE SURFACE FLOWS TOWARD PROPOSED BARRIER EDGE, STORM FACILITY OR EXISTING ASPHALT FLOW LINE.
11. ADJUST EXISTING STORM STRUCTURE FRAME AND GRATE TO FINISHED GRADE.
12. INSTALL STORM DRAIN PIPE AND REPAIR EXISTING ROADWAY DISTURBED BY THIS WORK PER DETAIL 2/D1.
13. NOTE NOT USED TO THIS SHEET.
14. INSTALL SOLID CIRCULAR FRAME AND COVER PER WSDOT STANDARD PLAN B–30.70–03 WITH "DRAIN" LETTERING CAST INTO COVER.
15. NOTE NOT USED TO THIS SHEET.
16. NOTE NOT USED TO THIS SHEET.

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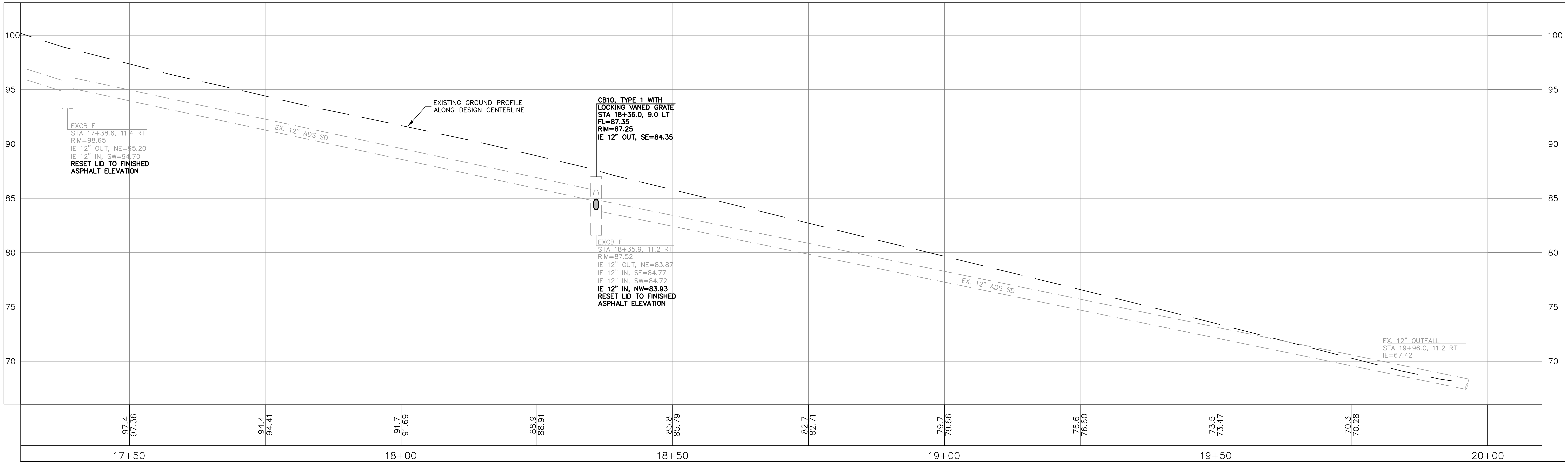
ROAD AND STORM PLAN AND PROFILE

RP3

☐ CONSTRUCTION NOTES

1. SEE ROADWAY SECTIONS, RS1, FOR PAVING DEPTHS AND GENERAL ROADWAY IMPROVEMENTS LEFT AND RIGHT OF CENTERLINE.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. NOTE NOT USED TO THIS SHEET.
4. NOTE NOT USED TO THIS SHEET.
5. NOTE NOT USED TO THIS SHEET.
6. NOTE NOT USED TO THIS SHEET.
7. NOTE NOT USED TO THIS SHEET.
8. INSTALL TYPE 1 CATCH BASIN PER COM STANDARD PLANS SW–001, SW–003, SW–005, AND SW–007.
9. CONNECT TO EXISTING STORM STRUCTURE.
10. TRANSITION ASPHALT FLOW LINE TO ENSURE POSITIVE SURFACE FLOWS TOWARD PROPOSED BARRIER EDGE, STORM FACILITY OR EXISTING ASPHALT FLOW LINE.
11. ADJUST EXISTING STORM STRUCTURE FRAME AND GRATE TO FINISHED GRADE.
12. INSTALL STORM DRAIN PIPE AND REPAIR EXISTING ROADWAY DISTURBED BY THIS WORK PER DETAIL 2/D1.
13. NOTE NOT USED ON THIS SHEET.
14. NOTE NOT USED ON THIS SHEET.
15. NOTE NOT USED TO THIS SHEET.
16. NOTE NOT USED TO THIS SHEET.



TUTTLE ENGINEERING AND MANAGEMENT
275 West Rio Vista Avenue, Suite 1 Burlington, WA 98233
O: (360) 899-5953 W: www.tuttle-team.com

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NO.	DATE	BY	REVISION

PLAN PRINTED AT
11"x17" DEPICTS A 1:2
SCALE RATIO
(I.E. 1"=10' TO 1"=20')

Scale:
Horiz: 1"=10'
Vert: 1"=5'
Designed By:
Inspected By:
W.O. No.:
Date:
JULY 12, 2018

CITY OF MUKILTEO

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT

11930 Cyrus Way Mukilteo, Washington 98275
425–263–8000 FAX 425–290–1009
http://mukilteowa.gov

JOHN RAYMOND TUTTLE
43718

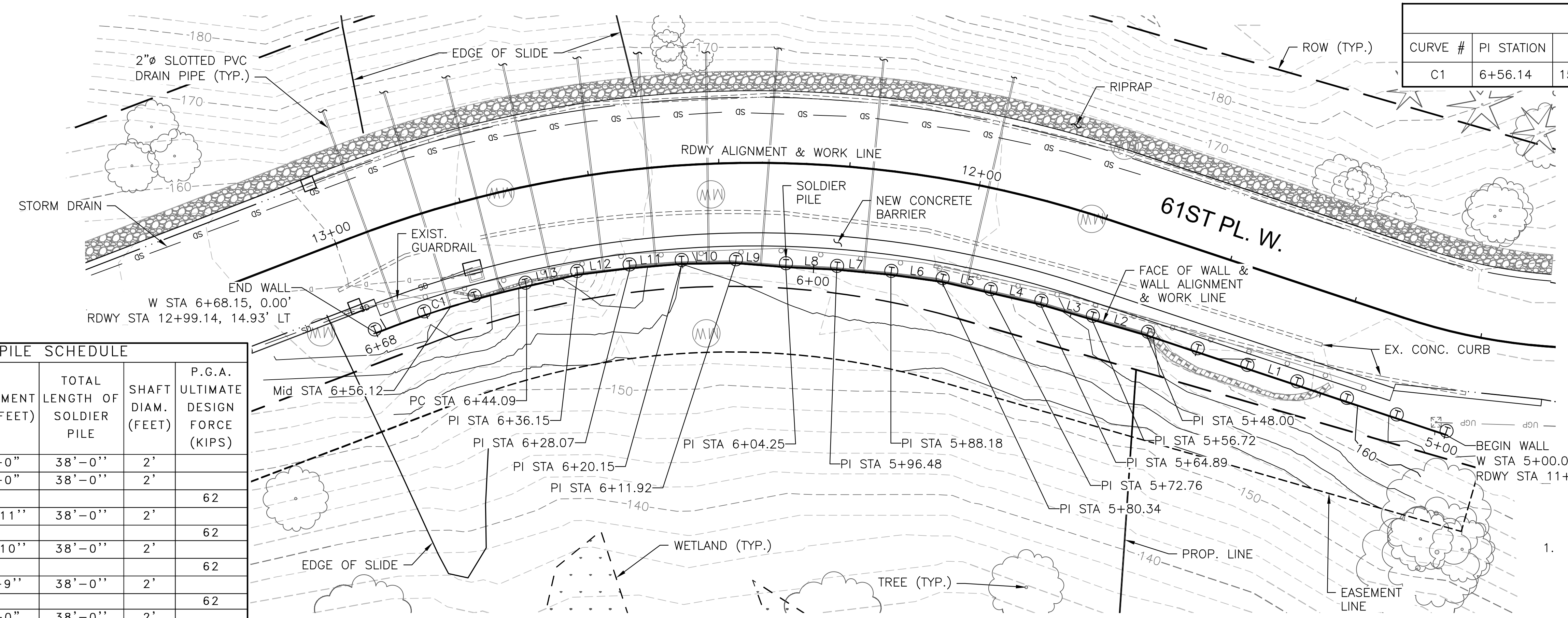
61st Place West
Retaining Wall Project

99% Design - Not For Construction

ROAD AND STORM PLAN AND PROFILE

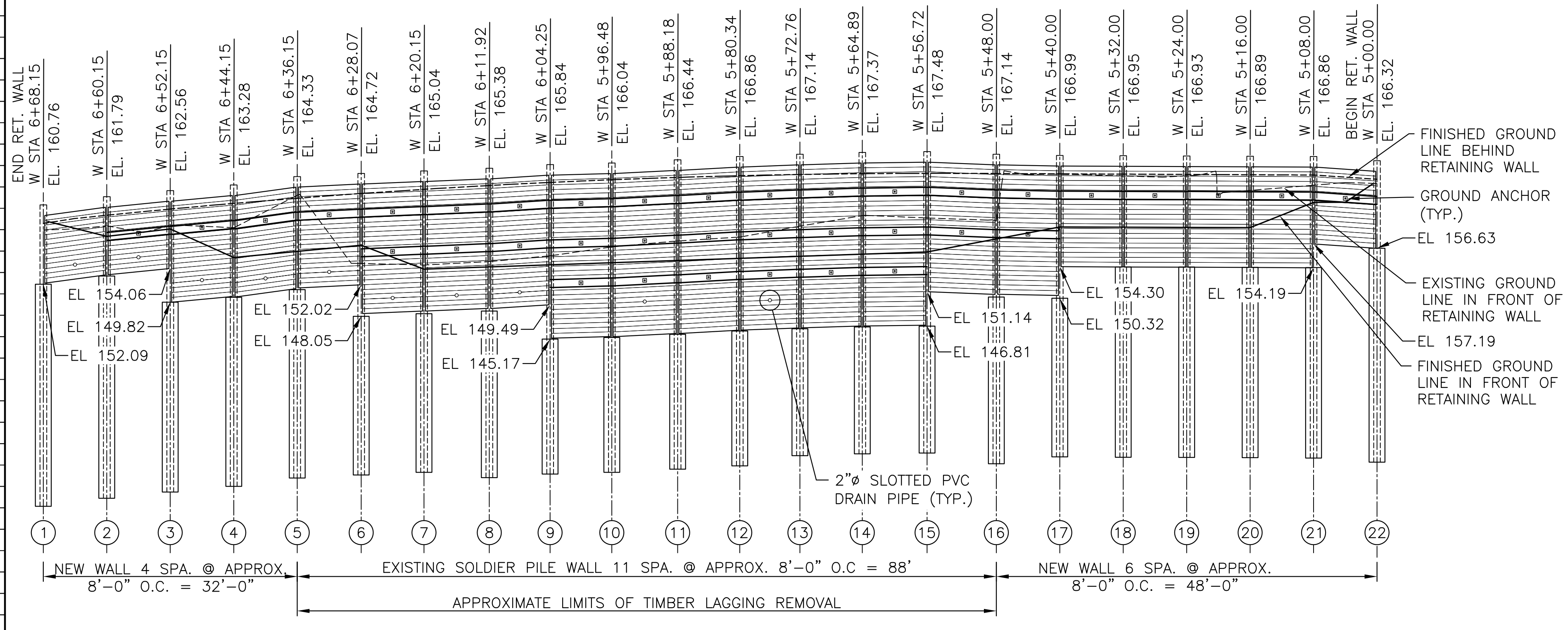
RP4

XREF Filename:
Filename:
Drawn By: J. HOYER
Checked By: J. TUTTLE
Surveyed By:
Date:
Field Bk/Pg:
Datum:
Recorded Survey: SNOHOMISH COUNTY
AF–
Vol/Bk Page
Firm:
Date: JUNE 29, 2018
GIS Cntl Pnts:
Aerial Mapping & Control Survey
Firm:
Date: JUNE 29, 2018
Field BK/PG:
Constructed By:
Date:



PLAN

SCALE: 1"=10'



WALL ELEVATION

SCALE: 1"=10'

* TOP OF WALL ELEVATIONS SHOWN ARE AT TOP OF LAGGING

CURVE TABLE

CURVE #	PI STATION	R	LENGTH	Δ	PI NORTHING	PI EASTING
C1	6+56.14	157.00	24.05	008.78	337615.11	1276803.68

LINE TABLE

LINE #	LENGTH	BEARING
L1	48.00	S71° 36' 53"E
L2	8.72	S73° 52' 31"E
L3	8.17	S73° 37' 40"E
L4	7.87	S77° 07' 27"E
L5	7.58	S77° 05' 15"E
L6	7.84	S82° 07' 38"E
L7	8.29	S84° 38' 17"E
L8	7.78	S87° 08' 09"E
L9	7.67	S85° 29' 21"E
L10	8.23	N89° 15' 56"E
L11	7.92	N85° 06' 44"E
L12	8.07	N82° 54' 21"E
L13	7.95	N77° 10' 14"E

SOLDIER PILE SCHEDULE

SOLDIER PILE NUMBER	SOLDIER PILE SIZE	EMBEDMENT "D" (FEET)	TOTAL LENGTH OF SOLDIER PILE	SHAFT DIAM. (FEET)	P.G.A. ULTIMATE DESIGN FORCE (KIPS)
1	W14x74	28'-0"	38'-0''	2'	
2	W14x74	28'-0"	38'-0''	2'	
BTW 2-3					62
3	W14x74	23'-11''	38'-0''	2'	
BTW 3-4					62
4	W14x74	23'-10''	38'-0''	2'	
BTW 4-5					62
5*	W14x74	23'-9''	38'-0''	2'	
BTW 5-6					62
6*	W14x74	20'-0"	38'-0''	2'	
BTW 6-7					56
7*	W14x74	20'-0''	38'-0''	2'	
BTW 7-8					56
8*	W14x74	21'-0"	39'-0''	2'	
BTW 8-9					56
9*	W14x74	17'-0"	39'-0''	2'	
BTW 9-10					58
10*	W14x74	17'-0''	39'-0''	2'	
BTW 10-11					58
11*	W14x74	17'-0''	39'-0''	2'	
BTW 11-12					58
12*	W14x74	17'-0''	39'-0''	2'	
BTW 12-13					58
13*	W14x74	16'-0"	38'-0''	2'	
BTW 13-14					58
14*	W14x74	16'-0"	38'-0''	2'	
BTW 14-15					58
15*	W14x74	16'-0"	38'-0''	2'	
BTW 15-16					56
16*	W14x74	21'-0"	39'-0''	2'	
BTW 16-17					56
17	W14x74	20'-0"	38'-0''	2'	
BTW 17-18					62
18	W14x74	24'-0"	38'-0''	2'	
BTW 18-19					62
19	W14x74	24'-0''	38'-0''	2'	
BTW 19-20					62
20	W14x74	24'-0''	38'-0''	2'	
BTW 20-21					62
21	W14x74	24'-0"	38'-0''	2'	
BTW 21-22					62
22	W14x74	27'-0"	38'-0''	2'	

*EXISTING SOLDIER PILE. EMBEDMENT, PILE LENGTH, AND SHAFT SIZE ARE BASED ON AS-BUILTS DRAWINGS

GENERAL NOTES:

1. ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION DATED 2018, AND ADMENDMENTS.
2. THIS STRUCTURE HAS BEEN DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS 8TH EDITION – 2017.
3. THE SOLDIER PILE SHAFT BACKFILL SHALL BE CONTROLLED DENSITY FILL (CDF) CONFORMING TO SECTION 2–09.3(1)E. ALL OTHER CAST–IN–PLACE CONCRETE SHALL BE CLASS 4000.
4. ALL DIMENSIONS ARE HORIZONTAL AND VERTICAL UNLESS OTHERWISE SHOWN.
5. STEEL PILES SHALL BE PAINTED TO LIMITS SHOWN IN THE PLANS.
6. ALL STRUCTURAL STEEL PILES SHALL BE ASTM A992
7. STRUCTURAL CARBON STEEL SHALL BE STRUCTURAL LOW ALLOY STEEL CONFORMING TO AASHTO M270 GRADE 50, EXCEPT STRUCTURAL PLATES SHALL BE STRUCTURAL CARBON STEEL CONFORMING TO AASHTO M270, GRADE 36.
8. HOT–DIP GALVANIZE ALL STRUCTURAL CARBON STEEL INCLUDING FASTENERS AFTER FABRICATION PER ASTM 123 AND ASTM 153.
9. ALL FIELD AND SHOP CONNECTIONS SHALL BE MADE WITH HIGH STRENGTH BOLTS. HIGH STRENGTH BOLTS SHALL BE AASHTO M 164 (ASTM A325) NUTS AND WASHERS SHALL CONFORM TO STANDARD SPECIFICATION SECTION 9–06.5(3). MINIMUM CENTER TO CENTER DIMENSION SHALL BE 2¾ INCH AND MINIMUM EDGE DISTANCE SHALL BE 1⅛ INCH UNLESS SHOWN OTHERWISE.
10. WELDING AND REPAIR WELDING SHALL COMPLY WITH THE AWS D1.5/D1.5M 2015. ALL WELDING SHALL BE DONE TO MINIMIZE DISTORTION. THE WELDING SEQUENCED AND PROCEDURE TO BE USED SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO THE START OF WELDING.
11. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS PRIOR TO CONSTRUCTION.
12. APPROXIMATE QUANTITY OF STRUCTURAL CARBON STEEL IS 25,000 LBS.

10 5 0 10 20

SCALE IN FEET

NO.	DATE	REVISION	BY	APPROVED

DESIGNED: HAC DATE: 7/3/2018
DRAWN: MST DATE: 7/3/2018
CHECKED: RLS DATE: 7/3/2018

NOTES:
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HEIDI ANN CLAYVILLE

CELEBRATING 25 YEARS exeltech

CITY OF MUKILTEO

MUKILTEO 61ST PLACE WEST RET WALL

PLAN AND ELEVATION

PROJECT NO. **1610**
SHEET NO. **W-1**
SHEET 1 OF 5

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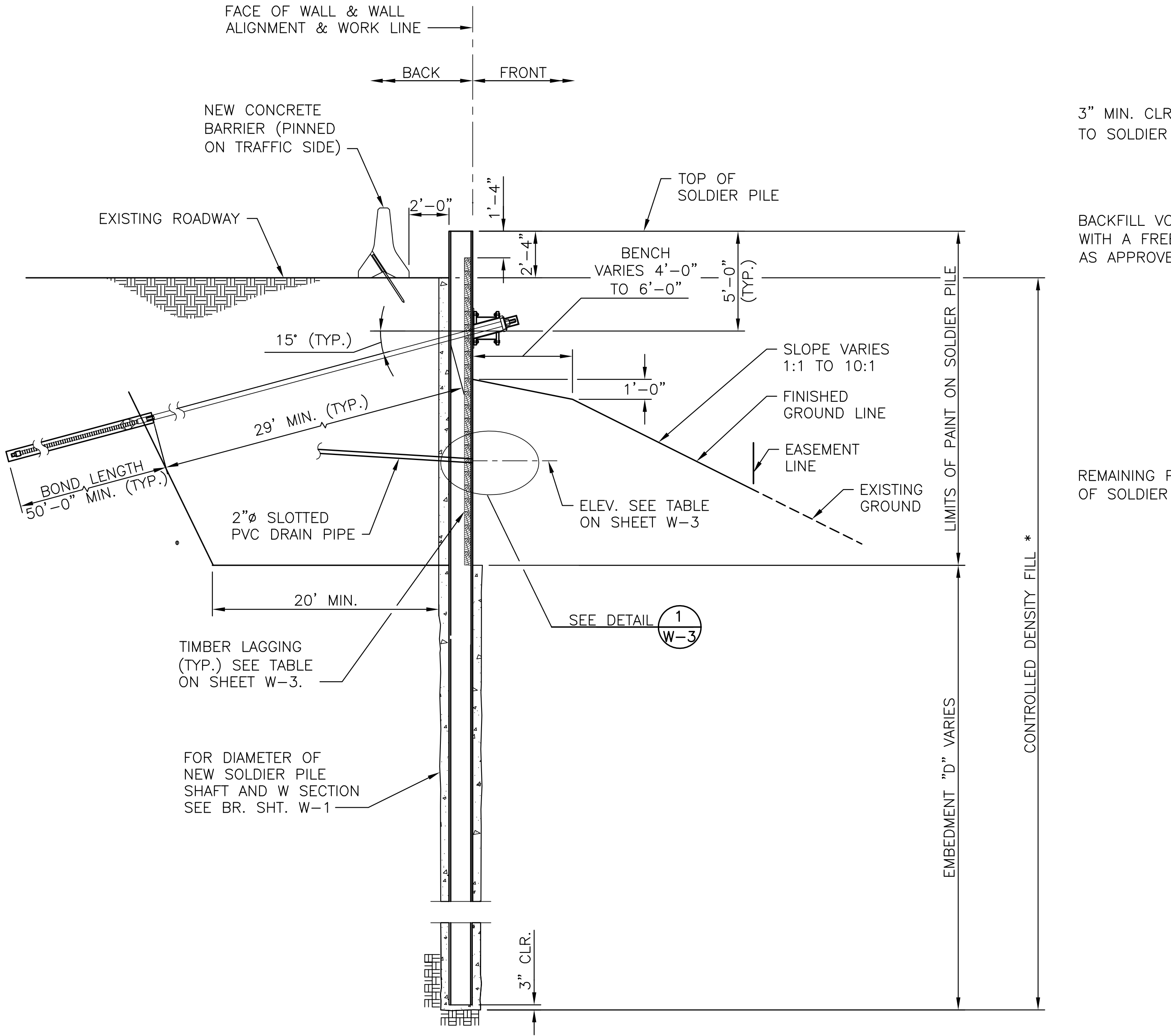
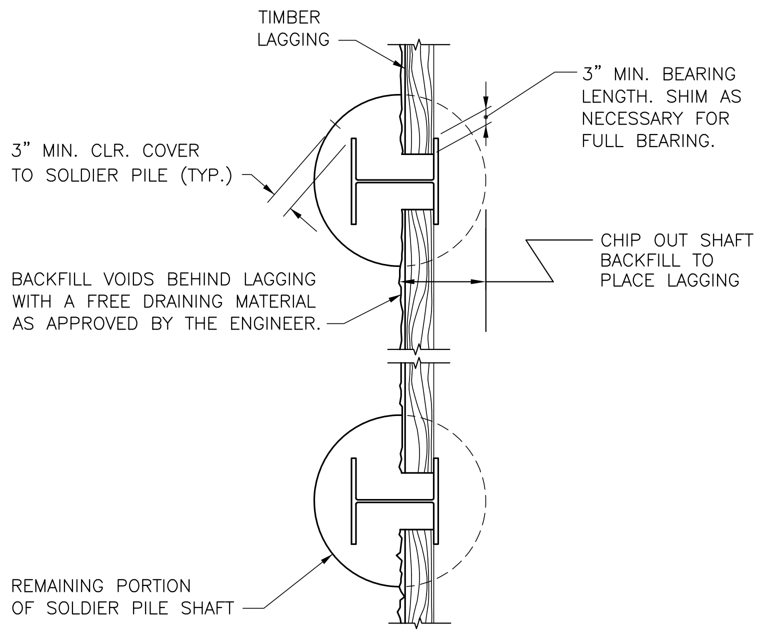


* USE CONTROL DENSITY FILL WHEN PLACED IN THE DRY. USE PUMPABLE LEAN CONCRETE WHEN PLACED IN THE WET.

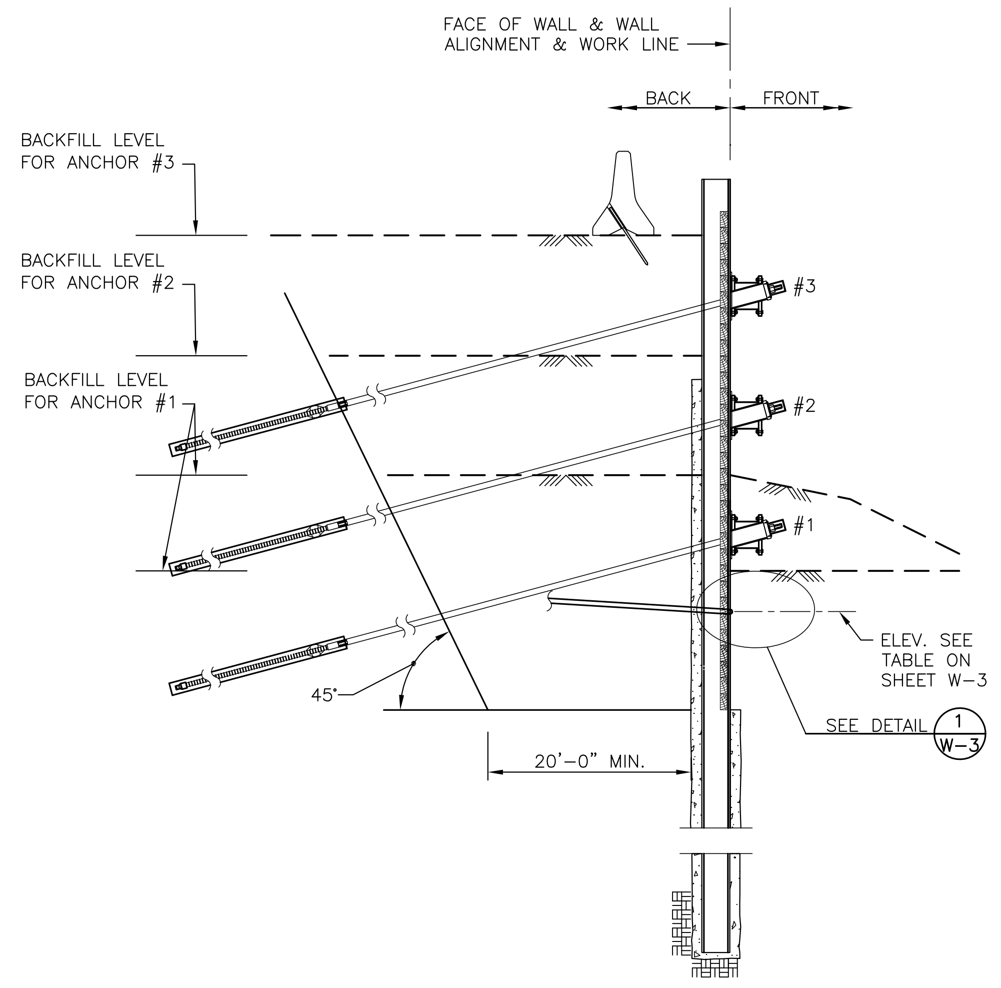
NEW TIEBACK TYPICAL WALL SECTION

SHOWN FOR SOLDIER PILE WITH 1 P.G.A.
SIMILAR FOR SOLDIER PILE WITH 2 OR WITHOUT P.G.A.

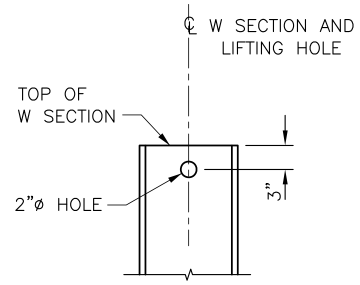
P.G.A. = PERMANENT GROUND ANCHOR



PLAN - LAGGING DETAILS



EXISTING WALL BACKFILL SEQUENCE



SOLDIER PILE LIFTING HOLE

LIFTING HOLE TO BE DRILLED IN THE SHOP PRIOR TO PAINTING THE PILE

SUGGESTED CONSTRUCTION SEQUENCE:

CONSTRUCTION SEQUENCE TO BE DETERMINED BY THE CONTRACTOR.

1. SET THE TRAFFIC CONTROL AND CLOSE THE 61ST PLACE W ROADWAY TO TRAFFIC.
2. REMOVE THE EXISTING GUARDRAIL.
3. PLACE TEMPORARY SHORING AS REQUIRED ON THE BACK SIDE OF THE EXISTING STEEL SOLDIER PILES.
4. EXCAVATE BEHIND THE EXISTING WALL.
5. REMOVE THE EXISTING TIMBER LAGGING, FROM THE TOP DOWN, AND REPLACE WITH NEW TIMBER LAGGING FROM THE BOTTOM UP.
6. BACKFILL THE NEW TIMBER LAGGING IN 3 STAGES, SEE SECTION, AND INSTALL PERMANENT GROUND ANCHORS IN 3 STAGES, SEE SECTION, FOR THE LENGTH OF THE EXISTING SOLDIER PILE WALL WHILE REMOVING THE TEMPORARY SHORING OVER THE LENGTH OF THE EXISTING SOLDIER PILE WALL.
7. INSTALL THE NEW SOLDIER PILES.
8. INSTALL LAGGING FROM THE TOP DOWN, FOR THE LENGTH OF THE NEW SOLDIER PILE WALL, WHILE INSTALLING THE PERMANENT GROUND ANCHORS.
9. THE EXCAVATION SHALL BE NOT MORE THAN 3FT. BELOW THE PERMANENT GROUND ANCHOR UNTIL ALL THE GROUND ANCHORS AT THAT LEVEL ARE INSTALLED AND STRESSED.
10. INSTALL DRAINAGE SYSTEM AND BACKFILL TO FINISHED GROUND LINE IN FRONT SIDE OF THE WALL.

NOTE:

1. INSTALL THE HORIZONTAL 2" DIA. PVC SLOTTED DRAINPIPE WITH 2-5 DEGREE INCLINATION WITH A COMPLETED LENGTH OF 80'-0" TO 120'-0" AS DIRECTED BY GEOTECHNICAL ENGINEER.

NO.	DATE	REVISION	BY	APPROVED

DESIGNED:	HAC	DATE:	7/3/2018
DRAWN:	MST	DATE:	7/3/2018
CHECKED:	RLS	DATE:	7/3/2018

NOTES:
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49155

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CITY OF MUKILTEO

MUKILTEO 61ST PLACE WEST RET WALL

SOLDIER PILE DETAILS 1 OF 3

PROJECT NO.
1610
SHEET NO.
W-2
SHEET 2 OF 5

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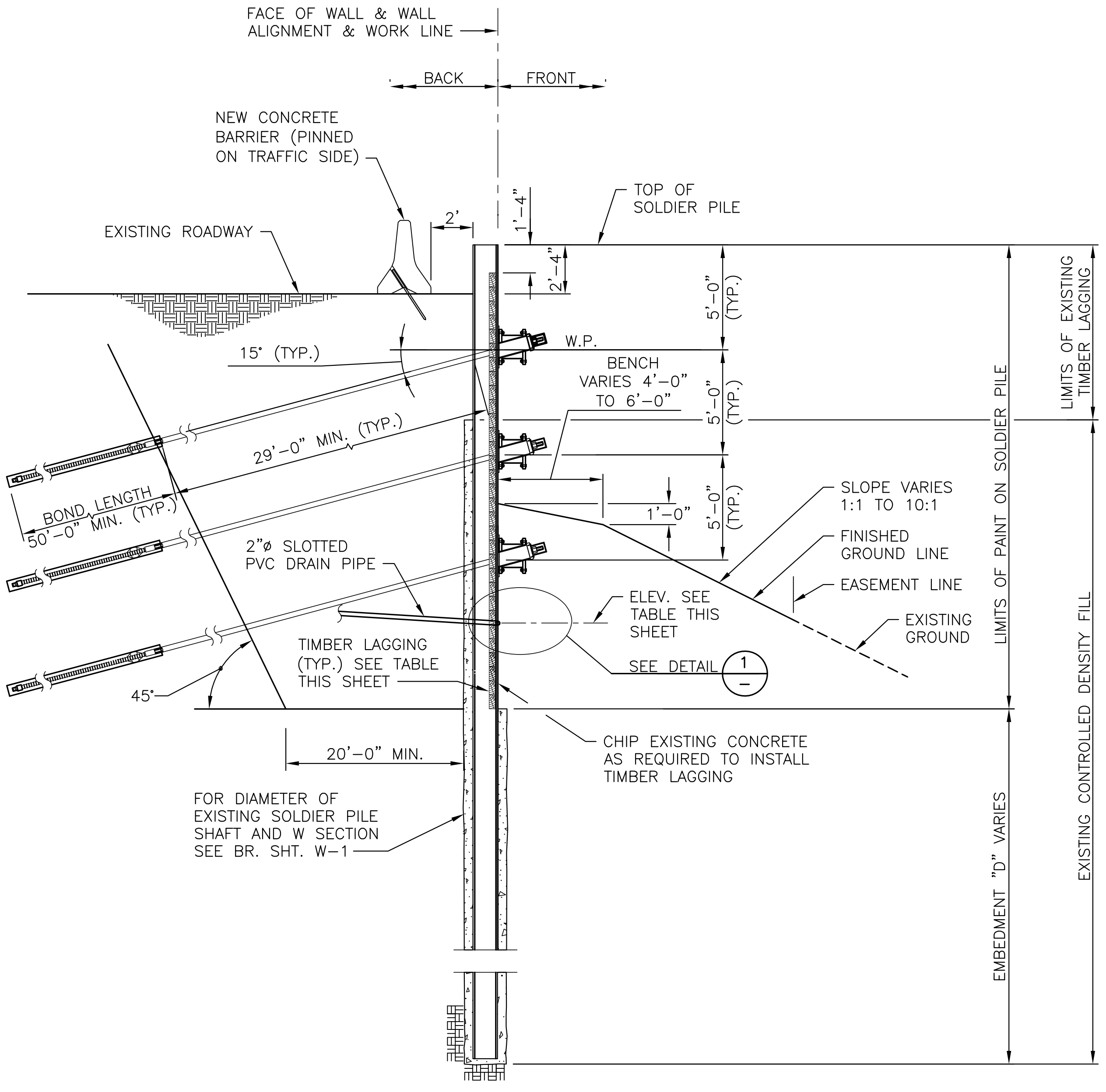
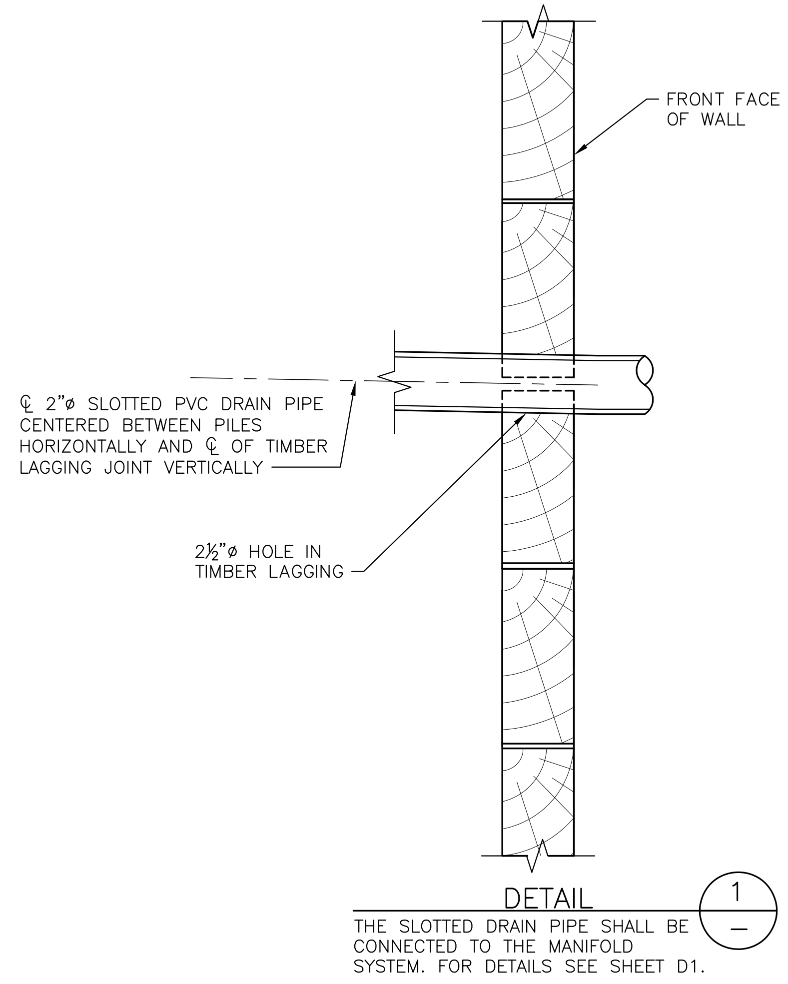


EXISTING TIEBACK TYPICAL WALL SECTION

SHOWN FOR SOLDIER PILE WITH 3 P.G.A.
SIMILAR FOR SOLDIER PILE WITH 1 OR 2 P.G.A.

P.G.A.= PERMANENT GROUND ANCHOR.

TIMBER LAGGING SIZES	
DEPTH (FT)	SIZE
0 – 16	4 x 8
16 – 24	6 x 8



DETAIL

THE SLOTTED DRAIN PIPE SHALL BE CONNECTED TO THE MANIFOLD SYSTEM. FOR DETAILS SEE SHEET D1.

DRAIN ELEVATION TABLE		
DRAIN NUMBER	"W" LINE STATION	ELEVATION
1	6+64.15	154.6
2	6+56.15	155.5
3	6+48.15	152.6
4	6+40.15	152.8
5	6+32.11	153.6
6	6+24.11	150.4
7	6+16.03	150.7
8	6+08.09	151.1
9	5+92.33	149.9
10	5+76.55	150.1

NOTE:

1. INSTALL THE HORIZONTAL 2" DIA. PVC SLOTTED DRAINPIPE WITH 2–5 DEGREE INCLINATION WITH A COMPLETED LENGTH OF 80'–0" TO 120'–0" AS DIRECTED BY GEOTECHNICAL ENGINEER.

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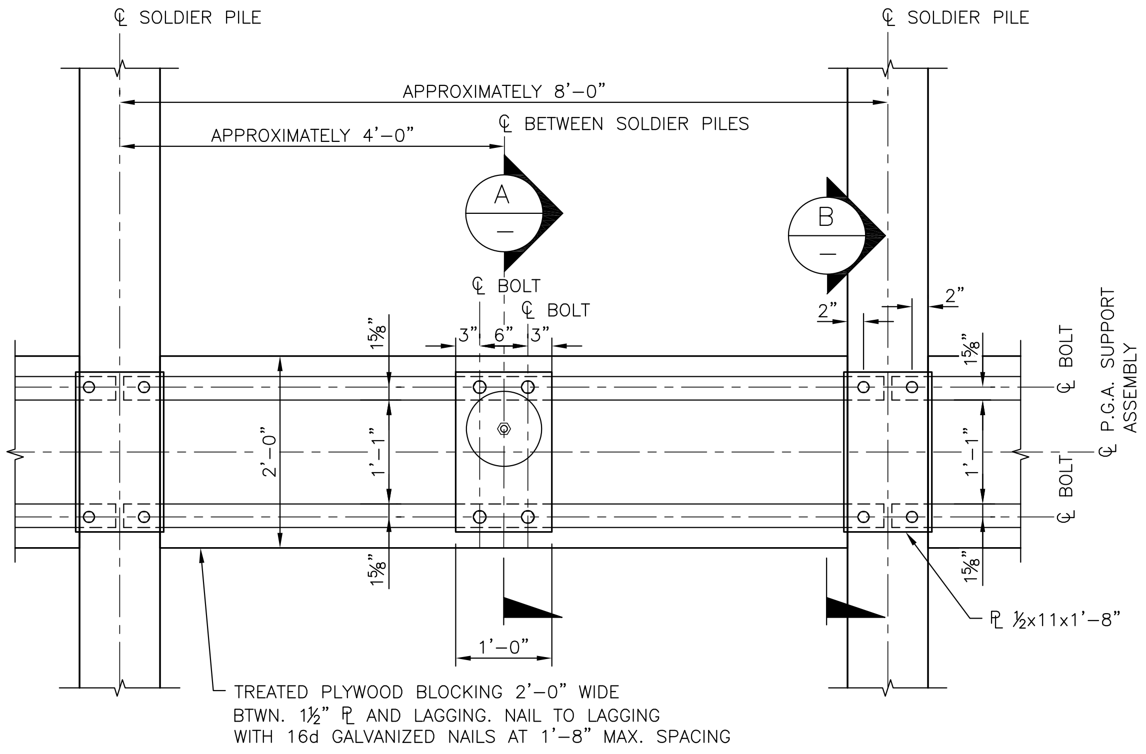
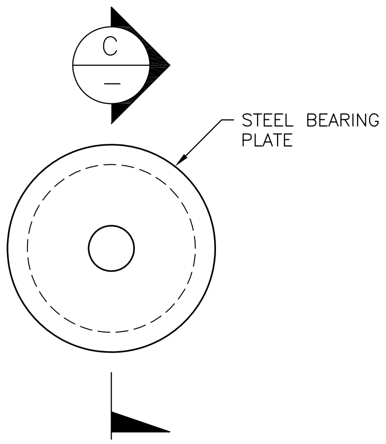
MUKILTEO 61ST PLACE WEST RET WALL

SOLDIER PILE DETAILS 2 OF 3

PROJECT NO. **1610**
SHEET NO. **W-3**
SHEET 3 OF 5

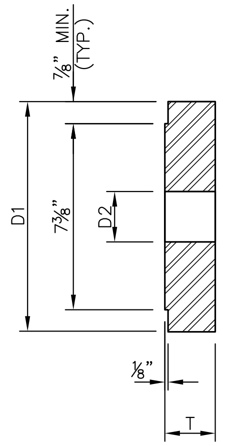


ELEVATION - SOLDIER PILE WALL WITH P.G.A

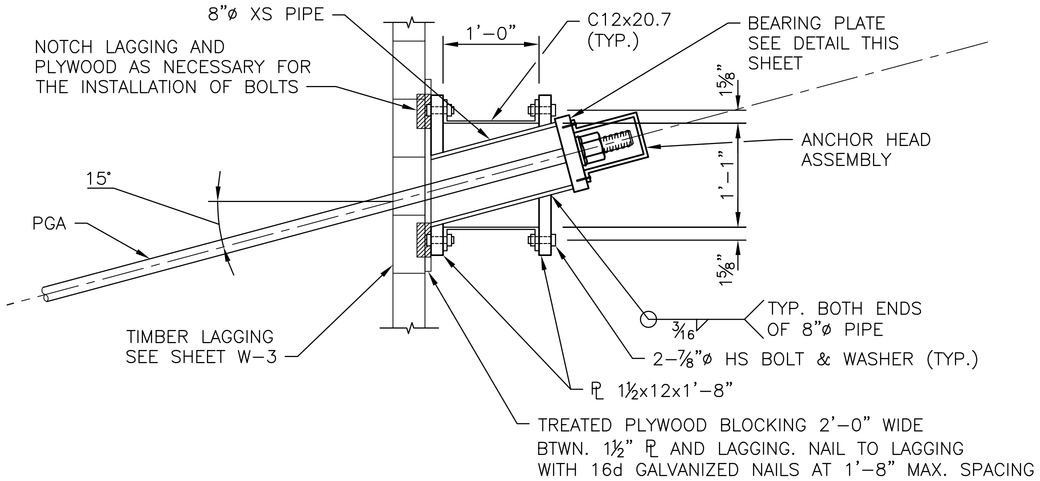


BEARING PLATE

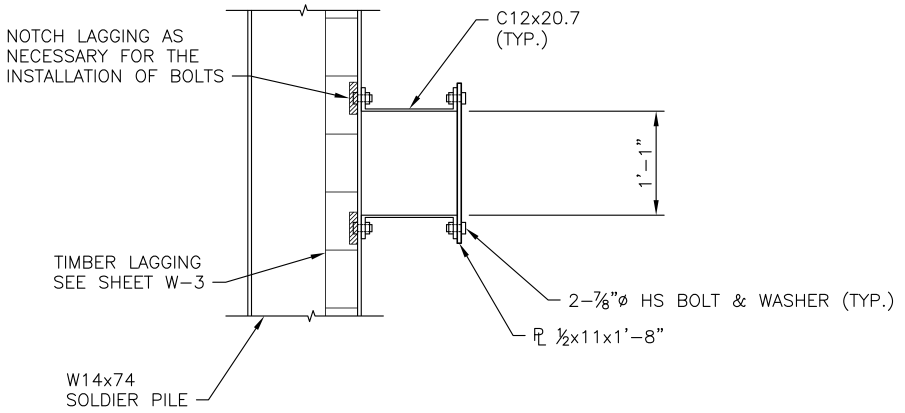
BEARING PLATE SHALL BE DESIGNED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL IN ACCORDANCE WITH THE STANDARD SPECIFICATION SECTION 6–17.3(5).



SECTION C



SECTION A
NTS



SECTION B
NTS

NO.	DATE	REVISION	BY	APPROVED

DESIGNED: HAC DATE: 7/3/2018
DRAWN: CRS DATE: 7/3/2018
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MUKILTEO 61ST PLACE WEST RET WALL

SOLDIER PILE DETAILS 3 OF 3

PROJECT NO.
1610
SHEET NO.
W-4
SHEET 4 OF 5

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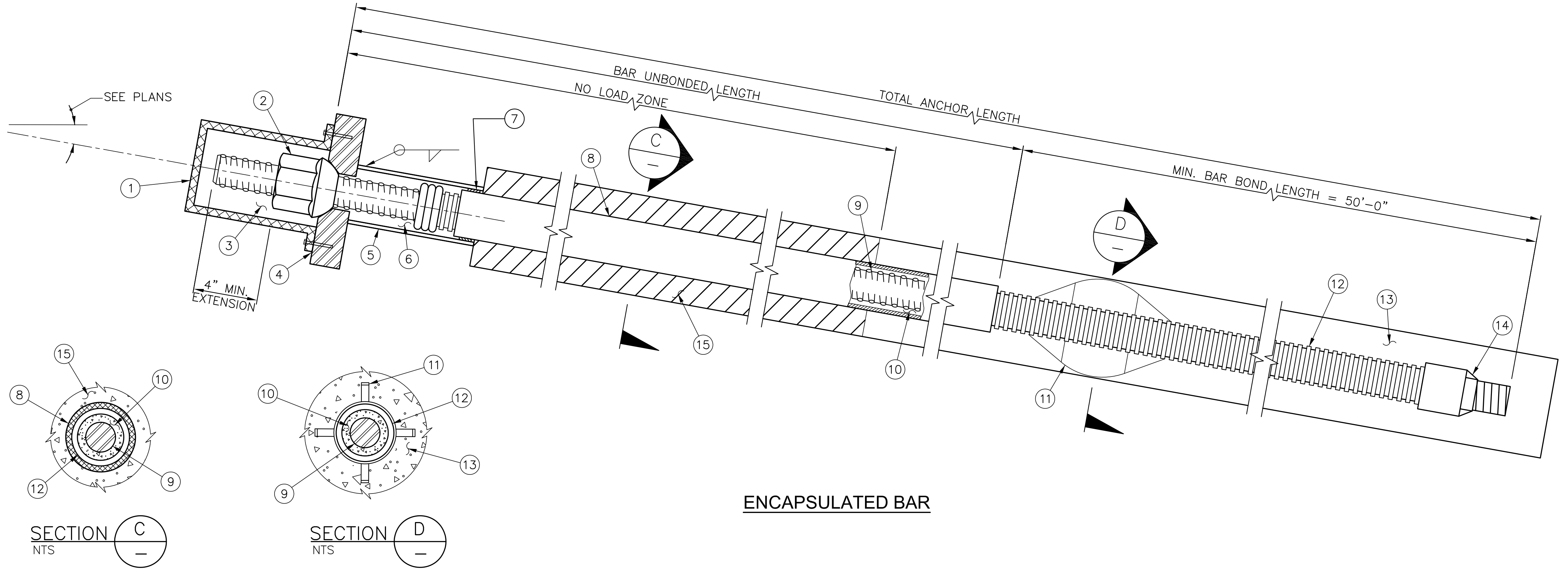


ENCAPSULATED BAR

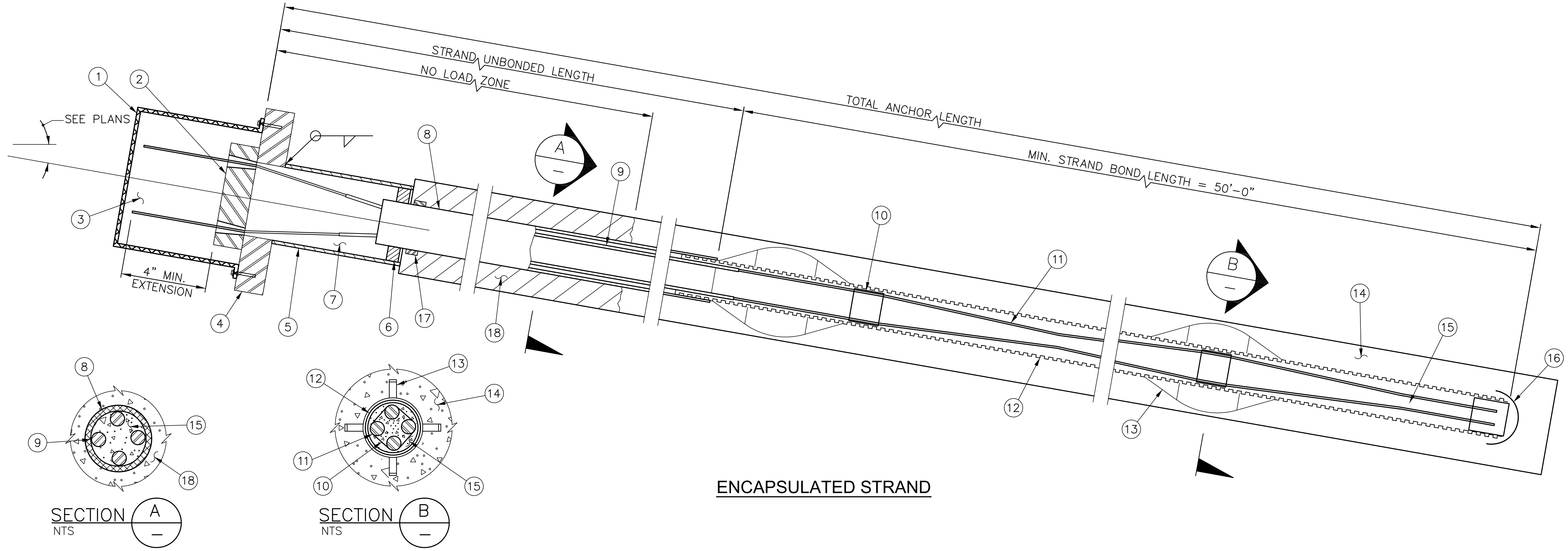
1. ANCHORAGE COVER
2. NUT
3. ANTICORROSION GREASE*
4. BEARING PLATE
5. TRUMPET
6. ANTICORROSION GREASE
7. SEAL
8. SMOOTH PVC BOND BREAKER
9. BAR
10. ENCAPSULATION GROUT
11. CENTRALIZERS
12. CORRUGATED PVC
13. ANCHOR GROUT
14. END CAP
15. NONSTRUCTURAL FILLER

* USE GROUT IF ANCHORAGE COVER IS EXPOSED

NOTES:

THE DOUBLE CORROSION PROTECTION SYSTEM AT THE ANCHOR HEAD SHALL BE DETAILED TO ALLOW A MINIMUM OF ± 2° VARIATION IN THE SLOPE OF THE SOIL ANCHOR FOR PLACEMENT TOLERANCE.

ALL ANCHORAGE COVERS SHALL BE BOLTED TO THE BEARING PLATES.



ENCAPSULATED STRAND

1. ANCHORAGE COVER
2. ANCHOR HEAD AND WEDGES
3. ANTICORROSION GREASE
4. BEARING PLATE
5. TRUMPET
6. SEAL
7. ANTICORROSION GREASE
8. PVC OR POLYETHYLENE TUBE
9. INDIVIDUALLY GREASED AND SHEATHED STRAND.
10. SPACER
11. STRAND
12. CORRUGATED PVC
13. CENTRALIZER
14. ANCHOR GROUT
15. ENCAPSULATION GROUT
16. END CAP
17. TENSION RING TO RESIST SPLITTING FORCE OF DEFLECTED STRANDS.
18. NON-STRUCTURAL FILLER

NO.	DATE	REVISION	BY	APPROVED

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MUKILTEO 61ST PLACE WEST RET WALL

GROUND ANCHOR DETAILS

PROJECT NO.
1610
SHEET NO.
W-5
SHEET 5 OF 5

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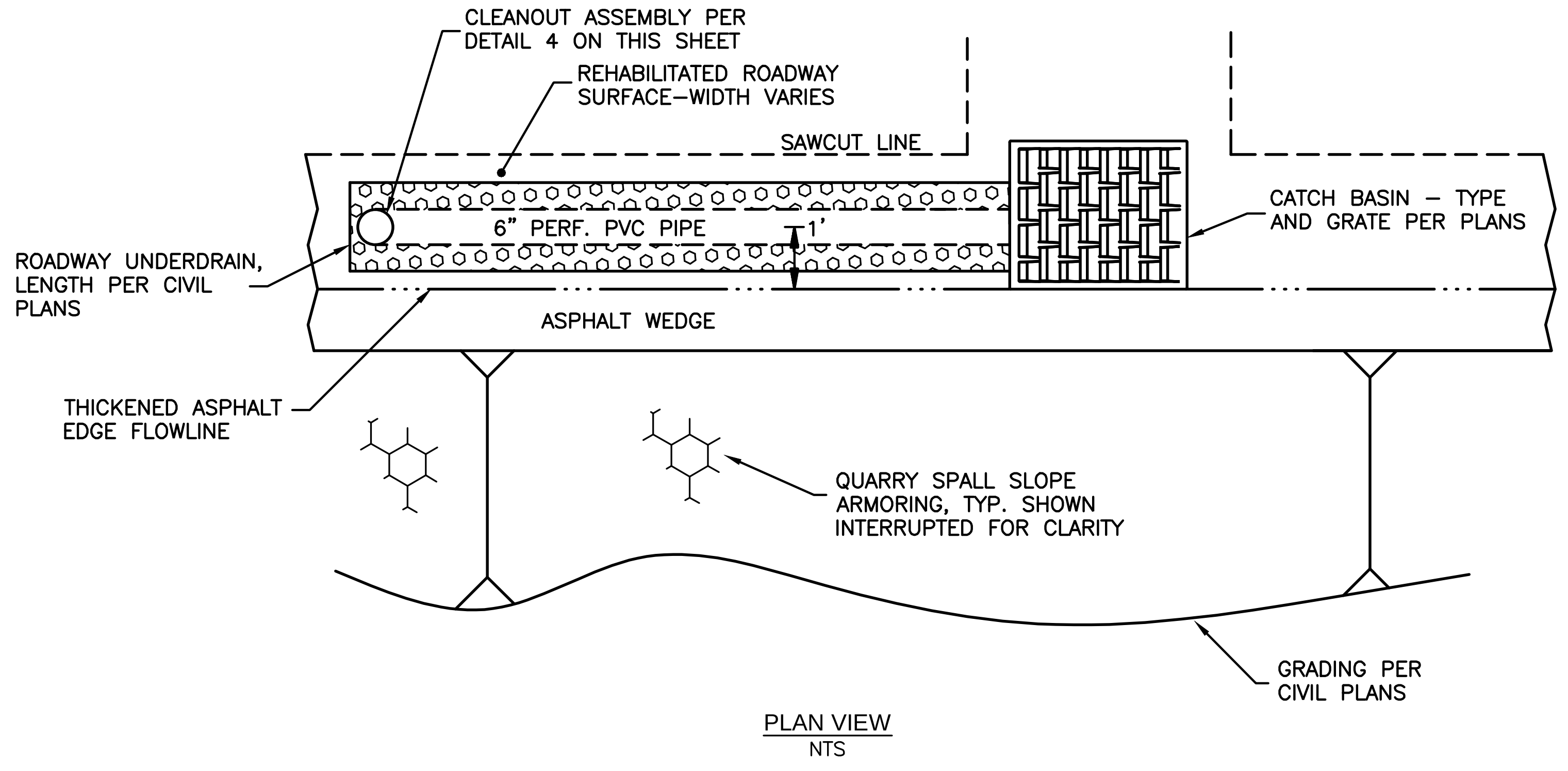
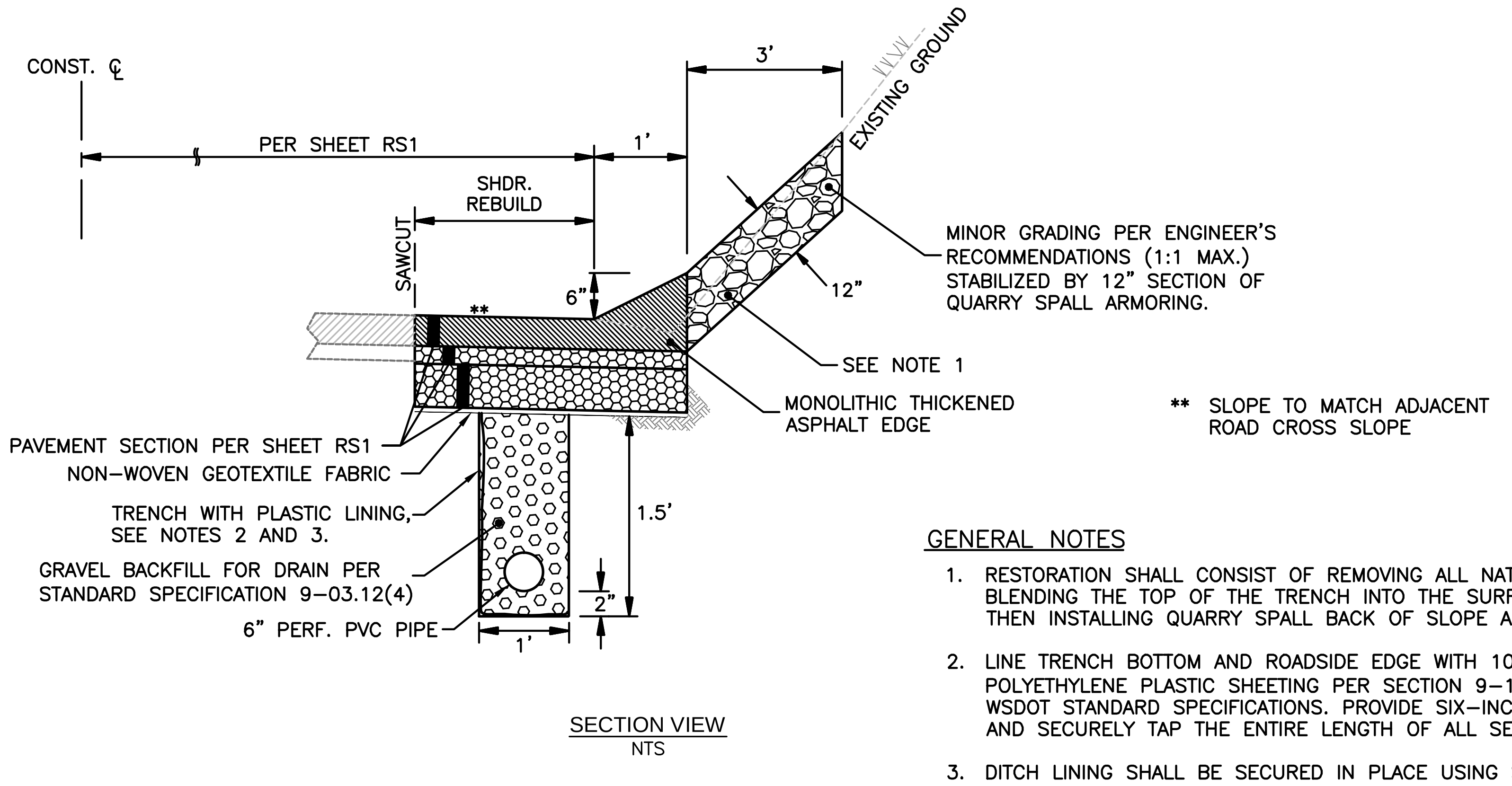


PLAN VIEW
NTS



** SLOPE TO MATCH ADJACENT ROAD CROSS SLOPE

SECTION VIEW
NTS

GENERAL NOTES

1. RESTORATION SHALL CONSIST OF REMOVING ALL NATIVE MATERIAL, BLENDING THE TOP OF THE TRENCH INTO THE SURROUNDING GRADE, THEN INSTALLING QUARRY SPALL BACK OF SLOPE ARMORING.
2. LINE TRENCH BOTTOM AND ROADSIDE EDGE WITH 10–MIL THICK POLYETHYLENE PLASTIC SHEETING PER SECTION 9–14.5(3) OF THE WSDOT STANDARD SPECIFICATIONS. PROVIDE SIX–INCH OVERLAP ALONG AND SECURELY TAP THE ENTIRE LENGTH OF ALL SEAMS.
3. DITCH LINING SHALL BE SECURED IN PLACE USING SECTION D OF WSDOT STANDARD PLAN I–60.20–01. NO FASTENERS OR ANCHORS THAT PUNCTURE THE LINING SHALL BE PERMITTED.

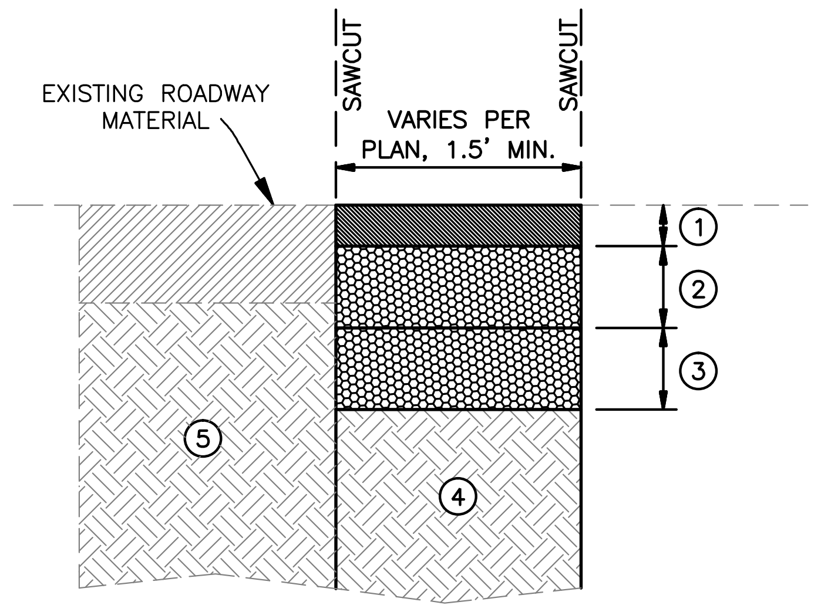
ROADWAY CURTAIN DRAIN DETAIL ①
NTS

TRENCH NOTES

① – 4" HOT MIX ASPHALT CL. 1/2" PG64–22 (2 LIFTS)
② – 8" CRUSHED SURFACING BASE COURSE
③ – CRUSHED SURFACING BASE COURSE AS NECESSARY TO PREPARE THE ROADWAY SECTION
④ – EXISTING ROADWAY SUBGRADE COMPACTED TO 95% OF MAXIMUM DENSITY PER ASTM D–1557.
⑤ – UNDISTURBED EXISTING ROADWAY SUBGRADE.

GENERAL NOTES

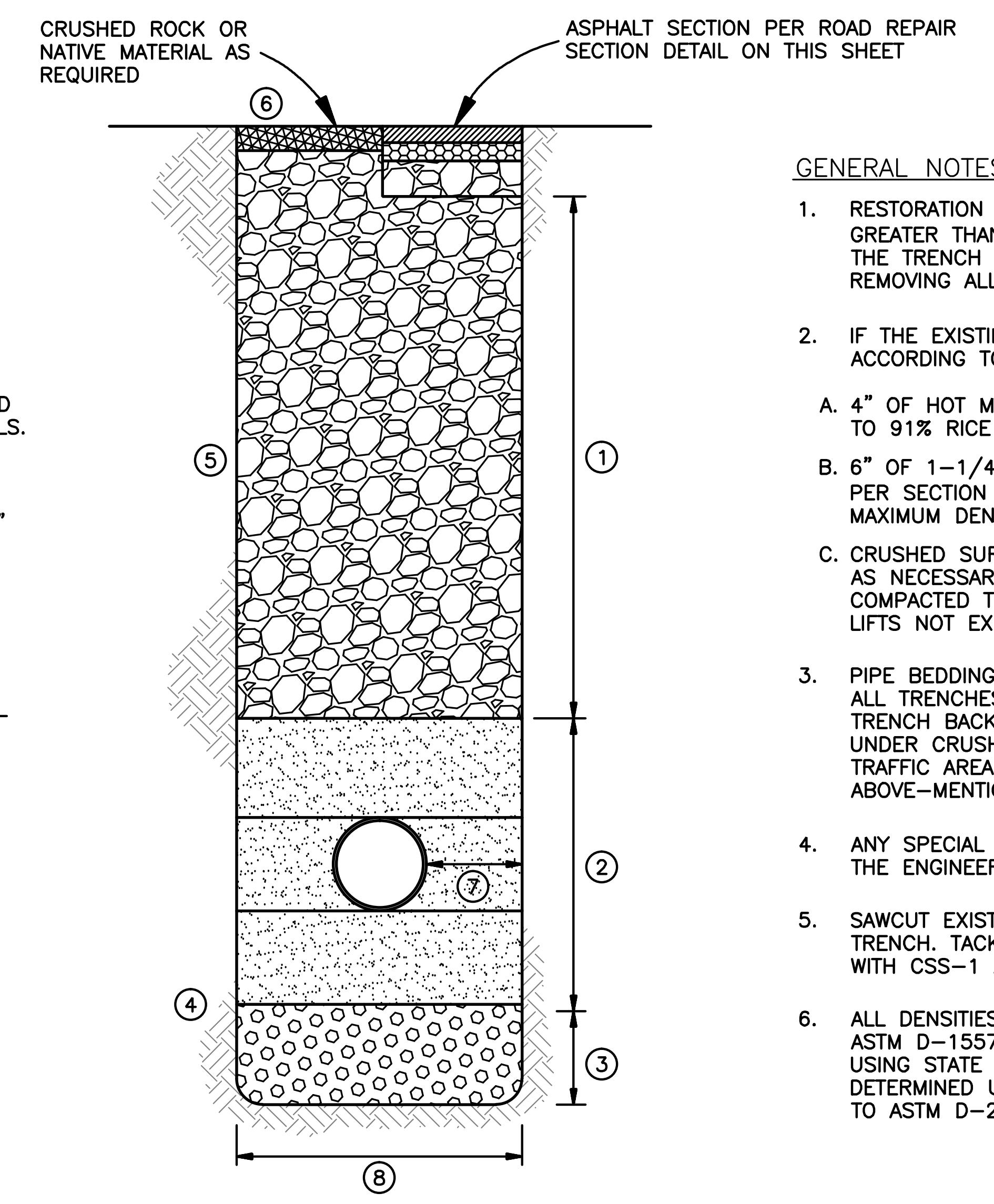
1. ANY SPECIAL CONDITIONS MUST FIRST BE APPROVED BY THE ENGINEER.
2. ALL DENSITIES FOR GRAVEL SHALL BE PROCTORED USING ASTM D–1557. ASPHALT SHALL BE PROCTORED USING STATE APPROVED METHODS. DENSITIES SHALL BE DETERMINED USING A NUCLEAR DENSOMETER CONFORMING TO ASTM D–2950.
3. ALL DEPTHS SHOWN ARE COMPACTED DEPTHS.
4. ALL GRAVEL MATERIALS TO BE COMPACTED TO 95% OF MAXIMUM DENSITY ABOVE A TWO–FOOT DEPTH.



ROAD REPAIR SECTION ②
NTS

TRENCH NOTES

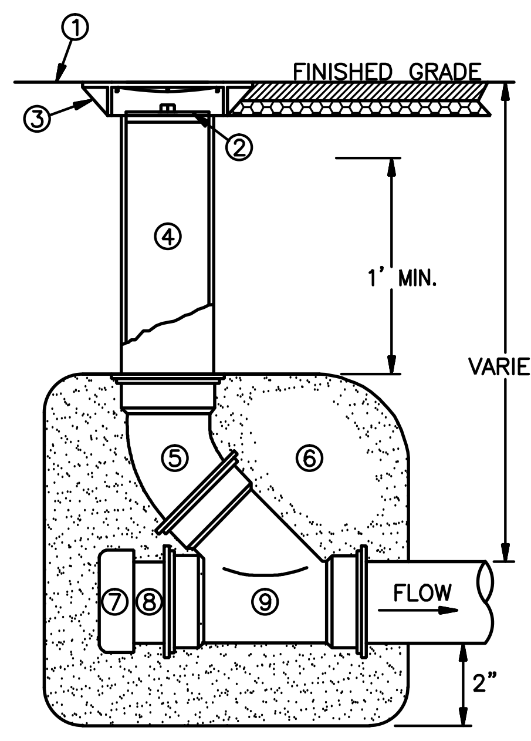
① – GRAVEL BORROW, PER SECTION 9–03.14, PLACED IN LOOSE LIFTS NOT EXCEEDING 6" IN DEPTH AND COMPACTED TO A MINIMUM OF 95% MAXIMUM DENSITY AT LOCATIONS WHERE REQUIRED AND/OR SPECIFIED. NATIVE MATERIAL, WHERE DEEMED ACCEPTABLE BY THE GEOTECHNICAL ENGINEER, MAY BE USED IF PLACED IN LIFTS NOT EXCEEDING 12" AND COMPACTED TO A MINIMUM OF 90%.
② SEE STANDARD PLAN B–55.20–00 FOR PIPE ZONE BEDDING AND BACKFILL REQUIREMENTS FOR VARYING PIPE SIZES AND MATERIALS.
③ IN TRENCHES WITH SOFT, YIELDING MATERIAL, AS DIRECTED BY THE ENGINEER, THE CONTRACTOR SHALL OVER–EXCAVATE TO ONE–FOOT BELOW THE PIPE INVERT AND BACKFILL WITH 2–1/2" MINUS BALLAST AGGREGATE TO THE BOTTOM OF PIPE BEDDING PER STANDARD SPECIFICATION 9–03.9(1).
④ UNDISTURBED STABLE EARTH.
⑤ TRENCH LINE.
⑥ SURFACE RESTORATION SHALL BE IN ACCORDANCE WITH GENERAL NOTE 1.
⑦ 6" MINIMUM IN THE MANIFOLD TRENCH SYSTEM, 15" MINIMUM IN THE STORM SYSTEM WITHIN ROADWAYS.
⑧ SEE STANDARD SPECIFICATION 2–09.4 FOR TRENCH WIDTH REQUIREMENTS FOR VARYING PIPE SIZES.



UTILITY PIPE TRENCH DETAIL ③
NTS

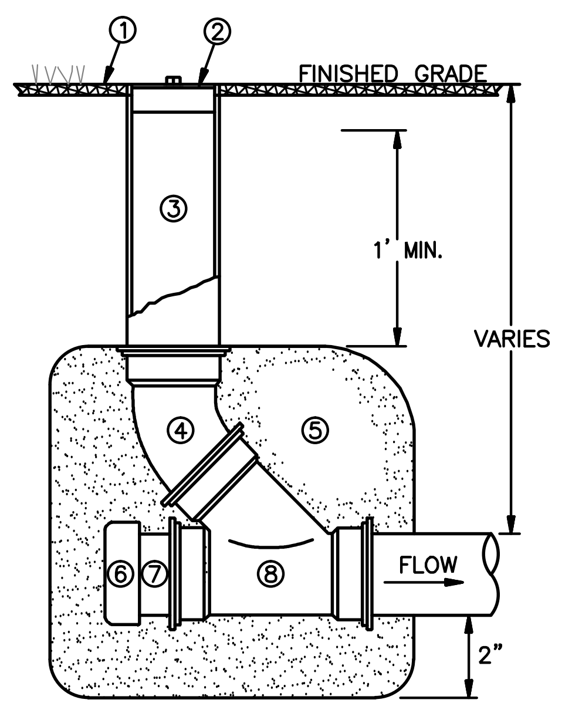
GENERAL NOTES

1. RESTORATION SHALL CONSIST OF REMOVING ALL ROCKS GREATER THAN 1" IN DIAMETER, BLENDING THE TOP OF THE TRENCH WITH THE SURROUNDING GRADE AND REMOVING ALL SPOILS FROM THE SITE.
2. IF THE EXISTING ASPHALT ROADWAY IS DISTURBED, REPAIR ACCORDING TO THE FOLLOWING REQUIREMENTS:
   - A. 4" OF HOT MIX ASPHALT PER SECTION 5–04, COMPACTED TO 91% RICE DENSITY
   - B. 6" OF 1–1/4" MINUS CRUSHED SURFACING BASE COURSE PER SECTION 9–03.9(3), TO BE COMPACTED TO 95% OF MAXIMUM DENSITY
   - C. CRUSHED SURFACING BASE COURSE PER SECTION 9–03.9(3), AS NECESSARY TO PREPARE THE ROADWAY SECTION, COMPACTED TO 95% OF MAXIMUM DENSITY. PLACE IN LOOSE LIFTS NOT EXCEEDING EIGHT INCHES.
3. PIPE BEDDING AND COVER MATERIAL SHALL BE USED IN ALL TRENCHES REGARDLESS OF LOCATION. GRAVEL BORROW TRENCH BACKFILL SHALL BE USED IN ALL TRENCHES UNDER CRUSHED ROCK, CONSTRUCTION AND PERMANENT TRAFFIC AREAS, AND WITHIN FOUR FEET OF THE ABOVE–MENTIONED CONDITIONS.
4. ANY SPECIAL CONDITIONS MUST FIRST BE APPROVED BY THE ENGINEER.
5. SAWCUT EXISTING ASPHALT ONE–FOOT BEYOND EDGE OF TRENCH. TACK COAT EDGE OF SAWCUT AND SEAL JOINT WITH CSS–1 AND SAND, APPLIED WITH HEAT.
6. ALL DENSITIES FOR GRAVEL SHALL BE PROCTORED USING ASTM D–1557 TESTING. ASPHALT SHALL BE PROCTORED USING STATE APPROVED METHODS. DENSITIES SHALL BE DETERMINED USING A NUCLEAR DENSOMETER CONFORMING TO ASTM D–2950.



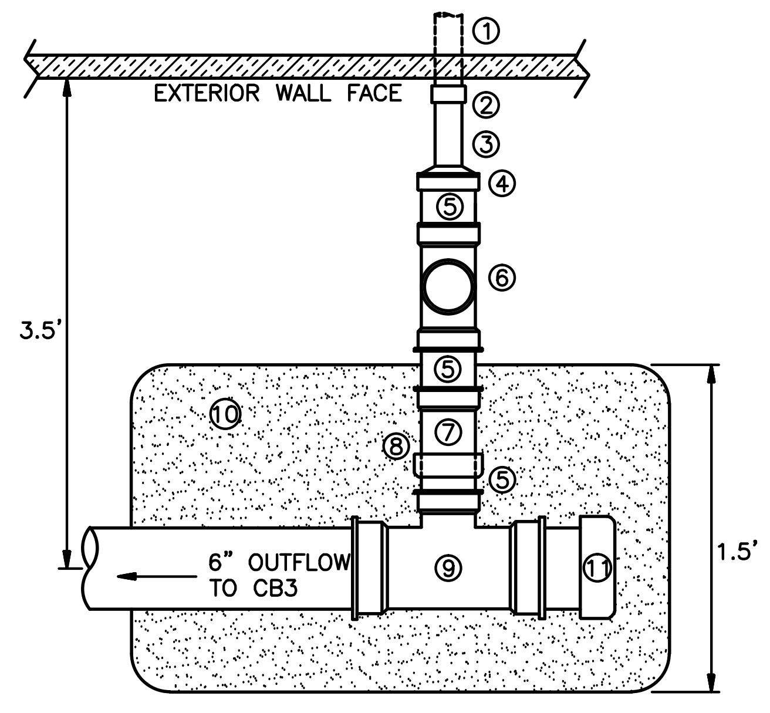
① RESTORATION SHALL BE IN ACCORDANCE WITH GENERAL NOTE 1 FOUND ON THIS PLAN SHEET
② THREADED PVC PLUG
③ ALUMINUM OR CAST IRON FOG–TIGHT VALVE CASING COVER OR EQUAL. LID SHALL BE TRAFFIC TYPE WITH LOCKING BOLTS
④ PVC STAND PIPE – SIZE TO PLAN
⑤ PVC 45° BEND – SIZE TO PLAN
⑥ COMPACTED SAND
⑦ PVC CAP OR PIPE AS DEFINED ON DRAINAGE PLAN
⑧ SHORT PVC STUB – SIZE TO PLAN
⑨ PVC 45° WYE – SIZE TO PLAN

CLEANOUT ASSEMBLY DETAIL ④
INSTALLED IN TRAFFIC AREAS -- NTS



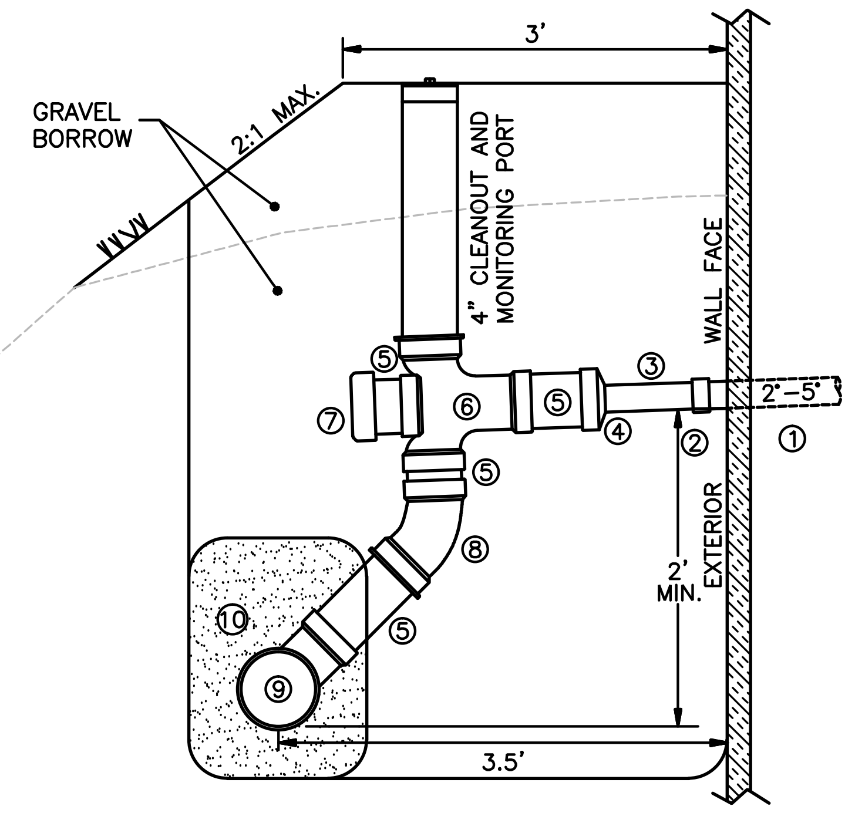
① RESTORATION SHALL BE IN ACCORDANCE WITH GENERAL NOTE 1 FOUND ON THIS PLAN SHEET
② THREADED PVC PLUG
③ PVC STAND PIPE – SIZE TO PLAN
④ PVC 45° BEND – SIZE TO PLAN
⑤ COMPACTED SAND
⑥ PVC CAP OR PIPE AS DEFINED ON DRAINAGE PLAN
⑦ SHORT PVC STUB – SIZE TO PLAN
⑧ PVC 45° WYE – SIZE TO PLAN

CLEANOUT ASSEMBLY DETAIL ⑤
INSTALLED IN NON-TRAFFIC AREAS -- NTS



① 2" SLOTTED PVC HORIZONTAL WALL DRAIN ELEV. PER SHEET W–3
② 2" PVC COUPLING
③ 2" SOLID WALL PVC STUB – FIELD FIT
④ 4"x2" PVC REDUCER
⑤ 4" SOLID WALL PVC STUB – FIELD FIT
⑥ 4" PVC DOUBLE WYE WITH 4" PVC MONITORING PORT PER CLEANOUT DETAIL ON THIS SHEET
⑦ 4" PVC STUB WITH 4" PVC CAP – FIELD FIT
⑧ 4" PVC 45° BEND
⑨ 6"x4" PVC TEE ANGLED VERTICALLY
⑩ TRENCHING PER UTILITY PIPE TRENCH DETAIL ON THIS SHEET.
⑪ 6" PVC STUB WITH 6" PVC CAP, WEST END TERMINUS ONLY.

MANIFOLD FITTING DETAIL ⑥
PLAN VIEW -- NTS



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Inspected By:
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43718

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ROAD AND STORM DETAILS AND NOTES

D1

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Checked By: J. TUTTLE
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Date:
Field Bk/Pg:
Datum:
Recorded Survey: SNOHOMISH COUNTY
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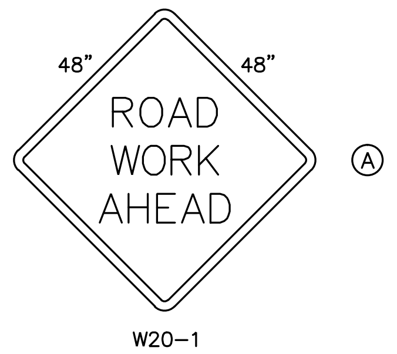
Aerial Mapping & Control Survey
Firm:
Date: JUNE 29, 2018
GIS Cntl Pnts:
Firm:
Date: JUNE 29, 2018
Field BK/PG:
Constructed By:
Date:

CONSTRUCTION NOTES

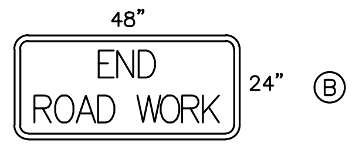
1. THIS PLAN ASSUMES DROP–OFFS OF MORE THAN TWO INCHES WILL NOT BE LEFT EXPOSED TO TRAFFIC DURING NON–WORKING HOURS. SEE STANDARD SPECIFICATION 1–07.23(1) FOR FURTHER GUIDANCE.
2. MINIMUM TEMPORARY ACCESS LANE WIDTH IS 10 FEET. ACTUAL WIDTHS AND OFFSETS MAY VARY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADJUST THE WORK AS NECESSARY WITH APPROVAL FROM THE PROJECT ENGINEER.
3. "MOTORCYCLES USE EXTREME CAUTION" SIGNS (W21–1701) SHALL BE INSTALLED THROUGHOUT THE WORK ZONE WHEN THE FOLLOWING SIGNIFICANT CONDITIONS EXIST:
   - GROOVED PAVEMENT
   - ABRUPT LANE EDGE
   - STEEL PLATES
   - LOOSE GRAVEL OR EARTH
4. SPECIFIC SIGNS FOR EACH OF THE CONDITIONS NOTED ABOVE SHALL BE INSTALLED ALONG WITH A "MOTORCYCLES USE EXTREME CAUTION" SIGN.
4. FLAGGER STATIONS SHALL BE ILLUMINATED DURING HOURS OF DARKNESS.
5. AT THE CONCLUSION OF EACH WORKING DAY, THE CONTRACTOR SHALL RETURN THE ROAD TO SUCH A CONDITION THAT NORMAL TRAFFIC PATTERNS AREA REESTABLISHED.
6. PROVISIONS MUST BE MADE BY THE CONTRACTOR TO ENSURE DAILY ACCESS AND DELIVERY OF GOODS AND SERVICES TO THE EXISTING ADJACENT RESIDENCES ARE MAINTAINED THROUGHOUT THE CONSTRUCTION WITH NO DELAYS BEING CREATED.
7. IF SIGNS ARE IN PLACE FOR MORE THAN THREE WORKING DAYS, THEN THEY SHALL BE POST MOUNTED. SEE STANDARD PLAN K–80.10–01.
8. TEMPORARY MARKINGS, AS APPROVED BY THE PROJECT ENGINEER, CAN BE USED AS NECESSARY. SEE STANDARD PLAN K–70.20–01.
9. ONE LANE OF TRAFFIC SHALL BE MAINTAINED ON 61ST PLACE WEST AT ALL TIMES UNLESS OTHERWISE APPROVED BY THE PROJECT ENGINEER.
10. CHANNELIZATION DEVICES IN TAPERS SHALL BE TRAFFIC SAFETY DRUMS WITH A MINIMUM OF SIX TRAFFIC DRUMS PER LANE TAPER. CHANNELIZATION DEVICES SHALL BE SPACED AT A MINIMUM OF 30 FEET ON CENTER.
11. CHANNELIZING DEVICES ARE TO BE EXTENDED TO A POINT WHERE THEY ARE VISIBLE TO APPROACHING TRAFFIC.
12. OTHER WARNING SIGNS, SUCH AS LOOSE GRAVEL, BUMP, ABRUPT PAVEMENT EDGE, ETC. MAY BE USED AS NECESSARY.

LEGEND

→	CURRENT DIRECTION OF TRAVEL
▨	ESTIMATED WORK AREA
◂	CLASS "A" CONSTRUCTION SIGN
▷	CLASS B SIGN
⊗	CHANNELIZATION DEVICES
⚑	FLAGGING STATION
NTS	NOT TO SCALE



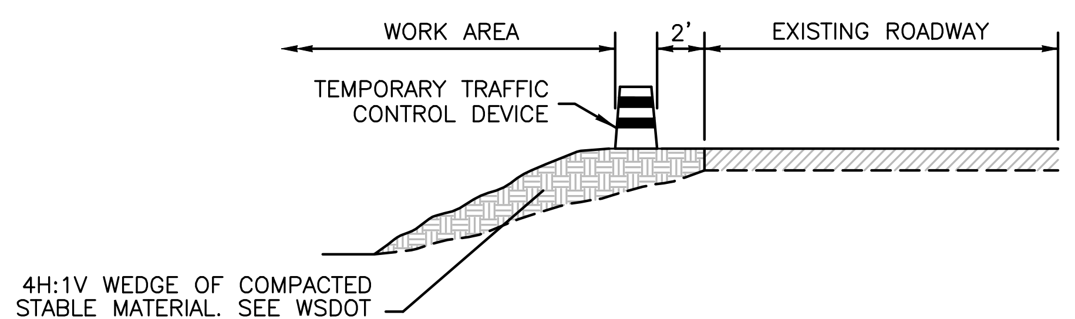
W20–1
BLACK ON ORANGE



G20–2A
48" x 24"
BLACK ON ORANGE

GENERAL NOTES

1. THE PHASING SHOWN ON THIS DRAWING IS ONE STRATEGY. THE CONTRACTOR MAY SUBMIT AN ALTERNATE TRAFFIC CONTROL PHASING PLAN WITH CONTRACTOR–DEFINED TRAFFIC CONTROL PER STANDARD SPECIFICATION 1–10.2(2) IN ORDER TO SHOW TRAFFIC CONTROL STRATEGIES THAT RESPOND TO LOW SPEED SHOULDER CLOSURES, LOW SPEED SINGLE–LANE CLOSURES, AS WELL AS COMPLETE ROAD CLOSURES.
2. ALL TEMPORARY ROADWAY STRIPING AND SIGNING SHALL BE SHOWN ON THE CONTRACTOR–PROVIDED TRAFFIC CONTROL PLAN.
3. COORDINATE STAGED IMPROVEMENTS WITH ALL UTILITY WORK.
4. THE CONTRACTOR SHALL ADJUST CHANNELIZATION DEVICES AS NEEDED TO SUIT TRAFFIC AND VISIBILITY CONDITIONS. REVISED LAYOUTS SHALL BE APPROVED BY THE PROJECT ENGINEER.
5. SIGNS WITHIN WORK AREAS SHALL BE IN ACCORDANCE WITH WSDOT STANDARD PLANS AND THE MUTCD.
6. ACCOMPLISH ROAD CLOSURES PER WSDOT STANDARD PLAN K–80.20–00.
7. SEE WSDOT WORK ZONE TRAFFIC CONTROL PLAN TC1 FOR SINGLE–LANE CLOSURES WITH FLAGGER CONTROL.
8. SEE WSDOT WORK ZONE TRAFFIC CONTROL PLAN TC5 FOR SHOULDER CLOSURES GUIDANCE.



