PRELIMINARY
STORMWATER SITE PLAN
FOR
GORBUN SUBDIVISION

APRIL 16, 2020

PRELIMINARY
STORMWATER SITE PLAN

FOR

GORBUN SUBDIVISION

A portion of the NE ¼ of Section 4, Township 20 North, Range 4 East,
W.M., City of Milton, Pierce County, Washington

Prepared for:

Igor Gorbun
PNW Home Buyer, LLC
2110 104th Avenue East #205
Edgewood, WA 98372
(253) 691-2049

Prepared by:

Apex Engineering, PLLC
2601 South 35th Street, Suite 200
Tacoma, Washington 98409
(253) 473-4494
File #34956
April 16, 2020

4/17/2020

Project Engineer: _____
Joseph Blankenship, P.E.

Project Manager: _____
James Kirkebo, III

TABLE OF CONTENTS

CHAPTER 1 - PROJECT OVERVIEW

The Gorbun Subdivision Plat is a proposed 6 lot single family subdivision located along and east of 23rd Avenue in the City of Milton. The project limits include one parcel that is adjacent to the 23rd Avenue R/W for a total site area of 1.58± acres.

The existing parcel address is 308 23rd Ave., Milton, WA, lying in the NE 1/4 of Section 4, Twp. 20 N, Rge. 4 E, W.M.

Storm Drainage design is intended to follow the guidelines and requirements of the 2019 Stormwater Management Manual for Western Washington (SMMWW) prepared by the Department of Ecology.

Site topography is relatively flat with a slight high point at the center of the site. The eastern portion of the site is relatively flat with existing slope varying from 0-1%. The western portion of the site in the vicinity of the 23rd Avenue right-of-way has an existing slope of approximately 3%.

Storm water generally sheet flows from the east to the west to the drainage ditch along 23rd Avenue. Stormwater then heads south within the ditch and enters a storm drain pipe system. There are no other known drainage features on the site. Run-on from adjacent properties is insignificant. There are no known critical areas onsite.

In the developed condition roof runoff, onsite sidewalk runoff, access tract and lawn runoff areas are proposed to be detained onsite.

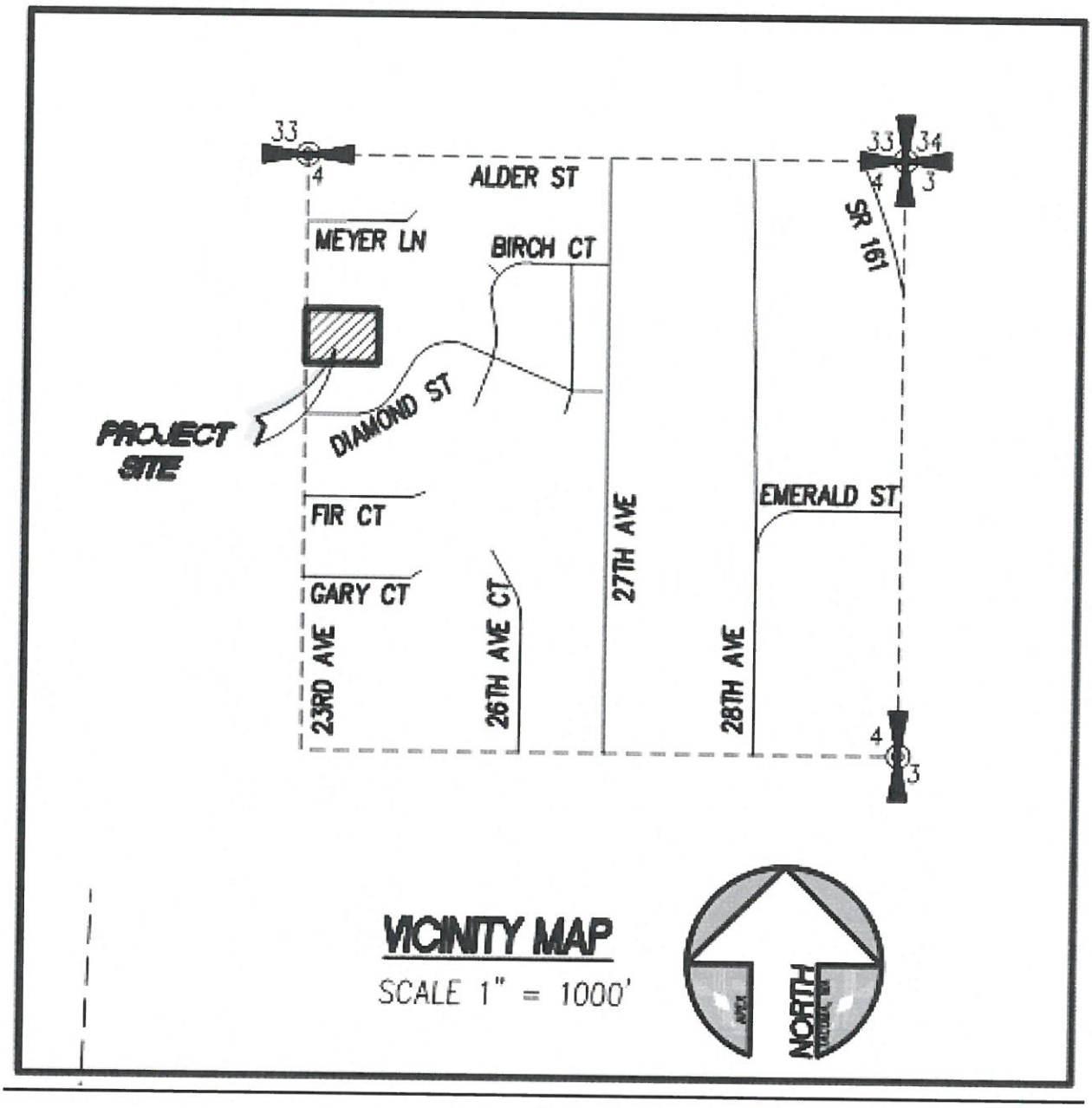
There is minimal runoff entering the site from adjacent properties.

See Figure 1.1 for a vicinity map.

See Chapter 4 for a discussion of existing and developed site locations and hydrology.

A Stormwater Infiltration Feasibility: Soils Report was prepared by GeoResources, dated October 8, 2019. A copy is included as Figure 1.4. The report provides a copy of the NRCS Web Soil Survey Map and 6 soil logs/samples were taken across the site. Generally, site soils are mapped as Alderwood series. Roof drain infiltration is not considered feasible. Porous pavement may be feasible.

Figure 1.1 – Vicinity Map



Site Maps

Existing Conditions: Figure 1.2

Proposed Improvements: Figure 1.3

GORBUN SUBDIVISION

PRELIMINARY PLAT

A PORTION OF THE NW 1/4 OF THE NE 1/4 OF SECTION 4, TOWNSHIP 20 NORTH, RANGE 04 EAST, W.M.
CITY OF MILTON, PIERCE COUNTY, WASHINGTON

NORTH

GRAPHIC SCALE
20 0 10 20 40
(IN FEET)
1 inch = 20 ft.

OLOFSSON ESTATES

PARCEL D
RUDOLF JOHNSON
TPN 0420041166

CITY OF MILTON
LOT LINE
ADJUSTMENT
AFN 9302020521

LOT 9
DONNA JOHNSON
TPN 6025450090

OLOFFSON ESTATES
AFN 200612145002

LOT 10
KATHLEEN DRAKE
TPN 7275200100

NADIYA VELICHKO
6000000090

23RD AVENUE
23RD AVE.

30'

N88°18'15"W 300.05'

S02°44'20"W 230.04'

N02°44'20"E 230.04'

S88°18'15"E 300.05'

TDA

Exist Dwelling

365

LOT 11
MARETTE SATTERLEE
TPN 7275200110

ROSECREST

LOT 15
LESLEY & JOHN
CHRISTENSEN
TPN 7275200150

LOT 13
THOMAS BOSLEY
TPN 7275200130

LOT 12
LYNN & DOUGLAS SHORE
TPN 7275200120

ROSECREST
AFN 2571484

ROSECREST

VICINITY MAP
SCALE 1" = 1000'
PROJECT SITE
ALDER ST
MEYER LN
BIRCH CT
DIAMOND ST
FIR CT
GARY CT
23RD AVE
26TH AVE CT
27TH AVE
28TH AVE
EMERALD ST

PLAT AREA
69,012+/- SF. (1.58+/- ACRES)

NOTE
BOUNDARY AND TOPOGRAPHY COMPLETED BY APEX ENGINEERING

Existing Conditions
Figure 1.2

PROJECT MANAGER: TREB KIRKEBO SIGNATURE:
REV NO | REVISION DESCRIPTION | DATE | BY
DESIGN KRS
DRAWN KRS
CHECKED
SEC 4 T 20 N R 04 E
DISC NO DISC-NO
DATE 11-12-19
SCALE 1"=20'
DATE SEALED
PRELIMINARY
STATE OF WASHINGTON 45706 REGISTERED PROFESSIONAL LAND SURVEYOR

TITLE GORBUN SUBDIVISION
PRELIMINARY PLAT

CLIENT/OWNER
PNW HOME BUYER, LLC.
2110 - 104TH AVENUE EAST #205
EDGEWOOD, WA. 98372
KOOR GORBUN (253)691-2049 pnwhomebuyer@gmail.com

Apex Engineering
2601 South 35th, Suite 200
Tacoma, Washington 98409-7479
(253) 473-4494 FAX: (253) 473-0599

SHEET 1 OF 1
FILE NO 34956

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GORBUN SUBDIVISION

PRELIMINARY PLAT

A PORTION OF THE NW 1/4 OF THE NE 1/4 OF SECTION 4, TOWNSHIP 20 NORTH, RANGE 04 EAST, W.M.
CITY OF MILTON, PIERCE COUNTY, WASHINGTON

NORTH (RADIAL NW)

GRAPHIC SCALE
20 0 10 20 40
(IN FEET)
1 inch = 20 ft.

NEW IMPERVIOUS SURFACES 3740 S.F.

OLOFSSON ESTATES

PARCEL D
RUDOLF JOHNSON
TPN 0420041166

CITY OF MILTON LOT LINE ADJUSTMENT
AFN 9302020521

LOT 9
DONNA JOHNSON
TPN 6025450090

OLOFFSON ESTATES
AFN 200612145002

N88°18'15"W 300.05'

30'

STANDARD HMA

ROW

LOT 6

LOT 5

TDA

LOT 4

LOT 10
KATHLEEN DRAKE
TPN 7275200100

NADIYA VELICHKO
6000000090

S02°44'20"W 230.04'

TRACT "A"

LOT 3

N02°44'20"E 230.04'

ROSECREST

23RD AVENUE

23RD AVE.

LOT 1

Standard HMA

LOT 2

LOT 11
MARETTE SATTERLEE
TPN 7275200110

EXISTING DITCH

S88°18'15"E 300.05'

LOT 15
LESLEY & JOHN CHRISTENSEN
TPN 7275200150

LOT 13
THOMAS BOSLEY
TPN 7275200130

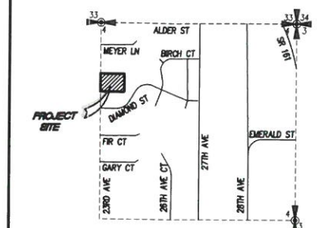
LOT 12
LYNN & DOUGLAS SHORE
TPN 7275200120

ROSECREST
AFN 2571484

ROSECREST

Proposed Improvements
Figure 1.3

VICINITY MAP
SCALE 1" = 1000'



PLAT AREA
69,012+/- SF. (1.58+/- ACRES)

NOTE
BOUNDARY AND TOPOGRAPHY COMPLETED BY APEX ENGINEERING

DESIGN KRS
DRAWN KRS
CHECKED
SEC 4 T 20 N R 04 E
DISC NO DISC-NO
DATE 11-12-19
SCALE 1"=20'

REV NO	REVISION DESCRIPTION	DATE	BY

PROJECT MANAGER: TREB KIRKEBO SIGNATURE:

DATE SEALED

TITLE: GORBUN SUBDIVISION
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CLIENT/OWNER
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SHEET 1 OF 1
FILE NO 34956

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Figure 1.4 – Stormwater Infiltration Feasibility: Soils Report

GEORESOURCES
earth science & geotechnical engineering
5007 Pacific Hwy E., Suite 16 | Fife, WA 98424 | 253.896.1011 | www.georesources.rocks

October 8, 2019

Mr. Igor Gorbun
2110 – 104th Avenue East, ##205
Edgewood, Washington 98372
(253) 691-2049
pnwhomebuyer@gmail.com

Stormwater Infiltration Feasibility: Soils Report
Proposed Short Plat
308 – 23rd Avenue
Milton, Washington
PN: 0420041048
Doc ID: Gorbun.23rdAve.SR

INTRODUCTION

This stormwater soils report addresses the feasibility of the site soils to support infiltration of stormwater runoff generated by the proposed short plat to located at 308 – 23rd Avenue in Milton, Washington. The general site location is shown on the Site Location Map, Figure 1.

Our understanding of the project is based on our conversations with you; our review of the provided preliminary site plan; our review of available published geologic literature for the site area; our September 18, 2019 site visit and subsurface explorations; our understanding of the City of Milton development requirements; and our experience in the area. The site is currently developed with an existing single-family residence, driveway, and associated utilities. We understand that you propose to remodel the existing structure and subdivide the parcel into 5 or 6 residential lots. We further understand that access to the site will be via a 30-foot wide access road from 23rd Avenue. We anticipate the proposed residences will be a one- to two-story, wood-framed structures supported by conventional shallow foundations. A copy of the preliminary site plan is included as the Site & Exploration Plan, Figure 2.

Because of the proposed amount of new and replaced hard surface, the City of Milton is requiring that a site specific soils report be prepared in accordance with the Department of Ecology 2012 Stormwater Management Manual for Western Washington (2012 SWMMWW) with 2014 Amendments, as adopted by the City of Milton, to confirm subsurface conditions and to address the feasibility of the onsite infiltration of stormwater runoff generated by the proposed development.

SCOPE

The purpose of our services was to evaluate the surface and subsurface conditions at the site as a basis for developing and providing geotechnical stormwater recommendations for the proposed development. Specifically, our scope of services for the project included the following:

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;
2. Exploring surface and subsurface conditions across the site by reconnoitering the site and monitoring the excavation of a series of test pits at select locations across the site;

3. Describing surface and subsurface conditions, including soil type, depth to groundwater, and an estimate of seasonal high groundwater levels;
4. Providing our opinion about the feasibility of onsite infiltration in accordance with the 2012 SWMMWW, including a preliminary design infiltration rate based on grain size analysis, as applicable; and,
5. Preparing this written *Soils Report* summarizing our site observations and conclusions, and our geotechnical recommendations and design criteria, along with the supporting data.

Our services were performed in general accordance with the scope of services described in our *Proposal for Geotechnical Engineering Services* dated September 5, 2019. We received written authorization to proceed from you on September 10, 2019.

Site Conditions

The site is located at 308 – 23rd Avenue in Milton, Washington, within an area of existing residential development. The site is generally rectangular in shape, measures about 228 to 230 feet wide (north to south) by about 295 to 297 feet deep (east to west), and encompasses about 1.58 acres. The site is bounded by residential development to the north, east, and south, and by 23rd Avenue to the west. As stated, the site is developed with an existing single-family residence in the southwest portion of the site.

