Preliminary Stormwater Management Report

July 7, 2025

Primrose of North Creek

Prepared for:

Primrose School

Prepared by:

7/8/25

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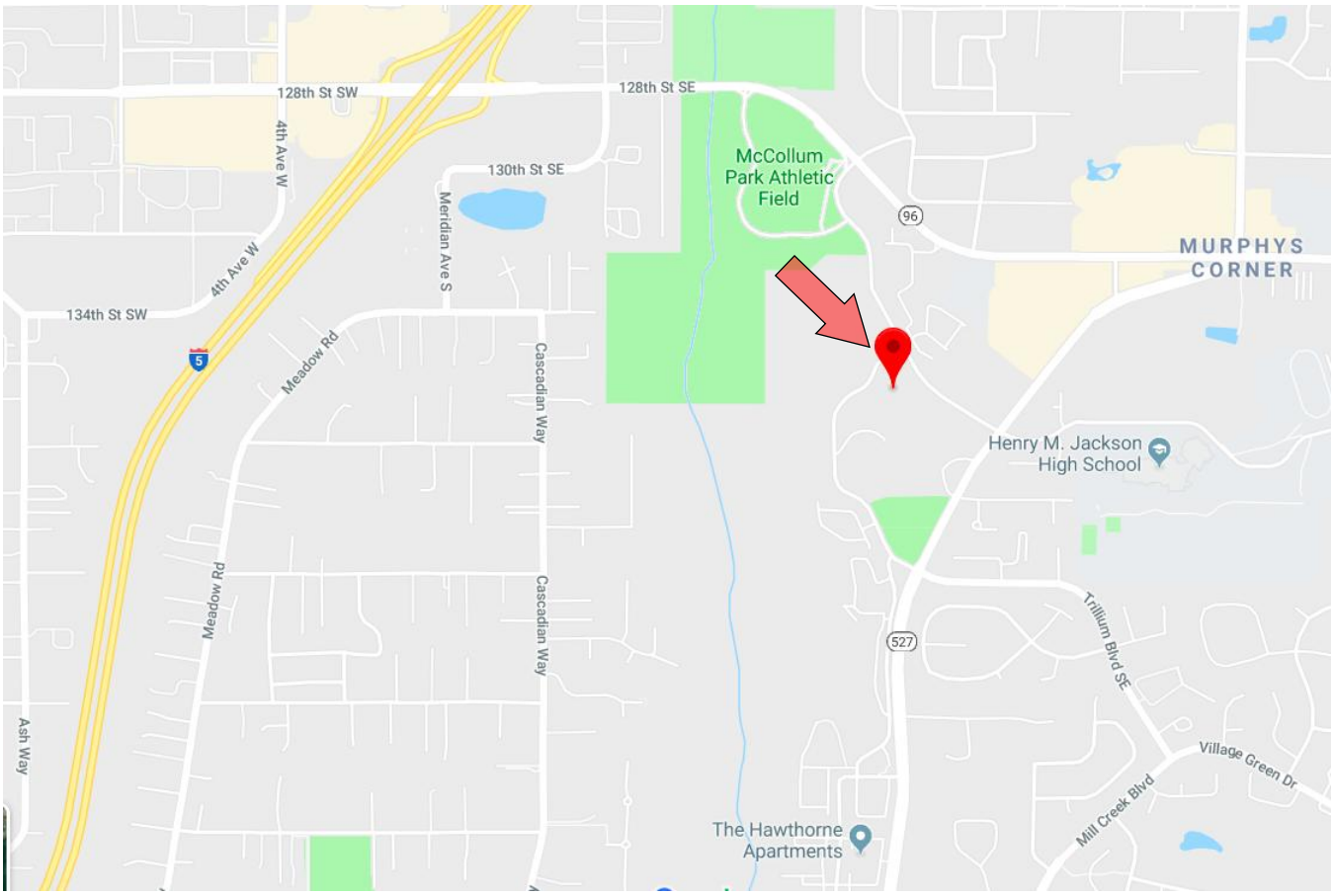
Project Overview

Site Location

The project is located on the southern parcel at the corner of North Creek Dr and Dumas Rd in Mill Creek (Parcel #28053100203700) on a 4.54 acre site.



Code Compliance

The project will comply with:

- [WSDOT] STANDARD SPECIFICATIONS for ROAD, BRIDGE and MUNICIPAL CONSTRUCTION, WSDOT, 2018 Edition with amendments
- [MCDCS] Mill Creek Design and Construction Standards
- [MCMC] Mill Creek Municipal Code
- [SWMMWW] 2019 Stormwater Management Manual for Western Washington

Executive Summary

The project will include construction of a 14,785 SF, one story facility located at North Creek Drive and Dumas Road. The site is currently an undeveloped parcel. Site improvements will include parking, stormwater facilities, and utilities. The site improvements will be on approximately 33% of

the total site area. Flow control will be mitigated via a below grade stormwater detention vault. Water quality will be mitigated by a Biopod system and a single cartridge catch basin.

An existing wetland is located on the northern portions of the site, however, the proposed development will be downslope from the wetland. The portion of the wetland buffer that will be impacted by the proposed development will be mitigated.

Existing Conditions

The subject property is undeveloped forest land with an existing wetland. The site is bordered by North Creek Drive to the west and Dumas Road to the north. Adjacent undeveloped lots are to the south and to the east. Overall topography of the site slopes from north to south, as well as to the east and west.

Soils

Site soils consist of approximately 4 to 14 inches of forest duff/topsoil directly underlain by approximately 1 to 2 feet of native, loose to medium-dense, well-graded gravel with sand and varying amounts of organic material (possible weathered till). Underlying the loose to medium-dense, near-surface native soils was very dense, gray, poorly-graded sand with gravel and silt (glacial till). The very dense till was encountered 8 to 9 feet below grade.

Geologic information for the project site was obtained from the Geologic map of the Everett 7.5 minute quadrangle, Snohomish County, Washington (Minard, 1985) published by the U.S. Geological Survey. According to the referenced map, near surface soils in the vicinity of the project site consist of Glacial Till (Qvt). The till generally consists of a nonsorted mixture of clay, silt, sand, pebbles, cobbles, and boulders. It is a compact lodgment till and is often locally referred to as Vashon till or hardpan. Native soils encountered during our subsurface exploration were generally consistent with the mapped till deposits is generally consistent with published geological information. No groundwater seepage was encountered in the exploration pits.

As stated on page 15 of the Geotechnical report, based upon an evaluation of the data collected during onsite investigations, it is the opinion of the geotechnical engineer that subsurface conditions are generally unsuitable for the onsite infiltration of stormwater. Additionally, glacially consolidated till soils as found on site within two feet of the surface are considered a restrictive layer by the 2012 Washington State Department of Ecology Stormwater Management Manual for Western Washington (amended December 2014).

Refer to soils report in Appendix B for additional information.

Proposed Conditions

The proposed facility will be a 14,785 sf school building. Site improvements will include parking, stormwater facilities, and utilities. The site improvements will be on approximately 33% of the total site area.

Pervious/Impervious Areas

Refer to Figure 1 for a graphical depiction of tributary areas. For use in determining stormwater mitigation fees the following areas represent the true pervious/impervious area for the entire site.

Onsite Pervious / Impervious Area

Total impervious surface……..……..…1.43 ac

Total pervious surface……..……...…..3.11 ac

TOTAL ONSITE AREA……..……...…..4.54 ac

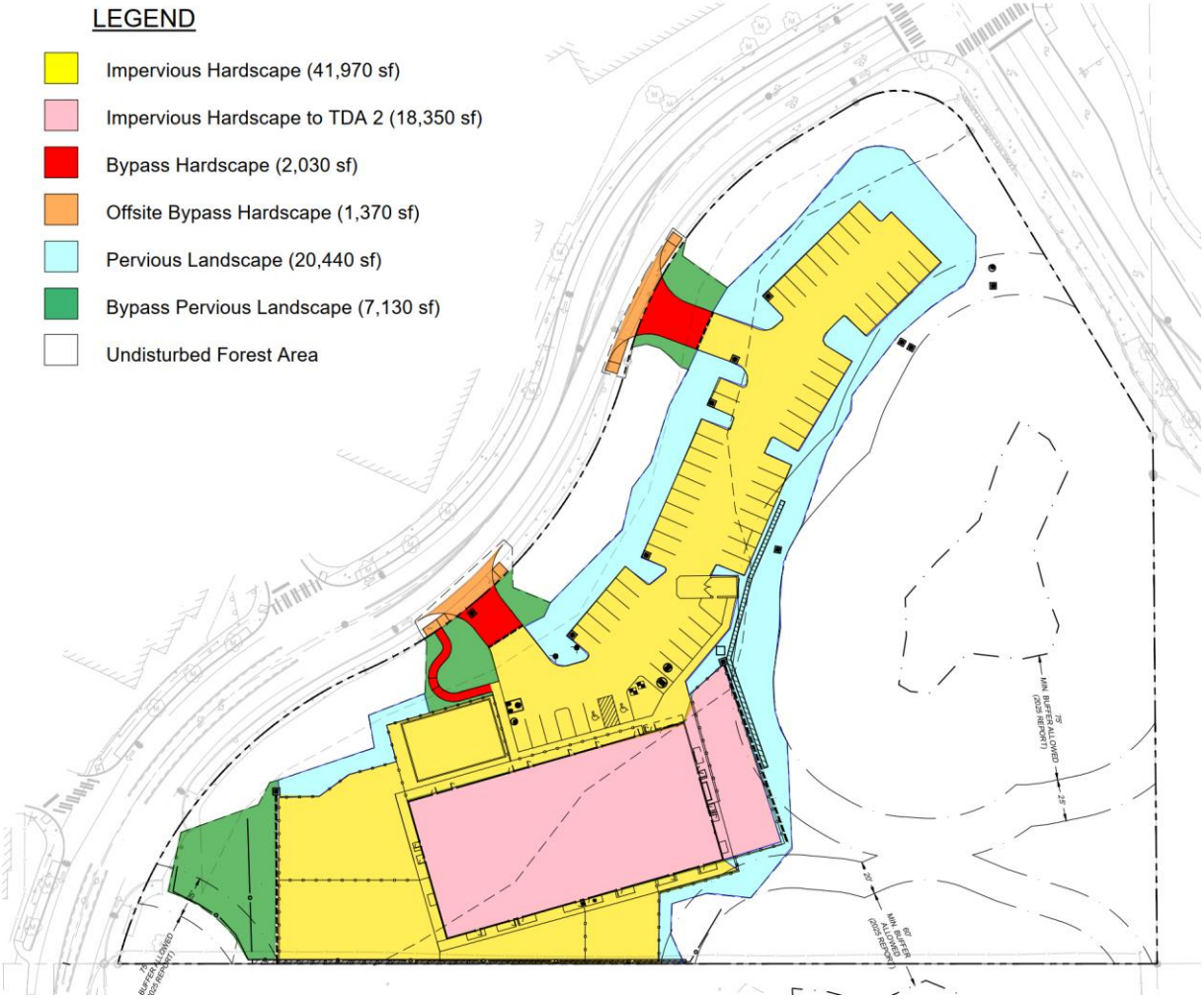
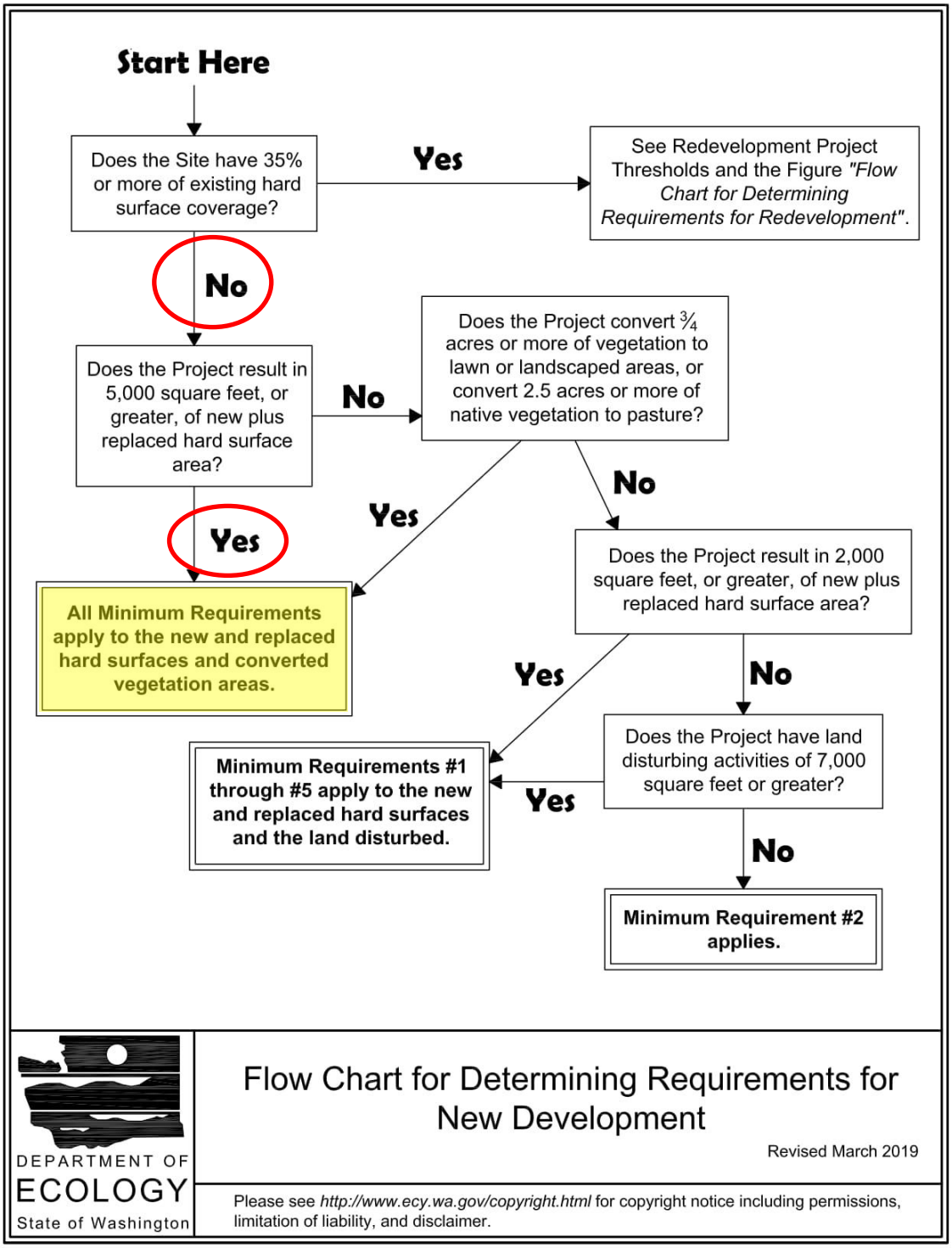


FIGURE 1 – Landuse Breakdown

Minimum Stormwater Management Requirements

Overview of Minimum Requirements

Minimum requirements 1-9 shall apply to the project.



1-Preparation of Stormwater Site Plans

Stormwater site plans were prepared in accordance with Volume I, Chapter 3 of the SWMMWW.

2-Construction Stormwater Pollution Prevention Plan (SWPPP)

A SWPPP narrative has been prepared and is included in Appendix A and on the plan set along with an erosion control plan being included with the plan set. The erosion potential for the site is moderate.

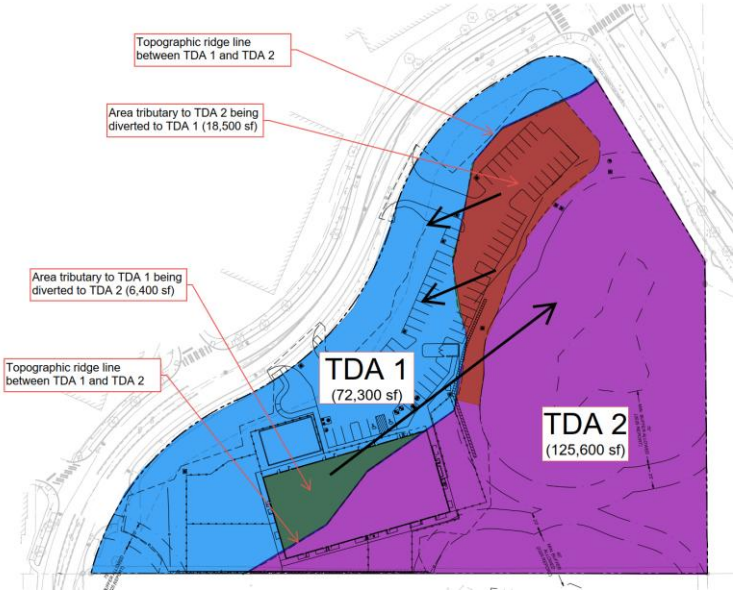
A sediment trap will be utilized (BMP C240) near the SW corner of the site. The trap will be sized for the full disturbed area in accordance with BMP C240. The purpose of this is to provide a level of conservancy and ease of construction. The surface area of the traps was determined to be [TBD] sf or a [TBD] depression. Supporting calculations will be included in Appendix E.