SHOULDER WORK AREA PROTECTION
(NOT TO SCALE)

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TRAFFIC CONTROL PLAN

TCP1

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Date:

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Field Bk/PG:

Firm:
Date: JUNE 29, 2018
GIS Cntl Pnts:

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Date:
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Datum:

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XREF Filename:
Filename:

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FIGURE 2
WETLAND BUFFER IMPACTS PLAN

WM1

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Date:

NO.	DATE	BY	REVISION

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Vert: N/A
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Date: JULY 12, 2018

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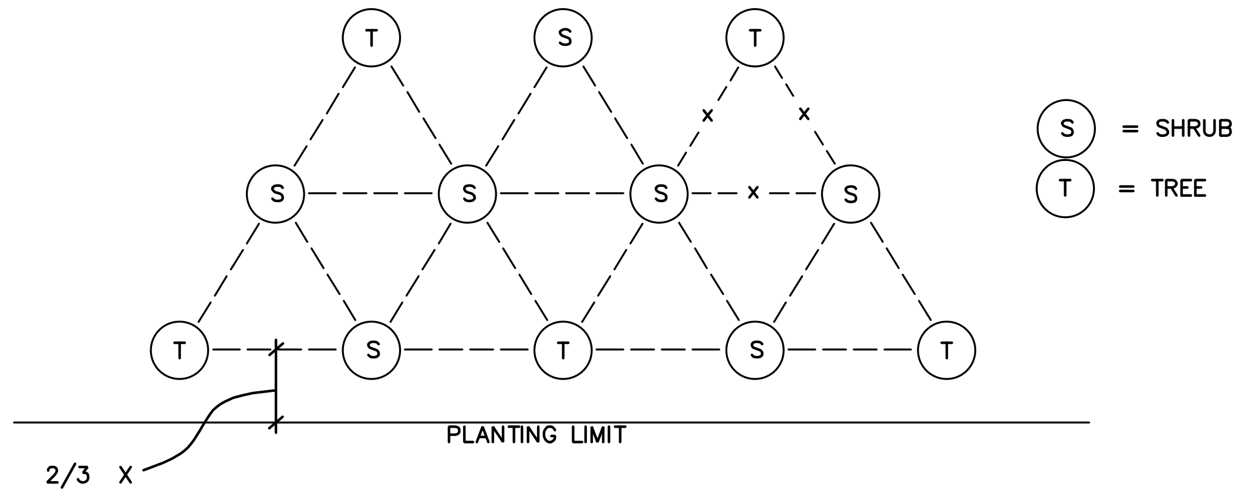
FIGURE 3
WETLAND BUFFER ENHANCEMENT PLAN

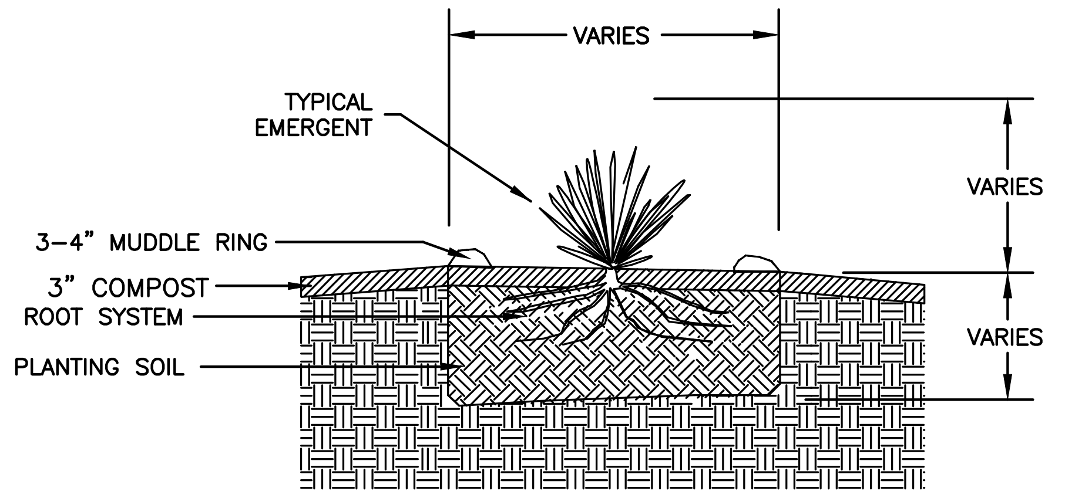
WM2



NOTES:
1. GROUP LIKE SHRUBS IN GROUPS OF 3, 5 OR 7.
2. TREES SHOULD NOT BE PLACED NEXT TO EACH OTHER.

TYPICAL PLANT SPACING DETAIL

X = PLANT SPACING

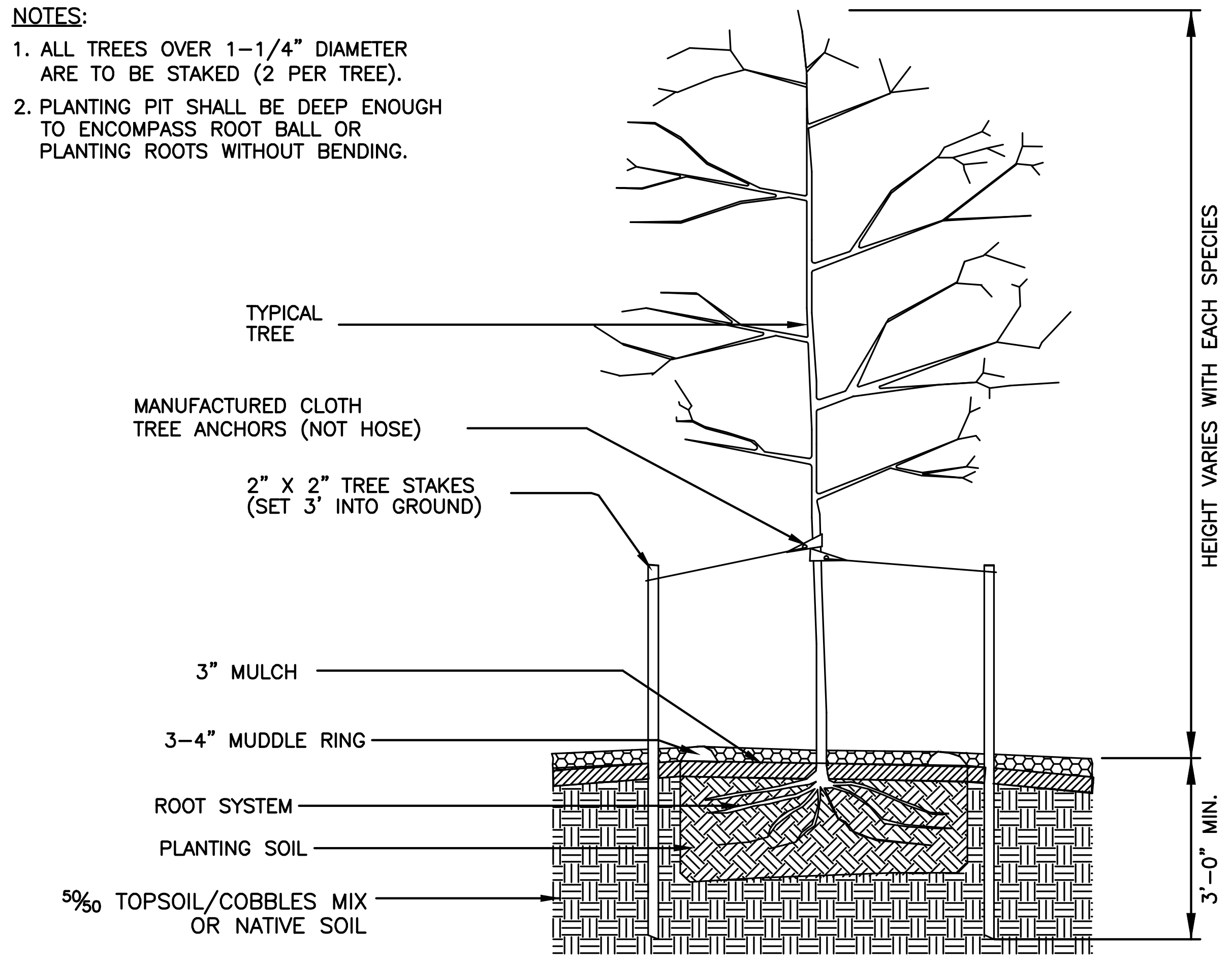


HERBACEOUS PLANTING DETAIL

NOT TO SCALE

NOTES:
1. PLANTING PIT SHALL BE DUG DEEP ENOUGH TO ENCOMPASS PLANTING ROOTS WITHOUT BENDING.

NOTES:
1. ALL TREES OVER 1-1/4" DIAMETER ARE TO BE STAKED (2 PER TREE).
2. PLANTING PIT SHALL BE DEEP ENOUGH TO ENCOMPASS ROOT BALL OR PLANTING ROOTS WITHOUT BENDING.



BARE ROOT OR POTTED DECIDUOUS OR EVERGREEN TREE AND SHRUB PLANTING DETAIL

NOT TO SCALE

Common Name	Scientific Name	Type	Size	Spacing	Zone 1 Qty
Trees					
Shore Pine	*Pinus contorta*	Bare root/potted	18"	5'	5
Red Alder	*Alnus rubra*	Bare root/potted	18"	5'	5
Service Berry	*Amelanchier alnifolia*	Bare root/potted	18"	5'	5
Beaked Hazelnut	*Corylus cornuta*	Bare root/potted	18"	5'	10
				Tree Total	**25**
Common Name	**Scientific Name**	**Type**	**Size**	**Spacing**	**Zone 1 Qty**
Shrubs/Ground Cover					
Evergreen Huckleberry	*Vaccinium ovatum*	Bare root/potted	12"	5'	20
Indian Plum	*Oemleria cerasiformis*	Bare root/potted	12"	5'	20
Vine Maple	*Acer circinatum*	Bare root/potted	12"	5'	20
Snowberry	*Symphoricarpos albus*	Bare root/potted	12"	5'	20
Sword Fern	*Polystichum munitum*	Bare root/potted	12"	5'	20
				Shrub Total	**100**
				Total Plantings	**125**

TREE AND SHRUB PLANTING SCHEDULE

SE FIGURES 2 AND 3 FOR AREAS

GENERAL NOTES

1. PLANTING AREA INCLUDES ENTIRE GROUND SURFACE REGARDLESS OF SURFACE COVER BETWEEN PLANTS.
2. SPACING ALL PLANTS IRREGULARLY AT THE DESIGNATED LOCATIONS AND SPACING, FOR NATURAL APPEARANCE. INTERMIX SPECIES GROUPS IN GROUPS OF THREE, FIVE, OR SEVEN.
3. PLANT MATERIAL SHALL CONFORM TO AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z601–2001) FOR PLANT SIZE AND CONDITION FOR SPECIFIED MATERIAL.
4. PLANT MATERIAL SHALL BE LOCALLY GROWN (PUGET SOUND REGION) AND SHALL BE IN HEALTHY AND VIGOROUS GROWING CONDITION.
5. PLANTS LOCATED ON THE PLAN ARE SCHEMATIC AND MAY NEED ADJUSTMENT TO MEET ACTUAL FIELD CONDITIONS. WHEN A CONFLICT WITH FIELD CONDITIONS IS APPARENT, CONSULT WITH THE PROJECT ENGINEER.
6. SUBSTITUTIONS OF PLANT SPECIES OR SIZES MAY BE PERMITTED BASED ON PLANT AVAILABILITY, BUT ONLY WITH PRIOR APPROVAL BY THE MITIGATION CONSTRUCTION MONITOR.

PLANTING SEQUENCE

1. PREPARE SITE BY ADDING 1 INCH OF COMPOST AND 3 INCHES OF MULCH TO ZONE 1.
2. REMOVE ALL INVASIVE PLANTS FROM ZONE 1 BEFORE PLANTING.
3. LAYOUT PLANTS IN PLANTING AREA BEFORE DIGGING PITS.
4. DIG A PLANT FOR EACH PLANT THAT IS TWICE THE SIZE OF THE ROOT BALL OR PLANT CONTAINER. REMOVE LARGE ROCKS AND OTHER DEBRIS FROM PIT. SOAK PIT WITH WATER BEFORE PLANTING.
5. "ROUGH UP" ROOTS OF THE PLANTS AND PRUNE OR STRAIGHTEN CIRCLING ROOTS. INSTALL PLANT IN THE PIT.
6. FORM A BASIN TO HOLD WATER AROUND THE PLANT USING REMAINING SOIL AND MULCH TO FORM A MULCH RING A MINIMUM OF 3 INCHES IN DIAMETER AROUND STEM.
7. WATER THE PLANT AGAIN FILLING THE SMALL BASIN FORMED IN STEP 6.

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FIGURE 4
WETLAND BUFFER
PLANTING DETAILS

WM3

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ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies and reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals: [help]

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background [help]

1. Name of proposed project, if applicable: [help]

   61st Place West Retaining Wall Project

2. Name of applicant: [help]

   City of Mukilteo Public Works Department
   Randall Roberts, P.E. - Capital Projects Engineer

3. Address and phone number of applicant and contact person: [help]

   City of Mukilteo
   Randall Roberts, P.E. - Capital Projects Engineer
   11930 Cyrus Way
   Mukilteo, WA 98275
   425-263-8084

4. Date checklist prepared: [help]

   April 30, 2018

5. Agency requesting checklist: [help]

   City of Mukilteo

6. Proposed timing or schedule (including phasing, if applicable): [help]

   July 2018 - 100% design complete with Plans, Specifications, and Cost Estimate (PS&E). Advertisement of the project for contractor bids is tentatively scheduled for late Spring 2018 pending environmental permit approvals. Construction is expected to begin in the Fall of 2018 pending acquisition of temporary construction easements.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. [help]

   Not anticipated.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal. [help]

   Northwest Environmental Consulting, a subconsultant to Tuttle Engineering and Management, will prepare a memo documenting how the project will fall under the Categorical Exclusion from NEPA for submission with a Biological Evaluation (BE) to FEMA for review. Memo will address the following, as applicable:

   1. Biological Resources
   2. Climate and Air Quality
   3. Geology/Soils
   4. Hazardous Materials
   5. Historic Preservation

6. Socio-Economic Issues
7. Water Resources
8. A Critical Areas Report addressing wetland delineation and mitigation was also prepared.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. [help]

NEPA application has not yet been submitted for regulatory review.

10. List any government approvals or permits that will be needed for your proposal, if known. [help]

a. NEPA approval (anticipated Documented Categorical Exclusion)
b. Right of Way Permit (City review)
c. City of Mukilteo Engineering Permit

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.) [help]

A retaining wall along the 61st Place West roadway has suffered damage, and the road is at risk of failure. This roadway serves as the only access to adjacent residential properties, as well as the Mukilteo Water and Wastewater District's regional sewer lift station located north and downhill of the wall system. The project's goal is to maintain this access by repairing existing damage and preventing future failure of the road.

This project proposes to repair and reinforce an existing 90-foot-long, soldier pile retaining wall and associated roadway. The proposed work is located within the western region of the City of Mukilteo overlooking Possession Sound. This project will be designed and constructed using FEMA's Severe Repetitive Loss Program Hazard Mitigation Grant funds.

In addition to repairing and reinforcing the existing soldier pile wall, the wall will be extended by an additional 30-40 feet at each end. This project will also repair a segment of the existing roadway that has failed adjacent to the existing wall and install surface and subsurface stormwater management systems to collect roadway runoff and groundwater, which will enhance stability to existing steep slopes. To strengthen the existing wall, tie-back anchors and walkers will be installed at the face of the wall and will extend under the roadway and uphill slope to an appropriate bonded length of approximately 55 feet. Additionally, subsurface drains will extend under the roadway and uphill slope to an approximate length of 80 feet to 120 feet. Quarry spall slope armoring will be placed within 3 feet of the back of shoulder to stabilize the existing toe of cut-slopes.

After construction, disturbed vegetated areas will be restored, and areas within critical area buffers will be restored with plantings to meet the City of Mukilteo critical areas regulations.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist. [help]

The location of the project is near the south end of the 61st Place West roadway, in the Northwest Quarter of Section 17, Township 28 North, Range 4 East, Willamette Meridian, Snohomish County, Washington.

See the attached Project Limits Plan.

B. ENVIRONMENTAL ELEMENTS [help]

1. Earth [help]

a. General description of the site: [help]

(circle one): Flat, rolling, [✓ hilly], steep slopes, mountainous, other:

The physical topography ranges from flat to hilly (0-20%) along the roadway profile with moderate to steep, vegetated slopes on both sides of the existing roadway.

b. What is the steepest slope on the site (approximate percent slope)? [help]:

Northside slope (downhill from roadway grade) = approximately 2H:1V (50%)
Southside slope (uphill from roadway grade) = approximately 1H:1V (100%)

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils. [help]

Soils in the immediate area consist of:

1. Colluvium/Fill: Soft to medium stiff silt with sand and pockets of organics that is wet to saturated and with isolated blocky zones and slickensides.

2. Transition Zone: Silt with partings to lenses of fine sand, occasional zones of finely laminated silt and very fine sand, typically moist with isolated wet zones, with blocky zones and slickensides.

3. Glacial Silt: Silt with isolated zones of interbedded lenses to layers of fine sand. Slickensides and blocky textures indicating deformation or sliding were not observed in this unit.

The project intends to remove existing soils, then as required, replace them with structural backfill.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. [help]

Yes, in January 1997 a slide impacted approximately 65 feet of 61st Place West roadway. Following this event, the City of Mukilteo contracted a geotechnical engineering consultant to conduct a geotechnical investigation and provide recommendations for stabilizing the road. A soldier pile wall was constructed in 1998.

In the spring of 1999, shortly after construction was completed, additional deformation of the slope occurred in front of the wall. The slope in front of the wall slid again in March 2011, further compromising the stability of the soldier pile wall.

In 2012, the City of Mukilteo again contracted a geotechnical consultant to conduct updated geotechnical investigations and services to evaluate the site conditions and provide rehabilitation alternatives for the wall and slide in order to stabilize the roadway.

In 2017, the slope on the south side of the roadway slid into the eastbound lane prompting closure of the road.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill. [help]

For the roadway, utility, and wall repair improvements, an approximate excavation quantity of 1,100 cubic yards and an approximate fill quantity of 1,500 cubic yards is expected and will be derived from stripping the site of native vegetation, installing stormwater facilities, repairing and lengthening the existing soldier pile retaining wall, rebuilding paved roadway shoulders, and installing slope armoring.

a. Filling: 1,500 CY
b. Excavation: 1,100 CY
c. Source of Fill: Material will be provided by a local source and will conform to the material specifications for gravel backfill for walls, gravel borrow, crushed surfacing, quarry spalls and hot mix asphalt as identified in the current WSDOT Standard Specifications.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. [help]

The likelihood of on-site erosion is small. Prior to any land disturbing activities, erosion control measures, as defined on an erosion control plan, will be installed. Existing vegetation will be maintained to the largest extent possible and care will be taken to protect existing storm drain systems located within public rights-of-way.

The on-site soil will likely be susceptible to erosion, thus all efforts will be made to limit construction during periods of wet weather. However, if construction occurs during wet weather, erosion control measures should be implemented prior to construction and in conformance with the Washington State Department of Ecology Best Management Practice Standards.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? [help]

This project does not intend to augment the impervious surface within the project area. This project will strengthen the existing retaining wall and repair the existing roadway surface that has failed in the shoulder area adjacent to the wall and in those areas temporarily disturbed during installation of new stormwater management facilities.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: [help]

Immediately before site work begins, high visibility silt fence will be installed to protect off-site properties and to delineate work areas. Prior to stripping of the native ground, existing drainage features will be protected with catch basin inserts or any other Washington State Department of Ecology approved Best Management Practices.

A construction entrance will be installed to stage equipment and to provide access to wall repair areas from existing paved roadway surfaces. Any areas disturbed by this or any other construction activities that are potentially susceptible to erosion will be temporarily seeded and fertilized, as weather conditions dictate. Existing vegetation will be maintained to its largest extent possible during construction. An erosion control plan will be developed and approved by the City of Mukilteo prior any site disturbing activities.

2. Air [help]

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known. [help]

Construction vehicles and equipment may generate a minimal increase in emissions during construction. Minimal vehicular traffic will use daily the completed project.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. [help]

None known.

c. Proposed measures to reduce or control emissions or other impacts to air, if any: [help]

Equipment will not be left idling when not in active use. The site will be watered for dust abatement during construction.

3. **Water** [help]

a. Surface Water:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. [help]

Yes, one wetland was identified downslope (north) of the project area. The City of Mukilteo rates wetlands based on the Washington State Department of Ecology's 2014 Wetland Rating System for Western Washington (see City of Mukilteo Municipal Code (MMC) section 17.52B.090). The City determines wetland buffer widths based on a combination of the Category rating and the specific habitat score from Ecology's rating system (MMC 17.52B.100).

This wetland is categorized as a Type III forested wetland with a specific habitat score of 4. Based on these metrics, the wetland has a 60-foot buffer width that extends up to the 61st Place West roadway and retaining wall. This wetland buffer does not extend across the roadway.

The wetlands water source appears to be seepage emerging near the surface at the slope surface. The wetland extends downslope from the seepage points and includes indications of unstable soils.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. [help]

Yes, though no work will be performed within the existing wetland. Construction activity is expected within the 60-foot wetland buffer zone and exclusively conducted within a 15-foot temporary construction easement adjacent to the roadway. The construction easement limit is approximately 25 feet from the nearest edge of the wetland.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material. [help]

None expected.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. [help]

Since surface water and groundwater seepage is a causative factor for initiating past slope movements, the additional stabilizing measures this project will implement include improving the surface drainage away from the slide area and decreasing groundwater levels. This project intends to capture surface and subsurface water by constructing curtain drain trenches along the edge of the roadway, as well as installing horizontal subsurface drains through the wall and under the roadway and uphill slope. This water will then be directed to a new conveyance system that will ultimately connect to the existing conveyance system downhill from the project area.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. [help]

No.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge. [help]

No.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known. [help]

No.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. [help]

None.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. [help]

Stormwater from rainfall is the primary source of runoff. This project intends to capture surface and subsurface water by constructing curtain drain trenches along the edge of the roadway, as well as installing horizontal subsurface drains under the roadway and uphill slope. This water will then be directed to a new conveyance system that will ultimately connect to the existing conveyance system downhill from the project area.

2) Could waste materials enter ground or surface waters? If so, generally describe. [help]

No.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe. [help]

Yes. With the installation of longitudinal curtain trench drains along the roadway edge and traverse subsurface drains under the road and uphill slope, surface and subsurface water can be collected and routed to an enclosed storm drain conveyance system, reducing the negative impact on the retaining wall and existing slopes.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any: [help]

With the installation of longitudinal curtain trench drains along the roadway edge and traverse subsurface drains under the road and uphill slope, surface and subsurface water can be collected and routed to an enclosed storm drain conveyance system, reducing the negative impact on the retaining wall and existing slopes.

4. **Plants** [help]

a. Check the types of vegetation found on the site: [help]

_X_ deciduous tree: alder, maple, aspen, other
_X_ evergreen tree: fir, cedar, pine, other
_X_ shrubs
_X_ grass
____pasture
____crop or grain
____Orchards, vineyards or other permanent crops.
_X _wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: water lily, eelgrass, milfoil, other
_X_ other types of vegetation

Shrubs and herbs include; Sword Fern, Salmonberry, Red Huckleberry, Trailing Blackberry, and Himalayan Blackberry, with patches of Horsetail and Fringecup.

b. What kind and amount of vegetation will be removed or altered? [help]

Approximately 0.2 acres of disturbance is expected during construction. Any vegetation that is disturbed will be restored using seed mixes. Any vegetation that is to be removed will be stabilized with seeding or will be replaced with structural roadway materials to provide long-term stability for the roadway. Wetland buffer areas disturbed will be restored (planted) with native tree, shrub, and plant species. A few immature trees may be removed in areas where the soil is already destabilized by the wall failure.

c. List threatened and endangered species known to be on or near the site. [help]

No threatened/endangered plant species are known to exist in the vicinity of the project. Species listed in the DNR Natural Heritage Database are generally associated with previously undisturbed areas and have not been observed at the site.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: [help]

Any vegetation that is disturbed will be restored using seed mixes. Wetland buffer areas disturbed will be restored (planted) with native tree, shrub, and plant species.

e. List all noxious weeds and invasive species known to be on or near the site. [help]

None known.

5. **Animals** [help]

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site. Examples include: [help]

birds: hawk, heron, eagle, songbirds, other:	Hawk and Songbirds
mammals: deer, bear, elk, beaver, other:	Squirrel and rabbit
fish: bass, salmon, trout, herring, shellfish, other:	None

b. List any threatened and endangered species known to be on or near the site. [help]

None observed. Species potentially using the site include streaked horned larks, yellow-billed cuckoos, and marbled murrelets. Murrelets would be associated with the water where they are known to dive for food. The other bird species have not been observed at the site and would be unlikely to nest in the area.

c. Is the site part of a migration route? If so, explain. [help]

Yes, the site is within the north-south Pacific Flyway.

d. Proposed measures to preserve or enhance wildlife, if any: [help]

All disturbed areas will be restored. Disturbed areas within the wetland buffer will be enhanced with native trees and shrubs.

e. List any invasive animal species known to be on or near the site. [help]

None known.

6. **Energy and Natural Resources** [help]

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc. [help]

Not applicable. The completed project will have no energy needs.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. [help]

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any: [help]

None are proposed.

7. **Environmental Health** [help]

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe. [help]

The use of construction vehicles and equipment can potentially lead to accidental spills of hydraulic fluids, diesel fuels and gasoline. The City of Mukilteo construction contract requires a spill prevention and countermeasures plan be developed by the contractor and submitted to the City prior to construction commencing.

1) Describe any known or possible contamination at the site from present or past uses. [help]

None known.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity. [help]

None known.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project. [help]

Hydraulic fluids, diesel fuels, and gasoline will be present during construction.

4) Describe special emergency services that might be required. [help]

No special emergency services are anticipated. Because the project is in the vicinity of unstable soils, the Health, Safety and Emergency Response Plan that addresses potential hazards unique to the site.

5) Proposed measures to reduce or control environmental health hazards, if any: [help]

The contractor is required to adhere to Occupational Safety and Health Administration (OSHA), Washington Industrial Safety and Health Act (WISHA) guidelines, state law, and specifications of this proposal in the application of construction methods and in the use of all construction equipment on this project.

b. Noise [help]

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)? [help]

Low-volume roadway traffic, aircraft, and rural noises are present in the area, but are not anticipated to affect the project.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site. [help]

Pile installation for wall extensions, drilling for wall tie-backs and horizontal drains, excavation for new storm drainage facilities, and paving of new roadway surfaces will be heard during construction. Construction equipment will include generators, backhoes, excavators, pavers, trucks, and service vehicles.

Short Term: During construction, normal workdays will be 7AM to 6PM Monday through Friday and will include noise generated by construction equipment. The duration of construction is approximately 6-8 weeks.

Long Term: No noise increases are expected as a result of the improvements.

3) Proposed measures to reduce or control noise impacts, if any: [help]

Construction will be limited to normal work day hours in accordance with the City of Mukilteo Municipal Code.

8. Land and Shoreline Use [help]

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe. [help]

The 61st Place West roadway provides access to adjacent residential properties. The project improvements lie within the 61st Place West roadway right-of-way and will not affect current land use. However, the proposed subsurface horizontal drains will require a “Subsurface Slope Stabilization Easement” as these drains will be installed under the roadway and uphill slope, and extend beyond the roadway right-of-way, to a depth of approximately 40’-60’ below the private property surface. A temporary construction easement has been secured to access and repair the existing wall. Any disturbed areas will be reseeded or replanted to ensure no negative effects are experienced on adjacent properties.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use? [help]

No.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how: [help]

No.

c. Describe any structures on the site. [help]

Existing site structures include the 61st Place West roadway, a soldier-pile retaining wall, roadway drainage structures, and surface utility features.

d. Will any structures be demolished? If so, what? [help]

Yes, two short sections of block wall (at the end of the existing pile wall) will be removed to provide room for new, structurally-designed soldier pile wall sections.

e. What is the current zoning classification of the site? [help]

Public right-of-way and "RD 12.5 Single Family Residential".

f. What is the current comprehensive plan designation of the site? [help]

Public right-of-way and "Single Family Residential – Low Density".

g. If applicable, what is the current shoreline master program designation of the site? [help]

Not applicable.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify. [help]

A wetland exists downslope from the project improvements. This wetland is categorized as a Type III forested wetland with a specific habitat score of 4. Based on these metrics, the wetland has a 60-foot buffer width that extends up to the 61st Place West roadway and retaining wall.

This wetland buffer does not extend across the roadway. Though no work will be performed in the wetland, construction activity is expected within the 60-foot wetland buffer zone, and exclusively conducted within a 15-foot temporary construction easement adjacent to the roadway. The construction easement limit is approximately 20 feet from the nearest edge of the wetland.

The property is also in a geologically sensitive area subject to the requirements of MMC Chapter 17.52A entitled "Geologic Sensitive Area Regulations.

i. Approximately how many people would reside or work in the completed project? [help]

None.

j. Approximately how many people would the completed project displace? [help]

None.

k. Proposed measures to avoid or reduce displacement impacts, if any: [help]

Not applicable.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: [help]

Because this is a repair project and not new construction, land use will not change. The project will be reviewed by the City of Mukilteo and undergo SEPA review by stakeholder agencies.

m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any: [help]

Not applicable.

9. **Housing** [help]

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. [help]

None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. [help]

None.

c. Proposed measures to reduce or control housing impacts, if any: [help]

Not applicable.

10. **Aesthetics** [help]

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? [help]

Extensions to the existing wall will be approximately ten feet higher than the adjacent ground, but the cut-bank nature of the wall will have the reinforced retaining wall, and its extensions, extending only a few feet above the roadway surface.

b. What views in the immediate vicinity would be altered or obstructed? [help]

None.

c. Proposed measures to reduce or control aesthetic impacts, if any: [help]

Not applicable.

11. **Light and Glare** [help]

a. What type of light or glare will the proposal produce? What time of day would it mainly occur? [help]

None.

b. Could light or glare from the finished project be a safety hazard or interfere with views? [help]

No

c. What existing off-site sources of light or glare may affect your proposal? [help]

None.

d. Proposed measures to reduce or control light and glare impacts, if any: [help]

Not applicable.

12. **Recreation** [help]

a. What designated and informal recreational opportunities are in the immediate vicinity? [help]

None.

b. Would the proposed project displace any existing recreational uses? If so, describe. [help]

No

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: [help]

Not applicable.

13. **Historic and cultural preservation** [help]

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe. [help]

The Department of Architectural and Historical Preservation (DAHP)'s WISAARD database was consulted. No registered properties exist within a mile of the site.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources. [help]

The Point Elliott Treaty signing point is approximately 3 miles north of the site. No evidence of occupation has been found at the project site, and it should be noted that the area is already altered by road, retaining wall, and residential construction.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc. [help]

As stated in previous responses, the DAHP WISAARD database was consulted to find the nearest registered properties. The area is previously altered by road, retaining wall, and residential construction.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required. [help]

If during construction any evidence of archeological or historic resources are found, all work will be stopped, and a qualified professional will be consulted. The Washington State Department of Archeology and Historic Preservation and the office of the Tulalip Tribes will also be contacted and consulted to determine the correct course of action.

14. **Transportation** [help]

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any. [help]

The project site is served by 61st Place West roadway, which is accessed via 92nd Street S.W. and SR 525 (Mukilteo Speedway).

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop? [help]

No. The closest transit stop is on SR 525, approximately 1.2 miles east of the project site.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate? [help]

Not applicable.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private). [help]

No, however, surface and subsurface water erosion has also contributed to the failure of the roadway shoulder adjacent to the failing soldier pile wall, which will be improved in conjunction with the wall improvements.

e. Describe the existing condition of the proposed access road, including width of easement, width of pavement or roadway, curbs, gutters, and/or sidewalks.

The existing roadway pavement is in poor condition. The roadway varies between 18-30 feet in width, with no defined shoulder, no curb and gutter, no sidewalks. A roadside drainage ditch intermittently serves both sides of the roadway.

f. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe. [help]

No.

g. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates? [help]

It is expected that no additional vehicular trips per day will be generated by the project improvements.

h. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe. [help]

No.

i. Proposed measures to reduce or control transportation impacts, if any: [help]

Currently the 61st Place West roadway is closed to traffic due to unstable slopes within the project limits. It is anticipated that the roadway will remain closed until the improvements are implemented.

15. **Public Services** [help]

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe. [help]

No.

b. Proposed measures to reduce or control direct impacts on public services, if any. [help]

Not applicable.

16. **Utilities** [help]

a. Circle utilities currently available at the site: [help]

[✓ electricity], natural gas, [✓ water], [✓ refuse service], [✓ telephone], [✓ sanitary sewer], septic system,
other: ____________

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed. [help]

Other than improving the roadway storm drain conveyance system using conventional trench excavation and backfill techniques, no changes to the utilities within the project site are expected.

C. Signature [help]

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: ________________________________

Name of signee RANDALL ROBERTS

Position and Agency/Organization CAPITAL PROJECTS ENGINEER, CITY OF MUKILTEO

Date Submitted: JAN. 14, 2019

D. supplemental sheet for nonproject actions [help]

(**IT IS NOT NECESSARY** to use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Proposed measures to avoid or reduce such increases are:

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

3. How would the proposal be likely to deplete energy or natural resources?

Proposed measures to protect or conserve energy and natural resources are:

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

Proposed measures to protect such resources or to avoid or reduce impacts are:

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Proposed measures to avoid or reduce shoreline and land use impacts are:

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Proposed measures to reduce or respond to such demand(s) are:

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

Northwest
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Technical Memorandum

TO: **City of Mukilteo**

FROM: Kristin Noreen, Northwest Environmental Consulting, LLC

DATE: August 1, 2018

SUBJECT: **NEPA Determination of Categorical Exclusion**

PROJECT: 61st Place West Retaining Wall

ACTION DESCRIPTION

In 1996, a storm event occurred which resulted in a presidential declaration of a disaster in the region. Damage included a roadway failure on 61st Place West. At that time, the City used FEMA funds to repair the roadway, constructing a soldier pile wall centered on segmental block walls.

In March 2011, a landslide occurred below and north of the wall; the main scarp of the landslide was located at the base of two retaining walls on the north side of the road. The block wall collapsed and several feet of soil is now exposed below the soldier pile wall timber and plywood lagging. The ground displacement also resulted in the loss of the backfill between the wall piles, causing the roadway pavement to be undermined and fail. Portions of the segmental block wall and soldier pile wall appear to be intact, but the landslide main scarp appears to be within several feet of these structures.

The wall along the 61st Place roadway has suffered damage, and the road is at risk of complete failure. This roadway serves as the only access to adjacent residential properties, as well as the Mukilteo Water and Wastewater District's regional sewer lift station located north and downhill of the wall system. The project's goal is to maintain this access by repairing existing damage and preventing future failure of the road supports.

The City of Mukilteo proposes to reinforce 190 feet of the existing soldier pile wall with tiebacks and walers, install horizontal wall drains, reconstruct roadway shoulders, install new asphalt shoulder treatments, construct a new stormwater system to collect roadway runoff and groundwater, and install concrete barriers along the wall face. Prior to construction, topographic and boundary surveying and geotechnical investigations will be performed, temporary easements, and a right-of-way easement will be acquired. The acquisition is being on a sliver of property that the existing roadway is currently encroaching into.

After construction, disturbed vegetated areas will be restored, and designated critical areas will be restored to meet the City of Mukilteo critical areas regulations.

This project will be designed and constructed using FEMA's Severe Repetitive Loss Program Hazard Mitigation Grant funds.

The following sections detail various aspects of the project that have been considered in the State of Washington's SEPA (State Environmental Policy Act) environmental documentation. While the SEPA checklist is appended (A) to this document, these categories are also addressed below:

RESOURCES

Biological Resources

ESA listed species potentially using the site are bird species: streaked horned larks, yellow-billed cuckoos, and marbled murrelets. None of these species would be present in the site's secondary forest habitat:

- Murrelets are present in Puget Sound waters where they are known to forage. Murrelets fly inland to forest habitat for nesting, but require mature forest stands dominated by conifers and containing frequent platform features in the canopy. No such habitat is present at or near the site.
- Streaked horned larks require prairie habitat or sandy islands, and are currently known only in specific nesting areas within Washington. The Mukilteo area is not known to support the species, nor is suitable habitat present at the project site.
- Yellow-billed cuckoos were historically present in the Puget Sound lowlands but are now presumed to be extirpated in Washington. Only four sightings have occurred in Western Washington in the last 70 years. The species requires large areas (50-200+ acres) of continuous riparian forest containing cottonwoods or willows, with areas of dense shrub foliage. No such habitat is present around the project site.

Listed marine species may use Possession Sound at the bottom of the bluff. Project effects will not be widespread enough to affect these fish and marine mammal species. A Biological Evaluation was prepared for this project and is attached as Appendix B.

WDFW's Priority Habitats and Species map (WDFW 2018) does not show any state species of concern using the site.

Climate and Air Quality

Mukilteo is in the coastal zone of the Pacific Northwest. The climate is temperate, with mild winters and warm, but not hot, summers. Rainfall averages 39 inches per year, with the rainy season beginning in October and running through May.

Air quality in the region is monitored continuously by the Puget Sound Clean Air Agency. Air quality in Mukilteo is generally good, with prevailing breezes from the west bringing maritime air inland. Air quality can be affected by regional forest fires during the summer months.

There are no air quality considerations that would affect this project, nor are emissions anticipated to be a problem (Section 2, SEPA Checklist, Appendix A).

Geology/Soils

The project site is hilly and a landslide is responsible for the damage to the retaining wall. Landslides are common in the region during the winter, and the railroad tracks are often closed to clear slides.

A geotechnical report was prepared in July 2016 by GeoDesign to evaluate the original design proposal. The findings of the study indicated that the design, for which FEMA funding had already been approved, was not feasible due to unique site constraints. An alternative was recommended that will stabilize the roadway less expensively, without causing additional problems. The geotechnical report is attached as Appendix C.

Prior to any land disturbing activities, erosion control measures will be installed as described on an erosion control plan. Existing vegetation will be maintained to the largest extent possible, and care will be taken to protect existing storm drain systems located within public rights-of-way.

Efforts will be made to limit construction during periods of wet weather. However, if construction occurs during wet weather, erosion control measures would be implemented prior to construction and in conformance with the Washington State Department of Ecology's Best Management Practice Standards.

Hazardous Materials

There are no known sources of contamination on or near the site. Project activities are of low risk. The only hazardous materials that could be released would be mechanical fuels and fluids. The City of Mukilteo construction contract requires a spill prevention and countermeasures plan be developed by the contractor and submitted to the City prior to commencement of construction.

Historic Preservation

The Washington State Department of Archaeology and Historical Preservation (DAHP)'s WISAARD database was consulted. No registered properties exist within a mile of the site. The Point Elliott Treaty signing point is approximately 3 miles north of the site. No evidence of occupation has been found at the project site, and it should be noted that the area is already altered by road, retaining wall, and residential construction.

If during construction any evidence of archeological or historic resources are found, all work will be stopped, and a qualified professional will be consulted. The DAHP and the office of the Tulalip Tribes will be contacted and consulted to determine the correct course of action.

Socio-Economic Issues

According the U.S. Census Bureau, Mukilteo is an upper middle class community with a median household income of $98,823, compared to the national median of approximately $58,000. The population is 75 percent white, 17 percent Asian, and 8 percent other races (African-American, Native American, Hispanic). The median age is 42, 5 years older than the US median age. Housing is 94 percent occupied and 6 percent vacant. Statistically, Mukilteo is a comfortable, stable community with few members of disadvantaged populations.

The project site is located in a middle class residential neighborhood. The project is necessary to maintain access to homes on 61st Place West. There will be no negative impacts to housing or vehicle parking.

There will be temporary impacts to resident access during construction. If the project were not done, access restrictions would be permanent, and residents in the area would have to detour several miles to reach their homes. The project will not disproportionately impact any economically disadvantaged communities.

Water Resources

No floodplains or streams are present within the project footprint. Smuggler's Gulch Creek is present about 775 feet downslope of the project. Smugglers Gulch Creek is a high gradient stream with several partial to full fish barriers downgradient of the existing stormwater discharge point. Smugglers Gulch Creek is not known to be used by any ESA listed species.

The slope below the project site contains a Category III forested wetland in a portion of the hill with unstable soils. The City of Mukilteo would apply a 60-foot-wide buffer to this wetland, which would extend up to the 61st Place West retaining wall footprint below the slope. All disturbed areas within the buffer will be restored to reflect existing conditions.

STATEMENT OF CATEGORICAL EXCLUSION

The above action has been found to qualify for the categorical exclusion defined in 44 CFR 10.8 (c)(2): Repair, restoration, reconstruction, or replacement of a facility damaged or destroyed, and therefore, no environmental assessment or environmental impact statement will be prepared.

STATEMENT OF NO EXTRAORDINARY CIRCUMSTANCES

After review of the project and its environment, it was determined that no extraordinary circumstances as defined in 44 CFR 10.8(d)(3) exist regarding this action.

STATEMENT REGARDING OTHER FEDERAL ENVIRONMENTAL STATUTES AND EXECUTIVE ORDERS

This project is undergoing review under the State of Washington's SEPA (State Environmental Policy Act). The SEPA checklist document requires the Applicant to demonstrate compliance with all applicable federal, state, and local laws, and the project may be commented on by any interested party during the public notice period. The SEPA Checklist is attached, and a Determination of Non-Significance is anticipated in July 2018.

Individual statutes and executive orders are addressed below:

National Historic Preservation Act and Archaeological & Historical Preservation Act

The DAHP's WISAARD database was consulted and no registered properties lie within 2 miles of the site. The project's Area of Potential Effect is small and there is no potential to affect any listed sites. The project is on historically disturbed land and no excavation will be done into previously undisturbed areas.

Coordination with the DAHP and the Tulalip Tribes will be done as part of SEPA review. The State is subject to federal requirements and will ensure that all provisions of applicable laws are addressed.

Endangered Species Act

A Biological Evaluation has been prepared for review by the Services. Listed species in the area are primarily fish. The project is not anticipated to adversely affect any listed species.

Farmlands Protection Policy Act

The project area is on a steep slope. It has never been farmed, and it could not be farmed in the future. Land use is not changing at the site; there is no concern with conversion of actual or potential farmland to other uses.

Section 404 of the Clean Water Act

No fill will be placed in streams or wetlands; therefore, Section 404 does not apply to this project.

Executive Orders 11988, 11990, 12898

11988: Floodplain Management

This project is not located on a floodplain and no floodplain review is needed.

11990: Protection of Wetlands

A Wetland Determination Memorandum was prepared by Northwest Environmental Consulting, LLC in May 2016, and is attached as Appendix D. This memorandum supports the Critical Areas Permit application through the City of Mukilteo.

12989: Environmental Justice

The Socio-Economic Issues section, above, demonstrates that Mukilteo is a comfortable, stable community with few members of disadvantaged populations.

The SEPA review process allows potential issues of environmental justice to be addressed by inviting all stakeholder agencies to comment on the project. Agencies include the City of Mukilteo and the confederated Tulalip Tribes.

REFERENCES

U.S. Census Bureau. 2018. https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

Washington Department of Fish and Wildlife (WDFW). 2018. Priority Habitats and Species (PHS) database. Accessed in March 2018 at http://apps.wdfw.wa.gov/phsontheweb/ Accessed April 25, 2018

Washington State Department of Transportation. 2016. WSDOT Guidance on Wetland Buffers across Roadways. Available at http://www.wsdot.wa.gov/NR/rdonlyres/83C22B1F-8102-4087-8568-7D82C4DE3C95/0/Wet_BufferAcrossRdway.pdf

APPENDICES

A SEPA Checklist

B Biological Evaluation

C Geotechnical Report

D Wetland Determination Memorandum

Appendix A
SEPA Checklist

Appendix B
Biological Evaluation

Appendix C
Geotechnical Report

Appendix D
Critical Areas Report

Mukilteo 61st Place West Retaining Wall

Biological Evaluation

Prepared for

City of Mukilteo Public Works Department
11930 Cyrus Way
Mukilteo, WA 98275

Prepared by

Northwest
Environmental Consulting, LLC

Northwest Environmental Consulting, LLC
3639 Palatine Avenue North
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May 2018

Executive Summary

The City of Mukilteo is proposing to repair an existing 190-foot-long, soldier pile retaining wall and associated roadway on 61st Place. The wall along the 61st Place roadway has suffered damage, and the road is at risk of failure. This roadway serves as the only access to adjacent residential properties, as well as the Mukilteo Water and Wastewater District's regional sewer lift station located north and downhill of the wall system. The project's goal is to maintain this access by repairing existing damage and preventing future failure of the road supports.

The project will take place within the City of Mukilteo, within Section 17, Township 28N, and Range 4E. See Sheet T1 – Appendix A. The project is in Water Resource Inventory Area (WRIA) 8 and within the Hydraulic Unit Code (HUC) 17110019.

Work will occur in forested terrain and within a wetland buffer. No species of mammal, bird, amphibian, fish, or plant listed under the Endangered Species Act (ESA) is present at the work site or nearby. Listed fish species use the Puget Sound waters approximately 600 feet to the west and downslope. The project will create an additional 1,418 square feet of new impervious surface. This biological evaluation documents that no listed species are present on site, and that potential project effects will not reach the ESA-listed species downslope in Puget Sound.

Table of Contents

INTRODUCTION

Project Proponent

The project is proposed by the City of Mukilteo. The proposed work is located within the western region of the City overlooking Possession Sound.

Purpose and Need

The City of Mukilteo is proposing to repair an existing 190-foot-long, soldier pile retaining wall and associated roadway on 61st Place. This project will be designed and constructed using FEMA's Severe Repetitive Loss Program Hazard Mitigation Grant funds.

The wall along the 61st Place roadway has suffered damage, and the road is at risk of failure. This roadway serves as the only access to adjacent residential properties, as well as the Mukilteo Water and Wastewater District's regional sewer lift station located north and downhill of the wall system. The project's goal is to maintain this access by repairing existing damage and preventing future failure of the road supports.

Project Location

The project will take place within the City of Mukilteo, along 61st Place, on a forested and partially forested slope 600 feet from the shorelines of Puget Sound. The project is located within Section 17, Township 28N, and Range 4E. See Sheet T1 – Appendix A.

The project is in Water Resource Inventory Area (WRIA) 8 (Lake Washington/Cedar/ Sammamish Watershed) and within the Hydraulic Unit Code (HUC) 17110019.

PROJECT DESCRIPTION

General Description

The City of Mukilteo plans to repair the existing soldier pile retaining wall and associated roadway at 61st Place West, which is within the western region of the City on a forested slope overlooking Possession Sound. Work elements include topographic and boundary surveying, geotechnical investigations, right-of-way easement acquisition, repair of the 190-foot failing segmental block and soldier pile retaining wall, and installation of roadway runoff and underdrain systems. The project would also partially rebuild a section of failed roadway, and would widen the roadway to accommodate improved routing of stormwater. This project will be designed and constructed using FEMA's Severe Repetitive Loss Program Hazard Mitigation Grant funds.

Detailed Project Description

In 1996, a storm event occurred which resulted in a presidential declaration of a disaster in the region. Damage included a roadway failure on 61st Place West. At that time, the City used FEMA funds to repair the roadway, constructing a soldier pile wall centered on segmental block walls.

Since 1988, the ground at the base of the walls dropped several feet incrementally. On March 2011 a landslide occurred below and north of the wall; the main scarp of the landslide was located at the base of two retaining walls on the north side of the road. The block wall collapsed and several feet of soil is now exposed below the soldier pile wall timber and plywood lagging. The ground displacement also resulted in the loss of the backfill material placed behind the timber and plywood lagging, such that the backfill was completely lost between the wall piles and the roadway pavement has been undermined. Portions of the segmental block wall and soldier pile wall appear to be intact, but the landslide main scarp appears to be within several feet these structures.

Project work would occur in the summer of 2018.

The project will reinforce 190 feet of the existing soldier pile wall with tiebacks and walers, install horizontal wall drains, reconstruct roadway shoulders, install new asphalt shoulder treatments, construct a new stormwater system to collect roadway runoff and groundwater, and install concrete barriers along the wall face. The project will increase impervious area by 1,418 square feet, mainly to create the stormwater collection facilities and widen the existing shoulders.

Prior to construction, topographic and boundary surveying and geotechnical investigations will be performed, and a right-of-way easement will be acquired. Site preparation may include minor clearing of shrub, grass, and other vegetation for the construction work; there will be no vegetation clearing required to access the proposed site.

The wall construction work will be completed when conditions are dry. Erosion control BMPs will be installed to protect surrounding areas from sediment should a rain event occur. Construction equipment to be used includes backhoes, pavers, and other motorized equipment as well as manual construction equipment. New fill may be required behind the new soldier pile wall, this material will be suitable fill to support the roadway and will be obtained from a commercial source.

After construction, off-roadway vegetated areas will be restored, and mitigation will offset the project's disturbance within existing wetland buffers.

See project drawings in Appendix A for detailed project plans.

IMPACT AVOIDANCE AND MINIMIZATION MEASURES

The project will use BMPs and design elements to avoid or minimize potential effects to the environment. All work will be done in accordance with the City of Mukilteo's erosion control requirements (City of Mukilteo municipal code 15.16, Grading and Excavation). The project's purpose is to fix a failing wall, which will result in decreased erosion on surrounding hillsides and sedimentation downslope.

The following general avoidance and minimization measures will be used as applicable during construction:

- All environmental commitments will be clearly communicated to the contractor in the Request for Proposals (RFP) and within construction contract documentation.
- Prior to the start of construction, all sensitive areas and clearing limits will be marked with high visibility construction fencing, and erosion control devices will be placed to prevent runoff of sediment into downslope forested areas.
- Construction impacts will be confined to the minimum area necessary to complete the project.
- A Spill Prevention, Control, and Containment (SPCC) Plan will be developed for the project to ensure that all pollutants and products are controlled and contained.
- A Temporary Erosion and Sedimentation Control (TESC) Plan and a Source Control Plan will be developed and implemented for all projects requiring clearing, vegetation removal, grading, ditching, filling, embankment compaction, or excavation. The BMPs in these plans will be used to control sediments from all vegetation-disturbing or ground-disturbing activities.
- All exposed soils will be stabilized as specified. Re-vegetation of construction easements and other areas will occur after the project is completed. All disturbed riparian vegetation will be replanted in kind.

ACTION AREA

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

The action area for this project includes the immediate project site; the area affected by noise from construction activities; and areas downstream that could be affected by sediments escaping the project during rain events and new impervious surfaces.

The project site is in steep terrain. Habitat upslope of the road near the retaining wall includes herbaceous vegetation, small deciduous trees and shrubs, landscaping plants at the hill top, and the large landslide area with bare soil. Habitat downslope is forest with trees including big leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and Douglas-fir (*Psuedotsuga menziesii*). Shrubs and herbs in this forest patch include sword fern (*Polystichum munitum*), salmonberry (Rubus spectabilis), red huckleberry (Vaccinium parviflorum), trailing blackberry (*Rubus ursinus*) and Himalayan blackberry (*Rubus armeniacus*) with patches of horsetail (*Equisetum arvense*) and fringecup (*Tellima grandiflora*).

One wetland is present downslope of the retaining wall. This wetland's water source appears to be seepage emerging to near the surface at two points along a topographic break, and soils with clay content that prevent drainage of rainwater. The wetland extends downslope from these seepage points to a flat area. The wetland includes indications of unstable soils. The buffer for this wetland reaches the lower side of the wall.

Aquatic Action Area

No in-water work will occur as part of the project.

Stormwater from project site will not reach Puget Sound directly. Stormwater during construction and after project completion will flow to Smuggler's Gulch Creek via the existing open and closed drainage system along the roadway for about 800 feet before discharging to the stream. Proper BMPs will be followed so that any turbidity will be reduced to background levels within 300 feet of the project. The stream could be affected by increase in additional impervious area from construction of the project. Smugglers Gulch Creek is included in the action area because of the potential for increased stormwater flows. No stormwater will enter Puget Sound directly and increased flows from new impervious surfaces will not affect Puget Sound; therefore the action area does not include Puget Sound.

Terrestrial Action Area

Sound is defined as a density disturbance that propagates through a medium, such as air or water. In-air sound measurements are often recorded in decibels (dB) using the A-frequency weighting scale (dBA). The A-weighted rating of noise is used because it relates most closely to how humans interpret noise. Peak sound emitted from a source is called Lmax. All sounds averaged during a measured period of time are referred to as Leq.

Ambient conditions in a suburban residential area are typically 45 to 50 dbA. Drilling equipment used to drill shafts for the the 14-inch H-pilings will be the loudest of construction activities. A typical rock drill may reach 81 db LMAX at 50 feet (WSDOT 2018). More typical noise levels from equipment will be around 75 to 78 dbA. These noise levels will attenuate to background levels within about 1,600 feet. The project will take place along a steep slope. Sound will be deflected up and disturbance will be limited to the immediate project area and valley. Construction activities will take place during daytime hours.

SPECIES PRESENCE IN THE ACTION AREA

The following species are known to or believed to occur in Snohomish County, according the US Fish and Wildlife Service and NOAA Fisheries (USFWS 2018). Note that strictly marine species (e.g., whales, sea turtles, rockfish) and DPSs of salmonids not found in Puget Sound or its tributaries (e.g., ESUs of salmon found in the Willamette or Columbia rivers only) were excluded from this list.

BIRDS
Yellow-billed cuckoo
Marbled murrelet
Northern spotted owl

MAMMALS
Gray wolf (western WA)
Grizzly bear

PLANTS
Whitebark Pine

FISH
Bull trout, coastal-Puget Sound IRU
Chinook, Puget Sound ESU
Steelhead, Puget Sound
Sturgeon, Green (southern DPS)
Eulachon, Pacific (southern DPS)

REPTILES-AMPHIBIANS
Oregon Spotted Frog

The project takes place in an urbanized area within the City of Mukilteo. None of the birds, mammals, plants, fish, or reptiles listed above occur in the action area.

Species that may be found in in waters downslope of the action area include bull trout, coastal-Puget Sound Chinook salmon, and Puget Sound Steelhead. However, none of these species are in the action area, as no fish-bearing waters are near the project or directly downslope, and BMPs are expected to contain sediments within the immediate project area.

WDFW’s SalmonScape mapping database does not indicate any documented presence of salmon in Smuggler’s Gulch Creek. WDFW maps the general area (lands adjacent to Puget Sound) as accessible to the Puget Sound Distinct Population Segment (DPS) of steelhead (Federally Threatened).

According to the Washington State Department of Fish and Wildlife's (WDFW) Priority Habitats and Species (PHS) database, no terrestrial species listed above have been recorded in the action area. The database does list four bald eagle breeding areas about 2 miles north and 2 miles south of the project area. Bald eagles are designated state sensitive.

ENVIRONMENTAL SETTING WITHIN THE ACTION AREA

Project Setting

The project is located in Snohomish County, in the City of Mukilteo adjacent to Puget Sound. The project site is within the City of Mukilteo's right of way. Residential areas are adjacent to the site. Undeveloped second-growth forest is present downslope of the site.

Soils

The NRCS Soil Survey for Snohomish County maps one soil type in the vicinity of the project: Alderwood Everett gravelly sandy loams, 25 to 70 percent slopes. The Alderwood and series are upland soils with variable permeability and rapid runoff. The area has unstable soils that are subject to slides.

Wetlands

The slope below the project site contains a Category III forested wetland in a portion of the hill with unstable soils. The City of Mukilteo would apply a 60-foot buffer width to this wetland, which would extend up to the 61st Place West retaining wall footprint below the slope. All disturbed areas within the buffer will be restored to existing conditions.

The slope above the retaining wall (and across the road) does not contain wetlands. The buffer of the wetland below the road would not extend above the road per the WSDOT Guidance on Wetland Buffers across Roadways (WSDOT 2016).

Aquatic Resources

No floodplains or streams are present within the project footprint. Smuggler's Gulch Creek is present approximately 800 feet downslope of the project. Smugglers Gulch Creek is a high gradient stream with several partial to full fish barriers downgradient of the existing stormwater discharge point. Smugglers Gulch Creek is not known to be used by any ESA listed species.

ENVIRONMENTAL BASELINE CONDITIONS

Lake Washington/Cedar/Sammamish Watershed

The Lake Washington/Cedar/Sammamish Watershed, WRIA 8, is the most populated watershed in the state. This 692-square-mile watershed includes two major river systems and three large lakes, and numerous subbasins draining directly into Puget Sound (as is the case in Mukilteo). The watershed's streams support anadromous salmonids and bull trout/dolly varden. In addition, WRIA 8 includes marine shoreline that supports local anadromous salmonid stocks, as well as salmonid stocks from other Puget Sound WRIAs.

The project area is located in a portion of WRIA 8 where some small streams are not connected to other lakes and streams in the WRIA, and drain directly to Puget Sound. The project area itself does not contain fish-bearing streams, and is surrounded by residential properties and stands of second-growth forest.

Stormwater in the Project Area

Stormwater from the project area currently travels through gutters and pipes approximately 800 feet down 61st Place West where it eventually drains to Smuggler's Gulch Creek. The Project will increase impervious surface by about 1,418 square feet. The project will not increase traffic use so no new roadway pollutants are expected to be generated by new impervious surface

The project will not affect aquatic habitat elements in the Puget Sound.

Direct Effects

Direct effects are those that directly affect the species, including permanently removing or degrading habitats utilized by the species. No listed species are present on or adjacent to the property; thus, there will be no direct effects on listed species.

The project will directly affect the wetland buffer during construction but will avoid direct impacts to the wetland. The project will improve the wetland condition by reducing further loss of fill upslope, which is encroaching on the wetland. All disturbed vegetation in the buffer will be restored at the end of the project with a native planting plan that is suitable for a steep slope environment which will improve baseline habitat conditions in the project area in the long-term.

Indirect Effects and Cumulative Effects.

No listed species are present on or adjacent to the project site; thus, there will be no indirect effects or cumulative effects on listed species.

The project will increase stormwater runoff by increasing impervious surface by 1,418 square feet. This will slightly increase stormwater flows in Smugglers Gulch Creek. The new impervious surface created is mostly for shoulder widening and to collect stormwater. No increased vehicle use will result because of the project; therefore, pollution generation from the new impervious surface is not expected to be negligible. No ESA listed Species are present in Smugglers Gulch Creek, so no indirect effects will occur from runoff from the project.

Summary of Avoidance Measurements

BMPs will be used to prevent sediments from reaching Smugglers Gulch Creek. New impervious surface will be limited to less than 1,500 square feet and will not significantly alter flows in Smugglers Gulch Creek.

CONCLUSIONS AND EFFECT DETERMINATIONS

Provided that recommended practices for the use of construction BMPs and maintenance are employed as proposed, no sedimentation will reach the Puget Sound from this project. No activities that violate existing state or federal water quality standards are anticipated. No listed species occur within the action area; therefore, the project will have **No Effect** on listed species.

ESSENTIAL FISH HABITAT

Essential Fish Habitat (EFH) is broadly defined by the Act (now called the Magnuson-Stevens Act or the Sustainable Fisheries Act) to include “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”. This language is interpreted or described in the 1997 Interim Final Rule [62 Fed. Reg. 66551, Section 600.10 Definitions] -- Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include historic areas if appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle.

No aquatic, fish-bearing waters are present on or adjacent to the project site. Habitat for fish is present in Puget Sound, 600 feet west and downslope from the project. No floodplains or streams are present within the project footprint. Smuggler’s Gulch Creek is present approximately 800 feet downslope of the project. Smugglers Gulch Creek is a high gradient stream with several partial to full fish barriers downgradient of the existing stormwater discharge point. Smugglers Gulch Creek is not known to be used by any EFH listed species.

Direct Effects

Direct effects are those that directly affect the species, including permanently removing or degrading habitats utilized by the species. No listed species are present on or adjacent to the property; thus, there will be no direct effects on listed species.

The project will directly affect the wetland buffer during construction. The project will not directly affect the wetland itself. The project will improve the wetland condition by reducing further loss of fill upslope, which is encroaching on the wetland. All disturbed vegetation in the buffer will be restored at the end of the project with a native planting plan that is suitable for a steep slope environment which will improve baseline habitat conditions in the project area in the long-term.

Indirect Effects and Cumulative Effects.

No listed species are present on or adjacent to the project site; thus, there will be no indirect effects or cumulative effects on listed species.

The project will increase stormwater runoff by increasing impervious surface by 1,418 square feet. This will slightly increase stormwater flows in Smugglers Gulch Creek. The new impervious surface created is mostly for shoulder widening and to collect stormwater. No increased vehicle use will result because of the project; therefore, pollution generation from the new impervious surface is expected to be negligible. No ESA listed species are present in Smugglers Gulch Creek so no indirect effects will occur from runoff from the project.

Proposed Conservation Measures

The following proposed conservation measures will be used, which will reduce impacts of EFH species:

- All environmental commitments will be clearly communicated in the project plans and specifications.
- Prior to the start of construction, all sensitive areas and clearing limits will be marked with high visibility construction fencing, and erosion control devices will be placed to prevent runoff of sediment into downslope forested areas.
- Construction impacts will be confined to the minimum area necessary to complete the project.
- A Spill Prevention, Control, and Containment (SPCC) Plan will be developed for the project to ensure that all pollutants and products are controlled and contained.
- A Temporary Erosion and Sedimentation Control (TESC) Plan and a Source Control Plan will be developed and implemented for all projects requiring clearing, vegetation removal, grading, ditching, filling, embankment compaction, or excavation. The BMPs in these plans will be used to control sediments from all vegetation-disturbing or ground-disturbing activities.
- All exposed soils will be stabilized as specified. Re-vegetation of construction easements and other areas will occur after the project is completed. All disturbed riparian vegetation will be replanted in kind.

Conclusion and Effect Determination on EFH

This project will have no effects to fish and will result in similar or slightly better baseline conditions because of the reduction in sedimentation (from eroding road fill) in future heavy rain events. Because of the conservation measures to avoid and minimize effects, it is determined that this project will have **no adverse effect** on Essential Fish Habitat.

Adverse Effects on Essential Fish Habitat for Salmonids

The project will not have adverse effects on Essential Fish Habitat for Salmonids.

Adverse Effects on Essential Fish Habitat for Ground Fishes

The project will have no effects on ground fishes.

Adverse Effects on Essential Fish Habitat for Coastal Pelagic Species

The project will have no effects on coastal pelagic species.

REFERENCES

Otak

2010 Stream Habitat Survey in Smuggler's Gulch Technical Memorandum prepared for Washington Department of Fish and Wildlife. February 5.

U.S. Fish and Wildlife Service (USFWS)

2018 Endangered Species in Snohomish County, Washington (web-accessed database). Accessed in March 2018 at https://ecos.fws.gov/ecp0/reports/species-by-current-range-county?fips=53061

Washington Department of Fish and Wildlife (WDFW)

2018 Priority Habitats and Species (PHS) database. Accessed in March 2018 at http://apps.wdfw.wa.gov/phsontheweb/

Washington State Department of Ecology (Ecology)

2005 Stormwater Manual for Western Washington, revised 2017.

Washington State Department of Transportation (WSDOT)

2016 WSDOT Guidance on Wetland Buffers across Roadways. Available at http://www.wsdot.wa.gov/NR/rdonlyres/83C22B1F-8102-4087-8568-7D82C4DE3C95/0/Wet_BufferAcrossRdway.pdf

2017 The BA Writers Guidance for Preparing the Stormwater Section of Biological Assessments, updated November 13, 2006.

2018 Biological Assessment Preparation for Transportation Projects, Advanced Training Manual, version 5. Washington State Department of Transportation, Environmental Affairs Office, Olympia, WA.

Appendix A:
Figures and Project Drawings

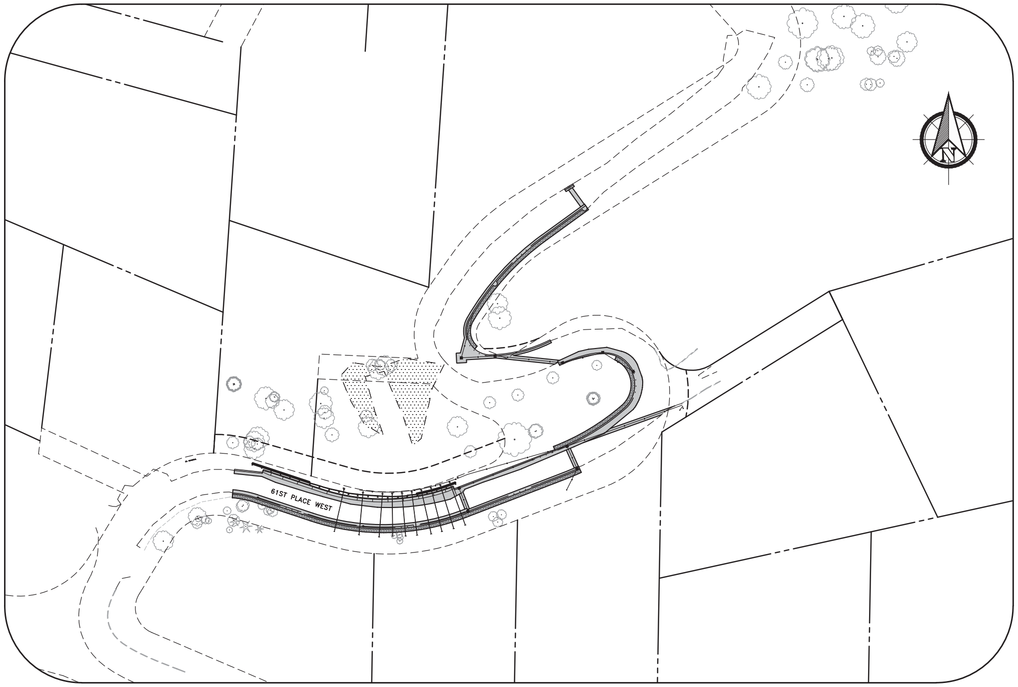
61ST PLACE WEST RETAINING WALL PROJECT

CITY OF MUKILTEO, SNOHOMISH COUNTY, WASHINGTON
CIVIL IMPROVEMENT PLANS

SHEET INDEX

SHEET	DESCRIPTION
T1	TITLE SHEET, VICINITY MAP, AND SHEET INDEX
SQ1	SUMMARY OF QUANTITIES *
DNL1	CITY DEVELOPMENT NOTES AND LEGENDS
RS1	ROADWAY SECTIONS
HAC1	HORIZONTAL ALIGNMENT AND CONTROL PLAN
EES1	EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN
EES2	EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN
EES3	EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN
ECN1	EROSION CONTROL NOTES
RP1	ROAD AND STORM PLAN AND PROFILE
RP2	ROAD AND STORM PLAN AND PROFILE
RP3	ROAD AND STORM PLAN AND PROFILE
RP4	ROAD AND STORM PLAN AND PROFILE
W-1	PLAN AND ELEVATION
W-2	SOLDIER PILE DETAILS 1 OF 3
W-3	SOLDIER PILE DETAILS 2 OF 3
W-4	SOLDIER PILE DETAILS 3 OF 3
W-5	GROUND ANCHOR DETAILS
D1	PROJECT DETAILS
TCP1	TRAFFIC CONTROL PLAN
WM1	WETLAND BUFFER IMPACTS PLAN
WM2	WETLAND BUFFER ENHANCEMENT PLAN
WM3	WETLAND BUFFER PLANTING DETAILS

* NOT POPULATED AS PART OF 90% DESIGN SUBMITTAL



OVERVIEW MAP
NE 1/4, SECTION 17, TOWNSHIP 24 N., RANGE 4 E., W.M.
SNOHOMISH COUNTY, WASHINGTON
SCALE: 1"=50'

CITY OF MUKILTEO EXECUTIVE STAFF

MAYOR
JENNIFER GREGERSON

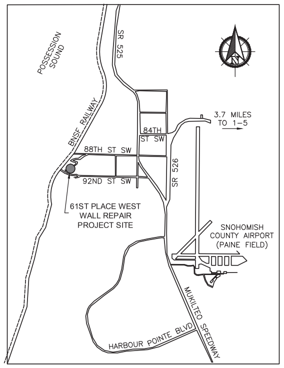
CITY COUNCIL
BOB CHAMPION – COUNCIL MEMBER
CHRISTINE COOK – COUNCIL MEMBER
RICHARD EMERY – COUNCIL MEMBER
SARAH KNELLER – COUNCIL MEMBER
ANNA ROHRBOUGH – COUNCIL MEMBER
STEVE SCHMALZ – COUNCIL MEMBER
SCOTT WHELPLEY – COUNCIL MEMBER

PUBLIC WORKS DIRECTOR
MICK MATHESON, P.E.

CITY CLERK
JANET KEEFE

PROJECT DESCRIPTION

THIS CONTRACT PROVIDES FOR THE IMPROVEMENT OF 61ST PLACE WEST BY REPAIRING AN EXISTING SOLDIER PILE RETAINING WALL AND ADJACENT ROADWAY FEATURES LOCATED IN THE WESTERN PORTION OF THE CITY OF MUKILTEO. WORK CONSISTS OF REMOVAL OF CERTAIN EXISTING SITE FEATURES; CLEARING AND GRUBBING; REINFORCING AN EXISTING SOLDIER PILE WALL WITH TIEBACKS AND WALERS; INSTALLING HORIZONTAL WALL DRAINS; ROADWAY EXCAVATION; INSTALLING A STORM DRAINAGE COLLECTION AND CONVEYANCE SYSTEM; REBUILDING EXISTING ROADWAY SHOULDERS WITH GRAVEL BORROW AND CRUSHED SURFACING; PAVING WITH HMA; INSTALLING CONCRETE BARRIERS; AND PLANTINGS FOR MITIGATION OF DISTURBANCES CREATED DURING CONSTRUCTION WITHIN EXISTING WETLAND BUFFERS; RESTORING OFF–ROADWAY VEGETATED AREAS. SOLE ACCESS TO THE PROPERTY WILL BE PROVIDED FROM 61ST PLACE WEST.



VICINITY MAP
NOT TO SCALE

SURVEYOR'S NOTES

HORIZONTAL DATUM:
BASIS OF BEARINGS: HELD OTAK POINTS 704 AND 700 PROVIDED BY THE CITY OF MUKILTEO.

POINT #700:	338071.42 NORTHING,	1277000.71 EASTING,	ELEV.=71.31	PK NAIL/WASHER
POINT #704:	337944.13 NORTHING,	1277024.77 EASTING,	ELEV.=68.82	PK NAIL/WASHER

VERTICAL DATUM:
N.A.V.D. 88

PROJECT CONTROL:

POINT #1:	337703.985 NORTHING,	1277011.377 EASTING,	ELEV.=138.15	MAG NAIL/WASHER
POINT #2:	337600.194 NORTHING,	1276545.835 EASTING,	ELEV.=164.99	GIN SPIKE
POINT #4:	337608.432 NORTHING,	1276803.753 EASTING,	ELEV.=161.28	MAG NAIL/WASHER
POINT #16:	337738.856 NORTHING,	1276799.437 EASTING,	ELEV.=108.40	MAG NAIL/WASHER

SURVEYOR'S NOTES:
1) SITE CONTROL ESTABLISHED BY STATIC GPS OBSERVATIONS, USING TRIMBLE R8 AND R6 GPS EQUIPMENT. TOPOGRAPHIC SURVEY PERFORMED USING A TRIMBLE S6 ROBOTIC TOTAL STATION.

CALL TWO BUSINESS DAYS BEFORE YOU DIG

811 Know what's below. 811 before you dig.

APPROVED FOR CONSTRUCTION:

PUBLIC WORKS DIRECTOR ____________ DATE ____________

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275 West Rio Vista Avenue, Suite 1, Burlington, WA 98233
O | (360) 899-9953 W | www.tuttle-team.com

P:\T16-009 Mukilteo 61st Place Wall\Eng\Drawings\Plan Sheets\01 - 61st Place Cover Sheet.dwg - T-1 - JRT - 4/13/2018 2:08 PM

XREF Filename:	Drawn By: M. VAUGHAN	Surveyed By:	Recorded Survey: SNOHOMISH COUNTY	Aerial Mapping & Control Survey	Constructed By:
Filename:	Checked By: J. TUTTLE	Date: Field Bk/Pg: Datum:	AF– – Vol/Bk Page	Firm: Date: GIS Cntl Pnts: Firm: Date: Field BK/PG:	Date:

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Horiz: 1"=50'
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CITY OF MUKILTEO

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT
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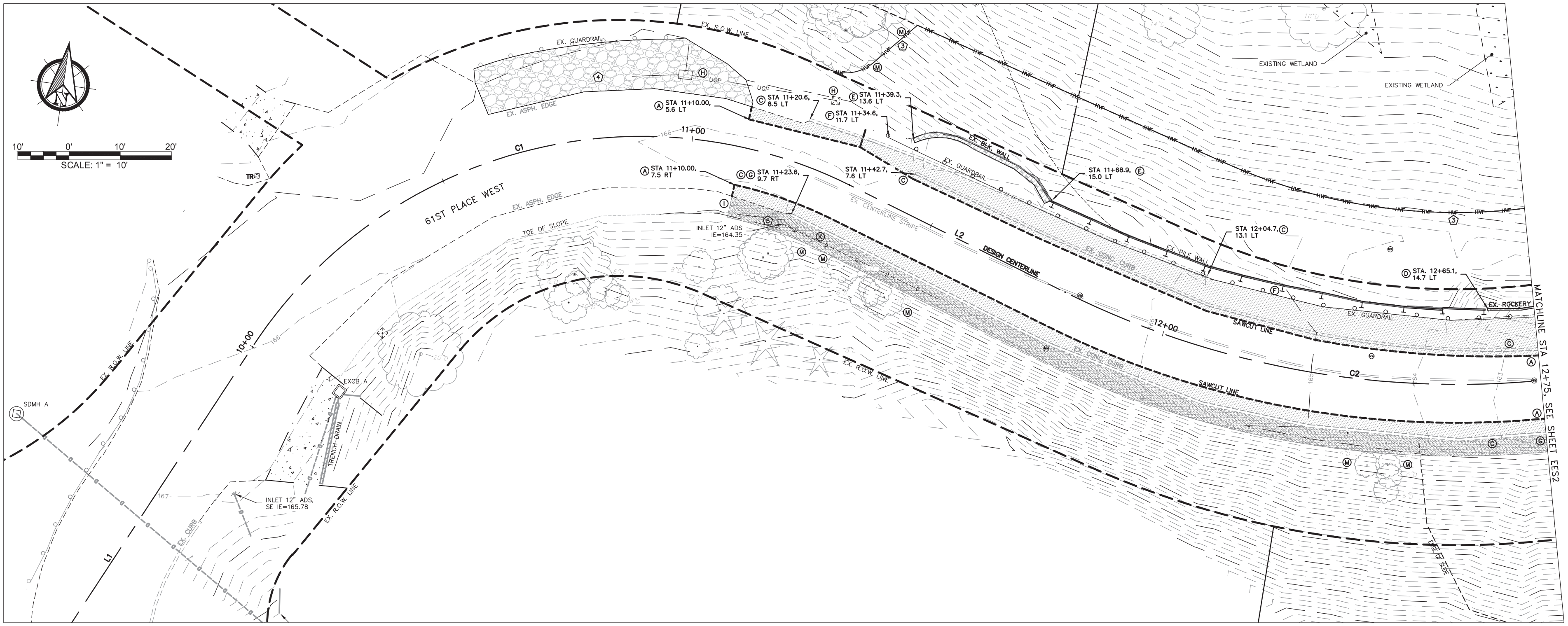
JOHN RAYMOND TUTTLE 43718
PRELIMINARY

61st Place West
Retaining Wall Project
90% Design - Not For Construction

TITLE SHEET, VICINITY MAP, AND SHEET INDEX

T1



○ SITE PREPARATION NOTES

A. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT IN PREPARATION FOR CONSTRUCTION OF ROADWAY IMPROVEMENTS. REMOVAL TIMELINE DEPENDANT UPON PHASED TRAFFIC CONTROL STRATEGIES AND CONSTRUCTION ACTIVITIES. CLEAN AND TACK ALL ASPHALT EDGES PRIOR TO PAVING. SEAL ALL JOINTS AFTER PAVING WITH PG 64-22 BINDER.

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D. REMOVE LIMITS OF EXISTING ROCKERY WALL IN PREPARATION FOR PROJECT IMPROVEMENTS. MATERIALS TO BE SALVAGED FOR REUSE BY THE CITY.

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J. REMOVE EXISTING STORM STRUCTURE TO ACCOMMODATE INSTALLATION OF NEW STORM SYSTEM.

K. REMOVE ENGINEER-SPECIFIED LENGTH OF EXISTING STORM PIPING. SEE THE ROAD AND STORM PLAN AND PROFILE PLANS FOR THE EXTENT OF STORM IMPROVEMENTS.

L. RETAIN FUNCTION OF EXISTING DITCH THROUGHOUT CONSTRUCTION.

M. TO THE LARGEST EXTENT PRACTICAL, PROVIDE PROTECTION AND RETAINAGE OF EXISTING TREES, BUSHES, AND ROOT SYSTEMS THAT WILL REMAIN AFTER CONSTRUCTION.

⬠ EROSION CONTROL NOTES

1. INSTALL STORM DRAIN INLET PROTECTION IN EACH EXISTING CATCH BASIN PER COM STANDARD PLAN EC-007.
2. INSTALL STORM DRAIN INLET PROTECTION IN EACH NEW CATCH BASIN AFTER IT HAS BEEN INSTALLED PER COM STANDARD PLAN EC-007.
3. INSTALL HIGH VISIBILITY SILT FENCE TO INTERCEPT AND MITIGATE UPSLOPE RUNOFF, TO PROTECT DOWNSTREAM PROPERTIES, CRITICAL AREAS, AND DRAINAGE SYSTEMS, AND TO DELINEATE AREAS NEEDING PROTECTION FROM CONSTRUCTION ACTIVITIES. SEE WSDOT STANDARD PLAN I-30.17-00.
4. CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE AS SHOWN PER COM STANDARD PLAN EC-006.
5. INSTALL BIODEGRADABLE CHECK DAMS IN EXISTING OR TEMPORARY CONVEYANCE DITCH AS SHOWN TO PREVENT RUNOFF FROM ENTERING ADJACENT PROPERTIES AND DOWNSTREAM CONVEYANCES. ASSUME CHECK DAM WILL REQUIRE RESETTING/RELOCATING AS PART OF INSTALLATION OF IMPROVEMENTS. ANY POINTS OF CONCENTRATED DISCHARGE WILL BE REDIRECTED TO AN ADJACENT CATCH BASIN OR CONVEYANCE SYSTEM. SEE WSDOT STANDARD PLAN I-50.20-01.
6. INSTALL WATTLE TO REDIRECT UP-SLOPE RUNOFF AWAY FROM WORK AREAS AND TO PROTECT DOWNSTREAM SYSTEMS. WATTLES INSTALLED ON IMPERVIOUS SURFACES SHALL BE SECURED WITH SAND BAGS. RESET AS CONSTRUCTION ACTIVITIES OR PRESERVATION OF ACCESS MANDATE. SEE WSDOT STANDARD PLAN I-30.40-01.

EXISTING STRUCTURES TABLE

SDMH A	EXCB A
RIM=156.26	RIM=167.41
18" CMP E, IE=152.36	4" PVC E, IE=164.30
12" ADS S, IE=152.56	4" PVC S, IE=166.21
24" PVC W, IE=150.96	12" CMP S, IE=164.11

RECOMMENDED EROSION CONTROL CONSTRUCTION SEQUENCE

1. CONDUCT PRE-CONSTRUCTION MEETING WITH CITY AND ENGINEER.
2. FLAG OR FENCE LIMITS OF DISTURBANCE/CONSTRUCTION.
3. INSTALL STORM DRAIN INLET PROTECTION IN EXISTING CATCH BASINS, AS REQUIRED.
4. INSTALL PERIMETER SITE AND CRITICAL AREA PROTECTION (HIGH VISIBILITY) FENCING.
5. GRADE AND INSTALL CONSTRUCTION ACCESSES/CONSTRUCTION STAGING AREAS.
6. INSTALL THEN MAINTAIN EROSION CONTROL MEASURES IN ACCORDANCE WITH ECOLOGY'S STORMWATER MANAGEMENT MANUAL, THE PROJECT'S STORMWATER POLLUTION PREVENTION PLAN, AND PER THE MANUFACTURER'S RECOMMENDATIONS.
7. RELOCATE EROSION CONTROL MEASURES OR INSTALL NEW MEASURES SO AS SITE CONDITIONS CHANGE, EROSION AND SEDIMENT CONTROL IS ALWAYS IN ACCORDANCE WITH ECOLOGY'S EROSION AND SEDIMENT CONTROL STANDARDS.
8. COVER ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN SEVEN DAYS DURING THE DRY SEASON OR TWO DAYS DURING THE WET SEASON WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING, OR EQUIVALENT.
9. STABILIZE ALL AREAS THAT REACH FINAL GRADE WITHIN SEVEN DAYS.
10. SEED OR SOD ANY AREAS TO REMAIN UNWORKED FOR MORE THAN 30 DAYS.
11. UPON COMPLETION OF THE PROJECT, STABILIZE ALL DISTURBED AREAS AND REMOVE ALL TEMPORARY BMPS.

GENERAL NOTES

1. THE CONTRACTOR SHALL INSTALL ALL NECESSARY BEST MANAGEMENT PRACTICES TO PROTECT DOWNSTREAM PROPERTIES AND WATER BODIES.
2. CARE SHALL BE TAKEN DURING INSTALLATION OF BEST MANAGEMENT PRACTICES NEAR EXISTING UTILITY LINES.
3. AS APPLICABLE, POSITION BMPS WITHIN PUBLIC RIGHT-OF-WAY SO AS NOT TO DISTURB PRIVATE PROPERTY.
4. CONTOURS ARE SHOWN AT A ONE-FOOT INTERVAL.
5. LOCATIONS OF UTILITIES ARE SHOWN FOR DISPLAY PURPOSES ONLY. THE CONTRACTOR SHALL TO VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION OF IMPROVEMENTS ADJACENT TO UTILITIES WITHIN WORK AREAS.

LEGEND

⊕	INLET PROTECTION
—HVF—	HIGH VISIBILITY SILT FENCE
═▸▸▸═	WATTLE
▨	ROADWAY DEMOLITION AREA
▨	GRUBBING AREA

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XREF Filename:
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Surveyed By:
Date:
Field Bk/Pg:
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Recorded Survey: SNOHOMISH COUNTY
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NO.	DATE	BY	REVISION

PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

Scale:
Horiz: 1"=10'
Vert: –
Designed By:
Inspected By:
W.O. No.:
Date:
APR. 13, 2018

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT
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425-263-8000 FAX 425-290-1009
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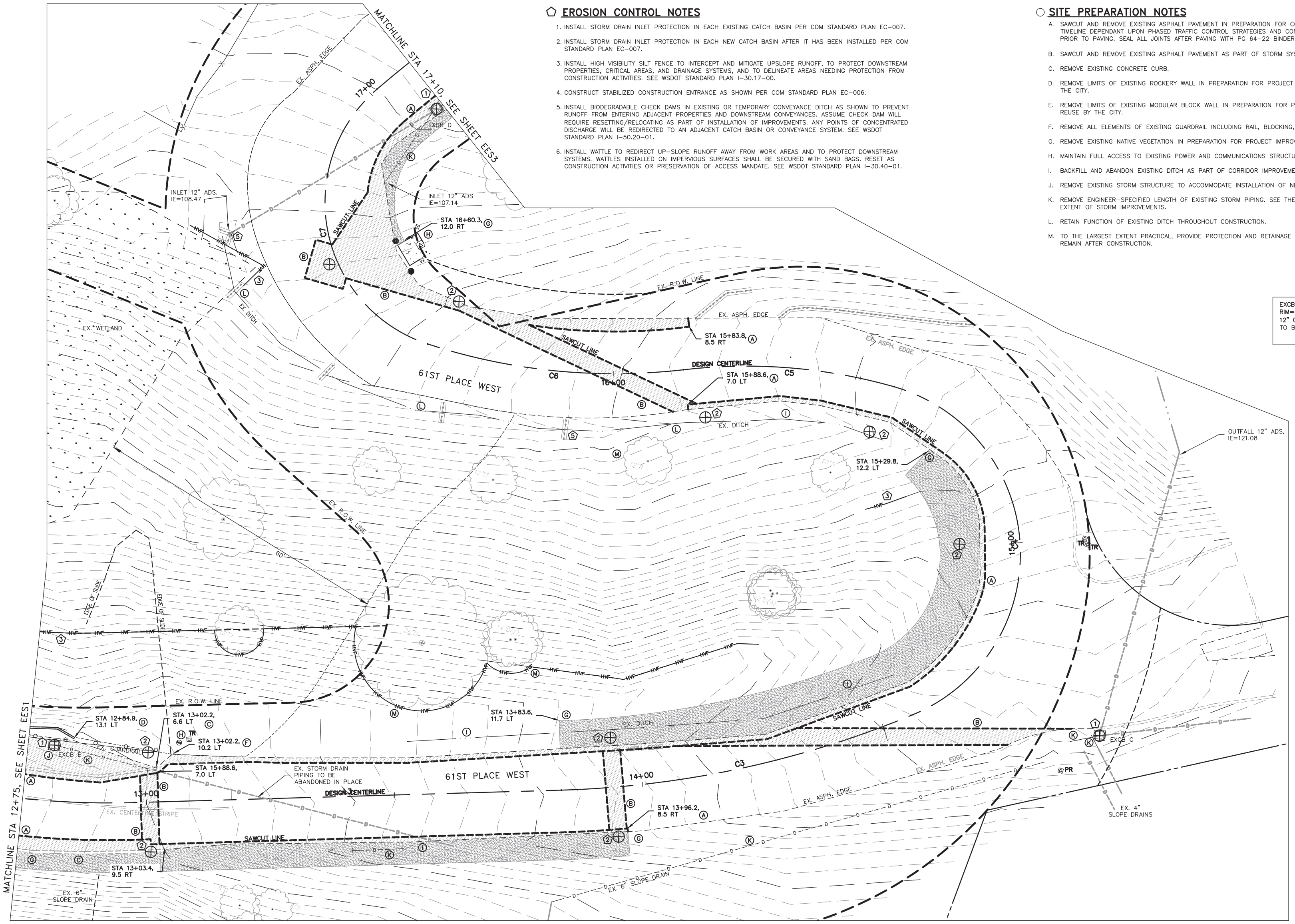
JOHN RAYMOND TUTTLE
43718
PRELIMINARY

61st Place West
Retaining Wall Project
90% Design - Not For Construction

EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN

EES1



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RIM=161.60	RIM=137.59	RIM=103.74
12" CMP E, IE=159.80	12" CMP NE, IE=135.79	12" ADS S, IE=100.59
TO BE REMOVED	12" CMP SW, IE=135.79	12" ADS SW, IE=99.34
	12" CMP N, IE=135.79	12" ADS NE, IE=99.49

LEGEND

⊕	INLET PROTECTION
—HVF—	HIGH VISIBILITY SILT FENCE
═	WATTLE
▨	ROADWAY DEMOLITION AREA
▨	GRUBBING AREA

10' 0' 10' 20'
SCALE: 1" = 10'

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61st Place West
Retaining Wall Project

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EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN

EES2

XREF Filename:
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Drawn By: M. VAUGHAN
Checked By: J. TUTTLE
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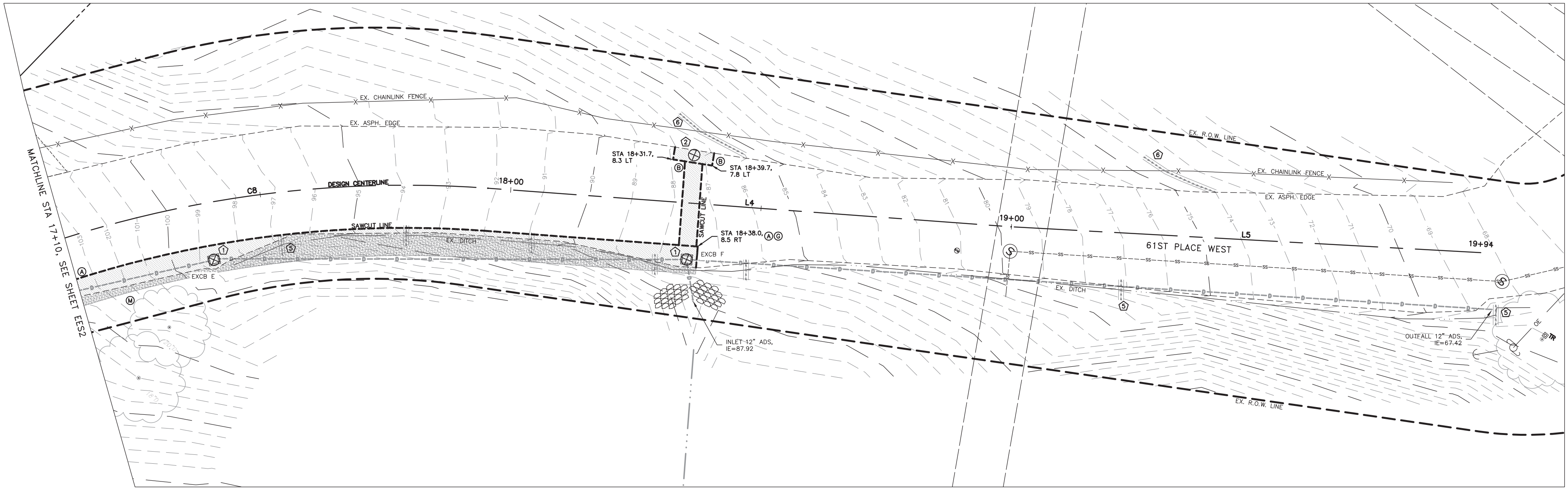

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4. CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE AS SHOWN PER COM STANDARD PLAN EC–006.
5. INSTALL BIODEGRADABLE CHECK DAMS IN EXISTING OR TEMPORARY CONVEYANCE DITCH AS SHOWN TO PREVENT RUNOFF FROM ENTERING ADJACENT PROPERTIES AND DOWNSTREAM CONVEYANCES. ASSUME CHECK DAM WILL REQUIRE RESETTING/RELOCATING AS PART OF INSTALLATION OF IMPROVEMENTS. ANY POINTS OF CONCENTRATED DISCHARGE WILL BE REDIRECTED TO AN ADJACENT CATCH BASIN OR CONVEYANCE SYSTEM. SEE WSDOT STANDARD PLAN I–50.20–01.
6. INSTALL WATTLE TO REDIRECT UP–SLOPE RUNOFF AWAY FROM WORK AREAS AND TO PROTECT DOWNSTREAM SYSTEMS. WATTLES INSTALLED ON IMPERVIOUS SURFACES SHALL BE SECURED WITH SAND BAGS. RESET AS CONSTRUCTION ACTIVITIES OR PRESERVATION OF ACCESS MANDATE. SEE WSDOT STANDARD PLAN I–30.40–01.