Based on information obtained from the Pierce County Public GIS as well as our site observations, the site generally flat to gently sloping up from west to east at about 3 percent. Total topographic relief across the parcel is on the order of about 6 feet. The existing site configuration and topography is shown on the Site Vicinity Map, Figure 3.

Vegetation across the site consists of scattered maple trees in the southwest corner of the site and scattered fir and cedar trees in the northeast corner of the site. The majority of the site is vegetated with grasses and low-lying blackberries. No surface erosion, seeps, springs, or evidence of slope instability was observed at the time of our site visit.

Site Soils

The USDA Natural Resource Conservation Services (NRCS) Web Soil Survey indicates that the site is underlain by Alderwood gravelly sandy loam (1B) soils. The Alderwood soils are derived from glacial till and form on slopes of 0 to 8 percent. These soils have a "slight" erosion hazard when exposed and are including in hydrologic soils group B. An excerpt of the NRCS soil map for the site vicinity is included as Figure 4.

Geologic Conditions

The *Geologic Map of the Poverty Bay 7.5-minute Quadrangle, Washington* (Booth, Waldron, Troost 2003) maps the site as being underlain by glacial till (Qvt). These glacial soils were deposited during the Vashon Stade of the Fraser Glaciation, some 12,000 to 15,000 years ago. The glacial till soils generally consist of a heterogeneous mixture of clay, silt, sand, and gravel that was deposited at the base of the advancing continental ice mass and was subsequently overridden. As such, the glacial till is considered to be over-consolidated and generally has high strength and low compressibility characteristics, where undisturbed. No areas of landslide deposits or mass wasting are mapped within the vicinity of the site. An excerpt of the above referenced geologic map is included as Figure 5.

Subsurface Explorations

On September 18, 2019, a representative from GeoResources, LLC (GeoResources) visited the site and monitored the excavation of 6 test pits to depths of approximately 6.2 to 10 feet below the existing ground surface, logged the subsurface conditions encountered in each test pit, and obtained representative soil samples. The test pits were excavated by a small track-mounted excavator operated by a licensed earthwork contractor under contract to GeoResources.

The specific number, locations, and depths of our explorations were selected based on the configuration of the proposed development and were adjusted in the field based on consideration for underground utilities, existing site conditions, site access limitations and encountered stratigraphy. Representative soil samples obtained from the test pits were placed in sealed plastic bags and then taken to a laboratory for further examination and testing as deemed necessary. The test pits were then backfilled with the excavated soils and bucket tamped, but not otherwise compacted.

The subsurface explorations excavated as part of this evaluation indicate the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site. Furthermore, the nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun.

The approximate locations and numbers of our test pits are shown on the attached Site & Exploration Map, Figure 2. The location indicated were based on pacing and taping from existing site features and as such should only be considered accurate to the degree implied by the method used. The soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. The soil densities noted on the logs were based on the difficulty of excavation and our experience. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our test pits are included as Figure A-2 through A-4.

Subsurface Conditions

At the locations explored, we encountered relatively uniform subsurface conditions that, in our opinion, generally confirmed the mapped stratigraphy. In general, our explorations encountered about 0.8 to 1.5 feet of brown to dark brown topsoil. Underlying these upper topsoil, our explorations encountered about 1.5 to 2.7 feet of tan to brown silty sand with gravel in a loose to medium dense, moist condition overlying grey brown silty sand with gravel in a dense to very dense, moist condition. We interpret these soils to be consistent with weathered till over undisturbed glacial till soils. The glacial till soils extended to the full depth explored at the test pit locations.

Laboratory Testing

Geotechnical laboratory tests were performed on select soil samples retrieved from the test pits to determine soil index and engineering properties encountered. Laboratory testing included visual soil classification per ASTM D2488, moisture content determinations per ASTM D2216, and grain size analyses per ASTM D6913 standard procedures. A sample was also submitted to a third party analytical laboratory for organic content testing per ASTM D2974-13 and cation exchange capacity testing per SW846 9081. The results of the laboratory tests are included in Appendix B.

Groundwater Conditions

No groundwater seepage was observed at the time of our explorations; however, mottling was observed in our test pit explorations at depths of approximately 2.0 to 2.7 feet below the existing ground surface. Mottling is generally indicative of a seasonal or fluctuating high perched groundwater table that typically develops when the vertical infiltration of precipitation through a more permeable soil is slowed at depth by a deeper, denser, less permeable soil type, such as glacial till. We anticipate fluctuations in the local groundwater levels will occur in response to precipitation patterns, off-site construction activities, and site utilization.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our data review, site reconnaissance, and subsurface explorations, it is our opinion that the infiltration of stormwater runoff generated onsite from the proposed single-family residences and driveways is not feasible for this project by conventional means; however, the use of shallow infiltration BMPs, such as permeable pavement, in the upper weathered till soils appears feasible, depending on the proposed grading at the site.

Infiltration Recommendations

For the purposes of this infiltration feasibility evaluation, we have a assumed that, at a minimum, the standard infiltration trench section (6 inches of topsoil over a 2 foot deep trench) and the standard permeable pavement section (6 inches of pavement over 6 inches of storage course) will be considered. Deeper trenches and thicker storage courses may be designed by a civil engineer where vertical separation requirements can be met.

The City of Milton uses the 2012 *Stormwater Management Manual for Western Washington* (SWMMWW) with 2014 amendments. Volume III, Section 3.1.1 Downspout Full Infiltration Systems of the 2012 SWMMWW lists the minimum vertical separation requirements for infiltration facilities. Per Section 3.1.1, a minimum of 1-foot of separation is required between the bottom elevation of the trench or dry well and the seasonal high groundwater table and the presence of 3 feet or more of permeable soil from the proposed final grade to the seasonal high groundwater table. Additionally, permeable pavement shall not create saturated conditions within 1 foot of the bottom of the proposed facility per Volume III, Section 3.4.2. As previously stated, evidence of seasonal groundwater was observed in our subsurface explorations from about 2.0 to 2.7 feet below the ground surface.

Based on the above, it is our opinion that downspout infiltration is not feasible at the site based on the minimum separation requirements. Alternative stormwater Best Management Practices (BMPs), such as permeable pavement in the upper weathered till soils, may be implemented at the site to manage the runoff from the proposed short plat. Based on a grain size analysis completed in general accordance with Volume III, Section 3.3.6, Method 3 of the 2012 SWMMWW, we recommend a preliminary infiltration rate of 1-inch per hour in the upper weathered till soils, provided minimum separation requirements are met after site grading is complete.

The above provided infiltration rate should be considered preliminary, and in-situ infiltration testing should be completed prior to or during construction, preferably with enough lead time for the civil engineer to redesign or resize the facility based on the results of infiltration testing. Because of the silty nature of the onsite soils, an emergency overflow should be incorporated into the design of permeable pavement sections. The overflow should be routed to an appropriate discharge location.

LID systems for water quality requires Cation Exchange Capacity (CEC) be at least 5 mEq/100g and a minimum organic content of 1 percent in order for soils to be used as a treatment layer beneath a water quality facility, such a permeable pavement. One representative soil sample from Test Pit TP-1 at a depth of approximately 0.8 to 1.5 feet was tested by Spectra Laboratories. The results of this test indicate that the CEC for the shallow site soils is about 7.75 mEq/100g and that the organic matter is about 3.3 percent, exceeding the required CEC and organic matter content. Test results are included in Appendix B.

All proposed stormwater facilities should be designed and constructed in accordance with the 2012 SWMMWW. Additionally, all minimum setback requirements and infeasibility criteria per the 2012 SWMMWW should be considered prior to the selection, design, and location of any stormwater facility for the proposed development.

LIMITATIONS

We have prepared this report for use by Mr. Igor Gorbun and other members of the design team for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. 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.

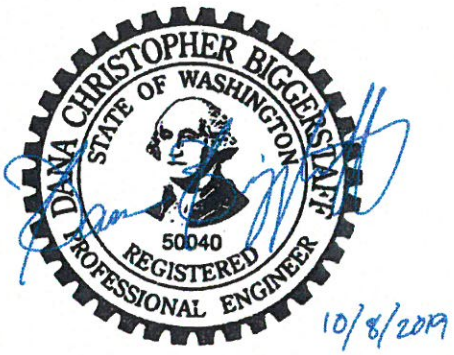
If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

Respectfully submitted,
GeoResources, LLC

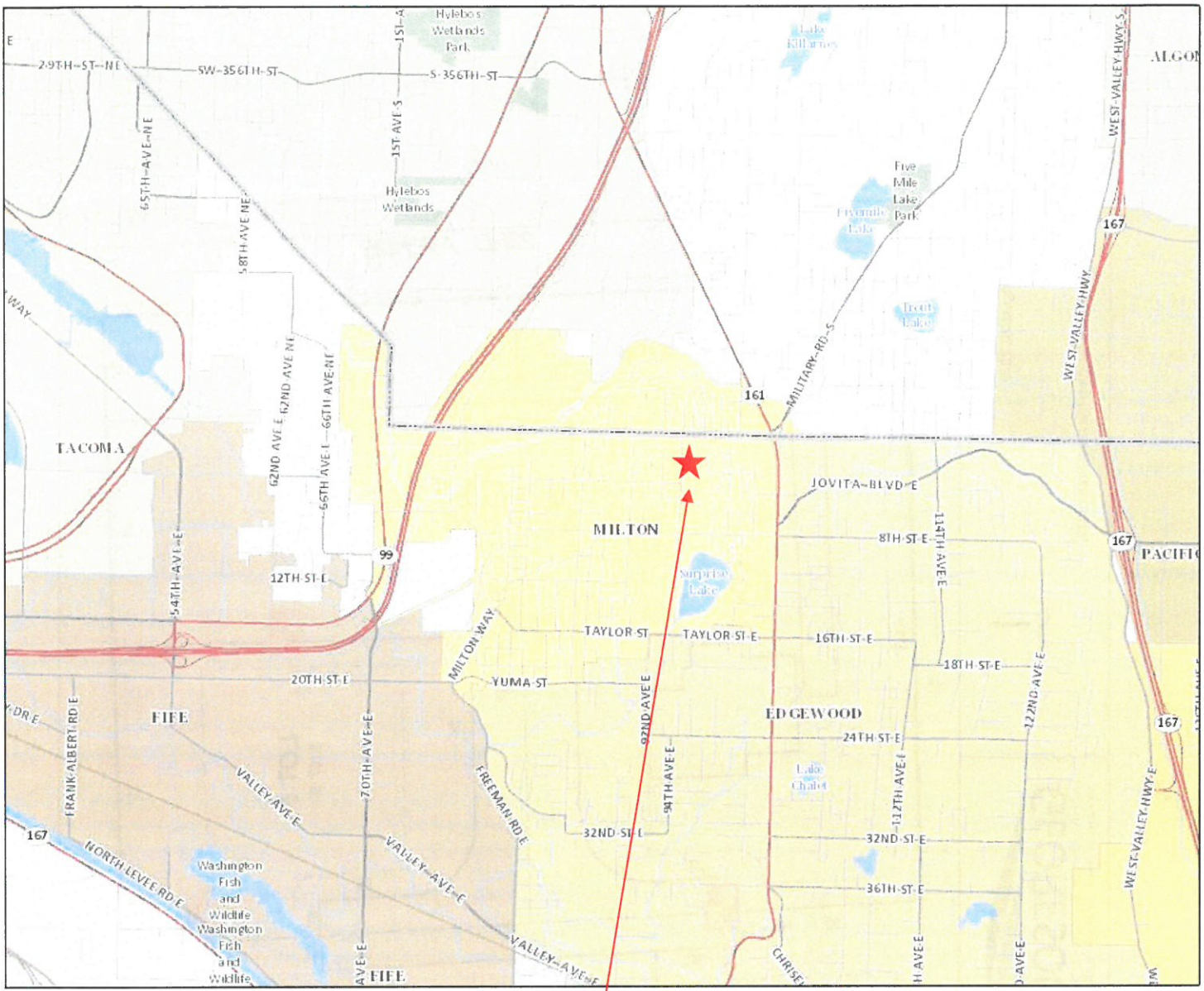
Jordan L. Kovash, GIT
Staff Geologist in Training



Dana C. Biggerstaff, PE
Senior Geotechnical Engineer

Eric W. Heller, PE, LG
Senior Geotechnical Engineer

JLK:DCB:EWH/jlk
Doc ID: Gorbun.23rdAve.SR
Attachments:
Figure 1: Site Location Map
Figure 2: Site & Exploration Plan
Figure 3: Site Vicinity Map
Figure 4: NRCS Soils Map
Figure 5: Geologic Map
Appendix A: Subsurface Explorations
Appendix B: Laboratory Test Results



Approximate Site Location

Map created from Peirce County Public GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

N
W E
S

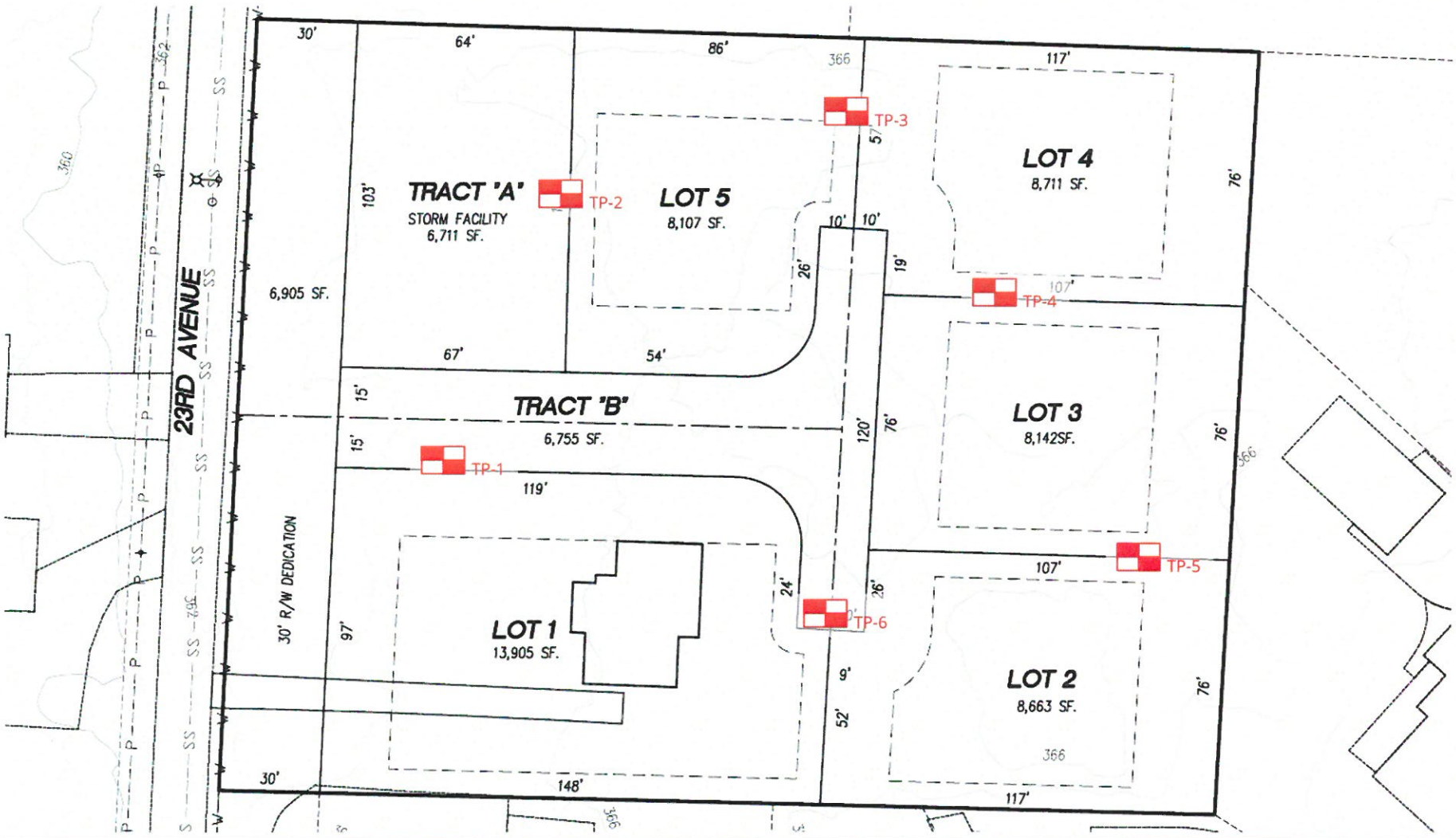
Not to Scale

GEORESOURCES
earth science & geotechnical engineering
5007 Pacific Hwy E., Suite 16 | Fife, WA 98424 | 253.896.1011 | www.georesources.rocks