3-Source Control of Pollution

The project will not pose any source of pollution for the site. Per Section V-1 of the SWMMWW, high use sites for traffic are defined as an area of a commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area. The project is well below this threshold and is therefore not considered a high use site. The SWPPP provided will address the source control of pollution during the construction phase.

4-Preservation of Natural Drainage Systems and Outfalls

There are two Threshold Discharge Areas (TDA) associated with the subject site. TDA 1 flows to the west through municipal stormwater pipes and eventually discharges to Sitka Creek which then discharges to North Creek. TDA 2 flows to the south and east and eventually discharges to an unnamed watercourse that discharges to North Creek. Flows from the two TDA join approximately one-half mile downstream.



The developed site is primarily within TDA 1, with some developed area tributary to TDA 2, comprised mostly of half the building and the northern portion of the parking area. Preserving 100% of runoff to TDA 2 is unfortunately not feasible due to several factors. The proposed topography of the site places the improvements in a bowl that is at a lower elevation than would be able to discharge to TDA 2 by gravity. As discussed in Minimum Requirement 8 below, compensatory area from the building will be

pumped up to Wetland A and released through dispersion trenches to compensate for the amount of area being diverted to TDA 1, for a net-zero impact on Wetland A.

Based on design limitations for the dispersion trenches on length and separation, additional area cannot be routed to the northern portion of TDA 2. This results in a net of 12,100 sf (18,500-6,400) of additional area in TDA 2 being routed to TDA 1. As this additional area is small in comparison to the entire tributary area to the point of confluence to TDA-1, the additional area is negligible. Additionally, the reduction of area to TDA-2 does not effect the downstream portion of TDA 1 as the area south of the site is undeveloped and Hydroperiod Protection is not required for Wetland 2.

Downstream impacts of the TDA areas are discussed below in Section 5.

Refer to Minimum Requirement 8-"Wetland Protection" for discussion of protection of offsite wetlands.

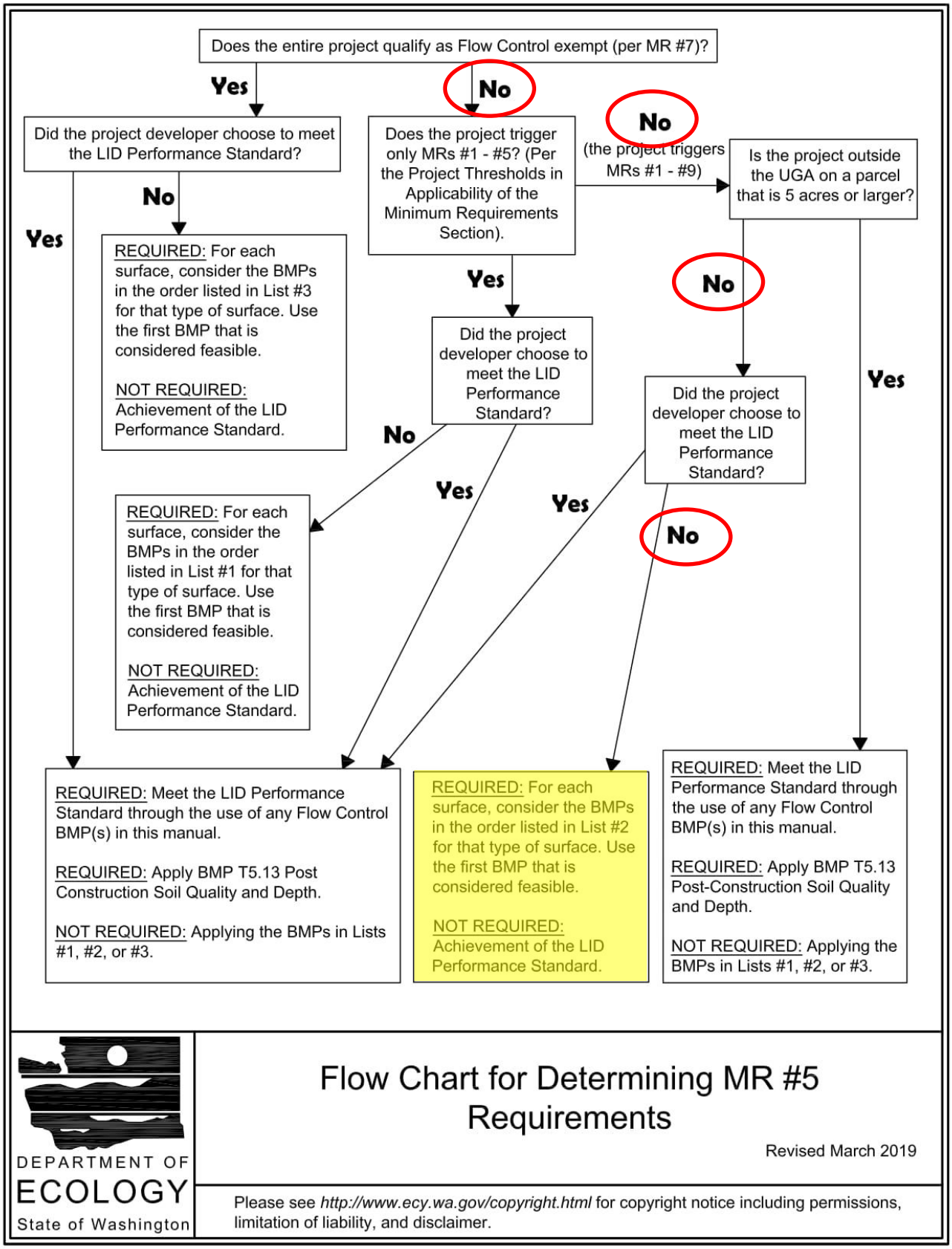
5-Onsite Stormwater Management

As there are two TDA areas, there will be two drainage systems. In TDA-1 runoff from both pollution and non-pollution generating surfaces will be combined and discharged to a stormwater detention system, to meet Minimum Requirement 7-Flow Control. Downstream of the detention system, a Biopod system will be used to meet Minimum Requirement 6-Water Quality, prior to discharging to the point of confluence.

In the event of an overflow condition in the detention vault, stormwater will simply fill up in the vault until it reaches the overflow discharge pipe. Stormwater will flow through the overflow system, bypass the treatment system through the internal bypass mechanism, and flow to the point of connection at the catch basin in the public roadway. The catch basin in the southern driveway will also act as a relief mechanism, and any backup of water in the system will simply flow out of the catch basins and flow into North Creek Drive. It is not anticipated that at any time stormwater back up into the building structure or cause a downstream flooding issue.

In TDA -2, nonpollutant runoff from the building roof and the adjacent play area will be collected and pumped north to dispersion trenches. This is to meet the hydroperiod protection requirement for the wetlands, discussed in Minimum Requirement 8 below.

The project will meet minimum requirement 1-9 based on the following flowchart.


Does the entire project qualify as Flow Control exempt (per MR #7)?
Yes
No
Did the project developer choose to meet the LID Performance Standard?
Yes
No
REQUIRED: For each surface, consider the BMPs in the order listed in List #3 for that type of surface. Use the first BMP that is considered feasible.
NOT REQUIRED: Achievement of the LID Performance Standard.
Does the project trigger only MRs #1 - #5? (Per the Project Thresholds in Applicability of the Minimum Requirements Section).
No
(the project triggers MRs #1 - #9)
Is the project outside the UGA on a parcel that is 5 acres or larger?
Yes
No
Yes
Did the project developer choose to meet the LID Performance Standard?
No
Yes
REQUIRED: For each surface, consider the BMPs in the order listed in List #1 for that type of surface. Use the first BMP that is considered feasible.
NOT REQUIRED: Achievement of the LID Performance Standard.
Did the project developer choose to meet the LID Performance Standard?
Yes
No
REQUIRED: Meet the LID Performance Standard through the use of any Flow Control BMP(s) in this manual.
REQUIRED: Apply BMP T5.13 Post Construction Soil Quality and Depth.
NOT REQUIRED: Applying the BMPs in Lists #1, #2, or #3.
REQUIRED: For each surface, consider the BMPs in the order listed in List #2 for that type of surface. Use the first BMP that is considered feasible.
NOT REQUIRED: Achievement of the LID Performance Standard.
REQUIRED: Meet the LID Performance Standard through the use of any Flow Control BMP(s) in this manual.
REQUIRED: Apply BMP T5.13 Post-Construction Soil Quality and Depth.
NOT REQUIRED: Applying the BMPs in Lists #1, #2, or #3.
DEPARTMENT OF ECOLOGY
State of Washington
Flow Chart for Determining MR #5 Requirements
Revised March 2019
Please see http://www.ecy.wa.gov/copyright.html for copyright notice including permissions, limitation of liability, and disclaimer.

List 2 outlines BMP's for hard surfaces in the following order:

Lawn and Landscape Areas

1. Post construction soil quality and depth in accordance with BMP 5.13 in Volume V, Chapter 5.

   Due to the limited area within the cleared site and the steep topography, existing topsoil will be removed from the site. At completion of clearing, grading, and hardscape, imported topsoil material will be placed in landscape areas in accordance with BMP 5.13.

Roofs

1. Full Dispersion in accordance with BMP T5.30: Full Dispersion, or Downspout Full Infiltration Systems in accordance with BMP T5.10A: Downspout Full Infiltration.

   Not feasible as the site does not retain 65% of the site as native forested area downslope of the proposed site. However, dispersion will be utilized to the maximum extent feasible for hydroperiod protection of Wetland A, as discussed below for Minimum Requirement 8. Per the geotechnical report, infiltration is not feasible on this site.

2. Bioretention (See BMP T7.30: Bioretention Cells, Swales, and Planter Boxes) facilities that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

   Not feasible as the site is not suitable for infiltration, per the geotechnical report, and thus below the required 0.3 in/hr rate identified in the infeasibility criteria.

3. Downspout Dispersion Systems in accordance with BMP T5.10B: Downspout Dispersion Systems

   BMP T5.10B is infeasible as the flow path from the point of discharge to the property line is less than the required length, as well as many areas are paved and will not facilitate vegetated flow.

4. Perforated Stub-out Connections in accordance with BMP T5.10C: Perforated Stub-out Connections

   Perforated stub-out connections are infeasible as the site is not conducive to infiltration and any water introduced into the subsoils may result in perched water traveling through the site undermining pavements and foundations.

Hard Surfaces

1. Full Dispersion in accordance with BMP T5.30: Full Dispersion

   Full dispersion is not applicable as 65% of the site will not be protected in a forest or native condition downslope of the proposed development. However, dispersion will be utilized to the maximum extent feasible for hydroperiod protection of Wetland A, as discussed below for Minimum Requirement 8.

2. Permeable pavement in accordance with BMP T5.15: Permeable Pavements

   Infeasible as onsite soil is not conducive to infiltration, per the geotechnical report.

3. Bioretention BMP's (BMP T7.30: Bioretention Cells, Swales, and Planter Boxes) that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.

   Not feasible as onsite soil is not conducive to infiltration, per the geotechnical report.

4. Sheet Flow Dispersion in accordance with BMP T5.12: Sheet Flow Dispersion, or Concentrated Flow Dispersion in accordance with BMP T5.11: Concentrated Flow Dispersion

BMP T5.12 is infeasible as minimum 10-foot flow path per every 20 feet of contributing surface flow path cannot be provided.

Upstream Analysis

No impacts from upstream areas are anticipated. Topography of the site slopes north to south, and the developed project extends northward to Dumas. Offsite runoff beyond Dumas Rd is not anticipated.

Downstream Analysis

There are two Threshold Discharge Areas (TDA) associated with the subject site. TDA 1 flows to the west through municipal stormwater pipes and eventually discharges to Sitka Creek which then discharges to North Creek. TDA 2 flows to the south and east and eventually discharges to an unnamed watercourse that discharges to North Creek. Flows from the two TDA join approximately one-half mile downstream.

The entire site is tributary to Upper North Creek Basin, as shown in the City's Drainage Basin Map included in Appendix G. The existing site disperses stormwater along the length of the property lines, however, in general the topography routes dispersed stormwater to the SW and SE portion of the project site. The point of compliance for the majority of the developed site is the existing public storm drain system in North Creek Drive.

For discharges in TDA 1 to the SW corner of the project site, the public storm drain flows west through Heatherwood Apartments to North Creek. According to the Drainage Report created for the Heatherwood Apartments development, the stormwater system for Heatherwood Apartments was designed to handle 2.06 acres of runoff from the subject property under landscaped conditions conditions. A tributary area plan from the Heatherwood Apartments drainage report is included for reference in Appendix H.

The runoff discharged from the developed site will be released at a rate that is at or less than predeveloped and forested conditions using stormwater detention. The mitigated flow from the developed site for the combination of area in TDA 1 and TDA 2 will mimic predeveloped flow to Heatherwood Apartments and will meet required flow control requirements. Impacts to the downstream system are not anticipated. Figure 2 below shows the downstream public storm drain system for the portion of the site that drains to TDA-1.

For more detailed downstream analysis of predeveloped off-site flows, see Appendix G, Figure 3 (Off-Site Basin Map). Photos of key locations along the downstream system are provided as well. Upon visual observation, the downstream system appears to be in good condition with no evidence of flooding or backwater conditions. The depth of the public system is fairly deep and can accommodate a high HGL flow.

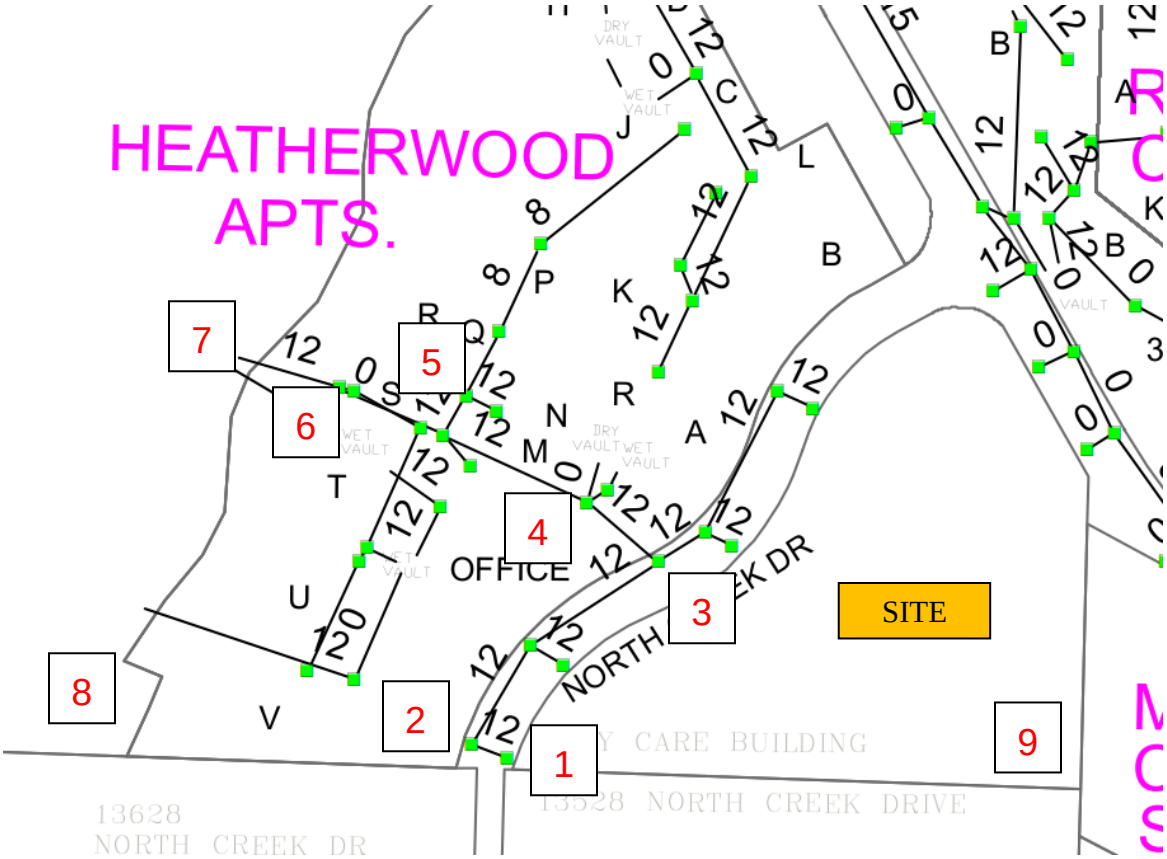

HEATHERWOOD
APTS.
SITE
OFFICE
NORTH
7
6
5
4
3
2
1
8
9
13628
NORTH CREEK DR
13528 NORTH CREEK DRIVE

Figure 2

1-Point of Connection to PSD

2-CB across the street

3-Junction with Apts

4-Type II CB

5-Type II CB

6-Type I CB

7-Outfall to North Creek

8-Downstream North Creek

9-SE corner of site

Refer to Figure 3-Offsite Basin Map in Appendix G for reference to the following photos.