EXISTING STRUCTURES TABLE

EXCB E RIM=98.65 12" ADS NE, IE=95.20 12" ADS SW, IE=94.70	SSMH A RIM=79.63 6" DI OUT NE AND SW CENTER OF CHANNEL=75.03
EXCB F RIM=87.52 12" ADS SE, IE=84.77 12" ADS SW, IE=84.72 12" ADS NE, IE=83.87	SSMH B RIM=68.10 6" DI NE AND SW CENTER OF CHANNEL=61.40

LEGEND

⊗	INLET PROTECTION
—HVF—	HIGH VISIBILITY SILT FENCE
⇶	WATTLE
▨	ROADWAY DEMOLITION AREA
▨	GRUBBING AREA

TUTTLE ENGINEERING
AND MANAGEMENT
275 West Rio Vista Avenue, Suite 1 Burlington, WA 98233
O | (360) 899-5953 W | www.tuttle-team.com

10' 0' 10' 20'
SCALE: 1" = 10'

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PLAN PRINTED AT
11"x17" DEPICTS A 1:2
SCALE RATIO
(I.E. 1"=10' TO 1"=20')

Scale:
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Vert: 1"=5'
Designed By:
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EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN

EES3

XREF Filename:
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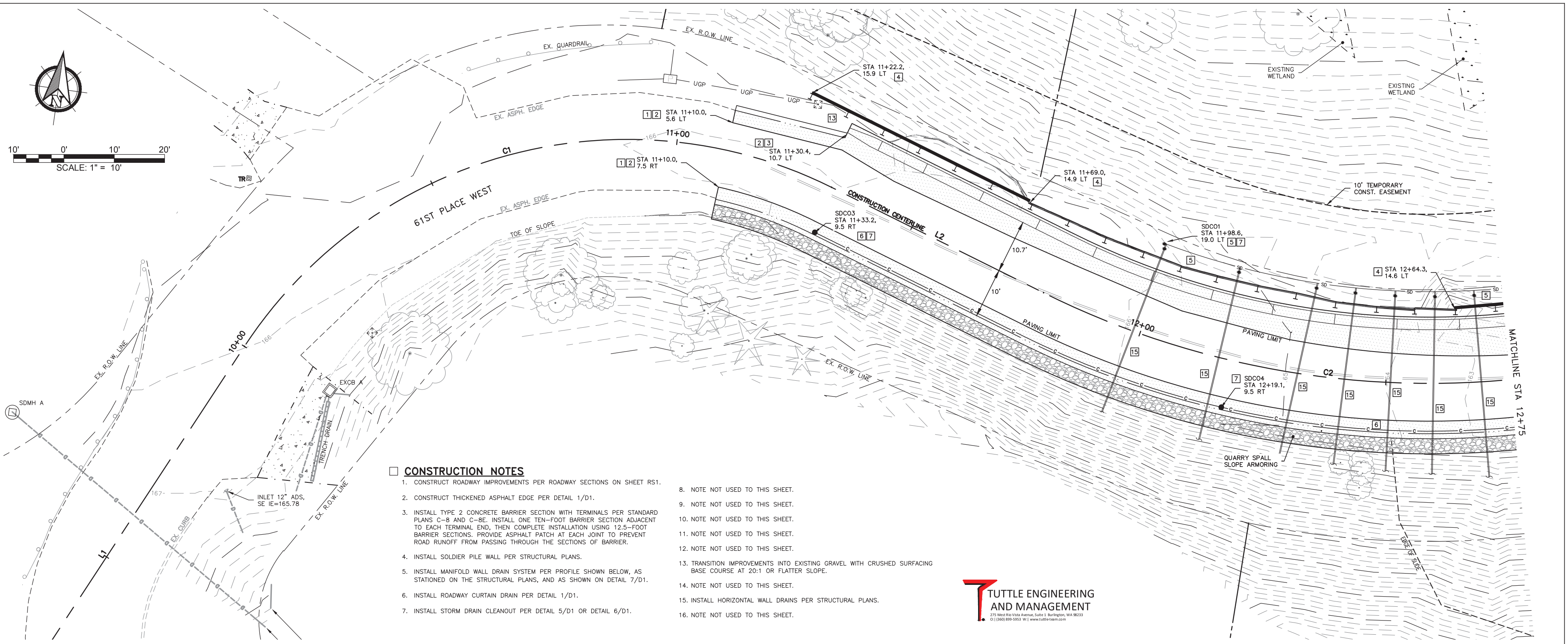
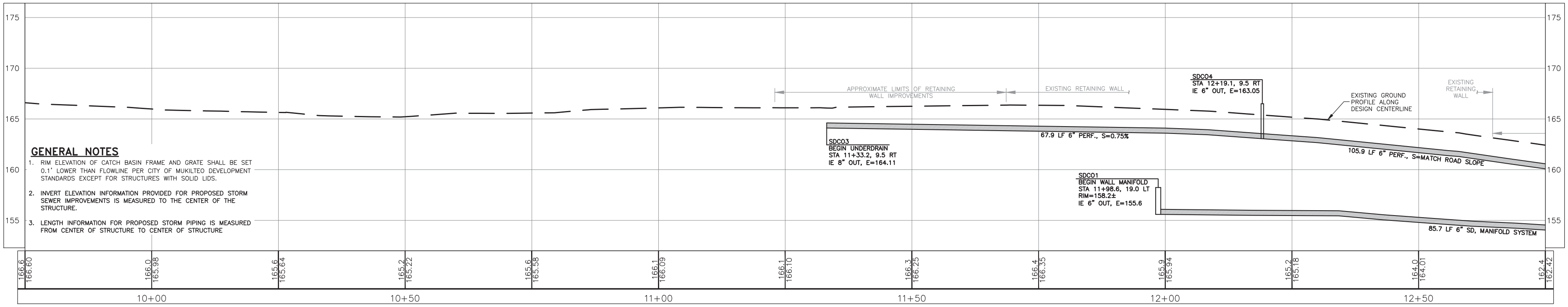


☐ **CONSTRUCTION NOTES**

1. CONSTRUCT ROADWAY IMPROVEMENTS PER ROADWAY SECTIONS ON SHEET RS1.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. INSTALL TYPE 2 CONCRETE BARRIER SECTION WITH TERMINALS PER STANDARD PLANS C–8 AND C–8E. INSTALL ONE TEN–FOOT BARRIER SECTION ADJACENT TO EACH TERMINAL END, THEN COMPLETE INSTALLATION USING 12.5–FOOT BARRIER SECTIONS. PROVIDE ASPHALT PATCH AT EACH JOINT TO PREVENT ROAD RUNOFF FROM PASSING THROUGH THE SECTIONS OF BARRIER.
4. INSTALL SOLDIER PILE WALL PER STRUCTURAL PLANS.
5. INSTALL MANIFOLD WALL DRAIN SYSTEM PER PROFILE SHOWN BELOW, AS STATIONED ON THE STRUCTURAL PLANS, AND AS SHOWN ON DETAIL 7/D1.
6. INSTALL ROADWAY CURTAIN DRAIN PER DETAIL 1/D1.
7. INSTALL STORM DRAIN CLEANOUT PER DETAIL 5/D1 OR DETAIL 6/D1.
8. NOTE NOT USED TO THIS SHEET.
9. NOTE NOT USED TO THIS SHEET.
10. NOTE NOT USED TO THIS SHEET.
11. NOTE NOT USED TO THIS SHEET.
12. NOTE NOT USED TO THIS SHEET.
13. TRANSITION IMPROVEMENTS INTO EXISTING GRAVEL WITH CRUSHED SURFACING BASE COURSE AT 20:1 OR FLATTER SLOPE.
14. NOTE NOT USED TO THIS SHEET.
15. INSTALL HORIZONTAL WALL DRAINS PER STRUCTURAL PLANS.
16. NOTE NOT USED TO THIS SHEET.



GENERAL NOTES

1. RIM ELEVATION OF CATCH BASIN FRAME AND GRATE SHALL BE SET 0.1' LOWER THAN FLOWLINE PER CITY OF MUKILTEO DEVELOPMENT STANDARDS EXCEPT FOR STRUCTURES WITH SOLID LIDS.
2. INVERT ELEVATION INFORMATION PROVIDED FOR PROPOSED STORM SEWER IMPROVEMENTS IS MEASURED TO THE CENTER OF THE STRUCTURE.
3. LENGTH INFORMATION FOR PROPOSED STORM PIPING IS MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE

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ROAD AND STORM
PLAN AND PROFILE

RP1

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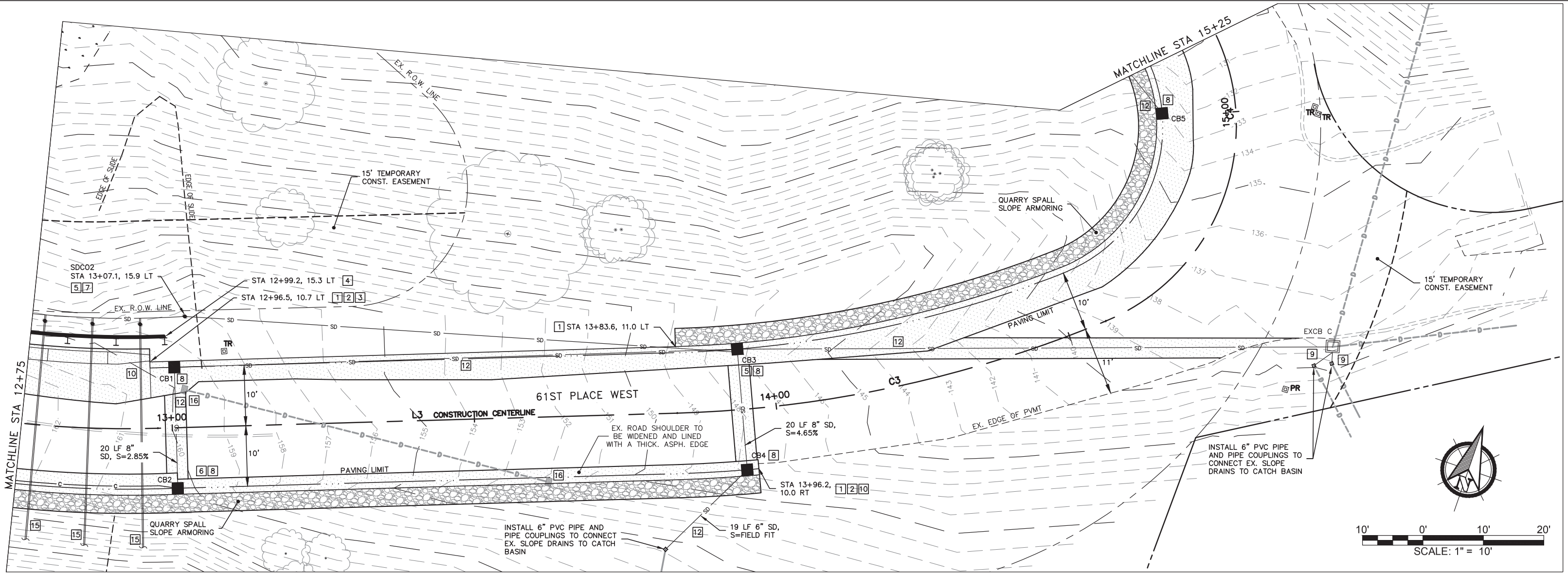

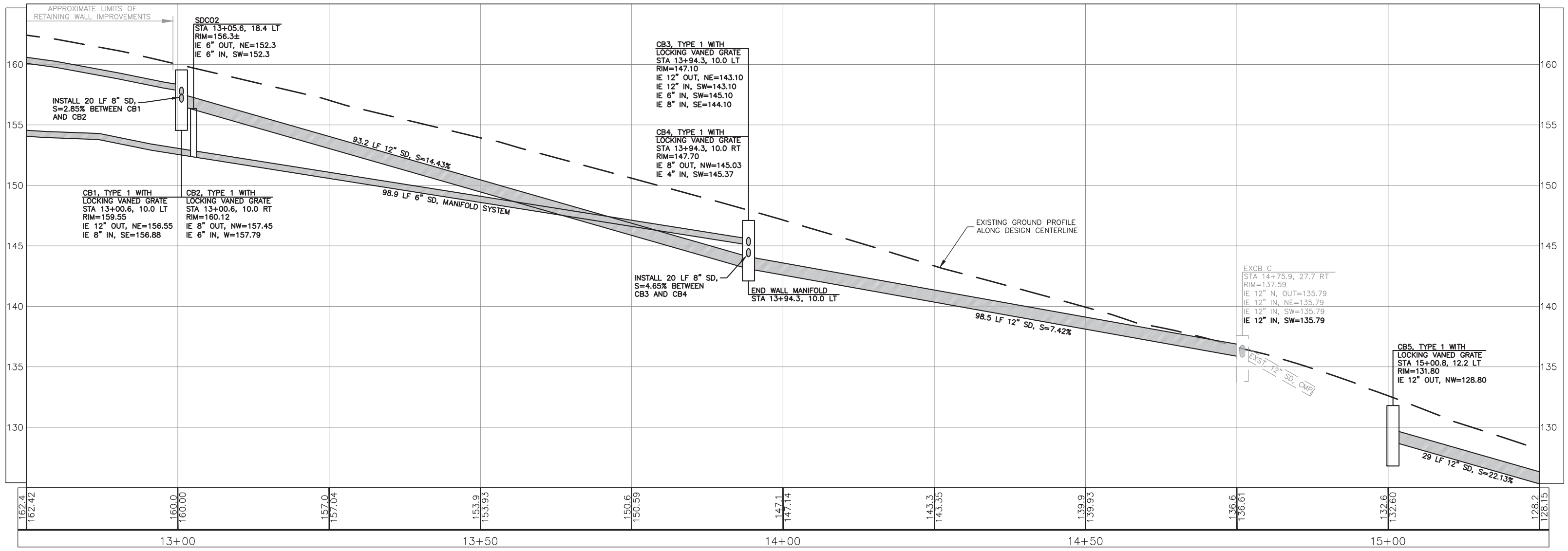

☐ CONSTRUCTION NOTES

1. CONSTRUCT ROADWAY FRONTAGE IMPROVEMENTS PER ROADWAY SECTIONS ON SHEET RS1.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. INSTALL TYPE 2 CONCRETE BARRIER SECTION WITH TERMINALS PER STANDARD PLANS C-8 AND C-8E. INSTALL ONE TEN-FOOT BARRIER SECTION ADJACENT TO EACH TERMINAL END, THEN COMPLETE INSTALLATION USING 12.5-FOOT BARRIER SECTIONS. PROVIDE ASPHALT PATCH AT EACH JOINT TO PREVENT ROAD RUNOFF FROM PASSING THROUGH THE SECTIONS OF BARRIER.
4. INSTALL SOLDIER PILE WALL PER STRUCTURAL PLANS.
5. INSTALL MANIFOLD WALL DRAIN SYSTEM PER PROFILE SHOWN BELOW, AS STATIONED ON THE STRUCTURAL PLANS, AND AS SHOWN ON DETAIL 7/D1.
6. INSTALL ROADWAY CURTAIN DRAIN PER DETAIL 1/D1.
7. INSTALL STORM DRAIN CLEANOUT PER DETAIL 5/D1 OR DETAIL 6/D1.
8. INSTALL TYPE 1 CATCH BASIN PER COM STANDARD PLANS SW-001, SW-003, SW-005, AND WSDOT STANDARD PLAN B-30.10-02.
9. CONNECT TO EXISTING STORM STRUCTURE.
10. PROVIDE GRADING THAT ALLOWS POSITIVE SURFACE FLOWS TOWARD STORMWATER FACILITIES AS PART OF STORM SYSTEM INSTALLATION.
11. NOTE NOT USED TO THIS SHEET.
12. INSTALL ENGINEER-SPECIFIED LENGTH OF STORM DRAIN PIPE. AS APPLICABLE, REPAIR EXISTING ROADWAY DISTURBED BY THIS WORK PER DETAIL 3/D1.
13. NOTE NOT USED TO THIS SHEET.
14. NOTE NOT USED TO THIS SHEET.
15. INSTALL HORIZONTAL WALL DRAINS PER STRUCTURAL PLANS.
16. PLUG EXISTING PIPE AS PART OF STORM SYSTEM INSTALLATION

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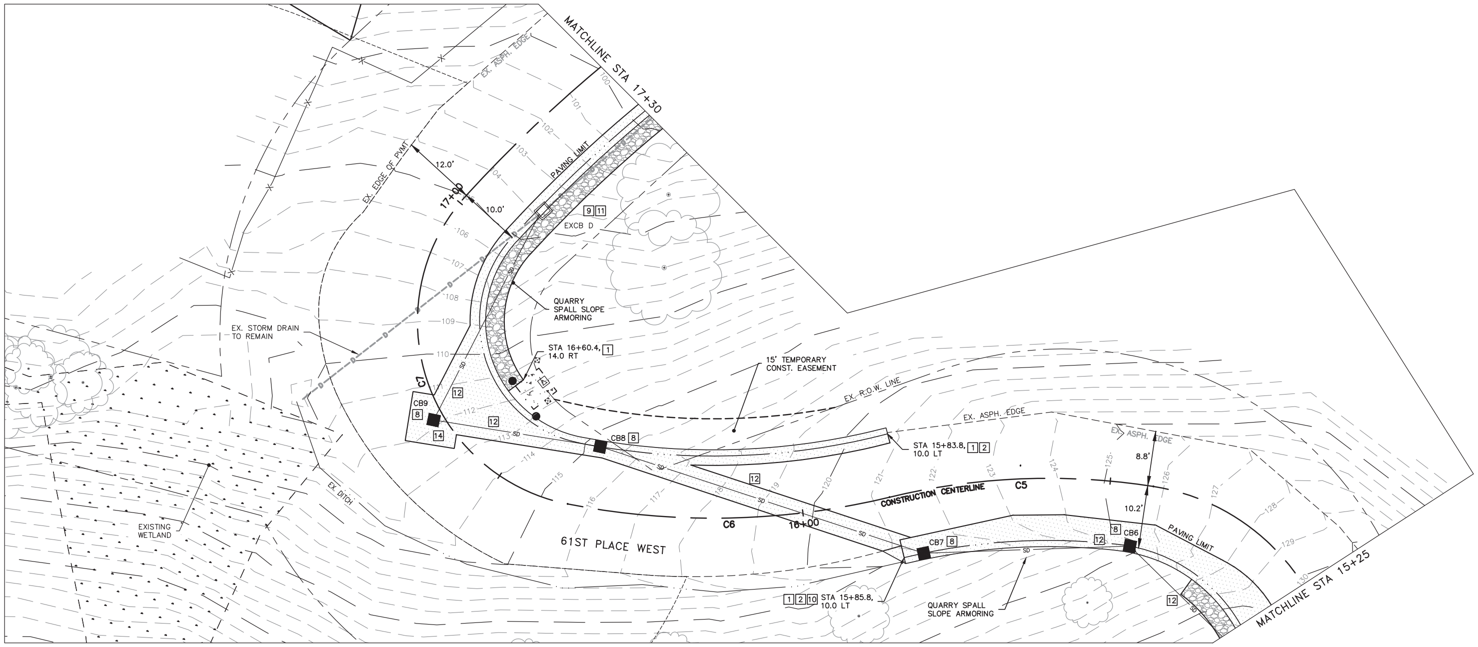

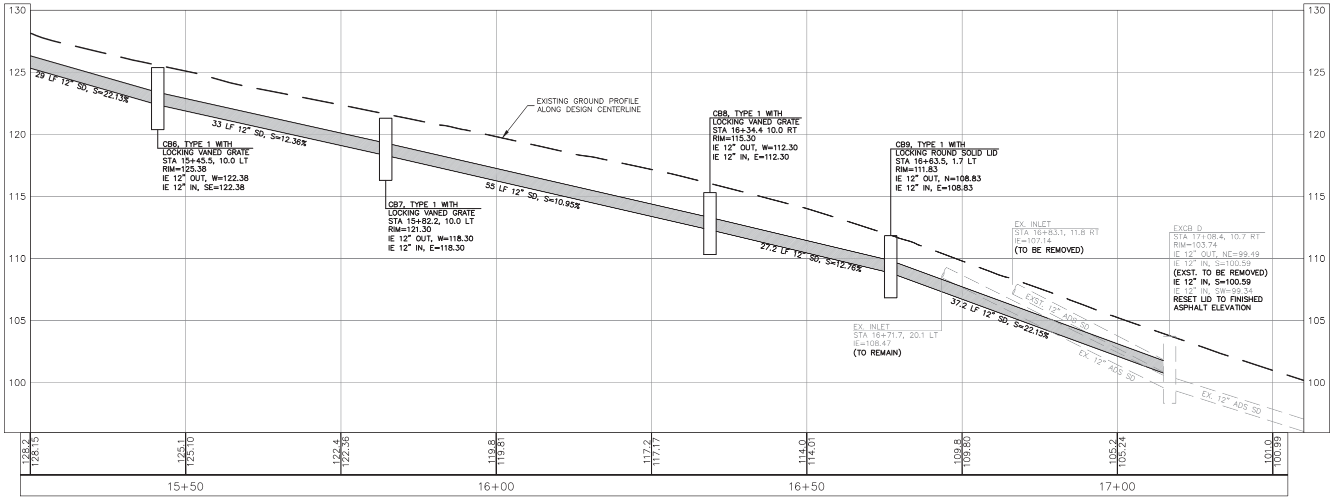

CB6, TYPE 1 WITH
LOCKING VANED GRATE
STA 15+45.5, 10.0 LT
RIM=125.38
IE 12" OUT, W=122.38
IE 12" IN, SE=122.38

CB7, TYPE 1 WITH
LOCKING VANED GRATE
STA 15+82.2, 10.0 LT
RIM=121.30
IE 12" OUT, W=118.30
IE 12" IN, E=118.30

CB8, TYPE 1 WITH
LOCKING VANED GRATE
STA 16+34.4 10.0 RT
RIM=115.30
IE 12" OUT, W=112.30
IE 12" IN, E=112.30

CB9, TYPE 1 WITH
LOCKING ROUND SOLID LID
STA 16+63.5, 1.7 LT
RIM=111.83
IE 12" OUT, N=108.83
IE 12" IN, E=108.83

EX. INLET
STA 16+83.1, 11.8 RT
IE=107.14
(TO BE REMOVED)

EX. INLET
STA 16+71.7, 20.1 LT
IE=108.47
(TO REMAIN)

EXCB D
STA 17+08.4, 10.7 RT
RIM=103.74
IE 12" OUT, NE=99.49
IE 12" IN, S=100.59
(EXST. TO BE REMOVED)
IE 12" IN, S=100.59
IE 12" IN, SW=99.34
RESET LID TO FINISHED
ASPHALT ELEVATION

☐ CONSTRUCTION NOTES

1. CONSTRUCT ROADWAY FRONTAGE IMPROVEMENTS PER ROADWAY SECTIONS ON SHEET RS1.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. NOTE NOT USED TO THIS SHEET.
4. NOTE NOT USED TO THIS SHEET.
5. NOTE NOT USED TO THIS SHEET.
6. NOTE NOT USED TO THIS SHEET.
7. NOTE NOT USED TO THIS SHEET.
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9. CONNECT TO EXISTING STORM STRUCTURE.
10. PROVIDE GRADING THAT ALLOWS POSITIVE SURFACE FLOWS TOWARD STORMWATER FACILITIES AS PART OF STORM SYSTEM INSTALLATION.
11. ADJUST EXISTING STORM OR SANITARY SEWER STRUCTURE FRAME AND GRATE TO FINISHED GRADE.
12. INSTALL ENGINEER–SPECIFIED LENGTH OF STORM DRAIN PIPE AND REPAIR EXISTING ROADWAY DISTURBED BY THIS WORK PER DETAIL 3/D1.
13. NOTE NOT USED TO THIS SHEET.
14. INSTALL SOLID CIRCULAR FRAME AND COVER PER WSDOT STANDARD PLAN B–30.70–03 WITH "DRAIN" LETTERING CAST INTO COVER.
15. NOTE NOT USED TO THIS SHEET.
16. NOTE NOT USED TO THIS SHEET.

TUTTLE ENGINEERING
AND MANAGEMENT

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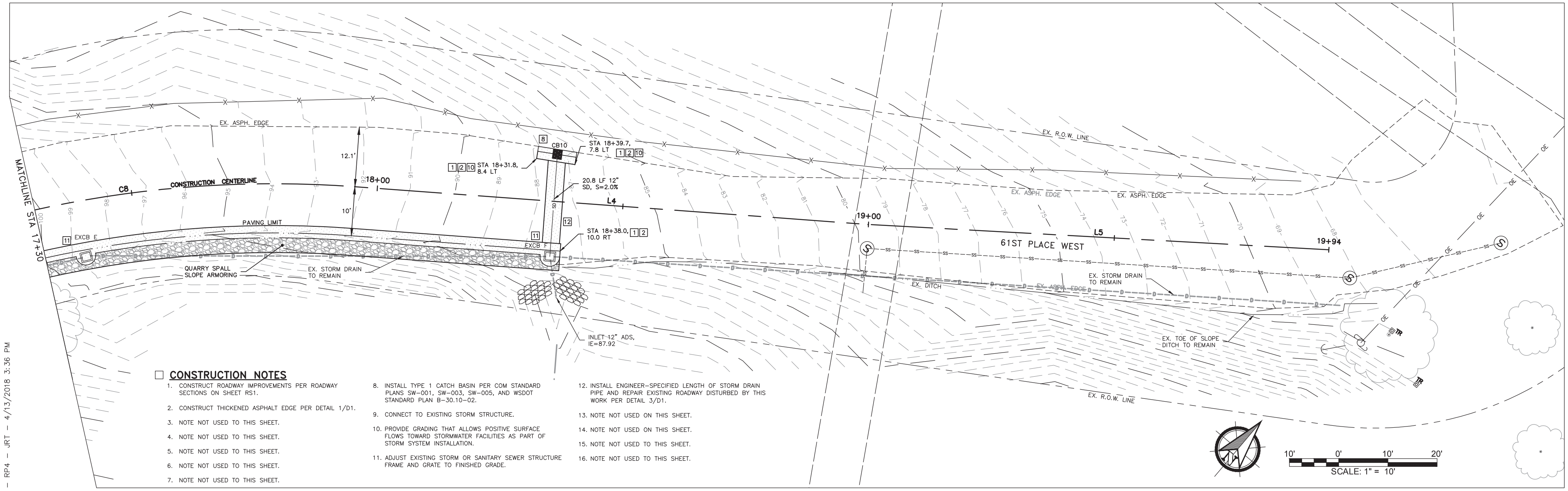
ROAD AND STORM
PLAN AND PROFILE

RP3



☐ CONSTRUCTION NOTES

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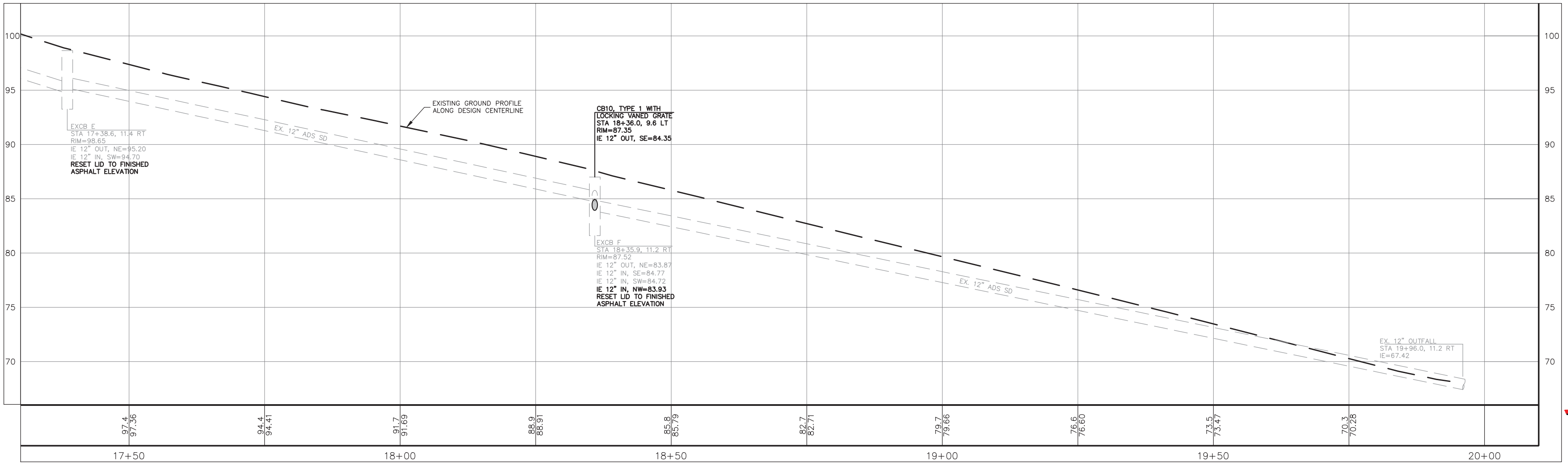
10. PROVIDE GRADING THAT ALLOWS POSITIVE SURFACE FLOWS TOWARD STORMWATER FACILITIES AS PART OF STORM SYSTEM INSTALLATION.
11. ADJUST EXISTING STORM OR SANITARY SEWER STRUCTURE FRAME AND GRATE TO FINISHED GRADE.
12. INSTALL ENGINEER–SPECIFIED LENGTH OF STORM DRAIN PIPE AND REPAIR EXISTING ROADWAY DISTURBED BY THIS WORK PER DETAIL 3/D1.
13. NOTE NOT USED ON THIS SHEET.
14. NOTE NOT USED ON THIS SHEET.
15. NOTE NOT USED TO THIS SHEET.
16. NOTE NOT USED TO THIS SHEET.



TUTTLE ENGINEERING AND MANAGEMENT

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PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

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Vert: 1"=5'
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ROAD AND STORM
PLAN AND PROFILE

RP4

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Field BK/PG:

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Date:

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PLAN PRINTED AT
11"x17" DEPICTS A 1:2
SCALE RATIO
(I.E. 1"=10' TO 1"=20')

Scale:
Horiz: 1"=20'
Vert: N/A

Designed By:

Inspected By:

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FIGURE 2
WETLAND BUFFER
IMPACTS PLAN

WM1

Northwest Environmental Consulting, LLC

TUTTLE ENGINEERING AND MANAGEMENT

Preliminary - Not For Construction

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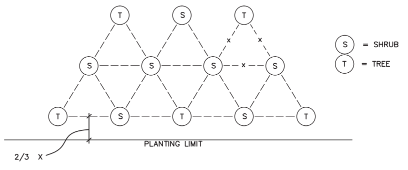
FIGURE 3
WETLAND BUFFER
ENHANCEMENT PLAN

WM2

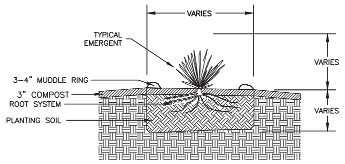


NOTES:

1. GROUP LIKE SHRUBS IN GROUPS OF 3, 5 OR 7.
2. TREES SHOULD NOT BE PLACED NEXT TO EACH OTHER.

TYPICAL PLANT SPACING DETAIL

X = PLANT SPACING



NOTES:

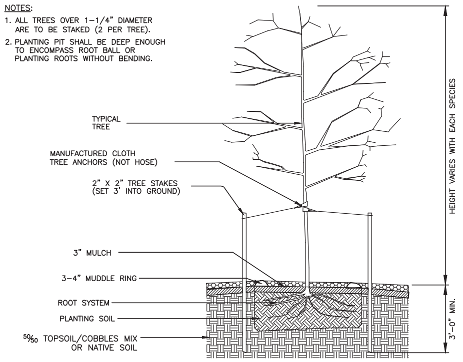
1. PLANTING PIT SHALL BE DUG DEEP ENOUGH TO ENCOMPASS PLANTING ROOTS WITHOUT BENDING.

HERBACEOUS PLANTING DETAIL

NOT TO SCALE

NOTES:

1. ALL TREES OVER 1–1/4" DIAMETER ARE TO BE STAKED (2 PER TREE).
2. PLANTING PIT SHALL BE DEEP ENOUGH TO ENCOMPASS ROOT BALL OR PLANTING ROOTS WITHOUT BENDING.



BARE ROOT OR POTTED DECIDUOUS OR EVERGREEN TREE AND SHRUB PLANTING DETAIL

NOT TO SCALE

Common Name	Scientific Name	Type	Size	Spacing	Zone 1 Qty
Trees					
Shore Pine	*Pinus contorta*	Bare root/potted	18"	5'	5
Red Alder	*Alnus rubra*	Bare root/potted	18"	5'	5
Service Berry	*Amelanchier alnifolia*	Bare root/potted	18"	5'	5
Beaked Hazelnut	*Corylus cornuta*	Bare root/potted	18"	5'	10
				Tree Total	**25**

Common Name	Scientific Name	Type	Size	Spacing	Zone 1 Qty
Shrubs/Ground Cover					
Evergreen Huckleberry	*Vaccinium ovatum*	Bare root/potted	12"	5'	20
Indian Plum	*Oemleria cerasiformis*	Bare root/potted	12"	5'	20
Vine Maple	*Acer circinatum*	Bare root/potted	12"	5'	20
Snowberry	*Symphoricarpos albus*	Bare root/potted	12"	5'	20
Sword Fern	*Polystichum munitum*	Bare root/potted	12"	5'	20
				Shrub Total	**100**
				Total Plantings	**125**

TREE AND SHRUB PLANTING SCHEDULE

SE FIGURES 2 AND 3 FOR AREAS

GENERAL NOTES

1. PLANTING AREA INCLUDES ENTIRE GROUND SURFACE REGARDLESS OF SURFACE COVER BETWEEN PLANTS.
2. SPACING ALL PLANTS IRREGULARLY AT THE DESIGNATED LOCATIONS AND SPACING, FOR NATURAL APPEARANCE. INTERMIX SPECIES GROUPS IN GROUPS OF THREE, FIVE, OR SEVEN.
3. PLANT MATERIAL SHALL CONFORM TO AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z601–2001) FOR PLANT SIZE AND CONDITION FOR SPECIFIED MATERIAL.
4. PLANT MATERIAL SHALL BE LOCALLY GROWN (PUGET SOUND REGION) AND SHALL BE IN HEALTHY AND VIGOROUS GROWING CONDITION.
5. PLANTS LOCATED ON THE PLAN ARE SCHEMATIC AND MAY NEED ADJUSTMENT TO MEET ACTUAL FIELD CONDITIONS. WHEN A CONFLICT WITH FIELD CONDITIONS IS APPARENT, CONSULT WITH THE PROJECT ENGINEER.
6. SUBSTITUTIONS OF PLANT SPECIES OR SIZES MAY BE PERMITTED BASED ON PLANT AVAILABILITY, BUT ONLY WITH PRIOR APPROVAL BY THE MITIGATION CONSTRUCTION MONITOR.

PLANTING SEQUENCE

1. PREPARE SITE BY ADDING 1 INCH OF COMPOST AND 3 INCHES OF MULCH TO ZONE 1.
2. REMOVE ALL INVASIVE PLANTS FROM ZONE 1 BEFORE PLANTING.
3. LAYOUT PLANTS IN PLANTING AREA BEFORE DIGGING PITS.
4. DIG A PLANT FOR EACH PLANT THAT IS TWICE THE SIZE OF THE ROOT BALL OR PLANT CONTAINER. REMOVE LARGE ROCKS AND OTHER DEBRIS FROM PIT. SOAK PIT WITH WATER BEFORE PLANTING.
5. "ROUGH UP" ROOTS OF THE PLANTS AND PRUNE OR STRAIGHTEN CIRCLING ROOTS. INSTALL PLANT IN THE PIT.
6. FORM A BASIN TO HOLD WATER AROUND THE PLANT USING REMAINING SOIL AND MULCH TO FORM A MULCH RING A MINIMUM OF 3 INCHES IN DIAMETER AROUND STEM.
7. WATER THE PLANT AGAIN FILLING THE SMALL BASIN FORMED IN STEP 6.

Northwest Environmental Consulting, LLC

TUTTLE ENGINEERING AND MANAGEMENT

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Date: APR. 13, 2018

CITY OF MUKILTEO

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PUBLIC WORKS DEPARTMENT

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JOHN RAYMOND TUTTLE
43718
PRELIMINARY

61st Place West
Retaining Wall Project

90% Design - Not For Construction

FIGURE 4
WETLAND BUFFER
PLANTING DETAILS

WM3

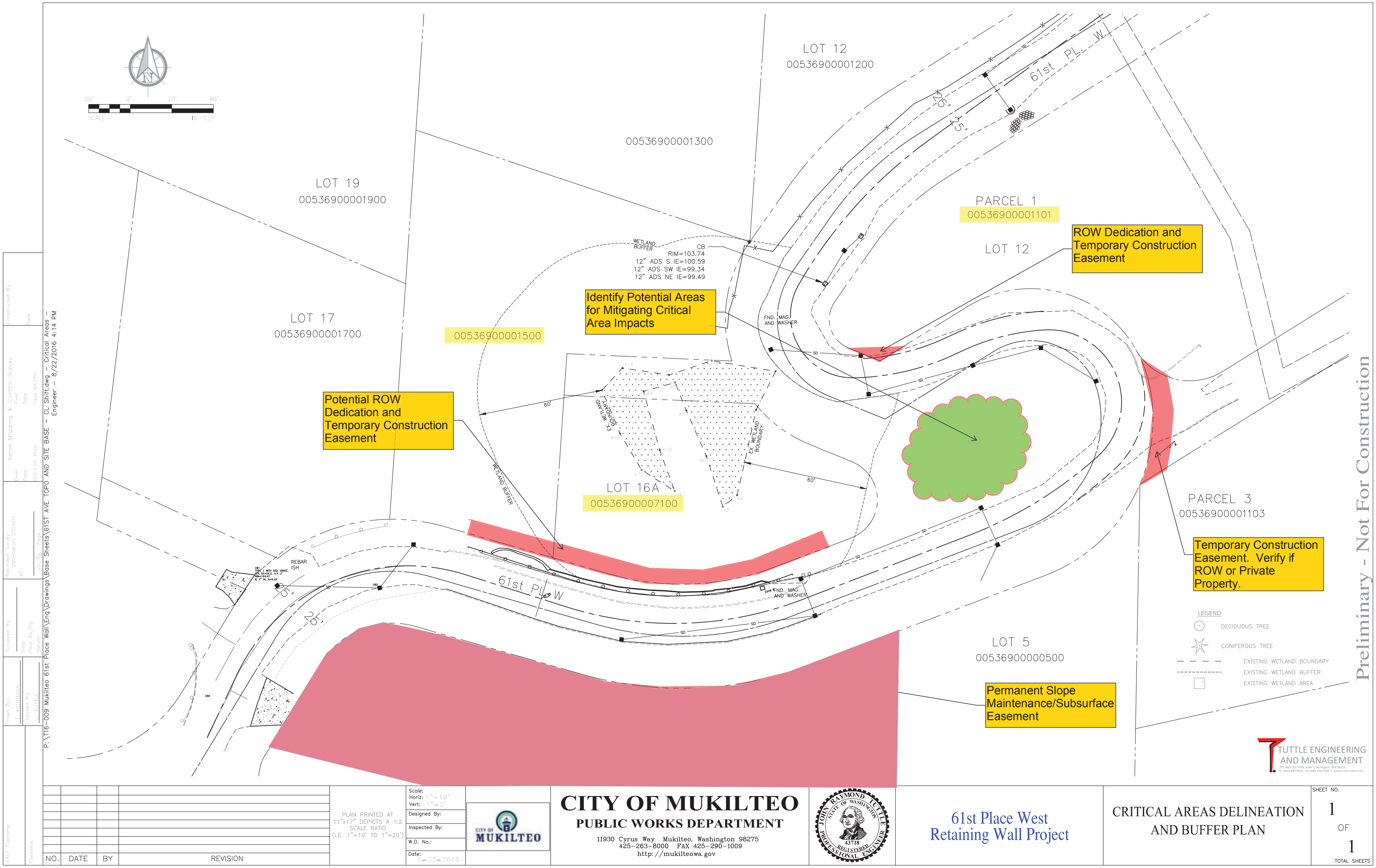

Figure 1 - Critical Areas and Easements

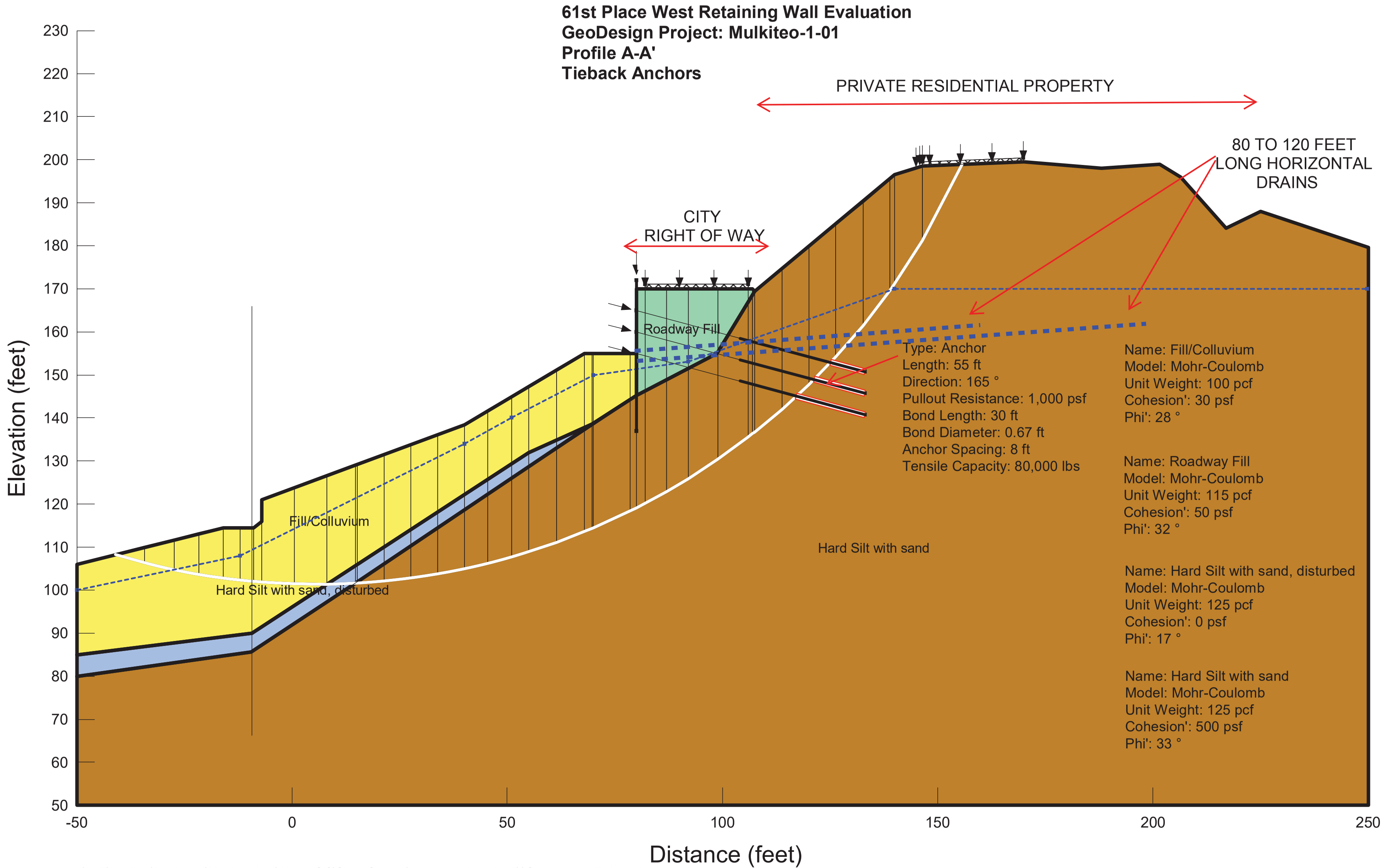

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Figure 2 - Tieback Anchor detail

Appendix B:
Site Photographs

Photo 1. Vegetation on slope below retaining wall.

Photo 2. Vegetation in Wetland A.

Photo 3. Vegetation on slope above retaining wall.

Photo 4. Vegetation on slope above retaining wall.

Photo 5. Retaining wall, looking from west to east.

Photo 6. Failing portion of retaining wall, and area of wetland buffer that will be temporarily affected.

Photo 7. Road bend below Wetland A.

Photo 5. Drainage along 61st Place West on curve below Wetland A.

Mukilteo 61st Place Retaining Wall Critical Areas Report

Prepared for

The City of Mukilteo
11930 Cyrus Way
Mukilteo, WA 98275

Prepared by

Northwest
Environmental Consulting, LLC

Northwest Environmental Consulting, LLC
3639 Palatine Avenue North
Seattle, WA 98103
206-234-2520

August 2018

SUMMARY

The City of Mukilteo is proposing to repair an existing 190-foot-long, soldier pile retaining wall and associated roadway on 61st Place. The wall along the 61st Place roadway has suffered damage, and the road is at risk of failure. This roadway serves as the only access to adjacent residential properties, as well as the Mukilteo Water and Wastewater District’s regional sewer lift station located north and downhill of the wall system. The project’s goal is to maintain this access by repairing existing damage and preventing future failure of the road supports.

The project will take place within the City of Mukilteo, within Section 17, Township 28N, and Range 4E (see Appendix A: Figure 1). Project drawings showing the plans are attached (Appendix A) and referenced within the report where appropriate.

Work will occur in forested terrain and within a wetland buffer. No species of mammal, bird, amphibian, fish, or plant listed under the Endangered Species Act (ESA) is present at the work site or nearby. Stormwater from the project area travels along 61st Place for about 775 feet until it reaches the road crossing with Smuggler’s Gulch Creek. This creek is potentially fish-bearing below the road’s culvert, though no salmonids have been documented there. Listed fish species use the Puget Sound waters downslope from the project.

One Category III wetland is present in the project area. The wetland has a 60-foot buffer that extends to the base of the retaining wall. Some of the work to repair the wall will occur in this buffer. There will be 3,050 square feet of temporary impacts, in the form of vegetation clearing and disturbance during construction. There will also be 135 square feet of permanent impacts in the buffer, where the wall needs to be expanded. The project will mitigate for these impacts by replanting and reseeding all of the temporary impact area, as well as an additional 270 square feet to mitigate for the permanent impacts at a 2 to 1 ratio.

Table of Contents

APPENDICES

1 INTRODUCTION

1.1 Report Purpose

This report documents the current conditions of critical areas adjacent to the 61st Place West Retaining Wall Project (the project) in Mukilteo, Washington. Northwest Environmental Consulting, LLC (NWEC) conducted a literature search and site visit to determine if features such as wetlands or sensitive wildlife habitat were present in or adjacent to the project site.

The report also describes the temporary and permanent impacts to these critical areas and their buffers from the planned repair of the roadway, reinforcement of the retaining wall, and widening of the road to accommodate improved routing of stormwater.

1.2 Project Purpose and Description

The City of Mukilteo is proposing to repair an existing 190-foot-long, soldier pile retaining wall and associated roadway on 61st Place. The wall along the 61st Place roadway has suffered damage, and the road is at risk of failure. This roadway serves as the only access to adjacent residential properties, as well as the Mukilteo Water and Wastewater District’s regional sewer lift station located north and downhill of the wall system. The project’s goal is to maintain this access by repairing existing damage and preventing future failure of the road supports.

In 1996, a storm event occurred which resulted in a presidential declaration of a disaster in the region. Damage included a roadway failure on 61st Place West. At that time, the City used FEMA funds to repair the roadway, constructing a soldier pile wall centered on segmental block walls.

Since 1988, the ground at the base of the walls dropped several feet incrementally. On March 2011, a landslide occurred below and north of the wall; the main scarp of the landslide was located at the base of two retaining walls on the north side of the road. The block wall collapsed and several feet of soil is now exposed below the soldier pile wall timber and plywood lagging. The ground displacement also resulted in the loss of the backfill material placed behind the timber and plywood lagging, such that the backfill was completely lost between the wall piles and the roadway pavement has been undermined. Portions of the segmental block wall and soldier pile wall appear to be intact, but the landslide main scarp appears to be within several feet these structures.

The project will reinforce 190 feet of the existing soldier pile wall with tiebacks and walers, install horizontal wall drains, reconstruct roadway shoulders, install new asphalt shoulder treatments, construct a new stormwater system to collect roadway runoff and groundwater, and install concrete barriers along the wall face. The project will increase impervious area by 1,556 square feet, mainly to create the stormwater collection facilities and widen the existing shoulders. An additional 1,714 square feet of pervious hardened surface will be added, in the form of quarry spalls for slope erosion.

Site preparation may include minor clearing of shrub, grass, and other vegetation for the construction work; there will be no vegetation clearing required to access the proposed site. After construction, off-roadway vegetated areas will be restored, and mitigation will offset the project's disturbance within existing wetland buffers.

See Figures 2, 6 and 7 for detailed project plans.

1.3 Landscape Setting

The project will take place in Snohomish County, within the City of Mukilteo, on a forested and partially forested slope along 61st Place West. The project site is about 600 feet from the shoreline of Puget Sound. The project is located within Section 17, Township 28N, and Range 4E (see Figure 1, Vicinity Map). The project is in Water Resource Inventory Area (WRIA) 8 (Lake Washington/Cedar/ Sammamish Watershed) and within the Hydraulic Unit Code (HUC) 17110019.

The project site is within the City of Mukilteo's right of way, and also includes slopes on portions of adjacent residential properties (Figure 6, Project Plan Overview).

The project site is in steep terrain alongside 61st Place West. Habitat upslope of the road near the retaining wall includes herbaceous vegetation, small deciduous trees and shrubs, landscaping plants at the hill top, and a large landslide area. Habitat downslope is forest with trees including big leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and Douglas-fir (*Psuedotsuga menziesii*). Shrubs and herbs in this forest patch include sword fern (*Polystichum munitum*), salmonberry (*Rubus spectabilis*), red huckleberry (*Vaccinium parviflorum*), trailing blackberry (*Rubus ursinus*) and Himalayan blackberry (*Rubus armeniacus*) with patches of horsetail (*Equisetum arvense*) and fringecup (*Tellima grandiflora*). See Attachment B for site photos.

The forested habitat below the wall connects with similar habitat farther downslope of the project site. Between the wall and the Puget Sound shoreline, coniferous and deciduous trees predominate, with a fairly open understory. Residences and yard landscaping are interspersed in this habitat.

No streams are present in the project area. Stormwater at the project site flows to Smuggler’s Gulch Creek via the existing open and closed drainage system along the roadway for about 775 feet before discharging to the stream. Smuggler’s Gulch is not a shoreline of the state, and is considered a Type 4 stream by the City of Mukilteo (Type 4 = waters that are perennial nonfish habitat streams). No turbidity from the project is expected to reach this stream, though it could see increased stormflows from an increase in impervious surfaces at the project site.

1.4 Critical Areas

NWEC biologists walked the project area and areas upslope of the road and 100 feet downslope from the wall in April 2016, looking for wetland characteristics and priority habitats.

Wetlands

One wetland was identified downslope of the retaining wall. This wetland’s water source appears to be seepage emerging to near the surface at two points along a topographic break, and soils with clay content that prevent drainage of rainwater. The wetland extends downslope from these seepage points to a flat area (Figure 4, Critical Areas Delineation). The wetland includes indications of unstable soils: portions of the slope appear to have recently slid downward.

Using the 2014 Wetland Rating System for Western Washington, Wetland A was determined to be Category III, with a specific habitat score of 4. Based on these metrics, the wetland has a 60-foot buffer width (City of Mukilteo 17.52B.100). The City of Mukilteo rates wetlands based on the Washington State Department of Ecology’s 2014 Wetland Rating System for Western Washington (see City of Mukilteo municipal code 17.52B.090). The City determines wetland buffer widths based on a combination of the Category rating and the specific habitat score from Ecology’s rating system (City of Mukilteo municipal code 17.52B.100).

The NWI map for the area does not indicate any wetlands within ½ mile of the project site (Figure 3, NWI Map). Estuarine habitat along Puget Sound’s shoreline is within 1,000 feet, downslope and west of the project site.

See Attachment C for the wetland determination memorandum.

Priority Wildlife Species and Habitat

During the site visit, NWEC biologists observed the habitat conditions for wildlife both in the wetland and in the surrounding buffer area. In particular, they looked for habitat that could support federally listed or state-listed species, or Priority Habitats and Species (PHS) identified by the Washington Department of Fish and Wildlife.

The project site includes one PHS habitat: freshwater wetlands.

The WDFW's publically available database for PHS species (WDFW 2018a) does not list any documented occurrences of PHS species at the site or between the site and Puget Sound. The database does list four bald eagle breeding areas about 2 miles north and 2 miles south of the project area. Bald eagles are designated state sensitive.

The second-growth mixed forest may support foraging and nesting songbirds, as well as foraging woodpeckers, including the PHS species pileated woodpecker (*Dryocopus pileatus*) and band-tailed pigeon (*Patagioenas fasciata*). The wetland habitat could support the PHS species western toad (*Bufo boreas*), though this toad is not normally observed to occur in urban/suburban areas. Deer and small mammals may also use the site.

There are no prominent trees for roosting or waterways for foraging directly adjacent to the project site that would attract bald eagles. If eagles are present within the project vicinity, they are likely to be roosting or perching in trees adjacent to the Puget Sound shoreline.

No streams are present at the project site. The nearest stream is 800-1,000 feet away, at Smuggler's Gulch Creek. WDFW's SalmonScape mapping database (WDFW 2018b) does not indicate any documented presence of salmon in Smuggler's Gulch Creek. The database does indicate modeled presence of coho salmon (Federal Species of Concern) in the creek downstream of the 61st Place West culvert (Figure 5). WDFW maps the general area (lands adjacent to Puget Sound) as accessible to coho salmon, pink salmon, chum salmon, and the Puget Sound Distinct Population Segment (DPS) of steelhead (Federally Threatened).

Steep Slopes

Critical areas issues related to steep slopes are covered in the geotechnical engineering report prepared for this project.

2.1 Unavoidable Impacts

Repair of the wall and installation of tie-back anchors will take place within the buffer of the wetland downslope of the road, in a construction easement within 10 feet of the base of the wall. Activities here will include installation of horizontal wall drain piping, repair of the existing wall, removal of a rockery feature at the base of the wall, and expansion of the existing wall. The road will be restored and will not encroach further into the critical areas buffer than the existing condition.

In order to reach the repair area at the base of the wall, there will be unavoidable, temporary impacts to 3,050 square feet of the wetland buffer area; this disturbance will consist of vegetation clearing in critical areas buffer, and disturbance during construction activities at the base of the wall (Figures 6, 7, and 8). In addition, the wall must be expanded to provide adequate structural support. For this step, there will be 134 square feet of permanent impact, along the base of the wall on the eastern site, in the area currently affected by the slide (Figure 8). At this location, existing rocks will be removed and the soldier pile wall will be extended.

2.2 Functions and Values Impacts

The project will increase impervious area by 1,556 square feet, mainly to create the stormwater collection facilities and widen the existing shoulders. None of this surface will occur within critical areas. The new impervious surface could slightly increase stormwater flows in Smugglers Gulch Creek. No increased vehicle use will result because of the project; therefore, no pollution generation from the new impervious surface is expected. No ESA listed species are present in Smugglers Gulch Creek, so no indirect effects will occur from runoff from the project.

The project plans estimate that the project will impact approximately 3,050 square feet of critical areas buffer (Figure 8). All disturbed vegetation in the buffer will be restored at the end of the project with a native planting plan that is suitable for a steep slope environment. The plan will improve baseline habitat conditions in the project area in the long-term (see Figures 9 and 10 for the planting plan).

3 MITIGATION APPROACH AND PLAN

3.1 Avoidance and Minimization

Impacts to critical areas are required to follow mitigation sequencing. Mitigation sequencing requires the following steps be taken:

- Avoiding the impact altogether by not taking a certain action or parts of actions;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
- Compensating for the impact by replacing or providing substitute resources or environments; and/or
- Monitoring the impact and the compensation projects and taking appropriate corrective measures.

In order to complete the project and stabilize the wall, impacts to the wetland buffer are unavoidable. The construction crew needs to enter the buffer to access the base of the wall. These impacts are unavoidable.

Project impacts will be minimized by using best management practices to contain all sediments within the project site. The footprint of disturbance to the critical area will be minimized during construction, and critical area buffer will be restored with plantings.

3.2 Mitigation Approach

The project is designed to be a positive action that will reduce future erosion and landslides in the vicinity, and to protect nearby properties and access along 61st Place West.

Construction equipment to be used includes backhoes, pavers, a pile driver to install the horizontal drains, and other motorized equipment, as well as manual construction equipment. Turbidity and sediment delivery to the downslope wetland and to Smuggler’s Gulch Creek is not an issue during construction, as best management practices such as temporary erosion fences and tarps over loose materials will minimize the movement of soil during any rainstorms during construction. Should rains occur, any turbidity will be reduced to background levels within 300 feet of the project by these BMPs, long before stormflows reach Smuggler’s Gulch 775 feet down the open and closed drainage system.

Potential erosion in new areas of topsoil will be reduced or eliminated by stabilizing all disturbed areas and replanting with native trees, shrubs, and grasses.

Restoring the buffer to existing conditions, and enhancing areas with native trees and shrubs will mitigate impacts to the critical areas buffer. Areas that are currently maintained as roadway right-of-way or landscaped will be restored to their existing conditions by hydroseeding and replacing existing trees and shrubs in kind. In total, approximately 3,320 square feet will be replanted (Figure 9).

Erosion control BMPs will be installed to protect surrounding areas from sediment should a rain event occur during construction.

3.3 Proposed Mitigation

To offset temporary impacts to the wetland buffer, all disturbed areas in the 3,050 square feet of temporarily disturbed buffer will be restored by covering with compost and erosion control fabric, and then planted with native trees and shrubs. An additional 270 square feet will also be planted, to mitigate for permanent impacts at the base of the wall.

Table 1 shows the proposed species to be planted in the buffer. The planting plan in Figures 9 and 10 provides more detail on the planting installations, quantities, and locations of these plantings.

Table 1. Tree and Shrub Species in Planting Plan

Common Name	Scientific Name	Zone 1
Trees		
Red alder	*Alnus rubra*	X
Shore pine	*Pinus Contorta*	X
Serviceberry	*Amelanchier alnifolia*	X
Beaked hazelnut	*Corylus cornuta*	X
Shrubs and groundcover		
Evergreen huckleberry	*Vaccinium ovatum*	X
Indian plum	*Oemleria cerasiformis*	X
Vine maple	*Acer circinatum*	X
Snowberry	*Symphoricarpos albus*	X
Sword fern	*Polystichum munitum*	X

4 MITIGATION GOALS, OBJECTIVES, AND PERFORMANCE STANDARDS

4.1 Mitigation Goals

The goals of the mitigation are to restore 3,050 square feet of disturbed wetland buffer, mitigate for 135 square feet of permanent buffer impacts, and control spread of invasive weeds into the enhancement area.

4.2 Mitigation Objectives and Performance Measures

Objective 1 – Restore 3,050 square feet of temporarily disturbed wetland buffer, and mitigate for 135 square feet of permanent buffer impacts.

Plant native trees and shrubs within the disturbed area of Wetland A buffer, as well as within 270 square feet directly downslope of the disturbed area. The mitigation area will have at least four species of native shrubs and trees. Plantings shall be containerized plants or bare root. Watering of the installed plants may be required if drought conditions occur during the summer months.

Performance Measures

- Year 1 – Native woody species (planted and volunteer) will maintain 100% survival in the restored and enhanced areas.
- Years 2 through 4 – Native woody species (planted and volunteer) will maintain 4 plants per 100 square feet in restored and enhanced areas.

Performance Standard

- Year 5 – Native woody species will achieve a minimum of 35 percent areal cover in the restored and enhanced areas.

Objective 2 – Control invasive plant species in the enhancement area.

Limit growth of non-native invasive plant species by establishing hardy native plants, which will shade and out-compete invasive species in the Planting Zones. Control invasive plants directly by hand-pulling or approved herbicides.

Performance Measures

- Years 1 through 4 – Invasives will not exceed 10 percent areal cover in the restored and enhanced areas, and will be removed when identified.

Performance Standard

- Year 5 – Invasives will not exceed 20 percent areal cover in the restored and enhanced areas, and will be removed when identified.

5 PROPOSED MONITORING, REPORTING AND CONTINGENCY

5.1 Plant Survival

To ensure that the performance standards are met, plantings will be counted in August or September for survival for the first year. The site will be monitored for three years from the time of completion of site construction by a qualified individual(s) who is experienced or trained in wetland vegetation and monitoring techniques.

Valid monitoring data are critical to making meaningful management decisions that help the mitigation site meet its objectives. Monitoring plans are based on mitigation site conditions and plant community development. These factors together with the mitigation objectives are to be incorporated into a site-specific monitoring plan that will be developed at the beginning of each monitoring season. Photo documentation of the planted area will be included during annual plant monitoring activities.

The monitoring team will be responsible for a complete count of the plantings, or if appropriate will take a representative sample of the site and determine an appropriate sample size.

5.2 Monitoring Reports

Monitoring reports will be completed and submitted to the City by December 31 for each of the monitoring years.

- Site plan and location
- General background information
- Goals of the mitigation plan
- Performance standards
- Monitoring methodology
- Photographic documentation
- Results of the monitoring to date
- Contingency actions, if needed

5.3 Contingency Actions

All dead plantings will be replaced so that 100% survival is reached for the first year. A sub-sample can be completed to assure that the 100% survival is reached. In years 2 and 3 all plantings will maintain an 80% survival rate for three years.

Himalayan blackberry and other invasive species identified will also be manually removed from the mitigation area if they occur during the three-year period.

6 DOCUMENT PREPARERS

Brad Thiele	Biologist	20 years of experience	Northwest Environmental Consulting, LLC. (NWEC)
Emily Drew	Ecologist	18 years of experience	NWEC

Northwest Environmental Consulting, LLC followed standard acceptable field methods and protocols at the time work was performed. These standards include delineation of wetland and stream boundaries, characterization, rating, functional analyses, impact assessments and mitigation of impacts. The conclusions and findings in this report are based on field observations and measurements and represent our best professional judgment and to some extent rely on other professional service firms and available site information. Within the limitations of project scope, budget, and seasonal variations, we believe the information provided herein is accurate and true to the best of our knowledge. Northwest Environmental Consulting does not warrant any assumptions or conclusions not expressly made in this report, or based on information or analyses other than what is included herein.

7 REFERENCES

City of Mukilteo Municipal Code, Chapter 17. Accessed at http://codepublishing.com/wa/mukilteo/

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Washington Department of Fish and Wildlife (WDFW). 2008. Priority Habitats and Species List. Olympia, WA. 177 pages.

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_____. 2018b. Washington SalmonScape mapping database. Accessed April 2018 at http://apps.wdfw.wa.gov/salmonscape/

Appendix A: Figures
61st Place West Retaining Wall Project

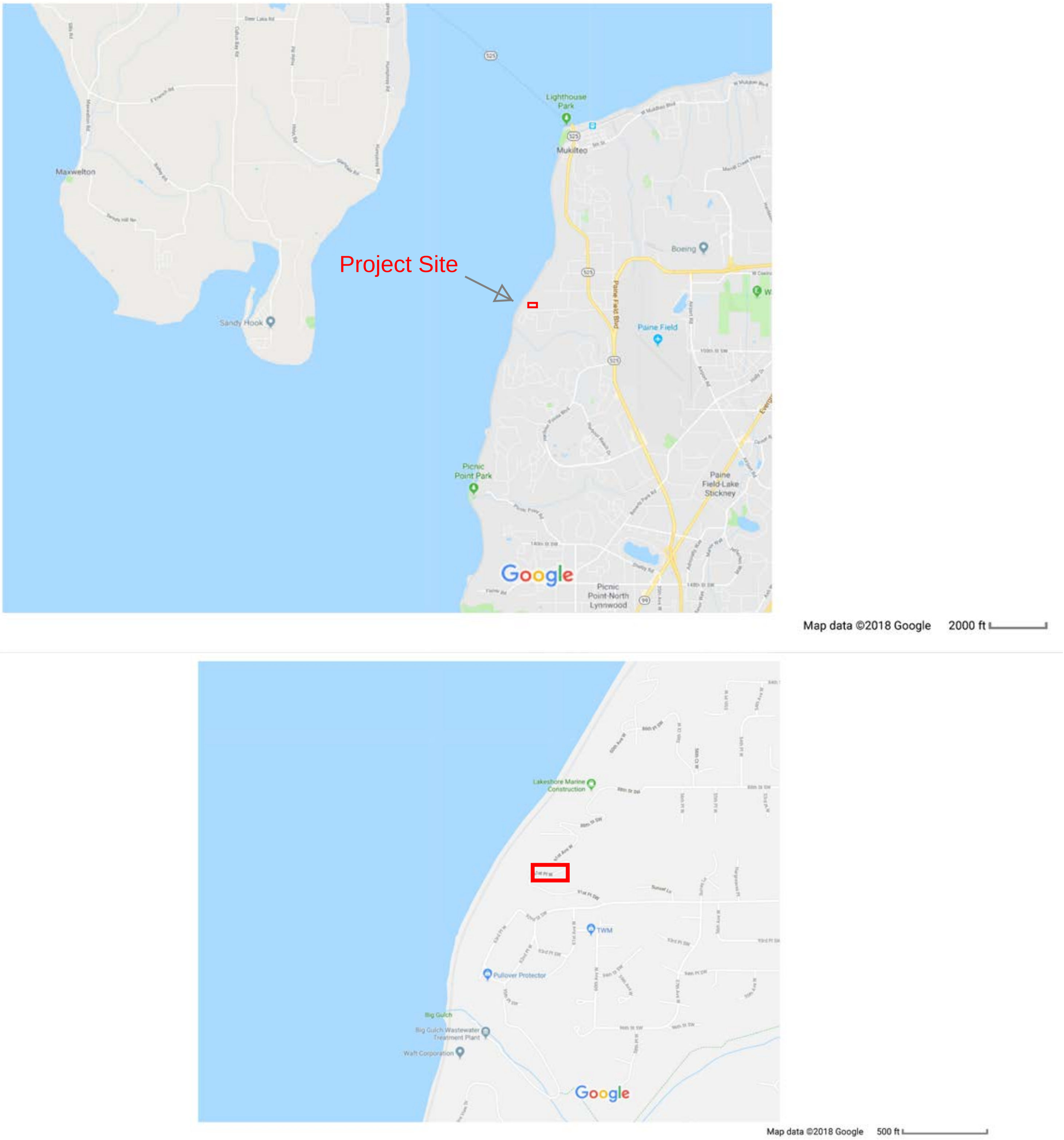

Figure 1 - Vicinity Map

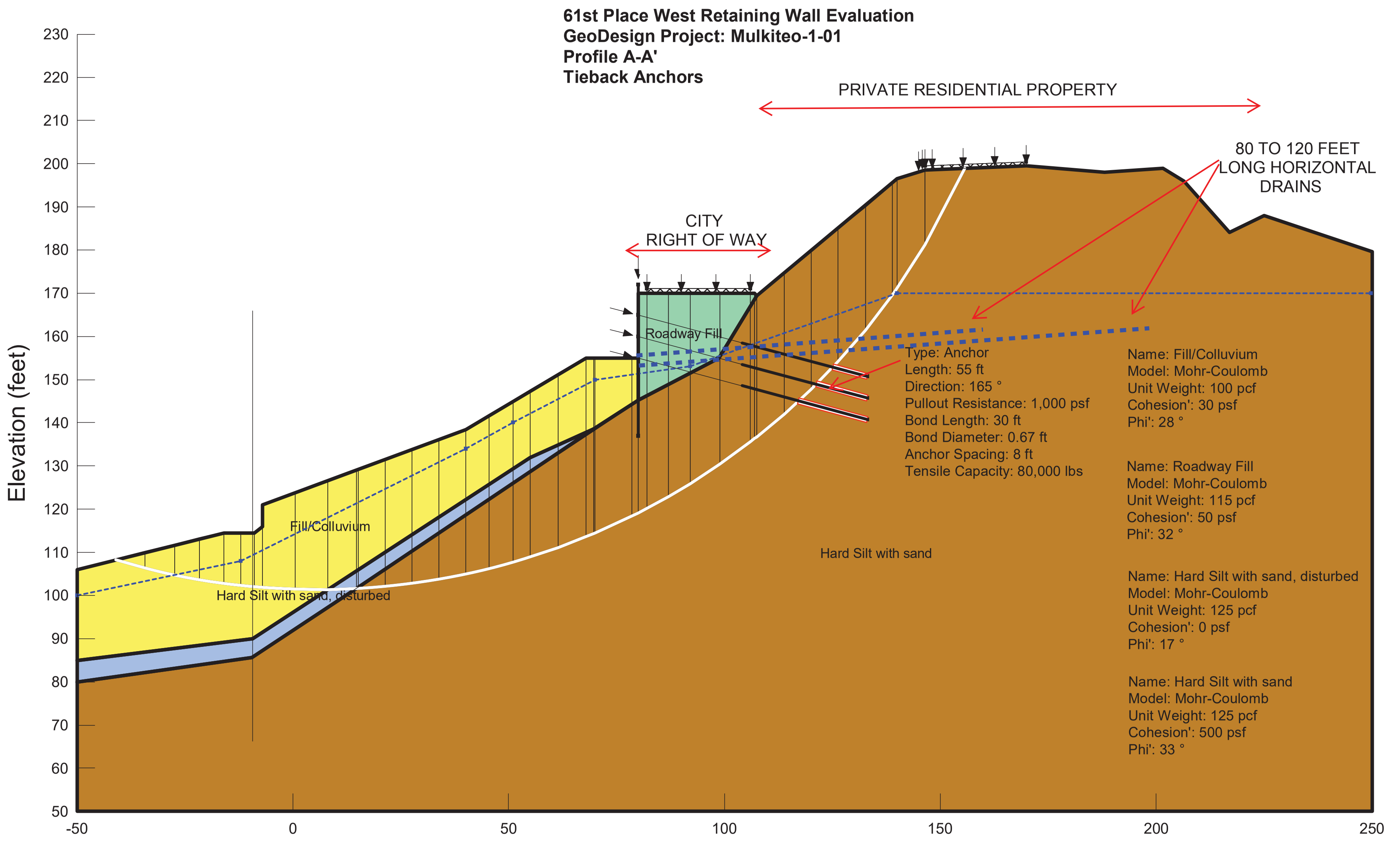

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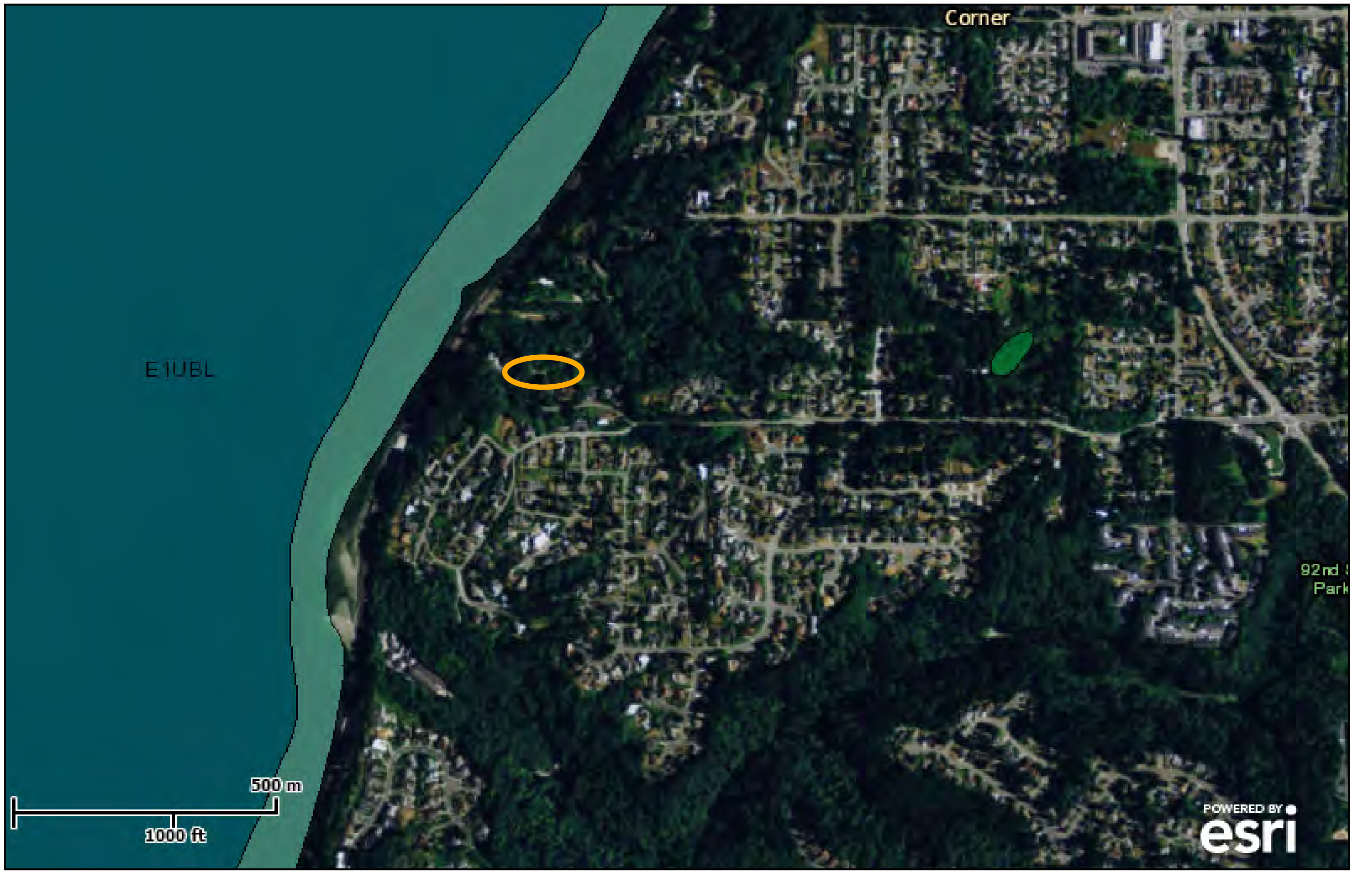
Figure 2 - Tieback Anchor detail

U.S. Fish and Wildlife Service

National Wetlands Inventory

May 10, 2016



Wetlands

- 🟩 Freshwater Emergent
- 🟩 Freshwater Forested/Shrub
- 🟦 Estuarine and Marine Deepwater
- 🟩 Estuarine and Marine
- 🟦 Freshwater Pond
- 🟦 Lake
- 🟦 Riverine
- 🟫 Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

Figure 3 - NWI Map

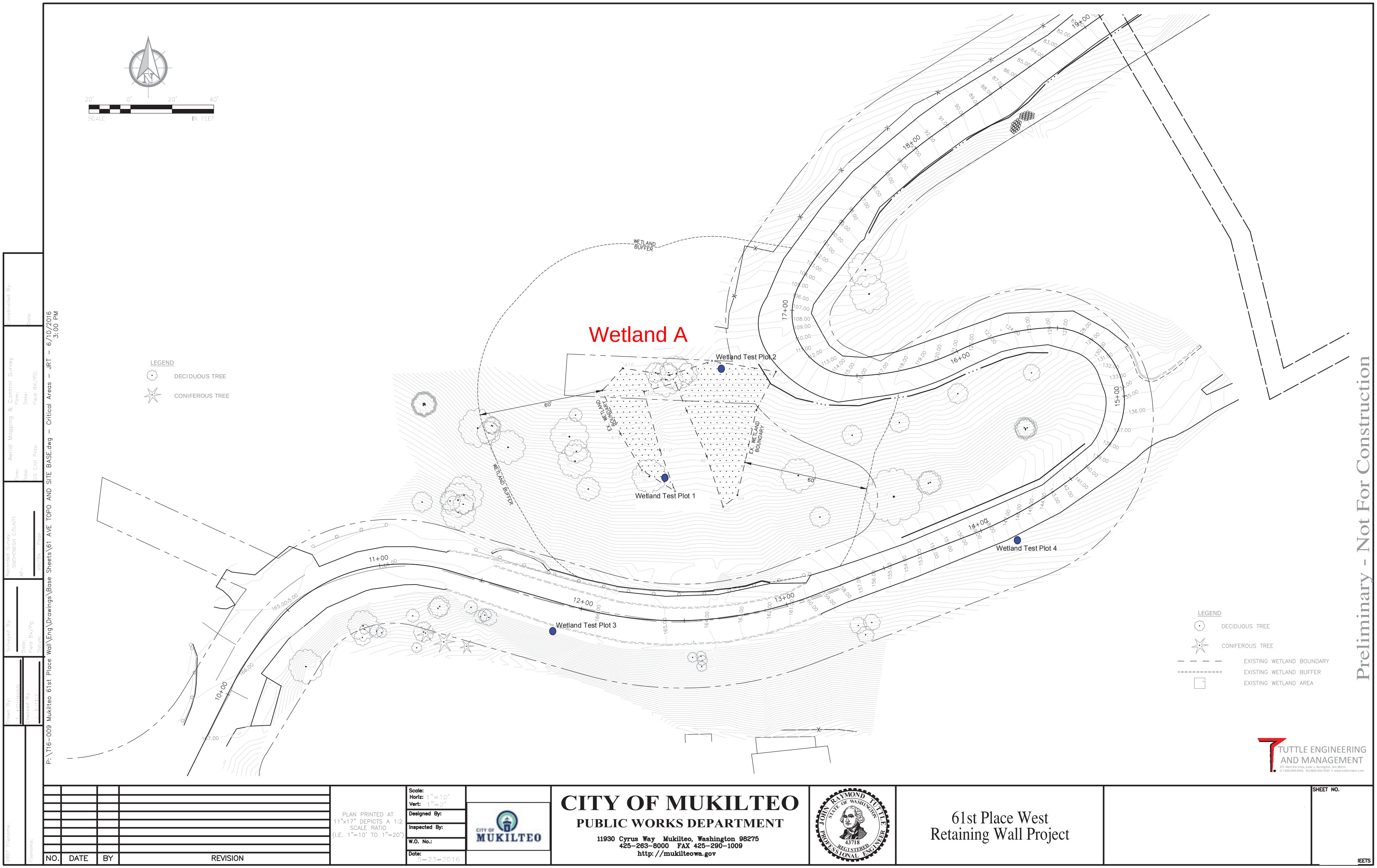
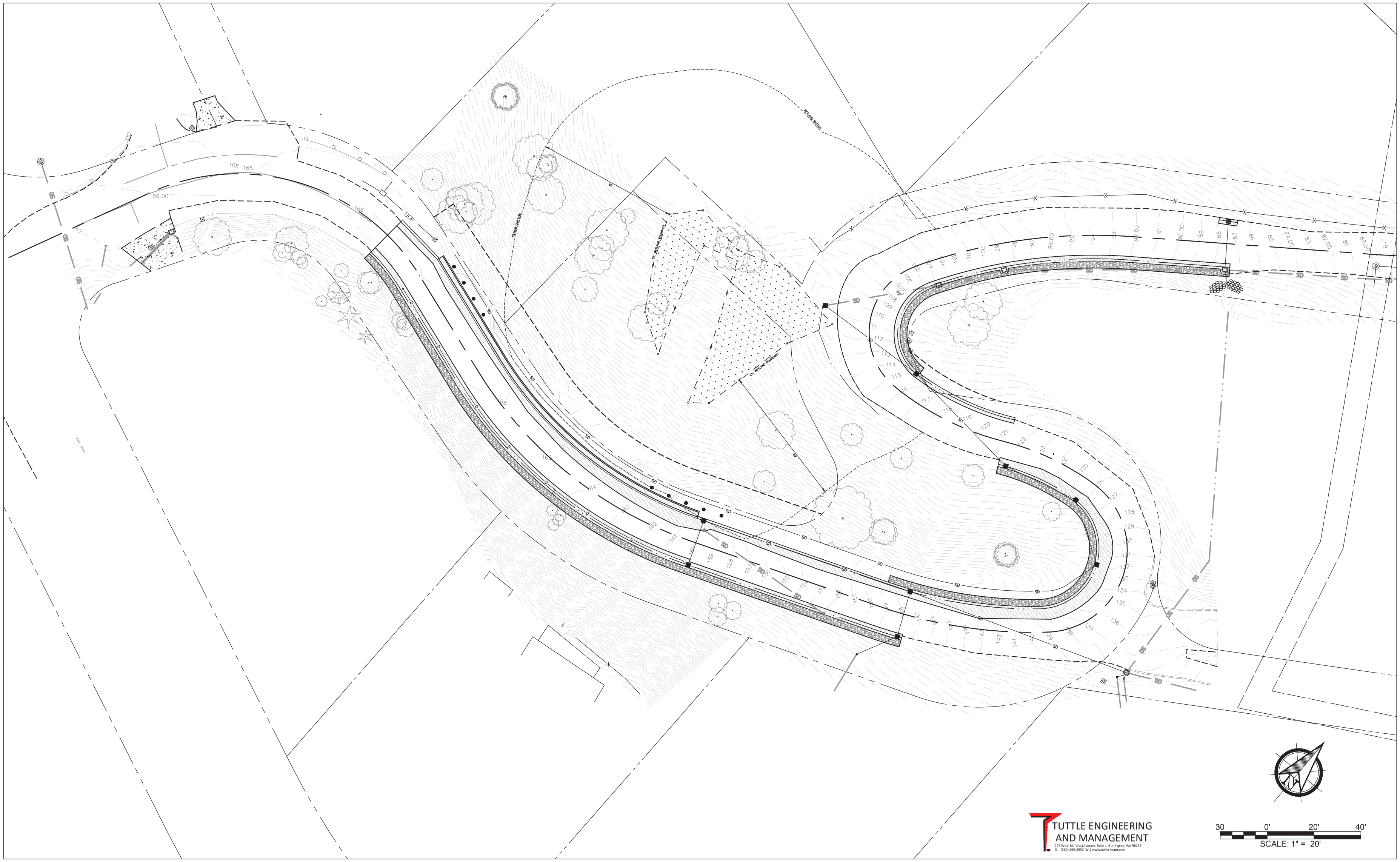


Figure 4 - Critical Areas Delineation

April 26, 2018

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri

Figure 5 - WDFW SalmonScape Map for Smuggler's Gulch Creek



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MAR. 2, 2018

CITY OF MUKILTEO
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Preliminary - Not For Construction

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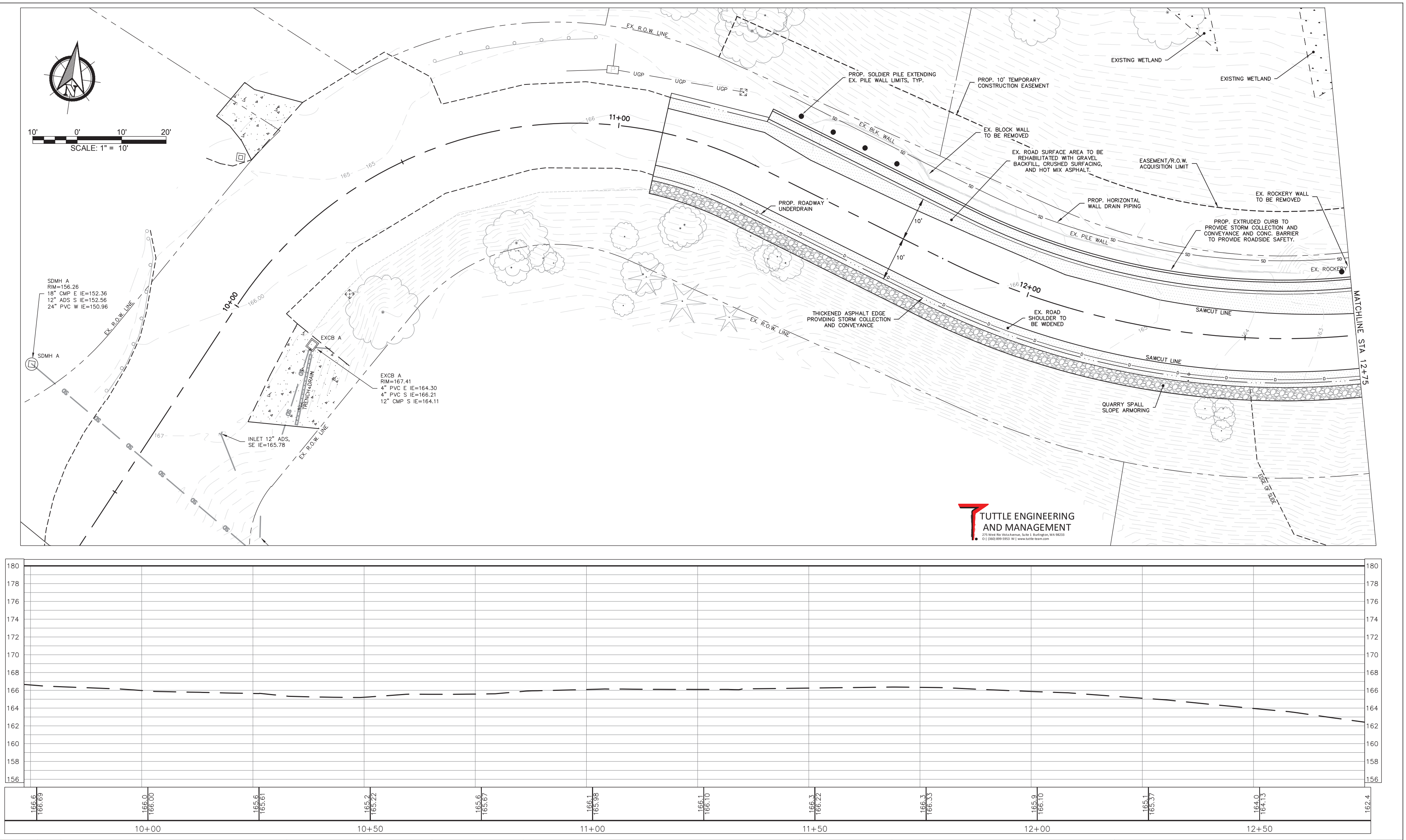
Figure 6 - Project Plan Overview