Site Location Map

Proposed Short Plat
308 – 23rd Avenue
Milton, Washington
PN: 0420041048

Doc ID: Gorbun.23rdAve.F	October 2019	Figure 1



Notes:
Site Plan prepared by Apex Engineering dated August 20, 2019

Not to Scale

NORTH

TP-1 Exploration number and approximate location (GeoResources 2019)

GEORESOURCES
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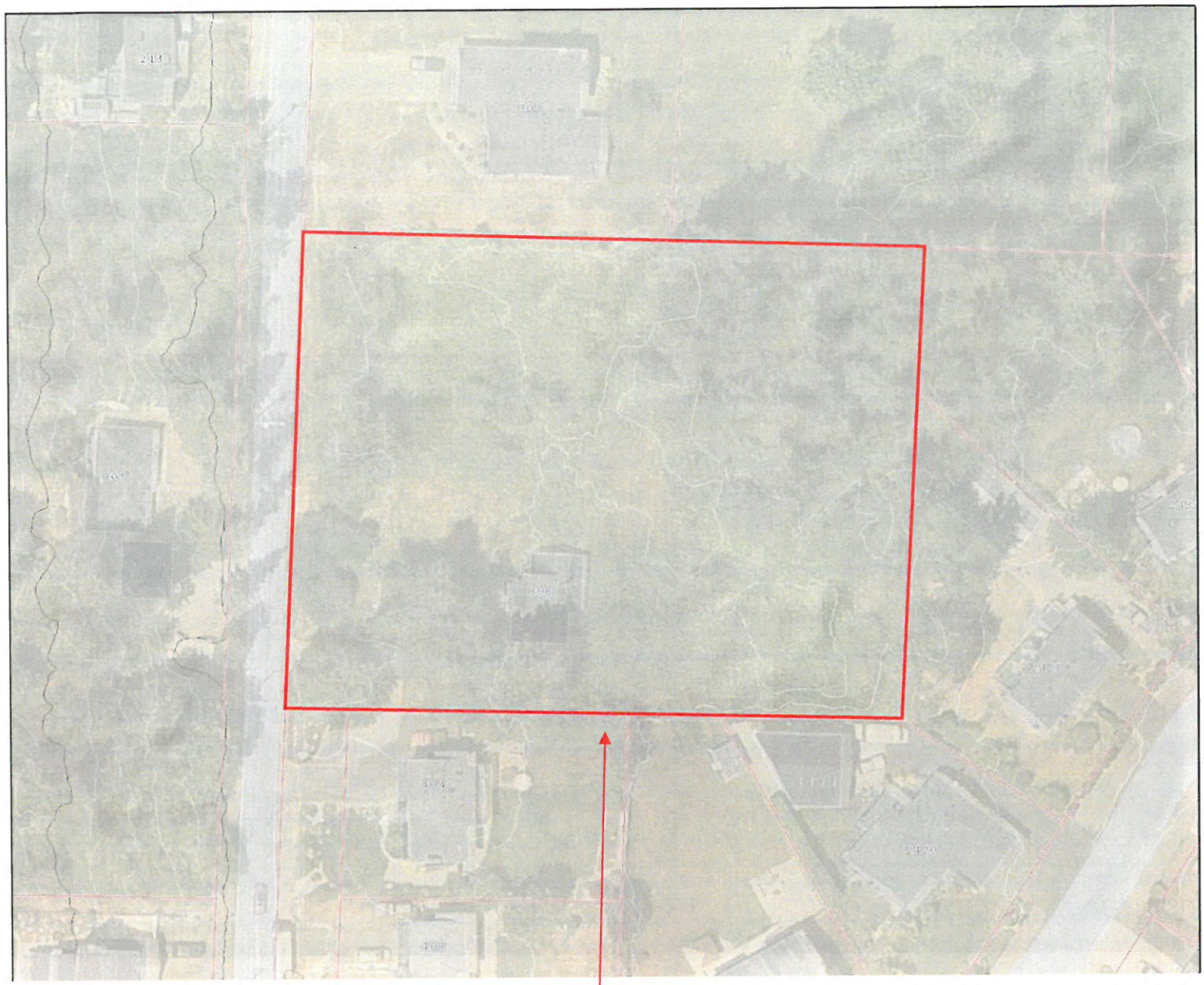
5007 Pacific Hwy E., Suite 16 | Fife, WA 98424 | 253.896.1011 | www.georesources.rocks

Site & Exploration Plan
Proposed Short Plat
308 – 23rd Avenue
Milton, Washington
PN: 0420041048

Doc ID: Gorbun.23rdAve.SEP	October 2019	Figure 2



Approximate Site Location

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N
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Site Vicinity Map

Proposed Short Plat
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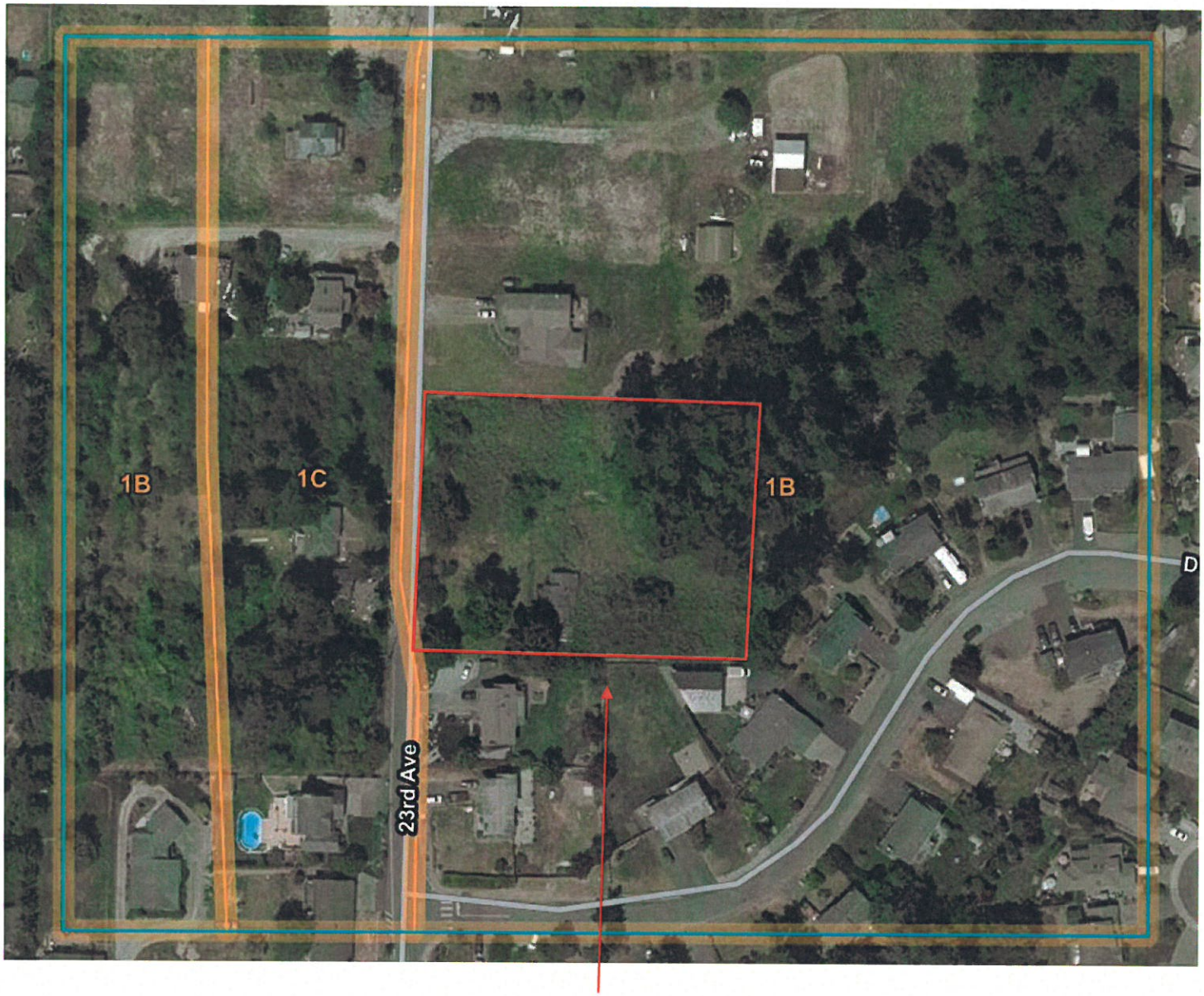
Doc ID: Gorbun.23rdAve.F	October 2019	Figure 3



Approximate Site Location

Map created from Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes	Erosion Hazard	Hydrologic Soils Group
1B	Alderwood gravelly sandy loam	Glacial Till	0 to 8	Slight	B
1C	Alderwood gravelly sandy loam	Glacial Till	8 to 15	Moderate	B

N W E S

Not to Scale

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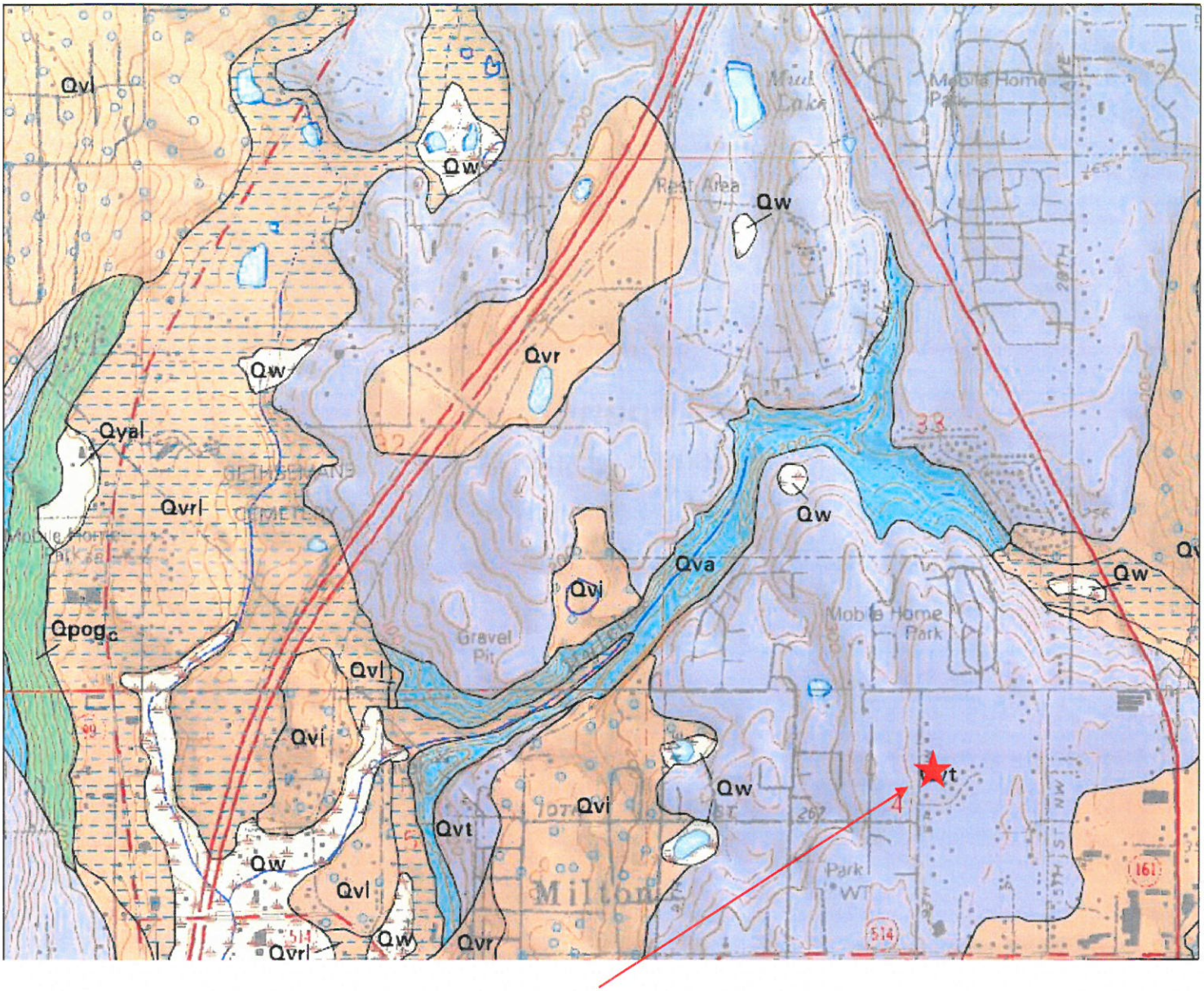
NRCS Soils Map

Proposed Short Plat
308 – 23rd Avenue
Milton, Washington
PN: 0420041048

Doc ID: Gorbun.23rdAve.F	October 2019	Figure 4



Approximate Site Location

An excerpt from the *Geologic Map of the Poverty Bay 7.5-minute Quadrangle, Washington* by Derek B. Booth, Howard H. Waldron, and Kathy G. Troost (2003)

Qw	Wetland
Qvi	Ice-contact deposits
Qvt	Glacial till

N W E S

Not to Scale

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Geologic Map

Proposed Short Plat
308 – 23rd Avenue
Milton, Washington
PN: 0420041048

Doc ID: Gorbun.23rdAve.F	October 2019	Figure 5

Appendix A

Subsurface Explorations

SOIL CLASSIFICATION SYSTEM

MAJOR 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 GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System
Proposed Short Plat
308 – 23rd Avenue
Milton, Washington
PN: 0420041048

Test Pit TP-1

Location: West central portion of site, Tract "B"/Lot 1
Approximate Elevation: 364'

Depth (ft)			Soil Type	Soil Description
0.0	-	0.8	-	Dark brown topsoil (loose, moist)
0.8	-	1.5	SM	Brown to grey brown silty SAND with some gravel (loose to medium dense, moist) (Weathered till)
1.5	-	3.0	SM	Tan to brown silty SAND with gravel, some cobbles, mottled in lower portion (medium dense to dense, moist) (Weathered till)
3.0	-	10.0	SM	Light grey silty SAND with gravel, some cobbles (dense to very dense, moist) (Glacial till)

Terminated at 10.0 feet below existing ground surface.
Mottling observed at 2.5 feet below existing ground surface.
No groundwater seepage observed at the time of excavation.
No caving observed at the time of excavation.