10-Looking NW along N Cr Dr (see Fig. 3)

11-Looking W along N Cr Dr (see Fig. 3)

12-Project site looking south (See Fig 3)

Conveyance System

The onsite conveyance system will consist of 8" pipe with a minimum slope of 0.5%. An 8" pipe at 0.5% slope has a capacity of 0.93 cfs. The peak 100 year flow of the mitigated site at the point of confluence is [TBD] cfs, therefore the conveyance pipe is approximately half full at peak discharge. As such, the onsite conveyance system has sufficient capacity to convey the peak 100 year mitigated flows.

6-Runoff Treatment

The site will meet the enhanced level of treatment, as the project does not meet the thresholds for phosphorous removal or oil treatment as described in Section V-3 of the SWMMWW.

Runoff treatment will consist of an underground Biopod system, manufactured by Oldcastle Precast. The Biopod is listed as an approved technology on the Department of Ecology's website for enhanced treatment.

Calculations will be included in Appendix E at a later submittal for the clearing and grading permit.

7-Flow Control

This requirement will be met through the use of two different methods. TDA 1 will utilize a detention vault located in the southern portion of the site. TDA 2 will utilize dispersion of compensatory area, as discussed in more detail below for Minimum Requirement 8.

The existing onsite soils will be modeled as Type D soils, based on statements contained within page 15 of the geotechnical report that state that the upper soil layer is considered a restrictive layer. Existing soil type / land use designation in the WWHM were inputted as "SAT Forest – Steep" to reflect the Type D

soils. TerraVista NW contacted WA DOE and confirmed that Type D soils should be modeled under this soil/land use designation in WWHM.

Calculations will be provided in Appendix D as part of the clearing and grading permit that show the proposed detention system meets the required flow control parameters.

8-Wetland Protection

Per the wetland study performed by Wetland Resources, an existing wetland (Wetland A) is present in the northeast portion of the site. There are also three existing offsite wetlands on adjacent parcels to the south and east. Wetland 1 is located to the SW of the site, Wetland 2 is located south and east of the site, and Wetland 3 is located to the east of the site. Wetland 3 is not impacted as the proposed project as proposed improvements onsite do not effect the headwaters of the wetland.

Per the flow charts below, protections for Wetland A will include:

- General Protection
- Protection from Pollutants
- Wetland Hydroperiod Protection (Method 1)

Protections for Wetland 1 will include:

- General Protection
- Protection from Pollutants
- Wetland Hydroperiod Protection (Method 2)

Protections for Wetland 2 will include

- General Protection
- Protection from Pollutants

All three wetlands will receive general protections as listed in the SWMMWW I-C.2 General Protection List.

For Wetland A, pollutants from pollutant generating surfaces will not be routed to the wetland, therefore the wetland will meet the pollutant protection criteria. To meet the Method 1 hydroperiod protection criteria, compensatory area will be routed to the wetland. As shown in Figure 4 below, the proposed topography of the parking area will be routed away from Wetland A. An approximately equal area of non-pollutant generating surface will be routed to the Wetland A to compensate. Routing will be via a pump system and dispersion into the wetland.

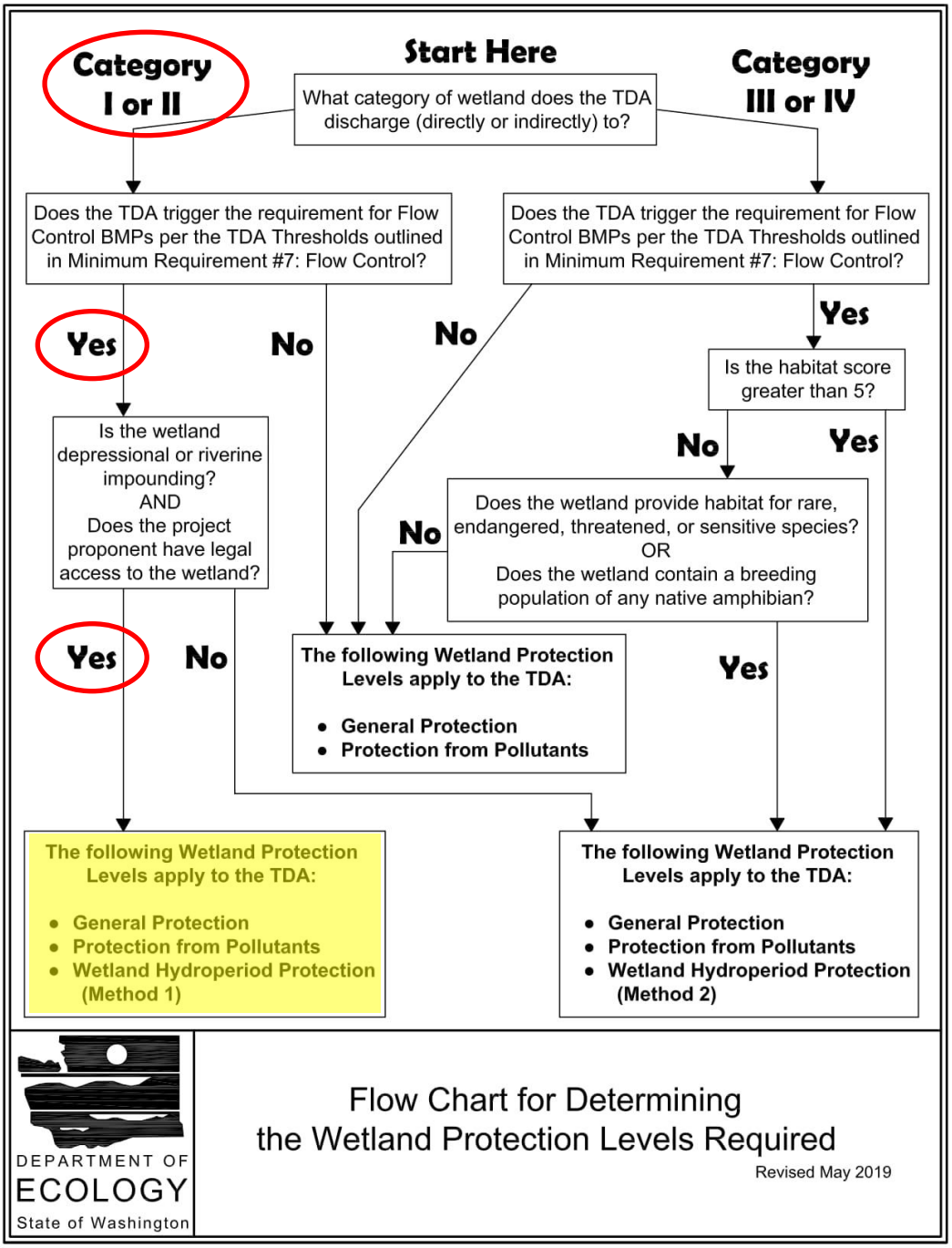
Monitoring of the wetland hydroperiod for the wetland will not be performed due to time constraints of the project, therefore the minimum fluctuations will be used in the calculations. As an equal amount of area is being diverted to Wetland A, fluctuations are not anticipated to change from existing conditions in regard to the six criteria related to method 1 hydroperiod. Calculations for Method 1 Wetland Hydroperiod Protection will be included later as part of the clearing and grading permit.

For Wetland 1, pollutant generating surfaces will not be tributary to the wetland. As the wetland is offsite, topographic information is not available to determine the tributary area of the wetland and thus how the proposed project may or may not affect the runoff to the wetland. As the wetland is small and adjacent to North Creek Drive, it is anticipated that no impacts will be present to the wetland.

For Wetland 2, no pollutant generating surfaces will be tributary to the wetland. A portion of the existing tributary area to the wetland will be routed to Wetland A, as discussed above. Based on the flow chart below for Wetland 2, Hydroperiod Protection is not required for the wetland, therefore diversion of stormwater runoff to the uphill wetland will not adversely affect the wetland.

Wetland A

HGM Class: Depressional
Cowardin Classification: Palustrine, Forested Wetland, Needle-leaved Evergreen, Seasonally flooded
Ecology Rating Category (Total Score/Habitat Score): Category II (22/5)
City of Mill Creek Buffer With Minimization Measures: 75 Feet
City of Mill Creek Buffer Without Minimization Measures: 100 Feet



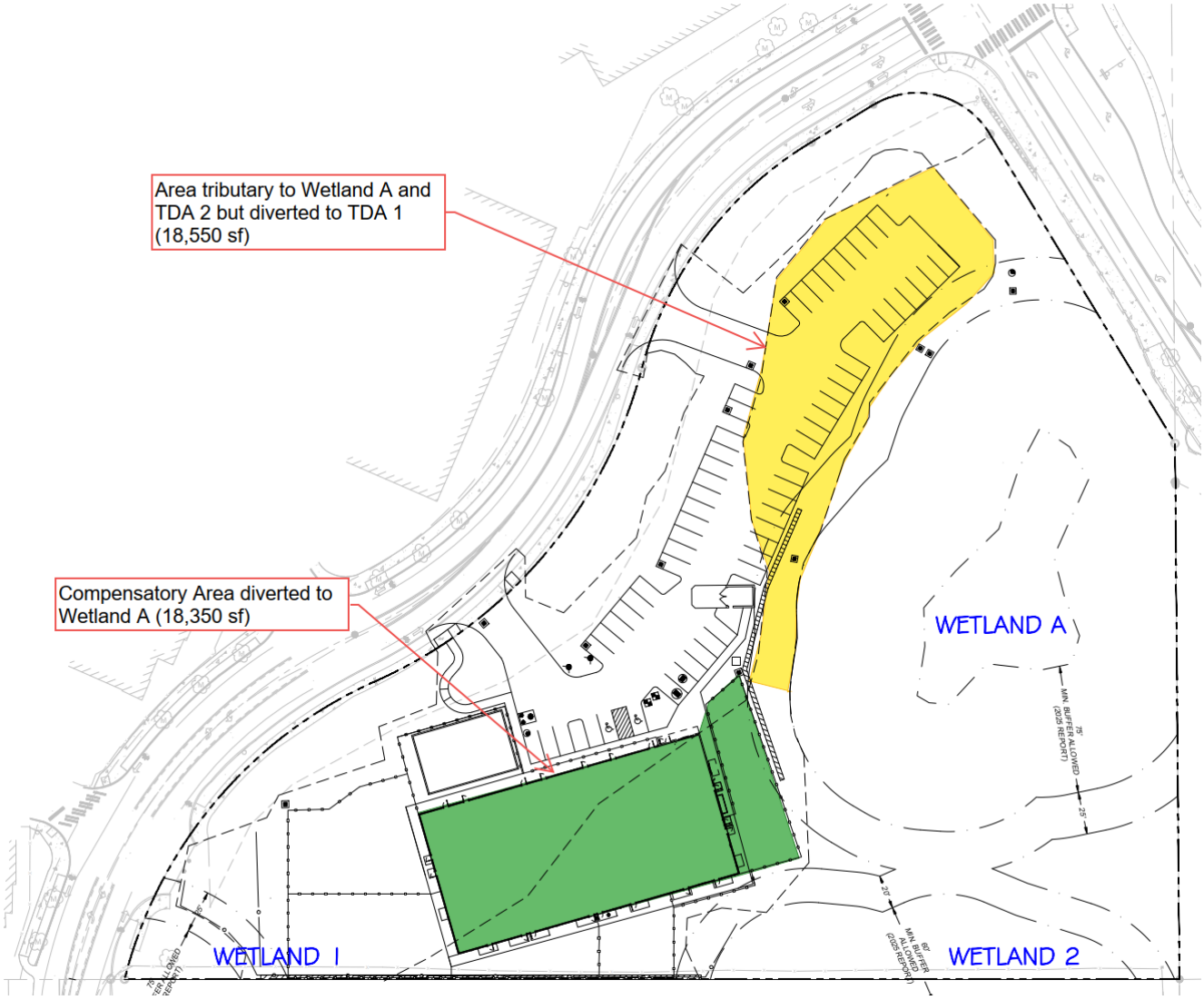
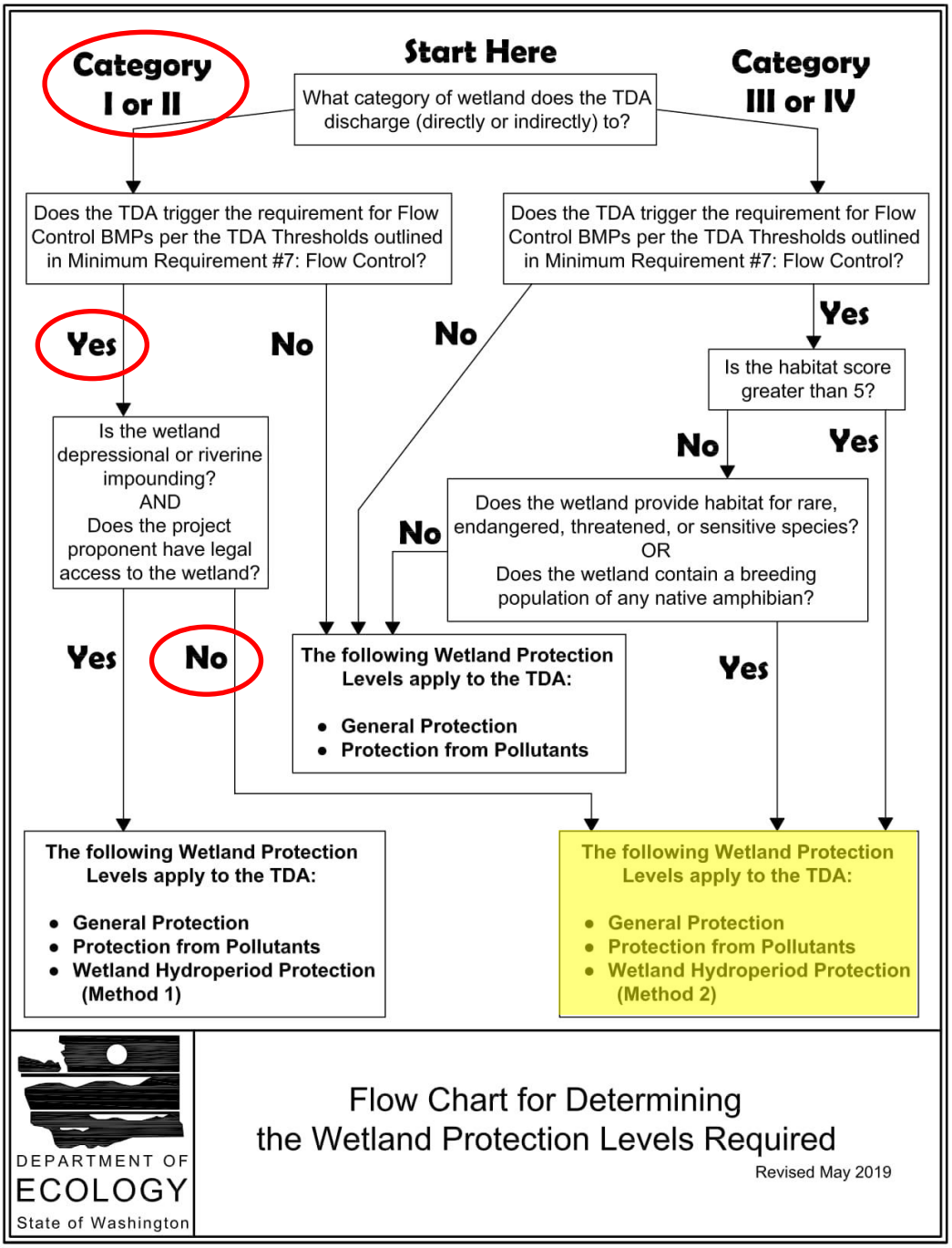