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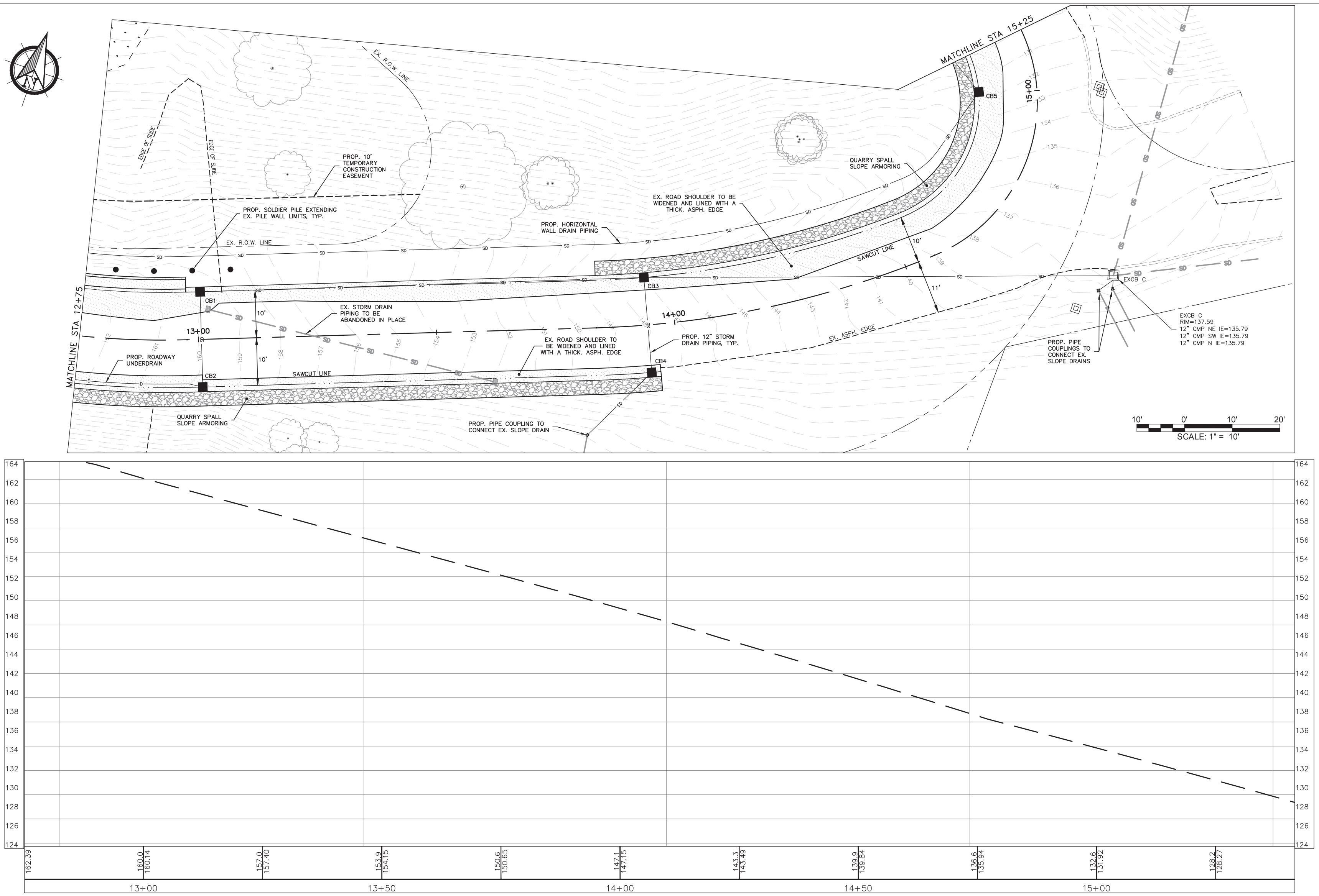
Retaining Wall Project
Preliminary - Not For Construction

ROAD AND STORM
PLAN AND PROFILE

SHEET NO.
RS1
OF
5
TOTAL SHEETS

Figure 7a - Road and Storm Plan



TUTTLE ENGINEERING AND MANAGEMENT

NO.	DATE	BY	REVISION

Scale:
Horiz: 1"=10'
Vert: 1"=5'
Designed By:
Inspected By:
W.O. No.:
Date: SEPT. 29, 2017

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT

11930 Cyrus Way Mukilteo, Washington 98275
425-263-8000 FAX 425-290-1009
http://mukilteowa.gov

JOHN RAYMOND TUTTLE
43718
PRELIMINARY

61st Place West
Retaining Wall Project
Preliminary - Not For Construction

ROAD AND STORM
PLAN AND PROFILE

SHEET NO.
RS2
OF
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TOTAL SHEETS

Drawn By: M. VAUGHAN
Checked By: J. TUTTLE
Surveyed By:
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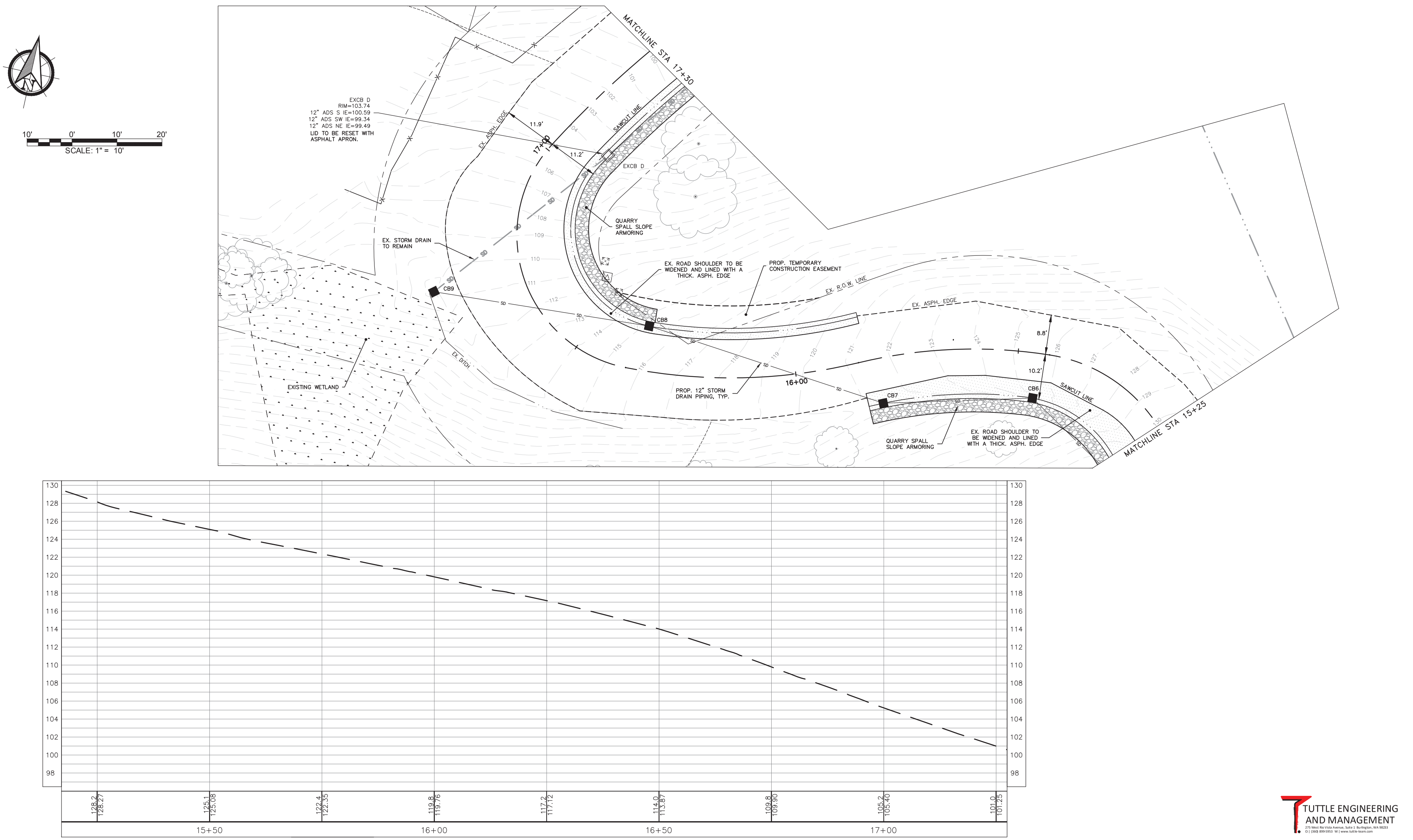
Figure 7b - Road and Storm Plan



TUTTLE ENGINEERING AND MANAGEMENT

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Date:
SEPT. 29, 2017

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ROAD AND STORM
PLAN AND PROFILE

SHEET NO.
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OF
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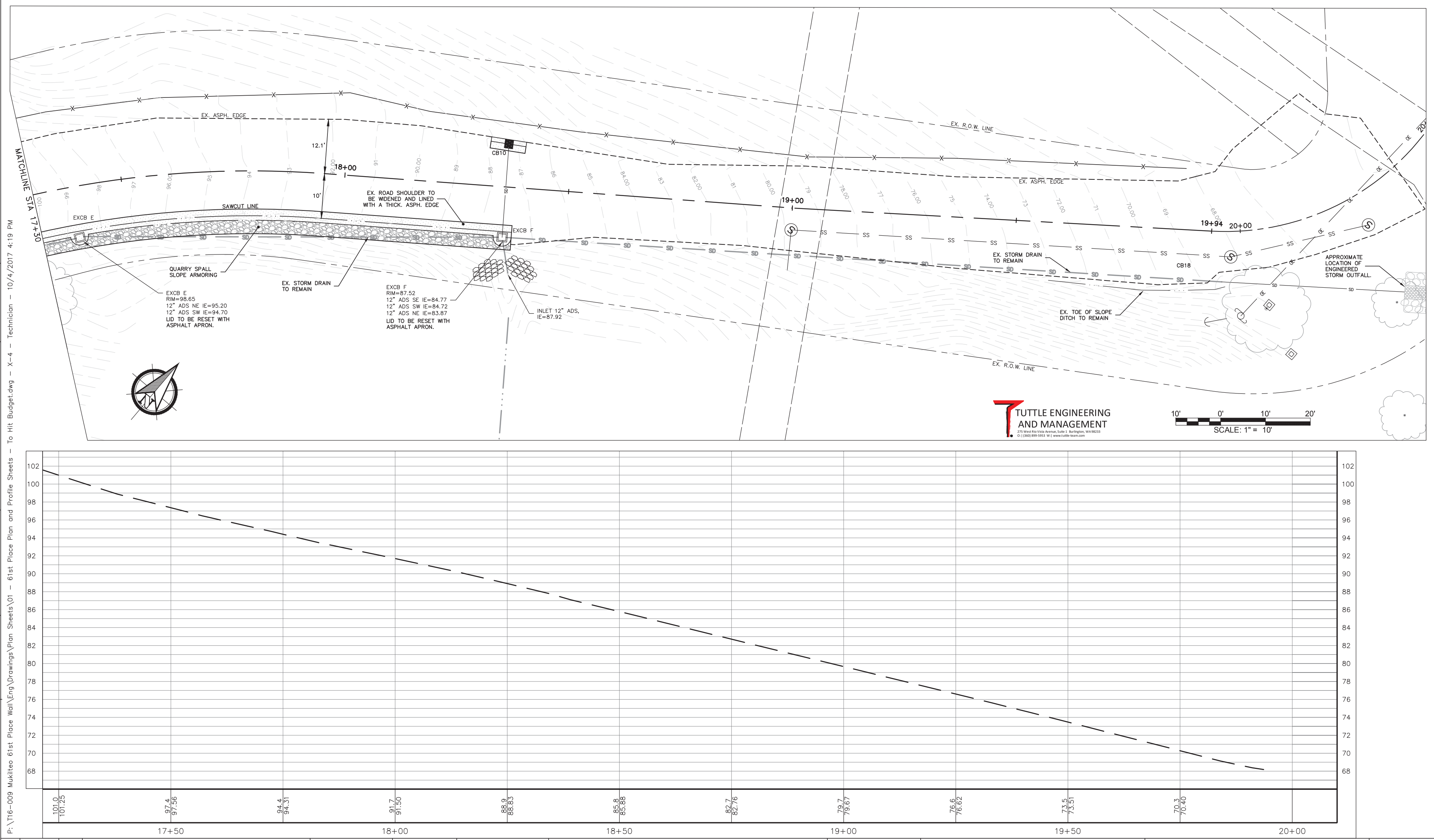
TOTAL SHEETS

Figure 7c - Road and Storm Plan



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PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

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Inspected By:
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Date: SEPT. 29, 2017

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ROAD AND STORM
PLAN AND PROFILE

SHEET NO.
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Figure 7d - Road and Storm Plan

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Drawn By: M. RANDALL
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PLAN PRINTED AT
11"x17" DEPICTS A 1:2
SCALE RATIO
(I.E. 1"=10' TO 1"=20')

Scale:
Horiz: 1"=20'
Vert: N/A
Designed By:
Inspected By:
W.O. No.:
Date: APR. 13, 2018

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WETLAND BUFFER
IMPACTS PLAN

Figure 8 - Wetland Buffer Impacts Plan

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PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

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Horiz: 1"=20'
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Inspected By:
W.O. No.:
Date: APR. 13, 2018

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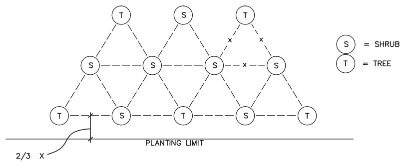
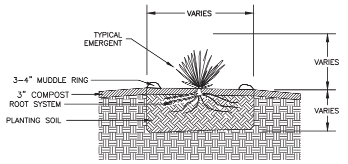
WETLAND BUFFER
ENHANCEMENT PLAN

Figure 9 - Wetland Buffer Enhancement Plan



NOTES:
1. GROUP LIKE SHRUBS IN GROUPS OF 3, 5 OR 7.
2. TREES SHOULD NOT BE PLACED NEXT TO EACH OTHER.

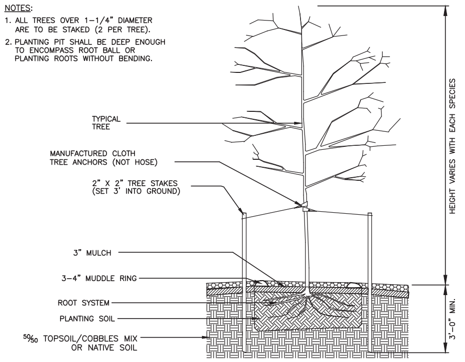
TYPICAL PLANT SPACING DETAIL
X = PLANT SPACING



NOTES:
1. PLANTING PIT SHALL BE DUG DEEP ENOUGH TO ENCOMPASS PLANTING ROOTS WITHOUT BENDING.

HERBACEOUS PLANTING DETAIL
NOT TO SCALE

NOTES:
1. ALL TREES OVER 1–1/4" DIAMETER ARE TO BE STAKED (2 PER TREE).
2. PLANTING PIT SHALL BE DEEP ENOUGH TO ENCOMPASS ROOT BALL OR PLANTING ROOTS WITHOUT BENDING.



BARE ROOT OR POTTED DECIDUOUS OR EVERGREEN TREE AND SHRUB PLANTING DETAIL
NOT TO SCALE

Common Name	Scientific Name	Type	Size	Spacing	Zone 1 Qty
Trees					
Shore Pine	*Pinus contorta*	Bare root/potted	18"	5'	5
Red Alder	*Alnus rubra*	Bare root/potted	18"	5'	5
Service Berry	*Amelanchier alnifolia*	Bare root/potted	18"	5'	5
Beaked Hazelnut	*Corylus cornuta*	Bare root/potted	18"	5'	10
				Tree Total	**25**

Common Name	Scientific Name	Type	Size	Spacing	Zone 1 Qty
Shrubs/Ground Cover					
Evergreen Huckleberry	*Vaccinium ovatum*	Bare root/potted	12"	5'	20
Indian Plum	*Oemleria cerasiformis*	Bare root/potted	12"	5'	20
Vine Maple	*Acer circinatum*	Bare root/potted	12"	5'	20
Snowberry	*Symphoricarpos albus*	Bare root/potted	12"	5'	20
Sword Fern	*Polystichum munitum*	Bare root/potted	12"	5'	20
				Shrub Total	**100**
				Total Plantings	**125**

TREE AND SHRUB PLANTING SCHEDULE
SE FIGURES 2 AND 3 FOR AREAS

GENERAL NOTES

1. PLANTING AREA INCLUDES ENTIRE GROUND SURFACE REGARDLESS OF SURFACE COVER BETWEEN PLANTS.
2. SPACING ALL PLANTS IRREGULARLY AT THE DESIGNATED LOCATIONS AND SPACING, FOR NATURAL APPEARANCE. INTERMIX SPECIES GROUPS IN GROUPS OF THREE, FIVE, OR SEVEN.
3. PLANT MATERIAL SHALL CONFORM TO AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z601–2001) FOR PLANT SIZE AND CONDITION FOR SPECIFIED MATERIAL.
4. PLANT MATERIAL SHALL BE LOCALLY GROWN (PUGET SOUND REGION) AND SHALL BE IN HEALTHY AND VIGOROUS GROWING CONDITION.
5. PLANTS LOCATED ON THE PLAN ARE SCHEMATIC AND MAY NEED ADJUSTMENT TO MEET ACTUAL FIELD CONDITIONS. WHEN A CONFLICT WITH FIELD CONDITIONS IS APPARENT, CONSULT WITH THE PROJECT ENGINEER.
6. SUBSTITUTIONS OF PLANT SPECIES OR SIZES MAY BE PERMITTED BASED ON PLANT AVAILABILITY, BUT ONLY WITH PRIOR APPROVAL BY THE MITIGATION CONSTRUCTION MONITOR.

PLANTING SEQUENCE

1. PREPARE SITE BY ADDING 1 INCH OF COMPOST AND 3 INCHES OF MULCH TO ZONE 1.
2. REMOVE ALL INVASIVE PLANTS FROM ZONE 1 BEFORE PLANTING.
3. LAYOUT PLANTS IN PLANTING AREA BEFORE DIGGING PITS.
4. DIG A PLANT FOR EACH PLANT THAT IS TWICE THE SIZE OF THE ROOT BALL OR PLANT CONTAINER. REMOVE LARGE ROCKS AND OTHER DEBRIS FROM PIT. SOAK PIT WITH WATER BEFORE PLANTING.
5. "ROUGH UP" ROOTS OF THE PLANTS AND PRUNE OR STRAIGHTEN CIRCLING ROOTS. INSTALL PLANT IN THE PIT.
6. FORM A BASIN TO HOLD WATER AROUND THE PLANT USING REMAINING SOIL AND MULCH TO FORM A MULCH RING A MINIMUM OF 3 INCHES IN DIAMETER AROUND STEM.
7. WATER THE PLANT AGAIN FILLING THE SMALL BASIN FORMED IN STEP 6.

Northwest Environmental Consulting, LLC

TUTTLE ENGINEERING
AND MANAGEMENT
275 West Rio Vista Avenue, Suite 1 Burlington, WA 98233
O | (360) 899-5953 W | www.tuttle-team.com

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WETLAND BUFFER
PLANTING DETAILS

Figure 10 - Wetland Buffer Planting Details

Appendix B: Site Photos

61st Place West Retaining Wall Project

Photo 1. Vegetation on slope below retaining wall.

Photo 2. Vegetation in Wetland A.

Photo 3. Vegetation on slope above retaining wall.

Photo 4. Vegetation on slope above retaining wall.

Photo 5. Retaining wall, looking from west to east.

Photo 6. Failing portion of retaining wall, and area of wetland buffer that will be temporarily affected.

Photo 7. Road bend below Wetland A.

Photo 5. Drainage along 61st Place West on curve below Wetland A.

Appendix C: Wetland Determination Memo 61st Place West Retaining Wall Project

Northwest
Environmental Consulting, LLC

3639 Palatine Avenue North
Seattle, Washington 98103
(206) 234-2520

TECHNICAL MEMORANDUM

To: **City of Mukilteo**

From: Emily Drew, Northwest Environmental Consulting, LLC

Date: May 24, 2016

Subject: **Wetland Determination**

Project: 61st Place West Retaining Wall

This memorandum summarizes a site visit on April 26, 2016 to a failing retaining wall at 61st Place West, Mukilteo, Washington (Figure 1 – Vicinity Map). The City of Mukilteo is planning to repair the failing wall and portions of 61st Place West adjacent to the wall (Figure 2 – Project Work Area). The project is located in Township 21N, Range 5E, Section 28.

The site visit was conducted to investigate the potential presence of wetlands or other critical areas on the allotment. One wetland was identified downslope (north) of the estimated project work area.

Methods

Northwest Environmental Consulting (NWEC) biologist Emily Drew reviewed the relevant National Wetland Inventory (NWI) maps and the U.S. Department of Agriculture (USDA) National Resources Conservation Service (NRCS) Soil Survey for the Snohomish County area to see whether these sources indicated the presence of wetlands or hydric soils at the site. NWEC then visited the site in April to confirm conditions in the field.

The wetland determinations used the "Routine Method" described in the Washington State Wetlands Identification and Delineation Manual (Ecology 1997), the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987), and the Western Mountains, Valleys and Coast Region Interim Regional Supplement to the Corps of Engineers Delineation Manual (U.S. Army Corps of Engineers 2008).

The City of Mukilteo rates wetlands based on the Washington State Department of Ecology's 2014 Wetland Rating System for Western Washington (see City of Mukilteo municipal code 17.52B.090). The City determines wetland buffer widths based on a combination of the Category rating and the specific habitat score from Ecology's rating system (City of Mukilteo municipal code 17.52B.100).

Results

Document Review

The NWI map for the area does not indicate any wetlands within ½ mile of the project site (Figure 3 – NWI Map). Estuarine habitat along Puget Sound's shoreline is within 1,000 feet, downslope and west of the project site.

The NRCS Soil Survey for Snohomish County maps one soil type in the vicinity of the project: Alderwood Everett gravelly sandy loams, 25 to 70 percent slopes (Figure 4 – Soils Map). The Alderwood and series are upland soils with variable permeability and rapid runoff.

Site Description

The project site is in steep terrain alongside 61st Place West. Habitat upslope of the road near the retaining wall includes herbaceous vegetation, small deciduous trees and shrubs, landscaping plants at the hill top, and a large, recent landslide area with bare soil. Habitat downslope is forest with trees including big leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and Douglas-fir (*Psuedotsuga menziesii*). Shrubs and herbs in this forest patch include sword fern (*Polystichum munitum*), salmonberry (*Rubus spectabilis*), red huckleberry (*Vaccinium parviflorum*), trailing blackberry (*Rubus ursinus*) and Himalayan blackberry (*Rubus armeniacus*) with patches of horsetail (*Equisetum arvense*) and fringecup *(Tellima grandiflora*). See Attachment B for site photos.

Wetland Test Plots and Mapped Points

One wetland, Wetland A, was identified downslope of the retaining wall (photos 1, 2, 3, 6, 7 and 8). This wetland's water source appears to be seepage emerging to near the surface at two points along a topographic break, and soils with clay content that prevent drainage of rainwater. The wetland extends downslope from these seepage points to a flat area (Figure 5 – Wetland A). The wetland includes indications of unstable soils: portions of the slope appear to have recently slid downward.

Two test plots were established within Wetland A during the site visit.

- Test plot 1 (TP-1) is located at the uphill end of Wetland A, and is 30 feet north (downslope) of the retaining wall, under big leaf maple canopy. This plot has hydrophytic vegetation (though no obligate wetland species were present), hydric soils, and hydrology (saturation and a high water table). The main water source appears to be seepage starting 30 feet downslope of the retaining wall.
- Test plot 2 (TP-2) was located at the lower end of Wetland A. This plot is in an area of mucky soils that contained hydric features. Vegetation is hydrophytic (though facultative upland species are present in a mosaic of upland areas around the wetter soils) and hydrology is indicated by standing water in puddles, saturation, and hydrogen sulfide odor within the soil. See photos 2, 6, 7 and 8.

Two additional test plots were established to check for wetland conditions along the slopes above 61st Place West near the retaining wall. These areas contained some facultative and facultative wetland plants and indications of hydrology (saturation from seepage along the slope), but no hydric soils.

- Test plot 3 (TP-3) was located along the steep slope upslope and across the street from the retaining wall. This steep slope is covered in herbaceous vegetation, including hydrophytic species. Hydrology is present in the form of seepage coming out of the steep slope. However, no hydric soils were present. See photos 4 and 5)
- Test plot 4 (TP-4) was east of the project site along the upslope side of the road, and downslope from a clump of willows. This roadside area had marginally hydrophytic vegetation and some hydrology (in the form of saturated soils below 8 inches), but soils were not hydric.

See Attachment C for the test plot forms.

Wetland Rating and Buffer Width

Using the 2014 Wetland Rating System for Western Washington, Wetland A was determined to be Category III, with a specific habitat score of 4. Based on these metrics, the wetland has a 60-foot buffer width (City of Mukilteo 17.52B.100).

Conclusion

The slope below the project site contains a Category III forested wetland (Wetland A) in a portion of the hill with unstable soils. The City of Mukilteo would apply a 60-foot buffer width to this wetland, which would extend up to the 61st Place West retaining wall footprint below the slope. Buffers do not extend across roadways per the WSDOT Guidance on Wetland Buffers Across Roadways (WSDOT 2016).

The slope above the retaining wall (and across the road) does not contain wetlands, as some facultative species and seepage are present, but no hydric soils. The slope east of the site along the road also lacks hydric soils. No other critical areas were located.

Works Cited

Environmental Laboratory. 1987. Corps of Engineers Wetland Delineation Manual (1987 Manual). Technical Report Y-87-1, U.S. Army Engineers Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Army Corps of Engineers. 2008. Western Mountains, Valleys and Coast Region Interim Regional Supplement to the Corps of Engineers Delineation Manual. Report ERDC/EL TR-08-13. April.

U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 2015. Survey of Snohomish County Area Washington.

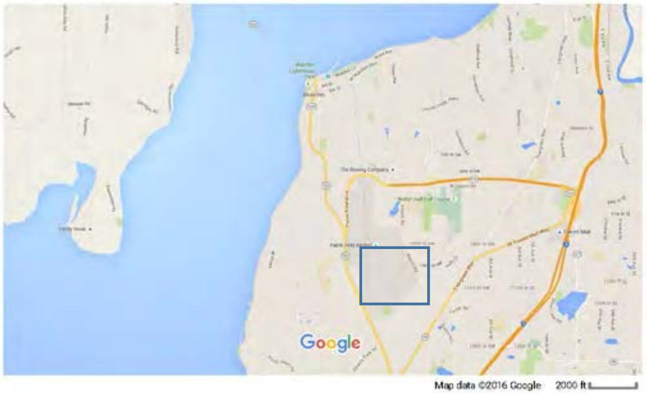
Washington Department of Ecology. 1997. Washington State Wetlands Identification and Delineation Manual. Ecology Publication 96-94.

Washington Department of Ecology. 2014. Wetland Rating System for Western Washington, Updated 2014. Effective January 1, 2015.

WSDOT. 2016. WSODT Guidance on Wetland Buffers Across Roadways. http://www.wsdot.wa.gov/NR/rdonlyres/83C22B1F-8102-4087-8568-7D82C4DE3C95/0/Wet_BufferAcrossRdway.pdf

Attachment A:

Figures



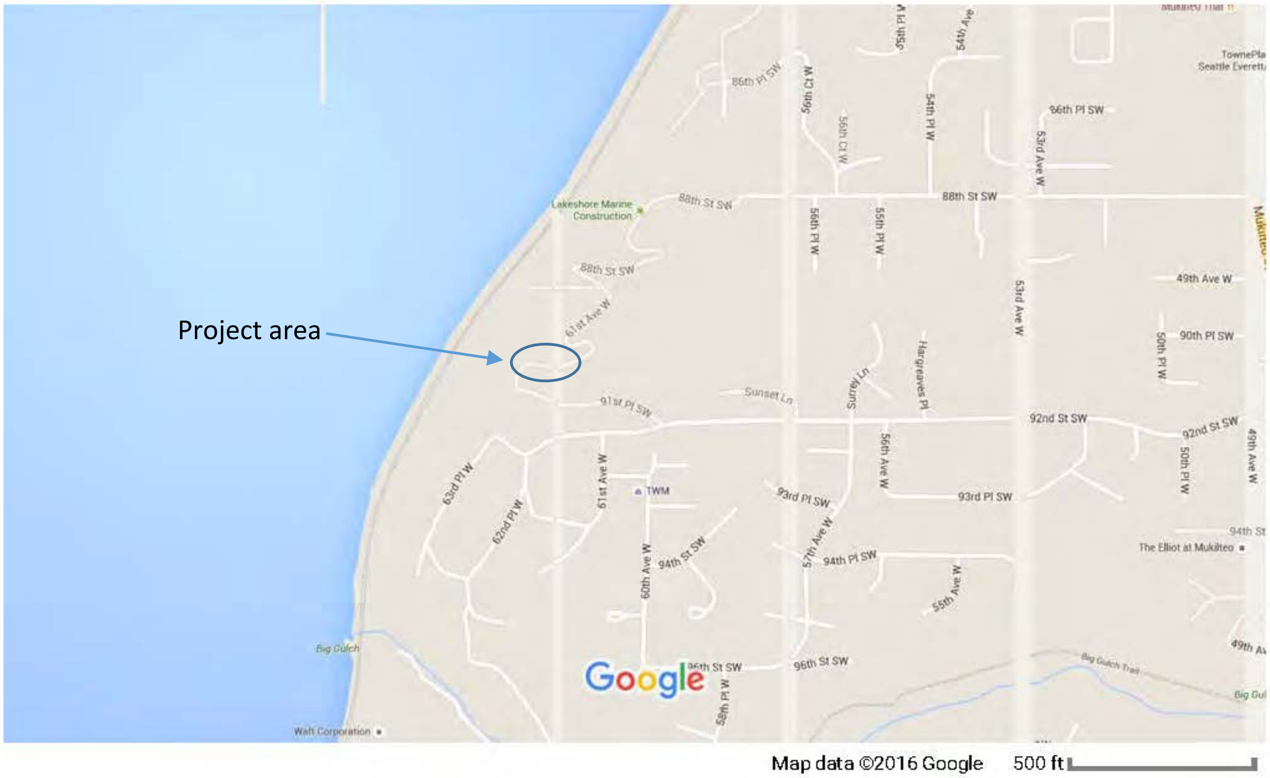
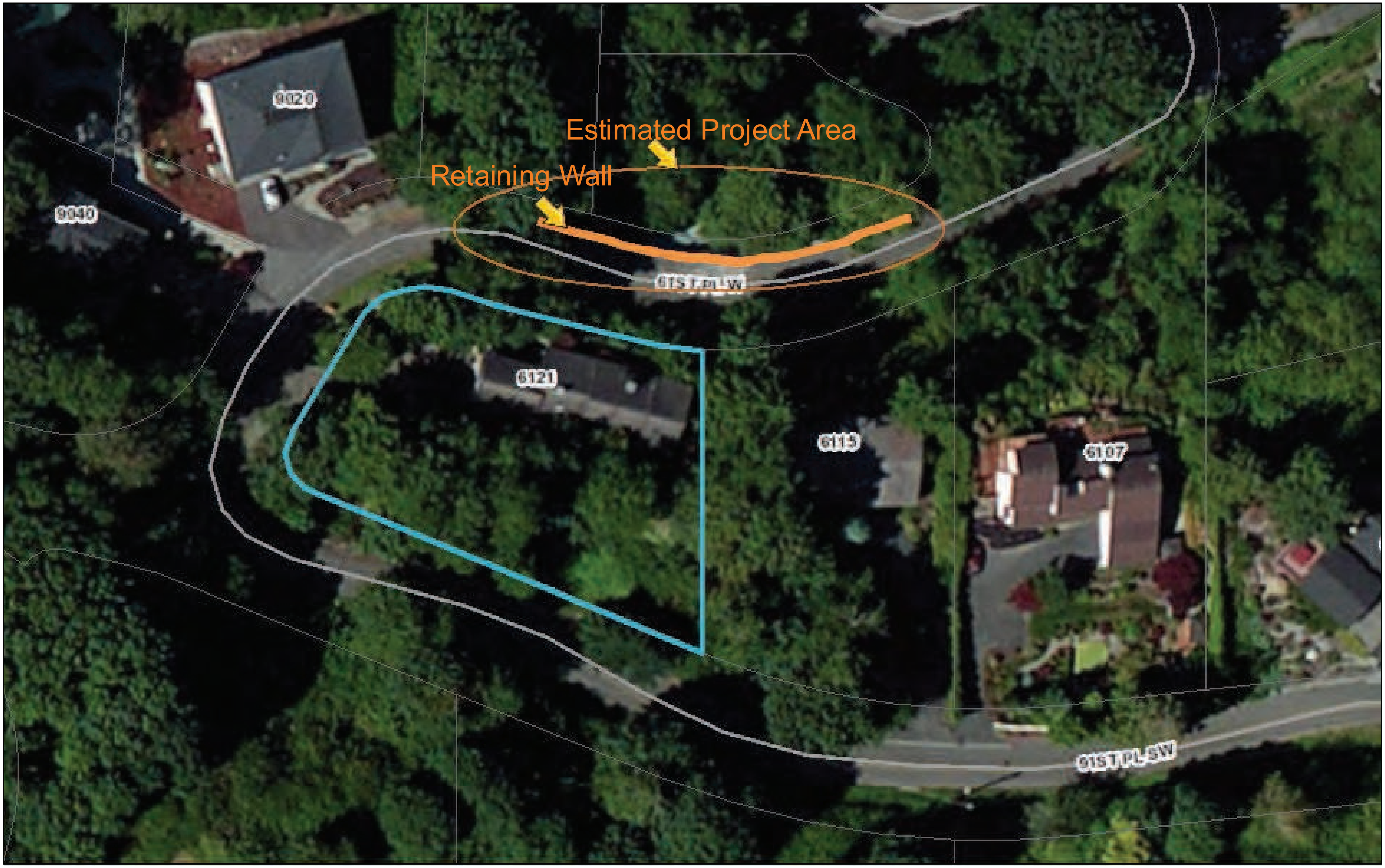


Figure 1 – Vicinity Map

6121 91st Pl SW



January 12, 2016

1:1,128

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and

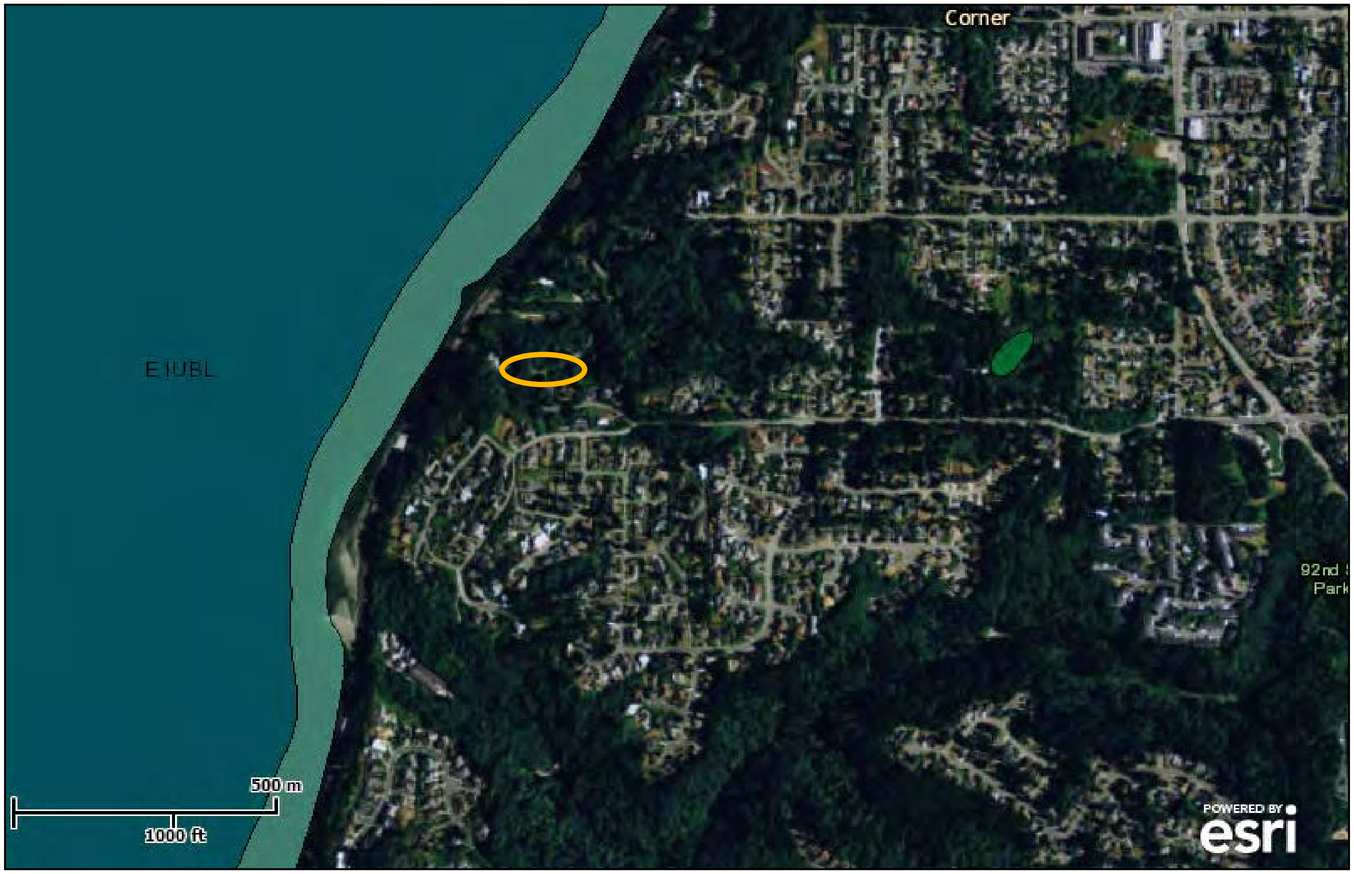
City of Mukilteo GIS

Figure 2 - Project Area

U.S. Fish and Wildlife Service

National Wetlands Inventory

May 10, 2016



Wetlands

- 🟩 Freshwater Emergent
- 🟩 Freshwater Forested/Shrub
- 🟦 Estuarine and Marine Deepwater
- 🟩 Estuarine and Marine
- 🟦 Freshwater Pond
- 🟦 Lake
- 🟦 Riverine
- 🟫 Other

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

User Remarks:

Figure 3 - NWI Map

Soil Map—Snohomish County Area, Washington

Map Scale: 1:1,880 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Figure 4 - Soils Map (pg 1 of 3)

MAP LEGEND

Area of Interest (AOI)

- ☐ Area of Interest (AOI)

Soils

- ☐ Soil Map Unit Polygons
- 〰 Soil Map Unit Lines
- ■ Soil Map Unit Points

Special Point Features

- ◉ Blowout
- ⊠ Borrow Pit
- ✱ Clay Spot
- ◇ Closed Depression
- ✕ Gravel Pit
- ∴ Gravelly Spot
- ● Landfill
- ʌ Lava Flow
- ⩛ Marsh or swamp
- ⚒ Mine or Quarry
- ◎ Miscellaneous Water
- ○ Perennial Water
- ∨ Rock Outcrop
- + Saline Spot
- ⁙ Sandy Spot
- ⊖ Severely Eroded Spot
- ◈ Sinkhole
- ≽ Slide or Slip
- ø Sodic Spot
- ≡ Spoil Area
- ● Stony Spot
- ● Very Stony Spot
- ♆ Wet Spot
- △ Other
- ┅ Special Line Features

Water Features

- ∼ Streams and Canals

Transportation

- ┼┼┼ Rails
- ∼ Interstate Highways
- ∼ US Routes
- ∼ Major Roads
- ∼ Local Roads

Background

- ▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Snohomish County Area, Washington
Survey Area Data: Version 13, Sep 15, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

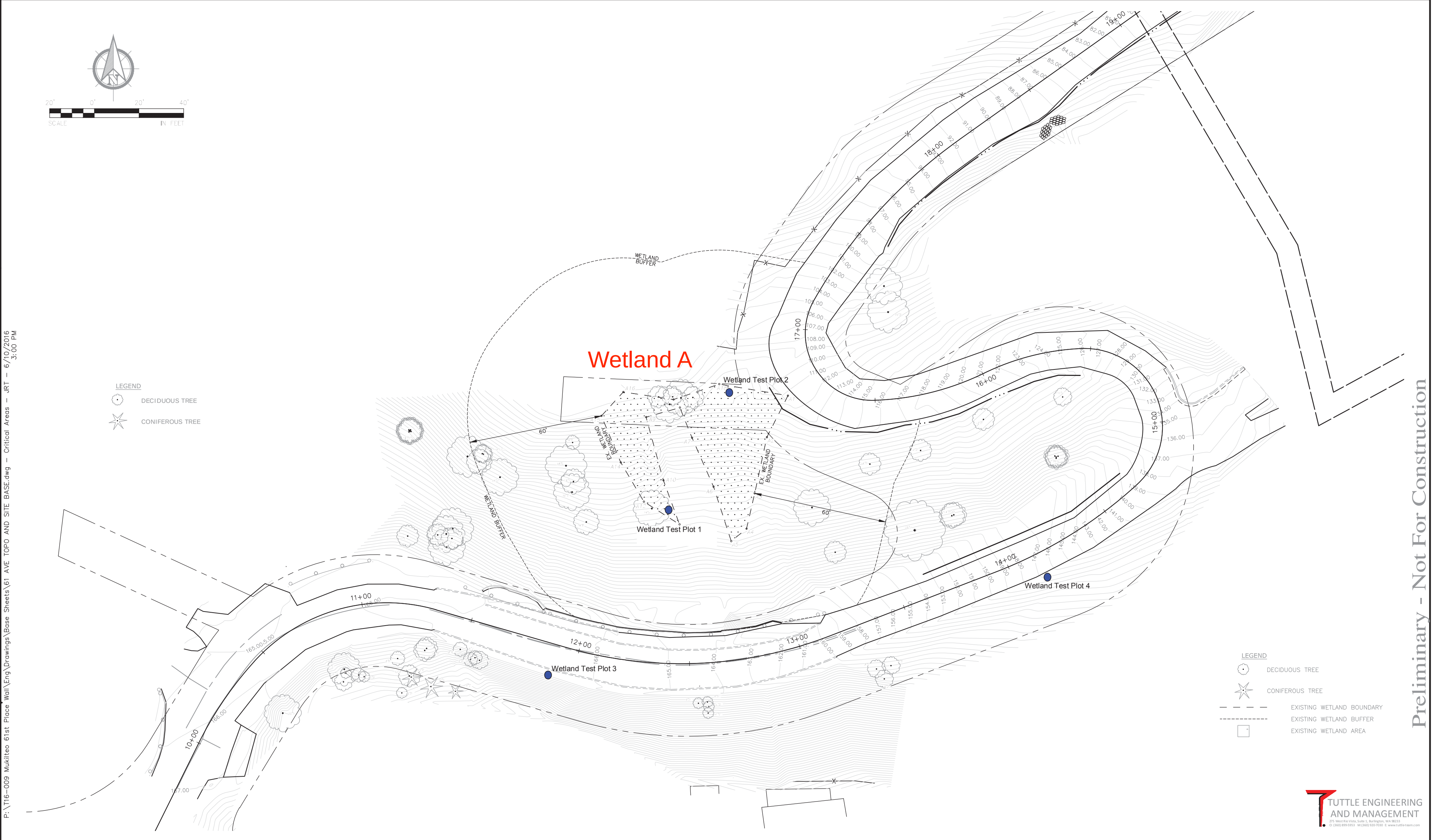
Date(s) aerial images were photographed: Aug 1, 2011—Jul 8, 2014

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

Figure 4 - Soils Map (pg 2 of 3)

Map Unit Legend

Snohomish County Area, Washington (WA661)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
4	Alderwood-Everett gravelly sandy loams, 25 to 70 percent slopes	11.4	100.0%
Totals for Area of Interest		**11.4**	**100.0%**



TUTTLE ENGINEERING AND MANAGEMENT
275 West Rio Vista, Suite 1, Burlington, WA 98233
O: (360) 899-5953 M:(360) 920-7030 E: www.tuttle-team.com

P:\T16-009 Mukilteo 61st Place Wall\Eng\Drawings\Base Sheets\61 AVE TOPO AND SITE BASE.dwg – Critical Areas – JRT – 6/10/2016 3:00 PM

XREF Filename:
Filename:
Drawn By: T. HOHMANN
Checked By: J. TUTTLE
Surveyed By:
Date:
Field Bk/Pg:
Datum:
Recorded Survey: SNOHOMISH COUNTY
AF–
Vol/Bk Page
Aerial Mapping & Control Survey
Firm:
Date:
GIS Cntl Pnts:
Firm:
Date:
Field BK/PG:
Constructed By:
Date:

NO.	DATE	BY	REVISION

PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

Scale:
Horiz: 1"=10'
Vert: 1"=2'
Designed By:
Inspected By:
W.O. No.:
Date: 5-23-2016

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT

11930 Cyrus Way Mukilteo, Washington 98275
425-263-8000 FAX 425-290-1009
http://mukilteowa.gov

JOHN RAYMOND TUTTLE
43718

61st Place West
Retaining Wall Project

CRITICAL AREAS DELINEATION AND BUFFER PLAN

SHEET NO.
Figure 6 OF 1
TOTAL SHEETS

Attachment B:

Site Photos

Photo 1. Hill containing Wetland A.

Photo 2. Downslope portion of Wetland A.

Photo 3. Wetland A.

Photo 4. Slope above / across street from retaining wall. Site of TP-3.

Photo 5. Slope above retaining wall; site of TP-3.

Photo 6. Mud at TP-2.

Photo 7. Site of TP-2 and downslope edge of Wetland A.

Photo 8. Lower edge of Wetland A.

Attachment C:

Test Plot Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 61st Pl W Retaining Wall City/County: Mukilteo, Snohomish Sampling Date: April 26, 2016
Applicant/Owner: City of Mukilteo State: WA Sampling Point: Test Plot 1
Investigator(s): Brad Thiele, Emily Drew Section, Township, Range: T28N, R04E, Sec 17
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): varied Slope (%): 18%
Subregion (LRR): A Lat: 47.916086 Long: -122.316467 Datum: NAD83
Soil Map Unit Name: Alderwood Everett gravelly sandy loam 25-70 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___ , Soil ___ , or Hydrology ___ significantly disturbed? Are “Normal Circumstances” present? Yes x No ___
Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes x No ___ Hydric Soil Present? Yes x No ___ Wetland Hydrology Present? Yes x No ___	**Is the Sampled Area within a Wetland?**	**Yes** x **No** ___

Remarks: Test plot is about 30-35 feet downslope from the retaining wall. Drainage on the slope may be affected by presence of road and retaining wall 30 feet upslope.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 20’)			
1. Rubus spectabilis	35	Y	FAC
2. Oemleria cerasiformis	5	N	FACU
3. Rubus ursinus	55	Y	FACU
4.			
5.			
= Total Cover	95		
Herb Stratum (Plot size: 10’)			
1.			
2. Equisetum arvense	25	Y	FAC
3. Tolmiea menziesii	5	N	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	30		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover	0		
% Bare Ground in Herb Stratum 10			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	5	x 2 =	10
FAC species	60	x 3 =	180
FACU species	90	x 4 =	360
UPL species		x 5 =	
Column Totals:	155	(A)	550 (B)

Prevalence Index = B/A = 3.5

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** s **No** ___

Remarks: Sword ferns are also present but rooted in hummocks of upland, not the wet areas. Wet soil areas are within a mosaic of upland conditions.

SOIL

Sampling Point: TP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11”	10YR 3/1	100					loam	
11”-15”+	7.5YR 4/1	50	7.5YR 5/1	30	C	M	Clay loam	coarse
11”-15”+	7.5YR 4/1	50	10YR 4/6	20	C	M	Clay loam	coarse

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
_x_ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: Clay-filled layer
Depth (inches): 16”

Hydric Soil Present? **Yes** x **No**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
_x_ High Water Table (A2)
_x_ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______
Water Table Present? Yes x No ___ Depth (inches): 11”
Saturation Present? (includes capillary fringe) Yes x No ___ Depth (inches): 12”

Wetland Hydrology Present? **Yes** x **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Soil is saturated at 11 inches, with water table present below that. Source of water is seepage hitting the less porous layer of clay soils and flowing towards the surface.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 61st Pl W Retaining Wall City/County: Mukilteo, Snohomish Sampling Date: April 26, 2016
Applicant/Owner: City of Mukilteo State: WA Sampling Point: Test Plot 2
Investigator(s): Brad Thiele, Emily Drew Section, Township, Range: T28N, R04E, Sec 17
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): varied Slope (%): 2-5
Subregion (LRR): A Lat: 47.916238 Long: -122.316316 Datum: NAD83
Soil Map Unit Name: Alderwood Everett gravelly sandy loam 25 to 70 percent NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___ , Soil ___ , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	x	No		**Is the Sampled Area within a Wetland? Yes x No ___**
Hydric Soil Present?	Yes	x	No		
Wetland Hydrology Present?	Yes	x	No		

Remarks: Test plot is in downslope corner of Wetland A along an informal path.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	50	Y	FAC
2.			
3.			
4.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 20')	Absolute % Cover	Dominant Species?	Indicator Status
1. Rubus spectabilis	55	Y	FAC
2. Rubus armeniacus	20	y	FACU
3. Rubus ursinus	5		FACU
4.			
5.			
= Total Cover	80		

Herb Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Athyrium filix-femina	15	Y	FAC
2. Equisetum arvense	35	Y	FAC
3. Tellima grandiflora	10		FACU
4. Blechnum spicant	1		FAC
5. Luzula sp.	1		
6. Polystichum munitum	1		FACU
7.			
8.			
9.			
10.			
11.			
= Total Cover	63		

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
= Total Cover	0		

% Bare Ground in Herb Stratum 25

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	156	x 3 =	468
FACU species	36	x 4 =	144
UPL species		x 5 =	
Column Totals:	192	(A)	612 (B)

Prevalence Index = B/A = 3.18

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Vegetation meets the dominance test for hydrophytic vegetation but not the dominance test. Upland plants are present in a mosaic of upland conditions surrounding the wetter soil areas.

SOIL

Sampling Point: TP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2”	7.5YR 3/1	100	-				silty clay loam	
2-6”	7.5YR 3/1	90	-				silty clay loam	
2-6”	5GY 4/1	10	-				silty clay loam	large patches
6-10”	7.5YR 3/1	100	-				silty clay loam	
11” +	7.5YR 2/1	80	10YR 4/1	10	C	M	silty clay loam	
11” +	7.5YR 2/1	80	10YR 4/6	10	C	M	silty clay loam	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
x Loamy Gleyed Matrix (F2)
x Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: ____________________

Depth (inches): ____________________

Hydric Soil Present? **Yes** x **No** ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

x Surface Water (A1)
___ High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
x Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes x No ____ Depth (inches): 1”
Water Table Present? Yes ____ No ____ Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes x No ____ Depth (inches): 0”

Wetland Hydrology Present? **Yes** x **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Soils were wet or inundated (in small puddles). Patches had hydrogen sulfide odor.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 61st Pl W Retaining Wall City/County: Mukilteo, Snohomish Sampling Date: April 26, 2016
Applicant/Owner: City of Mukilteo State: WA Sampling Point: Test Plot 3
Investigator(s): Brad Thiele, Emily Drew Section, Township, Range: T28N, R04E, Sec 17
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): slope Slope (%): 30%
Subregion (LRR): A Lat: 47.915874 Long: -122.316438 Datum: NAD83
Soil Map Unit Name: Alderwood Everett gravelly sandy loam 25 to 70 percent NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	x	No		**Is the Sampled Area within a Wetland?** **Yes** ___ **No** x
Hydric Soil Present?	Yes		No	x	
Wetland Hydrology Present?	Yes	x	No		

Remarks: Test plot is on slope above the road, across the street from the failing retaining wall. Vegetation was hydrophytic (though no obligate species were present.) Hydrology is present from seepage. Soils were not hydric.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1. Rubus spectabilis	15	Y	FAC
2. Rubus parviflorus	2		FACU
3. Rubus armeniacus	5		FACU
4.			
5.			
= Total Cover	22		
Herb Stratum (Plot size: ___)			
1. Carex deweyana	5		FAC
2. Phalaris arundinacea	1		FACW
3. Equisetum arvense	15		FAC
4. Ranunculus repens	80	Y	FAC
5. Geum macrophyllum	10		FAC
6. Athyrium filix-femina	5		FAC
7. Polystichum munitum	5		FACU
8. Tellima grandiflora	20	Y	FACU
9.			
10.			
11.			
= Total Cover	141		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover	0		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	66	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	1	x 2 =	2
FAC species	130	x 3 =	390
FACU species	32	x 4 =	128
UPL species		x 5 =	
Column Totals:	163	(A)	520 (B)

Prevalence Index = B/A = 3.19

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** x **No** ___

Remarks: Vegetation is marginally hydrophytic as it passes the dominance test, but it fails the prevalence index. Plants present are a mix of facultative and facultative upland species, with only 1% facultative wetland species.

SOIL

Sampling Point: TP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12”	10YR 3/2	100					silty clay loam	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** ___ **No** x

Remarks: Soils are not hydric; no redox features or other indicators

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___
Water Table Present? Yes x No ___ Depth (inches): surface
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? **Yes** x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Saturation to surface present due to seepage from within slope.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 61st Pl W Retaining Wall City/County: Mukilteo, Snohomish Sampling Date: April 26, 2016
Applicant/Owner: City of Mukilteo State: WA Sampling Point: Test Plot 4
Investigator(s): Brad Thiele, Emily Drew Section, Township, Range: T28N, R04E, Sec 17
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): slope Slope (%): 10%
Subregion (LRR): A Lat: 47.9159789 Long: -122.315807 Datum: NAD83
Soil Map Unit Name: Alderwood Everett gravelly sandy loam 25 to 70 percent NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x	No	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** x
Hydric Soil Present?	Yes	No x		
Wetland Hydrology Present?	Yes x	No		

Remarks: Test plot is on road slope above 61st place west below a couple of willow trees. Vegetation is marginally hydrophytic. Hydric soil is not present. Saturation was present as a hydrology indicator

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1. Alnus rubra	20	Y	FAC
2.			
3.			
4.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30)			
1. Rubus spectabilis	25	Y	FAC
2.			
3. Rubus armeniacus	25	Y	FACU
4.			
5.			
	50	= Total Cover	
Herb Stratum (Plot size: 10)			
1. Mustard sp.	1		Unk
2. Agrostis sp.	10		FAC
3. Equisetum arvense	50	Y	FAC
4. Polystichum munitum	1		FACU
5. Geum macrophyllum	5		FAC
6. Tellima grandiflora	1		FACU
7.			
8.			
9.			
10.			
11.			
	68	= Total Cover	
Woody Vine Stratum (Plot size:)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	75	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	106	x 3 =	318
FACU species	27	x 4 =	108
UPL species		x 5 =	
Column Totals:	133	(A)	426 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** x **No** ___

Remarks: Meets the dominance test but fails the prevalence test. No FACW species present.

SOIL

Sampling Point: TP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12”	2.5YR 5/3	100					silty clay loam	contains cobbles

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ______ **No** x

Remarks: Soil has no hydric indicators

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______
Water Table Present? Yes ___ No ___ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes x No ___ Depth (inches): 8”

Wetland Hydrology Present? **Yes** x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Saturation at 8” but no other hydrological indicators

Northwest
Environmental Consulting, LLC

3639 Palatine Avenue North
Seattle, Washington 98103
(206) 234-2520

TECHNICAL MEMORANDUM

To: **City of Mukilteo**

From: Emily Drew, Northwest Environmental Consulting, LLC

Date: May 24, 2016

Subject: **Wetland Determination**

Project: 61st Place West Retaining Wall

This memorandum summarizes a site visit on April 26, 2016 to a failing retaining wall at 61st Place West, Mukilteo, Washington (Figure 1 – Vicinity Map). The City of Mukilteo is planning to repair the failing wall and portions of 61st Place West adjacent to the wall (Figure 2 – Project Work Area). The project is located in Township 21N, Range 5E, Section 28.

The site visit was conducted to investigate the potential presence of wetlands or other critical areas on the allotment. One wetland was identified downslope (north) of the estimated project work area.

Methods

Northwest Environmental Consulting (NWEC) biologist Emily Drew reviewed the relevant National Wetland Inventory (NWI) maps and the U.S. Department of Agriculture (USDA) National Resources Conservation Service (NRCS) Soil Survey for the Snohomish County area to see whether these sources indicated the presence of wetlands or hydric soils at the site. NWEC then visited the site in April to confirm conditions in the field.

The wetland determinations used the "Routine Method" described in the Washington State Wetlands Identification and Delineation Manual (Ecology 1997), the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987), and the Western Mountains, Valleys and Coast Region Interim Regional Supplement to the Corps of Engineers Delineation Manual (U.S. Army Corps of Engineers 2008).

The City of Mukilteo rates wetlands based on the Washington State Department of Ecology's 2014 Wetland Rating System for Western Washington (see City of Mukilteo municipal code 17.52B.090). The City determines wetland buffer widths based on a combination of the Category rating and the specific habitat score from Ecology's rating system (City of Mukilteo municipal code 17.52B.100).

Results

Document Review

The NWI map for the area does not indicate any wetlands within ½ mile of the project site (Figure 3 – NWI Map). Estuarine habitat along Puget Sound's shoreline is within 1,000 feet, downslope and west of the project site.

The NRCS Soil Survey for Snohomish County maps one soil type in the vicinity of the project: Alderwood Everett gravelly sandy loams, 25 to 70 percent slopes (Figure 4 – Soils Map). The Alderwood and series are upland soils with variable permeability and rapid runoff.

Site Description

The project site is in steep terrain alongside 61st Place West. Habitat upslope of the road near the retaining wall includes herbaceous vegetation, small deciduous trees and shrubs, landscaping plants at the hill top, and a large, recent landslide area with bare soil. Habitat downslope is forest with trees including big leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and Douglas-fir (*Psuedotsuga menziesii*). Shrubs and herbs in this forest patch include sword fern (*Polystichum munitum*), salmonberry (*Rubus spectabilis*), red huckleberry (*Vaccinium parviflorum*), trailing blackberry (*Rubus ursinus*) and Himalayan blackberry (*Rubus armeniacus*) with patches of horsetail (*Equisetum arvense*) and fringecup *(Tellima grandiflora*). See Attachment B for site photos.

Wetland Test Plots and Mapped Points

One wetland, Wetland A, was identified downslope of the retaining wall (photos 1, 2, 3, 6, 7 and 8). This wetland's water source appears to be seepage emerging to near the surface at two points along a topographic break, and soils with clay content that prevent drainage of rainwater. The wetland extends downslope from these seepage points to a flat area (Figure 5 – Wetland A). The wetland includes indications of unstable soils: portions of the slope appear to have recently slid downward.

Two test plots were established within Wetland A during the site visit.

- Test plot 1 (TP-1) is located at the uphill end of Wetland A, and is 30 feet north (downslope) of the retaining wall, under big leaf maple canopy. This plot has hydrophytic vegetation (though no obligate wetland species were present), hydric soils, and hydrology (saturation and a high water table). The main water source appears to be seepage starting 30 feet downslope of the retaining wall.
- Test plot 2 (TP-2) was located at the lower end of Wetland A. This plot is in an area of mucky soils that contained hydric features. Vegetation is hydrophytic (though facultative upland species are present in a mosaic of upland areas around the wetter soils) and hydrology is indicated by standing water in puddles, saturation, and hydrogen sulfide odor within the soil. See photos 2, 6, 7 and 8.

Two additional test plots were established to check for wetland conditions along the slopes above 61st Place West near the retaining wall. These areas contained some facultative and facultative wetland plants and indications of hydrology (saturation from seepage along the slope), but no hydric soils.

- Test plot 3 (TP-3) was located along the steep slope upslope and across the street from the retaining wall. This steep slope is covered in herbaceous vegetation, including hydrophytic species. Hydrology is present in the form of seepage coming out of the steep slope. However, no hydric soils were present. See photos 4 and 5)
- Test plot 4 (TP-4) was east of the project site along the upslope side of the road, and downslope from a clump of willows. This roadside area had marginally hydrophytic vegetation and some hydrology (in the form of saturated soils below 8 inches), but soils were not hydric.

See Attachment C for the test plot forms.

Wetland Rating and Buffer Width

Using the 2014 Wetland Rating System for Western Washington, Wetland A was determined to be Category III, with a specific habitat score of 4. Based on these metrics, the wetland has a 60-foot buffer width (City of Mukilteo 17.52B.100).

Conclusion

The slope below the project site contains a Category III forested wetland (Wetland A) in a portion of the hill with unstable soils. The City of Mukilteo would apply a 60-foot buffer width to this wetland, which would extend up to the 61st Place West retaining wall footprint below the slope. Buffers do not extend across roadways per the WSDOT Guidance on Wetland Buffers Across Roadways (WSDOT 2016).

The slope above the retaining wall (and across the road) does not contain wetlands, as some facultative species and seepage are present, but no hydric soils. The slope east of the site along the road also lacks hydric soils. No other critical areas were located.

Works Cited

Environmental Laboratory. 1987. Corps of Engineers Wetland Delineation Manual (1987 Manual). Technical Report Y-87-1, U.S. Army Engineers Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Army Corps of Engineers. 2008. Western Mountains, Valleys and Coast Region Interim Regional Supplement to the Corps of Engineers Delineation Manual. Report ERDC/EL TR-08-13. April.

U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 2015. Survey of Snohomish County Area Washington.

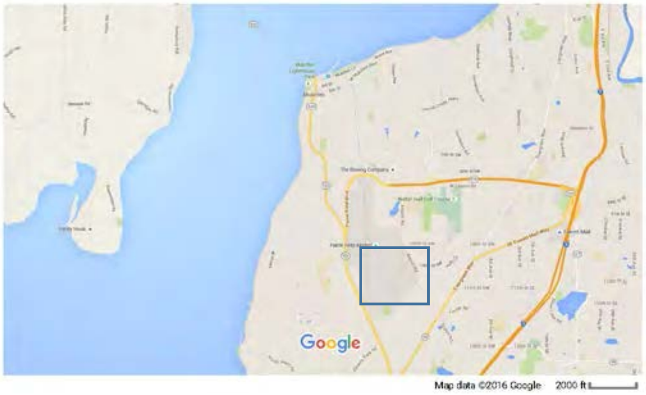
Washington Department of Ecology. 1997. Washington State Wetlands Identification and Delineation Manual. Ecology Publication 96-94.

Washington Department of Ecology. 2014. Wetland Rating System for Western Washington, Updated 2014. Effective January 1, 2015.

WSDOT. 2016. WSODT Guidance on Wetland Buffers Across Roadways. http://www.wsdot.wa.gov/NR/rdonlyres/83C22B1F-8102-4087-8568-7D82C4DE3C95/0/Wet_BufferAcrossRdway.pdf

Attachment A:

Figures



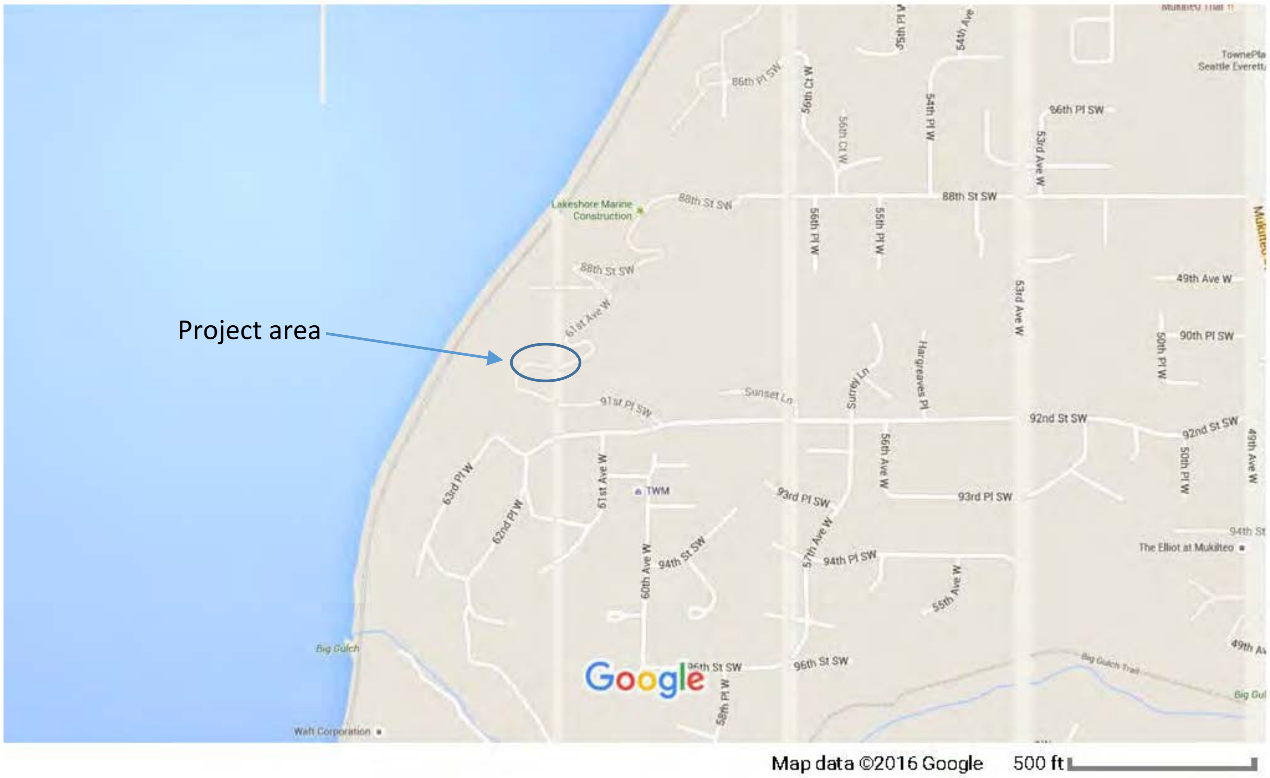
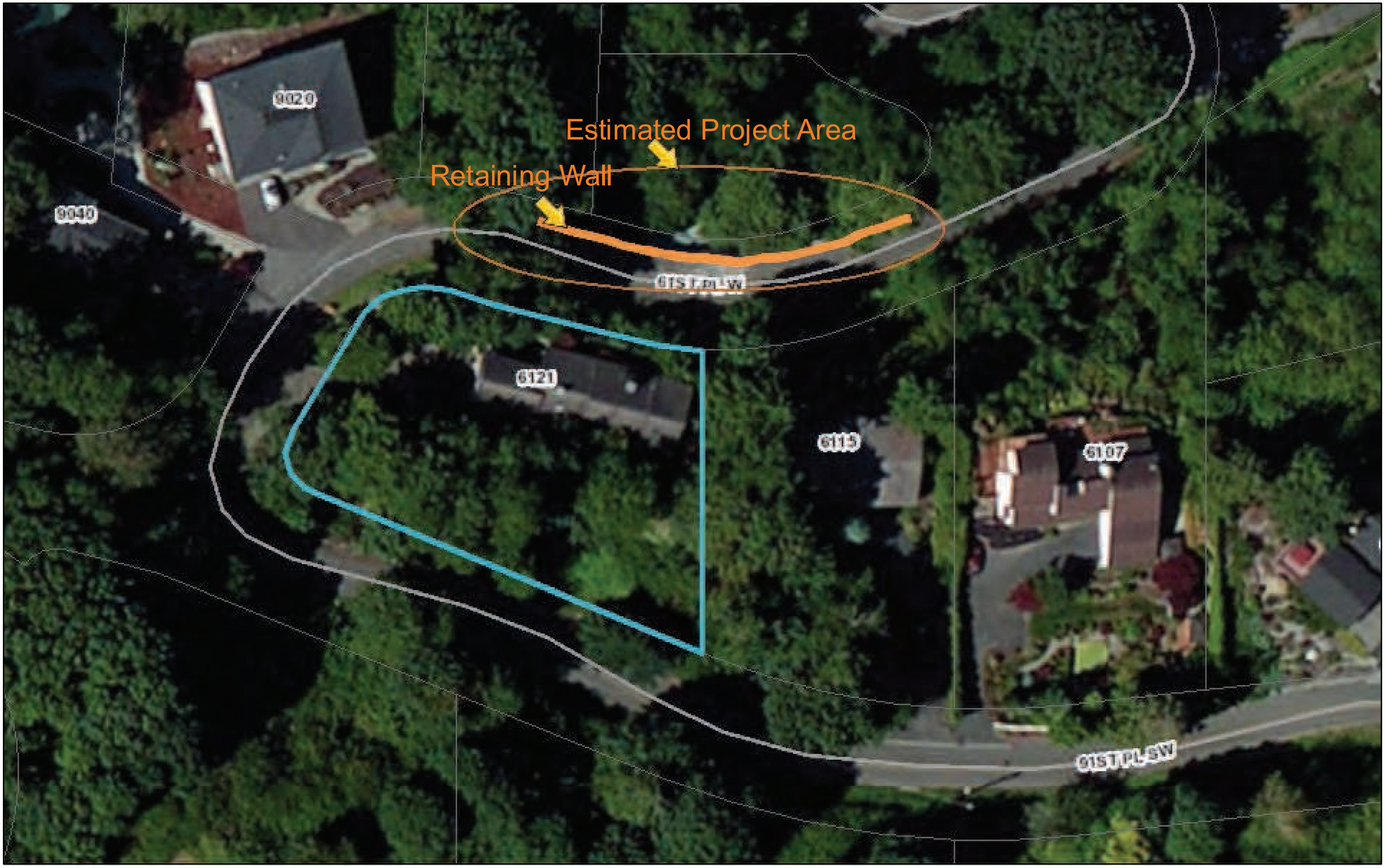


Figure 1 – Vicinity Map

6121 91st Pl SW



January 12, 2016

1:1,128

0 0.0075 0.015 0.03 mi

0 0.015 0.03 0.06 km

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and

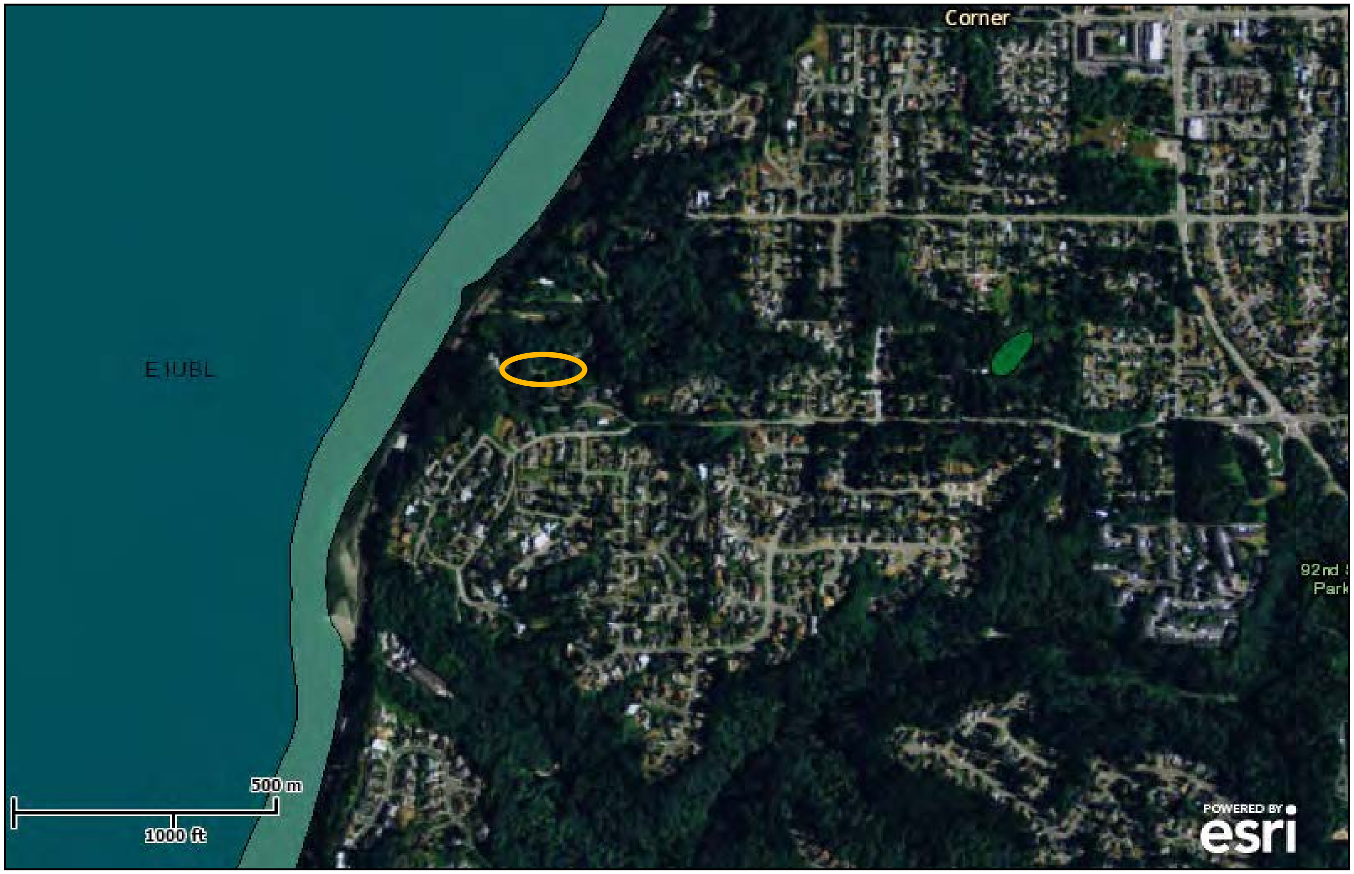
City of Mukilteo GIS

Figure 2 - Project Area

U.S. Fish and Wildlife Service

National Wetlands Inventory

May 10, 2016



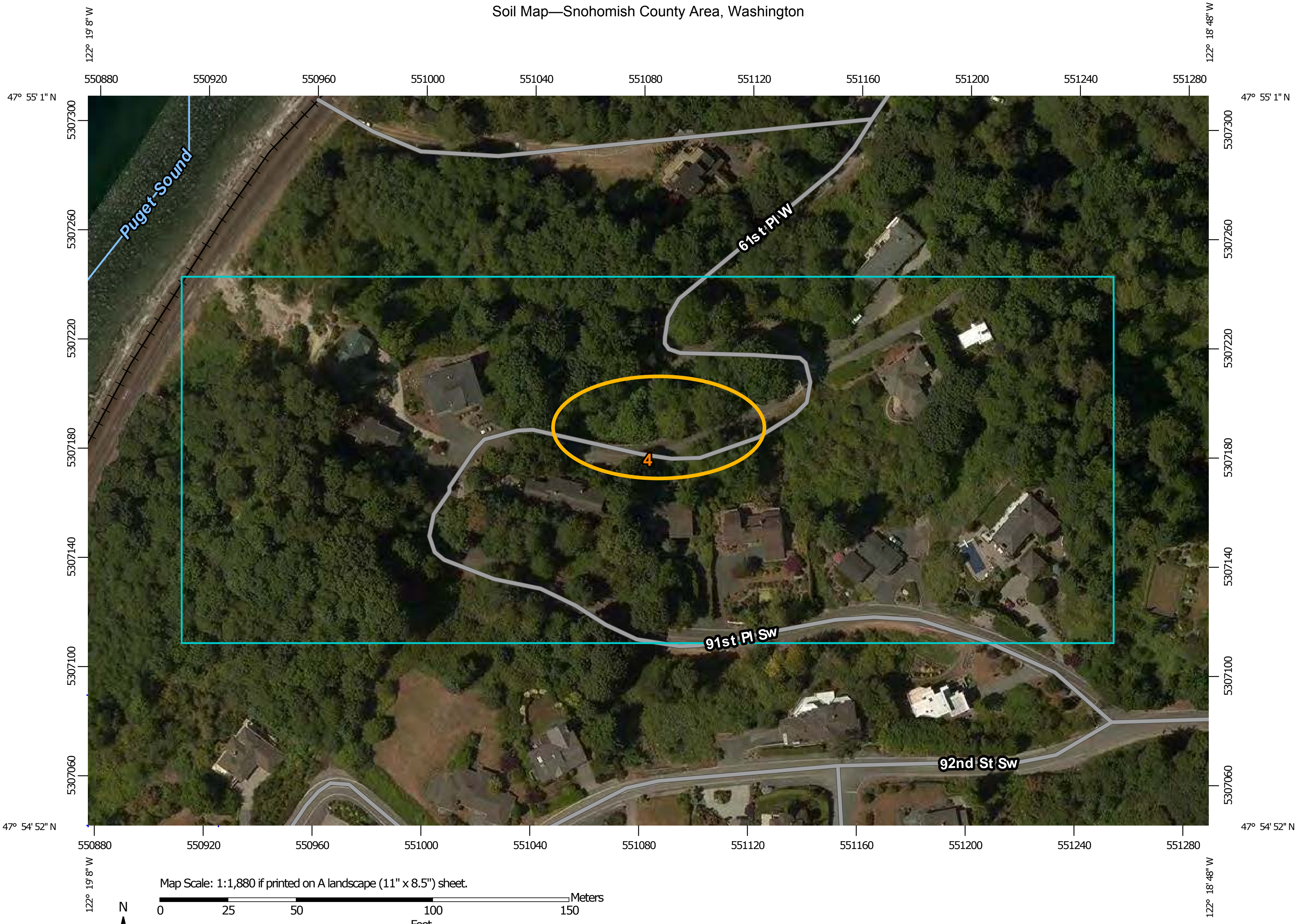
Wetlands

🟩 Freshwater Emergent
🟩 Freshwater Forested/Shrub
🟦 Estuarine and Marine Deepwater
🟩 Estuarine and Marine
🟦 Freshwater Pond
🟦 Lake
🟦 Riverine
🟫 Other

User Remarks:

Figure 3 - NWI Map

Soil Map—Snohomish County Area, Washington



Map Scale: 1:1,880 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 25, 50, 100, 150

Feet: 0, 50, 100, 200, 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

Figure 4 - Soils Map (pg 1 of 3)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Snohomish County Area, Washington
Survey Area Data: Version 13, Sep 15, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 1, 2011—Jul 8, 2014

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

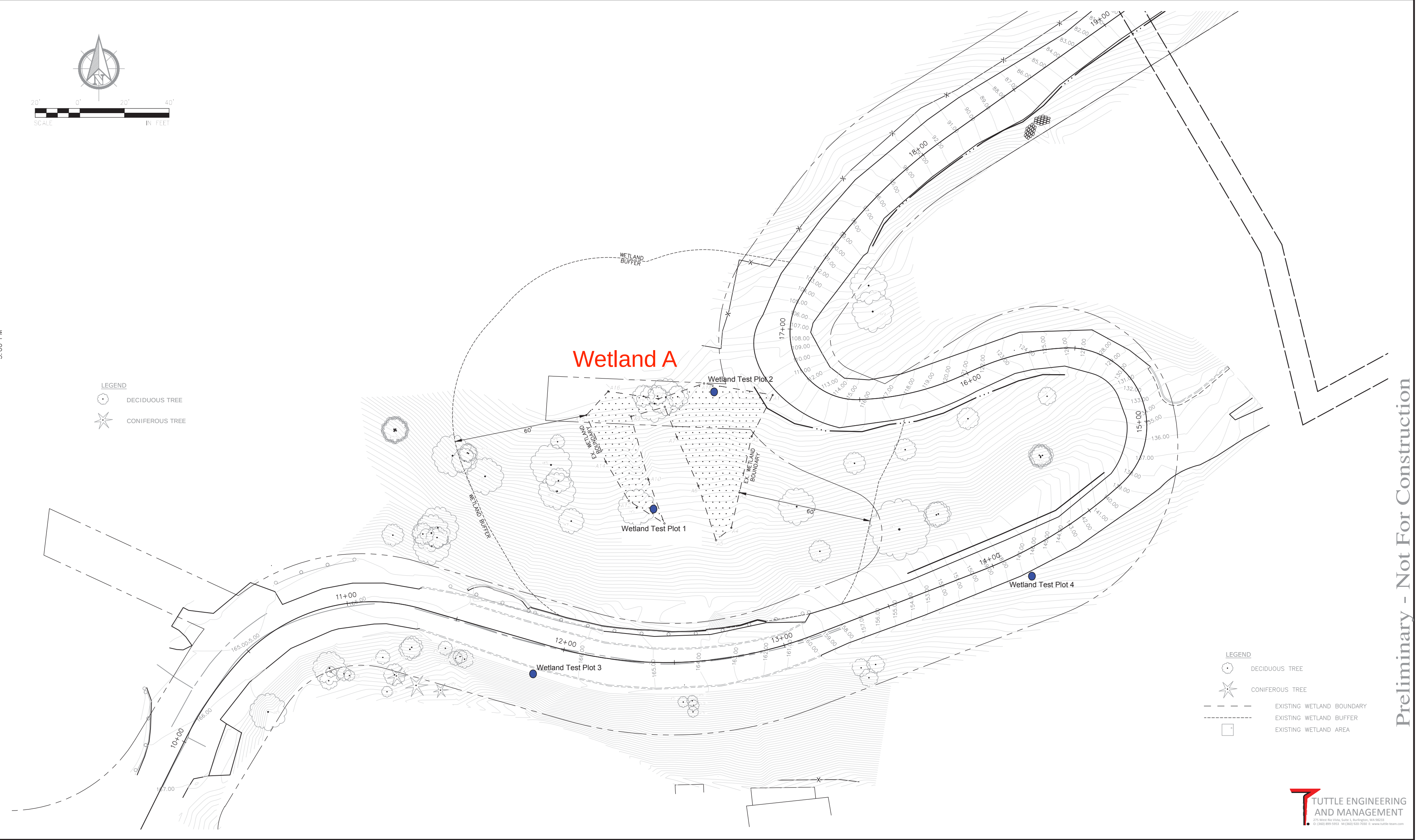
Figure 4 - Soils Map (pg 2 of 3)

Map Unit Legend

Snohomish County Area, Washington (WA661)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
4	Alderwood-Everett gravelly sandy loams, 25 to 70 percent slopes	11.4	100.0%
Totals for Area of Interest		**11.4**	**100.0%**

Figure 4 - Soils Map (pg 3 of 3)

P:\T16-009 Mukilteo 61st Place Wall\Eng\Drawings\Base Sheets\61 AVE TOPO AND SITE BASE.dwg - Critical Areas - JRT - 6/10/2016 3:00 PM



TUTTLE ENGINEERING AND MANAGEMENT
275 West Rio Vista, Suite 1, Burlington, WA 98233
O: (360) 899-5953 M:(360) 920-7030 E: www.tuttle-team.com

NO.	DATE	BY	REVISION

PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

Scale:
Horiz: 1"=10'
Vert: 1"=2'
Designed By:
Inspected By:
W.O. No.:
Date: 5-23-2016

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT

11930 Cyrus Way Mukilteo, Washington 98275
425-263-8000 FAX 425-290-1009
http://mukilteowa.gov

JOHN RAYMOND TUTTLE
43718

61st Place West
Retaining Wall Project

CRITICAL AREAS DELINEATION
AND BUFFER PLAN

SHEET NO.
Figure 6 1 OF 1
TOTAL SHEETS

Attachment B:

Site Photos

Photo 1. Hill containing Wetland A.

Photo 2. Downslope portion of Wetland A.

Photo 3. Wetland A.

Photo 4. Slope above / across street from retaining wall. Site of TP-3.

Photo 5. Slope above retaining wall; site of TP-3.

Photo 6. Mud at TP-2.

Photo 7. Site of TP-2 and downslope edge of Wetland A.

Photo 8. Lower edge of Wetland A.

Attachment C:

Test Plot Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 61st Pl W Retaining Wall City/County: Mukilteo, Snohomish Sampling Date: April 26, 2016
Applicant/Owner: City of Mukilteo State: WA Sampling Point: Test Plot 1
Investigator(s): Brad Thiele, Emily Drew Section, Township, Range: T28N, R04E, Sec 17
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): varied Slope (%): 18%
Subregion (LRR): A Lat: 47.916086 Long: -122.316467 Datum: NAD83
Soil Map Unit Name: Alderwood Everett gravelly sandy loam 25-70 percent slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___ , Soil ___ , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes x No ___ Hydric Soil Present? Yes x No ___ Wetland Hydrology Present? Yes x No ___	**Is the Sampled Area within a Wetland?**	**Yes** x **No** ___

Remarks: Test plot is about 30-35 feet downslope from the retaining wall. Drainage on the slope may be affected by presence of road and retaining wall 30 feet upslope.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 20')			
1. Rubus spectabilis	35	Y	FAC
2. Oemleria cerasiformis	5	N	FACU
3. Rubus ursinus	55	Y	FACU
4.			
5.			
= Total Cover	95		
Herb Stratum (Plot size: 10')			
1.			
2. Equisetum arvense	25	Y	FAC
3. Tolmiea menziesii	5	N	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	30		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover	0		
% Bare Ground in Herb Stratum 10			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	66	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	5	x 2 =	10
FAC species	60	x 3 =	180
FACU species	90	x 4 =	360
UPL species		x 5 =	
Column Totals:	155	(A)	550 (B)

Prevalence Index = B/A = 3.5

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** s **No** ___

Remarks: Sword ferns are also present but rooted in hummocks of upland, not the wet areas. Wet soil areas are within a mosaic of upland conditions.

SOIL

Sampling Point: TP-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-11”	10YR 3/1	100					loam	
11”-15”+	7.5YR 4/1	50	7.5YR 5/1	30	C	M	Clay loam	coarse
11”-15”+	7.5YR 4/1	50	10YR 4/6	20	C	M	Clay loam	coarse

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
_x_ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: Clay-filled layer
Depth (inches): 16”

Hydric Soil Present? **Yes** x **No**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
_x_ High Water Table (A2)
_x_ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______
Water Table Present? Yes _x_ No ___ Depth (inches): 11”
Saturation Present? (includes capillary fringe) Yes _x_ No ___ Depth (inches): 12”

Wetland Hydrology Present? **Yes** x **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Soil is saturated at 11 inches, with water table present below that. Source of water is seepage hitting the less porous layer of clay soils and flowing towards the surface.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 61st Pl W Retaining Wall City/County: Mukilteo, Snohomish Sampling Date: April 26, 2016
Applicant/Owner: City of Mukilteo State: WA Sampling Point: Test Plot 2
Investigator(s): Brad Thiele, Emily Drew Section, Township, Range: T28N, R04E, Sec 17
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): varied Slope (%): 2-5
Subregion (LRR): A Lat: 47.916238 Long: -122.316316 Datum: NAD83
Soil Map Unit Name: Alderwood Everett gravelly sandy loam 25 to 70 percent NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x No ___	**Is the Sampled Area within a Wetland? Yes x No ___**
Hydric Soil Present?	Yes x No ___	
Wetland Hydrology Present?	Yes x No ___	

Remarks: Test plot is in downslope corner of Wetland A along an informal path.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	50	Y	FAC
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 20')			
1. Rubus spectabilis	55	Y	FAC
2. Rubus armeniacus	20	y	FACU
3. Rubus ursinus	5		FACU
4.			
5.			
= Total Cover	80		
Herb Stratum (Plot size: 10')			
1. Athyrium filix-femina	15	Y	FAC
2. Equisetum arvense	35	Y	FAC
3. Tellima grandiflora	10		FACU
4. Blechnum spicant	1		FAC
5. Luzula sp.	1		
6. Polystichum munitum	1		FACU
7.			
8.			
9.			
10.			
11.			
= Total Cover	63		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover	0		

% Bare Ground in Herb Stratum 25

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	156	x 3 =	468
FACU species	36	x 4 =	144
UPL species		x 5 =	
Column Totals:	192	(A)	612 (B)

Prevalence Index = B/A = 3.18

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Vegetation meets the dominance test for hydrophytic vegetation but not the dominance test. Upland plants are present in a mosaic of upland conditions surrounding the wetter soil areas.