Test Pit TP-2

Location: Northwest portion of site, Tract "A"/Lot 5
Approximate Elevation: 366'

Depth (ft)			Soil Type	Soil Description
0.0	-	0.9	-	Dark brown topsoil, some roots (loose, moist)
0.9	-	1.8	SM	Brown to grey brown silty SAND with some gravel (loose to medium dense, moist) (Weathered till)
1.8	-	2.7	SM	Tan to brown silty SAND with gravel, some cobbles (medium dense to dense, moist) (Weathered till)
2.7	-	6.2	SM	Light grey silty SAND with gravel, some cobbles, mottled in upper portion (dense to very dense, moist) (Glacial till)

Terminated at 6.2 feet below existing ground surface.
Mottling observed at 2.7 feet below existing ground surface.
No groundwater seepage observed at the time of excavation.
No caving observed at the time of excavation.

Logged by: JLK **Excavated on: September 18, 2019**

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Test Pit Logs

Proposed Short Plat
308 – 23rd Avenue
Milton, Washington
PN: 0420041048

Test Pit TP-3

Location: North portion of site, Lot 5/Lot 4
Approximate Elevation: 366'

Depth (ft)			Soil Type	Soil Description
0.0	-	1.3	-	Brown to dark brown topsoil/forest duff
1.3	-	3.2	SM	Tan to brown silty SAND with gravel, some cobbles, mottled in lower portion (medium dense to dense, moist) (Weathered till)
3.2	-	7.8	SM	Grey silty SAND with gravel, some cobbles, mottled in upper portion (dense to very dense, moist) (Glacial till)

Terminated at 7.8 feet below existing ground surface.
Mottling observed at 2.2 feet below existing ground surface.
No groundwater seepage observed at the time of excavation.
No caving observed at the time of excavation.

Test Pit TP-4

Location: Northeast portion of site, Lot 4/Lot 3
Approximate Elevation: 366'

Depth (ft)			Soil Type	Soil Description
0.0	-	1.5	-	Dark brown topsoil/forest duff, some trash at the surface
1.5	-	3.0	SM	Tan to brown silty SAND with gravel, some cobbles, mottled in lower portion (medium dense, moist) (Weathered till)
3.0	-	7.3	SM	Grey silty SAND with gravel, some cobbles, mottled in upper portion (dense to very dense, moist) (Glacial till)

Terminated at 7.3 feet below existing ground surface.
Mottling observed at 2.7 feet below existing ground surface.
No groundwater seepage observed at the time of excavation.
No caving observed at the time of excavation.

Logged by: JLK **Excavated on: September 18, 2019**

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Test Pit Logs
Proposed Short Plat
308 – 23rd Avenue
Milton, Washington
PN: 0420041048

Test Pit TP-5

Location: Southeast portion of site, Lot 3/Lot 2
Approximate Elevation: 366'

Depth (ft)			Soil Type	Soil Description
0.0	-	1.0	-	Dark brown topsoil, some roots (loose, moist)
1.0	-	3.7	SM	Tan to brown silty SAND with gravel, some cobbles, mottled in lower portion (medium dense to dense, moist) (Weathered till)
3.7	-	8.0	SM	Grey silty SAND with gravel, some cobbles, mottled in upper portion (dense to very dense, moist) (Glacial till)

Terminated at 8.0 feet below existing ground surface.
Mottling observed at 2.0 feet below existing ground surface.
No groundwater seepage observed at the time of excavation.
No caving observed at the time of excavation.

Test Pit TP-6

Location: South portion of site, Tract "B" and Lot 1/Lot 2
Approximate Elevation: 233'

Depth (ft)			Soil Type	Soil Description
0.0	-	0.8	-	Dark brown topsoil, some roots (loose, moist)
0.8	-	2.0	SM	Brown to grey brown silty SAND with gravel, some cobbles (loose to medium dense, moist) (Weathered till)
2.0	-	3.3	SM	Tan to brown silty SAND with gravel, some cobbles, mottled in lower portion (medium dense, moist) (Weathered till)
3.3	-	7.7	SM	Grey silty SAND with gravel, some cobbles (dense to very dense, moist) (Glacial till)

Terminated at 7.7 feet below existing ground surface.
Mottling observed at 2.7 feet below existing ground surface.
No groundwater seepage observed at the time of excavation.
No caving observed at the time of excavation.

Logged by: JLK **Excavated on: September 18, 2019**

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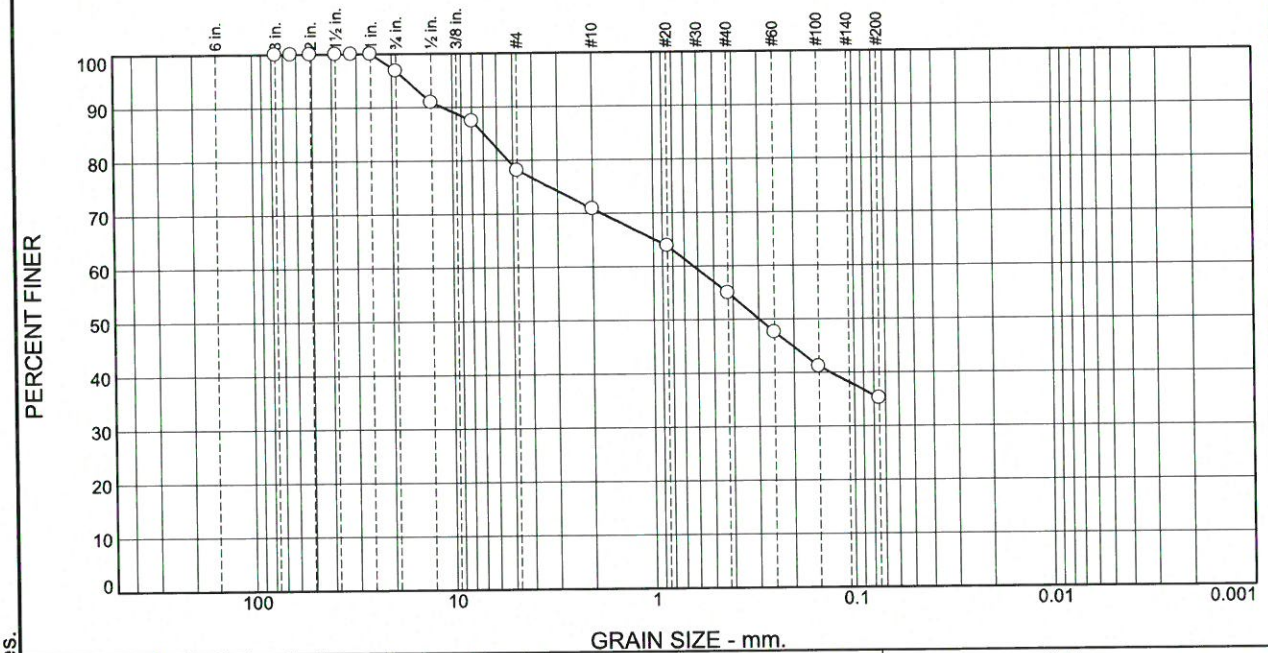
Test Pit Logs
Proposed Short Plat
308 – 23rd Avenue
Milton, Washington
PN: 0420041048

Appendix B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.2	18.7	7.3	15.8	19.8	35.2	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3.0	100.0		
2.5	100.0		
2.0	100.0		
1.5	100.0		
1.25	100.0		
1	100.0		
.75	96.8		
.5	90.9		
.3125	87.4		
#4	78.1		
#10	70.8		
#20	63.8		
#40	55.0		
#60	47.6		
#100	41.1		
#200	35.2		

* (no specification provided)

Material Description

Tan to brown silty SAND with gravel (SM)

Atterberg Limits (ASTM D 4318)

PL= NP LL= PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= 11.2169 D_{85}= 6.9483 D_{60}= 0.6309
D_{50}= 0.2977 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

NM: 12.9%

Date Received: 9/18/2019 **Date Tested:** 9/24/2019

Tested By: JLK

Checked By: DCB

Title: PM

Location: TP-1 S-1 **Date Sampled:** 9/18/2019
Sample Number: 098303 **Depth:** 0.8-1.5'

GeoResources, LLC

Fife, WA

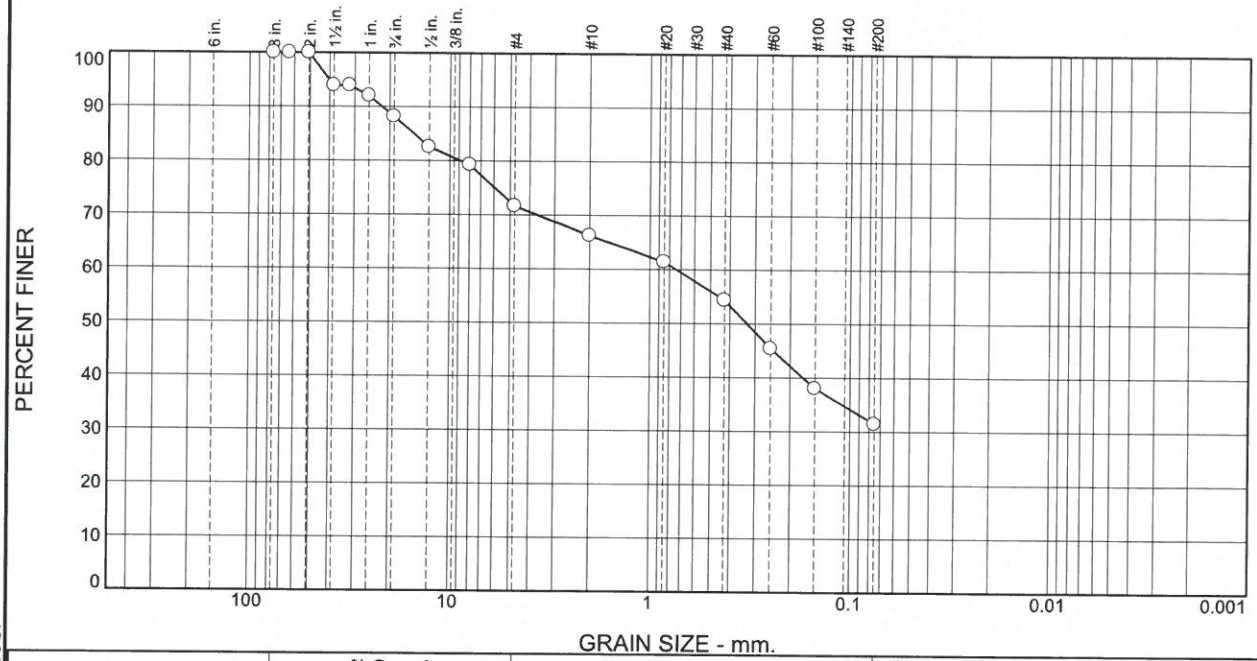
Client: Igor Gorbun
Project: Proposed Short Plat

Project No: Gorbun.23rdAve **Figure** B-1

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.8	16.5	5.5	11.9	22.9	31.4	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3.0	100.0		
2.5	100.0		
2.0	100.0		
1.5	93.9		
1.25	93.9		
1	92.0		
.75	88.2		
.5	82.5		
.3125	79.3		
#4	71.7		
#10	66.2		
#20	61.4		
#40	54.3		
#60	45.4		
#100	38.0		
#200	31.4		

* (no specification provided)

Material Description

Grey brown silty SAND with gravel (SM)

Atterberg Limits (ASTM D 4318)

PL= NP LL= PI=

Classification

USCS (D 2487)= SM AASHTO (M 145)=

Coefficients

D_{90}= 21.8299 D_{85}= 15.1667 D_{60}= 0.7406
D_{50}= 0.3283 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

NM: 9.0%

Date Received: 9/18/2019 **Date Tested:** 9/24/2019

Tested By: JLK

Checked By: DCB

Title: PM

Location: TP-5 S-1
Sample Number: 098309 **Depth:** 5'

Date Sampled: 9/18/2019

GeoResources, LLC

Fife, WA

Client: Igor Gorbun
Project: Proposed Short Plat

Project No: Gorbun.23rdAve **Figure** B-2

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

SPECTRA Laboratories ...Where experience matters

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10/04/2019

Geo Resources, LLC
5007 Pacific Hwy. E
Suite 16
Fife, WA 98424

Project:	Gorbun.23rdAve
Client ID:	098303
Sample Matrix:	Soil
Date Sampled:	09/18/2019
Date Received:	09/25/2019
Spectra Project:	2019090731
Spectra Number:	1

Analyte	Result	Units	Method
Organic Matter	3.3	wt. % Dry	ASTM D-2974-13
Cation Exchange Capacity	7.75	Na, mEq/ 100g	SW846 9081

SPECTRA LABORATORIES

Jeffrey Cooper, Laboratory Manager

CHAPTER 2 – EXISTING CONDITIONS SUMMARY

A site survey was completed by Apex Engineering, LLC. See Figure 1.2.

The site is generally rectangular and encompasses 1.58± ac. Residential development lies to the north, east and south. The existing 23rd Ave. is adjacent to the west.

Site topography is relatively flat with a slight high point at the center of the site. The eastern portion of the site is relatively flat with existing slope varying from 0-1%. The western portion of the site in the vicinity of the 23rd Avenue right-of-way has an existing slope of approximately 3%. Storm water generally sheet flows from the east to the west to the drainage ditch along 23rd Avenue. There are no other known drainage features on the site. Run-on from adjacent properties is insignificant. A small portion of the site could flow east. This area is relatively small and is included in the TDA for the site drainage to 23rd Ave.

Vegetation across the site consisted of a few scattered maple trees in the southwest corner of the site and a few scattered fir and cedar trees in the northeast corner of the site. The majority of the site is vegetated with grasses and low-lying blackberries. No surface erosion, seep, springs, or evidence of slope instability was observed at the time of our site visit.

The site did include a single family dwelling and two driveway approaches from 23rd Ave.

A soils investigation was prepared for the project (see Appendix C). On site soils generally consist of Alderwood gravelly sandy loam (1B). See Figure 1.4 for Soils Report.

The project is not located in a mapped flood plain. See Figure 2.1 for FEMA FIRM mapping.

For modeling purposes, "C" soils with flat site slopes were assumed.

Figure 2.1 – FEMA FIRM Map

National Flood Hazard Layer FIRMette

FEMA

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/13/2019 at 2:10:26 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

CHAPTER 3 – OFF-SITE ANALYSIS

The project encompasses one threshold discharge area.

Threshold Discharge Area (TDA) drains toward the southwest corner to a drainage ditch along 23rd Avenue. Stormwater is conveyed south in the 23rd Avenue drainage ditch approximately 150 feet where it enters a storm pipe. The stormwater continues south in a combination of stormwater pipe and open channel until it empties into Surprise Lake approximately 3500 feet downstream of the site.