Figure 4 – Wetland A Tributary Area

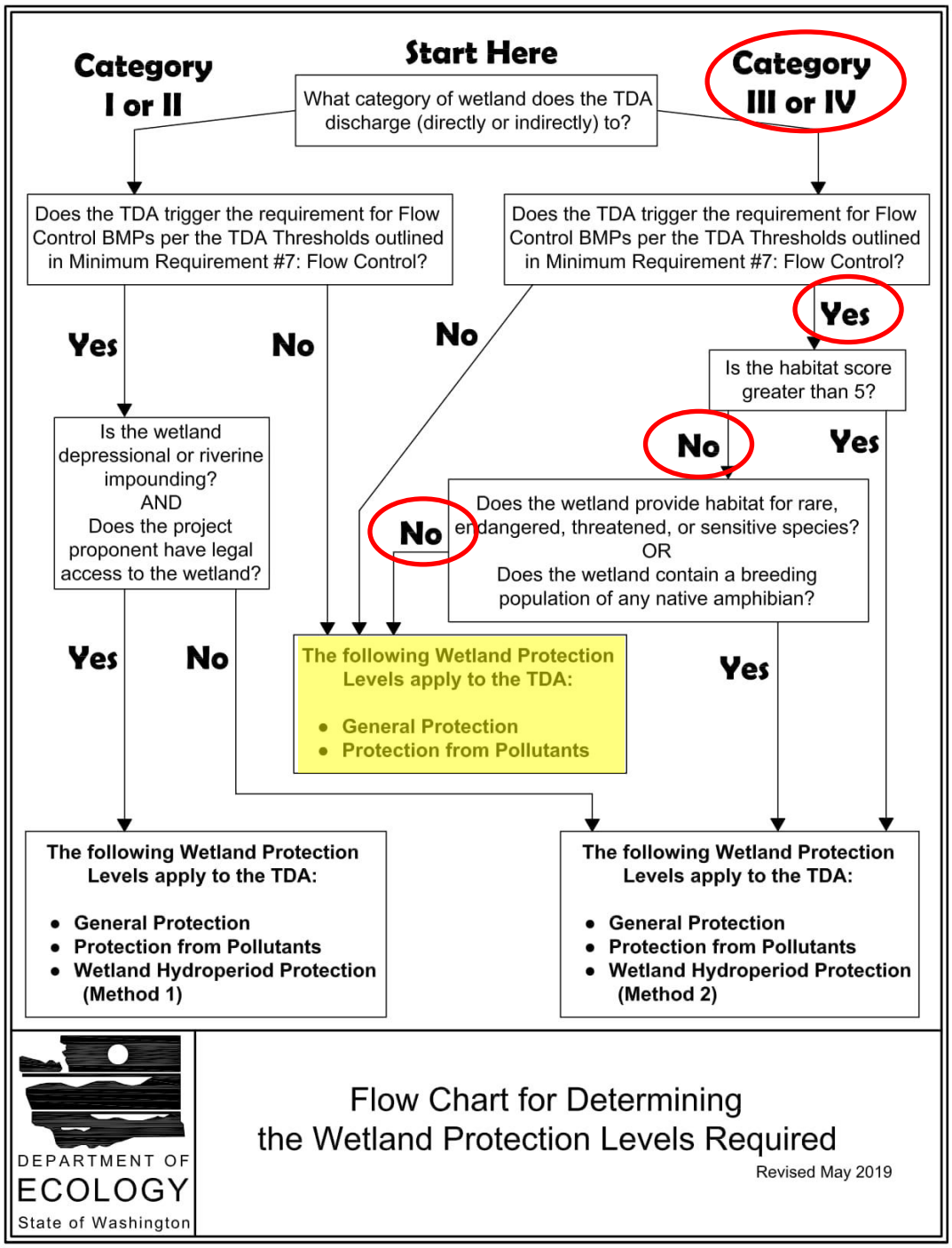
Off-site Wetland 1

HGM Class: Depressional
Cowardin Classification: Palustrine, Forested Wetland, Needle-leaved Evergreen, Seasonally flooded
Ecology Rating Category (Total Score/Habitat Score): Category II (20/4)
City of Mill Creek Buffer With Minimization Measures: 75 Feet
City of Mill Creek Buffer Without Minimization Measures: 100 Feet



Off-site Wetland 2

HGM Class: Depressional
Cowardin Classification: Palustrine, Forested Wetland, Needle-leaved Evergreen, Seasonally flooded
Ecology Rating Category (Total Score/Habitat Score): Category III (19/4)
City of Mill Creek Buffer With Mitigation: 60 Feet
City of Mill Creek Buffer Without Mitigation: 80 Feet



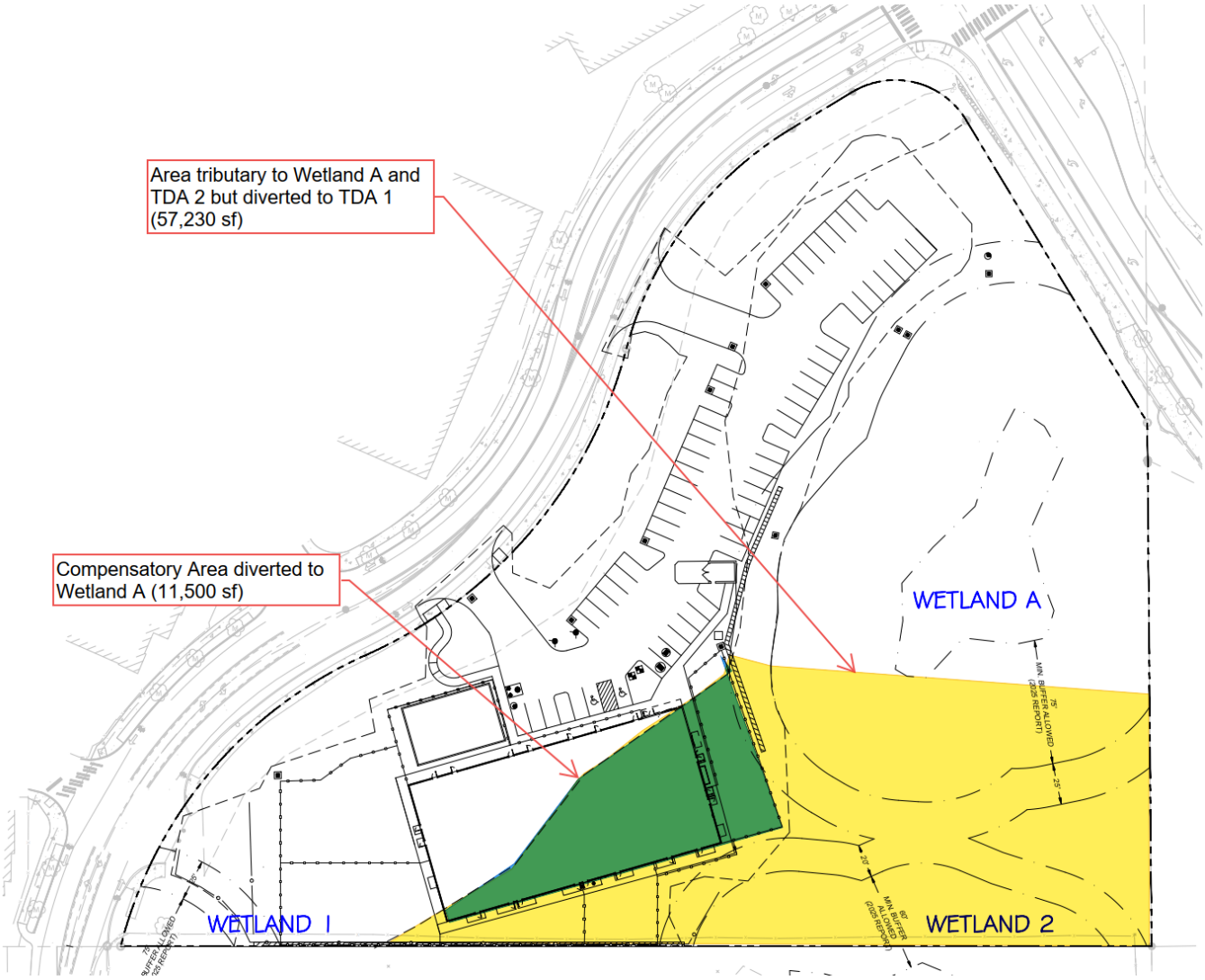


Figure 5 – Wetland 2 Tributary Area

9-Operation and Maintenance

Operation and maintenance procedures are included in Appendix C.

Appendix A

Construction Stormwater Pollution Prevent Plan (SWPPP)

Construction Stormwater General Permit (CSWGP)
Stormwater Pollution Prevention Plan (SWPPP)
for
Primrose School

Prepared for:
Department of Ecology
Northwest Region

Permittee / Owner	Developer	Operator / Contractor
Primrose School	Same	TBD

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	TBD	TBD

SWPPP Prepared By

Name	Organization	Contact Phone Number
Eric Scott	TerraVista NW	360-386-9997

SWPPP Preparation Date
July 7, 2025

Project Construction Dates

Activity / Phase	Start Date	End Date
Construction	March 2020	Dec 2020

GENERAL INSTRUCTIONS AND CAVEATS

This template presents the recommended structure and content for preparation of a Construction Stormwater General Permit (CSWGP) Stormwater Pollution Prevention Plan (SWPPP).

The Department of Ecology's (Ecology) CSWGP requirements inform the structure and content of this SWPPP template; however, **you must customize this template to reflect the conditions of your site.**

A Construction Stormwater Site Inspection Form can be found on Ecology's website. https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

Using the SWPPP Template

Each section will include instructions and space for information specific to your project. Please read the instructions for each section and provide the necessary information when prompted. This Word template can be modified electronically. You may add/delete text, copy and paste, edit tables, etc. Some sections may be completed with brief answers while others may require several pages of explanation.

INSTRUCTIONS

Instructions are identified by gray shading, and should **be deleted upon SWPPP completion.** Delete this entire section upon SWPPP completion.

Follow this link to a copy of the Construction Stormwater General Permit: https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

Table of Contents

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

Project Information (1.0)
Project/Site Name: Primrose School
Street/Location: *North Creek Road*
City: *Mill Creek* State: *WA* Zip code: *98012*
Subdivision:
Receiving waterbody: *North Creek*

Existing Conditions (1.1)
Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).
Total acreage: *4.54 acres*
Disturbed acreage: *2.06 acres*
Existing structures: *None*
Landscape topography: *Steep*
Drainage patterns: *Runoff*
Existing Vegetation: *Forest*
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes): *Wetland*

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody: *None*
Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

List all known or suspected contaminants associated with this site in Table 1. Include contaminants previously remediated.
Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration
None	[Insert Text]	[Insert Text]	[Insert Text]

Proposed Construction Activities (1.2)
Description of site development (example: subdivision):

Commercial Development

Description of construction activities (example: site preparation, demolition, excavation):

Site preparation, demolition, excavation and fill, paving, and building construction

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:

Stormwater will be collected by a conveyance system and routed to three detention systems. A single water qualtity facility will be used at the confluence of the three detention facilties. The outfall of the site will be at an existing CB in North Creek Road.

Description of final stabilization (example: extent of revegetation, paving, landscaping):

Site will be paved as well as seeded with grasses within landscape areas.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):

NA

Construction Stormwater Best Management Practices (BMPs) (2.0)
Describe the BMPs identified to control pollutants in stormwater discharges. Depending on the site, multiple BMPs for each element may be necessary. For each element identified:

- Clearly describe the control measure(s).
- Describe the implementation sequence.
- Describe the inspection and maintenance procedures for that specific BMP.
- Identify the responsible party for maintaining BMPs (if your SWPPP is shared by multiple operators, indicate the operator responsible for each BMP).

Categorize each BMP under one of the following elements as listed below:

1. Preserve Vegetation / Mark Clearing Limits
2. Establish Construction Access
3. Control Flow Rates
4. Install Sediment Controls
5. Stabilize Soils
6. Protect Slopes
7. Protect Drain Inlets
8. Stabilize Channels and Outfalls
9. Control Pollutants
10. Control Dewatering
11. Maintain BMPs
12. Manage the Project
13. Protect Low Impact Development

- BMPs must be consistent with the most current approved edition of the Stormwater Management Manual for Western Washington (SWMMWW) at sites west of the crest of the Cascade Mountains; the Stormwater Management Manual for Eastern Washington (SWMMEW) for sites east of the crest of the Cascade Mountains at the time the general permit was issued; or other Ecology-approved manual.
- Note the location of each BMP on your Site Map in Appendix A.
- Include the corresponding Ecology source control BMPs and runoff conveyance and treatment BMPs in Appendix B.
    - SWMMWW Volume II Chapter 4 Sections 4.1 and 4.2 – https://fortress.wa.gov/ecy/publications/SummaryPages/1410055.html or
    - SWMMEW Chapter 7 Section 7.3.1 and 7.3.2 – https://fortress.wa.gov/ecy/publications/summarypages/0410076.html
    - If it can be justified that a particular element does not apply to the project site, include a written justification in lieu of the BMP description in the text for the appropriate element.

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e. hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.
The 12 Elements (2.1)
Element 1: Preserve Vegetation / Mark Clearing Limits (2.1.1)
Describe the methods (signs, fences, etc,) you will use to protect those areas that should not be disturbed.
Describe natural features identified and how each will be protected during construction. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans.

Describe how natural vegetation and native topsoil will be preserved.

List and describe BMPs: BMP C103 – High Visibility Fence, BMP C233-Silt Fence
Installation Schedules: Installed prior to ground breaking
Inspection and Maintenance plan: Inspected weekly and after major precipitation event
Responsible Staff: CESCL

Element 2: Establish Construction Access (2.1.2)
Describe how you will minimize dust generation and vehicles tracking sediment off-site.
Limit vehicle access to one route, if possible.
Recycled concrete used to establish construction ingress or egress may be a stormwater pollutant source that requires treatment prior to discharge.
Street sweeping, street cleaning, or wheel wash/tire baths may be necessary if the stabilized construction access is not effective. All wheel wash wastewater shall be controlled on-site and CANNOT be discharged into waters of the State.
Install site ingress/egress stabilization BMPs according to BMP C105.
Describe how you will clean the affected roadway(s) from sediment which is tracked off-site.

List and describe BMPs: BMP C105-Stabilized Construction Entrance
Installation Schedules: installed at the start of construction
Inspection and Maintenance plan: Inspected and maintained weekly or after significant rainfall event
Responsible Staff: CESCL

Element 3: Control Flow Rates (2.1.3)
Describe how you will protect properties and waterways downstream of the project from increased speed and volume of stormwater discharges due to construction activity.
Construction of stormwater retention and/or detention facilities must be done as one of the first steps in grading.
Assure that detention facilities are functioning properly before constructing site improvements (i.e. impervious surfaces).
If applicable, describe how you will protect areas designed for infiltration from siltation during the construction phase.

Will you construct stormwater retention and/or detention facilities?
Yes **No**

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?
Yes **No**

List and describe BMPs: None
Installation Schedules: [Insert text here]
Inspection and Maintenance plan: [Insert text here]
Responsible Staff: [Insert text here]

Element 4: Install Sediment Controls (2.1.4)
Describe how you will minimize sediment discharges from the site. Construct sediment control BMPs as one of the first steps of grading. These BMPs must be functional before other land disturbing activities – especially grading and filling – take place.
Describe the BMPs identified to filter sediment prior to it being discharged to an infiltration system or leaving the construction site.
Describe how you will direct stormwater for maximum infiltration where feasible.
Describe how you will not interfere with the movement of juvenile Salmonids attempting to enter off-channel areas or drainages.
Describe how you will respond if sediment controls are ineffective and turbid water is observed discharging from the site.
Consider the amount, frequency, intensity and duration of precipitation, soil characteristics, and site characteristics when selecting sediment control BMPs.

List and describe BMPs: BMP C233-Silt Fence
Installation Schedules: Installed at start of construction
Inspection and Maintenance plan: Inspect weekly or after rainfall event
Responsible Staff: CESCL

Element 5: Stabilize Soils (2.1.5)
Describe how you will stabilize exposed and unworked soils throughout the life of the project (i.e. temporary and permanent seeding, mulching, erosion control fabrics, etc.).
Describe how you will stabilize soil stockpiles.
Describe how you will minimize the amount of soil exposed throughout the life of the project.
Describe how you will minimize the disturbance of steep slopes.
Describe how you will minimize soil compaction.
Describe how you will stabilize contaminated soil and contaminated soil stockpiles if applicable.
Exposed and unworked soils will be stabilized according to the time period set forth for dry and wet seasons, on the west or east sides of the crest of the Cascade Mountains.

Select your region's table and delete the others.
West of the Cascade Mountains Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	May 1 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

East of the Cascade Mountains Crest, except the Central Basin*

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	July 1 – September 30	10 days
During the Wet Season	October 1 – June 30	5 days

The Central Basin*, East of the Cascade Mountain Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	July 1 – September 30	30 days
During the Wet Season	October 1 – June 30	15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.
Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: March 2020 End date: Dec 2020

Will you construct during the wet season?
Yes No

List and describe BMPs: BMP C120-Temp / Permanent Seeding, BMP C123-Plastic Covering, BMP C140-Dust Control
Installation Schedules: Dust control will be used from beginning of construction to final stabiliazation of soi. Plastic covering will be used during the wet season, permanent seeding will be done in the fall.
Inspection and Maintenance plan: Inspect weekly or after rain event
Responsible Staff: CESCL

Element 6: Protect Slopes (2.1.6)
West of the Cascade Mountains Crest
Describe how slopes will be designed, constructed, and protected to minimize erosion.
Temporary pipe slope drains must handle the peak 10-minute flow rate from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used.
The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits.
For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates.
If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as “landscaped area”.
Describe how you will reduce scouring within constructed channels that are cut down a slope.

East of the Cascade Mountain Crest
Describe how slopes will be designed, constructed, and protected to minimize erosion.
Temporary pipe slope drains must handle the expected peak flow velocity from a 6-month, 3-hour storm for the developed condition, referred to as the short duration storm.
Describe how you will reduce scouring within constructed channels that are cut down a slope.