SOIL

Sampling Point: TP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2”	7.5YR 3/1	100	-				silty clay loam	
2-6”	7.5YR 3/1	90	-				silty clay loam	
2-6”	5GY 4/1	10	-				silty clay loam	large patches
6-10”	7.5YR 3/1	100	-				silty clay loam	
11” +	7.5YR 2/1	80	10YR 4/1	10	C	M	silty clay loam	
11” +	7.5YR 2/1	80	10YR 4/6	10	C	M	silty clay loam	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)

___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
x Loamy Gleyed Matrix (F2)
x Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** x **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

x Surface Water (A1)
___ High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)

___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
x Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes x No ___ Depth (inches): 1”
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes x No ___ Depth (inches): 0”

Wetland Hydrology Present? **Yes** x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Soils were wet or inundated (in small puddles). Patches had hydrogen sulfide odor.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 61st Pl W Retaining Wall City/County: Mukilteo, Snohomish Sampling Date: April 26, 2016
Applicant/Owner: City of Mukilteo State: WA Sampling Point: Test Plot 3
Investigator(s): Brad Thiele, Emily Drew Section, Township, Range: T28N, R04E, Sec 17
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): slope Slope (%): 30%
Subregion (LRR): A Lat: 47.915874 Long: -122.316438 Datum: NAD83
Soil Map Unit Name: Alderwood Everett gravelly sandy loam 25 to 70 percent NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are “Normal Circumstances” present? Yes x No ___
Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes x No ___
Hydric Soil Present? Yes ___ No x
Wetland Hydrology Present? Yes x No ___

Is the Sampled Area within a Wetland? Yes ___ No x

Remarks: Test plot is on slope above the road, across the street from the failing retaining wall. Vegetation was hydrophytic (though no obligate species were present.) Hydrology is present from seepage. Soils were not hydric.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1. Rubus spectabilis	15	Y	FAC
2. Rubus parviflorus	2		FACU
3. Rubus armeniacus	5		FACU
4.			
5.			
= Total Cover	22		
Herb Stratum (Plot size: ___)			
1. Carex deweyana	5		FAC
2. Phalaris arundinacea	1		FACW
3. Equisetum arvense	15		FAC
4. Ranunculus repens	80	Y	FAC
5. Geum macrophyllum	10		FAC
6. Athyrium filix-femina	5		FAC
7. Polystichum munitum	5		FACU
8. Tellima grandiflora	20	Y	FACU
9.			
10.			
11.			
= Total Cover	141		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover	0		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	1	x 2 =	2
FAC species	130	x 3 =	390
FACU species	32	x 4 =	128
UPL species		x 5 =	
Column Totals:	163	(A)	520 (B)

Prevalence Index = B/A = 3.19

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Vegetation is marginally hydrophytic as it passes the dominance test, but it fails the prevalence index. Plants present are a mix of facultative and facultative upland species, with only 1% facultative wetland species.

SOIL

Sampling Point: TP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-12”	10YR 3/2	100					silty clay loam	

[1] Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2] Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3] Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ **No** x

Remarks: Soils are not hydric; no redox features or other indicators

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ______

Water Table Present? Yes x No ___ Depth (inches): surface

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ______

Wetland Hydrology Present? Yes x **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Saturation to surface present due to seepage from within slope.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 61st Pl W Retaining Wall City/County: Mukilteo, Snohomish Sampling Date: April 26, 2016
Applicant/Owner: City of Mukilteo State: WA Sampling Point: Test Plot 4
Investigator(s): Brad Thiele, Emily Drew Section, Township, Range: T28N, R04E, Sec 17
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): slope Slope (%): 10%
Subregion (LRR): A Lat: 47.9159789 Long: -122.315807 Datum: NAD83
Soil Map Unit Name: Alderwood Everett gravelly sandy loam 25 to 70 percent NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___ , Soil ___ , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___
Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes x	No ___	Is the Sampled Area within a Wetland?	Yes ___	No x
Hydric Soil Present?	Yes ___	No x			
Wetland Hydrology Present?	Yes x	No ___			

Remarks: Test plot is on road slope above 61st place west below a couple of willow trees. Vegetation is marginally hydrophytic. Hydric soil is not present. Saturation was present as a hydrology indicator

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	20	Y	FAC
2.			
3.			
4.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30)			
1. Rubus spectabilis	25	Y	FAC
2.			
3. Rubus armeniacus	25	Y	FACU
4.			
5.			
	50	= Total Cover	
Herb Stratum (Plot size: 10)			
1. Mustard sp.	1		Unk
2. Agrostis sp.	10		FAC
3. Equisetum arvense	50	Y	FAC
4. Polystichum munitum	1		FACU
5. Geum macrophyllum	5		FAC
6. Tellima grandiflora	1		FACU
7.			
8.			
9.			
10.			
11.			
	68	= Total Cover	
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 5

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species	106	x 3 =	318
FACU species	27	x 4 =	108
UPL species		x 5 =	
Column Totals:	133	(A)	426 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ 5 - Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1] Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Meets the dominance test but fails the prevalence test. No FACW species present.

SOIL

Sampling Point: TP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12”	2.5YR 5/3	100					silty clay loam	contains cobbles

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if present):

Type: ___
Depth (inches): ___

Hydric Soil Present? Yes ___ **No** x

Remarks: Soil has no hydric indicators

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
x Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___
Water Table Present? Yes ___ No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes x No ___ Depth (inches): 8”

Wetland Hydrology Present? Yes x **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Saturation at 8” but no other hydrological indicators

GeoDesign INC

REPORT OF GEOTECHNICAL ENGINEERING SERVICES

Stabilization Alternatives Feasibility and Evaluation
61st Place West Retaining Wall (ST11003)
City of Mukilteo
Mukilteo, Washington

For
Tuttle Engineering and Management
April 27, 2018

GeoDesign Project: Mukilteo-1-01

GeoDesign INC

April 27, 2018

Tuttle Engineering and Management
275 West Rio Vista Drive, Suite 1
Burlington WA, 98233

Attention: Dave Mariano, P.E.

Report of Geotechnical Engineering Services
Stabilization Alternatives Feasibility and Evaluation
61st Place West Retaining Wall (ST11003)
City of Mukilteo
Mukilteo, Washington
GeoDesign Project: Mukilteo-1-01

GeoDesign, Inc. is pleased to submit our Stabilization Alternatives Feasibility and Evaluation report for the failed cantilever wall on 61st Place West in Mukilteo, Washington. Our services for this project were conducted in accordance with our "Geotechnical Scope of Work" sent via email on January 19, 2016 and authorized by executed Subconsultant Agreement dated March 28, 2016.

We appreciate the opportunity to be of service to you. Please call if you have questions regarding this report.

Sincerely,

GeoDesign, Inc.

Kevin J. Lamb, P.E.
Principal Engineer

KJL:kt
Attachments
One copy submitted (via email only)
Document ID: Mukilteo-1-01-042718-geor-rev.docx

10700 Meridian Avenue North, Suite 402 I Seattle, WA 98133 I 206.838.9900 www.geodesigninc.com

EXECUTIVE SUMMARY

GeoDesign completed a geotechnical study for the 61st Place West stabilization project in Mukilteo to re-evaluate stabilization options that were identified during a previous study completed in 2012. Previous stabilization options considered included the following:

- A secant pile wall constructed in the middle of the uphill traffic lane
- A tied-back soldier pile wall in the middle of the uphill traffic lane
- Reinforcement of the existing wall by adding tiebacks
- Rock buttress at the toe of the existing colluvium slide
- Ground improvement, such as rammed aggregate piers, at the toe of the colluvium slide and re-grading the slope
- Reinforce the existing colluvium slope downhill of the roadway combined with tieback anchor installation in the existing soldier pile wall

The secant pile wall and the tied-back soldier pile wall were identified as the preferred alternatives in 2012 and design of them was taken to 30 percent before the project was stopped. FEMA funding was acquired for the secant pile wall option.

We reviewed the existing information, completed a subsurface exploration to augment the existing subsurface information, performed in situ measurements in inclinometer casings and monitoring wells, and completed slope stability analyses to compare the secant pile wall option to the option of reinforcing the existing wall by adding tiebacks. We evaluated the constructability of both options and developed preliminary cost estimates.

Our analysis indicates that the option of reinforcing the existing pile wall with tiebacks and improving surface and subsurface drainage will provide adequate support for the roadway embankment and will provide a similar level of slope stability improvement as the secant pile wall option. Surface water infiltration and groundwater flow are the primary causative factors resulting in slope failure. Drainage improvements to reduce groundwater and control surface water drainage uphill and adjacent to the area are necessary to stabilize the slope.

The poor site access, confined nature of the work area, and the compromised integrity of the existing wall will limit the size of construction equipment able to access the area. Equipment necessary to install a secant pile wall is large (drill rig in excess of 200,000 pounds and 25 to 30 feet in length) and cannot likely access the area without first stabilizing the existing wall. Equipment necessary to install tiebacks and additional soldier piles to reinforce the existing wall is much smaller and lighter and can access the site in its current condition.

We recommend abandoning the secant pile wall option and proceeding with the option to:

- reinforce the existing soldier pile wall with tieback ground anchors,
- install new soldier piles to repair the failed MSE wall at the east end of the wall and to replace the MSE wall at the west end of the wall,

- install horizontal drains to help manage and reduce groundwater flow into the area, and
- install a curtain drain at the toe of the south slope on the south side of the roadway to capture stormwater runoff and prevent it from infiltrating into the slope; the improvements should extend to the east and west of the project area approximately 250 feet.

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1.0 INTRODUCTION

GeoDesign, Inc. is pleased to submit this geotechnical report summarizing our stabilization alternatives feasibility and evaluation for the failed cantilever wall on 61st Place West Road in Mukilteo, Washington (Figure 1). This report presents analysis of the previously identified preferred mitigation option (secant pile wall) and evaluates other potential mitigation options that include a rock buttress and reinforcing the existing wall with tieback anchors, additional soldier piles, and improving drainage.

The site is located immediately east of the residential property addressed 9020 61st Place West (Figure 2). It includes the portion of the roadway and ROW that extends approximately 250 feet to the east along the alignment of 61st Place West. Through the project area 61st Place West is a two-lane, AC-surfaced road and traverses down a north-facing slope. The slope along the south side of the road is steep and extends up approximately 40 to 50 feet to residential houses at the top of the slope. The road embankment on the north side is supported by a CMU-block MSE wall (Keystone) at the west end of the project, a cantilever soldier pile wall, and a rock buttress on the east end that replaced a failed MSE wall. The slope below the wall has slid multiple times, and a slide in 2011 compromised the stability of the existing cantilever pile wall and resulted in failure of the MSE on the east end of the soldier pile wall.

The roadway continues downhill past the project area for an additional 750 feet where it ends. Beyond the project area the street provides access to the Mukilteo Water and Waste Water Lift Station, residential properties, and for emergency vehicle access A private road continues on from there to provide an additional access point to several other private properties.

The project area appears to be located within a larger ancient landslide complex as indicated by LiDAR data and ground deformation. Pavement deformation along 91st Place SW, uphill of the project area, indicates possible recent movement in portions of the larger slide complex.

1.1 BACKGROUND

As indicated above, the project area has been impacted by previous slide activity. In January 1997 a slide impacted approximately 65 feet of the north traffic. The ground along the shoulder and below a portion of the roadway dropped up to 2 feet (Landau, 1997). Following that event the City of Mukilteo subcontracted with Landau Associates, Inc. to conduct a geotechnical investigation and provide recommendations for stabilizing the road. Several mitigation measures were considered and a cantilever soldier pile wall was identified as the preferred method based on the conditions and the City's objectives. A cantilever soldier pile wall with timber lagging, along with MSE walls at the ends of the soldier pile wall, was constructed in 1998.

The design of the soldier pile wall interpreted the slide failure plane to extend to a depth of approximately 20 feet north of the road and recommended:

- piles be embedded 35 feet below the road subgrade.
- the wall be designed for up to 10 feet of exposed wall below the pavement elevation.

Construction records indicate the wall was constructed for an initial exposed face of approximately 3 to 4 feet and that the piles are 38 feet long with a stickup of approximately 2.5 feet above the surface of the road (Reid Middleton, 1998). Backfill around the piles was specified as "Lean Concrete with a compressive strength of 1,500 psi." Shortly after construction was completed, additional deformation of the slope in front of the wall occurred in the spring of 1999. The slope slid approximately 2 to 3 feet downward and a few inches outward from the wall. This movement undermined the bottom row of lagging over a portion of the wall (Landau, 1999). The wall had been constructed to accommodate an exposed wall face, up to 10 feet (Landau, 1998). Rather than installing additional lagging, a plywood bulkhead below the existing lagging was recommended to mitigate the deformation along with re-grading of the bench in front of the wall.

The slope in front of the wall slid again in March 2011. The slope appeared to drop an additional 3 to 5 feet, exposing up to 14 feet of wall face (we believe this was measured from the top of the pile rather than the road), in the central portion of the wall (Terracon, 2011). The slide undermined the lower level of lagging that had been repaired in 1999 and also resulted in the failure of the MSE wall at the east end of the soldier pile wall. Slight deformation of Piles 6, 7, and 8 was also reported by (Terracon, 2011). Evidence of surface water erosion was observed below two 4-inch-diameter drains on the slope south of the road, below the residential houses. Recommendations were provided to improve short-term stability while long-term stabilization options were being developed.

Terracon Consultants, Inc. (Terracon) completed a geotechnical investigation in 2012 to provide geotechnical engineering services to evaluate the site conditions and to provide rehabilitation alternatives for the wall and slide in order to stabilize the roadway. Investigation included additional borings and installation of inclinometer casings to measure ground deformation and monitoring wells. Subsurface explorations identified three distinct soil units below the roadway fill and the slope below the wall as follows:

1. Colluvium: Soft to medium stiff silt with sand and pockets of organics that is wet to saturated and with isolated blocky zones and slickensides.
2. Transition Zone: Silt with partings to lenses of fine sand, occasional zones of finely laminated silt and very fine sand, typically moist with isolated wet zones, with blocky zones and slickensides. Consistency based on blow counts varies from very stiff to hard.
3. Glacial Silt: Silt with isolated zones of interbedded lenses to layers of fine sand. Slickensides and blocky textures indicating deformation or sliding were not observed in this unit. The SPT blow counts are significantly higher than in the overlying Transition Zone unit and the Glacial Silt is described as hard.

Although inclinometer casings and groundwater monitoring wells were installed we were unable to locate any records of measurements that may have been made.

The report identified the following mitigation alternatives:

1. Secant pile wall located in the middle of the existing roadway
2. New soldier pile and tieback wall located in the middle of the roadway

3. Rock buttress at the toe of the existing colluvium slide with re-grading of the existing slope downhill of the roadway
4. Ground improvement, such as rammed aggregate piers, at the toe of the existing colluvium slide with re-grading of the existing slope downhill of the roadway
5. Reinforce the existing colluvium slope downhill of the roadway combined with tieback installation in the existing soldier pile wall

During preparation of the Terracon geotechnical investigation report (Terracon, 2012) the City selected Options 1 and 2 as the preferred options to develop to 30% design. It was recognized that the site location is within a larger regional landslide complex and that the preferred alternatives would be limited to improving stability of just the 61st Place West landslide. Geotechnical issues to be addressed included controlling groundwater seepage and accounting for slickensides and blocky zones encountered in the Transition Zone unit.

Tetra Tech and Terracon brought the design of the secant pile wall to 30 percent, at which time work on the project stopped.

1.2 PURPOSE AND SCOPE

The purpose of our services was to review the existing information and previous stabilization options, conduct additional subsurface explorations and in situ measurements, and evaluate the identified stabilization alternatives and their feasibility. This included slope stability analyses of the existing conditions and a comparison of the stability improvements associated with the secant pile wall and with the alternative of reinforcing the existing wall with tieback anchors. Our specific scope included the following:

- Reviewed the existing geotechnical information, daily report, investigation reports, and design drawings relevant to the site.
- Completed a soil boring at the toe of the slide below the roadway on private property.
- Completed in situ measurements in the installed inclinometer and monitoring wells.
- Completed slope stability analyses
- Evaluated feasibility of stabilization options.
- Developed preliminary cost estimates for the secant pile wall option and for reinforcing the existing tieback wall.
- Provided this report detailing our analysis, findings, and recommendations.

2.0 SITE CONDITIONS

2.1 GEOLOGY

Regional geologic mapping (USGS, 1982) indicates the surface geology of the site and surrounding area generally consists of pre-Vashon Whidbey Formation deposits, with a landslide mapped to the north, and glacial advance outwash deposits mapped in the upland areas to the south and east of the site. The Whidbey Formation in the area consists primarily of interbedded fine sand, silt, and clay. The overlying glacial advance outwash deposits typically vary from lenses to layers of very dense, silty sand with gravel to sandy gravel. The overlying glacial outwash deposits are more permeable and groundwater tends to infiltrate through it and perch on top of the finer grained silt and clay deposits of the Whidbey Formation. The perched groundwater condition increases pore water pressures and decreases slope stability.

LiDAR imaging has improved the ability to identify large landslide complexes. The LiDAR imagery for the area indicates the site is within a large landslide complex that extends to the south up to 92nd Street SW, as shown on Figure 3. There is an abrupt dip in the pavement along 91st Place SW near the residential house addressed 6016 91st Place SW. The dip occurs along the inferred scarp alignment of the larger landslide complex and may indicate possible slow movement of a portion of the slide.

2.2 SURFACE CONDITIONS

We observed the surface conditions during several visits to the site. The road section through the project area appears to have been constructed as a sidehill fill embankment. The steep slope on the south side of the road appears to be a scarp and the slope below the road appears to have been modified by filling and grading based on its surface characteristics.

The road is paved with AC. A concrete curb is present approximately 5 feet behind the soldier pile wall to keep cars and pedestrians away from the depressions that have formed behind the wall where the lagging has been undermined (Figure 4). A concrete curb is also present along the south side of the road near the toe of the steep slope. Significant cracks or pavement deformation is not present in the pavement or along the joint between the pavement and the curb along the south side of the road.

Between the curb along the north side of the road and the soldier pile wall depressions/sinkholes have formed between the soldier piles where the lagging has been undermined. The piles stick up approximately 2.5 feet above the surface of the road and a guardrail is attached to the top of the piles. Slide-induced pile movement is indicated at Pile #5 and less so at Pile #6, where a gap between the piles and the guardrail is present. The tops of the piles appear to have rotated downslope approximately 6 inches at Pile #5 and approximately 2 inches at Pile #6.

The exposed height of the wall as measured from the road elevation to the ground surface approximately 2 feet in front of the pile varies from approximately 6 feet at Pile #1(east end of the wall) to approximately 12 feet at Pile #5 and then decreases to approximately 7 feet at Pile #12 (west end of the wall). The lagging has been undermined due to the downward movement of the slide between Piles#1 through #10. Between Piles #2 through #6 up to approximately 5 feet of soil is exposed below the original lagging.

A curved depression, or graben-like feature, extends along the ground surface approximately 5 feet in front of the wall. The curved depression delineates the scarp of the slide in front of the wall. There is bench approximately 10 feet in width in front of the wall below which the ground surface slopes down at an approximately 2H:1V slope. Approximately 80 feet below the wall there is a significant bulge in the ground surface below the eastern one-third of the soldier pile wall. The trees downhill of the bulge are relatively vertical and do not reflect shallow downhill movement, while the trees above the bulge are inclined from the vertical. The bulge appears to be a toe bulge at the toe of the slide mass.

The eastern portion of the slope appears saturated and noticeably wetter than the ground surface on the western portion of the slope. Seepage on the slope and at the base of the slide was observed during our site visit in February 2016.

The slope on the south side of the road extends upwards approximately 40 to 50 feet at a steep inclination estimated at 1H:1V. The slope is thinly vegetated. Soil exposed on the surface or in areas where shallow veneer or skin slides have denuded the slope is typically hard silt or fine, sandy silt. The shallow veneer slides appear to have generally stopped at the toe of the slope above the road and have not resulted in deformation of the road surface. Remnants of corrugated drainpipes are present at multiple locations on the slope.

2.3 SUBSURFACE CONDITIONS

We explored subsurface conditions through a review of the summary logs of the borings previously completed on site and by completing boring B-1-16 near the toe bulge observed approximately 80 feet downslope of the wall. Locations of the borings that have been completed on site since 1998 are shown on Figure 2. Descriptions of our field explorations and laboratory procedures, logs of the explorations, and laboratory testing results are presented in Appendix A. The exploration logs by Terracon and Landau from the previous geotechnical studies are presented in Appendix B.

Boring B-1-16, located near the base of the slope, encountered similar soil conditions as found in the previous borings completed on site: an upper layer of soft to medium stiff colluvium underlain by what is referred to as the Transition Zone. The Transition Zone is composed of medium stiff to stiff silt with slickensides and blocky zones that are indicative of ground deformation or landsliding activity. The Transition Zone is underlain by hard glacial silt.

Cross section A-A' (Figure 5) provides a summary of the subsurface conditions interpreted from the borings and surficial exposures observed in the field.

2.4 GROUNDWATER

A summary of groundwater level measurements and observations is provided on Figure 6 and in Appendix C. Monitoring wells completed within the roadway indicate groundwater is present at approximately13 feet below the surface of the roadway at the east end of the wall and is generally below a depth of approximately 24 feet at the west end of the wall. Groundwater levels in boring B-3-11 were recorded during drilling at a depth of 17.5 feet BGS, with wet zones encountered above that at a depth of approximately 11 feet. During the winter of 2016 we observed surface water along the eastern portion of the slope and at the toe of the slide near boring B-1-16. We did not observe seepage on the steep slope on the south side of the road.

2.5 INCLINOMETER SURVEYS

Inclinometer casings had been installed by Terracon in borings B-1-11, B-3-11, B-1-12, and B-2-12. We installed an inclinometer in boring B-1-16 after drilling was completed. The location of the borings with inclinometers is shown on Figure 6. An initial baseline survey was completed in February 2016; however, the inclinometer was out of calibration and another baseline survey was completed in April 2016; follow-up surveys were completed in May, June, and September 2016 and in March 2017.

We understand that the inclinometer in boring B-3-11 was installed to a depth of 51 feet BGS based on the summary log (Terracon, 2012). However, upon beginning our study in February 2016 the inclinometer probe could not be inserted past a depth of 14 feet BGS, indicating the casing had deformed significantly or had been sheared off below that depth. Inclinometer surveys completed to a depth of 14 feet in the casing between April 2016 and March 2017 did not indicate significant deformation.

The inclinometer probe could be inserted to the full depth of the casings installed in the roadway behind the wall by Terracon in borings B-1-11, B-1-12, and B-2-12. Subsequent measurements during the monitoring period do not indicate significant movement or a trend in movement direction.

Boring B-1-16 installed near the toe of the landslide below the wall indicates a small amount of shallow down-slope movement beginning at a depth of approximately 6 feet.

The results of the displacement surveys are presented in Appendix D.

3.0 CONCLUSIONS

The landslide below the wall appears to be limited in extent and does not appear to extend below or behind the existing soldier pile retaining wall. The impacts associated with the landslide in front of the wall include failure of the MSE wall at the east end of the soldier pile wall, undermining the lagging and increasing the exposed height of the wall, and the tilting of the top of Pile #5 in the downhill direction.

The exposed height of the wall between Piles #2 through #9 exceeds the 10 feet that is included in the original wall design. The increased wall height decreases the passive pressure in front of the wall that is available to resist outward deformation. The exposed wall height is greatest at Pile #5, where the pile top appears to have deflected outwards.

The depressions along the back of the wall are a result of the lagging being undermined and the soil between the piles sloughing out below the exposed lagging.

The slide has impacted the integrity of the existing soldier pile retaining wall, but has not caused deformation or failure of the road behind the wall other than the depressions forming between the piles. We believe the slide is within the colluvium material above the Transition Zone soil and that the Transition Zone soil is more likely associated with the large landslide complex that encompasses the project and surrounding areas.

Surface water and groundwater seepage is a causative factor for initiating the slide. The initial slide in 1997 was associated with an extreme wet weather event involving rain over snow. We expect that the movement along the slide will continue to occur and that stabilization measures should address the wall stability and to improve drainage away from the slide area and decrease groundwater levels.

4.0 STABILIZATION ALTERNATIVES FEASIBILITY EVALUATION

Previous studies identified the following options to stabilize the area:

1. Secant pile wall
2. A new tied-back soldier pile wall
3. Reinforcement of the existing wall by adding tiebacks.
4. Rock buttress at the toe of the existing colluvium slide
5. Ground improvement, such as rammed aggregate piers, at the toe of the colluvium slide and re-grading slope
6. Reinforce the existing colluvium slope downhill of the roadway combined with tieback anchor installation in the existing soldier pile wall

4.1 SLOPE STABILITY ANALYSIS

Two-dimensional limit equilibrium slope stability analyses were used to evaluate the existing conditions in order to calibrate the slope stability model and then to evaluate improvements to slope stability associated with the stabilization options listed below:

- Secant pile wall option
- Reinforcement of the existing wall with tiebacks

The secant pile wall option was selected for analysis since it had been previously identified as the preferred option and been brought to 30% design. The option to reinforce the existing wall was selected as it appears to be the most viable and cost efficient when compared to the remaining options as discussed below.

The rock buttress option was not analyzed due to constructability concerns associated with excavation in front of the wall to install the rock buttress. Excavation for a buttress would need to begin at the toe of the slide in order to key it into intact material. The excavation would remove material at the toe, potentially destabilizing the slide mass above it. In addition, boring B-1-16, completed at the toe of the slide, encountered approximately 13.5 feet of soft to medium stiff colluvium/landslide debris, indicating that excavation to key in a buttress would be deep.

The installation of rammed aggregate piers to improve the ground at the toe of the slide is viable; however, aggregate piers do not provide much shear resistance to keep the upper portion of the slide from sliding. In addition, the aggregate columns could potentially allow for more groundwater seepage down to the underlying Transition Zone soil, which should be avoided.

The last option, which includes reinforcing the existing colluvium slope downhill of the roadway along with installing tiebacks to stabilize the wall, is also a viable stabilization method. However, reinforcing the existing slope may not be necessary if drainage improvements can be completed to decrease groundwater to improve stability of the lower slope. The slope below the wall is composed of soft, saturated silt and “reinforcement” would likely be limited to over-excavation and replacement with riprap, which could only be completed after the wall is stabilized to support construction traffic loading.

4.1.1 Analyses

Slope stability analyses were performed using the slope stability analysis software program Slope/W (version 7.11) by Geo-Slope International, Ltd. The software has a graphic-user interface for defining the slope geometry, inputting soil parameters, and defining the search limits for the entry and exist points of the failure surfaces. The program performs two-dimensional limit equilibrium analyses to compute the factor of safety for failure surfaces located within the search limits defined by the user.

The factor of safety against slope failure is simplistically defined as the ratio of the forces resisting slope movement (i.e., soil strength, soil mass, etc.) to the forces driving slope movement (i.e., gravity, water pressure, earthquake shaking). The program estimates the location and geometry of "critical failure surfaces" within the user-defined search area. Critical failure surfaces are those failure surfaces with the lowest factors of safety and define the path of the failure surface through the subsurface material. A factor of safety of 1.00 implies that the forces resisting a landslide exactly equal those tending to produce a landslide. Therefore, a factor of safety of 1.05 means that the forces resisting a landslide exceed those tending to cause a landslide by 5 percent.

Factors of safety were calculated using the Spencer method, which satisfies both moment and force equilibrium.

The "critical failure surface" search area is defined based on the conditions being modeled. Search limits were adjusted to model the existing conditions and to analyze for both deep-seated global stability and shallow local failures similar to the existing failure below the wall. Analyses were completed for static conditions only. Pseudo-static methods that are used to model seismic loading conditions were not completed since the stability of the slope is likely largely controlled by the stability of the large landslide complex.

4.1.2 Soil Parameters

Soil parameters used in the slope stability analyses were based on laboratory testing, boring explorations, SPT N-value correlations, and our experience with similar soil conditions. Laboratory strength testing consisted of direct shear tests. The soil input parameters used for stability analyses are presented in Table 1. A discussion of the laboratory test procedures and test results are presented in Appendix A.

Table 1. Slope/W Soil Input Parameters

Soil Type	Moist Unit Weight (pcf)	Friction Angle, ϕ' (degrees)	Cohesion, c' (psf)
Fill/Colluvium	100	28	30
Roadway Fill	115	32	50
Hard Silt with Sand (disturbed)	125	17	0
Hard Silt with Sand	125	33	500

4.1.3 Analysis Methodology and Results

The geotechnical model for the critical slope area is along a cross section constructed generally perpendicular to the slope and through Pile #5, as shown on Figure 5. The slope stability analysis results are presented in Appendix E.

Initial slope stability analyses of the existing conditions employed an iterative process of varying soil parameters in order to predict a failure near or close to the observed failure below the wall. Subsequent analyses for the two stabilization options were completed using wide critical failure search limits that were then narrowed to focus on zones within the slope where the predicted failure surfaces are concentrated. This process allows identification of potential failure surfaces for global conditions that extend from the toe of the existing slide up to the top of the slope above the roadway, and local failure conditions that are concentrated on the slope below the road.

Groundwater levels were modeled based on observations and from existing levels measured in monitoring wells and encountered during drilling.

The results of the slope stability analyses under static loading conditions are presented in Table 2.

Table 2. Slope Stability Factor of Safety - Static Loading Conditions

Condition	Factor of Safety Static Conditions	
	Local	**Global**
Existing	0.9	1.1
Secant Pile Wall	0.9	1.3
Reinforce Existing Wall	0.9	1.3

Based on our analysis, the secant pile wall option and the reinforcement of the existing wall option provide similar improvements to the stability of the global failure surface. We anticipate that the installation drainage improvements, such as a lined drainage swale south of the road and horizontal drains that extend back into the slope below the road, would improve stability of the local failure condition so that it remains above 1.

4.2 OPTION FEASIBILITY

We understand that FEMA funding has been acquired based on the construction of the secant pile wall stabilization alternative. The stability analysis above indicates that reinforcement of the existing wall with tiebacks will provide a similar level of improvement in slope stability as the secant pile wall. The installation of drainage measures to decrease surface water infiltration and decrease or manage groundwater levels was included in the secant pile wall option and would be included in the reinforcement of the existing wall option. Below we discuss the feasibility of constructing each option.

4.2.1 Secant Pile Wall

The secant pile wall option was selected as the preferred alternative and taken to 30% design. The proposed wall was to be placed in the uphill traffic lane and would reduce the available road width by one-half. This alternative has significant risk, cost, and constructability concerns due to the limited access of the site and the size of the equipment required to install drilled shafts to the diameters and depths identified in the 30% design drawings. The road embankment on which the equipment would sit is approximately 20 feet in width and currently supported by a soldier pile shoring wall with compromised integrity. The wall would likely fail if subjected to the wall surcharge loads associated with the construction equipment.

We discussed the equipment requirements with a local deep foundation contractor. The pertinent equipment necessary to install the piles would include a large drill rig likely in excess of 200,000 pounds, approximately 30 feet long, and 12 feet wide; a large crane for lifting shaft reinforcement and temporary casings (wet drilling conditions are anticipated); an excavator for handling spoils; and a concrete pumper truck. It would be necessary to construct a stabilized bench and/or tieback the existing wall in order to support the equipment and provide sufficient access for the equipment.

The 30% design drawing of the secant pile wall is provided on Figure 7. Included on the figure is a summary of the work scope along with a preliminary cost estimate. The cost estimate of approximately $750,000 does not include construction of a bench or reinforcement of the existing wall in order to create access to the site for the construction equipment.

4.2.2 Reinforcement of the Existing Wall with Tiebacks

As part of the stability analysis it was necessary to develop a preliminary design for reinforcing the existing shoring wall. Our goal was to reinforce the wall to maximize the allowable exposed wall face given the existing pile embedment. This resulted in allowable exposed wall height as measured from the road surface of approximately 18 feet, requiring up to three rows of tiebacks at a 5-foot vertical spacing below the road. We anticipate that only the portion of the wall between Piles #2 through #8 would need to be designed for an exposed wall height of 18 feet and that the design wall height and the number of tieback rows could be decreased towards the ends of the wall as shown on Figure 8. This stepping of the additional wall reinforcement is based on the existing slide deformation that has occurred to date. The tiebacks would be installed midway between the existing piles, and walers would be installed in front of the wall against the piles. The tiebacks would be installed through the waler and stressed. Additional piles would be installed to repair the failed MSE wall at the east end of the wall and to replace the MSE wall at the west end of the wall.

Subsurface drainage would be improved through the use of horizontal drains installed through the eastern one-third of the wall and installed below the lowest level of tiebacks. The drains would extend up the slope between 80 to 120 feet; actual length would depend on the conditions encountered during drilling. At the face of the wall the drains would be connected to a manifold collection system attached to and structurally supported on the face of the wall below the lowest waler. The drains will flow to a central point in the middle of the wall, where the pipe will extend down the slope to a suitable discharge location.

Equipment necessary to install the tiebacks is relatively small and could use the existing bench in front of the wall to access the tieback locations. After installation and stressing of the tiebacks, fill would be placed against the wall to approximately 8 feet below the road and the bench could be pulled back to decrease its width and remove material from the top of the slope. The drill rig required to install the soldier piles is much smaller than that required for the secant pile wall, since the piles are smaller in diameter and could be installed similar to the existing piles.

5.0 RECOMMENDATIONS

5.1 PREFERRED STABILIZATION OPTION

Based on our investigation and analysis, we recommend abandoning the secant pile wall option and proceeding with the more viable and cost-effective option of repairing and reinforcing the existing soldier pile wall. The concern with regards to accessing the area to install the drilled shafts for a secant pile wall indicates the option is not easily constructible.

The risk associated with potential change orders during drilling conditions is also significantly higher for the secant pile wall option. We estimate there is approximately 950 lineal feet of drilling required to install the 4-foot-diameter drilled shafts and only approximately 175 feet of drilling necessary to install additional piles at the ends of the existing wall.

Reinforcing the existing wall will also allow the City to maintain the original road width configuration through the area, while maintaining a similar level of slope stability as the secant pile wall option.

5.2 SHORING REINFORCEMENT DESIGN

Earth pressure distribution and soil parameters for design of mitigation measures that include installation of tieback soil anchors to stabilize the existing shoring wall are provided on Figure 9. Recommendations are provided for cantilevered and anchored soldier pile shoring walls and include tiebacks and additional soldier piles that are recommended to reinforce the existing wall and to replace the failed MSE wall on the east side of the wall.

The wall should be designed to accommodate future sliding in front of the wall and up to an exposed wall face of 18 feet. After the mitigation measures are installed the soil in front of the wall should be re-graded to provide a 4- to 6-foot-wide bench in front of the wall and then sloped down at an approximately 2H:1V slope to intersect the existing slope. Fill necessary to re-establish the grade in front of the wall should consist of quarry spalls.

5.2.1 Soldier Piles

The soldier pile elements should be embedded to provide sufficient resistance against kick-out at the toe of the wall but should also be embedded a minimum 30 feet below the existing ground surface in front of the wall. We recommend using factors of safety of 1.5 and 2.0 for design against overturning and kick-out, respectively.

Soldier piles embedded a minimum of 10 feet into undisturbed ice contact deposits may be designed using an allowable end bearing pressure of 18 ksf, which includes a safety factor of 3.

Shaft resistance below the base of the excavation can be designed using a side friction value of 1 ksf, which includes a factor of safety of 3. Side friction above the ground surface should be neglected.

5.2.2 Lagging

Permanent lagging should be installed 5 feet below the finish grade in front of the wall for the new and existing soldier piles to accommodate future sliding and loss of soil in front of the wall. Should the soil in front of the wall slide and increase the exposed height of the wall, additional fill consisting of quarry spalls should be placed to re-establish the original finish grade elevation in front of the wall.

Permanent lagging should consist of treated timber and should meet the specifications provided in WSS 9-09 - Timber and Lumber. The use of timber lagging will accommodate irregularities in soldier pile placement easier than concrete panels and will allow for a variable slope height along the toe of the slope and future placement of lagging if material is lost along the toe of the wall.

Lagging should be installed and backfilled on newly excavated faces the same working day the face is excavated and should be designed to resist lateral earth and surcharge pressures. To account for soil arching effects, the lagging should be designed to resist 50 percent of the recommended lateral earth pressures. A geosynthetic drainage panel should be installed behind the lagging to prevent the buildup of hydrostatic pressures.

5.2.3 Tieback Anchors

Permanent tiebacks are required to provide additional support to the existing cantilever soldier pile wall. As indicated above we anticipate three rows of tiebacks will be necessary to stabilize the central portion of the wall. Spacing between the rows is estimated at approximately 5 feet. The first row of tiebacks should be installed at approximately 5 feet below the road surface behind the wall and to sufficient depth to avoid any potential utility conflicts.

We anticipate that the tieback anchors installed into hard glacial silt deposits will be capable of achieving ultimate adhesion of 1 ksf, depending on the method of construction. However, the contractor should be responsible for selecting the appropriate type of strand anchor, bonded length, and installation methods to achieve the required anchor capacity. The bonded zone for the tieback anchors should be maintained outside of the "no load zone" show on Figure 9. The recommended no-load zone shown on Figure 9 is wider than typical no-load zone areas in order to extend the anchor load zone beyond the "Transition Zone" materials into the hard, glacial silt. Tieback anchors should be locked off at 100 percent of the design load.

Prior to installing production anchors, we recommend that performance tests be conducted on a minimum of two anchors. The purpose of these tests is to verify the bond strength used in design of the shoring and the installation procedure selected by the contractor before a large number of anchors are installed. Performance tests should be performed to 150 percent of the design load.

We recommend that proof tests be conducted on all production anchors. The anchors should be proof tested to at least 133 percent of the design load. We recommended that all of the anchor testing be completed in accordance with the guidelines provided in *Recommendations for Prestressed Rock and Soil Anchors* (Post-Tensioning Institute, 2014).

5.2.4 Horizontal Drains

The potential for additional movement of the existing landslide in front of the wall can be reduced through the installation of horizontal drains as shown on Figure 8. We recommend installing horizontal drains between the soldier pile elements along the eastern portion of the wall up to existing soldier Pile #7. We anticipate the drains can be installed during tieback installation and slightly above the last row of tiebacks along each section of the wall. The drains should be installed at an upward inclination of approximately 2 to 5 degrees with a planned length of 80 to 120 feet, depending on the actual drainage observed during installation.

PVC slotted drainpipe diameter should be 2 inches and slot size should be the smallest available, which we anticipate is 0.006 to 0.010 inch. A manifold system along the base of the wall should be used to collect the drainage and route it to the storm drain system. Unit pricing for the drains, based on linear feet, should be used in the contract documents to permit increasing drain length and or adding additional drains.

Monitoring flow from the drains should be completed on a weekly basis for the first month after installation and then decrease to a monthly basis for the first year. The effectiveness of the horizontal drains would need to be maintained by periodic inspection and cleaning of the drains. It is recommended that these drains be inspected once a year and their discharge measured and recorded. Cleaning and flushing of the drains should be completed once every five years or when significant reductions in the discharge rates are observed. If drains become plugged and ineffective, they should be replaced to prevent hydrostatic pressures from increasing; a permanent trail or service road to access the drains should be constructed to provide access.

6.0 LIMITATIONS

We have prepared this report for use by the City of Mukilteo and members of their design team members. The data and report can be used for bidding or estimating purposes, but our report, conclusions, and interpretations should not be construed as warranty of the subsurface conditions and are not applicable to other sites.

Soil exploration observations indicate soil conditions only at specific locations and only to the depths penetrated. They do not necessarily reflect soil strata or water level variations that may exist between exploration locations. If subsurface conditions differing from those described are noted during the course of excavation and construction, re-evaluation will be necessary.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time the report was prepared. No warranty, express or implied, should be understood.

◆ ◆ ◆

We appreciate the opportunity to be of continued service to you. Please call if you have questions concerning this report or if we can provide additional services.

Sincerely,

GeoDesign, Inc.

Kevin J. Lamb

Kevin J. Lamb, P.E.
Principal Engineer

KEVIN J. LAMB
STATE OF WASHINGTON
29441
REGISTERED PROFESSIONAL ENGINEER

Signed 04/27/2018

REFERENCES

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FIGURES

VICINITY MAP BASED ON AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO®

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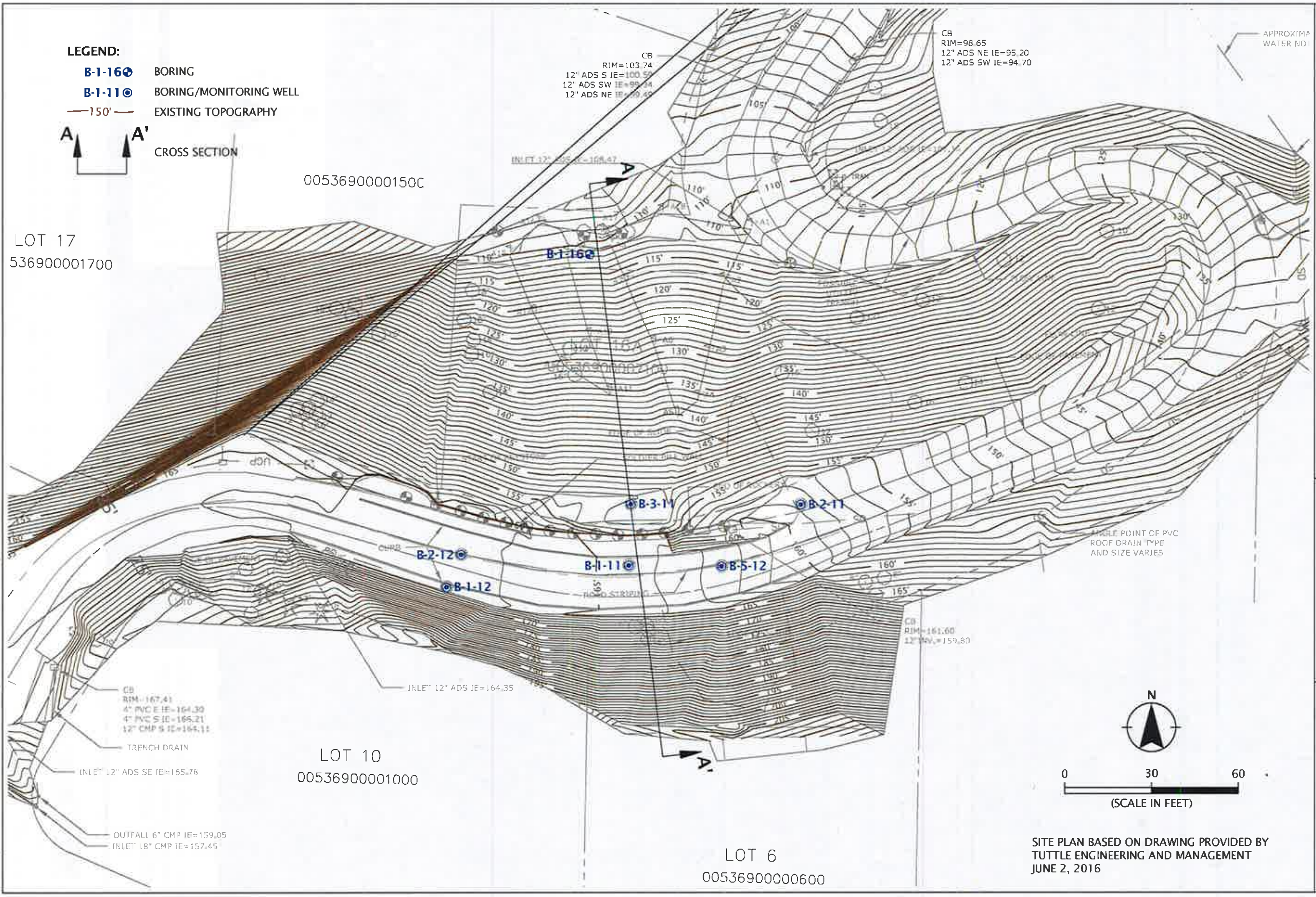
VICINITY MAP

61ST PLACE WEST RETAINING WALL PROJECT
MUKILTEO, WA

FIGURE 1

Printed By: mmiller | Print Date: 4/27/2018 10:32:37 AM
File Name: J:\M-R\Mukilteo\Mukilteo-1\Mukilteo-1-01\Figures\CAD\Mukilteo-1-01-VM01.dwg | Layout: FIGURE 1



SITE PLAN BASED ON DRAWING PROVIDED BY
TUTTLE ENGINEERING AND MANAGEMENT
JUNE 2, 2016

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SITE PLAN

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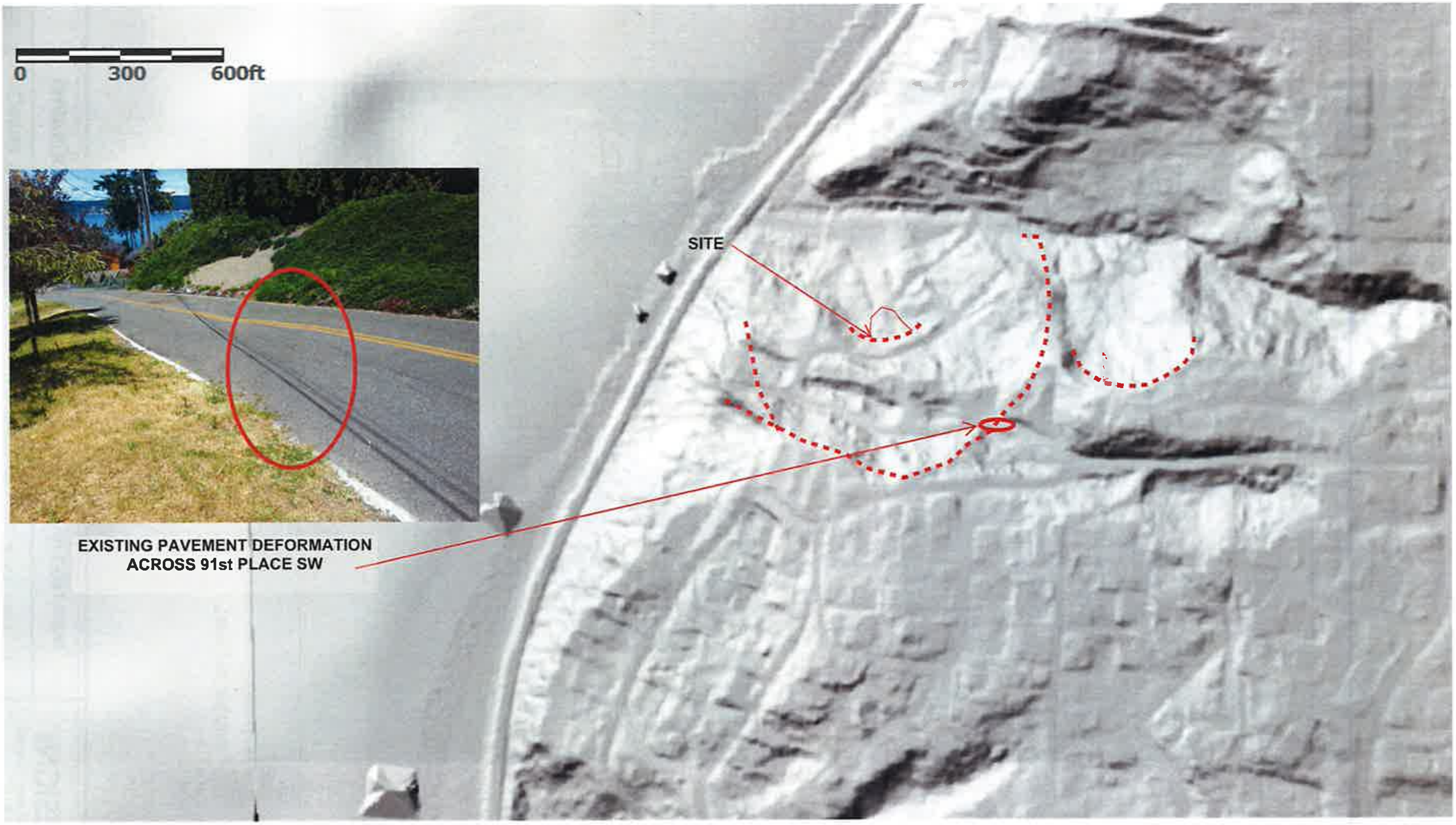
FIGURE 2

Printed By: mmiller | Print Date: 4/27/2018 10:32:48 AM
File Name: J:\M-R\Mukilteo\Mukilteo-1\Mukilteo-1-01\Figures\CAD\Mukilteo-1-01-SP01.dwg | Layout: FIGURE 2



REFERENCE: http://www5.kingcounty.gov/lidar/

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LIDAR IMAGE AND INFERRED LANDSLIDE COMPLEX

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FIGURE 3

EXISTING PILE WALL.

EXISTING PILE WALL.

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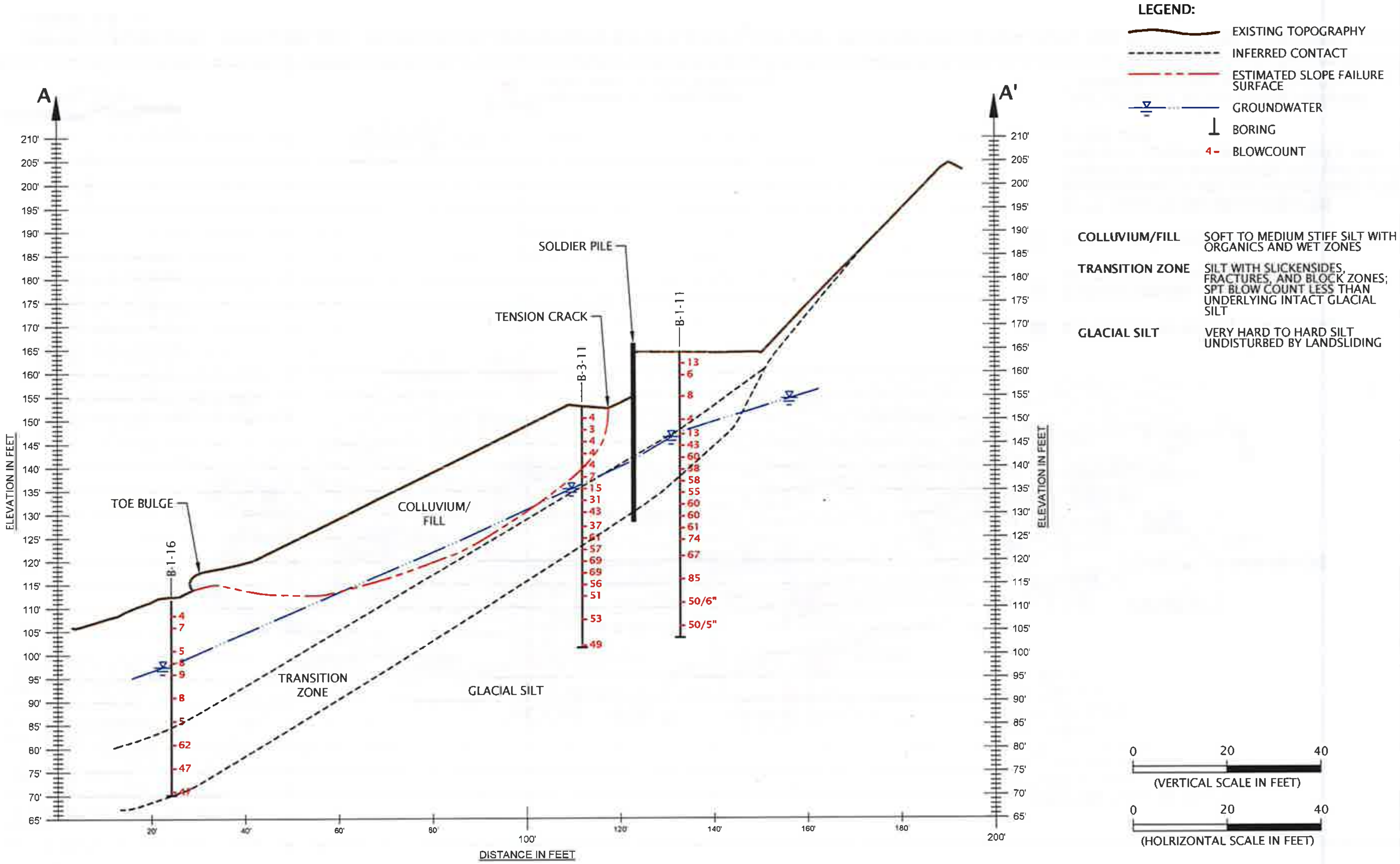
	APRIL 2018	61ST PLACE WEST RETAINING WALL PROJECT MUKILTEO, WA	**FIGURE 4**



COLLUVIUM/FILL	SOFT TO MEDIUM STIFF SILT WITH ORGANICS AND WET ZONES
TRANSITION ZONE	SILT WITH SLICKENSIDES, FRACTURES, AND BLOCK ZONES; SPT BLOW COUNT LESS THAN UNDERLYING INTACT GLACIAL SILT
GLACIAL SILT	VERY HARD TO HARD SILT UNDISTURBED BY LANDSLIDING

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CROSS SECTION

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FIGURE 5

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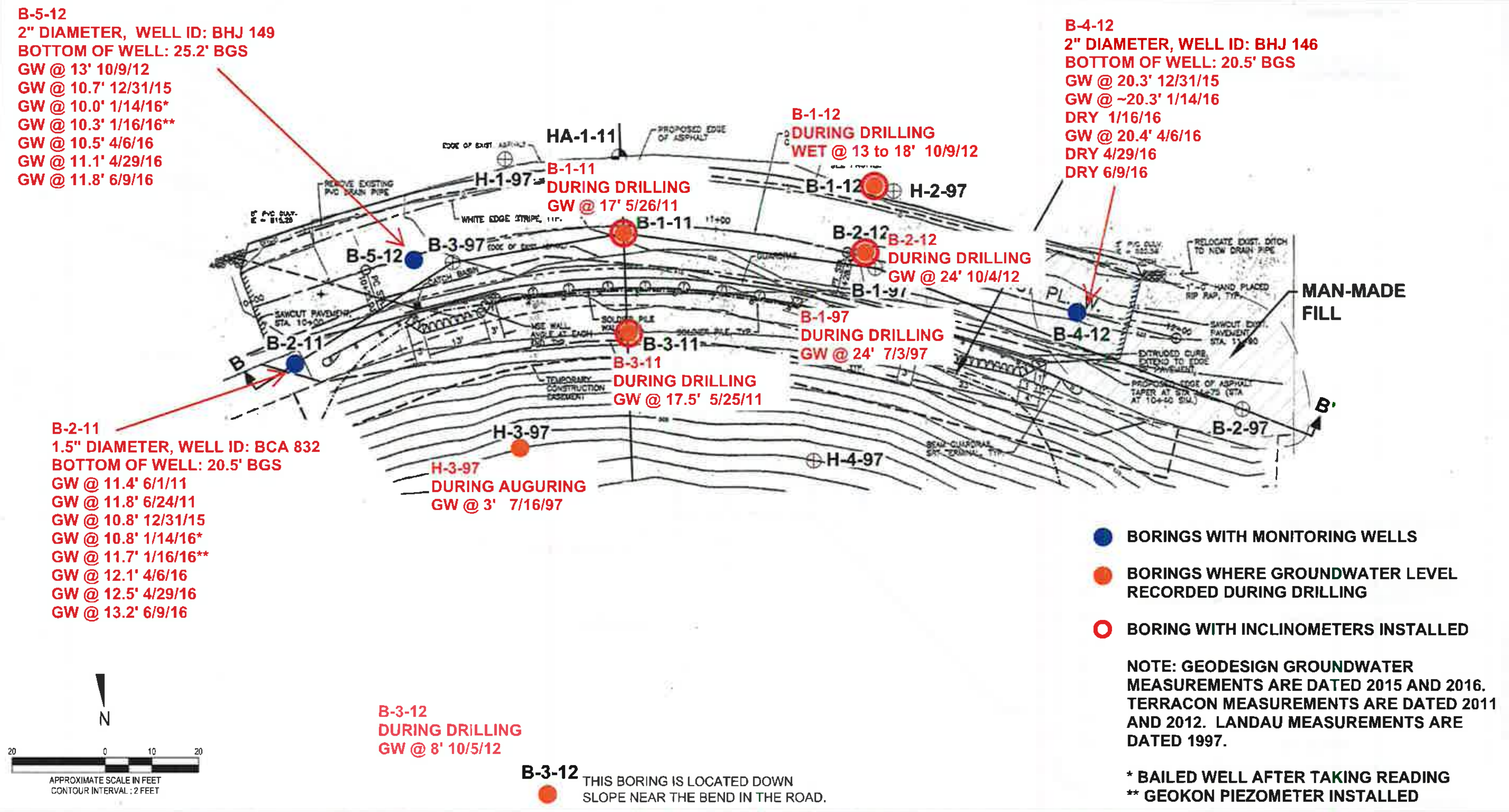
File Name: J:\M-R\Mukilteo\Mukilteo-1\Mukilteo-1-01\Figures\CAD\Mukilteo-1-01-SP01.dwg | Layout: FIGURE 5



THIS BORING IS LOCATED DOWN SLOPE NEAR THE BEND IN THE ROAD.

● BORINGS WITH MONITORING WELLS

● BORINGS WHERE GROUNDWATER LEVEL RECORDED DURING DRILLING

○ BORING WITH INCLINOMETERS INSTALLED

NOTE: GEODESIGN GROUNDWATER MEASUREMENTS ARE DATED 2015 AND 2016. TERRACON MEASUREMENTS ARE DATED 2011 AND 2012. LANDAU MEASUREMENTS ARE DATED 1997.

* BAILED WELL AFTER TAKING READING
** GEOKON PIEZOMETER INSTALLED

REFERENCE DRAWING: TERRACON, 2012, *GEOTECHNICAL ENGINEERING REPORT; 61ST PLACE WEST ROAD REHABILITATION; MUKILTEO, WASHINGTON*, 6 NOVEMBER, 2012, EXHIBIT A-2

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GROUNDWATER SUMMARY AND INCLINOMETER LOCATIONS

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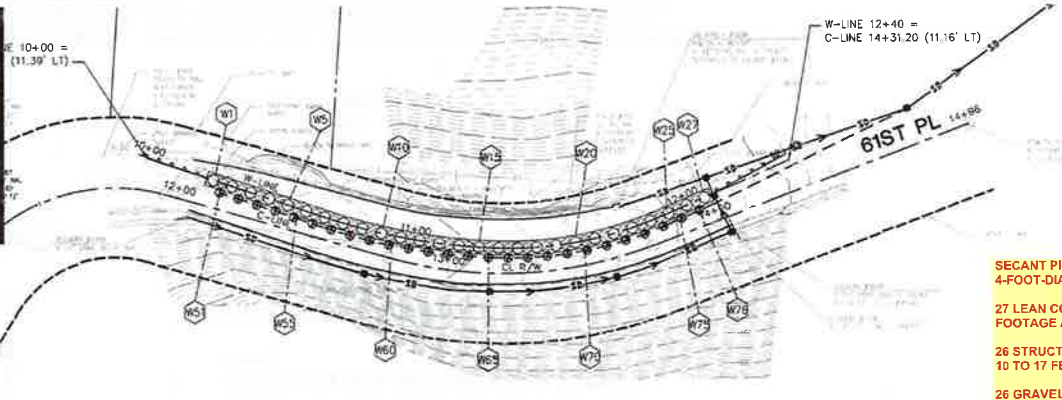
FIGURE 6



PLAN

SECANT PILE WALL
4-FOOT-DIAMETER CONCRETE PILES

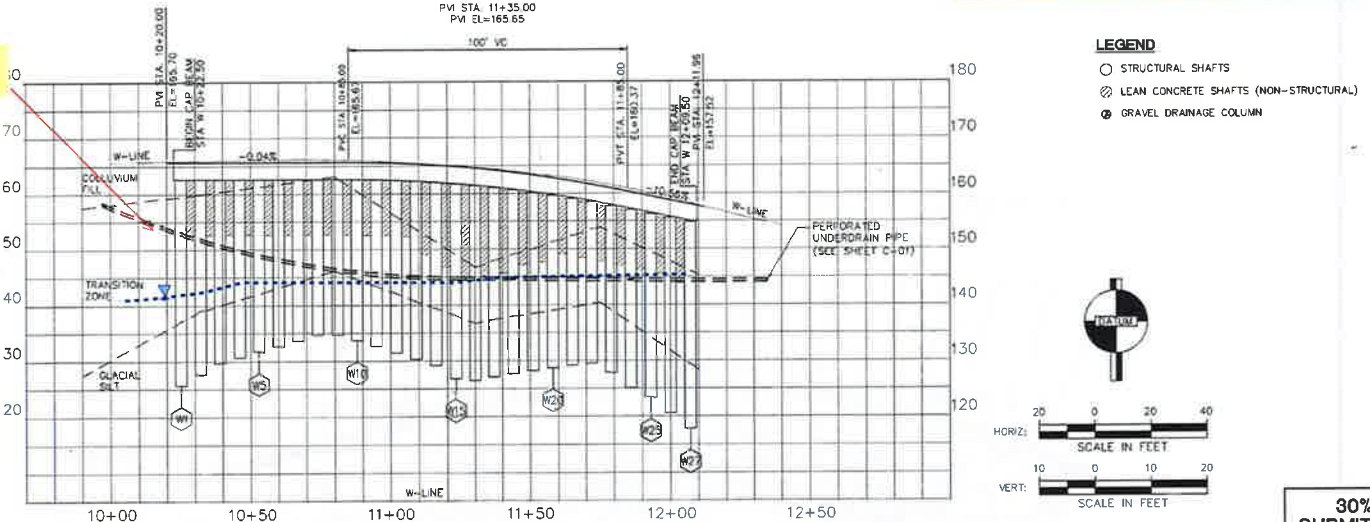
27 LEAN CONCRETE PILES: AVERAGE LENGTH 35 FEET, TOTAL FOOTAGE ABOUT 945 FEET

26 STRUCTURAL PILES: AVERAGE LENGTH 12 FEET, VARIES FOR 10 TO 17 FEET (TOTAL FOOTAGE ABOUT 312 FEET)

26 GRAVEL DRAIN COLUMNS: 1.5-FOOT DIAMETER, AVERAGE DEPTH 15 FEET

240-FOOT-LONG DIRECTIONAL-DRILLED SUBSURFACE DRAIN

DIRECTION-DRILLED SUBSURFACE DRAIN LINKING 18-INCH-DIAMETER GRAVEL COLUMNS. LENGTH ABOUT 240 FEET.



ELEVATION

LEGEND

○ STRUCTURAL SHAFTS

▨ LEAN CONCRETE SHAFTS (NON-STRUCTURAL)

● GRAVEL DRAINAGE COLUMN

30% SUBMITTAL
OCTOBER 17, 2012

REFERENCE: TETRATECH, 2012, 30 PERCENT SUBMITTAL, 61ST PLACE WALL REPLACEMENT DRAWING, SHEET S-01

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SECANT PILE WALL - 30% DESIGN

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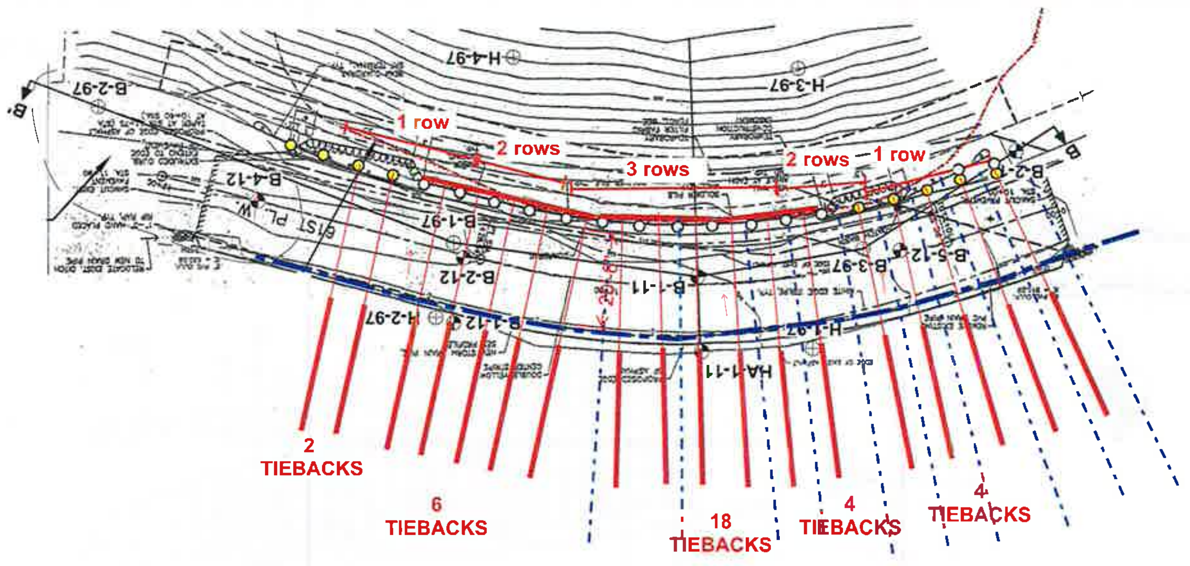
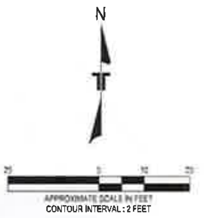
FIGURE 7





○ EXISTING SOLDIER PILE

○ PROPOSED NEW SOLDIER PILES, 35 FEET LONG

- · - · - PROPOSED HORIZONTAL SUBSURFACE DRAINS, 80 FEET LONG AT 2-DEGREE UP INCLINATION. EXTENDS PAST ROW UPHILL OF SITE.

— PROPOSED TIEBACK: FIRST ROW AT 5 FEET BELOW EXISITNG ROADWAY, ROWS ARE 5 FEET APART; 34 TIEBACKS, 60 FEET LONG. EXTENDS PAST ROW UPHILL OF SITE.

REFERENCE DRAWING: TERRACON, 2012, *GEOTECHNICAL ENGINEERING REPORT; 61ST PLACE WEST ROAD REHABILITATION; MUKILTEO, WASHINGTON*, 6 NOVEMBER, 2012, EXHIBIT A-2

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REINFORCE EXISTING WALL STABILIZATION ALTERNATIVE

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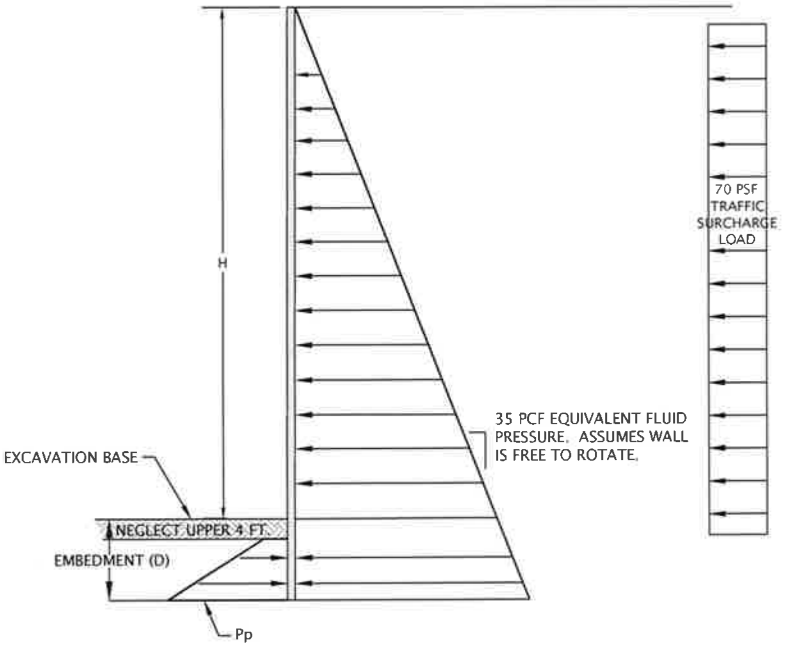
FIGURE 8

RECOMMENDED DESIGN PARAMETERS FOR CANTILEVERED WALL



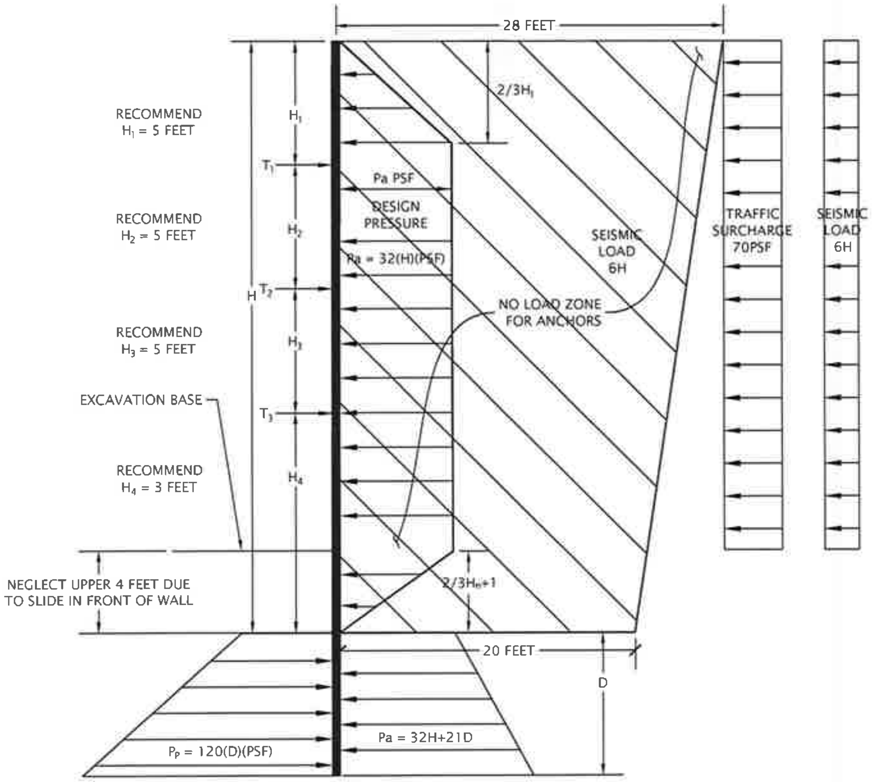
EXPLANATION:

Pp = 200 D PCF
H = HEIGHT OF WALL IN FEET
D = SOLDIER PILE EMBEDMENT DEPTH
PASSIVE PRESSURE ACTS OVER 2.5X THE PILE WIDTH
ACTIVE PRESSURE ACTS OVER 1X THE PILE WIDTH BELOW EXCAVATION BASE

NOTES:

1. PASSIVE PRESSURE EQUIVALENT FLUID DENSITY INCLUDES A FACTOR OF SAFETY OF 1.5 AND ACCOUNTS FOR WATER TABLE BELOW BASE OF WALL.
2. NEGLECT UPPER 4 FEET OF SOIL IN FRONT OF WALL TO ACCOUNT FOR SLOPE IN FRONT OF FACE.

RECOMMENDED DESIGN PARAMETERS FOR SHORING



EXPLANATION:

H = DESIGN EXPOSED HEIGHT = 22 FEET
D = EMBEDMENT DEPTH = 16 FEET FOR EXISTING SOLDIER PILES
T = TIEBACK ANCHOR

NOTES:

1. POST-CONSTRUCTION WALL TO BE BACKFILLED TO HAVE EXPOSED HEIGHT OF 15 FEET.
2. DESIGN ASSUMES HORIZONTAL DRAINS WILL BE INSTALLED AS RECOMMENDED AND NO HYDROSTATIC PRESSURE WILL BUILD UP BEHIND THE WALL.
3. PASSIVE PRESSURE Pp ACTS OVER 3X THE PILE WIDTH.
4. A SAFETY FACTOR OF 1.5 HAS BEEN APPLIED TO THE PASSIVE EARTH PRESSURE.
5. DIAGRAM IS VALID FOR MULTIPLE ROWS OF TIEBACK ANCHORS; ANCHOR SPACING SHOWN IS RECOMMENDED FOR CONSTRUCTABILITY AND MAY BE REVISED.
6. NO LOAD ZONE MODIFIED TO ACCOUNT FOR TRANSITIONAL SLIDE MATERIAL.
7. ONE-TIEBACK CASE - ASSUME H = 14 FEET, D = 24 FEET.
8. TWO-TIEBACK CASE - ASSUME H = 18 FEET, D = 20 FEET.
9. THREE-TIEBACK CASE - ASSUME H = 22 FEET, D = 16 FEET.

CANTILEVERED AND BRACED WALLS DESIGN CRITERIA

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FIGURE 9

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APPENDIX A

APPENDIX A

FIELD EXPLORATIONS

GENERAL

We explored subsurface conditions at the site by completing one boring (B-1-16) near the toe of the existing landslide to a depth of 41.5 feet BGS. The approximate location of our exploration and previous explorations drilled by others is shown on Figure 2. Drilling services were completed by BORETEC, Inc. of Valleyford and Bellevue, Washington. The boring was completed using hollow-stem auger drilling methods. A slope inclinometer casing was installed in the boring to a depth of 40.0 feet BGS. The exploration log is presented in this appendix.

SOIL SAMPLING

Samples were obtained from the boring using 1½-inch-inner diameter SPT split-barrel sampler in general accordance with ASTM D 1586. The sampler was driven into the soil with a 140-pound hammer free-falling 30 inches. The sampler was driven a total distance of 18 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the exploration logs, unless otherwise noted. Samples were generally taken at 2.5- to 5-foot intervals throughout the depth of the boring. In addition, relatively undisturbed samples were obtained by pushing thin-walled standard Shelby tubes into the base of the explorations in general accordance with ASTM D 1587. Sampler types and sampling intervals are shown on the exploration logs presented in this appendix.

SOIL CLASSIFICATION

The soil samples were classified in accordance with the "Explorations Key" (Table A-1) and "Soil Classification System" (Table A-2), which are presented in this appendix. The exploration log indicates the depths at which the soils or their characteristics change, although the change actually could be gradual. If the change occurred between sample locations, the depth was interpreted. Classifications and sampling intervals are shown on the exploration log presented in this appendix.

LABORATORY TESTING

CLASSIFICATION

The soil samples were classified in the laboratory to confirm field classifications. The laboratory classifications are shown on the exploration log if those classifications differed from the field classifications.

MOISTURE CONTENT AND DRY DENSITY

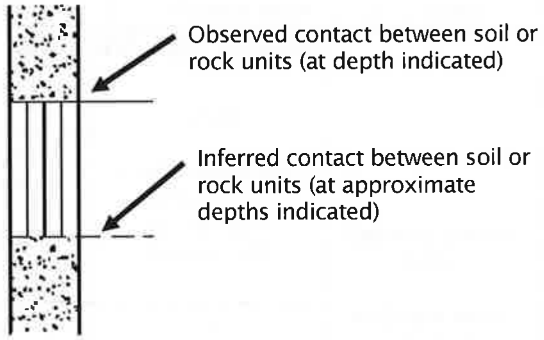
We performed moisture content and dry density determinations in general accordance with ASTM D 2216 and ASTM D 2937, respectively. The natural moisture content is a ratio of the weight of the water to soil in a test sample and is expressed as a percentage. The test results are presented in this appendix.

DIRECT SHEAR TESTING

Direct shear testing was completed on selected undisturbed Shelby tube sample in general accordance with ASTM D 3080 using the method for determining the in situ undrained strength. The test results are presented in this appendix.

SYMBOL	SAMPLING DESCRIPTION
▮	Location of sample obtained in general accordance with ASTM D 1586 Standard Penetration Test with recovery
▮	Location of sample obtained using thin-wall Shelby tube or Geoprobe® sampler in general accordance with ASTM D 1587 with recovery
▮	Location of sample obtained using Dames & Moore sampler and 300-pound hammer or pushed with recovery
▮	Location of sample obtained using Dames & Moore and 140-pound hammer or pushed with recovery
▮	Location of sample obtained using 3-inch-O.D. California split-spoon sampler and 140-pound hammer
⊠	Location of grab sample
▮	Rock coring interval
▽	Water level during drilling
▼	Water level taken on date shown

Graphic Log of Soil and Rock Types



GEOTECHNICAL TESTING EXPLANATIONS

ATT	Atterberg Limits	PP	Pocket Penetrometer
CBR	California Bearing Ratio	P200	Percent Passing U.S. Standard No. 200 Sieve
CON	Consolidation		
DD	Dry Density	RES	Resilient Modulus
DS	Direct Shear	SIEV	Sieve Gradation
HYD	Hydrometer Gradation	TOR	Torvane
MC	Moisture Content	UC	Unconfined Compressive Strength
MD	Moisture-Density Relationship	VS	Vane Shear
OC	Organic Content	kPa	Kilopascal
P	Pushed Sample		

ENVIRONMENTAL TESTING EXPLANATIONS

CA	Sample Submitted for Chemical Analysis	ND	Not Detected
P	Pushed Sample	NS	No Visible Sheen
PID	Photoionization Detector Headspace Analysis	SS	Slight Sheen
		MS	Moderate Sheen
ppm	Parts per Million	HS	Heavy Sheen

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EXPLORATION KEY

TABLE A-1

RELATIVE DENSITY - COARSE-GRAINED SOILS

Relative Density	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)
Very Loose	0 – 4	0 - 11	0 - 4
Loose	4 – 10	11 - 26	4 - 10
Medium Dense	10 – 30	26 - 74	10 - 30
Dense	30 – 50	74 - 120	30 - 47
Very Dense	More than 50	More than 120	More than 47

CONSISTENCY - FINE-GRAINED SOILS

Consistency	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)	Unconfined Compressive Strength (tsf)
Very Soft	Less than 2	Less than 3	Less than 2	Less than 0.25
Soft	2 - 4	3 – 6	2 - 5	0.25 - 0.50
Medium Stiff	4 - 8	6 – 12	5 - 9	0.50 - 1.0
Stiff	8 - 15	12 – 25	9 - 19	1.0 - 2.0
Very Stiff	15 - 30	25 – 65	19 – 31	2.0 - 4.0
Hard	More than 30	More than 65	More than 31	More than 4.0

PRIMARY SOIL DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOILS (more than 50% retained on No. 200 sieve)	GRAVEL (more than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVELS (< 5% fines)	GW or GP	GRAVEL
		GRAVEL WITH FINES (≥ 5% and ≤ 12% fines)	GW-GM or GP-GM	GRAVEL with silt
			GW-GC or GP-GC	GRAVEL with clay
		GRAVELS WITH FINES (> 12% fines)	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND (50% or more of coarse fraction passing No. 4 sieve)	CLEAN SANDS (<5% fines)	SW or SP	SAND
		SANDS WITH FINES (≥ 5% and ≤ 12% fines)	SW-SM or SP-SM	SAND with silt
			SW-SC or SP-SC	SAND with clay
		SANDS WITH FINES (> 12% fines)	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS (50% or more passing No. 200 sieve)	SILT AND CLAY	Liquid limit less than 50	ML	SILT
			CL	CLAY
			CL-ML	silty CLAY
			OL	ORGANIC SILT or ORGANIC CLAY
		Liquid limit 50 or greater	MH	SILT
			CH	CLAY
			OH	ORGANIC SILT or ORGANIC CLAY
HIGHLY ORGANIC SOILS			PT	PEAT

MOISTURE CLASSIFICATION

Term	Field Test
dry	very low moisture, dry to touch
moist	damp, without visible moisture
wet	visible free water, usually saturated

ADDITIONAL CONSTITUENTS

Secondary granular components or other materials such as organics, man-made debris, etc.

Percent	Silt and Clay In:		Percent	Sand and Gravel In:	
	Fine-Grained Soils	Coarse-Grained Soils		Fine-Grained Soils	Coarse-Grained Soils
< 5	trace	trace	< 5	trace	trace
5 - 12	minor	with	5 – 15	minor	minor
> 12	some	silty/clayey	15 – 30	with	with
			> 30	sandy/gravelly	Indicate %

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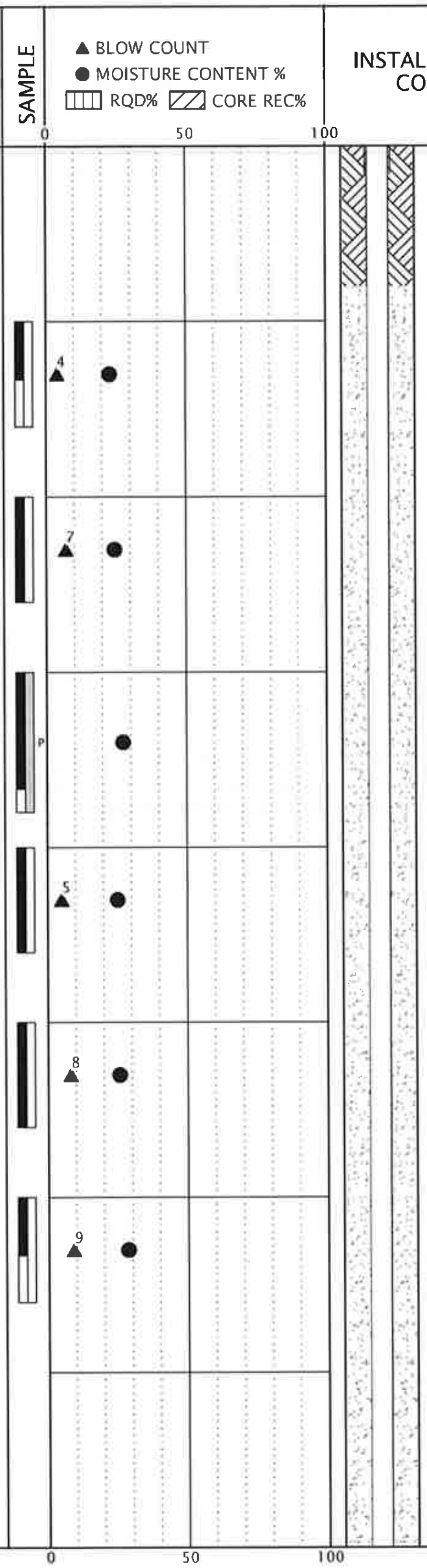
SOIL CLASSIFICATION SYSTEM

TABLE A-2

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING
0.0	Soft, gray with orange mottled SILT with sand (ML); moist - **COLLUVIUM/LANDSLIDE DEBRIS.**		
5.0	medium stiff, with organics (fiberous wood pieces), trace gravel at 5.0 feet		
8.0			DD DS
10.0	without gravel at 10.0 feet		
13.5	Medium stiff, gray, sandy SILT (ML); moist to wet - **TRANSITION ZONE.**	13.5	
15.0	wet at 15.0 feet		
20.0			



INSTALLATION AND COMMENTS

Flush-mount monument with 2 feet of concrete backfill

2.75-inch inclinometer casing

Cement-bentonite (ratio 3:1)

DD = 96 pcf

⊻ 13.5 feet, during drilling (perched)

DRILLED BY: Borelec®

LOGGED BY: JTW

COMPLETED: 04/29/16

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 4 1/4 inches

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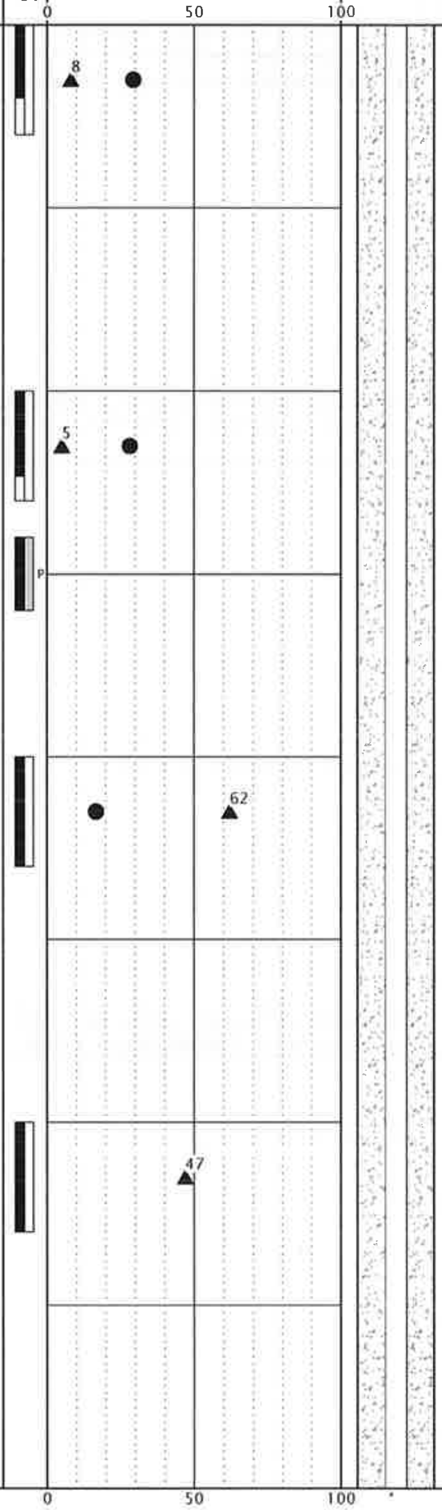
BORING B-1-16

61ST PLACE WEST RETAINING WALL PROJECT
MUKILTEO, WA

FIGURE A-1

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▥ RQD% ▨ CORE REC%	INSTALLATION AND COMMENTS
20.0		(continued from previous page)					
27.5							Attempted Shelby at 27.0 feet; poor recovery due to gravel too hard.
		Hard, gray SILT (ML); moist to wet, occasional zone with lens or parting of fine sand - **GLACIAL SILT**.	28.5				
30.0		moist at 30.0 feet					



Depth scale: 20.0, 22.5, 25.0, 27.5, 30.0, 32.5, 35.0, 37.5, 40.0

DRILLED BY: Boretec®

LOGGED BY: JTW

COMPLETED: 04/29/16

BORING METHOD: hollow-stem auger (see document text)

BORING BIT DIAMETER: 4 1/4 inches

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BORING B-1-16
(continued)

61ST PLACE WEST RETAINING WALL PROJECT
MUKILTEO, WA

FIGURE A-1

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % ▥ RQD% ▨ CORE REC% 0 50 100	INSTALLATION AND COMMENTS
40.0	▥	(continued from previous page)			■	▲ 47	▨
		Exploration completed at a depth of 41.5 feet.	41.5				Surface elevation was not measured at the time of exploration.
42.5							
45.0							
47.5							
50.0							
52.5							
55.0							
57.5							
60.0						0 50 100	

DRILLED BY: Boretec® LOGGED BY: JTW COMPLETED: 04/29/16

BORING METHOD: hollow-stem auger (see document text) BORING BIT DIAMETER: 4 1/4 inches

GEODESIGN INC

10700 Meridian Avenue North - Suite 402
Seattle WA 98133
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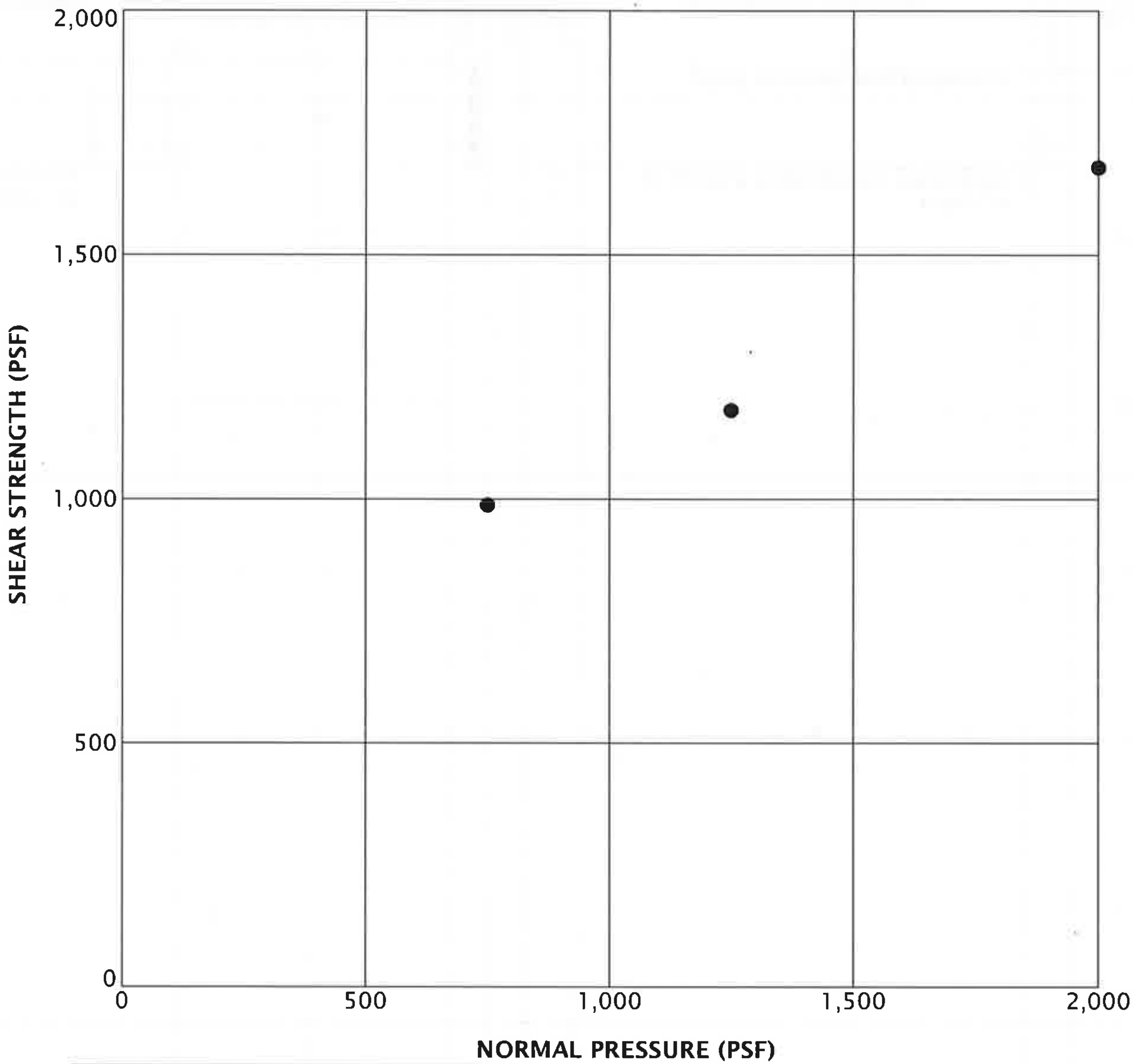
MUKILTEO-1-01

APRIL 2018

BORING B-1-16
(continued)

61ST PLACE WEST RETAINING WALL PROJECT
MUKILTEO, WA

FIGURE A-1



KEY	EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SOAKED
●	B-1-16	7.5	28	95	YES

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APRIL 2018

DIRECT SHEAR TEST RESULTS

61ST PLACE WEST RETAINING WALL PROJECT
MUKILTEO, WA

FIGURE A-2

SAMPLE INFORMATION			MOISTURE CONTENT (PERCENT)	DRY DENSITY (PCF)	SIEVE			ATTERBERG LIMITS		
EXPLORATION NUMBER	SAMPLE DEPTH (FEET)	ELEVATION (FEET)			GRAVEL (PERCENT)	SAND (PERCENT)	P200 (PERCENT)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
B-1-16	2.5		23							
B-1-16	5.0		24							
B-1-16	7.5		27	96						
B-1-16	10.0		25							
B-1-16	12.5		26							
B-1-16	15.0		29							
B-1-16	20.0		29							
B-1-16	25.0		28							
B-1-16	30.0		17							

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MUKILTEO-1-01

APRIL 2018

SUMMARY OF LABORATORY DATA

61ST PLACE WEST RETAINING WALL PROJECT
MUKILTEO, WA

FIGURE A-3

APPENDIX B

BORING LOG NO. B-1-11

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 520 (Ft.)

DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.5 inches Asphalt over **FILL - GRAVELLY SAND (SP)**, trace silt, gray, medium dense, wet										
3.0 ― 517			☒	16	7-7-6 N=13	S-1A		20		
FILL - SILT (ML), with sand, trace gravel and organics, mottled gray-brown, medium stiff, moist to wet (COLLUVIUM)			☒			S-1B				
	5		☒	16	2-2-4 N=6	S-2		39		
8.0 ― 512										
SILT (ML), with fine sand, mottled gray-brown, medium stiff, moist to wet (COLLUVIUM)			■	6		S-3		26		
1/2 inch blocky zone at 10.5 feet	10		☒	14	3-4-4 N=8	S-4	3 (HP)	27		81
			■	24		S-5	2 (HP)			
grades to tan-gray 2 inch soft, wet zone at 15.1 feet	15		☒	18	2-2-2 N=4	S-6		30		
		▽								
18.0 ― 502			☒	16	5-5-8 N=13	S-7		26		
SILT (ML), with trace fine sand, tan-gray, hard, moist to wet (TRANSITION ZONE)										
1/4 inch rust color seams at 18.3, 18.5, and 18.8 feet	20		☒	18	13-19-24 N=43	S-8	3 (HP)	25		
Slickenside at 20.2 feet 1/2 inch hard SILT layers at 23.3 and 25.5 feet Fracture at 26.2 feet			☒	18	16-27-33 N=60	S-9		25		88
1/2 inch blocky zone at 27.8 feet	25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 5/26/11.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *17' While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/26/2011	Boring Completed: 5/26/2011
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-6

BORING LOG NO. B-1-11

Page 2 of 3

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 520 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
SILT (ML), with trace fine sand, tan-gray, hard, moist to wet (TRANSITION ZONE) *(continued)*				☒	16	14-16-22 N=38	S-10	4.5 (HP)	24		
28.0	492										
SILT (ML), with fine sand, gray, hard, moist to wet, massive with occasional fine laminations (GLACIAL SILT)				☒	18	17-22-36 N=58	S-11	4.5 (HP)	24		
		30		☒	17	16-25-30 N=55	S-12		25		
2 inch wet, sandy zone at 30.5 feet											
				☒	18	17-28-32 N=60	S-13		25		
		35		☒	18	16-26-34 N=60	S-14		24		
				☒	18	17-27-34 N=61	S-15		25		81
		40		☒	18	19-34-40 N=74	S-16	4.5 (HP)	24		
		45		☒	18	20-31-36 N=67	S-17		33		
				☒	18	20-37-48 N=85	S-18		24		
		50									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 5/26/11.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *17' While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/26/2011	Boring Completed: 5/26/2011
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-6

BORING LOG NO. B-1-11

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

GRAPHIC LOG	LOCATION See Exhibit A-2 Surface Elev.: 520 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILT (ML), with fine sand, gray, hard, moist to wet, massive with occasional fine laminations (GLACIAL SILT) *(continued)*										
				☒	12	23-50/6" N=50/6"	S-19	4.5 (HP)	25		
		55									
				☒	16	22-48-50/5" N=50/5"	S-20		23		
		60									
	61.0 / 459										
	Boring Terminated at 61 Feet Well ID: BCA-831										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 5/26/11.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *17' While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/26/2011

Boring Completed: 5/26/2011

Drill Rig: XL

Driller: Geologic

Project No.: 81115031B

Exhibit: A-6

BORING LOG NO. B-2-11

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 515 (Ft.)

DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
Topsoil and Forest Duff over **SILT**, with sand, trace clay and organic clumps, mottled gray-brown, medium stiff, moist to wet (COLLUVIUM)											
				☒	14	3-3-3 N=6	S-1		24		
		5									
				☒	14	2-2-2 N=4	S-2		26		
grades to trace gravel				☒	16	2-4-5 N=9	S-3	1.5 (HP)	25		
		10									
				☒	4	2-3-4 N=7	S-4		26		
			▽ ▼								
				☒	16	2-3-3 N=6	S-5		27	30-21-9	
		15									
grades to with organics				☒	18	2-3-3 N=6	S-6	2.5 (HP)	28		
18.0	497										
SILT (ML), with fine sand, tan-gray, very stiff, moist to wet (TRANSITION ZONE) 1 inch mottled zone at 18.3 feet 1/4 inch blocky zone at 18.4 feet Oxidized fracture at 20.1 feet				☒	16	3-9-14 N=23	S-7		15		
		20	▽								
21.0	494										
SILT (ML), trace fine sand, gray, hard, moist (TRANSITION ZONE)				☒	18	13-16-18 N=34	S-8		23		
2 inch blocky, mottled zone at 22.8 feet 1/2 inch blocky zone at 23.5 feet				☒	18	10-18-23 N=41	S-9		25		
		25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring converted into 2" diameter piezometer on 10/5/12.
Screen between 14 and 24 feet.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽	*20' While Drilling*
▽	*11.42' 6/1/11*
▼	*11.8' 6/24/11*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/26/2011	Boring Completed: 5/26/2011
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-7

BORING LOG NO. B-2-11

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 515 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)
	SILT (ML), trace fine sand, gray, hard, moist (TRANSITION ZONE) *(continued)* 6 inch wet zone at 25.5 feet Fracture at 26.8 feet Slickenside at 30.4 feet 1/2 inch blocky zone at 30.7 feet 2 inch fractured zone at 33.6 feet	30
	34.5 / 480.5	
	SILT (ML), with fine sand, gray, hard, moist, massive to finely laminated (GLACIAL SILT) 4 inch wet zone at 36.5 feet	35 40 45 50

WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	☒	18	13-16-20 N=36	S-10		23		
	☒	18	17-23-26 N=49	S-11		22		97
	☒	18	15-18-27 N=45	S-12		23		
	☒	18	13-18-28 N=46	S-13		24		
	☒	18	17-25-27 N=52	S-14		24		
	☒	18	17-22-26 N=48	S-15		22		
	☒	18	19-25-30 N=55	S-16		23		
	☒	18	20-32-40 N=72	S-17		24		
	☒	12	22-50/6" N=50/6"	S-18		22		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring converted into 2" diameter piezometer on 10/5/12.
Screen between 14 and 24 feet.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *20' While Drilling*
▽ *11.42' 6/1/11*
▼ *11.8' 6/24/11*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/26/2011	Boring Completed: 5/26/2011
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-7

BORING LOG NO. B-2-11

Page 3 of 3

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

GRAPHIC LOG	LOCATION See Exhibit A-2 Surface Elev.: 515 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILT (ML), with fine sand, gray, hard, moist, massive to finely laminated (GLACIAL SILT) *(continued)*										
		55		☒	16	21-33-50/5" N=50/5"	S-19		22		
	60.0 / 455	60		☒	18	20-28-42 N=70	S-20		23		
	Boring Terminated at 60 Feet Well ID: BCA-832										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring converted into 2" diameter piezometer on 10/5/12.
Screen between 14 and 24 feet.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *20' While Drilling*

▽ *11.42' 6/1/11*

▼ *11.8' 6/24/11*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/26/2011	Boring Completed: 5/26/2011
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-7

BORING LOG NO. B-3-11

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 508 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)
	Leaves and weeds over **SILT (ML)**, with fine sand and organic clasts, trace fine gravel, and inclusions of hard silt, tan-brown, soft to medium stiff, moist (COLLUVIUM)	
11.3		497
11.8	**ORGANIC SILT (OL)**, with sand, dark brown, soft, moist to wet (COLLUVIUM)	496.5
	SILT (ML), with fine sand, mottled rust-tan, soft to medium stiff, moist grading to wet (COLLUVIUM)	
15.1		493
	SILT (ML), with fine sand, gray, stiff, moist (COLLUVIUM) 1 inch soft, wet SILT, with sand zone at 15.6 feet 2 inch stiff, blocky zone at 16.2 feet 2 inch very stiff, blocky zone at 18.7 feet	
19.5		488.5
	SILT (ML), trace fine sand, gray, hard, moist (TRANSITION ZONE) 2 inch blocky zone at 20.2 feet 3 inch wet, medium stiff SANDY SILT zone at 20.4 feet 2 inch blocky zone at 20.7 feet 6 inch wet zone at 23.5 feet	

DEPTH (Ft.): 5, 10, 15, 20, 25

WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	☒	14	2-2-2 N=4	S-1		24		
	☒	14	2-2-1 N=3	S-2		23		
	☒	10	1-2-2 N=4	S-3		28		79
	☒	18	2-2-2 N=4	S-4		26		
	☒	16	2-2-2 N=4	S-5		28		
	☒	17	2-3-4 N=7	S-6		27		88
▽	☒	18	7-6-9 N=15	S-7		24		
	☒	17	11-13-18 N=31	S-8		23		
	☒	18	16-21-22 N=43	S-9		23		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 5/25/11.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *17.5' While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/25/2011	Boring Completed: 5/25/2011
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-8

BORING LOG NO. B-3-11

PROJECT: **61st Place West Slide Rehabilitation**

CLIENT: **Tetra Tech**

SITE: **61st Place West**
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 508 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILT (ML), trace fine sand, gray, hard, moist (TRANSITION ZONE) *(continued)* Finely laminated from 25.7 to 26.1 feet			☒	18	12-18-19 N=37	S-10		24		90
	Slickenside at 27.8 feet 1/4 inch SILTY SAND seam at 28.5 feet			☒	18	16-28-33 N=61	S-11		22		
	Slickensides at 30.5 and 30.6 feet	30		☒	18	15-24-33 N=57	S-12		25		
	1/4 inch SANDY SILT seam at 32.7 feet Slickenside at 33.8 feet			☒	18	15-29-40 N=69	S-13		23	NP	
	35.0 473 **SILT (ML)**, with trace fine sand, gray, hard, moist, massive to finely laminated (GLACIAL SILT) 6 inch wet zone at 35 feet	35		☒	18	18-31-38 N=69	S-14		24		
				☒	18	15-24-32 N=56	S-15		23		
		40		☒	18	15-23-28 N=51	S-16		25		96
		45		☒	18	14-20-33 N=53	S-17		25		
		50									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 5/25/11.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *17.5' While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/25/2011	Boring Completed: 5/25/2011
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-8

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TERRACON SMART LOG-NO WELL 81115031B, BORING LOGS, 10-4-12.GPJ ODOT TEST.GPJ 11/6/12

BORING LOG NO. B-3-11

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

GRAPHIC LOG	LOCATION See Exhibit A-2 Surface Elev.: 508 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	51.5 / 456.5			☒	18	11-17-32 N=49	S-18		23		
	Boring Terminated at 51.5 Feet Well ID: BCA-830										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 5/25/11.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *17.5' While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/25/2011	Boring Completed: 5/25/2011
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-8

BORING LOG NO. HA-1-11

Page 1 of 1

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 521 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	1.5	**SILT (ML)**, with sand, trace gravel, roots and glass debris, mottled gray-brown and tan, medium stiff, moist to wet (COLLUVIUM)	519.5									
		SILT (ML), with fine sand, mottled tan-gray, medium stiff, miost (COLLUVIUM)						S-1		28		
								S-2		25		
				5								
	6.5		514.5					S-3		25		
		Boring Terminated at 6.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hand Auger

Abandonment Method:
Boring backfilled with soil cuttings on 5/25/11.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not Encountered

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 5/25/2011	Boring Completed: 5/25/2011
Drill Rig: Hand Auger	Driller: Terracon
Project No.: 81115031B	Exhibit: A-9

BORING LOG NO. B-1-12

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 522 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)
	FINE SANDY SILT (ML), tan with slight gray mottling, hard, moist to wet (TRANSITION ZONE)	
13.0		509
	SILT (ML), with sand, tan-gray, hard, wet (TRANSITION ZONE) slight iron oxide staining	
17.0		505
	FINE SANDY SILT (ML), gray, hard, moist (GLACIAL SILT) Fine SILTY SAND laminations 18.5 to 18.75 feet	
20.5		501.5
	SILTY FINE SAND (SM) to FINE SANDY SILT (ML), gray, dense/hard, moist, slightly blocky (GLACIAL SILT)	

DEPTH (Ft.): 5, 10, 15, 20, 25

WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	☒	18	14-20-22 N=42	S-1		18		
	☒	18	13-19-25 N=44	S-2		24		
	☒	18	12-19-26 N=45	S-3		23		
	☒	18	12-21-34 N=55	S-4		24		
	☒	18	9-21-29 N=50	S-5		23	NP	82
	☒	18	14-18-24 N=42	S-6		25		
	☒	18	11-14-20 N=34	S-7		24		
	☒	18	10-15-18 N=33	S-8		25		
	☒	18	12-14-21 N=35	S-9		24		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 10/9/12.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *30' Perched While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/9/2012	Boring Completed: 10/9/2012
Drill Rig: Track	Driller: Geologic
Project No.: 81115031B	Exhibit: A-10

BORING LOG NO. B-1-12

Page 2 of 2

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

GRAPHIC LOG	LOCATION See Exhibit A-2 Surface Elev.: 522 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY FINE SAND (SM) to FINE SANDY SILT (ML), gray, dense/hard, moist, slightly blocky (GLACIAL SILT) *(continued)*			☒	18	11-18-23 N=41	S-10		23		
	1 inch SAND zone at 27 feet			☒	18	13-16-23 N=39	S-11		23		
	grades to wet	30	∇	☒	16	15-23-32 N=55	S-12		24		
	32.0 490										
	FINE SANDY SILT (ML), with fine sand laminae, gray, hard, moist (GLACIAL SILT)			☒	18	16-23-33 N=56	S-13		22		
	4 inch wet SILTY SAND zone at 35.5 feet	35		☒	16	17-28-36 N=64	S-14		25		
				☒	16	16-21-50/5" N=50/5"	S-15		23		
	3 inch wet SILTY SAND zone at 41 feet	40		☒	18	16-25-39 N=64	S-16		27		
				☒	16	23-38-50/5" N=50/5"	S-17		23		
		45		☒	12	21-50/6" N=50/6"	S-18		22		
	46.0 476										
	Boring Terminated at 46 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Calhead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 10/9/12.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

∇ *30' Perched While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/9/2012	Boring Completed: 10/9/2012
Drill Rig: Track	Driller: Geologic
Project No.: 81115031B	Exhibit: A-10

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TERRACON SMART LOG-NO WELL 81115031B, BORING LOGS, 10-4-12.GPJ ODOT TEST.GPJ 11/6/12

BORING LOG NO. B-2-12

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 522 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.6	1.5 inches **ASPHALT** over 5 inches **CRUSHED ROCK**	521.5										
1.5	**FILL - SILTY SAND (SM)**, with gravel, brown, medium dense, moist	520.5										
	SILT (ML), with sand, tan-brown, hard, moist (TRANSITION ZONE)											
					☒	14	8-16-19 N=35	S-1		16		
	slight mottling at 5 feet		5									
					☒	14	12-14-20 N=34	S-2		17		
					☒	14	7-21-26 N=47	S-3		17		
	grades to brown-gray, slightly blocky		10									
					☒	14	7-22-30 N=52	S-4		19	NP	81
					☒	15	11-15-27 N=42	S-5		24		
			15									
					☒	16	12-19-22 N=41	S-6		24		
16.5	**SILT (ML)**, trace sand, gray, hard, moist to wet, massive (GLACIAL SILT)	505.5										
					☒	16	12-14-18 N=32	S-7		25	NP	90
			20									
					☒	16	10-19-19 N=38	S-8		24		
					☒	14	13-20-22 N=42	S-9		25		
				▽								
	4 inch wet SILTY SAND zone at 24 feet											
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 10/4/12.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *24' Perched While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/4/2012	Boring Completed: 10/4/2012
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-11

BORING LOG NO. B-2-12

Page 2 of 3

PROJECT: **61st Place West Slide Rehabilitation**

CLIENT: **Tetra Tech**

SITE: **61st Place West**
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 522 (Ft.)

DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
SILT (ML), trace sand, gray, hard, moist to wet, massive (GLACIAL SILT) *(continued)*			☒	14	12-16-19 N=35	S-10		23		
			☒	14	16-20-27 N=47	S-11		21		
29.5 — 492.5										
FINE SANDY SILT (ML), with fine sand laminae, gray, hard, moist, slightly blocky (GLACIAL SILT)	30		☒	14	23-35-42 N=77	S-12		21		
			☒	13	14-22-21 N=43	S-13		24		
	35		☒	14	16-27-30 N=57	S-14		23		
			☒	15	19-23-21 N=44	S-15		22		
39.5 — 482.5										
FINE SANDY SILT (ML), gray, hard, moist, massive (GLACIAL SILT)	40		☒	15	10-22-23 N=45	S-16		24		
			☒	15	18-25-25 N=50	S-17		24		
	45		☒	14	13-36-50/5" N=50/5"	S-18		24		
			☒	14	17-24-38 N=62	S-19		24		
	50									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 10/4/12.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *24' Perched While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/4/2012	Boring Completed: 10/4/2012
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-11

BORING LOG NO. B-2-12

PROJECT: **61st Place West Slide Rehabilitation**

CLIENT: **Tetra Tech**

SITE: **61st Place West**
Mukilteo, Washington

GRAPHIC LOG	LOCATION See Exhibit A-2 Surface Elev.: 522 (Ft.) DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
▥	**FINE SANDY SILT (ML)**, gray, hard, moist, massive (GLACIAL SILT) *(continued)* 51.4 470.5			☒	15	18-33-50/5" N=50/5"	S-20		21		
	Boring Terminated at 51.4 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Inclinometer installed to total depth on 10/4/12.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *24' Perched While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/4/2012
Boring Completed: 10/4/2012
Drill Rig: XL
Driller: Geologic
Project No.: 81115031B
Exhibit: A-11

BORING LOG NO. B-3-12

Page 1 of 2

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

GRAPHIC LOG / DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SANDY SILT (ML), trace to with organics, brown, soft, moist (COLLUVIUM)										
				☒	8	2-2-1 N=3	S-1		29		
	grades to stiff	5		☒	13	2-5-6 N=11	S-2		23		
6.5	**SANDY SILT (ML)**, trace gravel, mottled brown and gray, stiff, wet (COLLUVIUM)		▽								
				☒	13	4-4-5 N=9	S-3		24		
		10		☒	10	2-3-4 N=7	S-4		19		
11.0	**SANDY SILT (ML)**, gray, stiff, wet to saturated, slightly blocky texture ~~(GLACIAL SILT)~~ TRANSITION ZONE										
				☒	10	3-4-5 N=9	S-5		28		
		15		☒	9	2-4-3 N=7	S-6		29		
	grades to moist			☒	12	6-7-7 N=14	S-7		26		
		20		☒	12	4-6-8 N=14	S-8		25		
23.5	**SILT (ML)**, with sand, gray, hard, damp to moist GLACIAL SILT			☒	10	4-8-29 N=37	S-9		21		
		25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring backfilled with soil cuttings on 10/5/12.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *7.5' Perched While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/5/2012	Boring Completed: 10/5/2012
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-12

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TERRACON SMART LOG-NO WELL 81115031B, BORING LOGS, 10-4-12.GPJ ODOT TEST.GPJ 11/6/12

BORING LOG NO. B-3-12

Page 2 of 2

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

GRAPHIC LOG	LOCATION See Exhibit A-2 DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILT (ML), with sand, gray, hard, damp to moist *(continued)*			☒	8	28-50/5" N=50/5"	S-10		17		
	fine sand laminae			☒	12	26-38-50/5" N=50/5"	S-11		16		
		30		☒	12	21-39-50/5" N=50/5"	S-12		18		
		35		☒	12	31-40-50/4" N=50/4"	S-13		20		
	36.3										
	Boring Terminated at 36.3 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring backfilled with soil cuttings on 10/5/12.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *7.5' Perched While Drilling*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/5/2012	Boring Completed: 10/5/2012
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-12

BORING LOG NO. B-4-12

Page 1 of 2

PROJECT: **61st Place West Slide Rehabilitation**

CLIENT: **Tetra Tech**

SITE: **61st Place West**
Mukilteo, Washington

GRAPHIC LOG	LOCATION See Exhibit A-2 Surface Elev.: 522 (Ft.) DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.6 1.5 inches **ASPHALT** over 5 inches **CRUSHED ROCK**	521.5										
	FILL - SANDY SILT (ML), trace gravel, tan-brown, medium stiff to stiff, moist											
					☒	11	4-5-4 N=9	S-1		16		
			5		☒	11	2-3-2 N=5	S-2		21		
					☒	12	3-5-5 N=10	S-3		22		
	9.5 **SILTY CLAY (CL)**, with sand, tan-brown, stiff to very stiff, moist, blocky texture (TRANSITION ZONE)	512.5										
			10		☒	13	4-5-7 N=12	S-4		17		
					☒	14	6-9-10 N=19	S-5		21	44-22-22	79
			15		☒	13	8-9-9 N=18	S-6		22		
					☒	14	4-4-4 N=8	S-7		20		
			20		☒	13	4-4-8 N=12	S-8		23		
	21.0 **SANDY SILT (ML)**, brown-gray, hard, moist, fractured oxidized surfaces (TRANSITION ZONE)	501										
					☒	13	13-17-20 N=37	S-9		23		
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring converted into 2" diameter piezometer on 10/5/12.
Screen between 10 and 20 feet.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not Encountered

Dry 10/9/12

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/5/2012	Boring Completed: 10/5/2012
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-13

BORING LOG NO. B-4-12

PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 522 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
▨	**SANDY SILT (ML)**, brown-gray, hard, moist, fractured oxidized surfaces (TRANSITION ZONE) *(continued)*				☒	13	11-24-30 N=54	S-10		20		
▨	grades to gray				☒	13	12-25-26 N=51	S-11		22		
▨			30		☒	14	14-25-33 N=58	S-12		20		
▨	32.0	490										
▨	**SANDY SILT (ML)**, fine sand laminae, gray, hard, moist (GLACIAL SILT)				☒	13	25-38-50/5" N=50/5"	S-13		20		
▨			35		☒	14	12-25-31 N=56	S-14		24		
▨					☒	14	13-30-34 N=64	S-15		23		
▨			40		☒	14	21-32-46 N=78	S-16		22		
	41.5	480.5										
	Boring Terminated at 41.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring converted into 2" diameter piezometer on 10/5/12.
Screen between 10 and 20 feet.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Not Encountered

Dry 10/9/12

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/5/2012

Boring Completed: 10/5/2012

Drill Rig: XL

Driller: Geologic

Project No.: 81115031B

Exhibit: A-13

BORING LOG NO. B-5-12

Page 1 of 2

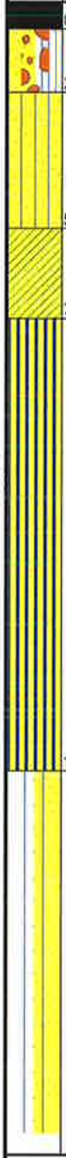
PROJECT: 61st Place West Slide Rehabilitation

CLIENT: Tetra Tech

SITE: 61st Place West
Mukilteo, Washington

LOCATION See Exhibit A-2

Surface Elev.: 519 (Ft.)



DEPTH		ELEVATION (Ft.)
0.6	2 inchs **ASPHALT** over 5 inches **CRUSHED ROCK**	518.5
2.0	**FILL - GRAVELLY SAND (SP-SM)**, with silt, brown, medium dense, moist	517
5.0	**SILTY SAND (SM)**, with gravel, trace organics, brown, medium dense, moist (COLLUVIUM)	514
7.0	**SANDY CLAY (CL)**, brown, stiff, moist (COLLUVIUM)	512
17.0	**SANDY SILT (ML)**, brown-gray, very stiff to hard, moist (COLLUVIUM) slightly blocky below 12.5 feet	502
	SILT (ML), with sand, gray, hard, moist, massive (GLACIAL SILT)	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		☒	2	8-9-12 N=21	S-1		14	NP	37
5		☒	12	4-5-5 N=10	S-2		25	34-21-13	
		☒	12	5-7-11 N=18	S-3		26		
10		☒	14	8-16-19 N=35	S-4		23		
	▽	☒	14	16-25-34 N=59	S-5		24		
15		☒	14	16-23-21 N=44	S-6		25		
		☒	13	14-25-25 N=50	S-7		24		
20		☒	15	14-21-25 N=46	S-8		25		
		☒	13	22-33-33 N=66	S-9		24	NP	83
25	▽								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring converted into 2" diameter piezometer on 10/5/12.
Screen between 20 and 30 feet.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *25' While Drilling*

▽ *13' 10/9/12*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/4/2012	Boring Completed: 10/4/2012
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-14

BORING LOG NO. B-5-12

Page 2 of 2

PROJECT: 61st Place West Slide Rehabilitation

SITE: 61st Place West Mukilteo, Washington

CLIENT: Tetra Tech

LOCATION See Exhibit A-2

Surface Elev.: 519 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	LABORATORY TORVANE/HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILT (ML), with sand, gray, hard, moist, massive (GLACIAL SILT) *(continued)* grades to wet to saturated			☒	12	17-27-30 N=57	S-10		24		
				☒	12	21-27-40 N=67	S-11		23		
	30.0 — 489	30									
	SANDY SILT (ML), with fine sand laminae, gray, hard, moist to wet (GLACIAL SILT)			☒	13	15-37-38 N=75	S-12		27		
				☒	13	10-15-38 N=53	S-13		25		
		35		☒	13	17-34-41 N=75	S-14		24		
				☒	12	17-41-50/5" N=50/5"	S-15		24		
		40		☒	12	14-34-50/5" N=50/5"	S-16		24		
	41.4 — 477.5										
	Boring Terminated at 41.4 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Hollow stem auger

Abandonment Method:
Boring converted into 2" diameter piezometer on 10/5/12.
Screen between 20 and 30 feet.

See Exhibit A-5 for description of field procedures

See Appendix B for description of laboratory procedures and additional data, (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *25' While Drilling*

▽ *13' 10/9/12*

Terracon
21905 64th Ave. W, Suite 100
Mountlake Terrace, Washington

Boring Started: 10/4/2012	Boring Completed: 10/4/2012
Drill Rig: XL	Driller: Geologic
Project No.: 81115031B	Exhibit: A-14

B-1

SAMPLE DATA / SOIL PROFILE / WELL DETAIL

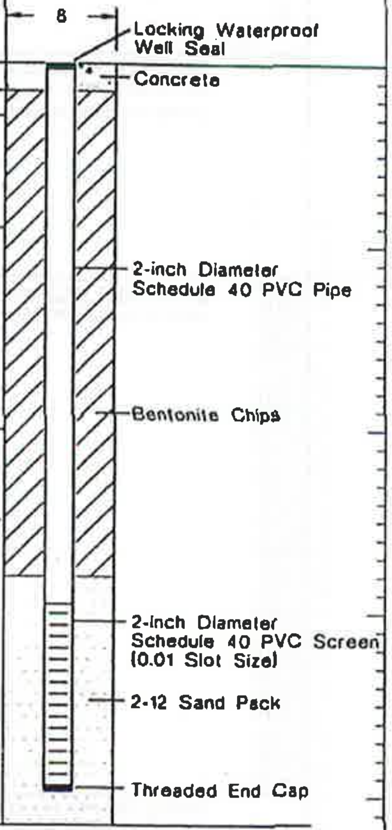
Drilling Method: Hollow-Stem Auger

Ground Elevation (ft): 521

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
0				
	S-1	b2	62	
	S-2	b2	72	19.8
	S-3	b2	61	21.1
	S-4	b2	68	22.4
	S-5	b2	86	GS/14.2
	S-6	b2	76	24.8
10	S-7	b2	65	24.2
	S-8	b2	97	ATT/24.7
	S-9	b2	62	
20	S-10	b2	62	GS/23.2
	S-11	b2	46	
30	S-12	b2	70	ATT/21.8
	S-13	b2	78	
40	S-14	b2	105	23.4
50				
60				

USCS Symbol	Soil Profile
AC	ASPHALT
AC	ASPHALT - treated base
ML	Tan-gray, fine sandy SILT with mottling (hard, dry)
ML	Tan-gray, fine sandy SILT with mottling (hard, wet)
ML	Dark gray, fine sandy SILT (hard, wet) Slickensides from 30-36 ft

▽ 7/16/97



Boring Completed 07/03/97
Total Depth = 41.5 ft.

Well Completed 07/03/97

Notes: 1. Stratigraphic contacts are based on field interpretations and are approximate. Refer to the text for an explanation of subsurface conditions.
2. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

126003.14 City of Mukilteo/61st Place West Landslide/Preliminary Design Report N:\126003\14\Predsrpt\Borings\FigA-2 (A) 8/97

B-2

SAMPLE DATA

SOIL PROFILE

Drilling Method: Hollow-Stem Auger

Ground Elevation (ft): 521

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data
0				
	S-1	b2	8	22.3
	S-2	a2	14	GS/22.2
	S-2A	a2	9	
	S-3	b2	5	20.7
	S-4	b2	6	GS/24.3
10	S-5	b2	20	20.6
	S-6	b2	36	ATT/24.0
20	S-7	b2	19	24.2
	S-8	b2	42	
30	S-9	b2	55	
40				
50				
60				

USCS Symbol	
ML	Tan, fine sandy SILT (medium stiff, moist) (fill)
ML	*Tan, fine sandy SILT (very stiff to hard, moist)* Slickensides at 30 ft

Boring Completed 07/03/97
Total Depth = 31.5 ft.

Notes: 1. Stratigraphic contacts are based on field interpretations and are approximate. Refer to the text for an explanation of subsurface conditions.
2. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

126003.14 City of Mukilteo/61st Place West Landslide/Preliminary Design Report N:\126003\14\Prelsrpt\Borings\FigA-3 (A) 8/97

Boring B-2

Figure A-3

B-3

SAMPLE DATA | **SOIL PROFILE**

Drilling Method: Hollow-Stem Auger

Ground Elevation (ft): 518

Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	USCS Symbol	
0					AC	ASPHALT
	S-1	a2	20	11.1	ML	Tan, fine sandy SILT with organics (medium stiff, moist) (fill)
	S-2	a2		GS/19.5		
	S-3	a2				
	S-4	a2	8	25.0		
	S-5	b2	6	27.7		
	S-6	b2	11		ML	Tan SILT with fine sand (stiff, wet)
10	S-7	b2	12	GS/25.6		
	S-8	b2	25		ML	Tan SILT with fine sand (very stiff, wet)
	S-9	b2	80			
	S-10	b2	32		ML	Dark gray SILT with fine sand (hard, moist to wet) fractured at 31 ft, possible slickensides at 36 ft
20	S-11	a2				
	S-12	a2	78	ATT/23.6		
	S-13	b2	61			
30	S-14	b2	75			
	S-15	b2	74			
40						
50						
60						

Boring Completed 07/03/97
Total Depth = 36.5 ft.

Notes: 1. Stratigraphic contacts are based on field interpretations and are approximate. Refer to the text for an explanation of subsurface conditions.
2. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

Boring B-3

Figure A-4

H-1

(1.0 ft Above Road)

Depth (ft)	Unified Soil Classification System Symbol	Description	Sample No./Depth (ft)	Moisture Content (%)	Other Tests
0.0-3.0	ML	Tan, fine sandy SILT (medium stiff, damp)	2.5-3.0		
3.0-3.5	SM	Gray, silty, fine SAND (medium dense, moist)	3.0-3.3		

Test pit completed to 3.5 ft on July 16, 1997.
No groundwater seepage encountered.

H-2

(0.7 ft Above Road)

Depth (ft)	Unified Soil Classification System Symbol	Description	Sample No./Depth (ft)	Moisture Content (%)	Other Tests
0.0-1.0	ML	Tan, fine sandy SILT (fill)			
1.0-2.0	ML	Gray, fine sandy SILT (hard, moist)			

Test pit completed to 2.0 ft on July 16, 1997.
No groundwater seepage encountered.

Note: Stratigraphic contacts are based on field interpretations and are approximate. Refer to the text for an explanation of subsurface conditions. Refer to *Soil Classification System* figure for additional information on symbols and terminology.

H-3

(22 ft Below Road)

Depth (ft)	Unified Soil Classification System Symbol	Description	Sample No./Depth (ft)	Moisture Content (%)	Other Tests
0.0-6.0	ML	Tan-gray SILT with fine sand (soft to medium stiff, wet)			
6.0-8.5	ML	Tan-gray SILT with fine sand (medium stiff to stiff, wet)			

Test pit completed to 8.5 ft on July 16, 1997.
Standing groundwater at 3.0 ft in test hole.

H-4

(24 ft Below Road)

Depth (ft)	Unified Soil Classification System Symbol	Description	Sample No./Depth (ft)	Moisture Content (%)	Other Tests
0.0-2.0	ML	Gray-tan, fine sandy SILT (soft to medium stiff, moist)			
2.0-4.0	ML	Gray, fine sandy SILT (medium stiff, moist)			

Test pit completed to 4.0 ft on July 16, 1997.
No groundwater seepage encountered.

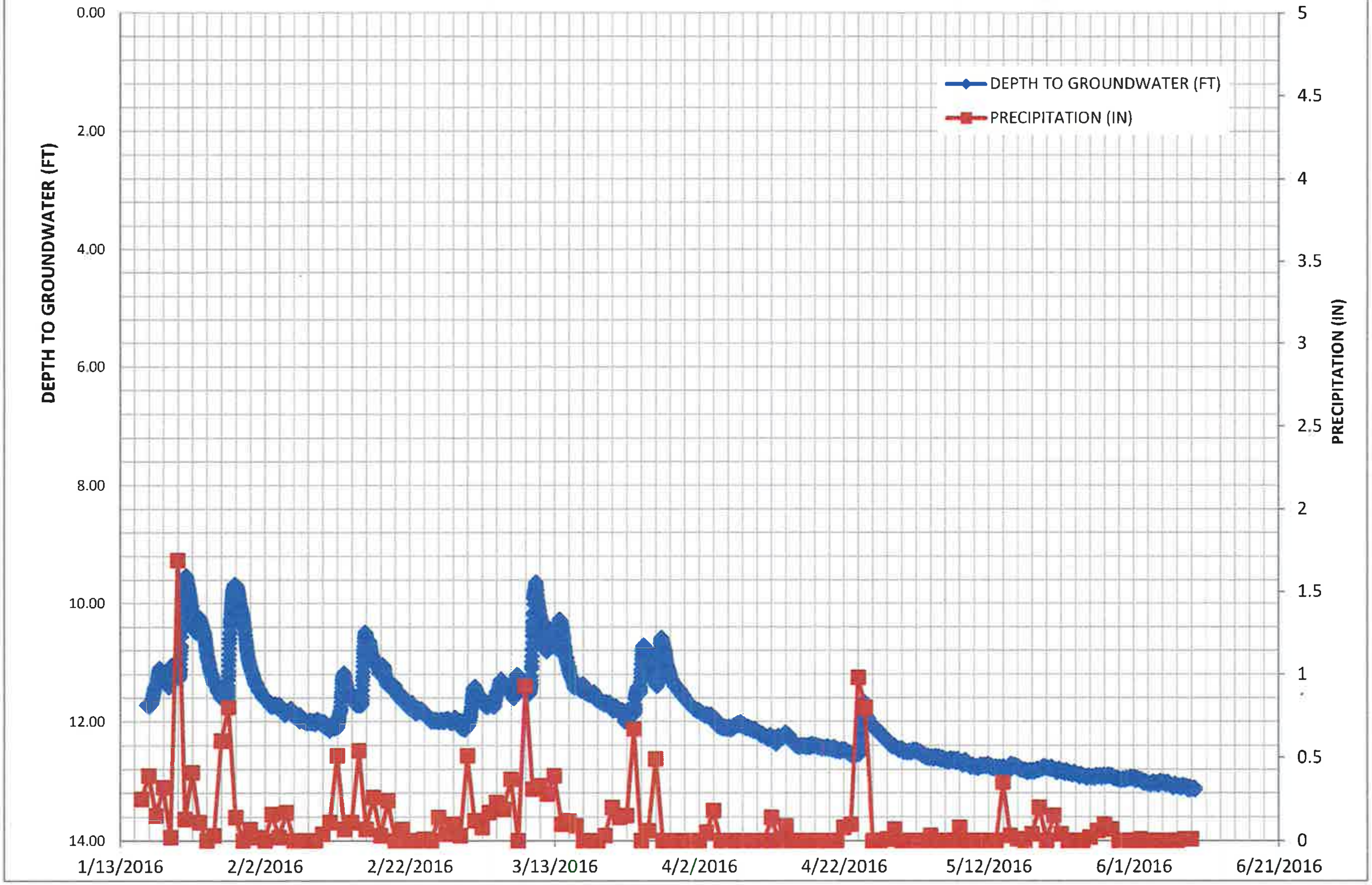
Note: Stratigraphic contacts are based on field interpretations and are approximate. Refer to the text for an explanation of subsurface conditions. Refer to *Soil Classification System* figure for additional information on symbols and terminology.

Log of Hand-Auger Pits

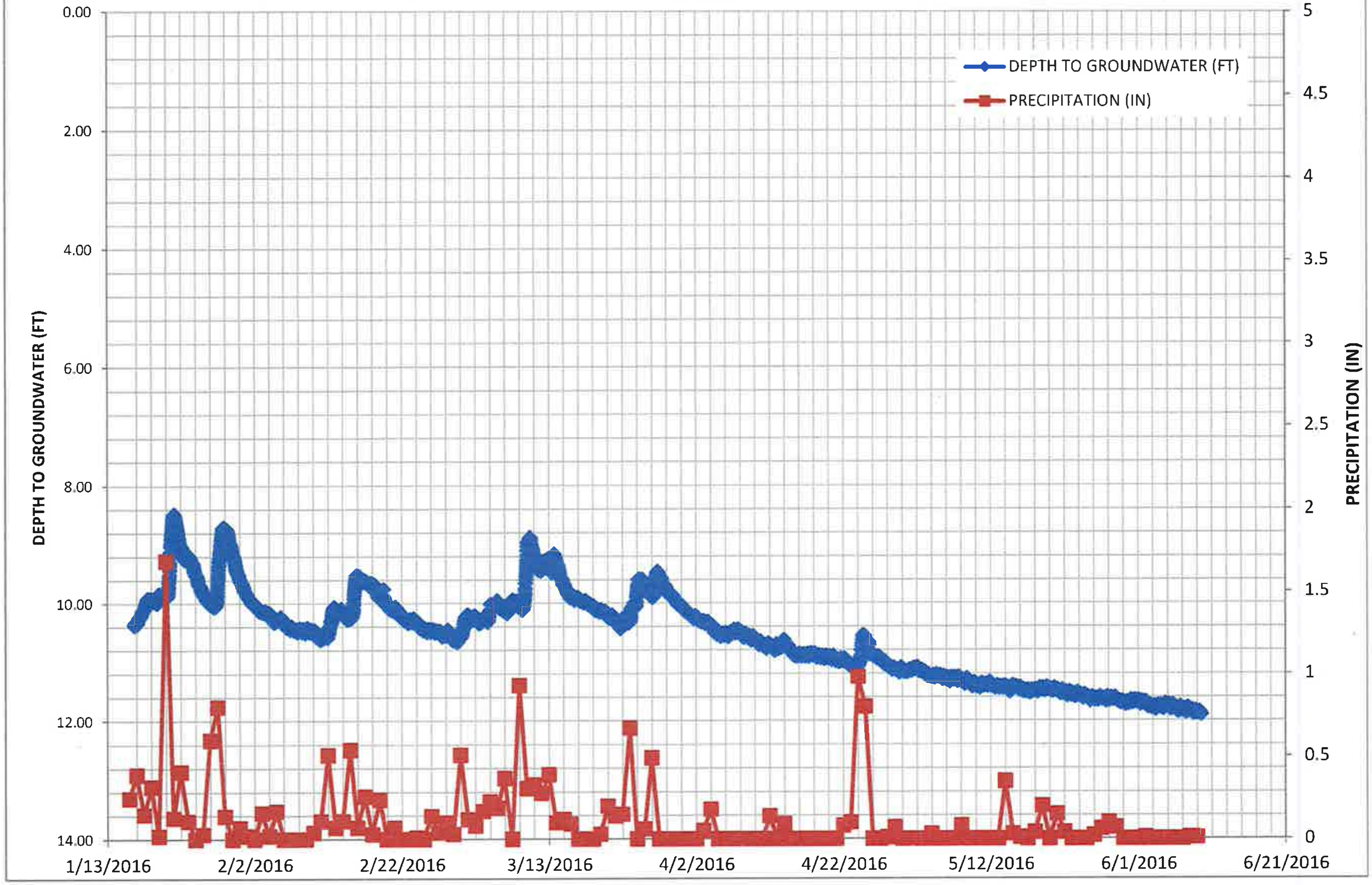
Figure A-6

APPENDIX C

CITY OF MUILTEO
61ST PLACE WALL
GROUNDWATER LEVEL MEASUREMENTS
B-2-11



CITY OF MUILTEO
61ST PLACE WALL
GROUNDWATER LEVEL MEASUREMENTS
B-5-12



APPENDIX D

APPENDIX D

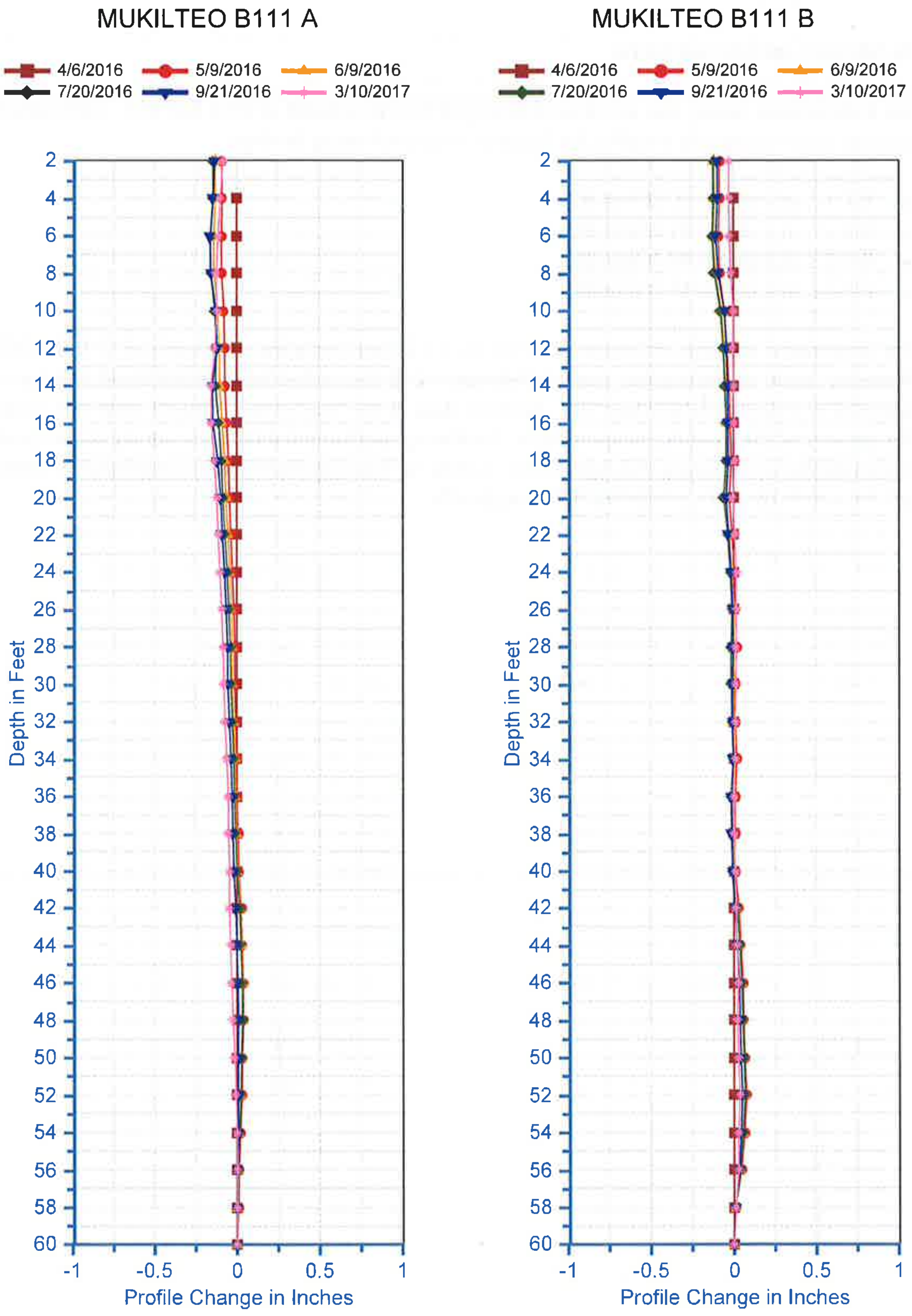
SLOPE INCLINOMETER DATA

An inclinometer casing was installed in boring B-1-16 to a depth of 40.0 feet BGS. Inclinometer casings were previously installed by Terracon in the following borings:

- B-1-11 at a depth 60.0 feet BGS
- B-3-11 at a depth 51.0 feet BGS
- B-1-12 at a depth 44.0 feet BGS
- B-2-12 at a depth 51.0 feet BGS

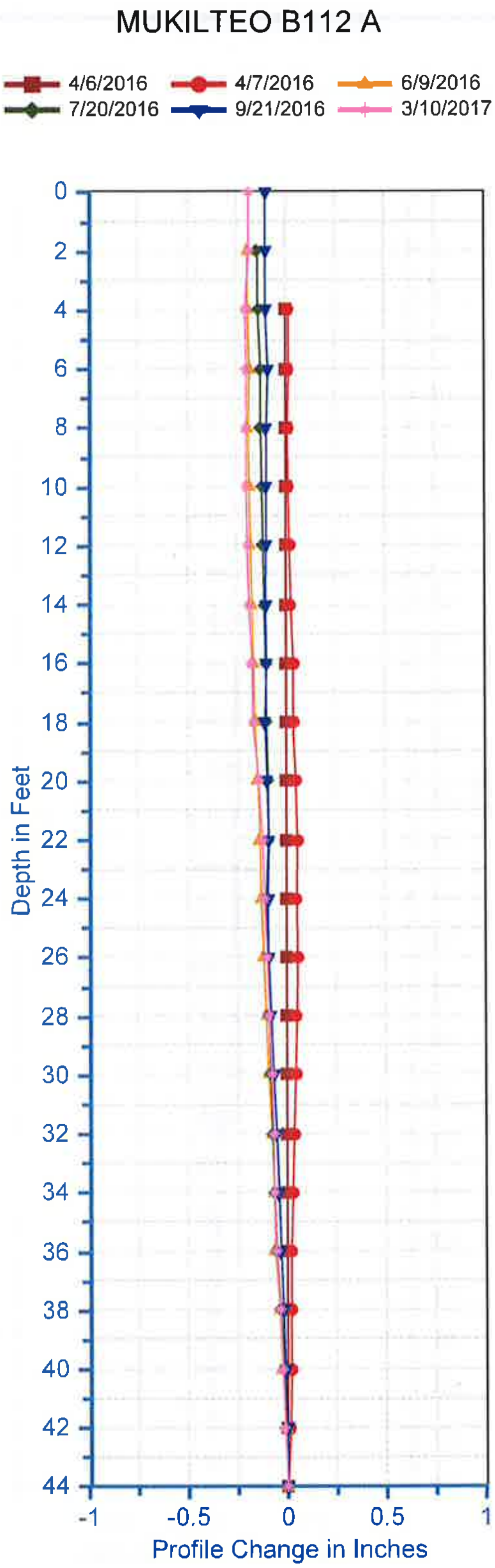
We understand that the inclinometer in boring B-3-11 was installed to a depth of 51.0 feet BGS. However, upon beginning our study in February 2016 the inclinometer probe could only be inserted to a depth of 14.0 feet BGS. Baseline data or previous measurements were not available for the any of the existing inclinometers. GeoDesign performed a baseline survey of the existing inclinometers in February and April 2016. Follow up measurements were completed as shown on the summary plots presented in this appendix.

BORING B-1-11



MUKILTEO B111 A
4/6/2016
5/9/2016
6/9/2016
7/20/2016
9/21/2016
3/10/2017
Depth in Feet
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
-1
-0.5
0
0.5
1
Profile Change in Inches
MUKILTEO B111 B
4/6/2016
5/9/2016
6/9/2016
7/20/2016
9/21/2016
3/10/2017
Depth in Feet
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
-1
-0.5
0
0.5
1
Profile Change in Inches

BORING B-1-12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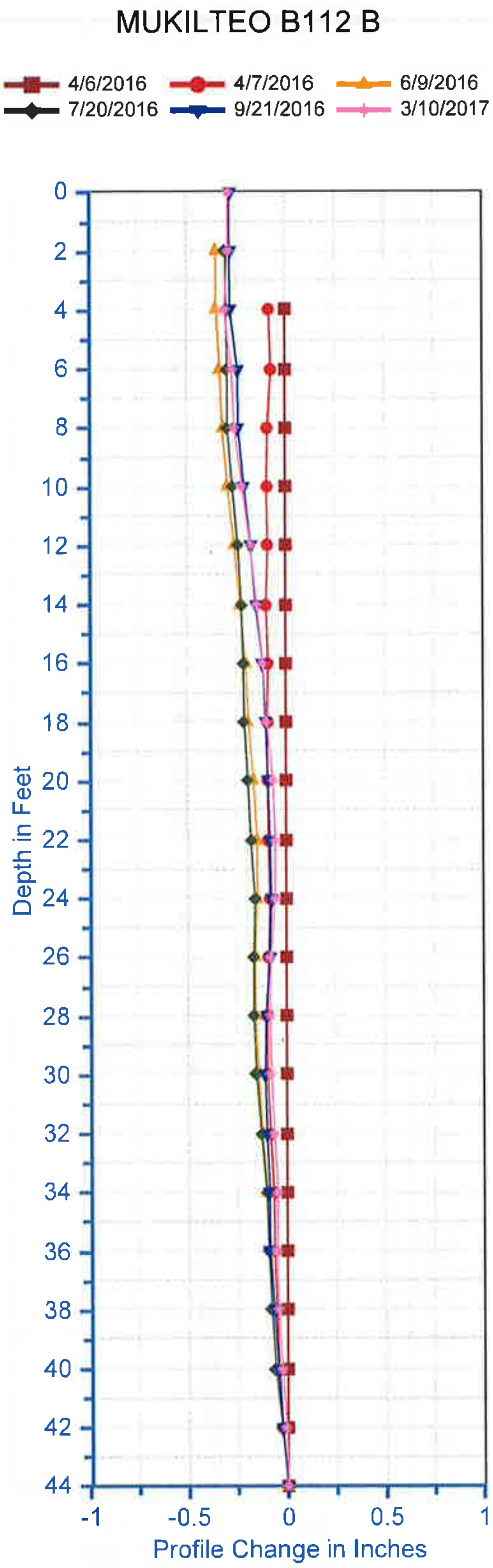
4/6/2016
4/7/2016
6/9/2016
7/20/2016
9/21/2016
3/10/2017
Depth in Feet
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
-1
-0.5
0
0.5
1
Profile Change in Inches


MUKILTEO B112 B
4/6/2016
4/7/2016
6/9/2016
7/20/2016
9/21/2016
3/10/2017
Depth in Feet
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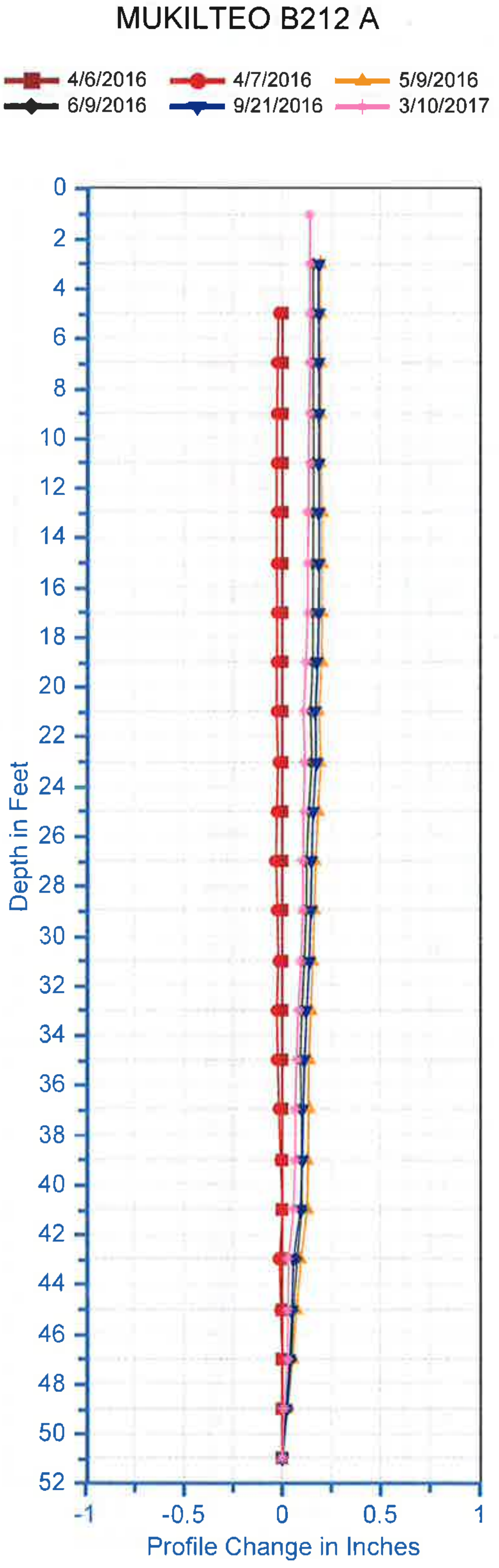
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
-1
-0.5
0
0.5
1
Profile Change in Inches

BORING B-2-12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4/6/2016
4/7/2016
5/9/2016
6/9/2016
9/21/2016
3/10/2017
Depth in Feet
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2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
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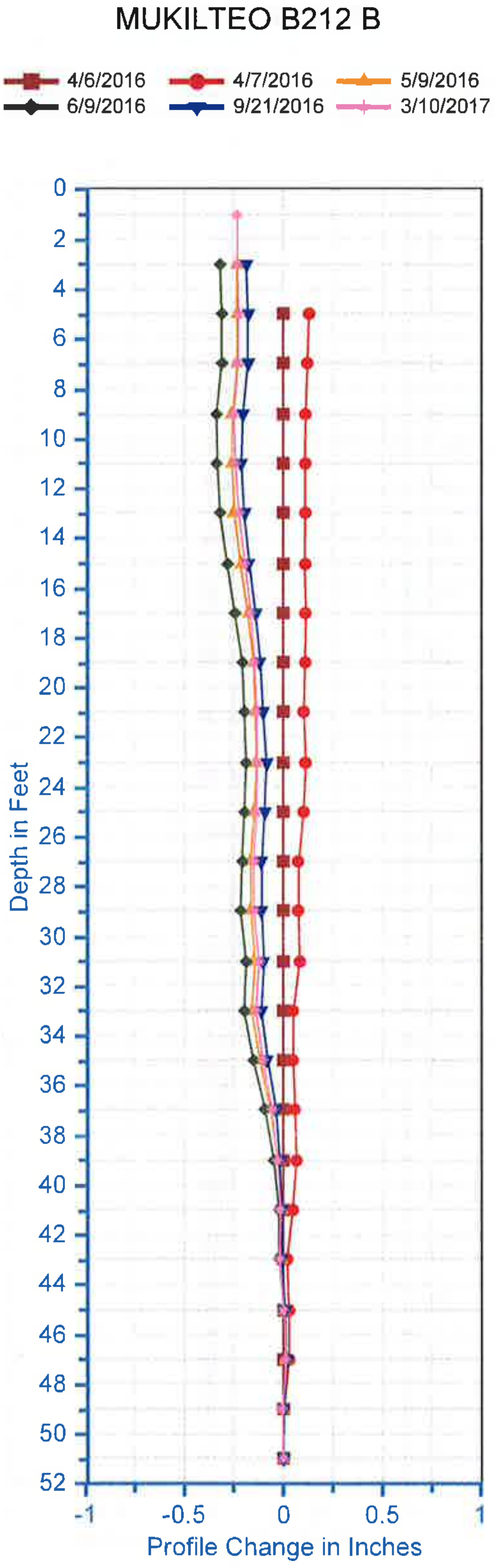
0
0.5
1
Profile Change in Inches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4/6/2016
4/7/2016
5/9/2016
6/9/2016
9/21/2016
3/10/2017
Depth in Feet
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4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
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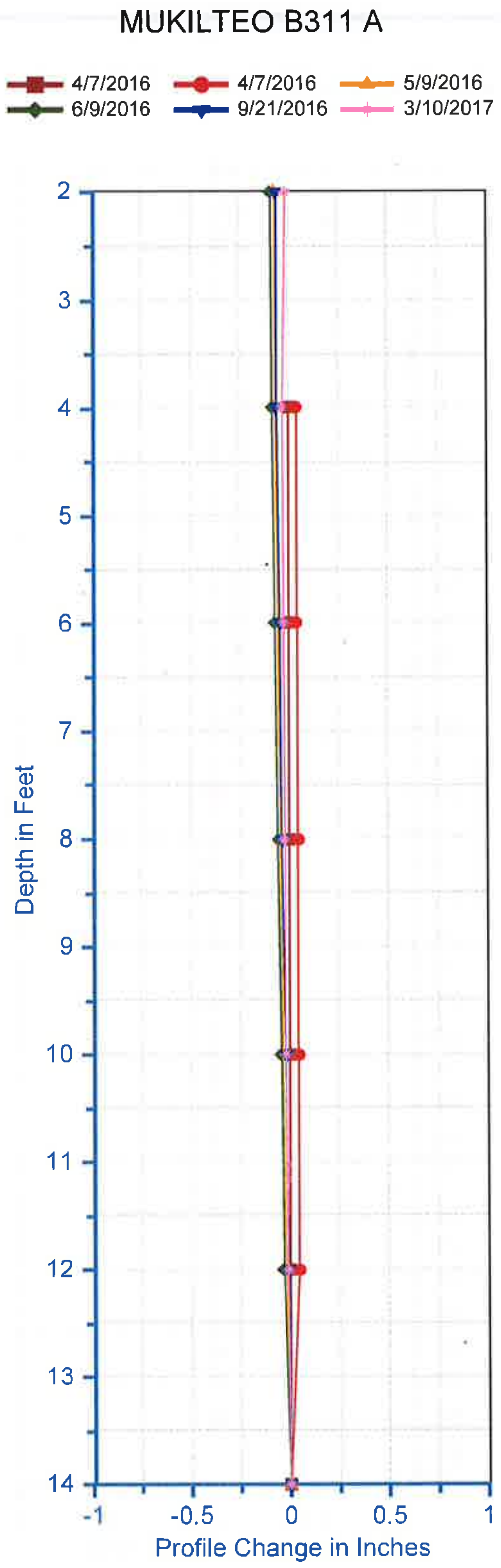
0
0.5
1
Profile Change in Inches

BORING B-3-11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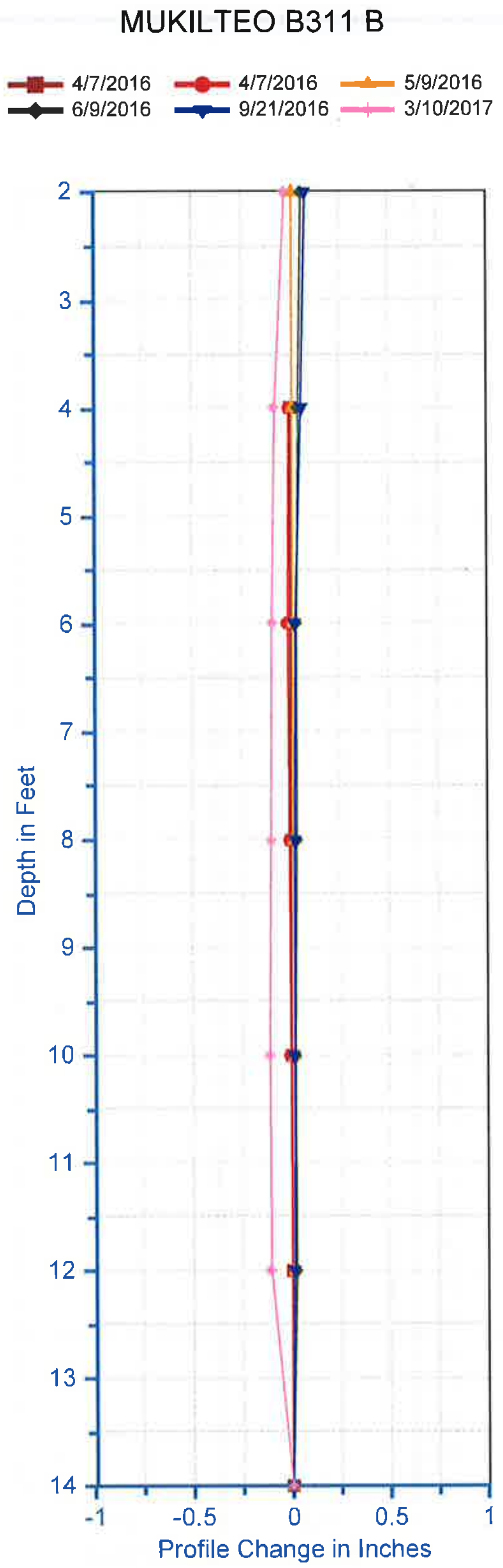
4/7/2016
4/7/2016
5/9/2016
6/9/2016
9/21/2016
3/10/2017
Depth in Feet
2
3
4
5
6
7
8
9
10
11
12
13
14
-1
-0.5
0
0.5
1
Profile Change in Inches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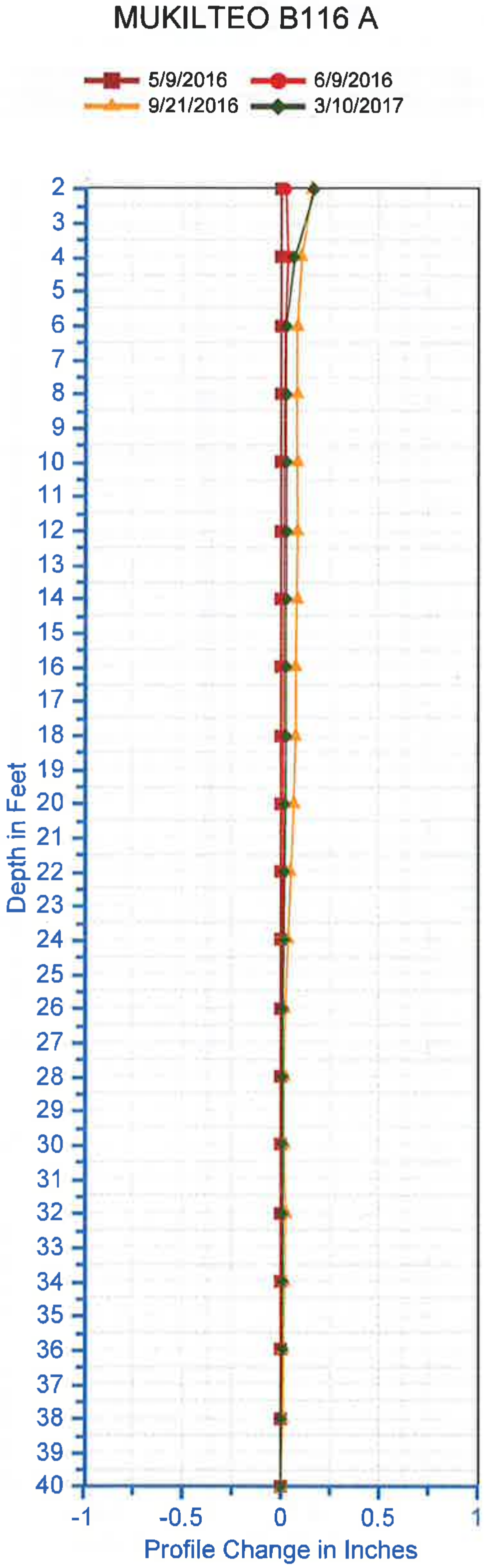
4/7/2016
4/7/2016
5/9/2016
6/9/2016
9/21/2016
3/10/2017
Depth in Feet
2
3
4
5
6
7
8
9
10
11
12
13
14
-1
-0.5
0
0.5
1
Profile Change in Inches

BORING B-1-16


MUKILTEO B116 A
5/9/2016
6/9/2016
9/21/2016
3/10/2017
Depth in Feet
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3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
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32
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34
35
36
37
38
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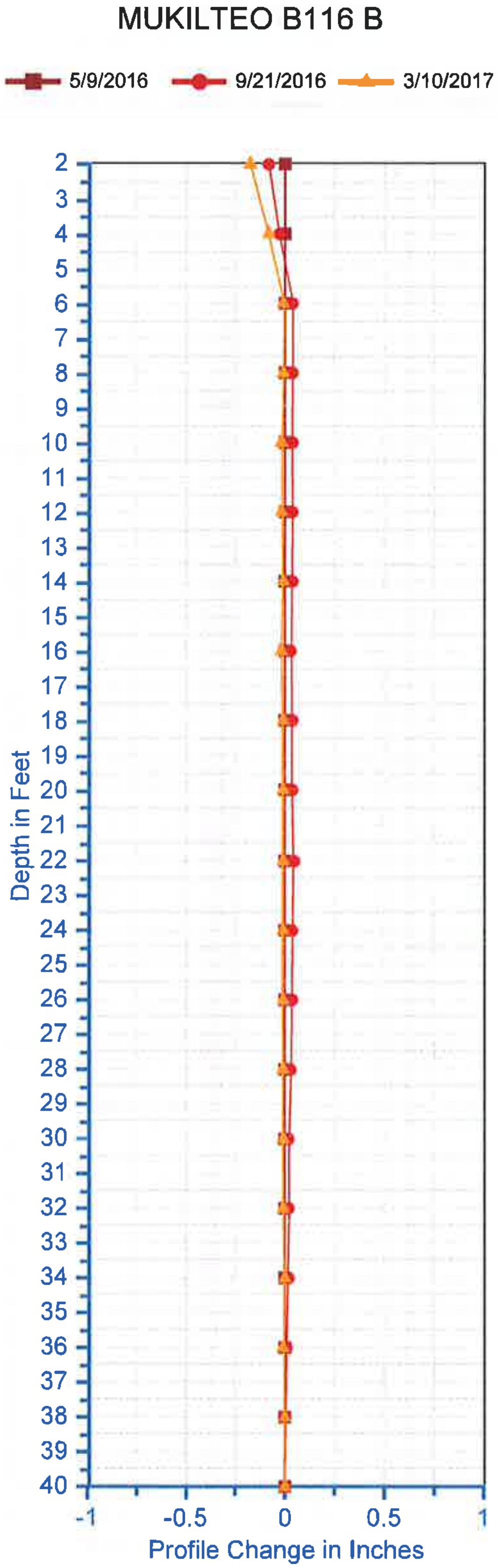
-0.5
0
0.5
1
Profile Change in Inches


MUKILTEO B116 B
5/9/2016
9/21/2016
3/10/2017
Depth in Feet
2
3
4
5
6
7
8
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14
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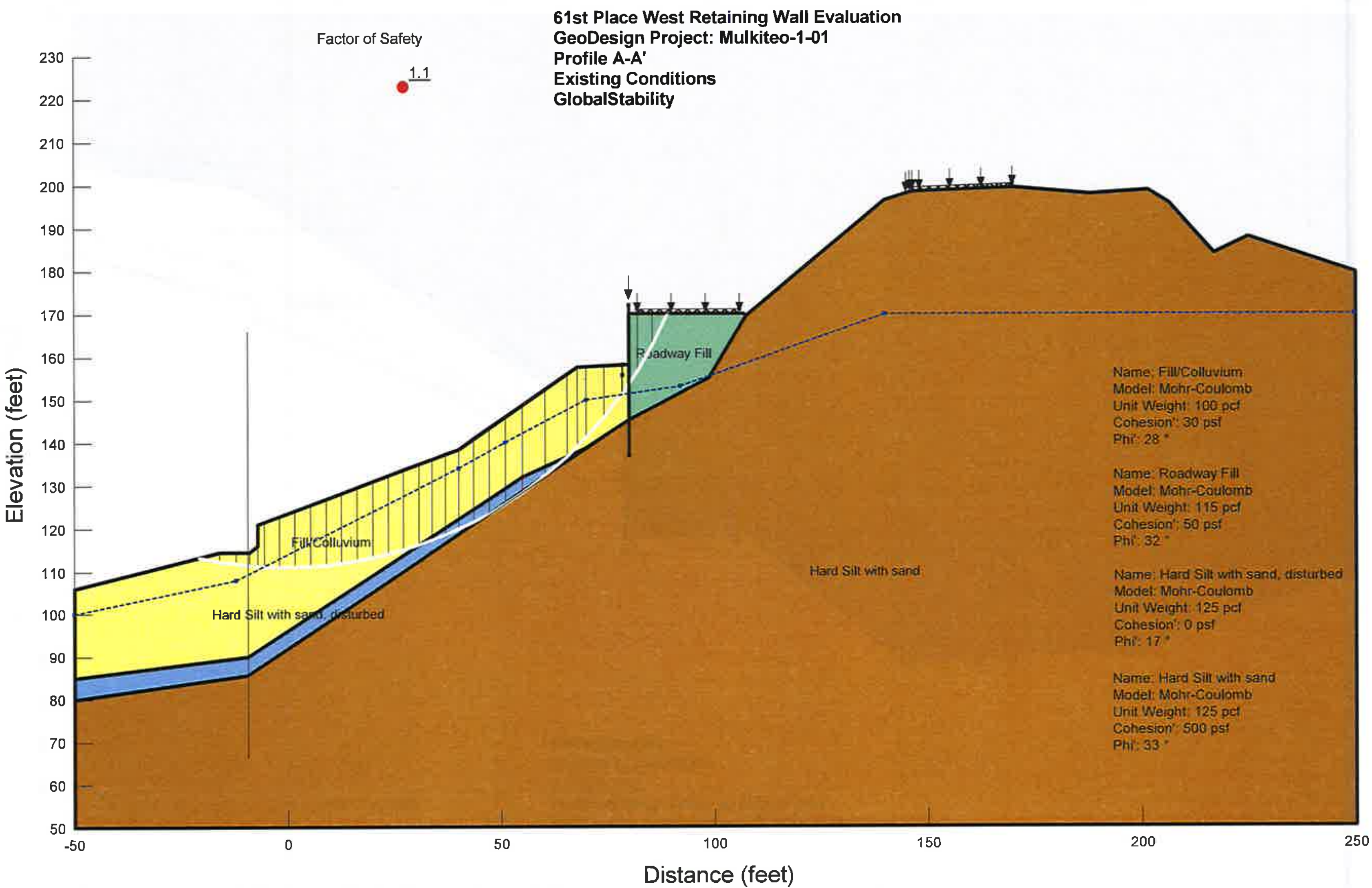
32
33
34
35
36
37
38
39
40
-1
-0.5
0
0.5
1
Profile Change in Inches

APPENDIX E

APPENDIX E

SLOPE STABILITY ANALYSIS

We conducted stability analyses using the two-dimensional limit equilibrium modeling program Slope/W by Geo-Slope International, Ltd. The figures in this appendix show the minimum factors of safety and associated critical failure planes estimated for the different conditions considered. Factors of safety were calculated using the Spencer method, which satisfies both moment and force equilibrium.



61st Place West Retaining Wall Evaluation
GeoDesign Project: Mulkiteo-1-01
Profile A-A'
Existing Conditions
GlobalStability

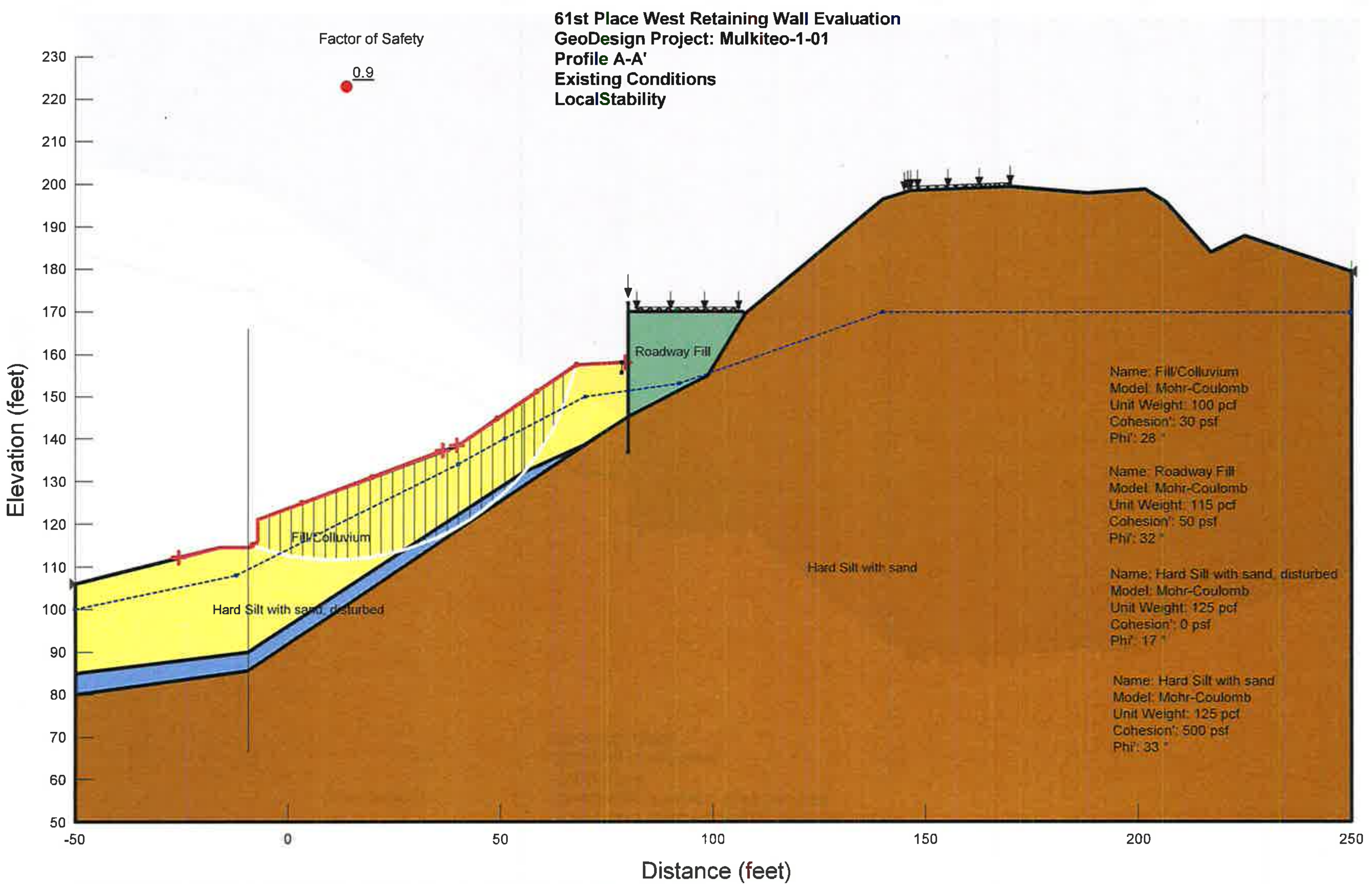
Name: Fill/Colluvium
Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 30 psf
Phi': 28 °

Name: Roadway Fill
Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion': 50 psf
Phi': 32 °

Name: Hard Silt with sand, disturbed
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 0 psf
Phi': 17 °

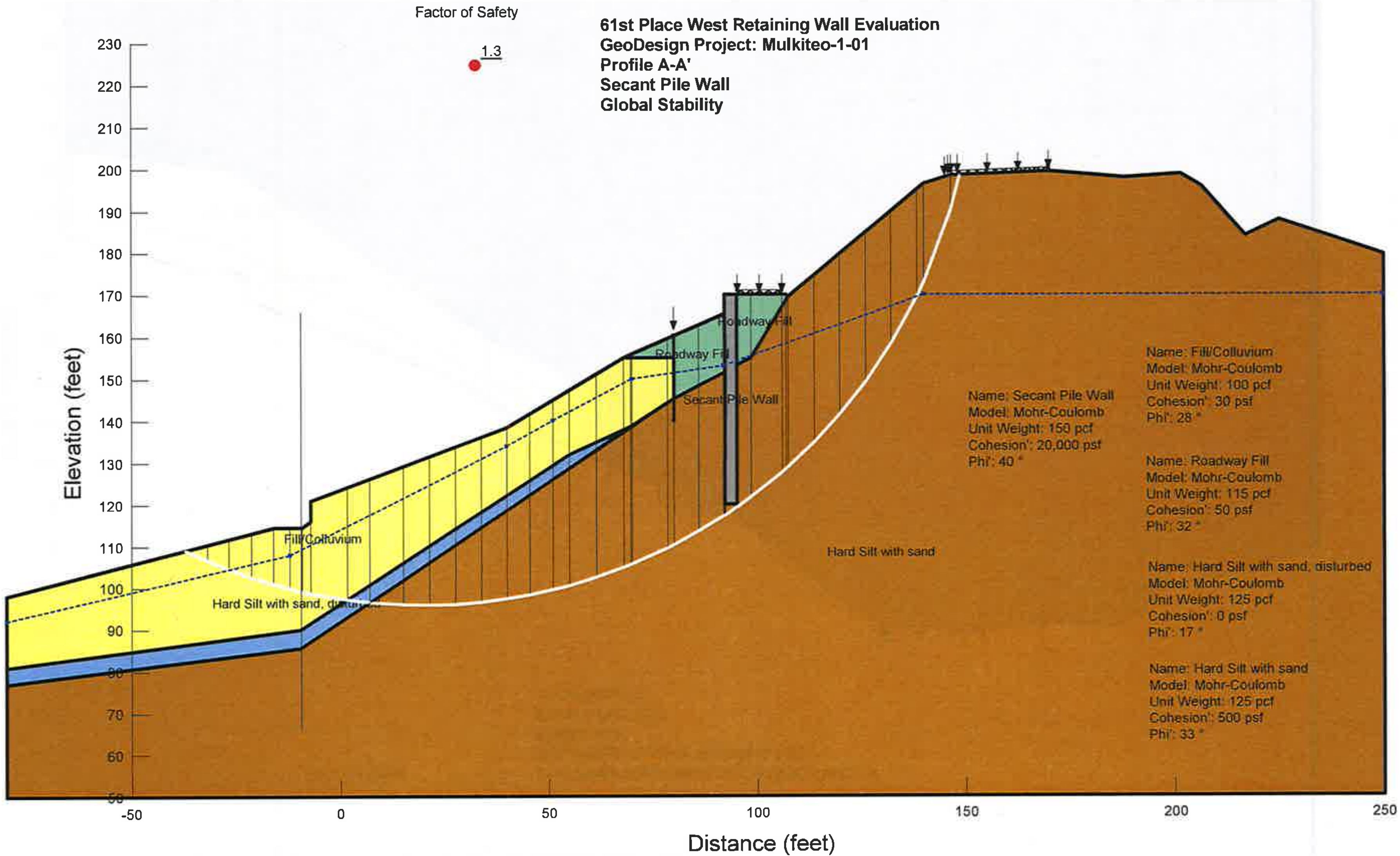
Name: Hard Silt with sand
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 500 psf
Phi': 33 °

J:\M-R\Mukilteo\Mukilteo-1\Mukilteo-1-01\ANALYSIS\Slope Stability\Analyses - June 2016\ Section A-A'- existing conditions-global-rev.gsz



61st Place West Retaining Wall Evaluation
GeoDesign Project: Mulkiteo-1-01
Profile A-A'
Existing Conditions
LocalStability

J:\M-R\Mukilteo\Mukilteo-1\Mukilteo-1-01\ANALYSIS\Slope Stability\Analyses - June 2016\' Section A-A'- existing conditions-local-rev.gsz



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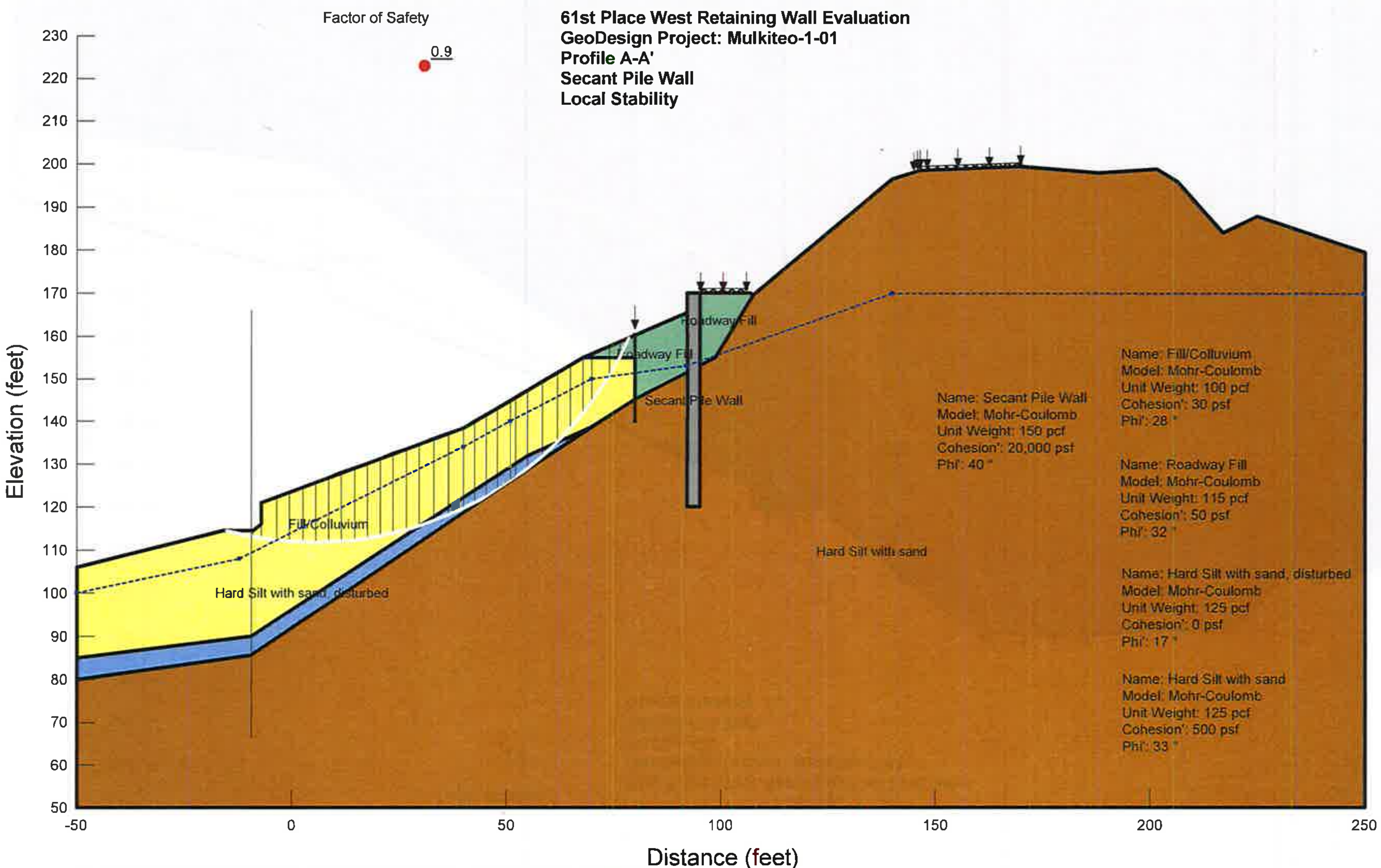

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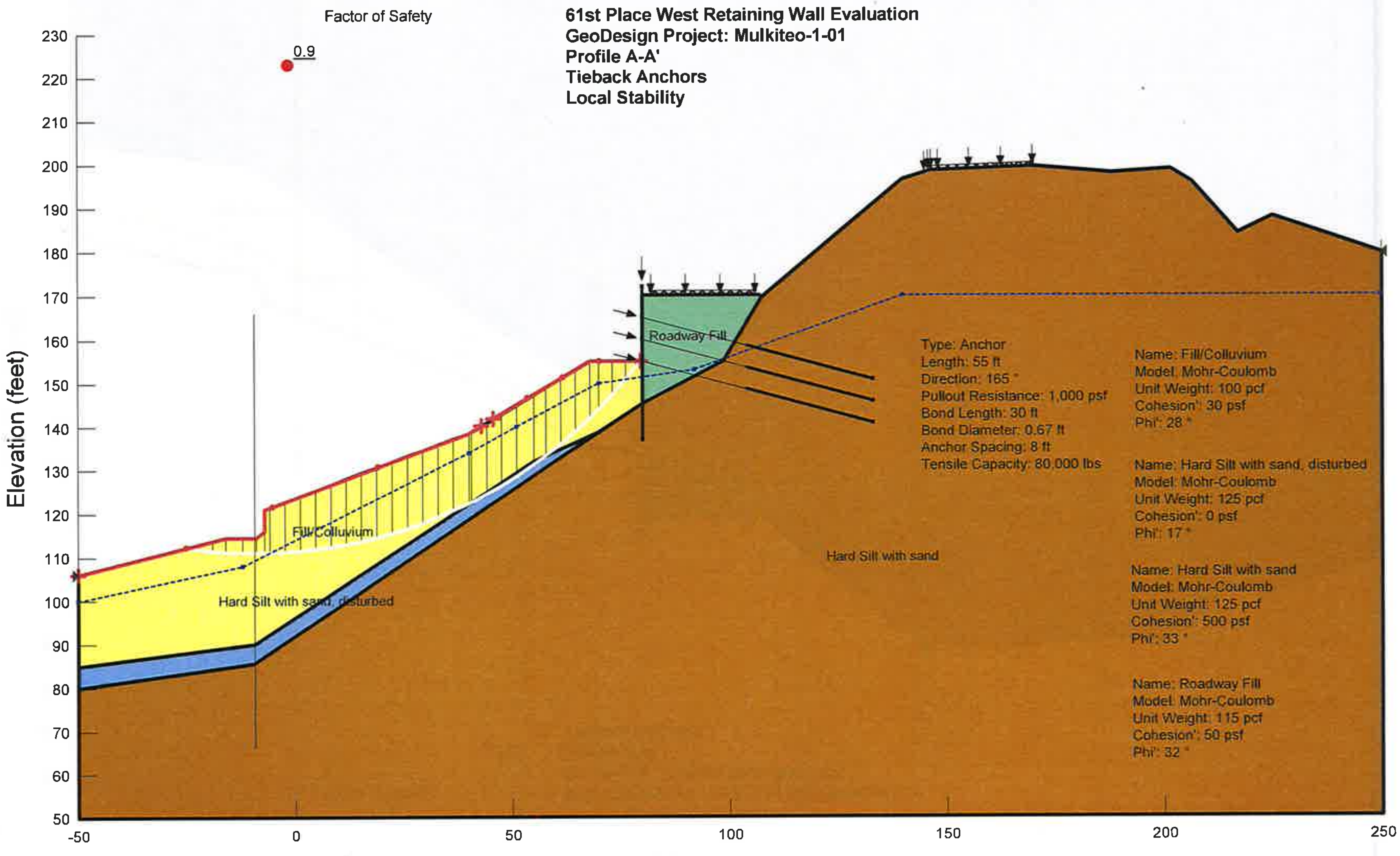

61st Place West Retaining Wall Evaluation
GeoDesign Project: Mulkiteo-1-01
Profile A-A'
Tieback Anchors
Local Stability

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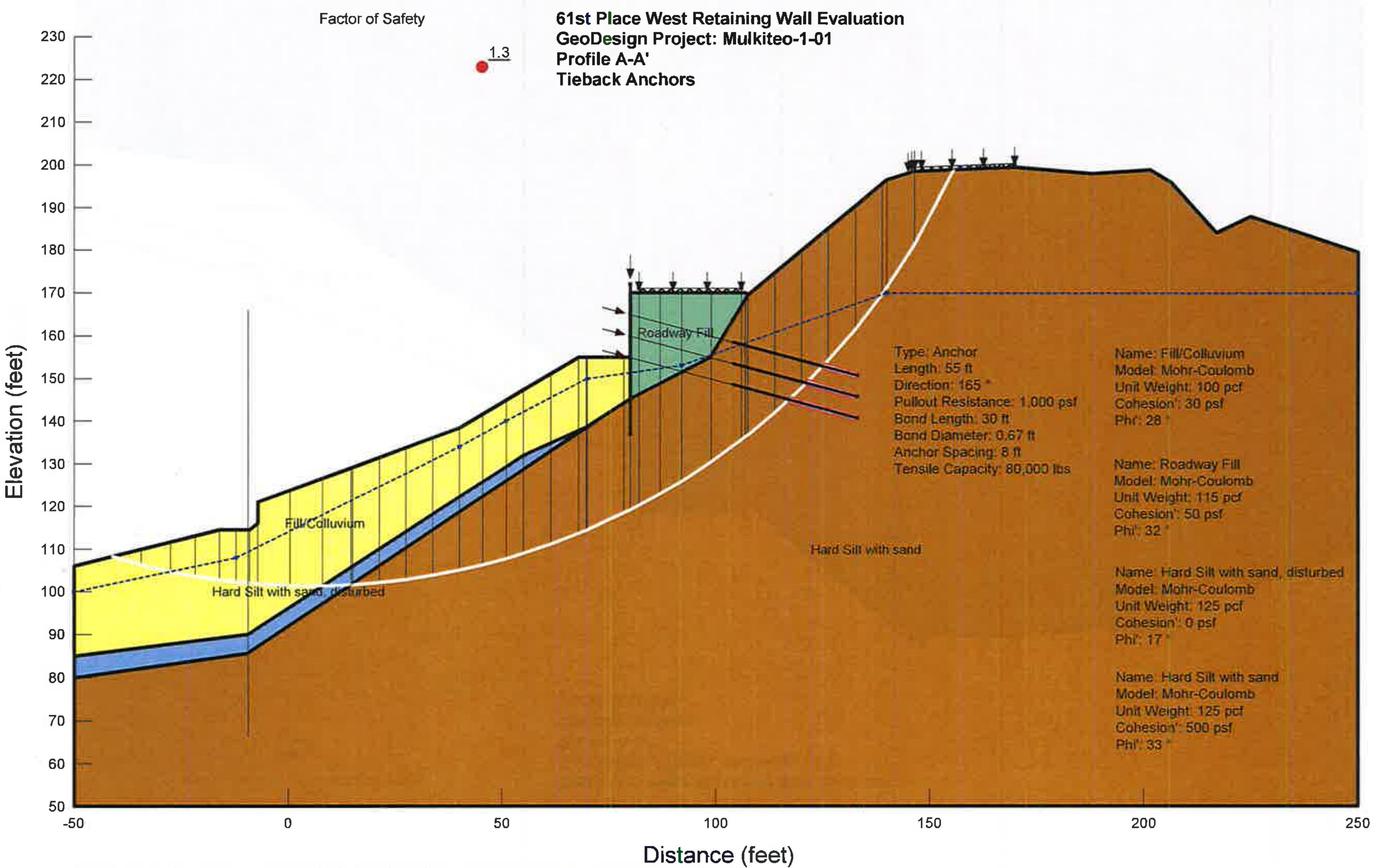

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ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

AC	asphalt concrete
ASTM	American Society for Testing and Materials
BGS	below ground surface
CMU	concrete masonry unit
FEMA	Federal Emergency Management Agency
H:V	horizontal to vertical
ksf	kips per square foot
LiDAR	light detection and ranging
MSE	mechanically stabilized earth
pcf	pounds per cubic foot
psf	pounds per square foot
psi	pounds per square inch
PVC	polyvinyl chloride
ROW	right-of-way
SPT	standard penetration test
USGS	U.S. Geological Survey
WSS	Washington Standard Specifications for Road, Bridge, and Municipal Construction (2014)

www.geodesigninc.com

2018

Stormwater Report

61st Place West Retaining Wall Project

61st Place West
Mukilteo, WA 98275

Prepared For Owner:
City of Mukilteo Public Works Dept.
11930 Cyrus Way
Mukilteo, WA 98275

Prepared By Engineer-of-Record:
Matt Randall, P.E.
Tuttle Engineering and Management
275 West Rio Vista Avenue, Suite 1
Burlington, WA 98233
360-899-5953

JULY 12, 2018

ENGINEERS CERTIFICATION

I, Matthew Randall, a Professional Engineer registered in the State of Washington as a Civil Engineer, do hereby declare that the technical information report titled *Stormwater Report for 61st Place West Retaining Wall Project* and dated July 12, 2018 was prepared by or under my personal supervision, and that said report was prepared in accordance with generally accepted engineering practices.