See Figure 3.1 for Downstream Drainage System Table, Figure 3.2 for the downstream drainage course map, and for basin mapping. The table provides a convenient summary of the downstream drain course description.

DOWNSTREAM DRAINAGE SYSTEM TABLE

Project: Gorbun Subdivision **Site Visit Date:** 10:30 a.m., 11-7-2019, Cloudy/Cold

Symbol	Drainage Component Type, Name, and Size	Drainage Component Description	Slope	Distance from site discharge	Existing Problems	Potential Problems	Observations of field inspector, resource reviewer, or resident
see map	Type: sheet flow, swale, stream, channel, pipe, pond; Size: diameter, surface area	drainage basin, vegetation, cover, depth, type of sensitive area, volume	%	1 ml = 5,280 ft.	constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion		tributary area, likelihood of problem, overflow pathways, potential impacts
A	Site discharge roadside ditch along 23rd Avenue	2-2.5 +/-, Wide, well vegetated and gravel.	2 +/-	0	None that were observed	None	Well vegetated and gravel swale bottom leading to a culvert pipe south of the project area.
B	Open ended 12" culvert pipe	Ductile Iron paralleling 23rd Ave.	5 +/-	130	None that were observed	None	Connects to a catch basin on the northeast corner of 23rd Ave. and Diamond Street. Inlet at the catch basin is approx. 4' +/- deep.
C	Catch Basin with 12" pipes	ADS PVC pipe paralleling 23rd Ave.	0.5	170	None	None	Catch basin outlet is approx. 6' deep within the curb on the northeast corner of 23rd Ave. and Diamond Street .
D	48" Manhole to 12" storm drain pipes to catch basins	Concrete		1680	None	None	Manhole is in the intersection at 23rd Ave. and Milton Way with storm water from the inlet pipe paralleling 23rd Ave. and the outlet pipe to the west paralleling Milton Way per GIS
E	Outfall pipe	Unknown type and size, outlets to large well vegetative area		2100	None observed	None	Pipe outlets to large flat well vegetated area. Unable to locate pipe end due to thick

Fig 3.1

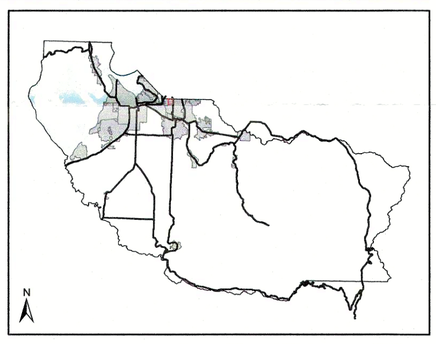
							blackberry vines.
F	Outlet structure	Concrete structure, inlets water from large well vegetative area.		2650	Filled with sediment	Further sediment build up	Structure is next to 23rd Ave and intakes stormwater from the large vegetative area and conveys to Surprise Lake. Structure sump was filled with sediment.
G	Storm outfall	Outfall pipe unknown type and size.		3500	Could not observe	None	Per mapping the existing storm drain system is located with existing private property. Unable to gain access to private property to observe the outfall pipe that extends into Surprise Lake.
H	Culvert pipe	Concrete Culvert unknown size		5000	None	None	Pipe outlets to the west of 23rd Avenue. Allows water to exist Surprise Lake to a swale that flows to the south towards Taylor Street.
I	Culvert pipe	Concrete pipe unknown size		5420	None	None	Pipe outlets to the south of Taylor Street to a well vegetated and gravel swale with a flat slope that continues to flow to the south.

CVWeb

Apex ENGINEERING PLLC
2601 S 35th St, Suite 200
Tacoma, WA 98409
(253) 473-4494 | www.apexengineering.net

Legend

- Drainage Basins - Milton
- Tax Parcels
  - Base Parcel
  - Condominium
  - Other
- Contours - 2017
  - 10' Contour Line
  - 2' Contour Line
- Drain Structures
  - Catch Basin - Type1
  - Catch Basin - Type2
  - Curb Inlet
- Main Lines - Drainage
  - Main Lines - Drainage
  - Catch Basins - Type I - Public - Milton
- Open Channels - Drainage
- Catch Basins - Type II - Public - Milton
- Catch Basins - Other - Public - Milton
- Control Structures - Public - Milton
- Outfalls - Public - Milton
- Open Channels - Public - Milton
- Pipes - Public - Milton
- Flow Control Facilities - Public - Milton
- WQ Treatment Facilities - Public - Milton
- Catch Basins - Private - Milton
  - Type I
  - Type II
- Other
- Control Structures - Private - Milton
- Outfalls - Private - Milton
- Open Channels - Private - Milton
- Pipes - Private - Milton
- Flow Control Facilities - Private - Milton
- Onsite SW Management - Private - Milton
- WQ Treatment Facilities - Private - Milton



Notes:

1:2,400

0 95 190 380 Feet

The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. Orthophotos and other data may not align. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

Date: 11/8/2019 09:33 AM

Figure 3.2

CHAPTER 4 – PERMANENT STORMWATER CONTROL PLAN

Part 1 – Existing Site Hydrology

Existing site runoff sheet flows to the west toward 23rd Avenue, encompassing one TDA.

Site soils are an Alderwood gravelly sandy loam. See Figure 1.4 for the soil report.

Sub-Basin ID	Land Use and Cover Condition	Acreage
TDA	Forest, flat slope	1.42 ac
	"C" Soils	

Part 2 – Developed Site Hydrology

a. Summary Section

It is our understanding that the City of Milton is in preliminary stages of obtaining funding to widen/improve 23rd Ave. Therefore, the right-of-way improvements and area were not considered in the flow control facilities preliminary design.

From the preliminary plat, the area to be dedicated is 6,905 square feet or 0.16 acres.

Site Area = 1.58 acres, therefore area within the onsite TDA = 1.42 acres

Site improvements within subdivision include grading for the shared access tract roadway, and installation of sidewalks. Roof runoff is intended to be conveyed to the detention system. Disturbed areas from site construction are to be stabilized with amended soils.
From the DOE SMMWW Figure 2.4.1 flowchart, all minimum requirements apply to this project.

Site stormwater: See Figure 4.1 for lot/parcel coverage table.

See Figure 4.2 for Engineering Calculations.

Onsite runoff basic treatment will be required for the onsite access tract, adjacent lot driveways and adjacent sidewalk. See section "e".

The impervious surfaces within the right-of-way are less than 5,000 therefore only the thresholds for minimum requirements #1 through #5 apply.

b. Performance Standards and Goals

Onsite stormwater is to be detained on site through the use of a detention vault located within lot 1. The project is to meet MR #7 – Flow Control. The performance standard to meet is:

- To closely match the developed conditions discharge duration to the predeveloped discharge durations.
- For flow rates from 50% of the 2 year flow up to the full 50 year peak flow.

c. Low Impact Development Features

Low Impact Development Features are to use BMP T5.13 : post construction soil quality and depth and possible BMP T5.10C: Perforated stub out connection for the roof runoff.

BMP's that rely on infiltration are not feasible as described in the soils report; the depth the mottling lies approximately 2.5 feet deep and would not meet the minimum vertical separation requirements.

Porous pavement was not considered and option. Review of preliminary grades for the access tract shows that grading for portions of the road profile would not allow the one foot separation from the mottling to pavement subgrade. Also, the preliminary grades vary from 7% to 8%, which exceeds the DOE standard of 5% maximum.

The onsite storm facilities are to be maintained by the homeowners association.

d. Flow Control System

An onsite detention vault is to be used to detain flow prior to release into the storm system within 28th Ave. This vault is to be located within lot 6. See Preliminary Storm Drain Plan.

An appropriate outfall is not available at the site along 28th Ave. The existing frontage ditch is shallow, not allowing for a deeper detention facility. To provide an adequate outfall, a storm pipe would need to be extended within 28th Ave., north to the site. This downstream connection flow into an existing catch basin and pipe system located near the northeast corner of the 28th Ave./ Diamond Street intersection.

Per site visit on March 27, 2020, the measured depth from rim to invert was approximately 6.1 feet.

Attached as Figure 4.3 is the print out of the WWHM Project Report. A vault with inside dimensions of 65 feet x 45 feet x 6 feet deep would be necessary to meet the discharge duration performance goals.

The WWHM Project Report show the areas used for the analysis.

e. Water Quality System

Basic runoff treatment is required. A storm filter, catch basin with two ZPG cartridges, manufactured by Contech is to be used. This is to be located near the access drive intersection with 28th Ave.

The treatment facility is to receive runoff from the access pavement, with sidewalk, adjacent driveway and adjacent lot lawn areas.

From Figure 4.1 the areas are as follows:

- 0.2 ac; shared access
- 0.06 ac; onsite driveways
- 0.2 ac ; adjacent lawns fronting the access drive

The WWHM software was used to determine the water quality flow rate to use. See Figure 4.3 for the WWHM Project Report. Unnecessary data was deleted/removed.

Assuming an offline facility, the target flow rate = 0.0228 cfs, or approximately 10.2 gpm.

Per Contech and DOE information, the flow rate per cartridge is 7.5 gpm. Therefore the number of cartridges is 10.2/7.5 = 1.4, use 2 cartridges.

If determined during final design that the treatment device would be better near the detention vault outlet, the on line flow rate would be 0.0398 cfs or approximately 17.9 gpm. The number of cartridges = 17.9/7.5 = 2.4, use 3 cartridges.

f. Conveyance System Analysis and Design

Not included for the preliminary storm analysis.

GORBUN SUBDIVISION

PROJECT AREA BREAKDOWN

Parcel Area (Ac)=	1.58		
R/W to be dedicated (Ac)=	0.16	(6905 sq ft)	
Lot Area (Ac)=	1.42		
Shared Access and Sidewalk (Ac)	0.2	8517 (sq ft)	0.21 (ac)
Available Lot Area (Ac)	1.22		

Lot Area Breakdown

Lot No.	Lot Area (sq ft)	Dwelling (sq ft)	Driveway (sq ft)	Patio/SW (sq ft)
1	12229	2200	400	180
2	8271	2200	400	180
3	8000	2200	400	180
4	8000	2200	400	180
5	8000	2200	400	180
6	8001	2200	400	180
	52501	13200	2400	1080
	Area in Acres	0.30	0.06	0.02
	Total Impervious Area		0.38	0.00
	Total Pervious Area		0.84	0.00

check 1.22

NOTES/ASSUMPTIONS

1. Dwelling roof area = 2200 sq/ft each.
2. Individual lot driveways are 20' x 20' = 400 sq ft each.
3. Shared acces is pervious pavement.
4. Patio is 8' x 10' and lot sidewalk is 5' x 20'

Figure 4.1

WWHM2012
PROJECT REPORT

Project Name: 34956 Detention Vault with access tract
Site Name:
Site Address:
City :
Report Date: 4/14/2020
Gage :
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2018/10/10
Version : 4.2.16

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	1.42
Pervious Total	1.42

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.42

Element Flows To:

Surface	Interflow	Groundwater

Figure 4.2

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Flat	.84
Pervious Total	0.84

Impervious Land Use	acre
ROOF TOPS FLAT	0.3
DRIVEWAYS FLAT	0.06
SIDEWALKS FLAT	0.02
Impervious Total	0.38
Basin Total	1.22

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Name : Vault 1
Width : 45 ft.
Length : 63 ft.
Depth: 7 ft.
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.015 ft.
Notch Height: 1.360 ft.
Orifice 1 Diameter: 0.56 in. **Elevation:** 0 ft.

Element Flows To:

Outlet 1	Outlet 2

Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.065	0.000	0.000	0.000
0.0778	0.065	0.005	0.002	0.000
0.1556	0.065	0.010	0.003	0.000
0.2333	0.065	0.015	0.004	0.000
0.3111	0.065	0.020	0.004	0.000
0.3889	0.065	0.025	0.005	0.000
0.4667	0.065	0.030	0.005	0.000
0.5444	0.065	0.035	0.006	0.000
0.6222	0.065	0.040	0.006	0.000
0.7000	0.065	0.045	0.007	0.000
0.7778	0.065	0.050	0.007	0.000
0.8556	0.065	0.055	0.007	0.000

0.9333	0.065	0.060	0.008	0.000
1.0111	0.065	0.065	0.008	0.000
1.0889	0.065	0.070	0.008	0.000
1.1667	0.065	0.075	0.009	0.000
1.2444	0.065	0.081	0.009	0.000
1.3222	0.065	0.086	0.009	0.000
1.4000	0.065	0.091	0.010	0.000
1.4778	0.065	0.096	0.010	0.000
1.5556	0.065	0.101	0.010	0.000
1.6333	0.065	0.106	0.010	0.000
1.7111	0.065	0.111	0.011	0.000
1.7889	0.065	0.116	0.011	0.000
1.8667	0.065	0.121	0.011	0.000
1.9444	0.065	0.126	0.011	0.000
2.0222	0.065	0.131	0.012	0.000
2.1000	0.065	0.136	0.012	0.000
2.1778	0.065	0.141	0.012	0.000
2.2556	0.065	0.146	0.012	0.000
2.3333	0.065	0.151	0.013	0.000
2.4111	0.065	0.156	0.013	0.000
2.4889	0.065	0.162	0.013	0.000
2.5667	0.065	0.167	0.013	0.000
2.6444	0.065	0.172	0.013	0.000
2.7222	0.065	0.177	0.014	0.000
2.8000	0.065	0.182	0.014	0.000
2.8778	0.065	0.187	0.014	0.000
2.9556	0.065	0.192	0.014	0.000
3.0333	0.065	0.197	0.014	0.000
3.1111	0.065	0.202	0.015	0.000
3.1889	0.065	0.207	0.015	0.000
3.2667	0.065	0.212	0.015	0.000
3.3444	0.065	0.217	0.015	0.000
3.4222	0.065	0.222	0.015	0.000
3.5000	0.065	0.227	0.015	0.000
3.5778	0.065	0.232	0.016	0.000
3.6556	0.065	0.237	0.016	0.000
3.7333	0.065	0.243	0.016	0.000
3.8111	0.065	0.248	0.016	0.000
3.8889	0.065	0.253	0.016	0.000
3.9667	0.065	0.258	0.016	0.000
4.0444	0.065	0.263	0.017	0.000
4.1222	0.065	0.268	0.017	0.000
4.2000	0.065	0.273	0.017	0.000
4.2778	0.065	0.278	0.017	0.000
4.3556	0.065	0.283	0.017	0.000
4.4333	0.065	0.288	0.017	0.000
4.5111	0.065	0.293	0.018	0.000
4.5889	0.065	0.298	0.018	0.000
4.6667	0.065	0.303	0.018	0.000
4.7444	0.065	0.308	0.020	0.000
4.8222	0.065	0.313	0.022	0.000
4.9000	0.065	0.318	0.024	0.000
4.9778	0.065	0.324	0.027	0.000
5.0556	0.065	0.329	0.031	0.000
5.1333	0.065	0.334	0.034	0.000
5.2111	0.065	0.339	0.038	0.000
5.2889	0.065	0.344	0.041	0.000
5.3667	0.065	0.349	0.045	0.000
5.4444	0.065	0.354	0.049	0.000
5.5222	0.065	0.359	0.053	0.000
5.6000	0.065	0.364	0.057	0.000
5.6778	0.065	0.369	0.061	0.000
5.7556	0.065	0.374	0.066	0.000