Will steep slopes be present at the site during construction?
Yes No

List and describe BMPs: BMP C120-Temp/Permanent Seeding
Installation Schedules: Installed in the fall
Inspection and Maintenance plan: Inspected weekly to insure germination of seed
Responsible Staff: CESCL

Element 7: Protect Drain Inlets (2.1.7)
Describe how you will protect all operable storm drain inlets so that stormwater runoff does not enter the stormwater conveyance system.
Describe how you will remove sediment that enters the stormwater conveyance system (i.e. filtration, treatment, etc.).
Keep in mind inlet protection may function well for coarse sediment but is less effective in filtering finer particles and dissolved constituents. Inlet protection is the last component of a treatment train and protection of drain inlets include additional sediment and erosion control measures. Inlet protection devices will be cleaned (or removed and replaced), when sediment has filled the device by one third (1/3) or as specified by the manufacturer.
Inlets will be inspected weekly at a minimum and daily during storm events.

List and describe BMPs: BMP C220-Storm Drain Inlet Protection
Installation Schedules: Installed prior to construction
Inspection and Maintenance plan: Inspected weekly or after rain event
Responsible Staff: CESCL

Element 8: Stabilize Channels and Outlets (2.1.8)
Describe how you will prevent downstream erosion where site runoff is to be conveyed in channels, discharged to a stream or, discharged to a natural drainage point.
West of the Cascade Mountains Crest
On-site conveyance channels must handle the peak 10-minute flow rate from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used.
The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits.
For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates.
If using the WWHM to predict flows, bare soil areas should be modeled as “landscaped area”.

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

List and describe BMPs: BMP C202 – Channel Lining
Installation Schedules: Installed prior to construction
Inspection and Maintenance plan: Inspected weekly or after rain event
Responsible Staff: CESCL

Element 9: Control Pollutants (2.1.9)
The following pollutants are anticipated to be present on-site:
Table 2 – Pollutants

Pollutant (and source, if applicable)
None

Describe how you will handle and dispose of all pollutants, including waste materials and demolition debris, in a manner that does not cause contamination of stormwater.
Describe how you will cover, contain, and protect from vandalism all chemicals, liquid products, petroleum products, and other polluting materials.
Describe how you will manage known contaminants to prevent their discharge with stormwater to waters of the State (i.e. treatment system, off-site disposal).

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?
Yes No Provisions of spill prevention plan will be used
If yes, describe spill prevention and control measures in place while conducting maintenance, fueling, and repair of heavy equipment and vehicles.
If yes, also provide the total volume of fuel on-site and capacity of the secondary containment for each fuel tank. Secondary containment structures shall be impervious.

Will wheel wash or tire bath system BMPs be used during construction?
Yes No
If yes, provide disposal methods for wastewater generated by BMPs.
If discharging to the sanitary sewer, include the approval letter from your local sewer district under Correspondence in Appendix C.

Will pH-modifying sources be present on-site?
Yes No If yes, check the source(s).
Table 3 – pH-Modifying Sources

	None
X	Bulk cement
	Cement kiln dust
	Fly ash
	Other cementitious materials
X	New concrete washing or curing waters
	Waste streams generated from concrete grinding and sawing
	Exposed aggregate processes
	Dewatering concrete vaults
X	Concrete pumping and mixer washout waters
	Recycled concrete
	Other (i.e. calcium lignosulfate) [please describe]

Describe BMPs you will use to prevent pH-modifying sources from contaminating stormwater.

List and describe BMPs: BMP C151-Concrete Handling, BMP C152-Sawcutting, BMP C154-Concrete Washout
Installation Schedules: *Installed prior to concrete work being performed*
Inspection and Maintenance plan: Inspected weekly
Responsible Staff: CESCL

Adjust pH of stormwater if outside the range of 6.5 to 8.5 su.
Obtain written approval from Ecology before using chemical treatment with the exception of CO_2 or dry ice to modify pH.

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Element 10: Control Dewatering (2.1.10)
Describe where dewatering will occur, including source of the water to be removed. State clearly if dewatering water is contaminated or has the potential to be contaminated.
Water from foundations, vaults, and trenches with characteristics similar to stormwater runoff shall be discharged into a controlled conveyance system before discharging to a sediment trap or sediment pond. Clean dewatering water will not be routed through stormwater sediment ponds.
Only clean, non-turbid dewatering water (such as well-point groundwater) may 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.
Describe how you will manage dewatering water to prevent the discharge of contaminants to waters of the State, including dewatering water that has comingled with stormwater (i.e. treatment system, off-site disposal).

Dewatering will not be used onsite

Check treatment of disposal option for dewatering water, if applicable:
Table 4 – Dewatering BMPs

	Infiltration
	Transport off-site in a vehicle (vacuum truck for legal disposal)
	Ecology-approved on-site chemical treatment or other suitable treatment technologies
	Sanitary or combined sewer discharge with local sewer district approval (last resort)
	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs: NA
Installation Schedules: NA
Inspection and Maintenance plan: NA
Responsible Staff: NA

Element 11: Maintain BMPs (2.1.11)

This section is a list of permit requirements and does not have to be filled out.

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC 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 stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

Element 12: Manage the Project (2.1.12)
The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.
Check all the management BMPs that apply at your site:
Table 5 – Management

X	Design the project to fit the existing topography, soils, and drainage patterns
X	Emphasize erosion control rather than sediment control
X	Minimize the extent and duration of the area exposed
X	Keep runoff velocities low
X	Retain sediment on-site
X	Thoroughly monitor site and maintain all ESC measures
X	Schedule major earthwork during the dry season
	Other (please describe)

Optional: Fill out Table 6 by listing the BMP associated with specific construction activities. Identify the phase of the project (if applicable). To increase awareness of seasonal requirements, indicate if the activity falls within the wet or dry season.

Table 6 – BMP Implementation Schedule

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]
Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
[Insert construction activity]	[Insert BMP]	[MM/DD/YYYY]	[Insert Season]

Element 13: Protect Low Impact Development (LID) BMPs (2.1.13)
Describe LIDs.
Permittees must protect all Bioretention and Rain Garden facilities from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden facilities. Restore the facilities to their fully functioning condition if they accumulate sediment during construction. Restoring the facility must include removal of sediment and any sediment-laden Bioretention/Rain Garden soils, and replacing the removed soils with soils meeting the design specification.
Permittees must maintain the infiltration capabilities of Bioretention and Rain Garden facilities by protecting against compaction by construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.
Permittees must control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements.
Permittees must clean permeable pavements fouled with sediments or no longer passing an initial infiltration test using local stormwater manual methodology or the manufacturer's procedures.
Permittees must keep all heavy equipment off existing soils under LID facilities that have been excavated to final grade to retain the infiltration rate of the soils.
Describe how you will protect LID facilities from sedimentation, protect soils from compaction, and maintain the infiltration capabilities.
Describe how you will clean permeable pavements fouled with sediments.

N/A as there are no biofiltration facilities onsite.

Pollution Prevention Team (3.0)
Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	Steve Rushton - Coast	425-315-4799
Resident Engineer	TBD	
Emergency Ecology Contact	TBD	425-649-7000
Emergency Permittee/ Owner Contact	Tim Shoultz-SmartCAP	425-896-8561
Non-Emergency Owner Contact	Same	
Monitoring Personnel		
Ecology Regional Office	[Insert Regional Office]	[Insert General Number]

Monitoring and Sampling Requirements (4.0)
Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

Create your own Site Inspection Form or use the Construction Stormwater Site Inspection Form found on Ecology's website. https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit
File a blank form under Appendix D.
The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.
Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

Complete the following paragraph for sites that discharge to impaired waterbodies for fine sediment, turbidity, phosphorus, or pH:

The receiving waterbody, insert waterbody name, is impaired for: insert impairment. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of 8.5 su for pH and/or 25 NTU for turbidity.
Site Inspection (4.1)
Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.
The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

Stormwater Quality Sampling (4.2)
Turbidity Sampling (4.2.1)
Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.
Method for sampling turbidity:
Check the analysis method you will use:
Table 8 – Turbidity Sampling Method

	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.
If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.

3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours. https://www.ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue
    - Central Region (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490
    - Eastern Region (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400
    - **Northwest Region (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000**
    - Southwest Region (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - o 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - o 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

pH Sampling (4.2.2)
pH monitoring is required for “Significant concrete work” (i.e. greater than 1000 cubic yards poured concrete or recycled concrete over the life of the project).The use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.
For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.
For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.
If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH:
Check the analysis method you will use:
Table 8 – pH Sampling Method

	pH meter
	pH test kit
	Wide range pH indicator paper

Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies (5.0)

303(d) Listed Waterbodies (5.1)
The 303(d) status is listed on the Water Quality Atlas: https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d
Circle the applicable answer, if necessary:
Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?
Yes No
List the impairment(s):
[Insert text here]
The receiving waterbody, insert waterbody name, is impaired for: insert impairment. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of 8.5 su for pH and/or 25 NTU for turbidity.
If yes, discharges must comply with applicable effluent limitations in S8.C and S8.D of the CSWGP.

Describe the method(s) for 303(d) compliance:
List and describe BMPs:
[Insert text here]

TMDL Waterbodies (5.2)
Waste Load Allocation for CWSGP discharges:
[Insert text here]
Describe the method(s) for TMDL compliance:
List and describe BMPs:
[Insert text here]

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.
The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

Reporting and Record Keeping (6.0)
Record Keeping (6.1)
This section does not need to be filled out. It is a list of reminders for the permittee.

Site Log Book (6.1.1)
A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

Records Retention (6.1.2)
Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.
Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

Updating the SWPPP (6.1.3)
The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in 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 will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

Reporting (6.2)
Discharge Monitoring Reports (6.2.1)
Select and retain applicable paragraph.
Cumulative soil disturbance is less than one (1) acre; therefore, Discharge Monitoring Reports (DMRs) will not be submitted to Ecology because water quality sampling is not being conducted at the site.
Or
Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting “No Discharge”. The DMR due date is fifteen (15) days following the end of each calendar month.
DMRs will be reported online through Ecology’s WQWebDMR System.
To sign up for WQWebDMR go to:

https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance/WQWebPortal-guidance

Notification of Noncompliance (6.2.2)

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Specific information to be included in the noncompliance report is found in Special Condition S5.F.3 of the CSWGP.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- Central Region at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- Eastern Region at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- Northwest Region at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- Southwest Region at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

Appendix/Glossary

A. Site Map

The site map must meet the requirements of Special Condition S9.E of the CSWGP

B. BMP Detail

Insert BMPs specification sheets here.
Download BMPs from the Ecology Construction Stormwater website at:
https://www.ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Stormwater-manuals

C. Correspondence

Ecology
EPA
Local Government

D. Site Inspection Form

Create your own or download Ecology's template: https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

E. Construction Stormwater General Permit (CSWGP)

Download CSWGP: https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Stormwater-general-permits/Construction-stormwater-permit

F. 303(d) List Waterbodies / TMDL Waterbodies Information

Proposed New Discharge to an Impaired Water Body form
SWPPP Addendum addressing impairment

G. Contaminated Site Information

Administrative Order
Sanitary Discharge Permit
Soil Management Plan
Soil and Groundwater Reports
Maps and Figures Depicting Contamination

H. Engineering Calculations

Appendix B

Geotechnical Report

GEOTEST

741 Marine Drive
Bellingham, WA 98225

20527-67th Avenue NE
Arlington, WA 98223

PHONE
360 733_7318

TOLL FREE
888 251_5276

FAX
360 733_7418

December 13, 2018
Project No. 18-0787

Coast Construction Group
328 N. Olympic Avenue
Arlington, WA 98223

Attn.: Mr. Trevor Gaskin

Re: Geotechnical Engineering Report
Proposed 7C's Swim Facility
SW Corner of North Creek Drive and Dumas Road
Mill Creek, WA 98012
(Parcel No. 28053100203700)

Dear Mr. Gaskin:

As requested, GeoTest Services, Inc. (GTS) is pleased to submit this report summarizing the results of our geotechnical evaluation for the proposed 7C's Swim Facility to be constructed at the above referenced address in Mill Creek, Washington (see *Vicinity Map*, Figure 1). This report has been prepared in general accordance with the terms and conditions established in our services agreement dated October 11, 2018 and authorized by Mr. Gaskin.

PURPOSE AND SCOPE OF SERVICES

The purpose of this evaluation is to establish general subsurface conditions beneath the site from which conclusions and recommendations for foundation design can be formulated. Specifically, our scope of services includes the following tasks:

- Explore soil and groundwater conditions underlying the site by advancing five test pits to approximate depths of 6.5 to 9 feet below ground surface (BGS).

- Perform laboratory testing on representative samples in order to classify and evaluate the engineering characteristics of the soils encountered. In addition, estimate long-term infiltration rates (if feasible) and determine stormwater treatment potential.

- Provide a written report containing a site plan showing pertinent existing site features and the approximate locations of explorations, a description of surface and subsurface conditions, and exploration logs. The findings and recommendations presented in the report pertain to site preparation and earthwork including approximate stripping depths, reuse of on-site soil, placement and compaction of fill, wet weather earthwork, foundation recommendations, estimates of settlement, foundation and site drainage, soil parameters for lateral load resistance, temporary and permanent slopes, and pavement sections.

PROJECT DESCRIPTION

The irregular-shaped, approximately 4.6-acre parcel is located at the southwest corner of North Creek Drive and Dumas Road in Mill Creek, Washington. GTS was provided with a preliminary

site plan of the proposed development. TerraVista NW Consulting Engineers prepared this drawing, which was undated. Based on this drawing and discussions with Ms. Kathy Demoors and Mr. Trevor Gaskin of Coast Construction Group, GTS understands that a new swim facility will be constructed on the southern portion of the subject property. The proposed building will have an approximate footprint of 100 feet by 100 feet. Access to the development will be via a new driveway entrance at the southwest corner of the parcel. Asphalt parking and driveways will surround the proposed building. Preliminary information regarding the proposed building was not available at the time that this report was written. GTS anticipates that the new building will be wood-framed and utilize shallow conventional foundations and slabs-on-grade, with the exception of the swimming pool that would be below grade. The depth and dimensions of the proposed swimming pool was not provided to GTS.

Stormwater infiltration facilities are also proposed for this project if feasible. The type and configuration of proposed facilities was not determined at the time that this report was written.

GTS understands that the proposed development will be limited to the southern portion of the property parallel to the southern property line. As of the writing of this report, GTS understands that no decision has been made as to the development of the remainder of the parcel. Thus, it should be understood that the recommendations presented in this report are only applicable to the proposed pool building and asphalt drive paths.

SITE CONDITIONS

This section presents the general surface and subsurface conditions observed at the project site at the time of the field investigation. Interpretations of the site conditions are based on the results of our review of available information, site reconnaissance, subsurface explorations, and laboratory testing.

Surface Conditions

As previously mentioned in the *Project Description* section of this report, the subject property is located at the southwest corner of North Creek Drive and Dumas Road in Mill Creek, Washington. The subject parcel is the shape of a three-sided polygon. Two sides make a right angle, and the northwestern edge of the parcel borders North Creek Drive. Vegetation is dense across the entirety of the site, and no surface water was observed at the time of visit. The topography across the site varies so that the highest part of the parcel is generally in its center with an elevation of approximately 430 feet. The elevation drops in all directions from the center of the parcel at a gentle to moderate rate. Along the western property line, the ground slopes to the west at an approximate 2.5H: 1V to 3H: 1V inclination over approximately 10 to 15 feet of vertical relief. It appears that the slope was created as a result of the construction of North Creek Drive. A moderate slope approximately 10 feet in height with an approximately 20 percent inclination is situated near the midpoint of the southern property line. The eastern portion of the property contains a wetland with an approximate 110-foot buffer, based on a review of a previous site plan prepared by TerraVista NW.

Bordering the subject property to the south is a maintenance yard that is owned by the City of Mill Creek.

Photo 1 – SW corner of parcel, looking NE into the site. Taken during a reconnaissance visit on September 13, 2018.

Subsurface Soil Conditions

Subsurface conditions were explored by advancing five exploratory test pits (TP-1 through TP-5) on November 15, 2018. The explorations were advanced to depths of between 8.0 and 9.0 feet below ground surface (BGS) using a track-mounted excavator. All excavations were terminated at or near the maximum reach of the equipment. The approximate locations of the explorations are shown on the *Site and Exploration Plan (*Figure 2).

The test pits generally encountered approximately 4 to 14 inches of forest duff/topsoil directly underlain by approximately 1 to 2 feet of native, loose to medium-dense, well-graded gravel with sand and varying amounts of organic material (possible weathered till). Underlying the loose to medium-dense, near-surface native soils was very dense, gray, poorly-graded sand with gravel and silt (glacial till). The very dense till was encountered to the maximum explored depth of each exploration.

Photo 2 shows the soil stratigraphy observed in TP-5, which was representative of other Test Pits on site. See the attached *Test Pit Logs* (Figures 5 through 7) and *Grain Size Analysis* (Figures 8 and 9) for more information regarding the approximate locations of the exploration test pits and subsurface soil conditions encountered.

Photo 2 – A view of TP-5. View facing south. Photo taken on November 15, 2018.