I hereby affirm, to the best of my knowledge, information, and belief, that the subject report was prepared in full compliance with the Washington State Department of Ecology (DOE) *2012 Stormwater Management Manual for Western Washington, as Amended in December 2014* (Manual) and *Mukilteo Municipal Code* (MMC) Section 13.12.

7/12/18

Matthew R. Randall, P.E.

Date

MATTHEW R. RANDALL

49708

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

1.1 Objectives

This stormwater report has been prepared to demonstrate that repairs to and construction of the 61st Place West Retaining Wall Project (Project) is feasible and that stormwater controls can successfully mitigate impacts created by repairs to the wall and adjacent roadway improvements. This report is to be used to guide the design and preparation of plans and the management of construction activities. Complete civil design plans, details, and specifications shall be submitted as part of the City of Mukilteo's (City) permit application process.

1.2 Background

The site is located at approximately 8900 61st Place West in Mukilteo, Washington. See Appendix A for a vicinity map. The property lies within Section 17, Township 24 North, Range 04 E, in Snohomish County and is within the city of limits of the City of Mukilteo.

Recent landslides in the area of the project resulted in the City seeking and obtaining funds to repair the existing retaining wall and adjacent roadway. A landslide in 2016 resulted in debris uphill of the roadway and soldier pile wall sliding across 61st Place West damaging portions of the retaining wall system, undermining the wall lagging, and washing out portions of the roadway behind the wall. Soil observations determined that the type of soil in combination with recent storm events and perched groundwater contributed to the slide. The City is proposing to remove the MSE portions of the existing wall and extend the soldier pile wall east and west along 61st Place West. The soldier pile wall will be reinforced with tiebacks and a new manifold system installed to collect groundwater from the uphill slope to reduce the potential for future slides.

The proposed stormwater management design will consist of collecting surface runoff from the slope and roadway in new roadside catch basins, collecting shallow groundwater in a curtain drain constructed along the interface of the road and uphill slope, and collecting groundwater via the manifold system and conveying it downhill away from the wall in a new and existing pipe system. Stormwater will outfall via an existing pipe outfall into Smuggler's Gulch. The project is required to comply with Minimum Requirements No. 1 through 5. See Section 4 of this document for Minimum Requirements for Redevelopment Projects.

1.3 Method of approach

This analysis is provided to describe the proposed project and to assure stormwater management concepts meet the requirements of the City of Mukilteo per City Code and the Washington State Department of Ecology (DOE) *2012 Stormwater Management Manual for Western Washington, as Amended in December 2014* (Manual). Per the City, the project must utilize the Manual, Vol. 1, Chapter 2 to determine which thresholds will be exceeded based on the proposed improvements and which corresponding Minimum Requirements need to be addressed. Results of this process, documented in the remainder of this report, are used to analyze and design the necessary Best Management Practices (BMPs) to manage stormwater to achieve requirements of the Manual.

2 EXISTING CONDITIONS

A site visit was conducted to assess site conditions and develop a strategy to mitigate stormwater runoff.

2.1 Land Use

The project site generally consists of a public roadway paved with asphalt. A retaining system, consisting of portions of modular blocks, soldier piles, and large rocks, borders the north side of the upper portion of the roadway. The roadway exists to provide access to downhill properties and to 88th Street SW.

2.2 Vegetation

The adjacent lots are forested with large trees and forest vegetation (ferns, blackberries). Paved driveways abut the roadway at the beginning of the project (west end), at the first curve, and at the low (east) end of the project. A gravel parking area exists west of the existing retaining wall on the north side of the roadway.

2.3 Existing Soil Conditions

Per the attached geotechnical report from GeoDesign, Inc., site soils are "fine sand, silt and clay" overlain by glacial outwash deposits of "very dense, silty sand with gravel and sandy gravel (p. 3)" Stormwater typically infiltrates through the top layer of soil and perches on the silty layer beneath. This contributes to the perched groundwater levels observed as well as to the instability of the slope. See Appendix B.

2.4 Topography

61st Place West traverses hillside slopes that range between 1:1 and 2:1. On average, most of the hill slopes down towards Puget Sound at approximately 1.5:1 (horizontal to vertical) in a north to northwesterly direction. Within the project limits, roadway longitudinal slopes range from 0.5% near the beginning of the project to steep slopes over 21% through the roadway curves. The elevation of the road at the beginning of the project is approximately 166. The elevation of the road near the lowest proposed catch basin is 87.

2.5 Off-site Analysis

The project is not required to provide an offsite analysis because the project does not propose to add 5,000 square feet of new hard surface per the Manual I-3.1.3. Currently, roadway runoff is collected in catch basins or roadside ditches and conveyed downhill to Smuggler's Gulch.

3 DEVELOPED CONDITIONS

A Stormwater Control Plan is developed to analyze the most effective BMPs for application to the proposed developed condition.

3.1 Developed Site Hydrology

For the developed condition, we analyzed the addition of 1,555 square feet of new asphalt roadway surface areas and approximately 1714 square feet of quarry spalls within and adjacent to the existing roadway prism. See the Road and Storm Plan and Profile within Appendix C. Roadway runoff will be directed to a flowline along the edge of the new concrete barriers and new thickened asphalt edge. Additional catch basins will be installed along the flow line at determined intervals to reduce the amount of stormwater running off the pavement onto the steep slope. Catch basins will also be located to reduce the amount of stormwater that sheets through both curves creating ice patches in winter months.

Surface runoff from the slope uphill from the wall will be allowed to flow through the new quarry spall slope protection into the soils where it will be captured by a new curtain drain system. The curtain drain will convey stormwater to the new piped storm system.

Groundwater behind the retaining wall will be collected via a new manifold system. Collected groundwater will be conveyed in a new pipe system below ground along the outside face of the wall to a new downstream catch basin constructed to collect roadway runoff.

All stormwater will be conveyed downhill to an existing storm drain system. Stormwater will continue to flow east towards Smuggler's Gulch within a piped storm drain system along the south side of the lower reach of the project.

3.2 Flow Control, Water Quality Treatment

Per the DOE Manual, the project does not add or replace enough hard surface to be required to address flow control and water quality treatment requirements. See Section 4 of this report for more information on the Minimum Requirements.

4 MINIMUM STORMWATER MANAGEMENT REQUIREMENTS

The Manual summarizes the requirements and stormwater management practices governing the design of this project. The DOE has provided a simple flowchart (Figure I-2.4.2, see Appendix D) to determine which Minimum Requirements must be addressed based on the amount of pervious and impervious surfaces that exist and are proposed to be installed or replaced for the project. Utilizing the areas listed in section 3.1, the project will add over 2,000 square feet of new hard surface area in the form of asphalt pavement repair and widening and quarry spall slope protection. In accordance with Volume 1, Chapter 3 of the Manual, the project is required to address Minimum Requirements 1 through 5 for all new and replaced hard surfaces and the land disturbed. The project does not add 5,000 square feet or more of new hard surfaces, convert ¾ acres or more of vegetation to lawn or landscaped areas, or convert 2.5 acres or more of native vegetation to pasture.

The project is a road related project. However, since it is only a road repair and widening project to repair the wall and improve storm runoff management on the roadway, the new hard surfaces do not exceed 5,000 square feet or add more than 50% to the existing hard surface area within the project limits. As such, no additional requirements are necessitated.

The project must address Minimum Requirements #1 through #5 of the Manual. These will be addressed in the remainder of this report:

1. Preparation of Stormwater Site Plans
2. Construction Stormwater Pollution Prevention (SWPP)
3. Source Control of Pollution
4. Preservation of Natural Drainage Systems and Outfalls
5. On-site Stormwater Management

The following sub-sections describe how the project will comply with each Minimum Requirement.

4.1 Minimum Requirement No. 1 – Preparation of Stormwater Site Plans

"All projects meeting the thresholds in Section 2.4 (of the Manual) shall prepare a Stormwater Site Plan for local government review. Stormwater Site Plans shall use site-appropriate

development principles, as required and encouraged by local development codes, to retain native vegetation and minimize impervious surfaces to the extent feasible. Stormwater Site Plans shall be prepared in accordance with Chapter 3 of this volume."

This report and the attached plans serve as the Site Stormwater Plan. The Site Stormwater Plan was prepared in accordance with Volume I, Chapter 3 of the Manual.

4.2 Minimum Requirement No. 2 – Construction Stormwater Pollution Prevention (SWPP)

"All new development and redevelopment projects are responsible for preventing erosion and discharge of sediment and other pollutants into receiving waters. Projects which result in 2,000 square feet or more of new plus replaced hard surface area, or which disturb 7,000 square feet or more of land must prepare a Construction SWPP Plan (SWPPP) as part of the Stormwater Site Plan."

As stated in section 3.1, the project will result in more than 2,000 square feet of new plus replaced hard surface area. All 13 Elements of the SWPPP have been considered and controls to address them are outlined below in text and within the attached stormwater site plan drawings.

4.2.1 Element 1: Preserve Vegetation/Mark Clearing Limits

- "Before beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area."
- "Retain the duff layer, native topsoil, and natural vegetation in an undisturbed state to the maximum degree practicable."

Relevant BMPs:
BMP C101 - Preserve Natural Vegetation
BMP C103 - High Visibility Fence

Site-Specific Note:
The project site is generally within the public right-of-way. A portion of the work required to repair the wall necessitates construction activities to be conducted within a temporary construction easement which may require tree protection or removal. Clearing and Grubbing will occur along the roadway edge. Trees to remain will be clearly marked to prevent damage as shown on the plans. Disturbance of vegetation and forest outside the limits of construction is to be avoided. Flagging will define the construction limits.

4.2.2 Element 2: Establish Construction Access

- "Limit construction vehicle access and exit to one route, if possible."
- "Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs, to minimize tracking of sediment onto public roads."
- "Locate wheel wash or tire baths on site, if the stabilized construction entrance is not effective in preventing tracking sediment onto roads."
- "If sediment is tracked off-site, clean the affected roadway thoroughly at the end of each day, or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or pick up and transport the sediment to a controlled sediment disposal area."
- "Conduct street washing only after sediment is removed in accordance with the above bullet."

- "Control street wash wastewater by pumping back on-site, or otherwise prevent it from discharging into systems tributary to waters of the State."

Relevant BMPs:
BMP C105 – Stabilized Construction Entrance
BMP C107 – Construction Road/Parking Area Stabilization

Site-Specific Note:

A stabilized gravel parking area exists at the project site. The contractor will utilize this area as a construction access and parking area. The contractor will be required to monitor the existing roadway for sediment tracking from the project site. Sediment removal from the roadway will be completed by shoveling or sweeping.

4.2.3 Element 3: Control Flow Rates

- "Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site."
- "Where necessary to comply with the bullet above, construct stormwater retention or detention facilities as one of the first steps in grading. Assure that detention facilities function properly before constructing site improvements (e.g. impervious surfaces)."
- "If permanent infiltration ponds are used for flow control during construction, protect these facilities from siltation during the construction phase."

Relevant BMPs:
BMP C207 – Check Dams
BMP C235 – Wattles

Site-Specific Note:

Because the project is a linear roadway project, wattles will be installed on contour downhill of proposed land-disturbing activities to prevent sediment-laden water from flowing into the roadway ditch. Wattles will be installed in the adjacent ditches as check dams. Due to the minimal area of disturbance on this linear project, stormwater detention is not required for this project.

4.2.4 Element 4: Install Sediment Controls

- "Design, install, and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants."
- "Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place."
- "Minimize sediment discharges from the site. The design, installation, and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site."
- "Direct stormwater runoff from disturbed areas through a sediment pond or other appropriate sediment removal BMP, before the runoff leaves a construction site or before discharge to an infiltration facility. Runoff from fully stabilized areas may be discharged without a sediment removal BMP but must meet the flow control performance standard in Element #3, bullet #1."

- “Locate BMPs intended to trap sediment on-site in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.”
- “Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.”

Relevant BMPs:
BMP C220 – Storm Drain Inlet Protection
BMP C235 – Wattles
BMP C240 – Sediment Trap, if necessary
BMP C241 – Sediment Pond, if necessary

Site-Specific Note:
The project is a linear roadway repair project. Extensive earthwork is not proposed for this project outside of the wall repair area. Grubbing and excavation along the south side of the road in the slope may result in some sediment on the roadway surface. Regular roadway cleanup and storm drain inlet protection are proposed for sediment control. As necessary, the contractor will install erosion control BMPs downslope of all earth disturbing activities.

4.2.5 Element 5: Stabilize Soils

- “Stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base early on areas to be paved, and dust control.”
- “Control stormwater volume and velocity within the site to minimize soil erosion.”
- “Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.”
- “Soils must not remain exposed and unworked for more than the time periods set forth below to prevent erosion:
    - During the dry season (May 1 - Sept. 30): 7 days
    - During the wet season (October 1 - April 30): 2 days”
- “Stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.”
- “Stabilize soil stockpiles from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.”
- “Minimize the amount of soil exposed during construction activity.”
- “Minimize the disturbance of steep slopes.”
- “Minimize soil compaction and, unless infeasible, preserve topsoil.”

Relevant BMPs:
BMP C120 – Temporary and Permanent Seeding
BMP C121 – Mulching
BMP C123 – Plastic Covering
BMP C125 – Topsoiling/Composting
BMP C130 – Surface Roughening

Site-Specific Note:
As stated above, it is not expected that the small areas of disturbed soil will remain in such a way as to create sediment-laden runoff issues. Slope stabilization along the toe of the slope will be completed using quarry spalls. Areas disturbed for construction of the trench will be backfilled and stabilized immediately as the storm pipe is constructed on site.

4.2.6 Element 6: Protect Slopes

- "Design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking)."
- "Divert off-site stormwater (run-on) or groundwater away from slopes and disturbed areas with interceptor dikes, pipes and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site."
- "At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion."
    - "Temporary pipe slope drains must handle the peak 10-minute velocity of flow from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year and 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped" area."
- "Place excavated material on the uphill side of trenches, consistent with safety and space considerations."
- "Place check dams at regular intervals within constructed channels that are cut down a slope."

Relevant BMPs:
BMP C120 – Temporary and Permanent Seeding
BMP C123 – Plastic Covering
BMP C130 – Surface Roughening

Site-Specific Note:
All disturbed surfaces and slopes less than 3:1 slope are to be mulched or have hog fuel placed on them until such a time that they can be seeded. Disturbed slopes steeper than 3:1 are to be covered with plastic until they can be stabilized with quarry spalls. All disturbed soils not proposed to be covered with quarry spalls will be permanently seeded.

4.2.7 Element 7: Protect Drain Inlets

- "Protect all storm drain inlets made operable during construction so that stormwater runoff shall not enter the conveyance system without first being filtered or treated to remove sediment."
- "Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer)."

Relevant BMPs:
BMP C220 – Storm Drain Inlet Protection

Site-Specific Note:
Inlet protection is to be installed in existing and proposed catch basins and is to remain for the duration of construction.

4.2.8 Element 8: Stabilize Channels and Outlets

- "Design, construct, and stabilize all on-site conveyance channels to prevent erosion from the following expected peak flows:
    - Channels must handle the peak 10-minute velocity of flow from a Type 1A, 10- year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate indicated by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped area."
- "Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream reaches at the outlets of all conveyance systems."

Relevant BMPs:
BMP C207 – Check Dams
BMP C209 – Outlet Protection

Site-Specific Note:
Temporary on-site conveyance is not proposed or expected for this project. An existing thickened asphalt edge will convey stormwater downhill to the existing storm drain system until the proposed system can be constructed. The existing ditch east of the wall will remain until the storm system is constructed. If construction requires temporary conveyance, channel lining, check dams, and outlet protection will be utilized to prevent erosion from peak flows as required. Check dams will be installed in the adjacent public stormwater ditch to ensure that any sediment-laden water that may come off of the project area will be managed prior to the water continuing down the roadside ditch.

4.2.9 Element 9: Control Pollutants

- "Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants."
- "Handle and dispose of all pollutants, including waste materials and demolition debris that occur on-site in a manner that does not cause contamination of stormwater."
- "Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the

containment structure. Double-walled tanks do not require additional secondary containment."

- "Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident."
- "Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland application, or to the sanitary sewer, with local sewer district approval."
- "Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures."
- "Use BMPs to prevent contamination of stormwater runoff by pH modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping, and mixer washout waters."
- "Adjust the pH of stormwater if necessary to prevent violations of water quality standards."
- "Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on-site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited."
- "Obtain written approval from Ecology before using chemical treatment other than CO2 or dry ice to adjust pH."

Relevant BMPs:
BMP C151 - Concrete Handling
BMP C152 - Sawcutting and Surfacing Pollution Prevention
BMP C153 – Material Delivery, Storage and Containment Area
BMP C154 - Concrete Washout Area

Site-Specific Note:
All contaminated materials from cleaning shall be disposed off-site at an approved waste facility. Concrete shall be handled, and a concrete washout area shall be provided near the construction parking area as needed.

4.2.10 Element 10: Control Dewatering

- "Discharge foundation, vault, and trench de-watering water, which has similar characteristics to stormwater runoff at the site, into a controlled conveyance system before discharge to a sediment trap or sediment pond."
- "Discharge clean, non-turbid de-watering water, such as well-point groundwater, to systems tributary to, or directly into surface waters of the State, as specified in Element #8, provided the dewatering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment ponds. Note that "surface waters of the State" may exist on a construction site as well as off-site; for example, a creek running through a site."
- "Handle highly turbid or otherwise contaminated dewatering water separately from stormwater."

- “Other treatment or disposal options may include:
  1. Infiltration.
  2. Transport off-site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters.
  3. Ecology-approved on-site chemical treatment or other suitable treatment technologies.
  4. Sanitary or combined sewer discharge with local sewer district approval, if there is no other option.
  5. Use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering.”

Relevant BMPs:

BMP C201 – Grass-lined Channels
BMP C235 – Wattles
BMP C236 – Vegetative Filtration
BMP C240 - Sediment Trap

Site-Specific Note:
At this time, dewatering is not expected for this project. However, if dewatering of the stormwater pipe trench or storm structure is required, the contractor will employ BMPs to control and treat pollution on-site to protect the nearby stream and slopes.

4.2.11 Element 11: Maintain BMPs

- “Maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.”
- “Remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.”

Relevant BMPs:

BMP C150 – Materials on Hand
BMP C160 – Certified Erosion and Sediment Control Lead

Site-Specific Note:
The contractor shall assign an individual to inspect all temporary and permanent erosion and sediment control BMPs utilized on the project. Repairs shall be made immediately to minimize any impacts. Temporary BMPs shall not be removed until final stabilization is complete, or the BMP is no longer required.

4.2.12 Element 12: Manage the Project

- “Phase development projects to the maximum degree practicable and consider seasonal work limitations.”
- “Inspection and monitoring – Inspect, maintain and repair all BMPs as needed to assure continued performance of their intended function. Projects regulated under the Construction Stormwater General Permit must conduct site inspections and monitoring in accordance with Special Condition S4 of the Construction Stormwater General Permit.”
- “Maintain, update, and implement the SWPPP.”

- "Projects that disturb one or more acres must have site inspections conducted by a Certified Erosion and Sediment Control Lead (CESCL). Project sites disturbing less than one acre may have a CESCL or a person without CESCL certification conduct inspections. By the initiation of construction, the SWPPP must identify the CESCL or inspector, who must be present on-site or on-call at all times."
- "The CESCL or inspector (project sites less than one acre) must have the skills to assess the:
    - Site conditions and construction activities that could impact the quality of stormwater.
    - Effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges."
- "The CESCL or inspector must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen. They must evaluate the effectiveness of BMPs and determine if it is necessary to install, maintain, or repair BMPs to improve the quality of stormwater discharges. Based on the results of the inspection, construction site operators must correct the problems identified by:
    - Reviewing the SWPPP for compliance with the 13 construction SWPPP elements and making appropriate revisions within 7 days of the inspection.
    - Immediately beginning the process of fully implementing and maintaining appropriate source control and/or treatment BMPs as soon as possible, addressing the problems not later than within 10 days of the inspection. If installation of necessary treatment BMPs is not feasible within 10 days, the construction site operator may request an extension within the initial 10-day response period."
- "The CESCL or inspector must inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge points at least once every calendar week and within 24 hours of any discharge from the site. (For purposes of this condition, individual discharge events that last more than one day do not require daily inspections. For example, if a stormwater pond discharges continuously over the course of a week, only one inspection is required that week.) The CESCL or inspector may reduce the inspection frequency for temporary stabilized, inactive sites to once every calendar month."

Relevant BMPs:
BMP C150 - Materials on Hand
BMP C160 - Certified Erosion and Sediment Control Lead
BMP C162 - Scheduling

Site-Specific Note:
The project disturbs less than one acre of land. Therefore, coverage under the NPDES Construction General Stormwater Permit will not be required and a CESCL is not needed. The contractor shall assign an individual to inspect and to manage the erosion control BMPs.

4.2.13 Element 13: Protect Low Impact Development BMP's

Site-Specific Note:
LID facilities are not proposed for this project. Therefore, this BMP is not applicable.

4.3 Minimum Requirement No. 3 – Source Control of Pollution

"All known, available and reasonable source control BMPs must be applied to all projects. Source control BMPs must be selected, designed, and maintained according to this manual. The intention of source control BMPs is to prevent stormwater from coming in contact with

pollutants. They are a cost-effective means of reducing pollutants in stormwater, and, therefore, should be a first consideration in all projects."

During construction, if sediment is tracked off the project site, the Contractor will thoroughly clean public roads at the end of each day or more frequently if required. Sediment collected from the cleaning process shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area. The Contractor will be allowed to wash the street only after sediment is removed in an aforementioned manner.

During construction, the contractor shall apply and use all known, available, and reasonable source control BMPs to prevent spills from reaching the existing and proposed stormwater management facilities and adjacent critical areas. After construction, the City will be responsible for implementing Source Control BMPs that prevent spills or excess use of materials needed for landscape maintenance and operation. All Source Control BMPs must be selected, designed, and maintained according to the Manual.

4.4 Minimum Requirement No. 4 – Preservation of Natural Drainage Systems and Outfalls

"Natural drainage patterns shall be maintained, and discharges from the project site shall occur at the natural location, to the maximum extent practicable. The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and down-gradient properties. All outfalls require energy dissipation."

This project does not change the location of existing drainage outfalls. Natural drainage patterns shall be maintained, and discharges from the project shall occur at the existing location to the public storm system. Stormwater from new impervious surfaces will be collected before sheet downslope to protect the downgradient properties.

4.5 Minimum Requirement No. 5 – On-Site Stormwater Management

"Projects shall employ On-site Stormwater Management BMPs in accordance with the following projects thresholds, standards, and lists to infiltrate, disperse, and retain stormwater runoff on-site to the extent feasible without causing flooding or erosion impacts. Projects triggering Minimum Requirements #1 through #5, shall either use on-site stormwater Management BMPs from List #1 (of the Manual) or meet the Low Impact Development Performance Standard."

The project proposes to address the requirements defined in List #1 of the Manual. The following describes whether each BMP is feasible for the described surface:

Lawn and landscaped areas:

- Post-Construction Soil Quality and Depth in accordance with BMP T5.13.

This is a feasible BMP to manage all disturbed areas not proposed as impervious or hard surfaces, when on slopes less than 33%. However, because of the steep slopes encountered throughout the project limits, no areas exist where the disturb areas will be on slopes less than 33%. As such, this BMP is not a feasible option for this project.

Roofs:
Roofs are not proposed for this project. Therefore, the requirements for roofs are not applicable.

Other Hard Surfaces:

- Full Dispersion in accordance with BMP T5.30

This is an infeasible BMP as it requires that at least 65% of the site remain in a forested or native condition and a 100 feet long vegetated flow path to disperse runoff. Additionally, the slope of the flow path must be no steeper than 15% for any 20-foot reach of the flow path. The project will not be able to meet these requirements.

- Permeable pavement in accordance with BMP T5.15.

Infiltration within 50 feet of the top of slopes greater than 20% and over 10 feet of vertical relief is not recommended. The adjacent slopes have been shown to be erosive. This is not feasible.

- Raingardens, BMP T5.14A, or Bioretention, BMP T7.30, that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

Infiltration within 50 feet of the top of slopes greater than 20% and over 10 feet of vertical relief is not recommended. The adjacent slopes have been shown to be erosive. This is not feasible.

- Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11.

This BMP is to be used for flat or moderately sloped surfaces (less than 15% slope). The adjacent slopes are greater than 15% making this BMP infeasible.

Due to the limiting constraints of available space and steep slopes within the project limits, on-site stormwater management is not possible. Stormwater will be collected in catch basins and conveyed downhill to the existing storm system. See Site Plans in Appendix C. Storm pipe calculations and bypass grate calculations are included in Appendix D.

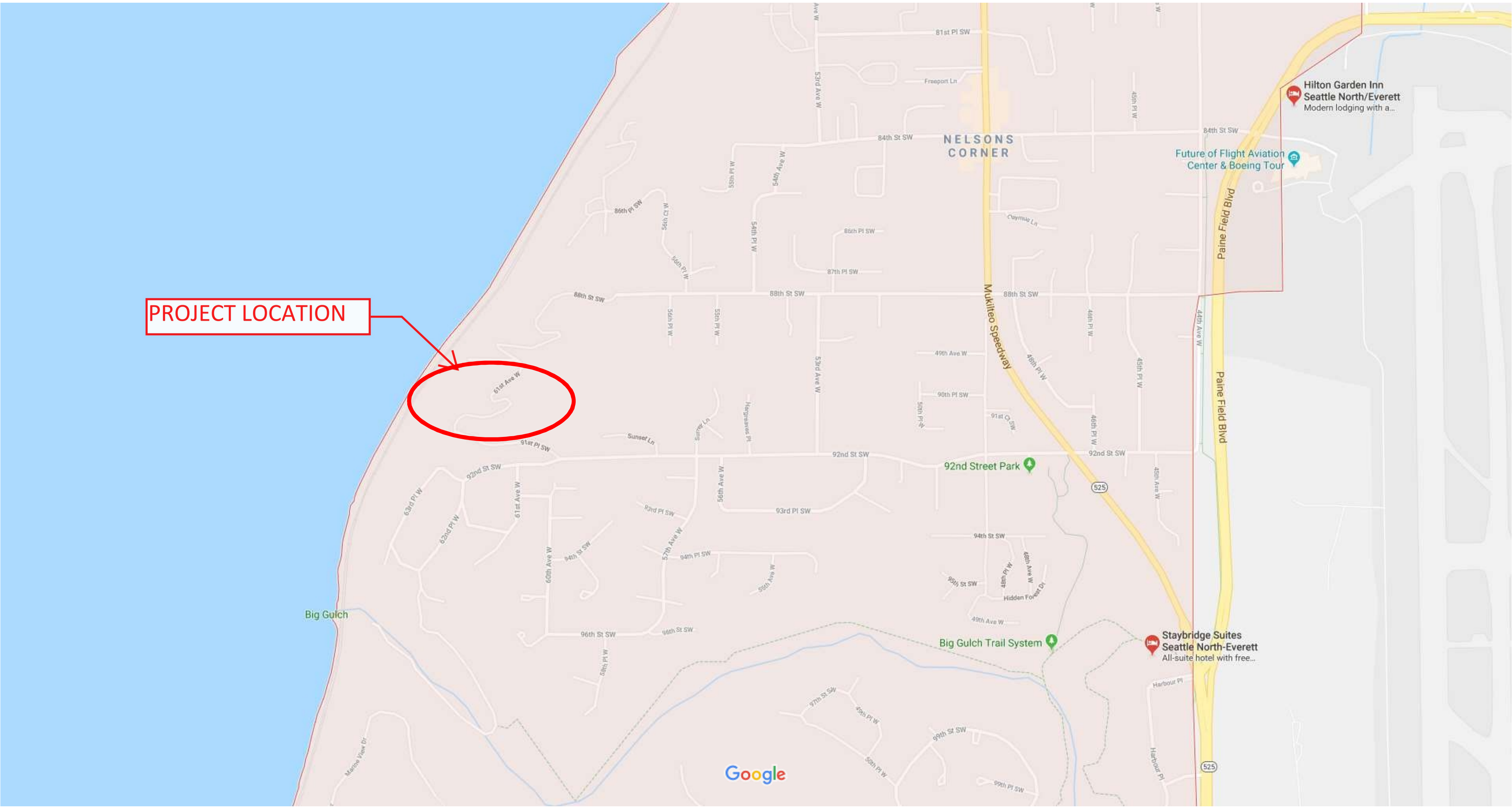
5 APPENDIX

APPENDIX A - VICINITY MAP
APPENDIX B – SOIL INFORMATION
APPENDIX C – SITE STORMWATER PLAN
APPENDIX D – BMP DESIGN

APPENDIX A - VICINITY MAP

Google Maps Mukilteo

VICINITY MAP



Map data ©2018 Google 500 ft

Mukilteo
Washington

APPENDIX B – SOIL INFORMATION

APPENDIX C – SITE STORMWATER PLAN

61ST PLACE WEST RETAINING WALL PROJECT

CITY OF MUKILTEO, SNOHOMISH COUNTY, WASHINGTON
CIVIL IMPROVEMENT PLANS

SHEET INDEX

SHEET	DESCRIPTION
T1	TITLE SHEET, VICINITY MAP, AND SHEET INDEX
~~SQ1~~	~~SUMMARY OF QUANTITIES~~
DNL1	CITY DEVELOPMENT NOTES AND LEGENDS
~~RS1~~	~~ROADWAY SECTIONS~~
~~HAC1~~	~~HORIZONTAL ALIGNMENT AND CONTROL PLAN~~
EES1	EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN
EES2	EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN
EES3	EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN
EN1	EROSION CONTROL NOTES
RP1	ROAD AND STORM PLAN AND PROFILE
RP2	ROAD AND STORM PLAN AND PROFILE
RP3	ROAD AND STORM PLAN AND PROFILE
RP4	ROAD AND STORM PLAN AND PROFILE
~~W-1~~	~~PLAN AND ELEVATION~~
~~W-2~~	~~SOLDIER PILE DETAILS 1 OF 3~~
~~W-3~~	~~SOLDIER PILE DETAILS 2 OF 3~~
~~W-4~~	~~SOLDIER PILE DETAILS 3 OF 3~~
~~W-5~~	~~GROUND ANCHOR DETAILS~~
D1	PROJECT DETAILS
~~TCP1~~	~~TRAFFIC CONTROL PLAN~~
~~WM1~~	~~WETLAND BUFFER IMPACTS PLAN~~
~~WM2~~	~~WETLAND BUFFER ENHANCEMENT PLAN~~
~~WM3~~	~~WETLAND BUFFER PLANTING DETAILS~~

OVERVIEW MAP
NE 1/4, SECTION 17, TOWNSHIP 28 N., RANGE 4 E., W.M.
SNOHOMISH COUNTY, WASHINGTON
SCALE: 1"=50'

CITY OF MUKILTEO EXECUTIVE STAFF

MAYOR
JENNIFER GREGERSON

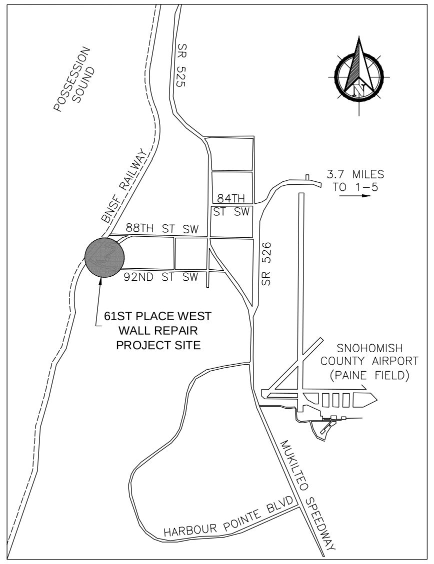
CITY COUNCIL
BOB CHAMPION – COUNCIL MEMBER
CHRISTINE COOK – COUNCIL MEMBER
RICHARD EMERY – COUNCIL MEMBER
SARAH KNELLER – COUNCIL MEMBER
ANNA ROHRBOUGH – COUNCIL MEMBER
STEVE SCHMALZ – COUNCIL MEMBER
SCOTT WHELPLEY – COUNCIL MEMBER

PUBLIC WORKS DIRECTOR
MICK MATHESON, P.E.

CITY CLERK
JANET KEEFE

PROJECT DESCRIPTION

THIS CONTRACT PROVIDES FOR THE IMPROVEMENT OF 61ST PLACE WEST BY REPAIRING AN EXISTING SOLDIER PILE RETAINING WALL AND ADJACENT ROADWAY FEATURES LOCATED IN THE WESTERN PORTION OF THE CITY OF MUKILTEO. WORK CONSISTS OF PREPARING THE SITE; REINFORCING AN EXISTING SOLDIER PILE WALL; INSTALLING HORIZONTAL WALL DRAINS; INSTALLING A STORM DRAINAGE COLLECTION AND CONVEYANCE SYSTEM; REBUILDING EXISTING ROADWAY SHOULDERS; PAVING; INSTALLING CONCRETE BARRIERS; AND PLANTINGS FOR MITIGATION OF DISTURBANCES CREATED DURING CONSTRUCTION WITHIN EXISTING WETLAND BUFFERS; AND RESTORING OFF–ROADWAY VEGETATED AREAS. SOLE ACCESS TO THE PROPERTY WILL BE PROVIDED FROM 61ST PLACE WEST.



VICINITY MAP
NOT TO SCALE

SURVEYOR'S NOTES

HORIZONTAL DATUM:
BASIS OF BEARINGS: HELD OTAK POINTS 704 AND 700 PROVIDED BY THE CITY OF MUKILTEO.

POINT #700:	338071.42 NORTHING,	1277000.71 EASTING,	ELEV.=71.31	PK NAIL/WASHER
POINT #704:	337944.13 NORTHING,	1277024.77 EASTING,	ELEV.=68.82	PK NAIL/WASHER

VERTICAL DATUM:
N.A.V.D. 88

PROJECT CONTROL:

POINT #1:	337703.985 NORTHING,	1277011.377 EASTING,	ELEV.=138.15	MAG NAIL/WASHER
POINT #2:	337600.194 NORTHING,	1276545.835 EASTING,	ELEV.=164.99	GIN SPIKE
POINT #4:	337608.432 NORTHING,	1276803.753 EASTING,	ELEV.=161.28	MAG NAIL/WASHER
POINT #16:	337738.856 NORTHING,	1276799.437 EASTING,	ELEV.=108.40	MAG NAIL/WASHER

SURVEYOR'S NOTES:
1) SITE CONTROL ESTABLISHED BY STATIC GPS OBSERVATIONS, USING TRIMBLE R8 AND R6 GPS EQUIPMENT. TOPOGRAPHIC SURVEY PERFORMED USING A TRIMBLE S6 ROBOTIC TOTAL STATION.

CALL TWO BUSINESS DAYS BEFORE YOU DIG
811 Know what's below. 811 before you dig.

APPROVED FOR CONSTRUCTION:

PUBLIC WORKS DIRECTOR DATE

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Filename:
Drawn By: J. HOYER
Checked By: J. TUTTLE
Surveyed By:
Date:
Field Bk/Pg:
Datum:
Recorded Survey: SNOHOMISH COUNTY
AF–
Vol/Bk _ Page
Firm: Aerial Mapping & Control Survey
Date: JUNE 29, 2018
GIS Cntl Pnts:
Firm:
Date: JUNE 29, 2018
Field BK/PG:
Constructed By:
Date:

NO.	DATE	BY	REVISION

Scale:
Horiz: 1"=50'
Vert: –
Designed By:
Inspected By:
W.O. No.:
Date: JULY 12, 2018

CITY OF MUKILTEO

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT
11930 Cyrus Way Mukilteo, Washington 98275
425–263–8000 FAX 425–290–1009
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JOHN RAYMOND TUTTLE
43718

61st Place West
Retaining Wall Project
99% Design - Not For Construction

TITLE SHEET, VICINITY MAP, AND SHEET INDEX

T1

APPENDIX B - CONSTRUCTION NOTES

B.1 GENERAL NOTES

1. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH CURRENT CITY OF MUKILTEO DEVELOPMENT STANDARDS; THE CURRENT EDITION OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION; AND THE ADOPTED EDITION OF THE WASHINGTON STATE DEPARTMENT OF ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON.
2. ALL WORK WITHIN THE CITY RIGHT-OF-WAY SHALL BE SUBJECT TO THE INSPECTION OF THE CITY.
3. THE CONTRACTOR IS RESPONSIBLE FOR WATER QUALITY AS DETERMINED BY THE MONITORING PROGRAM ESTABLISHED BY THE CITY. FOR INFORMATION, THE CONTRACTOR SHALL CONTACT THE PROJECT MANAGER (RANDALL ROBERTS, P.E., 425-263-8084) OR THE PROJECT BIOLOGIST (BRAD THIELE, 206-234-2520).
4. PRIOR TO ANY SITE WORK, THE CONTRACTOR SHALL CONTACT THE CITY OF MUKILTEO PLANNING & COMMUNITY DEVELOPMENT AT 425-263-8000 TO SCHEDULE A PRECONSTRUCTION CONFERENCE.
5. DATA TO SUPPORT CREATION OF AS-BUILT DRAWINGS WILL BE COLLECTED BY THE CONTRACTOR TO DOCUMENT INSTALLATION AND ANY PLAN CHANGES MADE DURING CONSTRUCTION.
6. THE CONTRACTOR SHALL KEEP A SET OF PLANS ON-SITE AT ALL TIMES FOR RECORDING AS-BUILT INFORMATION. THIS SET SHALL BE SUBMITTED TO THE PROJECT MANAGER AT COMPLETION OF CONSTRUCTION AND PRIOR TO FINAL ACCEPTANCE OF WORK
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS FOR UTILITY, ROAD, AND RIGHT-OF-WAY CONSTRUCTION.
8. THE CONSTRUCTION STORMWATER POLLUTION PREVENTION (SWPP) FACILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE APPROVED SWPPP PLANS PRIOR TO ANY GRADING OR LAND CLEARING ACTIVITIES. AN INSPECTION BY THE CITY OF THESE FACILITIES SHALL BE ARRANGED FOR BY THE CONTRACTOR PRIOR TO ANY GRADING. THESE FACILITIES MUST BE SATISFACTORILY MAINTAINED UNTIL CONSTRUCTION AND MITIGATION PLANTINGS ARE COMPLETE AND THE POTENTIAL FOR EROSION HAS PASSED.
9. SEDIMENT-LADEN WATER SHALL NOT ENTER THE NATURAL DRAINAGE SYSTEM.
10. A CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (CESCL) OR SWPPP SUPERVISOR SHALL BE RESPONSIBLE FOR MAINTAINING THE CONSTRUCTION SWPP FACILITIES, AS OUTLINED IN THE APPROVED SWPPP, OR AS MODIFIED FROM TIME TO TIME. CONTACT INFORMATION FOR THE CESCL (OR SWPPP SUPERVISOR) FOR THE PROJECT SHALL BE GIVEN TO THE CITY BY THE CONTRACTOR AT THE PRECONSTRUCTION CONFERENCE.
11. NONCOMPLIANCE WITH THE REQUIREMENTS FOR EROSION CONTROLS, WATER QUALITY, AND CLEARING LIMITS MAY RESULT IN REVOCATION OF PROJECT PERMITS, PLAN APPROVALS, AND BOND FORECLOSURES.
12. TRENCH BACKFILL OF NEW UTILITIES AND STORM DRAINAGE FACILITIES SHALL BE COMPACTED TO 95% MAXIMUM DENSITY (MODIFIED PROCTOR) UNDER ROADWAYS AND 90% MAXIMUM DENSITY (MODIFIED PROCTOR) OFF ROADWAYS. COMPACTION SHALL BE PERFORMED IN ACCORDANCE WITH SECTIONS 7-08.3(3) AND 2-03.3(14)D OF THE WSDOT STANDARD SPECIFICATIONS.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UTILITIES PRIOR TO AND DURING CONSTRUCTION. LOCATION OF UTILITIES SHOWN ON CONSTRUCTION PLANS ARE BASED ON BEST RECORDS AVAILABLE AND ARE SUBJECT TO VARIATION. FOR ASSISTANCE IN UTILITY LOCATION, CALL 811.
14. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE PROJECT MANAGER WHEN CONFLICTS EXIST BETWEEN THE PLANS AND FIELD CONDITIONS. CONFLICTS SHALL BE RESOLVED (INCLUDING PLAN AND PROFILE REVISIONS) AND RESUBMITTED FOR APPROVAL PRIOR TO PROCEEDING WITH CONSTRUCTION.
15. A RIGHT-OF-WAY PERMIT AND APPROVAL OF THE TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN SHALL BE OBTAINED FROM THE CITY PRIOR TO ANY ON-SITE GRADING.

B.2 SITE GRADING AND CONSTRUCTION SWPPP NOTES

1. PRIOR TO ANY SITE CONSTRUCTION INCLUDING CLEARING/LOGGING OR GRADING, THE SITE CLEARING LIMITS SHALL BE LOCATED AND FIELD IDENTIFIED BY THE PROJECT SURVEYOR (OR PROJECT ENGINEER OR PROJECT BIOLOGIST) AS REQUIRED BY THESE PLANS. THE CONTRACTOR SHALL CONTACT THE CITY TO OBTAIN THE NAME AND PHONE NUMBER OF THE PROJECT SURVEYOR RESPONSIBLE FOR DELINEATING THESE LIMITS .
2. SOILS IN MUKILTEO OFTEN CONTAIN FINER PARTICLES WHICH WILL PASS THROUGH SEDIMENT TRAPS UNTREATED AND HAVE EXTREMELY LONG SETTLING TIMES. THEREFORE, THE NEED TO CONTROL EROSION FROM THE SITE IS THE FIRST PRIORITY AND IS EMPHASIZED BY THESE NOTES.
3. STOCKPILES ARE TO BE LOCATED IN SAFE AREAS AND ADEQUATELY PROTECTED BY TEMPORARY SEEDING AND MULCHING, PERIMETER BMPS, OR TEMPORARY SEEDING.
4. ALL EARTH WORK SHALL BE PERFORMED IN ACCORDANCE WITH CITY STANDARDS. A PRECONSTRUCTION SOILS INVESTIGATION MAY BE REQUIRED TO EVALUATE SOIL STABILITY.
5. THE SURFACE OF ALL SLOPES SHALL BE COMPACTED. THIS MAY BE ACCOMPLISHED BY OVER-BUILDING THE SLOPES, THEN CUTTING BACK TO FINAL GRADES; OR BY COMPACTING EACH LIFT AS THE SLOPE IS BEING CONSTRUCTED. ALL SLOPES SHALL BE COMPACTED BY THE END OF EACH WORKING DAY.
6. ALL STRUCTURAL FILLS SHALL BE COMPACTED TO A MINIMUM OF 95% MAXIMUM DENSITY IN THE UPPER FOUR FEET AND 90% MAXIMUM DENSITY BELOW FOUR FEET AS DETERMINED BY MODIFIED PROCTOR METHODS.
7. A WET WEATHER EROSION CONTROL PLAN MUST BE SUBMITTED TO THE CITY FOR REVIEW AND APPROVAL ON OR BEFORE SEPTEMBER 1, IF THE PROJECT IS PROPOSING TO ACTIVELY CLEAR, GRADE, OR OTHERWISE DISTURB 1,000 SQUARE FEET OR MORE OF SOIL DURING THE PERIOD BETWEEN OCTOBER 1 AND APRIL 30. OTHER THRESHOLDS FOR A WET WEATHER EROSION CONTROL PLAN INCLUDE PROJECTS THAT:
    - A. HAVE AN AREA OR AREAS THAT DRAIN, BY PIPE, OPEN DITCH, SHEET FLOW, OR A COMBINATION OF THESE TO A TRIBUTARY WATER, AND THE TRIBUTARY WATER IS ONE-QUARTER MILE OR LESS DOWNSTREAM; OR
    - B. HAVE SLOPES STEEPER THAN 15 PERCENT ADJACENT OR ON-SITE; OR
    - C. HAVE HIGH POTENTIAL FOR SEDIMENT TRANSPORT; OR
    - D. HAVE A CRITICAL AREA OR CRITICAL AREA BUFFER ON-SITE, OR WITHIN 50 FEET OF THE SITE;
    - E. OR HAVE HIGH GROUNDWATER TABLE OR SPRINGS.

B.3 TEMPORARY SEEDING GENERAL NOTES

1. USE SEEDING THROUGHOUT THE PROJECT ON DISTURBED AREAS THAT HAVE REACHED FINAL GRADE OR THAT WILL REMAIN UNWORKED FOR MORE THAN 30 DAYS.
2. THE OPTIMUM SEEDING WINDOWS ARE APRIL 1 THROUGH JUNE 30 AND SEPTEMBER 1 THROUGH OCTOBER 1.
3. BETWEEN OCTOBER 1 AND MARCH 30 SEEDING REQUIRES A COVER OF MULCH WITH STRAW OR AN EROSION CONTROL BLANKET UNTIL 75 PERCENT GRASS COVER IS ESTABLISHED.
4. REVIEW ALL DISTURBED AREAS IN LATE AUGUST TO EARLY SEPTEMBER AND COMPLETE ALL SEEDING BY THE END OF SEPTEMBER.
    - A. MULCH IS REQUIRED AT ALL TIMES FOR SEEDING. MULCH CAN BE APPLIED ON TOP OF THE SEED OR SIMULTANEOUSLY BY HYDROSEEDING (SEE ECOLOGY BMP C121 MULCHING FOR SPECIFICATIONS).
    - B. SEED AND MULCH ALL DISTURBED AREAS NOT OTHERWISE VEGETATED AT FINAL SITE STABILIZATION.

B.4 MAINTENANCE OF SILTATION BARRIERS

1. SILTATION BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. CLOSE ATTENTION SHALL BE PAID TO THE REPAIR OF DAMAGED EROSION CONTROL ELEMENTS, ESPECIALLY END-RUNS AND SEDIMENT BUILD-UP. NECESSARY REPAIRS TO BARRIERS SHALL BE ACCOMPLISHED THE SAME DAY.
2. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH RAINFALL. SEDIMENT DEPOSITS MUST BE REMOVED WHEN THE SEDIMENT LEVEL REACHES APPROXIMATELY ONE-HALF THE SILTATION BARRIER HEIGHT.
3. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE CHECK DAM IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM TO THE EXISTING GRADE, PREPARED AND SEEDED.

B.5 STORM DRAINAGE GENERAL NOTES

1. ALL PIPE SHALL BE PLACED ACCORDING DIVISION 7 OF THE WSDOT STANDARD SPECIFICATIONS.
2. BACKFILL SHALL BE PLACED EQUALLY ON BOTH SIDES OF THE PIPE. EACH LIFT SHALL BE THOROUGHLY COMPACTED. COMPACTED LIFTS MUST EXTEND TO THE SIDE OF THE TRENCH. BACKFILL OVER THE PIPE SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 7-08.3(3) THE WSDOT STANDARD SPECIFICATIONS.
3. ALL GRATES LOCATED IN THE GUTTER FLOW LINE (INLET AND CATCH BASIN) SHALL BE DEPRESSED 0.1 FEET BELOW A PROJECTED FLOW LINE ELEVATION, EXCEPT FOR STRUCTURES REQUIRING SOLID LIDS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING ALL MANHOLE, INLET AND CATCH BASIN FRAMES AND GRATES TO GRADE JUST PRIOR TO CURB INSTALLATION AND/OR PAVING.
5. ALL CATCH BASINS WITH A DEPTH OF 5 FEET OR GREATER TO THE FLOW LINE SHALL BE TYPE 2 CATCH BASINS.
6. VANED GRATES ARE REQUIRED ON ALL STORM STRUCTURES. ALL CATCH BASINS AND MANHOLES SHALL HAVE LOCKING LIDS. ROLLED GRATES ARE NOT APPROVED FOR USE.
7. POLYPROPYLENE SAFETY STEPS AND LADDER STEPS SHALL BE PROVIDED IN ALL MANHOLES AND SHALL BE POSITIONED CORRECTLY WITH THE BOLT AREAS ON THE RIM.
8. CATCH BASIN FRAMES AND GRATES SHALL BE OLYMPIC FOUNDRY MODEL SM60, SM52, OR SM44, LOCKING TYPE OR EQUIVALENT. MODEL SM52 SHALL BE REFERRED TO AS A “THRU-CURB INLET” ON THE PLANS.
9. PRIOR TO SIDEWALK CONSTRUCTION; BACK OF WALL DRAIN LINES MUST BE INSTALLED AS REQUIRED. PIPE SHALL BE PVC 3034, OR SDR-35. LOCATIONS OF THESE INSTALLATIONS SHALL BE SHOWN ON THE AS-BUILT CONSTRUCTION PLANS SUBMITTED TO THE CITY.
10. STORM PIPING AND CATCH BASINS SHALL BE FLUSHED AND CLEANED BY THE CONTRACTOR PRIOR TO:
    - A. CITY OF MUKILTEO FINAL ACCEPTANCE OF THE PROJECT AND;
    - B. UPON COMMENCEMENT AND COMPLETION OF THE WARRANTY PERIOD. AN INVOICE DETAILING THE FLUSHING AND CLEANING SHALL BE PROVIDED TO THE CITY.
11. ALL PIPES SHALL BE INSTALLED WITH RUBBER GASKETS AS PER MANUFACTURER'S RECOMMENDATIONS.
12. UPON REQUEST BY THE CITY INSPECTOR, ALL PIPE RUNS SHALL PASS THE LOW PRESSURE AIR TEST REQUIREMENTS OF SECTION 7-04.3(1) E AND F OF THE WSDOT STANDARD SPECIFICATIONS. PIPE RUNS SHALL BE TESTED WITH PIPE LOADED AND COMPACTED TO FINISH GRADE.
13. UPON REQUEST BY THE CITY INSPECTOR, PIPE SHALL BE SUBJECT TO MANDREL TESTING (MANDREL SIZE = 90% OF NOMINAL PIPE DIAMETER).
14. PIPE SHALL BE STORED ON-SITE IN SHIPPING BUNKS ON A FLAT LEVEL SURFACE. THIS REQUIREMENT WILL BE STRICTLY ENFORCED. FAILURE TO COMPLY MAY RESULT IN REJECTION OF THE PIPE AND/OR FUTURE RESTRICTION ON USE OF MATERIAL.
15. COUPLINGS SHALL BE INTEGRAL BELL AND SPIGOT OR DOUBLE BELL SEPARATE COUPLINGS. SPLIT COUPLINGS WILL NOT BE ALLOWED.
16. ALL NON-PERFORATED METAL PIPE SHALL HAVE NEOPRENE GASKETS AT THE JOINTS. O-RING GASKETS MAY BE USED FOR TYPE-F COUPLING BANDS.
17. CULVERT ENDS SHALL BE BEVELED TO MATCH SIDE SLOPES. FIELD CUTTING OF CULVERT ENDS IS PERMITTED WHEN APPROVED BY THE CITY.
18. ALL FIELD CUT CULVERT PIPE SHALL BE TREATED AS REQUIRED IN THE STANDARD SPECIFICATIONS OR GENERAL SPECIAL PROVISIONS.

SYMBOL AND LINE LEGEND

◕	EXISTING CONTROL POINT	— — — — — —	EXISTING RIGHT–OF–WAY LINE
Ⓜ MW	EXISTING MONITORING WELL	——— - - ———	EXISTING PROPERTY LINE
Ⓢ	EXISTING SANITARY MANHOLE	——— · · · ———	EXISTING EASEMENT LINE
▣	EXISTING STORM DRAIN CATCH BASIN	============	EXISTING CURB AND GUTTER
⊠	EXISTING POWER BOX	- - - - - - - - - -	EXISTING EDGE OF PAVEMENT
P	EXISTING POWER TRANSFORMER	——— · · · ———	EXISTING DITCH LINE
▣	EXISTING TELEPHONE RISER	———x———	EXISTING FENCE LINE
⋈	EXISTING WATER VALVE	———SS———SS———	EXISTING SANITARY SEWER LINE
-○-	EXISTING UTILITY POLE	——D————D———	EXISTING STORM DRAIN LINE
-o-	EXISTING SIGN	o———o———o———oo	EXISTING GUARDRAIL
✳	EXISTING TREE	———OHP———	EXISTING OVERHEAD POWER LINE
		——— UGP ———	EXISTING UNDERGROUND ELECTRICAL
		~ ~ ~ ~	EXISTING CONTOUR
▒	EXISTING GRAVEL/ASPHALT	—— · —— · —— · ——	SAWCUT LINE
░	EXISTING WETLAND/GRASS	——— · · · ———	ASPHALT FLOWLINE
		———SD———	STORM DRAIN LINE
▨	PROPOSED ASPHALT	▨	PIPE PLUG

ABBREVIATIONS

ASPH	ASPHALT
ADS	ADVANCED DRAINAGE SYSTEMS
APPROX.	APPROXIMATE
BLK	BLOCK
BLVD	BOULEVARD
BMP	BEST MANAGEMENT PRACTICE
BO	BLOW–OFF
BVCE	BEGIN VERTICAL CURVE ELEVATION
BVCS	BEGIN VERTICAL CURVE STATION
C	CONIFEROUS
CB	CATCH BASIN
CL/C–L	CENTERLINE
CMP	CORRUGATED METAL PIPE
COM	CITY OF MUKILTEO
COMB	COMBINATION
CONC	CONCRETE
CONST.	CONSTRUCTION
CP	CONTROL POINT
CTRL	CONTROL
D	DECIDUOUS
DI	DUCTILE IRON
DIA	DIAMETER
DR	DRIVE
E	EAST, EASTING
EA	EACH
ELEV	ELEVATION
EST	ESTIMATE
EXCB	EXISTING CATCH BASIN
EVCE	END VERTICAL CURVE ELEVATION
EVCS	END VERTICAL CURVE STATION
EX/EXST	EXISTING
EXT	EXTRUDED
FDC	FIRE DEPARTMENT CONNECTION
FH	FIRE HYDRANT
FL	FLOW LINE
FND	FOUND
GA	GUY ANCHOR
GRAV	GRAVEL
GV	GATE VALVE
HMA	HOT MIX ASPHALT
HORIZ	HORIZONTAL
ICB	IRRIGATION CONTROL BOX
IE	INVERT ELEVATION
INCL.	INCLUDING
JB	JUNCTION BOX
LAND	LANDSCAPING
LF	LINEAR FEET
LP	LIGHT POLE
LT	LEFT
LVC	LENGTH OF VERTICAL CURVE
MAX.	MAXIMUM
MH	MANHOLE
MB	MAILBOX
MIN	MINIMUM
MPH	MILES PER HOUR
N	NORTHING
NAD	NORTH AMERICAN DATUM
NAVD	NORTH AMERICAN VERTICAL DATUM
NE	NORTHEAST
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NO	NUMBER
NTS	NOT TO SCALE
NW	NORTHWEST
OC	ON CENTER
PB	POWER BOX
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PERF.	PERFORATED
PM	POWER METER
PP	POWER POLE
PROP	PROPOSED
PT	POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE
PV	POWER VAULT
PVI	POINT OF VERTICAL INTERSECTION
PX	PEDESTRIAN PUSHBUTTON
ROW	RIGHT–OF–WAY
RD	ROAD
RR	RAILROAD
RT	RIGHT
S	SLOPE
SC	SERVICE CABINET
SD	STORM DRAIN
SDCO	STORM DRAIN CLEANOUT
SDMH	STORM DRAIN MANHOLE
SE	SOUTHEAST
SF	SQUARE FEET
SHDR	SHOULDER
SPEC.	SPECIFICATION
SR	STATE ROUTE
SSCO	SANITARY SEWER CLEANOUT
SSMH	SANITARY SEWER MANHOLE
STA	STATION
STD	STANDARD
SW	SOUTHWEST
SY	SQUARE YARDS
TAE	THICKENED ASPHALT EDGE
TF	TRANSFORMER
TYP	TYPICAL
UP	UTILITY POLE
VERT	VERTICAL
WAC	WASHINGTON ADMINISTRATIVE CODE
WM	WATER METER
WMS	WATER METERS
WR	WATER RISER
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
WV	WATER VALVE
WVS	WATER VALVES

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XREF Filename:
Filename:
Drawn By: J. HOYER
Checked By: J. TUTTLE
Surveyed By:
Date:
Field Bk/Pg:
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Recorded Survey: SNOHOMISH COUNTY
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Date: JUNE 29, 2018
GIS Cntl Pnts:
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Date: JUNE 29, 2018
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Scale:
Horiz:
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Designed By:
Inspected By:
W.O. No.:
Date:
JULY 12, 2018

CITY OF MUKILTEO

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT

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http://mukilteowa.gov

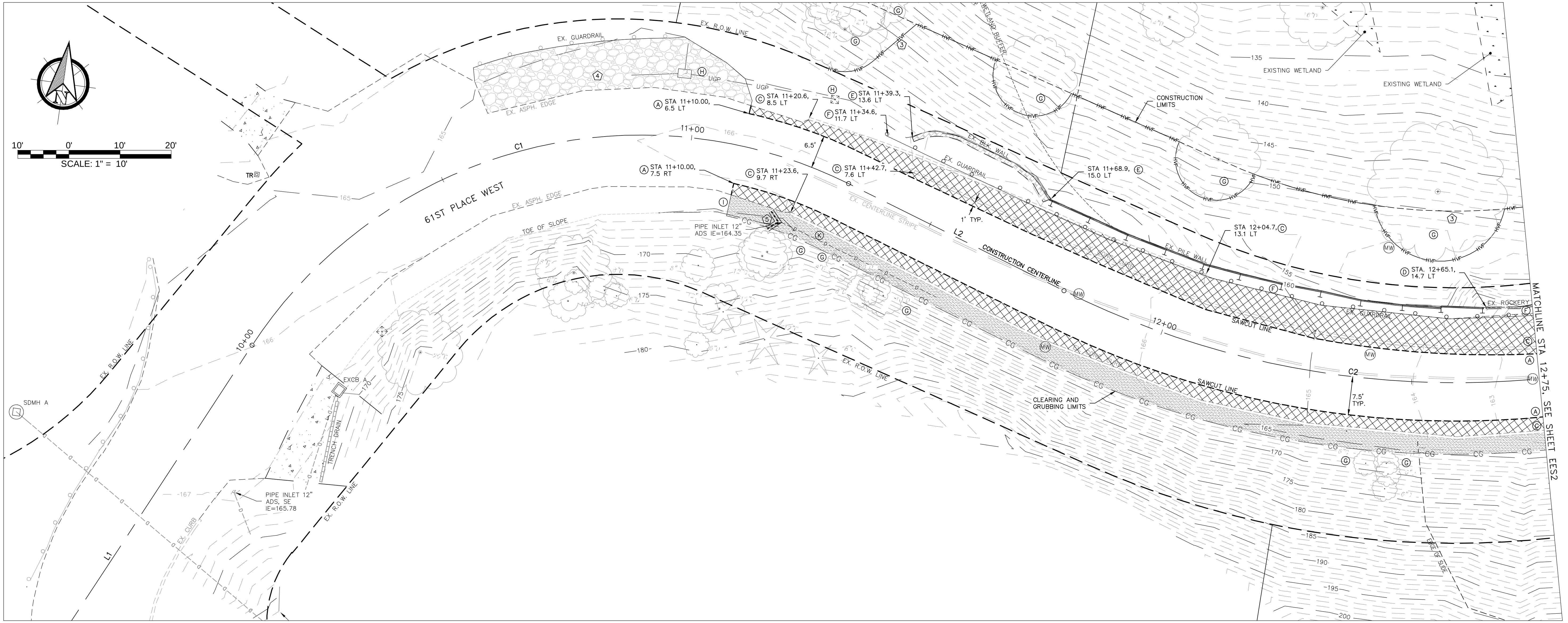
JOHN RAYMOND TUTTLE
43718

61st Place West Retaining Wall Project

99% Design - Not For Construction

CITY DEVELOPMENT NOTES AND LEGENDS

DNL1



○ SITE PREPARATION NOTES

A. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT IN PREPARATION FOR CONSTRUCTION OF ROADWAY IMPROVEMENTS AS DESCRIBED WITHIN THE ROADWAY EXCAVATION INCL. HAUL SPECIAL PROVISION. REMOVAL TIMELINE DEPENDANT UPON PHASED TRAFFIC CONTROL STRATEGIES AND CONSTRUCTION ACTIVITIES. CLEAN AND TACK ALL ASPHALT EDGES PRIOR TO PAVING. SEAL ALL JOINTS AFTER PAVING WITH PG 64–22 BINDER.

B. NOTE NOT USED ON THIS SHEET.

C. REMOVE EXISTING CONCRETE CURB AS DESCRIBED WITHIN THE ROADWAY EXCAVATION INCL. HAUL SPECIAL PROVISION.

D. REMOVE LIMITS OF EXISTING ROCKERY WALL IN PREPARATION FOR PROJECT IMPROVEMENTS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. MATERIALS TO BE SALVAGED FOR REUSE BY THE CITY.

E. REMOVE LIMITS OF EXISTING MODULAR BLOCK WALL IN PREPARATION FOR PROJECT IMPROVEMENTS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. MATERIALS TO BE SALVAGED FOR REUSE BY THE CITY.

F. REMOVE ALL ELEMENTS OF EXISTING GUARDRAIL INCLUDING RAIL, BLOCKING, POSTS, AND ANCHORS.

G. TO THE LARGEST EXTENT PRACTICAL, PROVIDE PROTECTION AND RETAINAGE OF EXISTING TREES, BUSHES, AND ROOT SYSTEMS THAT WILL REMAIN AFTER CONSTRUCTION.

H. MAINTAIN FULL ACCESS TO EXISTING POWER AND COMMUNICATIONS STRUCTURES AND SYSTEMS THROUGHOUT CONSTRUCTION AND PROVIDE FULL FUNCTION OF SAME STRUCTURES AND SYSTEMS AFTER CONSTRUCTION.

I. BACKFILL AND ABANDON EXISTING DITCH AS PART OF CORRIDOR IMPROVEMENTS.

J. NOTE NOT USED ON THIS SHEET.

K. REMOVE EXISTING STORM PIPING OR SLOPE DRAINS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. SEE THE ROAD AND STORM PLAN AND PROFILE PLANS FOR THE EXTENT OF STORM IMPROVEMENTS.

L. NOTE NOT USED ON THIS SHEET.

⬠ EROSION CONTROL NOTES

1. NOTE NOT USED ON THIS SHEET.
2. NOTE NOT USED ON THIS SHEET.
3. INSTALL HIGH VISIBILITY SILT FENCE TO INTERCEPT AND MITIGATE UPSLOPE RUNOFF, TO PROTECT DOWNSTREAM PROPERTIES, CRITICAL AREAS, AND DRAINAGE SYSTEMS, AND TO DELINEATE AREAS NEEDING PROTECTION FROM CONSTRUCTION ACTIVITIES. SEE WSDOT STANDARD PLAN I–30.17–00.
4. CONSTRUCT STABILIZED CONSTRUCTION ENTRANCE AS SHOWN PER COM STANDARD PLAN EC–006.
5. INSTALL BIODEGRADABLE CHECK DAMS IN EXISTING OR TEMPORARY CONVEYANCE DITCH AS SHOWN TO PREVENT RUNOFF FROM ENTERING ADJACENT PROPERTIES AND DOWNSTREAM CONVEYANCES. ASSUME CHECK DAM WILL REQUIRE RESETTING/RELOCATING AS PART OF INSTALLATION OF IMPROVEMENTS. ANY POINTS OF CONCENTRATED DISCHARGE WILL BE REDIRECTED TO AN ADJACENT CATCH BASIN OR CONVEYANCE SYSTEM. SEE WSDOT STANDARD PLAN I–50.20–01.
6. NOTE NOT USED ON THIS SHEET.

EXISTING STRUCTURES TABLE

SDMH A	EXCB A
RIM=156.26	RIM=167.41
18" CMP E, IE=152.36	4" PVC E, IE=164.30
12" ADS S, IE=152.56	4" PVC S, IE=166.21
24" PVC W, IE=150.96	12" CMP S, IE=164.11

RECOMMENDED EROSION CONTROL CONSTRUCTION SEQUENCE

1. CONDUCT PRE–CONSTRUCTION MEETING WITH CITY AND ENGINEER.
2. FLAG OR FENCE LIMITS OF DISTURBANCE/CONSTRUCTION.
3. INSTALL STORM DRAIN INLET PROTECTION IN EXISTING CATCH BASINS, AS REQUIRED.
4. INSTALL PERIMETER SITE AND CRITICAL AREA PROTECTION (HIGH VISIBILITY) FENCING.
5. GRADE AND INSTALL CONSTRUCTION ACCESSES/CONSTRUCTION STAGING AREAS.
6. INSTALL AND MAINTAIN EROSION CONTROL MEASURES IN ACCORDANCE WITH ECOLOGY'S STORMWATER MANAGEMENT MANUAL, THE PROJECT'S STORMWATER POLLUTION PREVENTION PLAN, AND PER THE MANUFACTURER'S RECOMMENDATIONS.
7. RELOCATE EROSION CONTROL MEASURES AS SITE CONDITIONS CHANGE TO ENSURE EROSION AND SEDIMENT CONTROL IS ALWAYS IN ACCORDANCE WITH ECOLOGY'S EROSION AND SEDIMENT CONTROL STANDARDS.
8. COVER ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN SEVEN DAYS DURING THE DRY SEASON OR TWO DAYS DURING THE WET SEASON WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING, OR EQUIVALENT.
9. STABILIZE PER SWPPP ALL AREAS THAT REACH FINAL GRADE WITHIN SEVEN DAYS.
10. SEED OR SOD ANY AREAS TO REMAIN UNWORKED FOR MORE THAN 30 DAYS.
11. UPON COMPLETION OF THE PROJECT, STABILIZE PER SWPPP ALL DISTURBED AREAS AND REMOVE ALL TEMPORARY BMPS.

GENERAL NOTES

1. THE CONTRACTOR SHALL INSTALL ALL NECESSARY BEST MANAGEMENT PRACTICES TO PROTECT DOWNSTREAM PROPERTIES AND WATER BODIES.
2. CARE SHALL BE TAKEN DURING INSTALLATION OF BEST MANAGEMENT PRACTICES NEAR EXISTING UTILITY LINES.
3. AS APPLICABLE, POSITION BMPS WITHIN PUBLIC RIGHT–OF–WAY SO AS NOT TO DISTURB PRIVATE PROPERTY.
4. CONTOURS ARE SHOWN AT A ONE–FOOT INTERVAL.
5. LOCATIONS OF UTILITIES ARE SHOWN FOR DISPLAY PURPOSES ONLY. THE CONTRACTOR SHALL TO VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION OF IMPROVEMENTS ADJACENT TO UTILITIES WITHIN WORK AREAS.

LEGEND

⊕	INLET PROTECTION
—HVF—	HIGH VISIBILITY SILT FENCE
➤➤➤➤	WATTLE/WATTLE AS CHECK DAM
⊠	ROADWAY DEMOLITION AREA
▨	GRUBBING AREA

TUTTLE ENGINEERING
AND MANAGEMENT
275 West Rio Vista Avenue, Suite 1 Burlington, WA 98233
O:| (360) 899-5953 W:| www.tuttle-team.com

NO.	DATE	BY	REVISION

PLAN PRINTED AT
11"x17" DEPICTS A 1:2
SCALE RATIO
(I.E. 1"=10' TO 1"=20')

Scale:
Horiz: 1"=10'
Vert: –
Designed By:
Inspected By:
W.O. No.:
Date:
JULY 12, 2018

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT

11930 Cyrus Way Mukilteo, Washington 98275
425–263–8000 FAX 425–290–1009
http://mukilteowa.gov

JOHN RAYMOND TUTTLE
43718

61st Place West
Retaining Wall Project

99% Design - Not For Construction

EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN

EES1

XREF Filename:
Filename:
Drawn By: J. HOYER
Checked By: J. TUTTLE
Surveyed By:
Date:
Field Bk/Pg:
Datum:
Recorded Survey: SNOHOMISH COUNTY
AF–
Vol/Bk Page
Aerial Mapping & Control Survey
Firm:
Date: JUNE 29, 2018
GIS Cntl Pnts:
Firm:
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Field BK/PG:
Constructed By:
Date:

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⬠ EROSION CONTROL NOTES

1. INSTALL STORM DRAIN INLET PROTECTION IN EACH EXISTING CATCH BASIN PER COM STANDARD PLAN EC-007.
2. INSTALL STORM DRAIN INLET PROTECTION IN EACH NEW CATCH BASIN AFTER IT HAS BEEN INSTALLED PER COM STANDARD PLAN EC-007.
3. INSTALL HIGH VISIBILITY SILT FENCE TO INTERCEPT AND MITIGATE UPSLOPE RUNOFF, TO PROTECT DOWNSTREAM PROPERTIES, CRITICAL AREAS, AND DRAINAGE SYSTEMS, AND TO DELINEATE AREAS NEEDING PROTECTION FROM CONSTRUCTION ACTIVITIES. SEE WSDOT STANDARD PLAN I-30.17-00.
4. NOTE NOT USED ON THIS SHEET.
5. INSTALL BIODEGRADABLE CHECK DAMS IN EXISTING OR TEMPORARY CONVEYANCE DITCH AS SHOWN TO PREVENT RUNOFF FROM ENTERING ADJACENT PROPERTIES AND DOWNSTREAM CONVEYANCES. ASSUME CHECK DAM WILL REQUIRE RESETTING/RELOCATING AS PART OF INSTALLATION OF IMPROVEMENTS. ANY POINTS OF CONCENTRATED DISCHARGE WILL BE REDIRECTED TO AN ADJACENT CATCH BASIN OR CONVEYANCE SYSTEM. SEE WSDOT STANDARD PLAN I-50.20-01.
6. INSTALL WATTLE TO REDIRECT UP-SLOPE RUNOFF AWAY FROM WORK AREAS AND TO PROTECT DOWNSTREAM SYSTEMS. WATTLES INSTALLED ON IMPERVIOUS SURFACES SHALL BE SECURED WITH SAND BAGS. RESET AS CONSTRUCTION ACTIVITIES OR PRESERVATION OF ACCESS MANDATE. SEE WSDOT STANDARD PLAN I-30.40-01.

○ SITE PREPARATION NOTES

A. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT IN PREPARATION FOR CONSTRUCTION OF ROADWAY IMPROVEMENTS AS DESCRIBED WITHIN THE ROADWAY EXCAVATION INCL. HAUL SPECIAL PROVISION. REMOVAL TIMELINE DEPENDANT UPON PHASED TRAFFIC CONTROL STRATEGIES AND CONSTRUCTION ACTIVITIES. CLEAN AND TACK ALL ASPHALT EDGES PRIOR TO PAVING. SEAL ALL JOINTS AFTER PAVING WITH PG 64-22 BINDER.

B. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT AS PART OF STORM SYSTEM INSTALLATION. WIDTH VARIES PER DETAIL 3/D1.

C. REMOVE EXISTING CONCRETE CURB AS DESCRIBED WITHIN THE ROADWAY EXCAVATION INCL. HAUL SPECIAL PROVISION.

D. REMOVE LIMITS OF EXISTING ROCKERY WALL IN PREPARATION FOR PROJECT IMPROVEMENTS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. MATERIALS TO BE SALVAGED FOR REUSE BY THE CITY.

E. NOTE NOT USED ON THIS SHEET.

F. REMOVE ALL ELEMENTS OF EXISTING GUARDRAIL INCLUDING RAIL, BLOCKING, POSTS, AND ANCHORS.

G. TO THE LARGEST EXTENT PRACTICAL, PROVIDE PROTECTION AND RETAINAGE OF EXISTING TREES, BUSHES, AND ROOT SYSTEMS THAT WILL REMAIN AFTER CONSTRUCTION.

H. MAINTAIN FULL ACCESS TO EXISTING POWER AND COMMUNICATIONS STRUCTURES AND SYSTEMS THROUGHOUT CONSTRUCTION AND PROVIDE FULL FUNCTION OF SAME STRUCTURES AND SYSTEMS AFTER CONSTRUCTION.

I. BACKFILL AND ABANDON EXISTING DITCH AS PART OF CORRIDOR IMPROVEMENTS.

J. REMOVE EXISTING STORM STRUCTURE TO ACCOMMODATE INSTALLATION OF NEW STORM SYSTEM.

K. REMOVE EXISTING STORM PIPING OR SLOPE DRAINS AS DESCRIBED WITHIN THE REMOVAL OF STRUCTURES AND OBSTRUCTIONS SPECIAL PROVISION. SEE THE ROAD AND STORM PLAN AND PROFILE PLANS FOR THE EXTENT OF STORM IMPROVEMENTS.

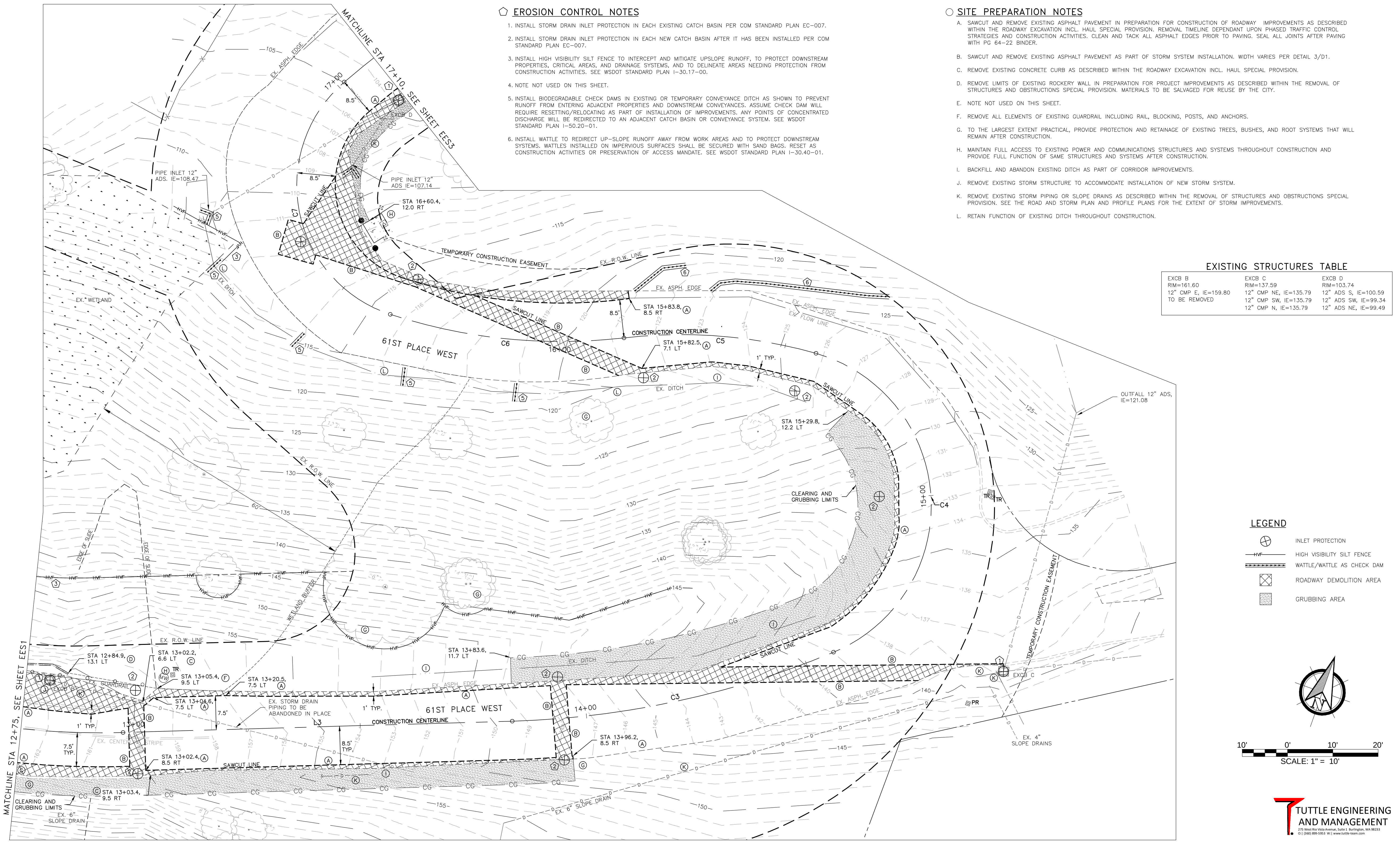
L. RETAIN FUNCTION OF EXISTING DITCH THROUGHOUT CONSTRUCTION.

EXISTING STRUCTURES TABLE

EXCB B RIM=161.60 12" CMP E, IE=159.80 TO BE REMOVED	EXCB C RIM=137.59 12" CMP NE, IE=135.79 12" CMP SW, IE=135.79 12" CMP N, IE=135.79	EXCB D RIM=103.74 12" ADS S, IE=100.59 12" ADS SW, IE=99.34 12" ADS NE, IE=99.49

LEGEND

⊕	INLET PROTECTION
—HVF—	HIGH VISIBILITY SILT FENCE
▬	WATTLE/WATTLE AS CHECK DAM
☒	ROADWAY DEMOLITION AREA
▨	GRUBBING AREA



TUTTLE ENGINEERING AND MANAGEMENT

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XREF Filename:
Filename:
Drawn By: J. HOYER
Checked By: J. TUTTLE
Surveyed By:
Date:
Field Bk/Pg:
Datum:
Recorded Survey: SNOHOMISH COUNTY
AF-
Vol/Bk. Page
Firm: Aerial Mapping & Control Survey
Date: JUNE 29, 2018
GIS Cntl Pnts:
Firm:
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NO.	DATE	BY	REVISION

PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

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Designed By:
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CITY OF MUKILTEO

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT

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425-263-8000 FAX 425-290-1009
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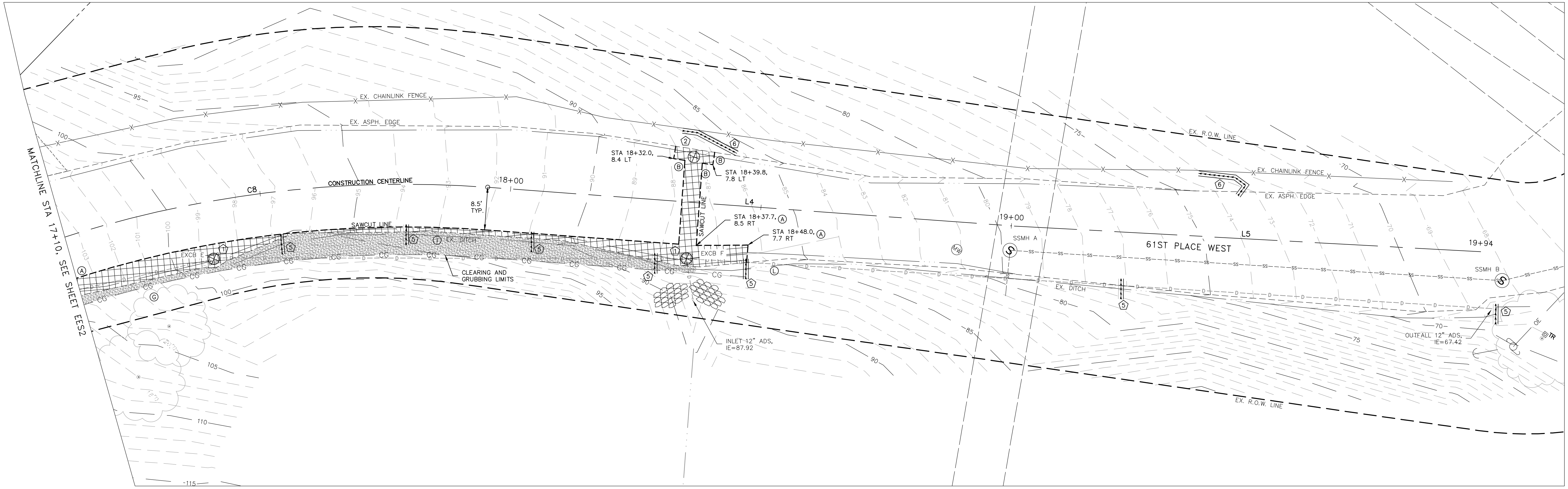
JOHN RAYMOND TUTTLE
STATE OF WASHINGTON
43718
REGISTERED PROFESSIONAL ENGINEER

61st Place West
Retaining Wall Project

99% Design - Not For Construction

EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN

EES2



SITE PREPARATION NOTES

A. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT IN PREPARATION FOR CONSTRUCTION OF ROADWAY IMPROVEMENTS AS DESCRIBED WITHIN THE ROADWAY EXCAVATION INCL. HAUL SPECIAL PROVISION. REMOVAL TIMELINE DEPENDANT UPON PHASED TRAFFIC CONTROL STRATEGIES AND CONSTRUCTION ACTIVITIES. CLEAN AND TACK ALL ASPHALT EDGES PRIOR TO PAVING. SEAL ALL JOINTS AFTER PAVING WITH PG 64–22 BINDER.

B. SAWCUT AND REMOVE EXISTING ASPHALT PAVEMENT AS PART OF STORM SYSTEM INSTALLATION. WIDTH VARIES PER DETAIL 3/D1.

C. NOTE NOT USED ON THIS SHEET.

D. NOTE NOT USED ON THIS SHEET.

E. NOTE NOT USED ON THIS SHEET.

F. NOTE NOT USED ON THIS SHEET.

G. TO THE LARGEST EXTENT PRACTICAL, PROVIDE PROTECTION AND RETAINAGE OF EXISTING TREES, BUSHES, AND ROOT SYSTEMS THAT WILL REMAIN AFTER CONSTRUCTION.

H. NOTE NOT USED ON THIS SHEET.

I. BACKFILL AND ABANDON EXISTING DITCH AS PART OF CORRIDOR IMPROVEMENTS.

J. NOTE NOT USED ON THIS SHEET.

K. NOTE NOT USED ON THIS SHEET.

L. RETAIN FUNCTION OF EXISTING DITCH THROUGHOUT CONSTRUCTION.

EROSION CONTROL NOTES

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2. INSTALL STORM DRAIN INLET PROTECTION IN EACH NEW CATCH BASIN AFTER IT HAS BEEN INSTALLED PER COM STANDARD PLAN EC–007.
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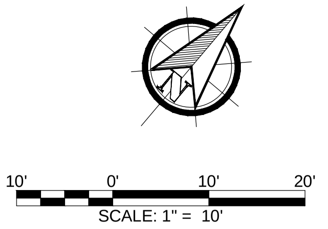
5. INSTALL BIODEGRADABLE CHECK DAMS IN EXISTING OR TEMPORARY CONVEYANCE DITCH AS SHOWN TO PREVENT RUNOFF FROM ENTERING ADJACENT PROPERTIES AND DOWNSTREAM CONVEYANCES. ASSUME CHECK DAM WILL REQUIRE RESETTING/RELOCATING AS PART OF INSTALLATION OF IMPROVEMENTS. ANY POINTS OF CONCENTRATED DISCHARGE WILL BE REDIRECTED TO AN ADJACENT CATCH BASIN OR CONVEYANCE SYSTEM. SEE WSDOT STANDARD PLAN I–50.20–01.
6. INSTALL WATTLE TO REDIRECT UP–SLOPE RUNOFF AWAY FROM WORK AREAS AND TO PROTECT DOWNSTREAM SYSTEMS. WATTLES INSTALLED ON IMPERVIOUS SURFACES SHALL BE SECURED WITH SAND BAGS. RESET AS CONSTRUCTION ACTIVITIES OR PRESERVATION OF ACCESS MANDATE. SEE WSDOT STANDARD PLAN I–30.40–01.