5.8333	0.065	0.379	0.071	0.000
5.9111	0.065	0.384	0.076	0.000
5.9889	0.065	0.389	0.081	0.000
6.0667	0.065	0.394	0.356	0.000
6.1444	0.065	0.399	0.951	0.000
6.2222	0.065	0.405	1.719	0.000
6.3000	0.065	0.410	2.584	0.000
6.3778	0.065	0.415	3.469	0.000
6.4556	0.065	0.420	4.299	0.000
6.5333	0.065	0.425	5.007	0.000
6.6111	0.065	0.430	5.551	0.000
6.6889	0.065	0.435	5.932	0.000
6.7667	0.065	0.440	6.288	0.000
6.8444	0.065	0.445	6.596	0.000
6.9222	0.065	0.450	6.889	0.000
7.0000	0.065	0.455	7.170	0.000
7.0778	0.065	0.460	7.441	0.000
7.1556	0.000	0.000	7.702	0.000

Name : access tract
Bypass: No

Impervious Land Use	**acre**
ROADS FLAT LAT	**0.2**

Element Flows To:
Outlet 1 **Outlet 2**
Vault 1

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:1.42
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.84
Total Impervious Area:0.58

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.03388
5 year	0.052145
10 year	0.062705
25 year	0.074145
50 year	0.081505
100 year	0.087891

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.018021
5 year	0.032448
10 year	0.047069
25 year	0.073686
50 year	0.101343
100 year	0.137711

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.024	0.016
1903	0.022	0.013
1904	0.036	0.015
1905	0.018	0.017
1906	0.008	0.009
1907	0.052	0.017
1908	0.038	0.014
1909	0.037	0.015
1910	0.051	0.015
1911	0.035	0.016
1912	0.114	0.018
1913	0.053	0.032
1914	0.013	0.010
1915	0.023	0.018
1916	0.035	0.015
1917	0.013	0.013
1918	0.037	0.047
1919	0.029	0.016
1920	0.035	0.016
1921	0.037	0.018
1922	0.037	0.016
1923	0.031	0.024
1924	0.015	0.014

1925	0.019	0.013
1926	0.033	0.013
1927	0.021	0.016
1928	0.026	0.016
1929	0.052	0.019
1930	0.033	0.015
1931	0.032	0.016
1932	0.024	0.018
1933	0.026	0.016
1934	0.068	0.075
1935	0.032	0.045
1936	0.030	0.017
1937	0.046	0.015
1938	0.029	0.016
1939	0.002	0.010
1940	0.031	0.018
1941	0.017	0.012
1942	0.047	0.076
1943	0.024	0.017
1944	0.049	0.033
1945	0.039	0.016
1946	0.023	0.012
1947	0.016	0.013
1948	0.072	0.018
1949	0.063	0.040
1950	0.019	0.013
1951	0.021	0.012
1952	0.092	0.069
1953	0.084	0.051
1954	0.031	0.023
1955	0.025	0.012
1956	0.012	0.012
1957	0.046	0.019
1958	0.089	0.161
1959	0.055	0.080
1960	0.016	0.011
1961	0.055	0.059
1962	0.032	0.016
1963	0.016	0.012
1964	0.016	0.013
1965	0.063	0.061
1966	0.019	0.013
1967	0.028	0.014
1968	0.028	0.017
1969	0.028	0.015
1970	0.044	0.018
1971	0.066	0.068
1972	0.043	0.017
1973	0.057	0.036
1974	0.031	0.016
1975	0.069	0.257
1976	0.038	0.017
1977	0.015	0.011
1978	0.062	0.052
1979	0.018	0.014
1980	0.036	0.016
1981	0.035	0.018
1982	0.015	0.012
1983	0.056	0.029
1984	0.027	0.015
1985	0.041	0.016
1986	0.035	0.018
1987	0.065	0.056

1988	0.041	0.031
1989	0.037	0.015
1990	0.043	0.017
1991	0.034	0.016
1992	0.044	0.044
1993	0.045	0.016
1994	0.066	0.018
1995	0.014	0.016
1996	0.072	0.072
1997	0.027	0.012
1998	0.037	0.016
1999	0.004	0.013
2000	0.027	0.018
2001	0.013	0.011
2002	0.049	0.016
2003	0.042	0.017
2004	0.037	0.015
2005	0.069	0.017
2006	0.021	0.013
2007	0.019	0.015
2008	0.036	0.016
2009	0.025	0.015
2010	0.022	0.019
2011	0.016	0.013
2012	0.029	0.014
2013	0.019	0.011
2014	0.016	0.013
2015	0.030	0.013
2016	0.012	0.013
2017	0.049	0.028
2018	0.091	0.233
2019	0.089	0.065
2020	0.027	0.013
2021	0.046	0.037
2022	0.020	0.014
2023	0.039	0.017
2024	0.102	0.015
2025	0.036	0.017
2026	0.056	0.029
2027	0.022	0.015
2028	0.020	0.012
2029	0.037	0.023
2030	0.069	0.043
2031	0.022	0.011
2032	0.013	0.012
2033	0.021	0.012
2034	0.020	0.014
2035	0.079	0.209
2036	0.041	0.017
2037	0.011	0.012
2038	0.032	0.017
2039	0.005	0.009
2040	0.022	0.015
2041	0.025	0.013
2042	0.077	0.075
2043	0.039	0.022
2044	0.052	0.040
2045	0.034	0.033
2046	0.040	0.055
2047	0.030	0.017
2048	0.040	0.015
2049	0.035	0.017
2050	0.026	0.014

2051	0.038	0.017
2052	0.022	0.015
2053	0.038	0.056
2054	0.047	0.045
2055	0.020	0.011
2056	0.019	0.012
2057	0.026	0.016
2058	0.032	0.018
2059	0.054	0.018

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1136	0.2567
2	0.1016	0.2333
3	0.0922	0.2089
4	0.0914	0.1608
5	0.0894	0.0795
6	0.0890	0.0759
7	0.0839	0.0750
8	0.0792	0.0746
9	0.0774	0.0723
10	0.0724	0.0687
11	0.0717	0.0677
12	0.0693	0.0648
13	0.0690	0.0605
14	0.0687	0.0586
15	0.0680	0.0558
16	0.0662	0.0555
17	0.0658	0.0547
18	0.0648	0.0521
19	0.0635	0.0512
20	0.0634	0.0469
21	0.0618	0.0455
22	0.0571	0.0447
23	0.0562	0.0444
24	0.0560	0.0431
25	0.0555	0.0401
26	0.0549	0.0400
27	0.0544	0.0371
28	0.0528	0.0356
29	0.0519	0.0330
30	0.0519	0.0328
31	0.0518	0.0325
32	0.0514	0.0312
33	0.0489	0.0289
34	0.0489	0.0286
35	0.0487	0.0283
36	0.0470	0.0238
37	0.0469	0.0231
38	0.0459	0.0227
39	0.0459	0.0216
40	0.0457	0.0194
41	0.0455	0.0185
42	0.0444	0.0185
43	0.0439	0.0184
44	0.0434	0.0182
45	0.0433	0.0181
46	0.0425	0.0181
47	0.0411	0.0180
48	0.0409	0.0179
49	0.0408	0.0179

50	0.0397	0.0177
51	0.0395	0.0177
52	0.0395	0.0177
53	0.0392	0.0176
54	0.0388	0.0176
55	0.0380	0.0176
56	0.0379	0.0174
57	0.0378	0.0174
58	0.0377	0.0173
59	0.0374	0.0173
60	0.0373	0.0173
61	0.0372	0.0173
62	0.0372	0.0172
63	0.0372	0.0171
64	0.0370	0.0171
65	0.0367	0.0170
66	0.0366	0.0169
67	0.0364	0.0169
68	0.0362	0.0169
69	0.0361	0.0168
70	0.0357	0.0167
71	0.0351	0.0167
72	0.0350	0.0166
73	0.0349	0.0165
74	0.0347	0.0164
75	0.0346	0.0164
76	0.0346	0.0164
77	0.0340	0.0164
78	0.0340	0.0163
79	0.0334	0.0163
80	0.0326	0.0163
81	0.0325	0.0162
82	0.0324	0.0161
83	0.0321	0.0161
84	0.0318	0.0161
85	0.0317	0.0160
86	0.0313	0.0160
87	0.0309	0.0159
88	0.0308	0.0159
89	0.0307	0.0158
90	0.0303	0.0157
91	0.0297	0.0156
92	0.0297	0.0156
93	0.0294	0.0156
94	0.0291	0.0156
95	0.0285	0.0154
96	0.0283	0.0154
97	0.0282	0.0153
98	0.0277	0.0153
99	0.0274	0.0153
100	0.0270	0.0153
101	0.0269	0.0153
102	0.0266	0.0152
103	0.0265	0.0152
104	0.0262	0.0152
105	0.0259	0.0150
106	0.0257	0.0150
107	0.0250	0.0149
108	0.0250	0.0149
109	0.0249	0.0149
110	0.0244	0.0148
111	0.0243	0.0146
112	0.0239	0.0142

113	0.0229	0.0141
114	0.0226	0.0141
115	0.0224	0.0140
116	0.0223	0.0139
117	0.0223	0.0137
118	0.0222	0.0135
119	0.0220	0.0135
120	0.0216	0.0135
121	0.0215	0.0134
122	0.0214	0.0134
123	0.0213	0.0133
124	0.0208	0.0132
125	0.0198	0.0131
126	0.0196	0.0131
127	0.0195	0.0130
128	0.0195	0.0128
129	0.0194	0.0127
130	0.0190	0.0127
131	0.0189	0.0127
132	0.0189	0.0126
133	0.0187	0.0126
134	0.0187	0.0126
135	0.0181	0.0125
136	0.0179	0.0124
137	0.0171	0.0124
138	0.0163	0.0124
139	0.0162	0.0123
140	0.0161	0.0121
141	0.0160	0.0120
142	0.0156	0.0120
143	0.0156	0.0118
144	0.0151	0.0117
145	0.0149	0.0117
146	0.0149	0.0117
147	0.0142	0.0116
148	0.0134	0.0115
149	0.0134	0.0114
150	0.0129	0.0113
151	0.0128	0.0112
152	0.0124	0.0112
153	0.0124	0.0112
154	0.0112	0.0108
155	0.0083	0.0103
156	0.0047	0.0098
157	0.0045	0.0094
158	0.0024	0.0092

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0169	56730	47678	84	Pass
0.0176	52237	32853	62	Pass
0.0182	48215	21146	43	Pass
0.0189	44570	18315	41	Pass
0.0195	41268	17135	41	Pass
0.0202	38287	16000	41	Pass
0.0209	35573	15196	42	Pass
0.0215	33052	14399	43	Pass
0.0222	30697	13562	44	Pass
0.0228	28553	12820	44	Pass
0.0235	26587	12138	45	Pass
0.0241	24819	11501	46	Pass
0.0248	23229	10958	47	Pass
0.0254	21833	10443	47	Pass
0.0261	20504	9928	48	Pass
0.0267	19252	9435	49	Pass
0.0274	18077	9041	50	Pass
0.0280	16881	8670	51	Pass
0.0287	15795	8293	52	Pass
0.0293	14759	7939	53	Pass
0.0300	13834	7590	54	Pass
0.0306	13003	7252	55	Pass
0.0313	12188	6886	56	Pass
0.0319	11429	6548	57	Pass
0.0326	10692	6249	58	Pass
0.0332	10033	5961	59	Pass
0.0339	9341	5701	61	Pass
0.0345	8764	5455	62	Pass
0.0352	8205	5210	63	Pass
0.0359	7706	4967	64	Pass
0.0365	7235	4764	65	Pass
0.0372	6792	4572	67	Pass
0.0378	6432	4410	68	Pass
0.0385	6094	4244	69	Pass
0.0391	5784	4064	70	Pass
0.0398	5523	3915	70	Pass
0.0404	5235	3740	71	Pass
0.0411	4982	3567	71	Pass
0.0417	4740	3401	71	Pass
0.0424	4524	3224	71	Pass
0.0430	4322	3070	71	Pass
0.0437	4105	2940	71	Pass
0.0443	3871	2790	72	Pass
0.0450	3656	2681	73	Pass
0.0456	3464	2585	74	Pass
0.0463	3291	2482	75	Pass
0.0469	3148	2378	75	Pass
0.0476	3008	2283	75	Pass
0.0482	2881	2206	76	Pass
0.0489	2758	2119	76	Pass
0.0495	2629	2031	77	Pass
0.0502	2521	1939	76	Pass
0.0509	2414	1841	76	Pass
0.0515	2305	1743	75	Pass
0.0522	2187	1664	76	Pass
0.0528	2068	1607	77	Pass

0.0535	1950	1543	79	Pass
0.0541	1841	1483	80	Pass
0.0548	1726	1412	81	Pass
0.0554	1653	1348	81	Pass
0.0561	1585	1282	80	Pass
0.0567	1505	1225	81	Pass
0.0574	1440	1179	81	Pass
0.0580	1365	1140	83	Pass
0.0587	1295	1102	85	Pass
0.0593	1237	1071	86	Pass
0.0600	1193	1033	86	Pass
0.0606	1140	987	86	Pass
0.0613	1088	943	86	Pass
0.0619	1034	895	86	Pass
0.0626	982	851	86	Pass
0.0632	923	811	87	Pass
0.0639	866	772	89	Pass
0.0645	809	741	91	Pass
0.0652	758	708	93	Pass
0.0659	701	674	96	Pass
0.0665	658	646	98	Pass
0.0672	614	611	99	Pass
0.0678	574	554	96	Pass
0.0685	532	492	92	Pass
0.0691	496	450	90	Pass
0.0698	456	426	93	Pass
0.0704	414	401	96	Pass
0.0711	379	378	99	Pass
0.0717	352	355	100	Pass
0.0724	322	326	101	Pass
0.0730	301	301	100	Pass
0.0737	277	273	98	Pass
0.0743	262	251	95	Pass
0.0750	245	216	88	Pass
0.0756	230	199	86	Pass
0.0763	215	185	86	Pass
0.0769	198	176	88	Pass
0.0776	185	164	88	Pass
0.0782	170	154	90	Pass
0.0789	146	142	97	Pass
0.0795	130	127	97	Pass
0.0802	119	119	100	Pass
0.0809	104	109	104	Pass
0.0815	95	97	102	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.0308 **acre-feet**
On-line facility target flow: 0.0156 **cfs.**
Adjusted for 15 min: 0.0156 **cfs.**
Off-line facility target flow: 0.0103 **cfs.**
Adjusted for 15 min: 0.0103 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Water Quality Needs Treatment (ac-ft)	Volume Percent Through Facility (ac-ft)	Comment
Infiltration Volume	Cumulative Volume Infiltrated	Percent Infiltration		
Credit				
Vault 1 POC	N	372.71		
N 0.00				
Total Volume Infiltrated		372.71	0.00	0.00
0.00	0.00	0%	No Treat. Credit	

Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes
No changes have been made.