General Geologic Conditions

Geologic information for the project site was obtained from the *Geologic map of the Everett 7.5 minute quadrangle, Snohomish County, Washington* (Minard, 1985) published by the U.S. Geological Survey. According to the referenced map, near surface soils in the vicinity of the project site consist of Glacial Till (Qvt). The till generally consists of a nonsorted mixture of clay, silt, sand, pebbles, cobbles, and boulders. It is a compact lodgment till and is often locally referred to as Vashon till or hardpan. Native soils encountered during our subsurface exploration were generally consistent with the mapped till deposits is generally consistent with published geological information.

Groundwater Seepage

At the time of the GTS site visit on November 15, 2018, no groundwater seepage was detected in any of the explorations. In addition, no distinctly mottled or gleyed horizons were encountered within the test pit explorations.

Perched groundwater typically develops when granular or more permeable soil (weathered glacial till) is underlain by more dense or less permeable soil (glacial till). The depositional pattern of

these soils is such that looser or more granular soils allow water to pass through the till, only to be restricted once groundwater encounters denser or siltier soils at depth. Perched groundwater conditions were not observed on-site at the time of exploration, but these conditions typically develop in the wet season or after extended periods of rainfall.

The groundwater conditions reported in the exploration logs are for the specific locations and dates indicated, and are not necessarily indicative of other locations and/or times. Groundwater levels are variable and will fluctuate depending on local subsurface conditions, season, precipitation, and changes in land use both on and off-site.

GEOLOGIC HAZARD AREAS

Chapter 18.08 of the Mill Creek Municipal Code addresses Environmentally Critical Areas within the City. The City defines Geologically Hazardous Areas to include erosion hazards, landslide hazards, and seismic hazards. Each of these as they apply to this project is discussed further in the following section.

Erosion Hazard Areas

The City defines Erosion Hazard areas as "lands or areas underlain by soils identified by the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) as having 'severe' or 'very severe' erosion hazards." Based on the Web Soil Survey for Snohomish County, Washington, the proposed development area is underlain by Everett very gravelly sandy loam (0 to 8 percent slopes). Areas underlain by these soils on slopes that are over 15 percent in inclination are defined as Erosion Hazards by the City.

The following recommendations are intended to limit the development of potential risks including excessive erosion and near-surface soil instability:

- All clearing and grading activities for the proposed development will need to incorporate Best Management Practices (BMPs) for erosion control in compliance with current City of Mill Creek codes and standards.
- GTS recommends that appropriate silt fencing be incorporated into the construction plan for erosion control.
- Removal of vegetation or trees without proper mitigation may increase the risk of failure of the surficial soils on the slope during periods of wet weather. No additional changes to existing slope vegetation are planned as a part of the proposed construction, other than normal maintenance and pruning.
- Organic waste or other debris should not be dumped onto the face of site slopes. These materials can retain water, smother the existing native vegetation, and cause instability on the slope face.
- Proper drainage controls have a significant effect on erosion. Collected site drainage should be directed to an appropriate discharge location. No water should be allowed to flow uncontrolled over the top of a steep slope.
- All areas disturbed by construction practices should be vegetated or otherwise protected to the limit the potential for erosion as soon as practical during and after construction. Areas requiring immediate protection from the effects of erosion should be covered with either plastic, mulch, or erosion control blankets.

In addition to the preceding recommendations, typical erosion control measures during construction will be required. These measures can include a rocked construction entrance or downslope silt fencing, depending on the regulations of the City of Mill Creek. No other mitigations are required to address erosion hazards on the property.

Landslide Hazard Areas

Landslide Hazard Areas in the City of Mill Creek include slopes that are over 40 percent inclination with at least 10 feet of vertical relief and areas meeting all three of the following criteria: Slopes over 15 percent, hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock, and wet season springs or groundwater seepage.

The slope along the western property line appears to have an approximate inclination of 2.5H: 1V to 3H: 1V over approximately 10 to 15 feet of vertical relief. This slope appears to have been created as a result of previous grading for North Creek Drive. Thus, this slope would not be considered as a Landslide Hazard Area. Another potential steep slope is situated adjacent to the southeast corner of the proposed building. Although this slope appears to be over 15 percent inclination and is underlain by permeable soils over glacial till, GTS did not observe any wet season springs or groundwater seepage in the explorations. It would not appear that this slope is a Landslide Hazard, and thus it is GTS's opinion that no mitigations are required to address landslide hazards on the property.

Seismic Hazard Areas

The City defines Seismic Hazard Areas are areas subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement, soil liquefaction, lateral spreading, or surface faulting. Based on the online interactive *Geologic Map of Washington State*, published by the Washington State Department of Natural Resources, the subject site is rated as a very low liquefaction susceptibility area. However, this map only provides an estimate of the likelihood that soil will liquefy as a result of earthquake shaking and is meant as a general guide to delineate areas prone to liquefaction. Though no known faults are mapped in the vicinity of the site, the Pacific Northwest is prone very large regional seismic events with a mean recurrence interval of approximately 475 years. Conventional construction techniques in the area do not typically include mitigation for liquefaction hazards based on the mapped site rating or the type of anticipated construction.

Due to the presence of very dense glacial till soils underlying the subject property, it does not appear that the property is located within a Seismic Hazard Area. No other mitigations are required to address seismic hazards on the property.

CONCLUSIONS AND RECOMMENDATIONS

Based upon an evaluation of the data collected during this investigation, it appears that subsurface conditions at the site are suitable for the proposed development provided that the recommendations contained herein are incorporated into the project design.

The test pits generally exposed 4 to 14 inches of forest duff/topsoil and approximately 1 to 2 feet of loose to medium-dense native soils (weathered till with variable amounts of organics) overlying dense to very dense glacial till. GTS recommends that the topsoil and loose fill soils (if present) be removed from the building footprint down to the native, weathered or unweathered glacial till

soils. The proposed building can then be constructed with conventional continuous or individual spread foundations bearing directly on firm and unyielding native soil, or on compacted structural fill placed atop firm and unyielding native soil. Dense, unweathered soils encountered at depth are unlikely to require much preparation. Please note that the weathered till that was observed in our explorations contained varying amounts of organics. If foundations are to be supported on the near-surface weathered till, the foundation subgrades should be free of organics and then compacted to a firm and unyielding condition with a smooth-drum roller, vibratory hoe-pack, or other appropriate piece of construction equipment. Further recommendations regarding the placement and compaction of structural fill can be found in the *Structural Fill and Compaction* section of this report.

Perched groundwater was not observed within any of the test pit explorations performed on November 15, 2018. Although no perched groundwater was observed, the native soils are glacially consolidated. GTS would expect perched water to be found during wet weather months. Therefore, it appears that the native soils are not suitable for the conventional infiltration of stormwater.

Site Preparation and Earthwork

The portions of the site to be occupied by the proposed building foundations, slab areas, and pavement, hardscape, and walkways should be prepared by removing existing forest duff, topsoil, organic material and loose/soft, upper portions of the subgrade soils. All proposed building foundations, slab areas, pavement, hardscape, and walkways may be placed on native, non-organic, weathered or unweathered glacial till soil, or existing firm and unyielding fill material after removal of any soft or medium dense soil, and organic soil.

GTS anticipates approximately 1 to 1.5 feet of surface stripping to reach suitable weathered glacial till soils, and approximately 2 to 3.5 feet of stripping to reach unweathered glacial till soils, in most locations. After site stripping has occurred, the exposed subgrade under all areas to be occupied by soil-supported floor slabs, spread or continuous foundations, pavement or new sidewalk areas should be evaluated to confirm a firm and unyielding condition and proof rolled with a loaded dump truck, large self-propelled vibrating roller, hoe-pack, or similar piece of equipment applicable to the size of the excavation.

Soils disturbed during excavation should be recompacted prior to placement of structural fill or foundation elements. Recompaction of the near-surface soils does not reduce or eliminate the need for overexcavation, where required, of near-surface loose soils or fill material below foundation elements. The purpose of recompacting and proof rolling near-surface soils is to identify possible loose or soft soil deposits and recompact, if feasible, the soil disturbed during site excavation activities.

Proof rolling should be carefully observed by qualified geotechnical personnel. Areas exhibiting significant deflection, pumping, or over-saturation cannot be readily compacted and should be overexcavated to firm soil. Overexcavated areas should be backfilled with compacted granular material placed in accordance with subsequent recommendations for structural fill. During periods of wet weather, proof rolling could damage the exposed subgrade. Under wet conditions, qualified geotechnical personnel should observe subgrade conditions to determine if proof rolling is feasible.

Structural Fill and Compaction

Structural fill used to obtain final elevations for footings and soil-supported floor slabs must be properly placed and compacted. Suitable, non-organic, predominantly granular soil may be used for fill material provided the material is properly moisture conditioned prior to placement and compaction, and the specified degree of compaction is obtained. Material containing topsoil, wood, trash, organic material, or construction debris is unsuitable for reuse as structural fill and should be properly disposed off-site or placed in non-structural areas.

Soils containing more than 5 percent fines are considered moisture sensitive. These soils are difficult to compact to a firm and unyielding condition when over the optimum moisture content by more than 2 percent. The optimum moisture content is that which allows the greatest dry density to be achieved at a given layer of compactive effort.

Reuse of On-site Soil

Near-surface, non-organic, native soils are suitable for reuse as structural fill when placed at optimum moisture contents as determined by ASTM D1557, and if allowed for in the project plans and specifications. The weathered and unweathered glacial till soils contain high percentages of fines and should be considered moisture-sensitive. Reuse of the unweathered glacial till soils may be considerably more difficult to use at or near perched groundwater elevations (if present) and during the wet weather season (typically October through May).

If using on-site materials, the contractor and owner should be prepared to manage over optimum moisture content soils. The moisture content of the site soils may be very difficult to control during periods of wet weather, and as such is not recommended.

Imported Structural Fill

GTS recommends that imported structural fill consist of clean, well-graded sandy gravel, gravelly sand, or other approved naturally occurring granular material (pit run) or a well-graded crushed rock. GTS recommends that structural fill for dry weather construction meet Washington State Department of Transportation (WSDOT) Standard Specification 9-03.14(2) for "Select Borrow" with the added requirement that 100 percent pass a 4-inch-square sieve. Soil containing more than about 5 percent fines (that portion passing the U.S. No. 200 sieve) cannot consistently be compacted to a dense, non-yielding condition when the water content is greater than optimum.

Accordingly, GTS recommends that imported structural fill for wet weather construction meet WSDOT Standard Specification 9-03.14(1) for "Gravel Borrow" with the added requirement that no more than 5 percent pass the U.S. No. 200 sieve. Due to wet weather or wet site conditions, soil moisture contents could be high enough that it may be very difficult to compact even "clean" imported select granular fill to a firm and unyielding condition. Soils with over-optimum moisture contents should be scarified and dried back to more suitable moisture contents during periods of dry weather or removed and replaced with fill soils at a more suitable range of moisture contents.

Backfill and Compaction

Structural fill should be placed in horizontal lifts approximately 8 to 10 inches in loose thickness and be thoroughly compacted. All structural fill placed under load bearing areas should be compacted to at least 95 percent of the maximum dry density, as determined using test method ASTM D1557. The top of the compacted structural fill should extend outside all foundations and

other structural improvements a minimum distance equal to the thickness of the fill. GTS recommends that compaction be tested periodically throughout the fill placement.

Wet Weather Earthwork

Earthwork taking place during the wet weather months or during extended periods of heavy precipitation can be difficult to perform when working with fine-grained soils such as glacial till. If construction is carried out during wet weather, GTS recommends that structural fill consist of imported, clean, well-graded sand or sand and gravel as described in the *Imported Structural Fill* section of this report. If earthwork is to be performed in wet weather or under wet conditions, the contractor may reduce soil disturbance by:

- Limiting the size of areas that are stripped of topsoil and left exposed
- Accomplishing earthwork in small sections
- Limiting construction traffic over unprotected soil
- Sloping excavated surfaces to promote runoff
- Limiting the size and type of construction equipment used
- Providing gravel 'working mats' over areas of prepared subgrade
- Removing wet surficial soil prior to commencing fill placement each day
- Sealing the exposed ground surface by rolling with a smooth drum compactor or rubber-tired roller at the end of each working day
- Providing up gradient perimeter ditches or low earthen berms and using temporary sumps to collect runoff and prevent water from ponding and damaging exposed subgrades.

Seismic Design Considerations

The Pacific Northwest is seismically active, and the site could be subject to shaking from a moderate to major earthquake. Consequently, moderate levels of shaking should be accounted for during the design life of the project, and the proposed structure should be designed to resist earthquake loading using appropriate design methodology.

For structures designed using the seismic design provisions of the 2015 International Building Code, the native soil that underlie the site within the upper 100 feet are classified as Site Class D, according to 2010 ASCE -7 Standard – Table 20.3-1, Site Class Definitions. The corresponding values for calculating a design response spectrum for the assumed soil profile type are considered appropriate for the site.

Please reference the following values for seismic structural design purposes:

Conterminous 48 States – 2015 International Building Code
Zip Code 98012
Central Latitude = 47.879722, Central Longitude = -122.219740

<u>Short Period (0.2 sec) Spectral Acceleration</u>

Maximum Considered Earthquake (MCE) Value of S_s = 1.407 (g)
Site Response Coefficient, F_a = 1.000 (Site Class D)
Adjusted spectral response acceleration for Site Class D, $S_{MS} = S_s \times F_a$ = 1.407 (g)
Design spectral response acceleration for Site Class D, $S_{DS} = 2/3 \times SM_s$ = 0.938 (g)

One Second Period (1 sec) Spectral Acceleration

Maximum Considered Earthquake (MCE) Value of S_1 = 0.547 (g)
Site Response Coefficient, F_v = 1.500 (Site Class D)
Adjusted spectral response acceleration for Site Class D, $S_{M1} = S_1 \times F_v$ = 0.820 (g)
Design spectral response acceleration for Site Class D, S_{D1} = 2/3 x SM_1 = 0.547(g)

Foundation Support

Foundation support for the proposed improvements may be provided by continuous and individual spread footings founded directly on firm and unyielding, native, weathered or unweathered glacial till soils, or on compacted structural fill placed over these competent, native soils. GTS recommends that qualified geotechnical personnel confirm that suitable bearing conditions have been reached prior to placement of structural fill or foundation formwork.

To provide proper support, GTS recommends that existing topsoil and fill (if present) be removed from beneath the building foundation areas down to the native soils. Dense, unweathered soils are unlikely to require much preparation. Please note that the weathered till that was observed in our explorations contained varying amounts of organics. If foundations are to be supported on the near-surface weathered till, the foundation subgrades should be free of organics and then compacted to a firm and unyielding condition with a smooth-drum roller, vibratory hoe-pack, or other appropriate piece of construction equipment. Once suitable bearing conditions have been confirmed, then foundations can bear directly on native soils or on properly compacted structural fill.

Continuous and isolated spread footings should be founded 18 inches, minimum, below the lowest adjacent final grade for freeze/thaw protection. The footings should be sized in accordance with the structural engineer's prescribed design criteria and seismic considerations.

Allowable Bearing Capacity

Assuming the above foundation support criteria are satisfied, continuous and individual spread footings founded directly on firm and unyielding native soil, or on compacted structural fill placed atop these soils, may be proportioned using a net allowable soil bearing pressure of 2,500 pounds per square foot (psf) for compacted structural fill over weathered glacial till. The weathered glacial till was generally encountered approximately 1 to 1.5 feet BGS in the explorations. If the footings bear directly on unweathered glacial till encountered approximately 2 to 3.5 feet BGS in the explorations, a net allowable soil bearing pressure of 3,000 psf can be used.

The 'net allowable bearing pressure' refers to the pressure that can be imposed on the soil at foundation level resulting from the total of all dead plus live loads, exclusive of the weight of the footing or any backfill placed above the footing. The net allowable bearing pressure may be increased by one-third for transient wind or seismic loads.

Foundation Settlement

Settlement of shallow foundations depends on foundation size and bearing pressure, as well as the strength and compressibility characteristics of the underlying soil. If construction is accomplished as recommended and at the maximum allowable soil bearing pressure, GTS estimates the total settlement of building foundations to be less than one inch, and differential settlement between two adjacent load-bearing components supported on competent soil to be

less than about one half the total settlement. The soil response to applied stresses caused by building and other loads is expected to be predominantly elastic in nature, with most of the settlement occurring during construction as loads are applied.

Floor Support

Conventional slab-on-grade floor construction appears feasible for the planned site improvements. Floor slabs may be supported on properly placed and compacted structural fill placed over properly prepared native soil. Prior to placement of any new structural fill for slab subgrade preparation, the native soil subgrade should be proof-rolled as recommended in the *Site Preparation and Earthwork* section of this report and approved for continued construction.

GTS recommends that interior concrete slab-on-grade floors be underlain with a minimum 6 inch layer of clean, compacted, free-draining gravel with less than 3 percent passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The purpose of this gravel layer is to provide uniform support for the slab, provide a capillary break, and act as a drainage layer. If desired, additional protection against water intrusion below the slab could include a slab underdrain system to collect and direct water towards an approved discharge point.