EXISTING STRUCTURES TABLE

EXCB E RIM=98.65 12" ADS NE, IE=95.20 12" ADS SW, IE=94.70	SSMH A RIM=79.63 6" DI OUT NE AND SW CENTER OF CHANNEL=75.03
EXCB F RIM=87.52 12" ADS SE, IE=84.77 12" ADS SW, IE=84.72 12" ADS NE, IE=83.87	SSMH B RIM=68.10 6" DI NE AND SW CENTER OF CHANNEL=61.40

LEGEND

⊕	INLET PROTECTION
—HVF—	HIGH VISIBILITY SILT FENCE
▶▶▶	WATTLE/WATTLE AS CHECK DAM
☒	ROADWAY DEMOLITION AREA
▨	GRUBBING AREA



TUTTLE ENGINEERING AND MANAGEMENT

Drawn By: J. HOYER Checked By: J. TUTTLE	Surveyed By: Date: Field Bk/Pg: Datum:	Recorded Survey: SNOHOMISH COUNTY AF– Vol/Bk Page	Aerial Mapping & Control Survey Firm: Date: JUNE 29, 2018 GIS Cntl Pnts: Firm: Date: JUNE 29, 2018 Field BK/PG:	Constructed By: Date:

XREF Filename:
Filename:

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NO.	DATE	BY	REVISION

PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

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Designed By:
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Date: JULY 12, 2018

CITY OF MUKILTEO

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT

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425–263–8000 FAX 425–290–1009
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JOHN RAYMOND TUTTLE
43718

61st Place West Retaining Wall Project

99% Design - Not For Construction

EXISTING CONDITIONS, EROSION CONTROL, AND SITE PREPARATION PLAN

EES3

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

ELEMENT 1 - MARK CLEARING LIMITS

PRIOR TO BEGINNING LAND DISTURBING ACTIVITIES, INCLUDING CLEARING AND GRADING, ALL CLEARING LIMITS, SENSITIVE AREAS AND THEIR BUFFERS, AND TREES THAT ARE TO BE PRESERVED WITHIN THE CONSTRUCTION AREA SHALL BE CLEARLY MARKED, BOTH IN THE FIELD AND ON THE PLANS, TO PREVENT DAMAGE AND OFFSET IMPACTS. PLASTIC, METAL, OR STAKE WIRE FENCE MAY BE USED TO MARK THE LIMITS. CLEARING LIMITS ARE LOCATED WITHIN THE PARCEL LIMITS AND IMMEDIATELY SURROUNDING THE ROADWAY PRISM AS INDICATED ON THE SITE PREPARATION PLANS. LIMITS WILL BE MARKED IN THE FIELD BY THE CONTRACTOR.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C101: PRESERVING NATURAL VEGETATION**
- **BMP C103: HIGH VISIBILITY PLASTIC OR METAL FENCE**

ELEMENT 2 - ESTABLISH CONSTRUCTION ACCESS

(A) CONSTRUCTION VEHICLE ACCESS AND EXIT SHALL BE LIMITED TO ONE ROUTE, IF POSSIBLE.

(B) ACCESS POINTS SHALL BE STABILIZED WITH QUARRY SPALL OR CRUSHED ROCK TO MINIMIZE THE TRACKING OF SEDIMENT ONTO PUBLIC ROADS.

(C) WHEEL WASH OR TIRE BATHS SHALL BE LOCATED ON-SITE, IF APPLICABLE.

(D) PUBLIC ROADS SHALL AT A MINIMUM BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM ROADS BY SHOVELING, SWEEPING, OR PICKUP AND SHALL BE TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA. STREET WASHING IS PROHIBITED UNLESS SPECIAL PERMISSION IS GRANTED BY THE CITY OF MUKILTEO (CITY).

(E) IF STREET WASHING IS ALLOWED, WASTEWATER SHALL BE CONTROLLED BY PUMPING BACK ONTO THE PARCEL, OR OTHERWISE BE PREVENTED FROM DISCHARGING INTO SYSTEMS TRIBUTARY TO STATE SURFACE WATERS.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C105: STABILIZED CONSTRUCTION ENTRANCE/EXIT**
- **BMP C107: CONSTRUCTION ROAD/PARKING AREA STABILIZATION**

ELEMENT 3 - CONTROL FLOW RATES

(A) PROPERTIES AND WATERWAYS DOWNSTREAM FROM CONSTRUCTION ACTIVITIES SHALL BE PROTECTED FROM EROSION DUE TO INCREASES IN THE VOLUME, VELOCITY, AND PEAK FLOW RATE OF STORMWATER RUNOFF FROM THE PROJECT SITE. PROPERTIES SUBJECT TO MINIMUM REQUIREMENT #5 AND/OR #7 SHALL IMPLEMENT CONTROLS AS EARLY IN THE DEVELOPMENT AS IS PRACTICABLE TO MITIGATE FOR FLOW RATES.

(B) A DOWNSTREAM ANALYSIS HAS BEEN PREPARED FOR THIS PROJECT. FURTHER ANALYSIS WILL BE NECESSARY IF CHANGES IN FLOWS COULD IMPAIR OR ALTER CONVEYANCE SYSTEMS, STREAM BANKS, BED SEDIMENT, OR AQUATIC HABITAT. SEE THE WASHINGTON STATE DEPARTMENT OF ECOLOGY (ECOLOGY) MANUAL FOR OFF-SITE ANALYSIS GUIDANCE.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C207: CHECK DAMS**
- **BMP C209: OUTLET PROTECTION**
- **BMP C235: WATTLES**
- **BMP C241: TEMPORARY SEDIMENT POND**

ELEMENT 4 - INSTALL SEDIMENT CONTROLS

(A) THE DUFF LAYER, NATIVE TOPSOIL, AND NATURAL VEGETATION SHALL BE RETAINED IN AN UNDISTURBED STATE TO THE MAXIMUM EXTENT PRACTICABLE.

(B) SEDIMENT PONDS, VEGETATED BUFFER STRIPS, SEDIMENT BARRIERS OR FILTERS, DIKES, AND OTHER BMPS INTENDED TO TRAP SEDIMENT SHALL BE CONSTRUCTED AS ONE OF THE FIRST STEPS IN GRADING. THESE BMPS SHALL BE FULLY FUNCTIONAL BEFORE OTHER LAND DISTURBING ACTIVITIES TAKE PLACE.

(C) PRIOR TO LEAVING A CONSTRUCTION SITE, OR PRIOR TO DISCHARGE TO AN INFILTRATION OR BIORETENTION FACILITY, STORMWATER RUNOFF FROM DISTURBED AREAS SHALL PASS THROUGH A SEDIMENT POND OR OTHER APPROPRIATE SEDIMENT REMOVAL BMP. RUNOFF FROM FULLY STABILIZED AREAS MAY BE DISCHARGED WITHOUT A SEDIMENT REMOVAL BMP, BUT MUST MEET THE FLOW CONTROL PERFORMANCE STANDARD IDENTIFIED IN THE PROJECT'S STORMWATER DOCUMENTATION. FULL STABILIZATION MEANS CONCRETE OR ASPHALT PAVING; QUARRY SPALLS USED AS DITCH LINING; OR THE USE OF ROLLED EROSION PRODUCTS, A BONDED FIBER MATRIX PRODUCT, OR VEGETATIVE COVER IN A MANNER THAT WILL FULLY PREVENT SOIL EROSION.

(D) EARTHEN STRUCTURES SUCH AS DAMS, DIKES, AND DIVERSIONS SHALL BE SEEDED AND MULCHED ACCORDING TO THE TIMING INDICATED IN ELEMENT 5 BELOW.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C101: PRESERVING NATURAL VEGETATION**
- **BMP C220: INLET PROTECTION**
- **BMP C235: WATTLES**
- **BMP C241: TEMPORARY SEDIMENT POND**

ELEMENT 5 - STABILIZE SOILS

(A) ALL EXPOSED AND UNWORKED SOILS SHALL BE STABILIZED BY APPLICATION OF EFFECTIVE BMPS THAT PROTECT THE SOIL FROM THE EROSIVE FORCES OF RAINDROP IMPACT, FLOWING WATER, AND WIND EROSION.

(B) FROM OCTOBER 1 THROUGH APRIL 30 OF EACH YEAR, NO SOILS SHALL REMAIN EXPOSED AND UNWORKED FOR MORE THAN 2 DAYS. FROM MAY 1 TO SEPTEMBER 30 OF EACH YEAR, NO SOILS SHALL REMAIN EXPOSED AND UNWORKED FOR MORE THAN 7 DAYS. THIS CONDITION APPLIES TO ALL ON-SITE SOILS, WHETHER AT FINAL GRADE OR NOT.

(C) STOCKPILES MUST BE STABILIZED/PROTECTED WITH SEDIMENT TRAPPING MEASURES. LOCATE AWAY FROM STORM DRAIN INLETS, WATERWAYS, AND DRAINAGE CHANNELS.

(D) SOIL STABILIZATION MEASURES SELECTED SHOULD BE APPROPRIATE FOR THE TIME OF YEAR, SITE CONDITIONS, ESTIMATED DURATION OF USE, AND POTENTIAL WATER QUALITY IMPACTS THAT STABILIZATION AGENTS MAY HAVE ON DOWNSTREAM WATERS OR GROUND WATER.

(E) WORK ON LINEAR CONSTRUCTION SITES AND ACTIVITIES, INCLUDING RIGHT-OF-WAY AND EASEMENT CLEARING, ROADWAY DEVELOPMENT, PIPELINES, AND TRENCHING FOR UTILITIES, SHALL NOT EXCEED THE CAPABILITY OF THE INDIVIDUAL CONTRACTOR FOR HIS PORTION OF THE PROJECT TO INSTALL THE BEDDING MATERIALS, ROADBEDS, STRUCTURES, PIPELINES, AND/OR UTILITIES, AND TO RE-STABILIZE THE DISTURBED SOILS, MEETING THE TIMING CONDITIONS LISTED ABOVE.

(F) IN ADDITION, AT THE DISCRETION OF THE CITY, THOSE SITES UNABLE TO MAINTAIN THE QUALITY OF THEIR STORMWATER DISCHARGE MAY BE REQUIRED TO PROVIDE SOIL STABILIZATION TO ALL EXPOSED SOIL AREAS REGARDLESS OF THE WORKING STATUS OF THE AREA. UPON WRITTEN NOTIFICATION, THE CONTRACTOR SHALL PROVIDE FULL STABILIZATION OF ALL EXPOSED SOIL AREAS WITHIN 24 HOURS.

(G) UTILIZE APPROPRIATE BMPS TO CONTROL STORMWATER VOLUME AND VELOCITY WITHIN THE SITE, TO MINIMIZE SOIL EROSION, TO CONTROL STORMWATER DISCHARGES INCLUDING BOTH FLOW RATES AND TOTAL STORMWATER VOLUME, TO MINIMIZE EROSION AT OUTLETS, AND TO MINIMIZE DOWNSTREAM CHANNEL AND STREAM BANK EROSION.

(H) ALL EXPOSED SOILS SHALL BE STABILIZED AT THE END OF THE SHIFT AND BEFORE A HOLIDAY OR WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C120: TEMPORARY AND PERMANENT SEEDING**
- **BMP C121: MULCHING**
- **BMP C122: NETS AND BLANKETS**
- **BMP C123: PLASTIC COVERING**
- **BMP C124: SODDING**
- **BMP C125: TOPSOILING/COMPOSTING**
- **BMP C130: SURFACE ROUGHENING**
- **BMP C140: DUST CONTROL**
- **BMP C235: WATTLES**

ELEMENT 6 - PROTECT SLOPES

(A) CUT AND FILL SLOPES SHALL BE DESIGNED AND CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION.

(B) CONSIDER SOIL TYPE AND ITS POTENTIAL FOR EROSION DURING BMP SELECTION, INSTALLATION, AND MAINTENANCE.

(C) REDUCE SLOPE RUNOFF VELOCITIES BY REDUCING THE CONTINUOUS LENGTH OF SLOPE WITH TERRACING AND DIVERSIONS, REDUCING SLOPE STEEPNESS, AND ROUGHENING SLOPE SURFACES.

(D) DIVERT UPSLOPE DRAINAGE AND RUN-ON WATERS FROM OFF-SITE SOURCES WITH INTERCEPTORS AT TOP OF SLOPES. OFF-SITE STORMWATER SHOULD BE HANDLED SEPARATELY FROM STORMWATER GENERATED ON THE SITE. DIVERSION OF OFF-SITE STORMWATER AROUND THE SITE MAY BE A VIABLE OPTION. DIVERTED FLOWS SHALL BE REDIRECTED TO THE NATURAL DRAINAGE LOCATION AT OR BEFORE PROJECT LIMITS OR PROPERTY BOUNDARIES.

(E) CONTAIN DOWNSLOPE COLLECTED FLOWS IN PIPES, SLOPE DRAINS, OR PROTECTED CHANNELS.

(F) PROVIDE DRAINAGE TO REMOVE GROUNDWATER INTERSECTING THE SLOPE SURFACE OF EXPOSED SOIL AREAS.

(G) EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES, CONSISTENT WITH SAFETY AND SPACE CONSIDERATIONS.

(H) CHECK DAMS SHALL BE PLACED AT REGULAR INTERVALS WITHIN TRENCHES THAT ARE CUT DOWN A SLOPE OR AS INSTALLED FOR TEMPORARY STORMWATER CONVEYANCE.

(I) STABILIZE SOILS ON SLOPES, AS SPECIFIED IN ELEMENT 5.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C120: TEMPORARY AND PERMANENT SEEDING**
- **BMP C121: MULCHING**
- **BMP C122: NETS AND BLANKETS**
- **BMP C127: PLASTIC COVERING**
- **BMP C130: SURFACE ROUGHENING**
- **BMP C201: GRASS-LINED CHANNELS**
- **BMP C204: PIPE SLOPE DRAINS**
- **BMP C207: CHECK DAMS**
- **BMP C233: SILT FENCE (HIGH VISIBILITY)**

ELEMENT 7: PROTECT DRAIN INLETS

(A) ALL STORM DRAIN INLETS, WHETHER EXISTING OR MADE OPERABLE DURING CONSTRUCTION, SHALL BE PROTECTED SO THAT STORMWATER RUNOFF SHALL NOT ENTER CONVEYANCE SYSTEMS WITHOUT FIRST BEING FILTERED OR TREATED TO REMOVE SEDIMENT.

(B) ALL APPROACH ROADS SHALL BE KEPT CLEAN, AND ALL SEDIMENT AND STREET WASH WATER SHALL NOT BE ALLOWED TO ENTER STORM DRAINS WITHOUT PRIOR AND ADEQUATE TREATMENT UNLESS TREATMENT IS PROVIDED BEFORE THE STORM DRAIN DISCHARGES TO WATERS OF THE STATE.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C220: STORM DRAIN INLET PROTECTION**
- **BMP C235: WATTLES**

ELEMENT 8: STABILIZE CHANNELS AND OUTLETS

(A) ALL TEMPORARY ON-SITE CONVEYANCE CHANNELS SHALL BE DESIGNED, CONSTRUCTED, AND STABILIZED TO PREVENT EROSION FROM THE EXPECTED VELOCITY OF FLOW FROM A 10-YEAR, 24-HOUR FREQUENCY STORM FOR THE DEVELOPED CONDITION.

(B) STABILIZATION, INCLUDING ARMORING MATERIAL, ADEQUATE TO PREVENT EROSION OF OUTLETS, ADJACENT STREAM BANKS, SLOPES AND DOWNSTREAM REACHES SHALL BE PROVIDED AT THE OUTLETS OF ALL CONVEYANCE SYSTEMS.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C122: NETS AND BLANKETS**
- **BMP C202: CHANNEL LINING**
- **BMP C207: CHECK DAMS**
- **BMP C209: OUTLET PROTECTION**
- **BMP C235: WATTLES**

ELEMENT 9: CONTROL POLLUTANTS

(A) 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.

(B) COVER, CONTAINMENT, AND PROTECTION FROM VANDALISM SHALL BE PROVIDED FOR ALL CHEMICALS, LIQUID PRODUCTS, PETROLEUM PRODUCTS, AND NON-INERT WASTES PRESENT ON THE SITE (SEE CHAPTER 173-304 WAC, AS CURRENTLY ENACTED OR HEREAFTER MODIFIED, FOR THE DEFINITION OF INERT WASTE, WHICH IS INCORPORATED HEREIN BY THIS REFERENCE). ON-SITE FUELING TANKS MUST INCLUDE SECONDARY CONTAINMENT.

(C) MAINTENANCE AND REPAIR OF HEAVY EQUIPMENT AND VEHICLES INVOLVING OIL CHANGES, HYDRAULIC SYSTEM DRAIN DOWN, SOLVENT AND DE-GREASING CLEANING OPERATIONS, FUEL TANK DRAIN DOWN AND REMOVAL, AND OTHER ACTIVITIES WHICH MAY RESULT IN DISCHARGE OR SPILLAGE OF POLLUTANTS TO THE GROUND OR INTO STORMWATER RUNOFF MUST BE CONDUCTED USING SPILL PREVENTION MEASURES, SUCH AS DRIP PANS. CONTAMINATED SURFACES SHALL BE CLEANED IMMEDIATELY FOLLOWING ANY DISCHARGE OR SPILL INCIDENT. EMERGENCY REPAIRS MAY BE PERFORMED ON-SITE USING TEMPORARY PLASTIC PLACED BENEATH AND, IF RAINING, OVER THE VEHICLE.

(D) WHEEL WASH, OR TIRE BATH WASTEWATER, SHALL BE DISCHARGED TO A SEPARATE ON-SITE TREATMENT SYSTEM OR TO A FULLY-FUNCTIONING SANITARY SEWER SYSTEM.

(E) APPLICATION OF ANY AGRICULTURAL CHEMICALS, INCLUDING FERTILIZERS AND PESTICIDES, SHALL BE CONDUCTED IN A MANNER AND AT APPLICATION RATES THAT WILL NOT RESULT IN LOSS OF CHEMICAL TO STORMWATER RUNOFF. MANUFACTURER RECOMMENDATIONS SHALL BE FOLLOWED FOR APPLICATION RATES AND PROCEDURES.

(F) MANAGEMENT OF PH-MODIFYING SOURCES SHALL PREVENT CONTAMINATION OF RUNOFF AND STORMWATER COLLECTED ON THE SITE. THESE SOURCES INCLUDE, BUT ARE NOT LIMITED TO, BULK CEMENT, CEMENT KILN DUST, FLY ASH, NEW CONCRETE WASHING AND CURING WATERS, WASTE STREAMS GENERATED FROM ASPHALT AND CONCRETE GRINDING AND SAWING, EXPOSED AGGREGATE PROCESSES, AND CONCRETE PUMPING AND MIXER WASHOUT WATERS.

SUGGESTED BMP/BMPS TO BE USED:
- **BMP C123: PLASTIC COVERING**
- **BMP C151: CONCRETE HANDLING**
- **BMP C152: SAWCUTTING AND SURFACING POLLUTION PREVENTION**
- **BMP C153: MATERIALS DELIVERY, STORAGE, AND CONTAINMENT AREA**
- **BMP C154: CONCRETE WASHOUT AREA**
- **BMP C235: WATTLES**

ELEMENT 10: CONTROL DE-WATERING

(A) ALL FOUNDATION, VAULT, AND TRENCH DE-WATERING WATER, WHICH HAS SIMILAR CHARACTERISTICS TO STORMWATER RUNOFF AT THE SITE, SHALL BE DISCHARGED INTO A CONTROLLED CONVEYANCE SYSTEM PRIOR TO DISCHARGE TO A TEMPORARY SEDIMENT TRAPPING FACILITY. CHANNELS MUST BE STABILIZED, AS SPECIFIED IN ELEMENT 8.

(B) CLEAN, NON-TURBID DE-WATERING WATER, SUCH AS WELL-POINT GROUND WATER, CAN BE DISCHARGED TO SYSTEMS TRIBUTARY TO STATE SURFACE WATERS, AS SPECIFIED IN ELEMENT 8, PROVIDED THE DE-WATERING FLOW DOES NOT CAUSE EROSION OR FLOODING OF THE RECEIVING WATERS. THESE CLEAN WATERS SHOULD NOT BE ROUTED THROUGH SEDIMENT PONDS IN ASSOCIATION WITH STORMWATER.

(C) HIGHLY TURBID OR OTHERWISE CONTAMINATED DEWATERING WATER, SUCH AS FROM CONSTRUCTION EQUIPMENT OPERATION, CLAMSHELL DIGGING, CONCRETE TREMIE POUR, OR WORK INSIDE A COFFERDAM SHALL BE HANDLED SEPARATELY FROM STORMWATER AT THE SITE.

(D) OTHER DISPOSAL OPTIONS, DEPENDING ON SITE CONSTRAINTS, MAY INCLUDE, BY WAY OF EXAMPLE: 1) INFILTRATION, 2) TRANSPORT OFF-SITE IN VEHICLE, SUCH AS A VACUUM FLUSH TRUCK, FOR LEGAL DISPOSAL IN A MANNER THAT DOES NOT POLLUTE STATE WATERS, 3) ON-SITE TREATMENT USING CHEMICAL TREATMENT OR OTHER SUITABLE TREATMENT TECHNOLOGIES.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C126: POLYACRYLAMIDE FOR SOIL EROSION PROTECTION**
- **BMP C152: SAWCUTTING AND SURFACING POLLUTION PREVENTION**
- **BMP C201: GRASS-LINED CHANNELS**

ELEMENT 11: MAINTAIN BMPS

(A) ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL BMPS SHALL BE MAINTAINED AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL MAINTENANCE AND REPAIR SHALL BE CONDUCTED IN ACCORDANCE WITH BMPS.

(B) SEDIMENT CONTROL BMPS SHALL BE INSPECTED WEEKLY OR AFTER A RUNOFF PRODUCING STORM EVENT DURING THE DRY SEASON AND DAILY DURING THE WET SEASON. ALL PROJECTS THAT DISTURB AN AREA GREATER THAN ONE ACRE SHALL HAVE A CERTIFIED EROSION CONTROL LEAD AVAILABLE TO THE SITE. THIS EROSION CONTROL LEAD SHALL BE RESPONSIBLE TO PROVIDE OVERVIEW OF ONGOING DAY TO DAY EROSION CONTROL REQUIREMENTS. THE EROSION CONTROL LEAD SHALL (WITHIN 24 HOURS) REPORT TO THE CITY ANY SITE DISCHARGES THAT EXCEED STATE WATER QUALITY STANDARDS THAT HAVE OR ARE LIKELY TO HAVE ENTERED WATERS OF THE STATE.

(C) 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. DISTURBED SOIL AREAS RESULTING FROM REMOVAL OF BMPS OR VEGETATION SHALL BE PERMANENTLY STABILIZED.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C120: TEMPORARY AND PERMANENT SEEDING**
- **BMP C150: MATERIALS ON HAND**
- **BMP C160: CERTIFIED EROSION AND SEDIMENT CONTROL LEAD**

ELEMENT 12: MANAGE THE PROJECT

(A) CONSTRUCTION PROJECTS SHALL BE PHASED WHERE FEASIBLE IN ORDER TO PREVENT, TO THE MAXIMUM EXTENT PRACTICABLE, THE TRANSPORT OF SEDIMENT FROM ALL AREAS DURING CONSTRUCTION. REVEGETATION OF EXPOSED AREAS, WHETHER TEMPORARY OR PERMANENT, AND MAINTENANCE OF THAT VEGETATION SHALL BE AN INTEGRAL PART OF THE CLEARING ACTIVITIES FOR ANY PHASE.

(B) COORDINATION WITH UTILITY COMPANIES AND OTHER CONTRACTORS - THE CONTRACTOR SHALL EVALUATE, WITH INPUT FROM UTILITIES AND OTHER CONTRACTORS, THE STORMWATER MANAGEMENT REQUIREMENTS FOR THE ENTIRE PROJECT, INCLUDING THE UTILITIES, WHEN PREPARING THE CONSTRUCTION SWPPP.

(C) INSPECTION AND MONITORING - ALL BMPS SHALL BE INSPECTED, MAINTAINED, AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. PROJECTS REGULATED UNDER THE CONSTRUCTION STORMWATER GENERAL PERMIT SHALL CONDUCT SITE INSPECTIONS AND MONITORING IN ACCORDANCE WITH SPECIAL CONDITION S4 OF THE CONSTRUCTION STORMWATER GENERAL PERMIT.

(D) FOR ANY PROJECT DISTURBING MORE THAN ONE ACRE, A CERTIFIED EROSION AND SEDIMENT CONTROL LEAD (CESCL) SHALL BE IDENTIFIED IN THE CONSTRUCTION SWPPP AND SHALL BE ON-SITE OR ON-CALL AT ALL TIMES. CERTIFICATION MAY BE THROUGH THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION/ASSOCIATION OF GENERAL CONTRACTORS (WSDOT/AGC) CONSTRUCTION SITE EROSION AND SEDIMENT CONTROL CERTIFICATION PROGRAM OR ANY EQUIVALENT LOCAL OR NATIONAL CERTIFICATION AND/OR TRAINING PROGRAM, IN THE CITY'S DISCRETION.

(E) WHENEVER INSPECTION AND/OR MONITORING REVEALS THAT THE BMPS IDENTIFIED IN THE CONSTRUCTION SWPPP ARE INADEQUATE, DUE TO THE ACTUAL DISCHARGE OF OR POTENTIAL TO DISCHARGE A SIGNIFICANT AMOUNT OF ANY POLLUTANT, THE SWPPP SHALL BE MODIFIED, AS APPROPRIATE, IN A TIMELY MANNER.

(F) MAINTENANCE OF THE CONSTRUCTION SWPPP - THE CONSTRUCTION SWPPP SHALL BE RETAINED ON-SITE. THE CONSTRUCTION SWPPP SHALL BE MODIFIED WHENEVER THERE IS A SIGNIFICANT CHANGE IN THE DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE OF ANY BMP.

SUGGESTED BMPS/BMPS TO BE USED:
- **BMP C150: MATERIALS ON HAND**
- **BMP C160: CERTIFIED EROSION AND SEDIMENT CONTROL LEAD**
- **BMP C162: SCHEDULING**

ELEMENT 13: PROTECT LOW IMPACT DEVELOPMENT BMPS

(A) PROTECT ALL LOW IMPACT DEVELOPMENT BMPS (BIORETENTION CELLS AND PERVIOUS PAVEMENTS) FROM SEDIMENTATION PRODUCED FROM THE SITE BY INSTALLING AND MAINTAINING EROSION AND SEDIMENT CONTROL BMPS ON PORTIONS OF THE SITE THAT DRAIN TO THESE FACILITIES.

(B) RESTORE THE BMPS TO THEIR FULLY FUNCTIONING CONDITION IF THEY ACCUMULATE SEDIMENT DURING CONSTRUCTION. RESTORING THE BMP MUST INCLUDE REMOVAL OF SEDIMENT AND ANY SEDIMENT-LADEN SOILS, AND REPLACING THE REMOVED SOILS WITH SOILS MEETING THE DESIGN SPECIFICATIONS.

(C) PREVENT COMPACTING BIORETENTION BMPS BY RESTRICTING CONSTRUCTION EQUIPMENT AND FOOT TRAFFIC. PROTECT COMPLETED LAWN AND LANDSCAPED AREAS FROM COMPACTION DUE TO CONSTRUCTION EQUIPMENT.

(D) KEEP ALL HEAVY EQUIPMENT OFF EXISTING SOILS UNDER LID FACILITIES THAT HAVE BEEN EXCAVATED TO FINAL GRADE TO RETAIN THE INFILTRATION RATE OF THE SOILS.

- **BMP C103: HIGH VISIBILITY FENCE**
- **BMP C204: PIPE SLOPE DRAINS**
- **BMP C233: SILT FENCE (HIGH VISIBILITY)**
- **BMP C235: WATTLES**

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PLAN PRINTED AT 11"x17" DEPICTS A 1:2 SCALE RATIO (I.E. 1"=10' TO 1"=20')

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43718

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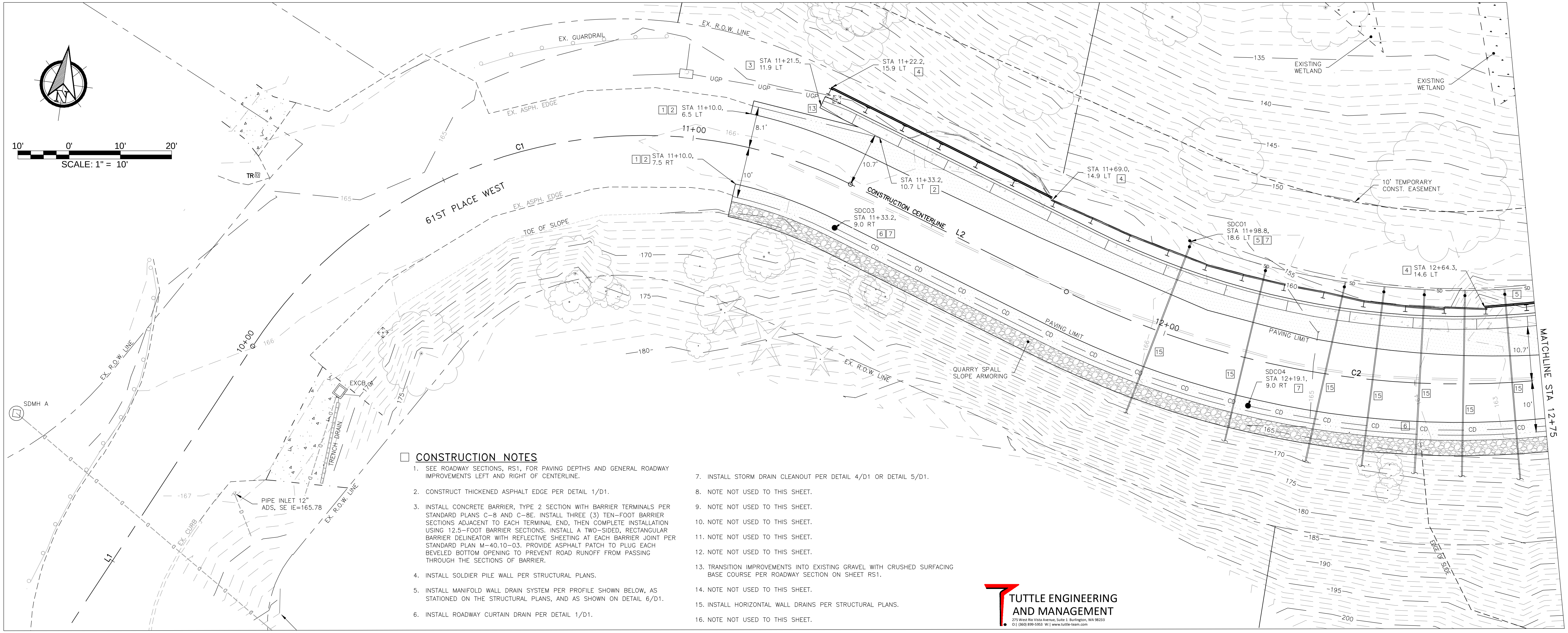
EROSION CONTROL NOTES

EN1



☐ CONSTRUCTION NOTES

1. SEE ROADWAY SECTIONS, RS1, FOR PAVING DEPTHS AND GENERAL ROADWAY IMPROVEMENTS LEFT AND RIGHT OF CENTERLINE.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. INSTALL CONCRETE BARRIER, TYPE 2 SECTION WITH BARRIER TERMINALS PER STANDARD PLANS C–8 AND C–8E. INSTALL THREE (3) TEN–FOOT BARRIER SECTIONS ADJACENT TO EACH TERMINAL END, THEN COMPLETE INSTALLATION USING 12.5–FOOT BARRIER SECTIONS. INSTALL A TWO–SIDED, RECTANGULAR BARRIER DELINEATOR WITH REFLECTIVE SHEETING AT EACH BARRIER JOINT PER STANDARD PLAN M–40.10–03. PROVIDE ASPHALT PATCH TO PLUG EACH BEVELED BOTTOM OPENING TO PREVENT ROAD RUNOFF FROM PASSING THROUGH THE SECTIONS OF BARRIER.
4. INSTALL SOLDIER PILE WALL PER STRUCTURAL PLANS.
5. INSTALL MANIFOLD WALL DRAIN SYSTEM PER PROFILE SHOWN BELOW, AS STATIONED ON THE STRUCTURAL PLANS, AND AS SHOWN ON DETAIL 6/D1.
6. INSTALL ROADWAY CURTAIN DRAIN PER DETAIL 1/D1.
7. INSTALL STORM DRAIN CLEANOUT PER DETAIL 4/D1 OR DETAIL 5/D1.
8. NOTE NOT USED TO THIS SHEET.
9. NOTE NOT USED TO THIS SHEET.
10. NOTE NOT USED TO THIS SHEET.
11. NOTE NOT USED TO THIS SHEET.
12. NOTE NOT USED TO THIS SHEET.
13. TRANSITION IMPROVEMENTS INTO EXISTING GRAVEL WITH CRUSHED SURFACING BASE COURSE PER ROADWAY SECTION ON SHEET RS1.
14. NOTE NOT USED TO THIS SHEET.
15. INSTALL HORIZONTAL WALL DRAINS PER STRUCTURAL PLANS.
16. NOTE NOT USED TO THIS SHEET.

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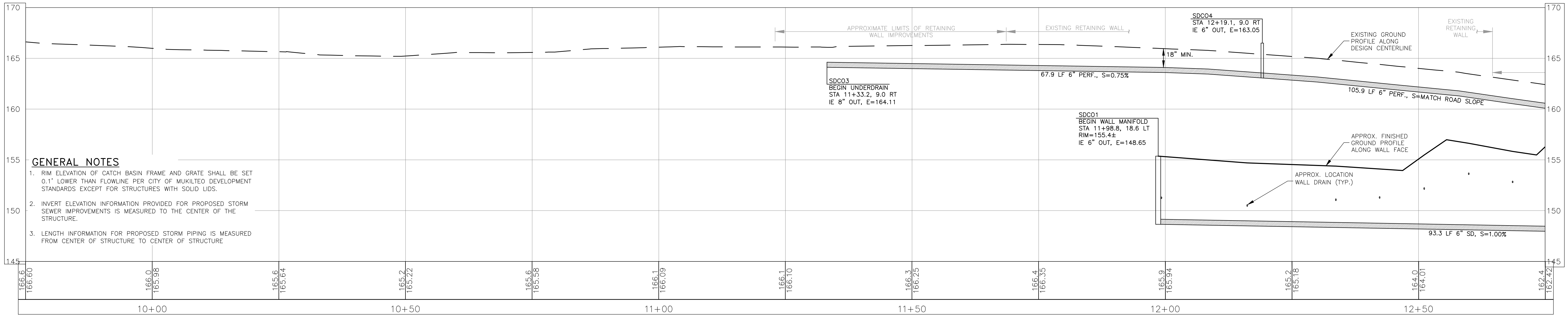

GENERAL NOTES

1. RIM ELEVATION OF CATCH BASIN FRAME AND GRATE SHALL BE SET 0.1' LOWER THAN FLOWLINE PER CITY OF MUKILTEO DEVELOPMENT STANDARDS EXCEPT FOR STRUCTURES WITH SOLID LIDS.
2. INVERT ELEVATION INFORMATION PROVIDED FOR PROPOSED STORM SEWER IMPROVEMENTS IS MEASURED TO THE CENTER OF THE STRUCTURE.
3. LENGTH INFORMATION FOR PROPOSED STORM PIPING IS MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE

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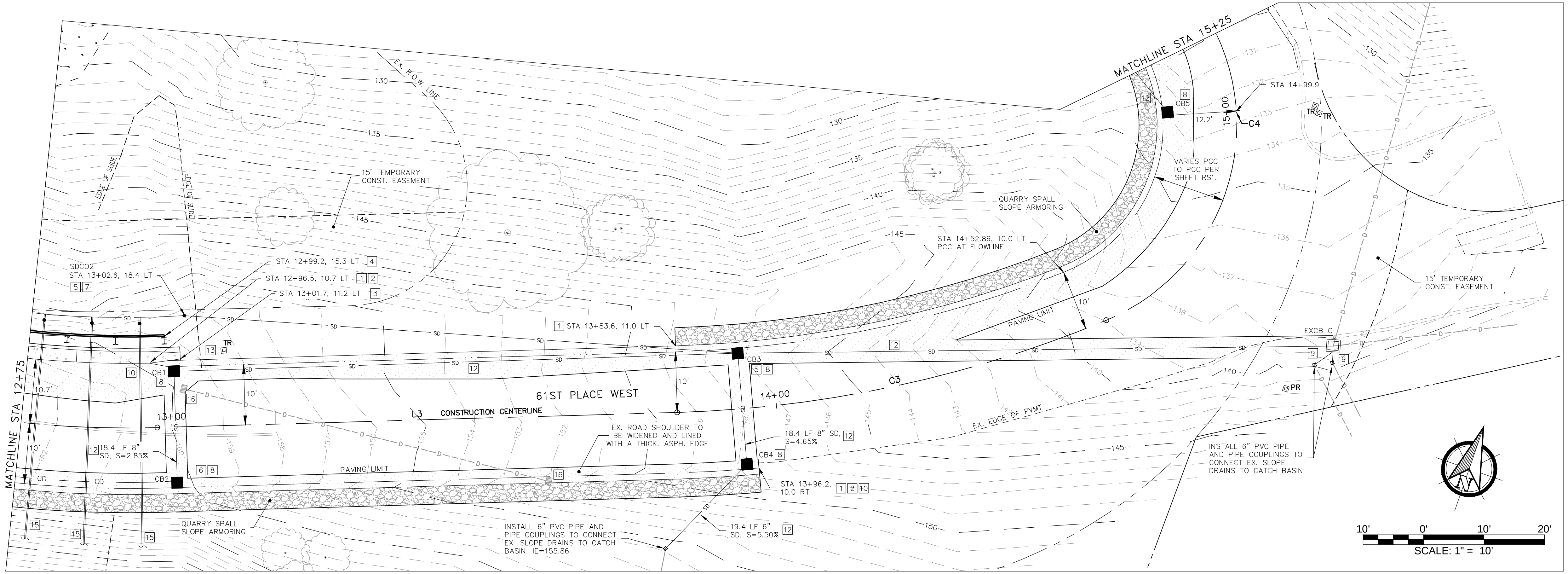
ROAD AND STORM
PLAN AND PROFILE

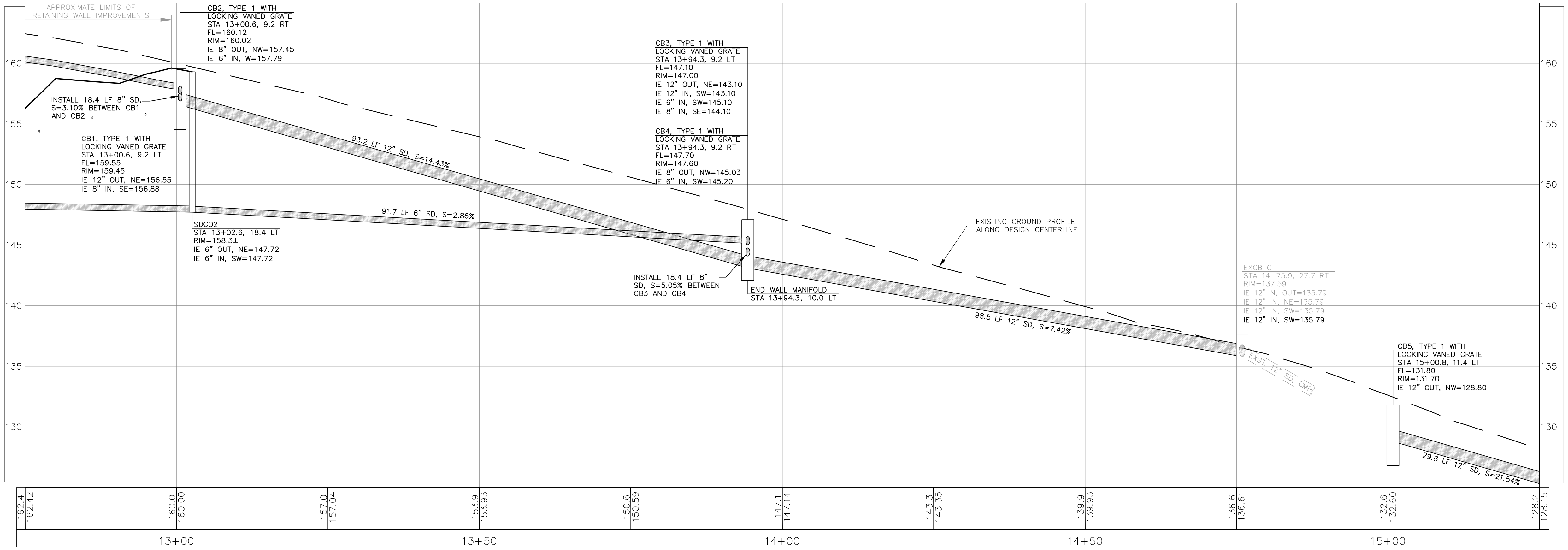
RP1



CONSTRUCTION NOTES

☐

1. SEE ROADWAY SECTIONS, RS1, FOR PAVING DEPTHS AND GENERAL ROADWAY IMPROVEMENTS LEFT AND RIGHT OF CENTERLINE.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. INSTALL CONCRETE BARRIER, TYPE 2 SECTION WITH BARRIER TERMINALS PER STANDARD PLANS C-8 AND C-8E. INSTALL THREE (3) TEN-FOOT BARRIER SECTIONS ADJACENT TO EACH TERMINAL END, THEN COMPLETE INSTALLATION USING 12.5-FOOT BARRIER SECTIONS. INSTALL A TWO-SIDED, RECTANGULAR BARRIER DELINEATOR WITH REFLECTIVE SHEETING AT EACH BARRIER JOINT PER STANDARD PLAN M-40.10-03. PROVIDE ASPHALT PATCH AT EACH JOINT TO PREVENT ROAD RUNOFF FROM PASSING THROUGH THE SECTIONS OF BARRIER.
4. INSTALL SOLDIER PILE WALL PER STRUCTURAL PLANS.
5. INSTALL MANIFOLD WALL DRAIN SYSTEM PER PROFILE SHOWN BELOW, AS STATIONED ON THE STRUCTURAL PLANS, AND AS SHOWN ON DETAIL 6/D1.
6. INSTALL ROADWAY CURTAIN DRAIN PER DETAIL 1/D1.
7. INSTALL STORM DRAIN CLEANOUT PER DETAIL 4/D1 OR DETAIL 5/D1.
8. INSTALL TYPE 1 CATCH BASIN PER COM STANDARD PLANS SW-001, SW-003, SW-005, AND SW-007.
9. CONNECT TO EXISTING STORM STRUCTURE.
10. PROVIDE GRADING THAT ALLOWS POSITIVE SURFACE FLOWS TOWARD STORMWATER FACILITIES AS PART OF STORM SYSTEM INSTALLATION.
11. NOTE NOT USED TO THIS SHEET.
12. INSTALL STORM DRAIN PIPE. AS APPLICABLE, REPAIR EXISTING ROADWAY DISTURBED BY THIS WORK PER DETAIL 3/D1.
13. TRANSITION IMPROVEMENTS INTO EXISTING GRAVEL WITH CRUSHED SURFACING BASE COURSE PER ROADWAY SECTION ON RS1.
14. NOTE NOT USED TO THIS SHEET.
15. INSTALL HORIZONTAL WALL DRAINS PER STRUCTURAL PLANS.
16. PLUG EXISTING PIPE AS PART OF STORM SYSTEM INSTALLATION



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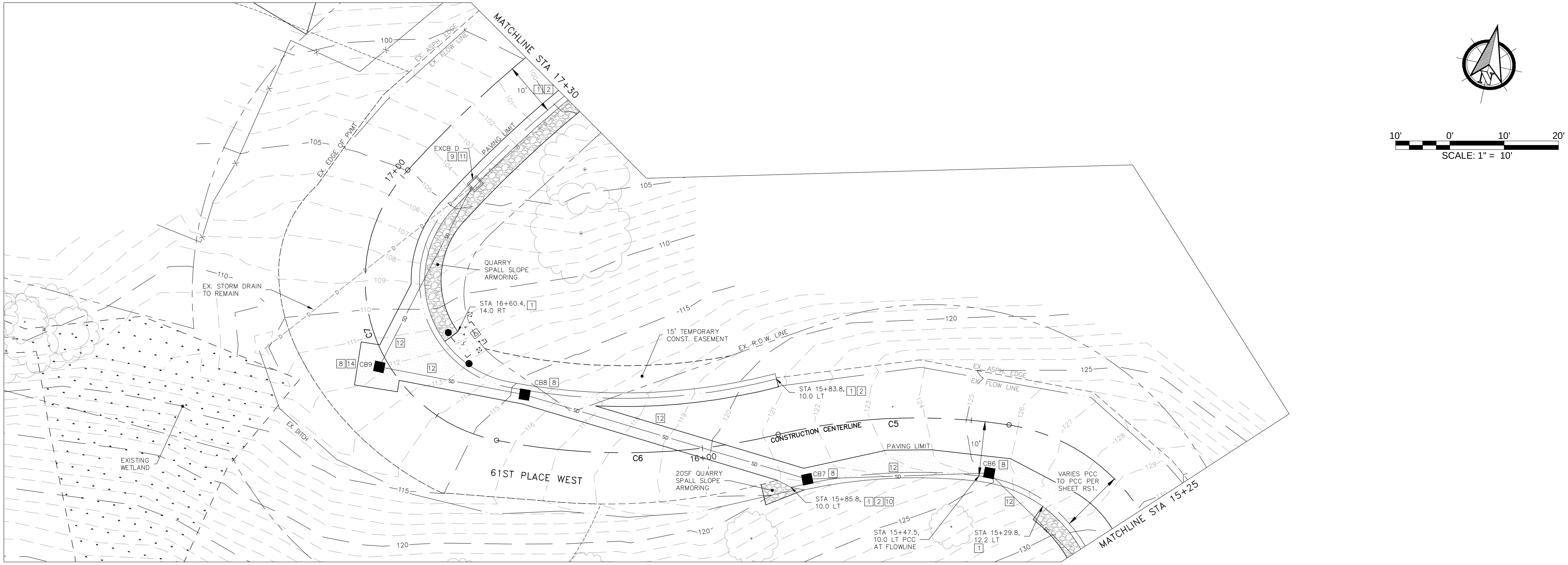
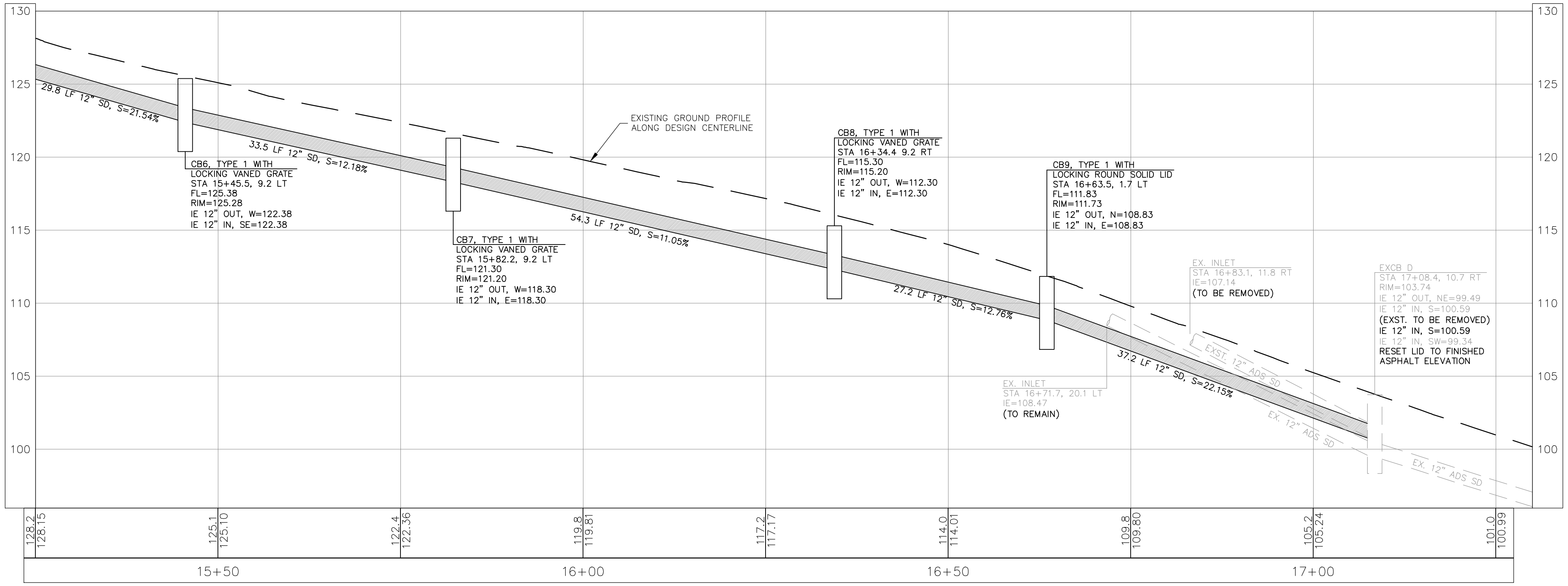
ROAD AND STORM PLAN AND PROFILE

RP2





☐ CONSTRUCTION NOTES

1. SEE ROADWAY SECTIONS, RS1, FOR PAVING DEPTHS AND GENERAL ROADWAY IMPROVEMENTS LEFT AND RIGHT OF CENTERLINE.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. NOTE NOT USED TO THIS SHEET.
4. NOTE NOT USED TO THIS SHEET.
5. NOTE NOT USED TO THIS SHEET.
6. NOTE NOT USED TO THIS SHEET.
7. NOTE NOT USED TO THIS SHEET.
8. INSTALL TYPE 1 CATCH BASIN PER COM STANDARD PLANS SW–001, SW–003, SW–005, AND SW–007.
9. CONNECT TO EXISTING STORM STRUCTURE.
10. TRANSITION ASPHALT FLOW LINE TO ENSURE POSITIVE SURFACE FLOWS TOWARD PROPOSED BARRIER EDGE, STORM FACILITY OR EXISTING ASPHALT FLOW LINE.
11. ADJUST EXISTING STORM STRUCTURE FRAME AND GRATE TO FINISHED GRADE.
12. INSTALL STORM DRAIN PIPE AND REPAIR EXISTING ROADWAY DISTURBED BY THIS WORK PER DETAIL 2/D1.
13. NOTE NOT USED TO THIS SHEET.
14. INSTALL SOLID CIRCULAR FRAME AND COVER PER WSDOT STANDARD PLAN B–30.70–03 WITH "DRAIN" LETTERING CAST INTO COVER.
15. NOTE NOT USED TO THIS SHEET.
16. NOTE NOT USED TO THIS SHEET.

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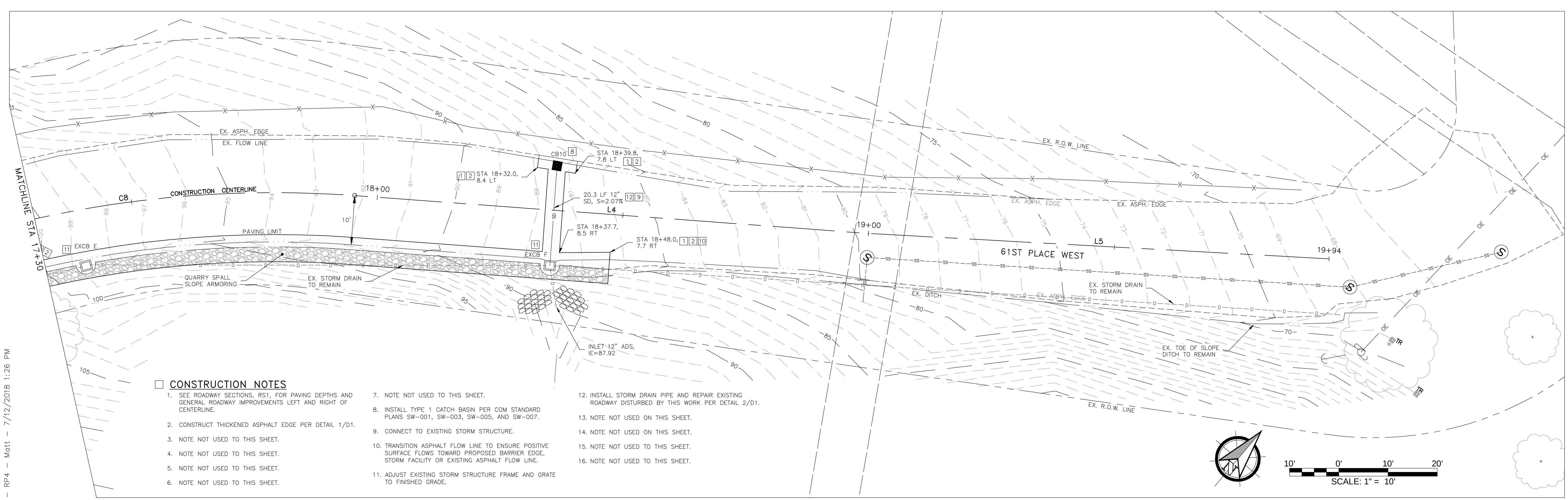
ROAD AND STORM PLAN AND PROFILE

RP3



☐ CONSTRUCTION NOTES

1. SEE ROADWAY SECTIONS, RS1, FOR PAVING DEPTHS AND GENERAL ROADWAY IMPROVEMENTS LEFT AND RIGHT OF CENTERLINE.
2. CONSTRUCT THICKENED ASPHALT EDGE PER DETAIL 1/D1.
3. NOTE NOT USED TO THIS SHEET.
4. NOTE NOT USED TO THIS SHEET.
5. NOTE NOT USED TO THIS SHEET.
6. NOTE NOT USED TO THIS SHEET.
7. NOTE NOT USED TO THIS SHEET.
8. INSTALL TYPE 1 CATCH BASIN PER COM STANDARD PLANS SW-001, SW-003, SW-005, AND SW-007.
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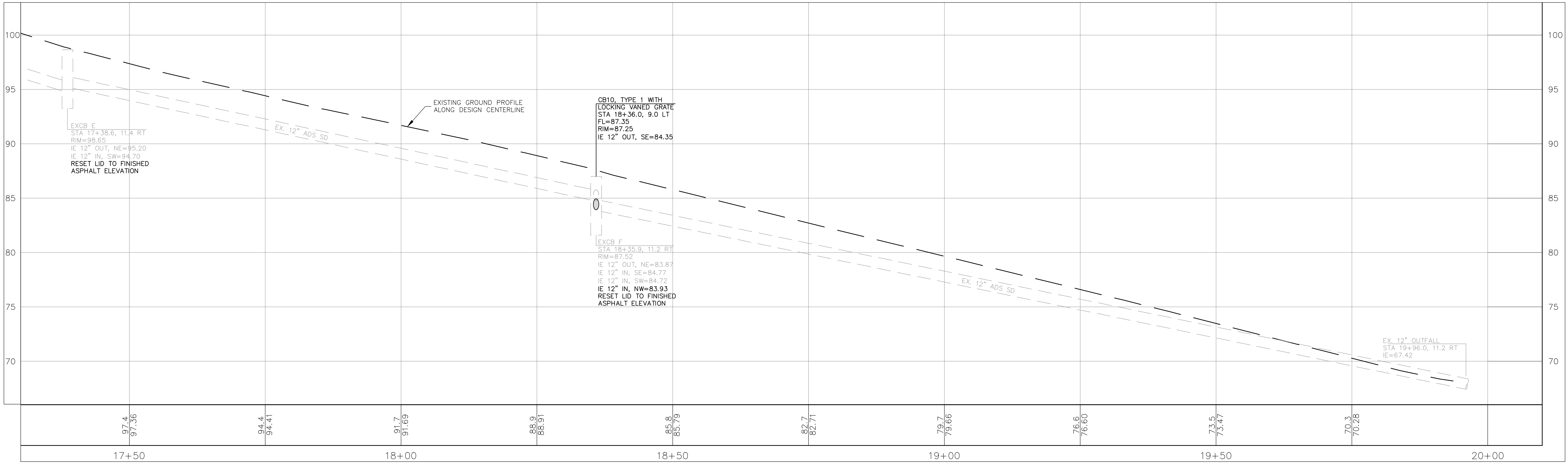
10. TRANSITION ASPHALT FLOW LINE TO ENSURE POSITIVE SURFACE FLOWS TOWARD PROPOSED BARRIER EDGE, STORM FACILITY OR EXISTING ASPHALT FLOW LINE.
11. ADJUST EXISTING STORM STRUCTURE FRAME AND GRATE TO FINISHED GRADE.
12. INSTALL STORM DRAIN PIPE AND REPAIR EXISTING ROADWAY DISTURBED BY THIS WORK PER DETAIL 2/D1.
13. NOTE NOT USED ON THIS SHEET.
14. NOTE NOT USED ON THIS SHEET.
15. NOTE NOT USED TO THIS SHEET.
16. NOTE NOT USED TO THIS SHEET.



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PLAN PRINTED AT
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SCALE RATIO
(I.E. 1"=10' TO 1"=20')

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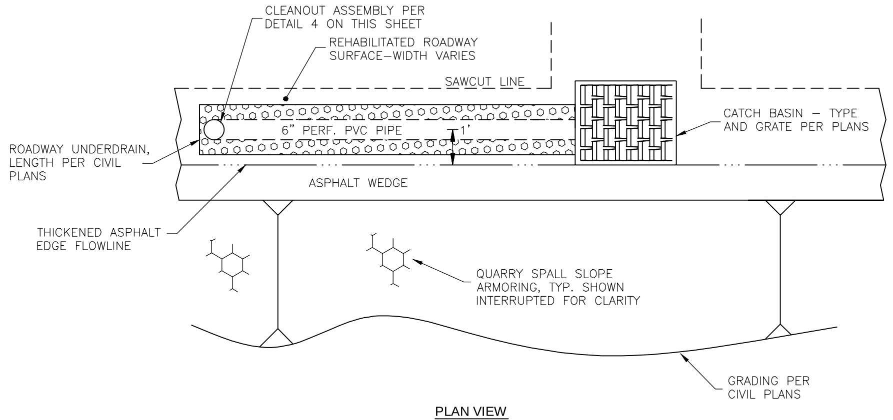
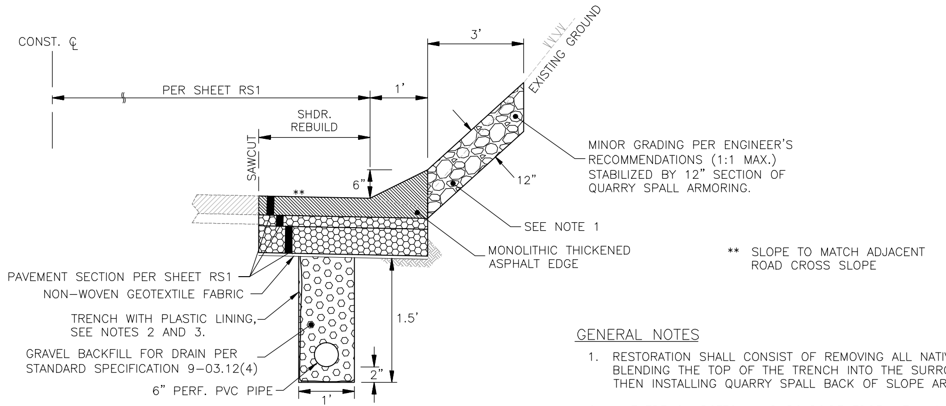
ROAD AND STORM PLAN AND PROFILE

RP4



PLAN VIEW
NTS



SECTION VIEW
NTS

GENERAL NOTES

1. RESTORATION SHALL CONSIST OF REMOVING ALL NATIVE MATERIAL, BLENDING THE TOP OF THE TRENCH INTO THE SURROUNDING GRADE, THEN INSTALLING QUARRY SPALL BACK OF SLOPE ARMORING.
2. LINE TRENCH BOTTOM AND ROADSIDE EDGE WITH 10-MIL THICK POLYETHYLENE PLASTIC SHEETING PER SECTION 9-14.5(3) OF THE WSDOT STANDARD SPECIFICATIONS. PROVIDE SIX-INCH OVERLAP ALONG AND SECURELY TAP THE ENTIRE LENGTH OF ALL SEAMS.
3. DITCH LINING SHALL BE SECURED IN PLACE USING SECTION D OF WSDOT STANDARD PLAN I-60.20-01. NO FASTENERS OR ANCHORS THAT PUNCTURE THE LINING SHALL BE PERMITTED.

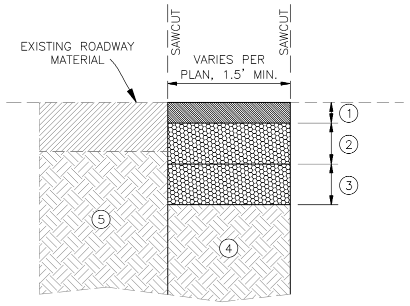
ROADWAY CURTAIN DRAIN DETAIL ①
NTS

TRENCH NOTES

①– 4" HOT MIX ASPHALT CL. 1/2" PG64-22 (2 LIFTS)
②– 8" CRUSHED SURFACING BASE COURSE
③– CRUSHED SURFACING BASE COURSE AS NECESSARY TO PREPARE THE ROADWAY SECTION
④– EXISTING ROADWAY SUBGRADE COMPACTED TO 95% OF MAXIMUM DENSITY PER ASTM D-1557.
⑤– UNDISTURBED EXISTING ROADWAY SUBGRADE.

GENERAL NOTES

1. ANY SPECIAL CONDITIONS MUST FIRST BE APPROVED BY THE ENGINEER.
2. ALL DENSITIES FOR GRAVEL SHALL BE PROCTORED USING ASTM D-1557. ASPHALT SHALL BE PROCTORED USING STATE APPROVED METHODS. DENSITIES SHALL BE DETERMINED USING A NUCLEAR DENSOMETER CONFORMING TO ASTM D-2950.
3. ALL DEPTHS SHOWN ARE COMPACTED DEPTHS.
4. ALL GRAVEL MATERIALS TO BE COMPACTED TO 95% OF MAXIMUM DENSITY ABOVE A TWO-FOOT DEPTH.

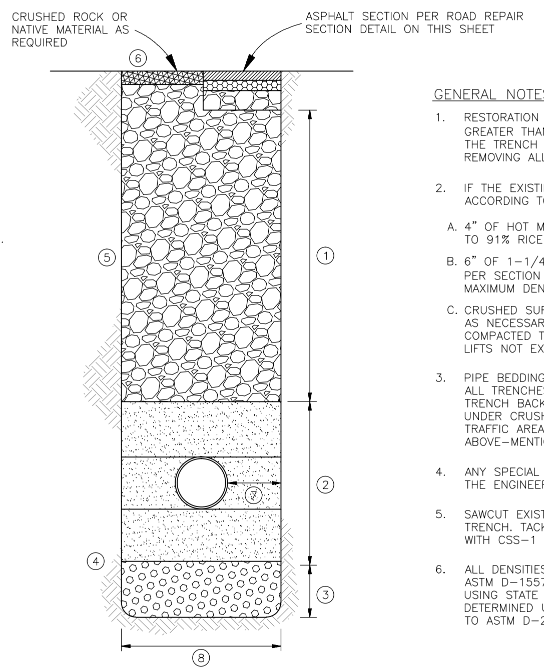


ROAD REPAIR SECTION ②
NTS

TRENCH NOTES

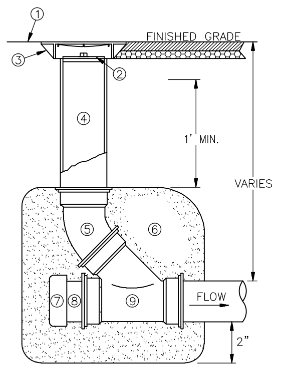
①– GRAVEL BORROW, PER SECTION 9-03.14, PLACED IN LOOSE LIFTS NOT EXCEEDING 6" IN DEPTH AND COMPACTED TO A MINIMUM OF 95% MAXIMUM DENSITY AT LOCATIONS WHERE REQUIRED AND/OR SPECIFIED. NATIVE MATERIAL, WHERE DEEMED ACCEPTABLE BY THE GEOTECHNICAL ENGINEER, MAY BE USED IF PLACED IN LIFTS NOT EXCEEDING 12" AND COMPACTED TO A MINIMUM OF 90%.
② SEE STANDARD PLAN B-55.20-00 FOR PIPE ZONE BEDDING AND BACKFILL REQUIREMENTS FOR VARYING PIPE SIZES AND MATERIALS.
③ IN TRENCHES WITH SOFT, YIELDING MATERIAL, AS DIRECTED BY THE ENGINEER, THE CONTRACTOR SHALL OVER-EXCAVATE TO ONE-FOOT BELOW THE PIPE INVERT AND BACKFILL WITH 2-1/2" MINUS BALLAST AGGREGATE TO THE BOTTOM OF PIPE BEDDING PER STANDARD SPECIFICATION 9-03.9(1).
④ UNDISTURBED STABLE EARTH.
⑤ TRENCH LINE.
⑥ SURFACE RESTORATION SHALL BE IN ACCORDANCE WITH GENERAL NOTE 1.
⑦ 6" MINIMUM IN THE MANIFOLD TRENCH SYSTEM, 15" MINIMUM IN THE STORM SYSTEM WITHIN ROADWAYS.
⑧ SEE STANDARD SPECIFICATION 2-09.4 FOR TRENCH WIDTH REQUIREMENTS FOR VARYING PIPE SIZES.

UTILITY PIPE TRENCH DETAIL ③
NTS



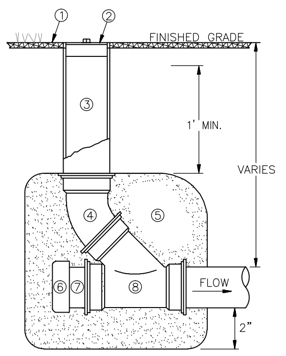
GENERAL NOTES

1. RESTORATION SHALL CONSIST OF REMOVING ALL ROCKS GREATER THAN 1" IN DIAMETER, BLENDING THE TOP OF THE TRENCH WITH THE SURROUNDING GRADE AND REMOVING ALL SPOILS FROM THE SITE.
2. IF THE EXISTING ASPHALT ROADWAY IS DISTURBED, REPAIR ACCORDING TO THE FOLLOWING REQUIREMENTS:
   A. 4" OF HOT MIX ASPHALT PER SECTION 5-04, COMPACTED TO 91% RICE DENSITY
   B. 6" OF 1-1/4" MINUS CRUSHED SURFACING BASE COURSE PER SECTION 9-03.9(3), TO BE COMPACTED TO 95% OF MAXIMUM DENSITY
   C. CRUSHED SURFACING BASE COURSE PER SECTION 9-03.9(3), AS NECESSARY TO PREPARE THE ROADWAY SECTION, COMPACTED TO 95% OF MAXIMUM DENSITY. PLACE IN LOOSE LIFTS NOT EXCEEDING EIGHT INCHES.
3. PIPE BEDDING AND COVER MATERIAL SHALL BE USED IN ALL TRENCHES REGARDLESS OF LOCATION. GRAVEL BORROW TRENCH BACKFILL SHALL BE USED IN ALL TRENCHES UNDER CRUSHED ROCK, CONSTRUCTION AND PERMANENT TRAFFIC AREAS, AND WITHIN FOUR FEET OF THE ABOVE-MENTIONED CONDITIONS.
4. ANY SPECIAL CONDITIONS MUST FIRST BE APPROVED BY THE ENGINEER.
5. SAWCUT EXISTING ASPHALT ONE-FOOT BEYOND EDGE OF TRENCH. TACK COAT EDGE OF SAWCUT AND SEAL JOINT WITH CSS-1 AND SAND, APPLIED WITH HEAT.
6. ALL DENSITIES FOR GRAVEL SHALL BE PROCTORED USING ASTM D-1557 TESTING. ASPHALT SHALL BE PROCTORED USING STATE APPROVED METHODS. DENSITIES SHALL BE DETERMINED USING A NUCLEAR DENSOMETER CONFORMING TO ASTM D-2950.



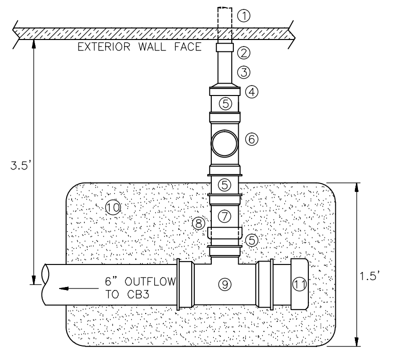
① RESTORATION SHALL BE IN ACCORDANCE WITH GENERAL NOTE 1 FOUND ON THIS PLAN SHEET
② THREADED PVC PLUG
③ ALUMINUM OR CAST IRON FOG-TIGHT VALVE CASING COVER OR EQUAL. LID SHALL BE TRAFFIC TYPE WITH LOCKING BOLTS
④ PVC STAND PIPE – SIZE TO PLAN
⑤ PVC 45° BEND – SIZE TO PLAN
⑥ COMPACTED SAND
⑦ PVC CAP OR PIPE AS DEFINED ON DRAINAGE PLAN
⑧ SHORT PVC STUB – SIZE TO PLAN
⑨ PVC 45° WYE – SIZE TO PLAN

CLEANOUT ASSEMBLY DETAIL ④
INSTALLED IN TRAFFIC AREAS -- NTS

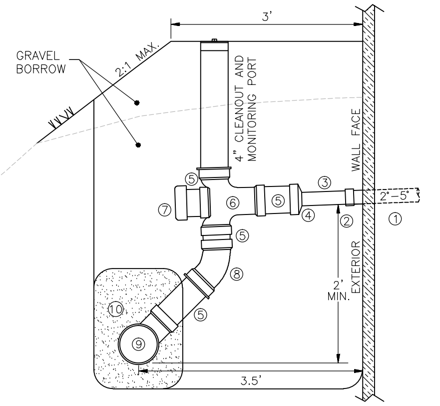


① RESTORATION SHALL BE IN ACCORDANCE WITH GENERAL NOTE 1 FOUND ON THIS PLAN SHEET
② THREADED PVC PLUG
③ PVC STAND PIPE – SIZE TO PLAN
④ PVC 45° BEND – SIZE TO PLAN
⑤ COMPACTED SAND
⑥ PVC CAP OR PIPE AS DEFINED ON DRAINAGE PLAN
⑦ SHORT PVC STUB – SIZE TO PLAN
⑧ PVC 45° WYE – SIZE TO PLAN

CLEANOUT ASSEMBLY DETAIL ⑤
INSTALLED IN NON-TRAFFIC AREAS -- NTS



① 2" SLOTTED PVC HORIZONTAL WALL DRAIN ELEV. PER SHEET W-3
② 2" PVC COUPLING
③ 2" SOLID WALL PVC STUB – FIELD FIT
④ 4"x2" PVC REDUCER
⑤ 4" SOLID WALL PVC STUB – FIELD FIT
⑥ 4" PVC DOUBLE WYE WITH 4" PVC MONITORING PORT PER CLEANOUT DETAIL ON THIS SHEET
⑦ 4" PVC STUB WITH 4" PVC CAP – FIELD FIT
⑧ 4" PVC 45° BEND
⑨ 6"x4" PVC TEE ANGLED VERTICALLY
⑩ TRENCHING PER UTILITY PIPE TRENCH DETAIL ON THIS SHEET.
⑪ 6" PVC STUB WITH 6" PVC CAP, WEST END TERMINUS ONLY.



MANIFOLD FITTING DETAIL ⑥
PLAN VIEW -- NTS

TUTTLE ENGINEERING
AND MANAGEMENT
275 West Rio Vista Avenue, Suite 3 Burlington, WA 98233
O | (360) 899-5953 W | www.tuttle-team.com

P:\T16-009 Mukilteo 61st Place Wall\Eng\Drawings\Plan Sheets\19 – 61st Place Project Details.dwg – D1 – Matt – 7/12/2018 1:44 PM

XREF Filename:
Filename:

Drawn By: J. HOYER
Checked By: J. TUTTLE

Surveyed By:
Date:
Field Bk/Pg:
Datum:

Recorded Survey: SNOHOMISH COUNTY
AF–
Vol/Bk Page

Aerial Mapping & Control Survey
Firm:
Date: JUNE 29, 2018
GIS Cntl Pnts:
Firm:
Date: JUNE 29, 2018
Field BK/PG:

Constructed By:
Date:

NO.	DATE	BY	REVISION

PLAN PRINTED AT
11"x17" DEPICTS A 1:2
SCALE RATIO
(I.E. 1"=10' TO 1"=20')

Scale:
Horiz: –
Vert: –
Designed By:
Inspected By:
W.O. No.:
Date: JULY 12, 2018

CITY OF MUKILTEO

CITY OF MUKILTEO
PUBLIC WORKS DEPARTMENT
11930 Cyrus Way Mukilteo, Washington 98275
425-263-8000 FAX 425-290-1009
http://mukilteowa.gov

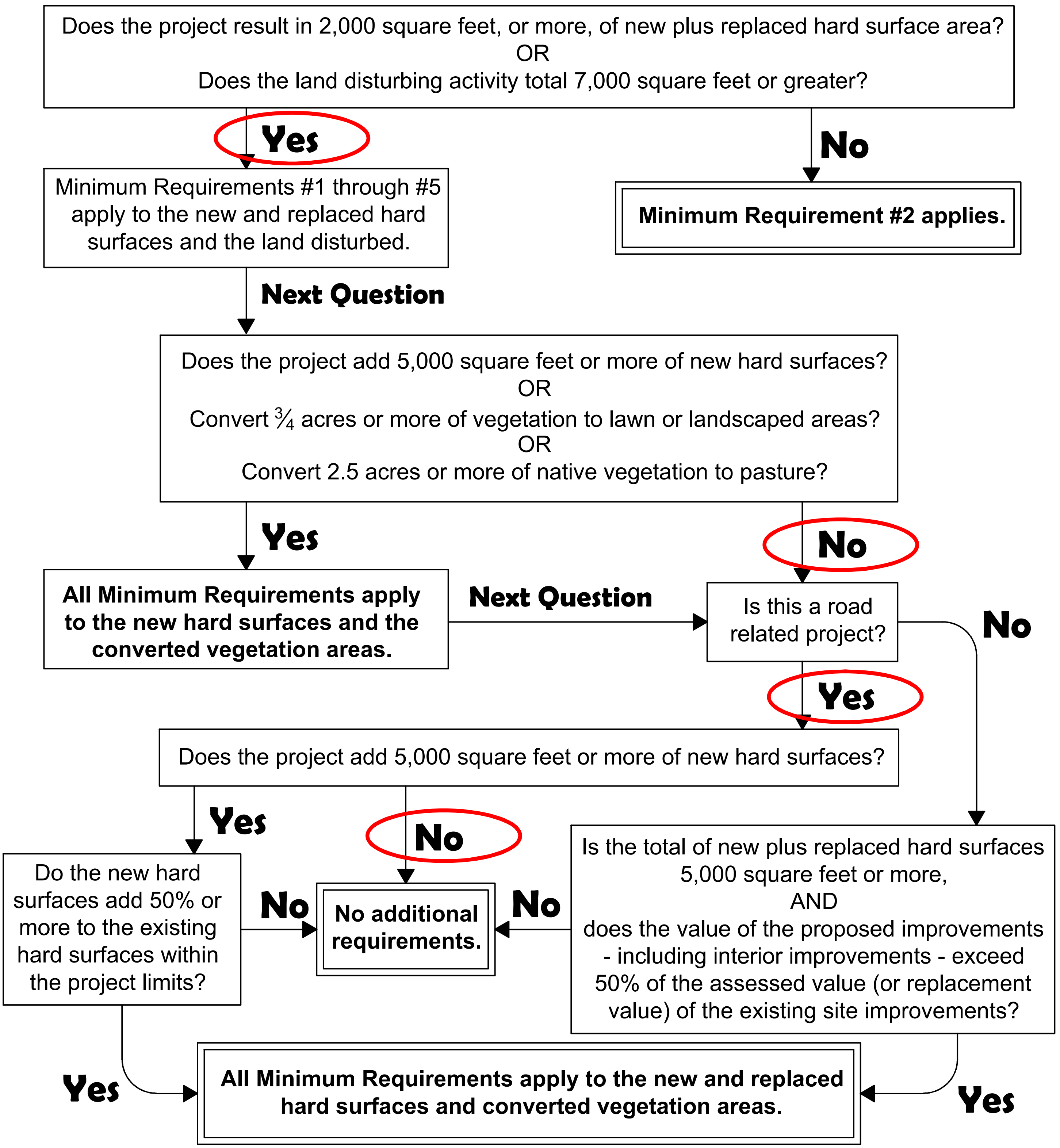
JOHN RAYMOND TUTTLE
43718

61st Place West
Retaining Wall Project
99% Design - Not For Construction

ROAD AND STORM DETAILS AND NOTES

D1

APPENDIX D – BMP DESIGN



DEPARTMENT OF
ECOLOGY
State of Washington

Figure I-2.4.2
Flow Chart for Determining Requirements for Redevelopment

Revised June 2015

BMP DESIGN CALCULATIONS

Pipe Sizing Calculations

Assumptions:
Minimum Pipe Diameter, D = 12” (1’) *
Minimum Pipe Slope, per plan, S = 7.42% (.0742 ft/ft) *
n = 0.012

Use Manning’s Equation for a pipe flowing full to determine minimum pipe diameter

$$Q = \frac{0.464}{n} \times D^{8/3} \times S^{1/2}$$

Calculations:

$$Q = \frac{0.464}{0.012} \times 1^{8/3} \times 0.0742^{1/2}$$

Q = 10.53 CFS

Summing Q_{100} per the attached Grate Bypass Calculations (see the Comments section under each drainage area) using the Rational Method = 0.785 CFS

10.53 CFS > 0.785 CFS
The pipe has enough capacity to convey the 100-year storm event.

* It is noted that the minimum pipe slope on the plan is 3.1% in an 8” pipe. However, this pipe is at the top of the system and will not convey runoff from the entire project. Q for an 8” pipe flowing full at a slope of 3.1% = 2.31 CFS. This is still greater than Q_{100} for the entire system. As such, the 8-inch pipe has adequate capacity to convey the flow from the 100-year storm event.

61st PLACE WEST RETAINING WALL PROJECT - BYPASS FLOW CALCULATIONS

Grate Bypass Flows - Continuous Gutter Condition (HP-CB2)

Drainage area (A):	2017 ft2	Profile grade:	8.50%
	0.046 acres	Road cross slope:	2.40%

Design Parameters:

T = 5 min.
C = 0.9
I = 2 in/hr (10-year)
Grate Width = 1.48 ft

Sta.	Average Width	Length	Area (ft2)	Q (cfs)	Sum Q	Gutter Slope (ft/ft)	Cross Slope (ft/ft)	G.W.	Flow Depth (ft)	Bypass Width Zd (ft)	Velocity (ft/sec)	Bypass Flow (cfs)
-	- - - -	- - - - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - -	- - -	- - -	- - -	- - - -
-	- - - -	- - - - - -	2017.0	0.083	0.083	0.0850	0.024	1.48	0.04	1.66	2.54	0.000

Design Flow Output =>	Collected:	0.083	ft3/sec
	Bypass flow:	0.000	ft3/sec

Comments:

* Meets final bypass flow criteria as defined under Section 5-5.1 of the Hydraulics Manual.

Q100= 0.121 CFS I=2.9 in/hr (100-year storm event)

Grate Bypass Flows - Continuous Gutter Condition (CB2-CB4)

Drainage area (A):	943 ft2	Profile grade:	13.00%
	0.022 acres	Road cross slope:	3.00%

Design Parameters:

T = 5 min.
C = 0.9
I = 2 in/hr (10-year)
Grate Width = 1.48 ft

Sta.	Average Width	Length	Area (ft2)	Q (cfs)	Sum Q	Gutter Slope (ft/ft)	Cross Slope (ft/ft)	G.W.	Flow Depth (ft)	Bypass Width Zd (ft)	Velocity (ft/sec)	Bypass Flow (cfs)
287	- - - -	- - - - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - -	- - -	- - -	- - -	- - - -
414			943.0	0.039	0.039	0.1300	0.030	1.48	0.03	1.00	3.33	0.000

Design Flow Output =>	Collected:	0.039	ft3/sec						
	Bypass flow:	0.000	ft3/sec	plus previous bypass:	0.000	ft3/sec	=	0.000	ft3/sec *

Comments:

* Meets final bypass flow criteria as defined under Section 5-5.1 of the Hydraulics Manual.

Q100= 0.057 CFS I=2.9 in/hr (100-year storm event)

61st PLACE WEST RETAINING WALL PROJECT - BYPASS FLOW CALCULATIONS

Grate Bypass Flows - Continuous Gutter Condition (HP-CB1)

Drainage area (A): 528 ft2
0.012 acres

Profile grade: 9.00%
Road cross slope: 2.50%

Design Parameters:

T = 5 min.
C = 0.9
I = 2 in/hr (10-year)
Grate Width = 1.48 ft

Sta.	Average Width	Length	Area (ft2)	Q (cfs)	Sum Q	Gutter Slope (ft/ft)	Cross Slope (ft/ft)	G.W.	Flow Depth (ft)	Bypass Width Zd (ft)	Velocity (ft/sec)	Bypass Flow (cfs)
- -	- - - -	- - - - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - -	- - -	- - -	- - -	- - - -
- -			528.0	0.022	0.022	0.0900	0.025	1.48	0.02	0.97	2.57	0.000

Design Flow Output => Collected: 0.022 ft3/sec
Bypass flow: 0.000 ft3/sec plus previous bypass: 0.000 ft3/sec = 0.000 ft3/sec *

Comments:

* Meets final bypass flow criteria as defined under Section 5-5.1 of the Hydraulics Manual.

Q100= 0.032 CFS I=2.9 in/hr (100-year storm event)

Grate Bypass Flows - Continuous Gutter Condition (CB1-CB3)

Drainage area (A): 1121 ft2
0.026 acres

Profile grade: 12.90%
Road cross slope: 2.50%

Design Parameters:

T = 5 min.
C = 0.9
I = 2 in/hr (10-year)
Grate Width = 1.48 ft

Sta.	Average Width	Length	Area (ft2)	Q (cfs)	Sum Q	Gutter Slope (ft/ft)	Cross Slope (ft/ft)	G.W.	Flow Depth (ft)	Bypass Width Zd (ft)	Velocity (ft/sec)	Bypass Flow (cfs)
531	- - - -	- - - - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - -	- - -	- - -	- - -	- - - -
591			1121.0	0.046	0.046	0.1290	0.025	1.48	0.03	1.20	2.71	0.000

Design Flow Output => Collected: 0.046 ft3/sec
Bypass flow: 0.000 ft3/sec plus previous bypass: 0.000 ft3/sec = 0.000 ft3/sec *

Comments:

* Meets final bypass flow criteria as defined under Section 5-5.1 of the Hydraulics Manual.

Q100= 0.067 CFS I=2.9 in/hr (100-year storm event)

Grate Bypass Flows - Continuous Gutter Condition (CB3-CB5)

Drainage area (A): 2120 ft2
0.049 acres

Profile grade: 16.00%
Road cross slope: 3.00%

Design Parameters:

T = 5 min.
C = 0.9
I = 2 in/hr (10-year)
Grate Width = 1.48 ft

Sta.	Average Width	Length	Area (ft2)	Q (cfs)	Sum Q	Gutter Slope (ft/ft)	Cross Slope (ft/ft)	G.W.	Flow Depth (ft)	Bypass Width Zd (ft)	Velocity (ft/sec)	Bypass Flow (cfs)
531	- - - -	- - - - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - -	- - -	- - -	- - -	- - - -
591			2120.0	0.088	0.088	0.1600	0.030	1.48	0.04	1.31	3.48	0.000

Design Flow Output => Collected: 0.088 ft3/sec
Bypass flow: 0.000 ft3/sec plus previous bypass: 0.000 ft3/sec = 0.000 ft3/sec *

Comments:
* Meets final bypass flow criteria as defined under Section 5-5.1 of the Hydraulics Manual.
Q100= 0.127 CFS I=2.9 in/hr (100-year storm event)

Grate Bypass Flows - Continuous Gutter Condition (CB5-CB6)

Drainage area (A): 325 ft2
0.007 acres

Profile grade: 13.80%
Road cross slope: 3.00%

Design Parameters:

T = 5 min.
C = 0.9
I = 2 in/hr (10-year)
Grate Width = 1.48 ft

Sta.	Average Width	Length	Area (ft2)	Q (cfs)	Sum Q	Gutter Slope (ft/ft)	Cross Slope (ft/ft)	G.W.	Flow Depth (ft)	Bypass Width Zd (ft)	Velocity (ft/sec)	Bypass Flow (cfs)
531	- - - -	- - - - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - -	- - -	- - -	- - -	- - - -
591			325.0	0.013	0.013	0.1380	0.030	1.48	0.02	0.67	-4.07	0.000

Design Flow Output => Collected: 0.013 ft3/sec
Bypass flow: 0.000 ft3/sec plus previous bypass: 0.000 ft3/sec = 0.000 ft3/sec *

Comments:
* Meets final bypass flow criteria as defined under Section 5-5.1 of the Hydraulics Manual.
Q100= 0.019 CFS I=2.9 in/hr (100-year storm event)

Grate Bypass Flows - Continuous Gutter Condition (CB6-CB7)

Drainage area (A):	712 ft2	Profile grade:	10.00%
	0.016 acres	Road cross slope:	2.00%

Design Parameters:

T = 5 min.
C = 0.9
I = 2 in/hr (10-year)
Grate Width = 1.48 ft

Sta.	Average Width	Length	Area (ft2)	Q (cfs)	Sum Q	Gutter Slope (ft/ft)	Cross Slope (ft/ft)	G.W.	Flow Depth (ft)	Bypass Width Zd (ft)	Velocity (ft/sec)	Bypass Flow (cfs)
531	- - - -	- - - - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - -	- - -	- - -	- - -	- - - -
591			712.0	0.029	0.029	0.1000	0.020	1.48	0.02	1.22	2.06	0.000

Design Flow Output => Collected: 0.029 ft3/sec
Bypass flow: 0.000 ft3/sec plus previous bypass: 0.000 ft3/sec = 0.000 ft3/sec *

Comments:

* Meets final bypass flow criteria as defined under Section 5-5.1 of the Hydraulics Manual.

Q100= 0.043 CFS I=2.9 in/hr (100-year storm event)

Grate Bypass Flows - Continuous Gutter Condition (CB7-CB8)

Drainage area (A):	5339 ft2	Profile grade:	10.50%
	0.123 acres	Road cross slope:	6.00%

Design Parameters:

T = 5 min.
C = 0.9
I = 2 in/hr (10-year)
Grate Width = 1.48 ft

Sta.	Average Width	Length	Area (ft2)	Q (cfs)	Sum Q	Gutter Slope (ft/ft)	Cross Slope (ft/ft)	G.W.	Flow Depth (ft)	Bypass Width Zd (ft)	Velocity (ft/sec)	Bypass Flow (cfs)
531	- - - -	- - - - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - -	- - -	- - -	- - -	- - - -
591			5339.0	0.221	0.221	0.1050	0.060	1.48	0.08	1.30	4.46	0.000

Design Flow Output => Collected: 0.221 ft3/sec
Bypass flow: 0.000 ft3/sec plus previous bypass: 0.000 ft3/sec = 0.000 ft3/sec *

Comments:

* Meets final bypass flow criteria as defined under Section 5-5.1 of the Hydraulics Manual.

Q100= 0.320 CFS I=2.9 in/hr (100-year storm event)