WWHM2012
PROJECT REPORT

Project Name: 34956 tract water quality calcs
Site Name:
Site Address:
City :
Report Date: 4/17/2020
Gage :
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2018/10/10
Version : 4.2.16

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Flat	.2
Pervious Total	0.2

Impervious Land Use	acre
ROADS FLAT	0.2
Impervious Total	0.2
Basin Total	0.4

Element Flows To:

Surface	Interflow	Groundwater

Figure 4.3

MITIGATED LAND USE

Name : shared access
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Flat	.2
Pervious Total	0.2

Impervious Land Use	acre
ROADS FLAT	0.2
DRIVEWAYS FLAT	0.06
Impervious Total	0.26
Basin Total	0.46

Element Flows To:

Surface	Interflow	Groundwater

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Land use Totals for POC #1
Total Pervious Area:0.2
Total Impervious Area:0.2

Mitigated Land use Totals for POC #1
Total Pervious Area:0.2
Total Impervious Area:0.26

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.082448
5 year	0.114617
10 year	0.138639
25 year	0.172239
50 year	0.199727
100 year	0.22941

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.10428
5 year	0.143587
10 year	0.172722
25 year	0.213233
50 year	0.246203
100 year	0.281656

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.0354 **acre-feet**
On-line facility target flow: 0.0398 **cfs.**
Adjusted for 15 min: 0.0398 **cfs.**
Off-line facility target flow: 0.0228 **cfs.**
Adjusted for 15 min: 0.0228 **cfs.**

Perlnd and Implnd Changes
No changes have been made.

Step 1: Determine the receiving waters and pollutants of concern based on off-site analysis

Step 2: Determine if an Oil Control BMP is required

Yes

Select an Oil Control BMP
- API Separator
- CP Separator
- Linear Sand Filter
- Manufactured Treatment Device

No

Step 3: Determine if it is practicable to provide Runoff Treatment by infiltrating into the native soil

Yes

Select a Pretreatment BMP (if not already provided, e.g. permeable pavement or bioretention)
- Presettling Basin
- Any Basic Treatment BMP
- Manufactured Treatment Device
- A Detention BMP designed to meet Flow Control requirements

Apply Infiltration
- Infiltration Basin
- Infiltration Trench
- Bioretention
- Permeable Pavement

****Runoff Treatment BMP Selection Complete****

No

Step 4: Determine if a Phosphorus Treatment BMP is Required

Yes

Select a Phosphorus Treatment BMP
- Large Sand Filter
- Large Wetpond
- Manufactured Treatment Device
- Two Facility Treatment Train

Determine if an Enhanced Treatment BMP is required

No

****Runoff Treatment BMP Selection Complete****

Yes

Is the selected Phosphorus Treatment BMP also listed as an Enhanced Treatment BMP?

No

Select an Enhanced Treatment BMP
- Large Sand Filter
- Stormwater Treatment Wetland
- CAVFS
- Bioretention
- Media Filter Drain
- Manufactured Treatment Device
- Two Facility Treatment Train

****Runoff Treatment BMP Selection Complete****

Yes

****Runoff Treatment BMP Selection Complete****

No

Step 5: Determine if an Enhanced Treatment BMP is Required

Yes

No

Step 6: Select a Basic Treatment BMP

- Sand Filters
- Media Filter Drain
- Biofiltration Swales
- Filter Strips
- Wetponds/Wetvaults
- Stormwater Treatment Wetlands
- Combined Detention/Wetpool Facilities
- Bioretention
- Manufactured Treatment Devices

****Runoff Treatment BMP Selection Complete****

Note: This flow chart does not include all Runoff Treatment BMP options. Review the text in this section for all options for each Runoff Treatment Performance Goal.

DEPARTMENT OF ECOLOGY
State of Washington

Runoff Treatment BMP Selection Flow Chart

Revised January 2019

Figure 4.4

CHAPTER 5 – DISCUSSION OF MINIMUM REQUIREMENTS

The proposed site improvements were designed to meet the 2019 SMMWW prepared by the Washington State Department of Ecology. The minimum requirements are listed below with a short narrative of how each is being met.

1. *Minimum Requirement #1: Preparation of Stormwater Site Plan:*

   Preparation of the site development plans and this report is to meet Minimum Requirement #1.

2. *Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP):*

   A Preliminary Construction Stormwater Pollution Prevention Plan (SWPPP) is included in this report. The final version will be prepared to meet Minimum Requirement #2.

3. *Minimum Requirement #3: Source Control of Pollution:*

   Source Control BMP's for the project may utilize BMP's outlined in the Stormwater Management Manual for Western Washington which shall be designed and maintained per the manual requirements. See the project SWPPP for details during construction.

4. *Minimum Requirement: #4: Preservation of Natural Drainage Systems and Outfalls:*

   The proposed project should not affect onsite natural drainage systems. New drainage patterns are not to be created.

5. *Minimum Requirement: #5: On-site Stormwater Management*

   Drainage from the onsite improvements is to be detained within a detention vault located in the western portion of lot 1. Amended soils are to conform to BMP T5.13 per DOE's SMMWW. Perforated stub-out connections for roof runoff may be used.

6. *Minimum Requirement: #6: Runoff Treatment:*

   Basic treatment is required. Prior to entering the onsite detention facility, stormwater is to be treated by a Contech storm filter catch basin using ZPG cartridges.

7. *Minimum Requirement: #7: Flow Control:*

   A vault is to be used to detain onsite storm water and release into the proposed pipe extensions within 28th Ave.

8. *Minimum Requirement: #8: Wetlands Protection:*

   The project does not discharge stormwater into an onsite known wetland. Therefore minimum requirement #8 does not apply, and no additional measures are proposed as part of this minimum requirement.

9. *Minimum Requirement: #9: Operation and Maintenance*:

   An Operation and Maintenance Manual will be prepared for the final design of this project.

   The operation and maintenance of the onsite storm drain facility is the responsibility of the Home Owners Association.

   The anticipated maintenance items will be for the detention vault, storm piping and storm filter.

CHAPTER 6 – OPERATION AND MAINTENANCE MANUAL

Will be prepared pending the final storm system design.

CHAPTER 7 – CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

A preliminary copy is attached. Exhibit plans and reports will be added for final design.

APPENDIX A

CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

PRELIMINARY
STORMWATER POLLUTION PREVENTION PLAN
FOR
GORBUN SUBDIVISION

APRIL 16, 2019

PRELIMNINARY
STORMWATER POLLUTION PREVENTION PLAN

FOR

GORBUN SUBDIVISION

A portion of the NE ¼ of Section 4, Township 20 North, Range 4 East,
W.M., City of Milton, Pierce County, Washington

Prepared for:

Igor Gorbun
PNW Home Buyer, LLC
2110 104th Avenue East #205
Edgewood, WA 98372
(253) 691-2049

Prepared by:

Apex Engineering, PLLC
2601 South 35th Street, Suite 200
Tacoma, Washington 98409
(253) 473-4494
File #34956
April 16, 2019

Project Engineer: _____
Joseph Blankenship, P.E.

Project Manager: _____
James Kirkebo, III

SECTION 1 – CONSTRUCTION SWPPP NARRATIVE

Project Description:

- Total project area: 1.58 ac
- Total proposed impervious area: 0.00 ac
- Total proposed area to be disturbed: 1.58 ac

There are no proposed off-site borrow and fill areas.

The project site is a proposed 6 lot single family subdivision located east of and adjacent to 23rd Avenue in the City of Milton.

Thirteen Required Elements:

1. Mark Clearing Limits

The work limits are intended to limit the disturbed areas during construction. See BMP C103 "High Visibility Fence" for additional information and maintenance requirements.

If additional measures beyond those shown on the approved grading and TESC plans are required, the following should be considered:

- Preserving Natural Vegetation (BMP C101)
- Buffer Zones (BMP C102)
- Silt Fence (BMP C233)

2. Establish Construction Access

During the construction period, vehicle ingress and egress shall be directed to one access point to minimize the tracking of sediment onto public road. If sediment is tracked off-site, construction activity shall stop and roads shall be cleaned immediately and thoroughly. Sediment shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area. Street washing is allowed only after sediment is removed in this manner. Street wash wastewater shall be controlled by pumping it back on-site or otherwise be prevented from discharging into systems tributary to waters of the state. See BMP C105 "Stabilized Construction Entrance/Exit" for additional information and maintenance requirements.

If additional measures beyond those shown on the approved grading and TESC plans are required, the following should be considered:

- Wheel Wash (BMP C106)
- Construction Road/Parking Area Stabilization (BMP C107)

3. Control Flow Rates

Properties and waterways downstream from development sites shall be protected from erosion resulting from increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site. Where necessary to comply with this, Temporary stormwater retention or detention facilities shall be constructed as one of the first steps in grading. Detention facilities shall be functional prior to construction of site improvements (e.g., impervious surfaces). Permanent infiltration areas shall not be used for flow control during construction unless specifically allowed in writing by the City of Milton. If allowed, these facilities shall be protected from siltation during the construction phase as required by the City of Milton. A liner may be required. See BMP C240 "Sediment Trap" for additional information and maintenance requirements.

4. Install Sediment Controls

If sediment is accidentally transported on to the adjacent streets, construction activity shall stop and the streets shall be cleaned immediately and thoroughly. Sediment will be shoveled and/or swept and disposed of in a manner which prevents contamination with stormwater or surface water (e.g., covered soil stockpile). In addition, a street sweeper may be used to maintain clean roads on an as-needed basis. See BMP C233 "Silt Fence" for additional information and maintenance requirements. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard of Element #3, above

If additional measures beyond those shown on the approved grading and TESC plans are required, the following should be considered:

- Brush Barrier (BMP C231)
- Gravel Filter Berm (BMP C232)
- Vegetated Strip (BMP C234)
- Wattles (BMP C235)
- Temporary Sediment Pond (BMP C241)
- Construction Stormwater Chemical Treatment (BMP C250)
- Construction Stormwater Filtration (BMP C251)
- Baker Tank (or approved equal)

5. Stabilize Soils

Exposed and unworked soils shall be stabilized by application of effective BMPs that prevent erosion. From May 1 to September 30, no soils shall remain exposed and unworked for more than seven days. From October 1 to April 30, no soils shall remain exposed and unworked for more than two days. This stabilization requirement applies to all soils, whether at final grade or not. Soils shall be stabilized at the end of the shift before a holiday or weekend if needed, based on the weather forecast. Appropriate soil stabilization measures shall be selected for the time of year, site conditions, estimated duration of use, and the potential water quality impacts that stabilization agents may have on downstream waters or groundwater. Soil stockpiles shall be stabilized from erosion, protected with sediment trapping measures, and, where possible, located away from storm drain inlets, waterways, and drainage channels. Landscaping materials shall not be stockpiled on pervious pavement, as these materials can clog the pervious pavement section and limit the infiltration. See BMP C120 "Temporary and Permanent Seeding," BMP C121 "Mulching," BMP C123 "Plastic Covering," BMP C140 "Dust Control" and BMP T5.13 "Post-Construction Soil Quality and Depth" for additional information and maintenance requirements.

If additional measures beyond those shown on the approved grading and TESC plans are required, the following should be considered:

- Nets and Blankets (BMP C122)
- Sodding (BMP C124)
- Topsoiling/Composting (BMP C125)
- Polyacrylamide (PAM) for Soil Erosion Protection (BMP C126)
- Surface Roughening (BMP C130)
- Gradient Terraces (BMP C131)

6. Protect Slopes

Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Permanent slopes are proposed for this project and shall be stabilized per BMP C120 "Temporary and Permanent Seeding," BMP C121 "Mulching," and BMP T5.13 "Post-Construction Soil Quality and Depth." Stormwater run-on or groundwater shall be diverted away from slopes and undisturbed areas with interceptor dikes, pipes, and/or swales. Off-site stormwater shall be managed separately from stormwater generated on the site. At the top of slopes, drainage shall be collected in pipe slope drains or protected channels to prevent erosion. Excavated material shall be placed on the uphill side of trenches, consistent with safety and space considerations. BMP C120 "Temporary and Permanent Seeding," See BMP C121 "Mulching," BMP C123 "Plastic Covering," BMP C200 "Interceptor Dike and Swale" and BMP T5.13 "Post-Construction Soil Quality and Depth" for additional information and maintenance requirements.

If additional measures beyond those shown on the approved grading and TESC plans be required, the following should be considered:

- Nets and Blankets (BMP C122)
- Surface Roughening (BMP C130)
- Gradient Terraces (BMP C131)
- Grass-Lined Channels (BMP C201)
- Pipe Slope Drains (BMP C204)
- Subsurface Drains (BMP C205)
- Level Spreader (BMP C206)
- Check Dams (BMP C207)
- Triangular Silt Dike (TSD) (Geotextile-Encased Check Dam) (BMP C208)

7. Protect Drain Inlets

Storm drain inlets made operable during construction shall be protected so stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment. Inlet protection devices shall be cleaned or removed and replaced when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer). See BMP C220 "Storm Drain Inlet Protection" for additional information and maintenance requirements.

8. Stabilize Channels and Outlets

The proposed storm system does not connect to any channels or existing outlets on-site. If required at a later date, all temporary on-site conveyance channels shall be designed, constructed and stabilized to prevent erosion from the expected peak flows. Stabilization, including armoring material, adequate to prevent erosion of outlets, streambanks, slopes and downstream reaches shall be provided at the outlets of all conveyance systems. See BMP C202 "Channel Lining" and BMP C209 "Outlet Protection" for additional information and maintenance requirements.

9. Control Pollutants

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Woody debris may be chopped and spread on-site.

Cover, containment, and protection from vandalism shall be provided 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 shall include secondary containment.

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

surface water 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.

Application of fertilizers and pesticides shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' label requirements for application rates and procedures shall be followed.

BMPs shall be used to prevent or treat contamination of stormwater runoff by pH-modifying sources. 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 concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout waters. Stormwater discharges shall not cause or contribute to a violation of the water quality standard for pH in the receiving water.

Construction site operators are required to adjust the pH of stormwater if necessary to prevent violations of water quality standards. Construction site operators shall obtain written approval from the City of Milton and the Department of Ecology prior to using chemical treatment other than CO_2 or dry ice to adjust pH.

See BMP C151 "Concrete Handling," BMP C152 "Sawcutting and Surfacing Pollution Prevention," BMP C154 "Concrete Washout Area", and BMP C209 "Outlet Protection" for additional information and maintenance requirements.

10. Control De-watering

Foundation, vault, and trench dewatering water, which have similar characteristics to stormwater runoff at the site, shall be discharged into a controlled conveyance system prior to discharge to a sediment trap or sediment pond. Channels must be stabilized, as specified in Element #8, above.

Clean, non-turbid dewatering water, such as well-point ground water, can be discharged to systems tributary to or directly into surface waters of the state, provided the dewatering flow does not cause erosion or flooding of receiving waters. Clean dewatering water shall not be routed through stormwater sediment traps or sediment ponds. All dewatering activities must be monitored prior to discharge.

Highly turbid or contaminated dewatering water from construction equipment operation, clamshell digging, concrete tremie pour, or work inside a cofferdam, shall be handled separately from stormwater.

Other dewatering disposal options may include: (i) infiltration; (ii) transport off-site in a vehicle (such as a vacuum flush truck) for legal disposal in a manner that does not pollute state waters;

(iii) on-site chemical treatment or other suitable treatment technologies approved by the City of Milton; (iv) sanitary sewer discharge with local sewer district approval, if there is no other option; or (v) use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering.