To help reduce the potential for water vapor migration through floor slabs, a continuous 10-mil minimum thick polyethylene sheet with tape-sealed joints should be installed below the slab to serve as an impermeable vapor barrier. The vapor barrier should be installed and sealed in accordance with the manufacturer's instructions.

The American Concrete Institute (ACI) guidelines suggest that the slab may either be poured directly on the vapor barrier or on a granular curing layer placed over the vapor barrier depending on construction conditions. GTS recommends that the architect or structural engineer specify if a curing layer should be used. If moisture control within the building is critical, GTS recommends that the vapor barrier be observed by a representative of GTS to confirm that openings have been properly sealed. Use of a curing layer is recommended during drier months of the year and/or when limited rain is expected during the slab-on-grade construction process. If the slab is constructed during the wet season and exposed to rain after construction, GTS does not recommend the use of curing layer as excessive moisture emissions through the slab may occur.

Exterior concrete slabs-on-grade, such as sidewalks, may be supported directly on undisturbed native soil or on properly placed and compacted structural fill; however, long-term performance will be enhanced if exterior slabs are placed on a layer of clean, durable, well-draining granular material.

Resistance to Lateral Loads

The lateral earth pressures that develop against retaining walls will depend on the method of backfill placement, degree of compaction, slope of backfill, type of backfill material, provisions for drainage, magnitude and location of any adjacent surcharge loads, and the degree to which the wall can yield laterally during or after placement of backfill. If the wall is allowed to rotate or yield so the top of the wall moves an amount equal to or greater than about 0.001 to 0.002 times its height (a yielding wall), the soil pressure exerted comprises the active soil pressure. When a wall is restrained against lateral movement or tilting (a nonyielding wall), the soil pressure exerted comprises the at-rest soil pressure. Wall restraint may develop if a rigid structural network is constructed prior to backfilling or if the wall is inherently stiff.

GTS recommends that yielding walls under drained conditions be designed for an equivalent fluid density of 35 pounds per cubic foot (pcf) for structural fill in active soil conditions. Nonyielding walls under drained conditions should be designed for an equivalent fluid density of 55 pcf for structural fill in at-rest conditions. Design of walls should include appropriate lateral pressures caused by surcharge loads located within a horizontal distance equal to or less than the height of the wall. To account for uniform surcharge pressures, a uniformly distributed lateral pressure should be added to the lateral soil pressures. This uniform pressure should be equal to 35 percent of the vertical surcharge pressure for yielding walls and 50 percent for nonyielding walls. GTS also recommends that a seismic surcharge pressure of 12H be included where H is the wall height in feet. The seismic surcharge should be modeled as a rectangular distribution with the resultant applied at the midpoint of the wall.

Passive earth pressures developed against the sides of building foundations, in conjunction with friction developed between the base of the footings and the supporting subgrade, will resist lateral loads transmitted from the structure to its foundation. For design purposes, the passive resistance of well-compacted fill placed against the sides of foundations is equivalent to a fluid with a density of 300 pcf. The recommended value includes a safety factor of 1.5. In order to calculate this passive resistance, GTS presumes that the ground surface adjacent to the structure is level in the direction of movement for a distance equal to or greater than twice the embedment depth, and drained conditions will prevent the buildup of hydrostatic pressure in the compacted fill. In design computations, the upper 12 inches of passive resistance should be omitted if the soil is not covered by floor slabs or pavement. If future plans call for the removal of the soil providing resistance, the passive resistance should be disregarded. Retaining walls should include a drain system constructed in general accordance with the recommendations presented in the *Foundation and Site Drainage* section of this report.

An allowable coefficient of base friction of 0.35 for structural fill, applied to vertical dead loads only, may be used between the base of the footing and the underlying imported granular structural fill and/or suitable native deposits. If passive and frictional resistance are applied together, one half the recommended passive soil resistance value should be used since larger strains are required to mobilize the passive soil resistance as compared to frictional resistance. A safety factor of about 1.5 is included in the base friction design value. GTS does not recommend increasing the coefficient of friction to resist seismic or wind loads.

Foundation and Site Drainage

To reduce the potential for groundwater and surface water to seep into interior spaces, GTS recommends that an exterior footing drain system be constructed around the perimeter of new building foundations as shown in the *Typical Footing Drain Section* (Figure 3). The drain should consist of a minimum 4-inch diameter perforated pipe, surrounded by a minimum 12 inches of filtering media. The pipe should be sloped to carry discharge to an approved collection system. The filtering media may consist of open-graded drain rock wrapped by a nonwoven geotextile fabric such as Mirafi 140N (or equivalent) or with a graded sand and gravel filter. For foundations supporting retaining walls, drainage backfill should be carried up the back of the wall and be at least 12-inches wide. The drainage backfill should extend from the foundation drain to within approximately 1 foot of the finished grade and consist of open-graded drain rock containing less than 3 percent by weight passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The invert of the footing drain pipe should be placed slightly below the elevation of the footing or 12 inches below the adjacent floor slab

grade, whichever is deeper, so that water will not seep through walls or floor slabs. The drain system should include cleanouts to allow for periodic maintenance and inspection.

As the subject property is underlain by glacial till, water that collects under the slab may not be able to drain. Additional protection against water intrusion below the slab could include a slab underdrain system to collect and direct water, if present, toward an approved discharge point. Passive drainage and adequate site planning could also help mitigate the potential for water to collect under the slab.

Positive surface gradients should be provided adjacent to the proposed building to direct surface water away from the building and toward suitable drainage facilities. Roof drainage should not be introduced into the perimeter footing drains, but should be separately discharged directly to the stormwater collection system or similar municipality-approved outlet. Pavement and sidewalk areas, if present, should be sloped and drainage gradients should be maintained to carry surface water away from the building towards an approved stormwater collection system. Surface water should not be allowed to pond and soak into the ground surface near buildings or paved areas during or after construction. Construction excavations should be sloped to drain to sumps where water from seepage, rainfall, and runoff can be collected and pumped to a suitable discharge facility.

GTS understands that a swimming pool will be incorporated as part of the proposed development. Water could potentially collect below the swimming pool, as these elements would be placed below existing site grades and in soils that are considered low permeability. Where appropriate, GTS recommends that the swimming pool have adequate water stops and waterproofing to resist the intrusion of water.

Additional measures such as gravity drains or sumps may also need to be incorporated into the drainage design for these elements. Although gravity drains are preferred, these drains may not be feasible due to the planned depth of the proposed swimming pool. Multiple sumps would likely be needed if water is present behind pool walls. As glacial till will not drain, water that makes its way behind the pool will remain there unless it is removed. The pool designer's recommendations should be followed if such a situation arises.

GTS recommends that additional information regarding pool size and depth be provided for our review in order to determine risk of damage due to hydrostatic forces acting on the pool. GTS is available to work with the project team to evaluate what mitigations may be required to reduce these risks.

Utilities

Utility trenches must be properly backfilled and compacted to reduce cracking or localized loss of foundation, slab, or pavement support. Excavations for new shallow underground utilities will expose medium-dense to very dense to dense weathered or unweathered glacial till.

Trench backfill in improved areas (beneath structures, pavements, sidewalks, etc.) should consist of structural fill as defined in the *Imported Structural Fill* section in this report. Outside of improved areas, trench backfill may consist of reused native deposits or clean fill provided the backfill can be compacted to the project specifications. Trench backfill should be placed and compacted in general accordance with the recommendations presented for structural fill and compaction.

The native glacial till soil is generally dense to very dense and is not expected to drain efficiently. Utility trench backfill is likely to be more permeable than the native soils. As such, up-gradient utility trenches have the potential to route subsurface sources of water towards new construction. GTS recommends that low-permeability trench dams and water stops be considered should utility trenches be installed up-gradient of any planned structures. Prior to implementing these mitigations, a review of the trench depth and gradients should be performed to determine if these mitigations should be included in the final design.

Surcharge loads on trench support systems due to construction equipment, stockpiled material, and vehicle traffic should be included in the design of any anticipated shoring system. The contractor should implement measures to prevent surface water runoff from entering trenches and excavations. In addition, vibration as a result of construction activities and traffic may cause caving of the trench walls.

The contractor is responsible for trench configurations. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored by the contractor during excavation for any evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring. If groundwater or groundwater seepage is present, and the trench is not properly dewatered, the soil within the trench zone may be prone to caving, channeling, and running. Trench widths may be substantially wider than under dewatered conditions.

Temporary and Permanent Slopes

The contractor is responsible for construction slope configurations and maintenance of safe working conditions, including temporary excavation stability, as this party is able to monitor the construction activities and has direct control over the means and methods of construction. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored during and after excavation for any evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring.

Temporary excavations in excess of 4 feet in depth should be shored or sloped in accordance with Safety Standards for Construction Work, WAC 296-155-66403.

Temporary unsupported excavations in the native soils encountered at the project site are classified as a Type B soil according to WAC 296-155-66403 and may be sloped as steep as 1H: 1V (Horizontal: Vertical). All soils encountered are classified as Type C soil in the presence of groundwater seepage. Flatter slopes or temporary shoring may be required in areas where groundwater flow is present and unstable conditions develop. Temporary slopes and excavations should be protected as soon as possible using appropriate methods to prevent erosion from occurring during periods of wet weather.

If permanent cut or fill slopes are used for this project, GTS recommends that these slopes be designed for inclinations of 2H: 1V or flatter. If used for this project, slopes for detention ponds should be designed for inclinations of 3H: 1V or flatter. All permanent cut slopes should be vegetated or otherwise protected to limit the potential for erosion as soon as practical after construction. Permanent slopes requiring immediate protection from the effects of erosion should be covered with either mulch or erosion control netting/blankets. Areas requiring permanent stabilization should be seeded with an approved grass seed mixture, or hydroseeded with an approved seed-mulch-fertilizer mixture.

Pavement Subgrade Preparation

Selection of a pavement section is typically a choice relative to higher initial cost and lower long term maintenance fees or lower initial cost and more frequent maintenance fees. For this reason, GTS recommends that the owner participate in the selection of proposed pavement improvements planned for the site. Site grading plans should include provisions for sloping of the subgrade soils in proposed pavement areas, so that passive drainage of the pavement section(s) can proceed uninterrupted during the life of the project. The proposed pavement areas should be prepared as indicated in the *Site Preparation and Earthwork* section of this report.

Flexible Pavement Sections

GTS anticipates that asphalt pavement will be used for new passenger vehicle access drives and parking areas. We recommend that a standard, or 'light duty,' pavement section consist of 2.5 inches of ½-inch HMA asphalt above 8 inches of crushed surfacing base course (CSBC) meeting criteria set forth in the Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9[3].

Areas that will be accessed by more heavily loaded vehicles, semi and garbage trucks, etc., such as the main drive paths, will require a thicker asphalt section and should be designed using a paving section consisting 4 inches of Class ½-inch HMA asphalt surfacing above 8 inches of CSBC meeting criteria set forth in the Washington State Department of Transportation (WSDOT) Standard Specification 9-03.9[3].

GTS is available to further consult, review and/or modify our pavement section recommendations based on further discussion and/or analysis with the project team/owner. The above pavement sections are initial recommendations and may be accepted and/or modified by the site civil engineer based on the actual finished site grading elevations and/or the owner's preferences.

Concrete Sidewalks and Hardscapes

We anticipate that Portland cement concrete (PCC) will be used for walkways and hardscapes. We recommend a concrete sidewalk and hardscape section consisting of 4 inches of PCC surfacing above a minimum of 4 inches of CSTC. It is assumed that sidewalks and hardscape sections will be placed over a firm and unyielding subgrade as previously addressed herein.

Stormwater Infiltration Potential

Based upon an evaluation of the data collected during this investigation, it is our opinion that subsurface conditions are generally unsuitable for the onsite infiltration of stormwater. GTS observed native soils on-site consisting of very dense, glacially compacted soils. Glacially consolidated till soils as found on site within two feet of the surface are considered a restrictive layer by the 2012 Washington State Department of Ecology *Stormwater Management Manual for Western Washington* (amended December 2014). We recommend that the design team consider connecting the new building and site stormwater facilities to the existing municipal storm system to properly convey collected stormwater to a suitable disposal area.

Stormwater mitigation utilizing Low Impact Development (LID) methods may be considered on-site. GTS is available to discuss the potential for partial infiltration and/or LID facilities.

Stormwater Pollutant Treatment

Prior to off-site discharge, stormwater may require some form of pollutant pretreatment with an amended soil. The reuse of on-site topsoil is often the most sustainable and cost-effective method for pollutant treatment purposes. Cation exchange capacities and organic contents of site topsoil and shallow subsurface soils were tested to determine their pollutant treatment suitability.

Cation Exchange Capacity and Organic Content Testing

Two composite samples were collected during our subsurface explorations for pollutant treatment purposes. Cation exchange capacity (CEC) and organic content (LOI) tests were performed by Northwest Agricultural Consultants. Laboratory test results are presented in Table 1.

TABLE 1
Cation Exchange Capacity, Organic Content, and pH Laboratory Test Results

Test Pit ID	Sample Depth (ft)	Geologic Unit	Cation Exchange Capacity (meq/100 grams)	Organic Content (%)	pH
TP-1	1.0	Topsoil	9.0	3.54	5.2
TP-2	1.5	Weathered Till	4.2	1.59	5.5
TP-3	0.5	Topsoil	13.3	6.15	5.2
TP-5	3.0	Weathered Till	7.9	2.90	5.4

Based on the results listed in Table 1, the fine-grained, near-surface topsoil and weathered till appear to be suitable for on-site pollutant treatment purposes based on the 2012 *Stormwater Management Manual for Western Washington* (amended December 2014). The Manual also states that cation exchange capacity must be greater than 5.0 meq/100 grams for treatment purposes. Low rates of infiltration can be expected if the on-site soils are amended due to their high silt contents.

Geotechnical Consultation and Construction Monitoring

GTS recommends that we be involved in the project review process. The purpose of the review is to verify that the recommendations presented in this report have been properly interpreted and incorporated in the design and specifications.

GTS recommends that geotechnical construction monitoring services be provided. These services should include observation by GTS personnel during structural fill placement, compaction activities and subgrade preparation operations to confirm that design subgrade conditions are obtained beneath the proposed building. We also recommend that periodic field density testing be performed to verify that the appropriate degree of compaction is obtained. The purpose of these services is to observe compliance with the design concepts, specifications, and recommendations contained within the report. In the event that subsurface conditions differ from those anticipated before the start of construction, GeoTest Services, Inc. would be pleased to provide revised recommendations appropriate to the conditions revealed during construction.

GTS is also available to provide a full range of materials testing and special inspection during construction as required by the local building department and the International Building Code. This may include specific construction inspections on materials such as reinforced concrete,

reinforced masonry, and structural steel. These services are supported by our fully accredited materials testing laboratory.

USE OF THIS REPORT

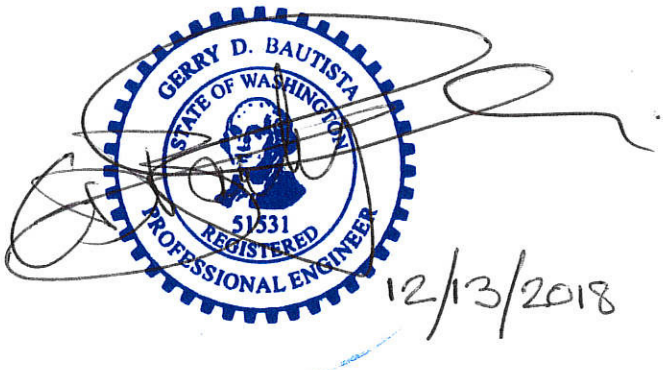
GeoTest Services, Inc. has prepared this report for the exclusive use of Coast Construction Group, and its design consultants for specific application to the design of the proposed 7C's Swim Facility to be constructed at North Creek Drive and Dumas Road in Mill Creek, Washington. Use of this report by others or for another project is at the user's sole risk. Within the limitations of scope, schedule, and budget, our services have been conducted in accordance with generally accepted practices of the geotechnical engineering profession; no other warranty, either expressed or implied, is made as to the professional advice included in this report.

Our site explorations indicate subsurface conditions at the dates and locations indicated. It is not warranted that these conditions are representative of subsurface conditions at other locations and times. The analyses, conclusions, and recommendations contained in this report are based on site conditions to the limited depth of our explorations at the time of our exploration program, a brief geological reconnaissance of the area, and review of published geological information for the site. GTS assumes that the explorations are representative of the subsurface conditions throughout the site during the preparation of our recommendations. If variations in subsurface conditions are encountered during construction, GTS should be notified to review the recommendations of this report, and revise if necessary. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations at or adjacent to the project site, GTS recommends that we review this report to determine the applicability of the conclusions and recommendations contained herein.

The earthwork contractor is responsible to perform all work in conformance with all applicable WISHA/OSHA regulations. GeoTest Services, Inc. is not responsible for job site safety on this project, and this responsibility is specifically disclaimed.