11. Maintain BMPs

All temporary and permanent erosion and sediment control BMPs shall be inspected, maintained, and repaired as needed to ensure continued performance of their intended function in accordance with BMP specifications. 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 resulting from removal of BMPs or vegetation shall be permanently stabilized.

12. Manage the Project

Projects that disturb one or more acres must have site inspections conducted by a Certified Erosion and Sediment Control Lead (CESCL). By the initiation of construction, the SWPPP must identify the CESCL who shall be present on-site or on-call at all times. The CESCL must have the skills to access 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 must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen. The CESCL 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 no 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.
- Documenting BMP implementation and maintenance in the site log book.
- The CESCL must inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge from the site. The CESCL may reduce the inspection frequency for temporary stabilized, inactive sites to once every calendar month.

Phasing of Construction

Development projects shall be phased where feasible in order to prevent soil erosion and, to the maximum extent practicable, the transport of sediment from the site during construction. Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities for any phase.

Clearing and grading activities for developments shall be permitted only if conducted pursuant to an approved site development plan (e.g. subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling. When establishing these permitted clearing and grading areas, consideration should be given to minimizing removal of existing trees and minimizing disturbance/compaction of native soils except as needed for building purposes. These permitted clearing and grading areas and any other areas required to preserve critical or sensitive areas, buffers, native growth protection easements, or tree retention areas as may be required by local jurisdictions, shall be delineated on the site plans and the development site.

Seasonal Work Limitations

From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the City that silt-laden runoff will be prevented from leaving the site through a combination of the following:

- Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters
- Limitations on activities and the extent of disturbed area
- Proposed ESC measures

Based on the information provided and/or local weather conditions, the City may expand or restrict the seasonal limitation on site disturbance. The City shall take enforcement action – such as a notice of violation, administrative order, penalty, or stop-work order under the following circumstances:

- If, during the course of any construction activity or soil disturbance during the seasonal limitation period, sediment leaves the construction site causing a violation of the surface water quality standard
- If clearing and grading limits or ESC measures shown in the approved plan are not maintained.

The following activities are exempt from the seasonal clearing and grading limitations:

- Routine maintenance and necessary repair of ESC BMP's
- Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to the soil
- Activities where there is 100 percent infiltration of surface water runoff within the site in approved and installed ESC facilities.

Coordination with Utilities and Other Contractors

The contractor shall evaluate, with input from utilities and other contractors, the stormwater management requirements for the entire project, including utilities.

Inspection and Monitoring

- All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function. Site inspections shall be conducted by a person who is knowledgeable in the principles and practices of ESC. The person must have the skills to: 1) assess the site conditions and construction activities that could impact the quality of stormwater and 2) assess the effectiveness of ESC measures used to control the quality of stormwater discharges.
- For construction sites one acre or larger that discharge stormwater to surface waters of the state, a CESCL must be identified in the construction SWPPP; this person must be on-site or on-call at all times. Certification must be obtained through an approved training program that meets the erosion and sediment control training standards established by the Department of Ecology.
- Appropriate BMPs or design changes shall be implemented as soon as possible 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.
- 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, appropriate BMPs or design changes shall be implemented as soon as possible.

Maintaining an Updated Construction SWPPP:

- The Construction SWPPP shall be retained on-site or within reasonable access to the site.
- The SWPPP shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state.
- The SWPPP shall be modified if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within 7 days following the inspection.

See BMP C150 "Materials on Hand," BMP C153 "Material Delivery, Storage and Containment", and BMP C162 "Scheduling," for additional information and maintenance requirements.

13. Protect Low Impact Development BMPs

The project is not proposing any bioretention elements, or rain garden elements. A pervious pavement section is proposed and will be protected from construction runoff.

SECTION 2 – EXISTING SITE CONDITIONS

The Gorbun Subdivision Plat is a proposed 6 lot single family subdivision located east of 23rd Avenue in the City of Milton. The project limits include one parcel that is adjacent to the 23rd Avenue R/W for a total site area of 1.58± acres.

The existing site has few trees, lawn, and brush with a single family residence and driveway that will be demolished.

Site topography is relatively flat with a slight high point at the center of the site. The eastern portion of the site is relatively flat with existing slope varying from 0-1%. The western portion of the site in the vicinity of the 23rd Avenue right-of-way has an existing slope of approximately 3%. Storm water generally sheet flows from the east to the west to the drainage ditch along 23rd Avenue. There are no other known drainage features on the site. Run-on from adjacent properties is insignificant.

SECTION 3 – ADJACENT AREAS

Adjacent properties consist of developed single family residences to the north, east, and south. The site boarders 23rd Avenue in the City of Milton to the west. The site is relatively flat with the steepest grade 3% and slopes to the west towards 23rd Avenue.

SECTION 4 – CRITICAL AREAS

There are no Critical Areas on site.

SECTION 5 –SOILS

A geotechnical investigation was prepared for the project. On-site soils generally consist of Alderwood gravelly sandy loam. The site soils have minimal infiltration capability that vary depending on the depth of the excavation.

SECTION 6 – EROSION PROBLEM AREAS

The project site currently has areas of approximately 1% to 3% slope that are stabilized by virtue of the existing vegetation and shrubbery. During construction, erosion control measures will be implemented to minimize off-site transport of sediment laden runoff. There are no known potential erosion problem areas off-site.

SECTION 8 – CONSTRUCTION PHASING

The construction of the site improvements is planned to be completed in one phase. The anticipated sequence of the operations is as follows:

1. Flag or otherwise locate clearing limits. Install high visibility fence and silt fence at clearing limits.
2. Arrange and attend a preconstruction conference with the City of Milton, owner, engineer, and Contractor.
3. Post sign with the name of the Certified Erosion Control Lead (CESCL).
4. Install catch basin inlet protection.
5. Install construction entrance outside/away from pervious pavement location.
6. Install temporary sediment tank and interceptor ditch if necessary.
7. Construct surface water controls (interceptor swales, check dams, etc.) simultaneously with clearing and grading of the site.
8. Construct required site development utilities (sanitary sewer, storm drainage, water, and dry utilities).
9. Construct site development road improvements (curb, gutter, sidewalk, and pavement).
10. Maintain erosion control measures in accordance with the City of Milton standards and manufacturer's recommendations.
11. Relocate erosion control measures or install new measures as site conditions change. The erosion and sediment control shall always be in accordance with the City of Milton minimum requirements.
12. Cover all areas that will be unworked for more than seven days between May 1 and September 31 or two days between October 1 and April 30 with plastic sheeting, straw, wood fiber mulch, compost, or equivalent.
13. Upon completion of the project, all disturbed areas must be stabilized and BMPS removed when approved by the City inspector.

From the beginning of construction until the completion of the project and stabilization of the site, the TESC facilities will remain operational to purify stormwater impacted by construction activities. A responsible, Certified Professional in Erosion Control is required to be on-site or on-call at all times. See BMP C160 "Contractor Erosion and Spill Control Lead" for more details.

SECTION 9 – CONSTRUCTION SCHEDULE

The work schedule has not been finalized at the time of preparation of this document. The contractor shall review the Seasonal Work Limitations described in Section 7.

SECTION 10 – FINANCIAL/OWNERSHIP RESPONSIBILITIES

The developer and/or contractor is responsible for all performance, maintenance, and mitigation bonds or other financial requirements associated with the construction.

The site is owned by:
Igor Gorbun
PNW Home Buyer, LLC
2110 104th Avenue East #205
Edgewood, WA 98372

SECTION 11 – ENGINEERING CALCULATIONS

To be included with final designs.

II-4.1 Source Control BMPs

This section contains the standards and specifications for Source Control BMPs. Table II-4.1.1 Source Control BMPs by SWPPP Element, below, shows the relationship of the BMPs in II-4.1 Source Control BMPs to the Construction Stormwater Pollution Prevention Plan (SWPPP) Elements described in II-3.3.3 Step 3 - Construction SWPPP Development and Implementation. Elements not shown on Table II-4.1.1 Source Control BMPs by SWPPP Element are not satisfied through installation of Source Controls.

Table II-4.1.1 Source Control BMPs by SWPPP Element

BMP or Element Name	Element #1 Preserve Vegetation/ Mark Clearing Limits	Element #2 Establish Construction Access	Element #5 Stabilize Soils	Element #6 Protect Slopes	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #11 Maintain BMPs	Element #12 Manage the Project	Element #13 Protect Low Impact Development
BMP C101: Preserving Natural Vegetation	✓								
BMP C102: Buffer Zones	✓								✓
BMP C103: High Visibility Fence	✓								✓
BMP C105: Stabilized Construction Entrance / Exit		✓							
BMP C106: Wheel Wash		✓							
BMP C107: Construction Road/Parking Area Stabilization		✓							
BMP C120: Temporary and Permanent Seeding			✓	✓					

BMP or Element Name	Element #1 Preserve Vegetation/ Mark Clearing Limits	Element #2 Establish Construction Access	Element #5 Stabilize Soils	Element #6 Protect Slopes	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #11 Maintain BMPs	Element #12 Manage the Project	Element #13 Protect Low Impact Development
BMP C121: Mulching			✓	✓					
BMP C122: Nets and Blankets			✓	✓	✓				
BMP C123: Plastic Covering			✓	✓					
BMP C124: Sodding			✓	✓					
BMP C125: Topsoiling / Composting			✓						
BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection			✓						
BMP C130: Surface Roughening			✓	✓					
BMP C131: Gradient Terraces			✓	✓					
BMP C140: Dust Control			✓						
BMP C150: Materials on Hand							✓	✓	
						✓			

BMP or Element Name	Element #1 Preserve Vegetation/ Mark Clearing Limits	Element #2 Establish Construction Access	Element #5 Stabilize Soils	Element #6 Protect Slopes	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #11 Maintain BMPs	Element #12 Manage the Project	Element #13 Protect Low Impact Development
BMP C151: Concrete Handling									
BMP C152: Sawcutting and Surfacing Pollution Prevention						✓			
BMP C153: Material Delivery, Storage and Containment						✓			
BMP C154: Concrete Washout Area						✓			
BMP C160: Certified Erosion and Sediment Control Lead							✓	✓	
BMP C162: Scheduling								✓	

BMP or Element Name	Element #3 Control Flow Rates	Element #4 Install Sediment Controls	Element #6 Protect Slopes	Element #7 Protect Drain Inlets	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #10 Control De-Watering	Element #13 Protect Low Impact Development
BMP C220: Storm Drain Inlet Protection				✓				
BMP C231: Brush Barrier		✓						✓
BMP C232: Gravel Filter Berm		✓						
BMP C233: Silt Fence		✓						✓
BMP C234: Vegetated Strip		✓						✓
BMP C235: Wattles	✓	✓						
BMP C236: Vegetative Filtration							✓	
BMP C240: Sediment Trap	✓	✓						
BMP C241: Temporary Sediment Pond	✓	✓						
BMP C250: Construction Stormwater Chemical Treatment		✓				✓		
BMP C251: Construction Stormwater Filtration		✓				✓		
BMP C252: High pH Neutralization Using CO2						✓		
BMP C253: pH Control for High pH Water						✓		

BMP Maintenance and Inspection Schedule
(Source Control BMPs)

BMP Designation	BMP Name	Recommended Maintenance	Recommended Schedule of Maintenance
C103	High Visibility Fence	Inspect fence regularly for damage or reduced visibility.	Daily
C105	Stabilized Construction Entrance/Exit	Inspect stabilized areas regularly, especially after large storm events. Add rock (hog fuel), gravel, etc. as needed to maintain a stable surface which won't erode.	Daily
C120	Temporary and Permanent Seeding	Re-seed areas failing to establish 80% cover within one month (during growing season). If re-seeding is ineffective, use sodding or nets/blankets. Eroded areas shall be corrected, re-planted, and irrigated as required.	Inspect to ensure growth weekly
C121	Mulching	Maintain specified thickness of mulch cover. Eroded areas must be corrected and re-mulched. Drainage problems must be corrected.	Weekly and following storms
C123	Plastic Covering	Torn sheets must be replaced and open seams repaired. If the plastic begins to deteriorate due to ultraviolet radiation, it must be completely removed and replaced. When the plastic is no longer needed, it shall be completely removed.	Weekly and following storms
C140	Dust Control	Use dust control practices in areas (including roadways) subject to surface and air movement of dust where on-site and off-site impacts to roadways, drainage ways, or surface waters are likely. Evaluate the potential for dust generation frequently during dry periods.	Daily
C150	Materials on Hand	Keep materials covered and out of sun and rain.	Daily
C151	Concrete Handling	Containers shall be checked for holes in the liner daily during concrete pours and repaired the same day.	Daily
C152	Sawcutting and Surfacing Pollution Prevention	Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation	Daily

		of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and vacuum trucks.	
C153	Material Delivery, Storage and Containment	Provide sufficient separation between stored containers to allow for spill cleanup and emergency response access. During the wet weather season (October 1 through April 30), cover each secondary containment facility during non-working days, prior to and during rain events. Keep material storage areas clean, organized, and equipped with an ample supply of appropriate spill clean-up material.	Daily
C154	Concrete Washout Area	Maintain washout facilities to provide adequate holding capacity with a minimum freeboard of 12-inches. Washout facilities shall be cleaned, or new facilities shall be constructed and ready for use once the washout is 75 percent full. Inspect for signs of weakening or damage and make any necessary repairs. Re-line the structure with new plastic after each cleaning.	Daily
C160	Certified Erosion and Sediment Control Lead	Oversee implantation of TESC Plans	Daily
C162	Scheduling	Avoid rainy periods. Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding in order to revegetate cut and fill slopes as the work progresses.	Daily
C200	Interceptor Dike and Swale	Immediately remove sediment from the flow area. Repair damage caused by construction traffic or other activity before the end of each working day. Check outlets and make timely repairs as needed to avoid gully formation. When the area below the temporary diversion dike is permanently stabilized, remove the dike	Weekly and following storms

		and fill and stabilize the channel to blend with the natural surface.	
C202	Channel Lining	Inspect filter fabric lining for rips, tears, holes, etc. Inspect channel lining for continuity and effectiveness as a liner. Repair and/or replace lining and liner as required to maintain proper functionality.	Daily
C209	Outlet Protection	Inspect and repair as needed. Add rock as needed to maintain the intended function. Clean energy dissipater if sediment builds up.	Weekly and following storms
C220	Storm Drain Inlet Protection	Replace clogged filter fabric. Clean sediment from stone filters. Do not wash collected sediments into storm drains – remove to soil stockpile.	Weekly and following storms
C233	Silt Fence	Repair any damage immediately. Check the uphill side of the fence for signs of the fence clogging, acting as a barrier to flow, and then causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment. Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence. If the filter fabric (geotextile) has deteriorated due to ultraviolet breakdown, replace it.	Weekly and following storms
C240	Sediment Trap	Remove sediment from the trap when it reaches 1-foot in depth. Repair any damage to the pond embankments or slopes.	Weekly and following storms
T5.13	Post-Construction Soil Quality and Depth	Maintain specified thickness of plant debris or its equivalent on top of soil surface. Eroded or overly-compacted areas must be corrected and re-soiled. Adjust the use of irrigation, fertilizers, herbicides and pesticides as necessary.	Weekly and following storms