GTS appreciates the opportunity to provide geotechnical services on this project and looks forward to assisting you during the construction phase. If you have any questions regarding the information contained in this report, or if we may be of further service, please contact the undersigned.

Respectfully Submitted,
GeoTest Services, Inc.



Erin N. Belsvik, E.I.T.
Project Engineer

Gerry D. Bautista, Jr., P.E.
Project Geotechnical Engineer

Attachments:	Figure 1	Vicinity Map
	Figure 2	Site and Exploration Plan
	Figure 3	Typical Footing and Wall Drain Section
	Figure 4	Soil Classification System and Key
	Figures 5-8	Test Pit Logs
	Figure 9-10	Grain Size Analysis
	(1 page)	Cation Exchange Capacity, pH and Organic Content Results
	(3 pages)	GeoTest – Report Limitations and Guidelines for its Use

References:

Minard, J.P., 1985, *Geologic map of the Everett 7.5-minute quadrangle, Snohomish County, Washington.* U.S. Geological Survey Miscellaneous Field Studies Map MF-1748, 1 sheet, scale 1:24,000.

Mill Creek (Washington) Municipal Code (Section 18.06), 2018.

Snohomish County Planning and Development Services Map Portal, Snohomish County (Washington).

Washington State Department of Ecology, *Stormwater Management Manual for Western Washington, 2012 (amended December 2014).*

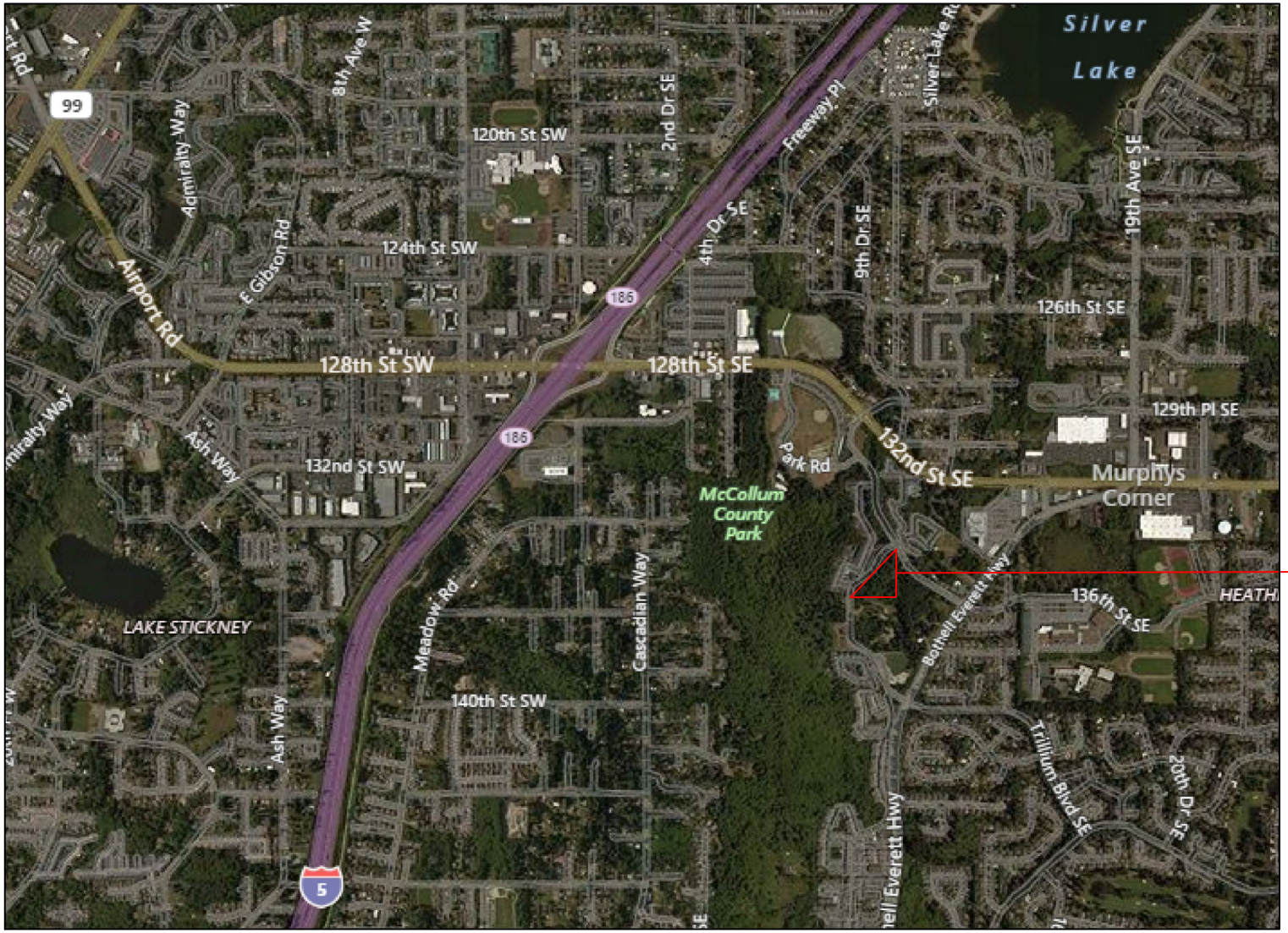
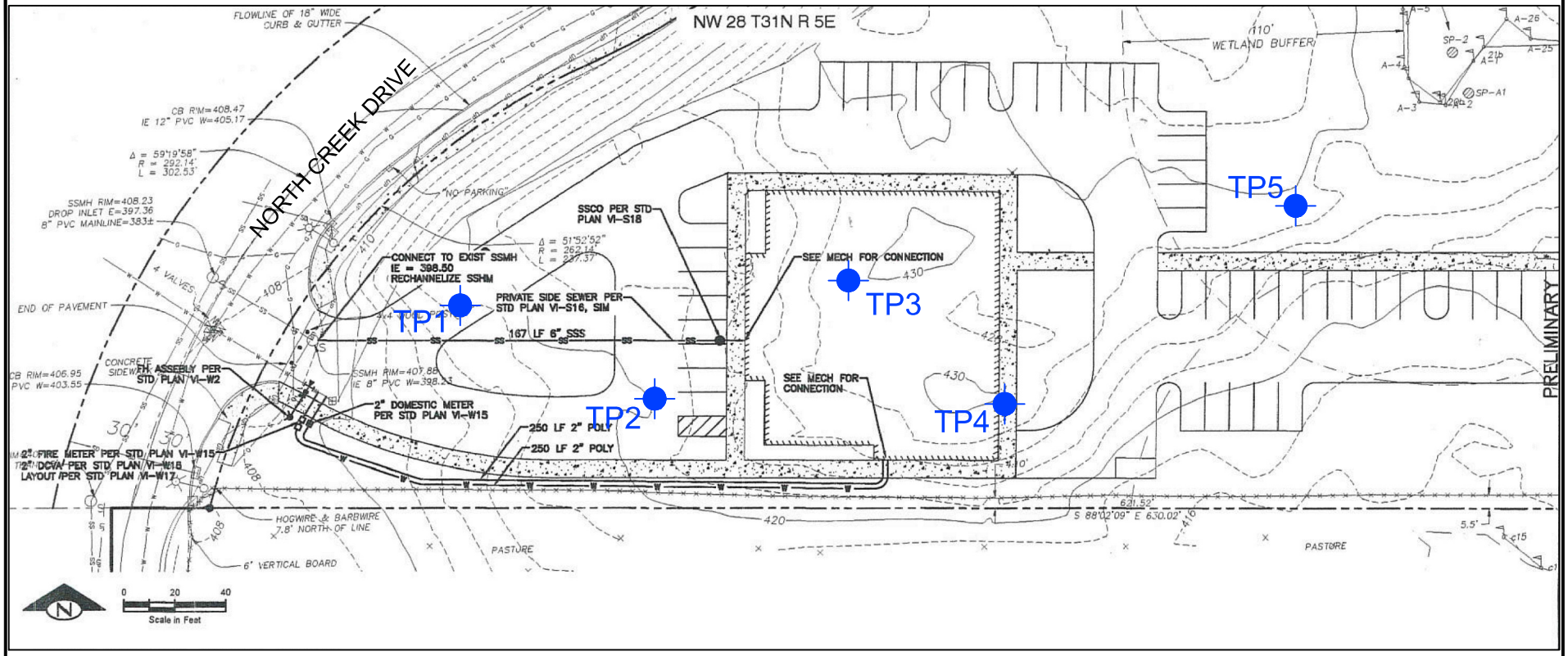


IMAGE REFERENCED FROM BING MAPS

FIGURE NO. GTS-1 GTS JOB NO: 18-0787	GeoTest Services Inc.	7C's SWIM SCHOOL SWC of NORTH CREEK DRIVE & DUMAS ROAD MILL CREEK, WASHINGTON 98223	VICINITY MAP

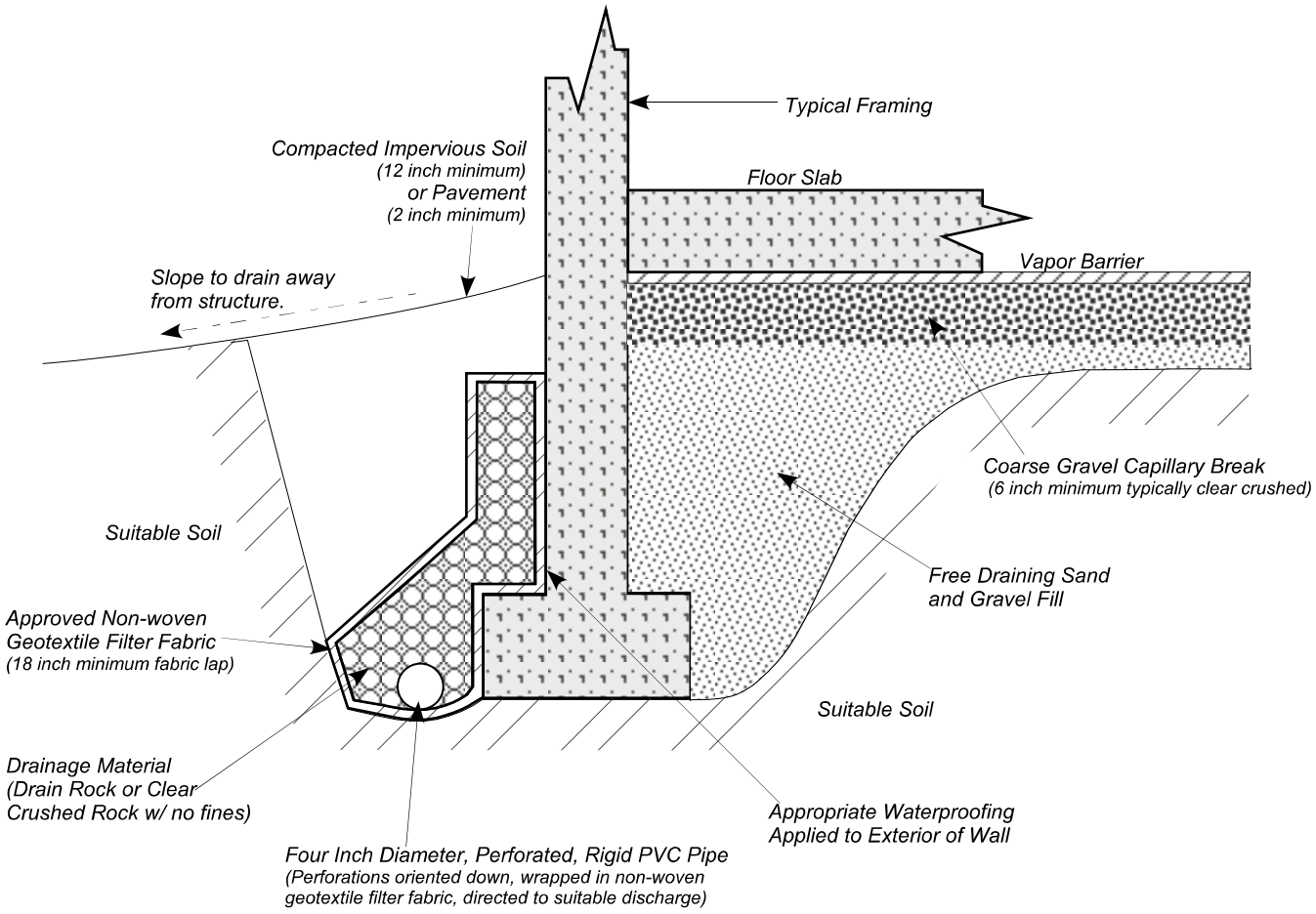


TP# - APPROXIMATE TEST PIT LOCATION

SITE PLAN REFERENCED FROM TERRAVISTA NW CONSULTING ENGINEERS
SCALE AND ORIENTATION AS SHOWN

FIGURE NO. GTS-2 GTS JOB NO: 18-0787	GeoTest Services Inc.	7C's SWIM SCHOOL SWC of NORTH CREEK DRIVE & DUMAS ROAD MILL CREEK, WASHINGTON 98223	SITE AND EXPLORATION PLAN

SHALLOW FOOTINGS WITH INTERIOR SLAB-ON-GRADE



Notes:
Footings Should be properly buried for frost protection in accordance with International Building Code or local building codes (Typically 18 inches below exterior finished grades)

The footing drain will need to be modified from this typical drawing to fit the dimensions of the planned monolithic footing and slab configuration

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Date: 11-30-18	By: EB	Scale: None	Project
			18-0787

TYPICAL FOOTING & WALL DRAIN SECTION
7C's Swim School
SWC of North Creek Drive & Dumas Road
Mill Creek, Washington 98223

Figure
3

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL	TYPICAL DESCRIPTIONS[1][2]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

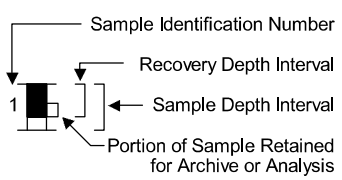
OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, as outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test Method for Classification of Soils for Engineering Purposes*, as outlined in ASTM D 2487.
2. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
> 12% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents: > 5% and ≤ 12% - "slightly gravelly," "slightly sandy," "slightly silty," etc.
≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLE NUMBER & INTERVAL



SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Other - See text if applicable

Groundwater

▽ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

GEOTEST

7C's Swim School
Mill Creek, Washington

Soil Classification System and Key

Figure 4

TP-1

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol		
0					WD	Excavation Method: Tracked Excavator Ground Elevation (ft): 418 Excavated By: Coast Construction Group/Erin Belsvik Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).	Groundwater not encountered.
2	S1	d			GW	Loose to medium dense, brown, moist, well-graded GRAVEL with SAND and organics (Possible Weathered Till).	
	S2	d	W = 7 GS		GW	Rootlets extend to 2.0 feet	
4					GP-GM	Very dense, grey, damp to moist, poorly graded GRAVEL with sand and silt (Glacial Till).	
	S3	d					
6							
	S4	d	W = 7 GS				
8							
10							
12							

Test Pit Completed 11/15/18
Total Depth of Test Pit = 8.5 ft.

TP-2

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol		
0					WD	Excavation Method: Tracked Excavator Ground Elevation (ft): 420 Excavated By: Coast Construction Group/Erin Belsvik Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).	Groundwater not encountered.
2	S5	d			SP	Loose to medium dense, brown, moist, well-graded SAND, with gravel and organics (Possible Weathered Till).	
	S6	d	W = 3 GS		SP-SM	Rootlets extend to 2.5 feet	
4						Very dense, grey, damp to moist, poorly graded SAND with gravel and silt (Glacial Till).	
6	S7	d					
	S8	d	W = 7 GS				
8							
10							
12							

Test Pit Completed 11/15/18
Total Depth of Test Pit = 8.5 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

GEOTEST	7C's Swim School Mill Creek, Washington	Log of Test Pits	Figure 5 (1 of 3)

TP-3

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	
0					WD	Excavation Method: Tracked Excavator Ground Elevation (ft): 430 Excavated By: Coast Construction Group/Erin Belsvik Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).
	S9	d			GW	Groundwater not encountered.
2					SP-SM	Loose to medium dense, brown, moist, well-graded GRAVEL, with sand with organics (Possible Weathered Till).
	S10	d				Very dense, grey, damp to moist, poorly graded SAND with gravel and silt (Glacial Till).
4						
6	S11	d	W = 6 GS			
8						
10						
12						

Test Pit Completed 11/15/18
Total Depth of Test Pit = 8.0 ft.

TP-4

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	
0					WD	Excavation Method: Tracked Excavator Ground Elevation (ft): 430 Excavated By: Coast Construction Group/Erin Belsvik Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).
					GW	Groundwater not encountered.
2	S12		W = 8 GS			Loose to medium dense, brown, moist, well-graded GRAVEL, with sand with organics (Possible Weathered Till).
4	S13		W = 8 GS		SP-SM	Very dense, grey, damp to moist, poorly graded SAND with gravel and silt (Glacial Till).
6						
	S14					
8	S15					
10						
12						

Test Pit Completed 11/15/18
Total Depth of Test Pit = 8.5 ft.

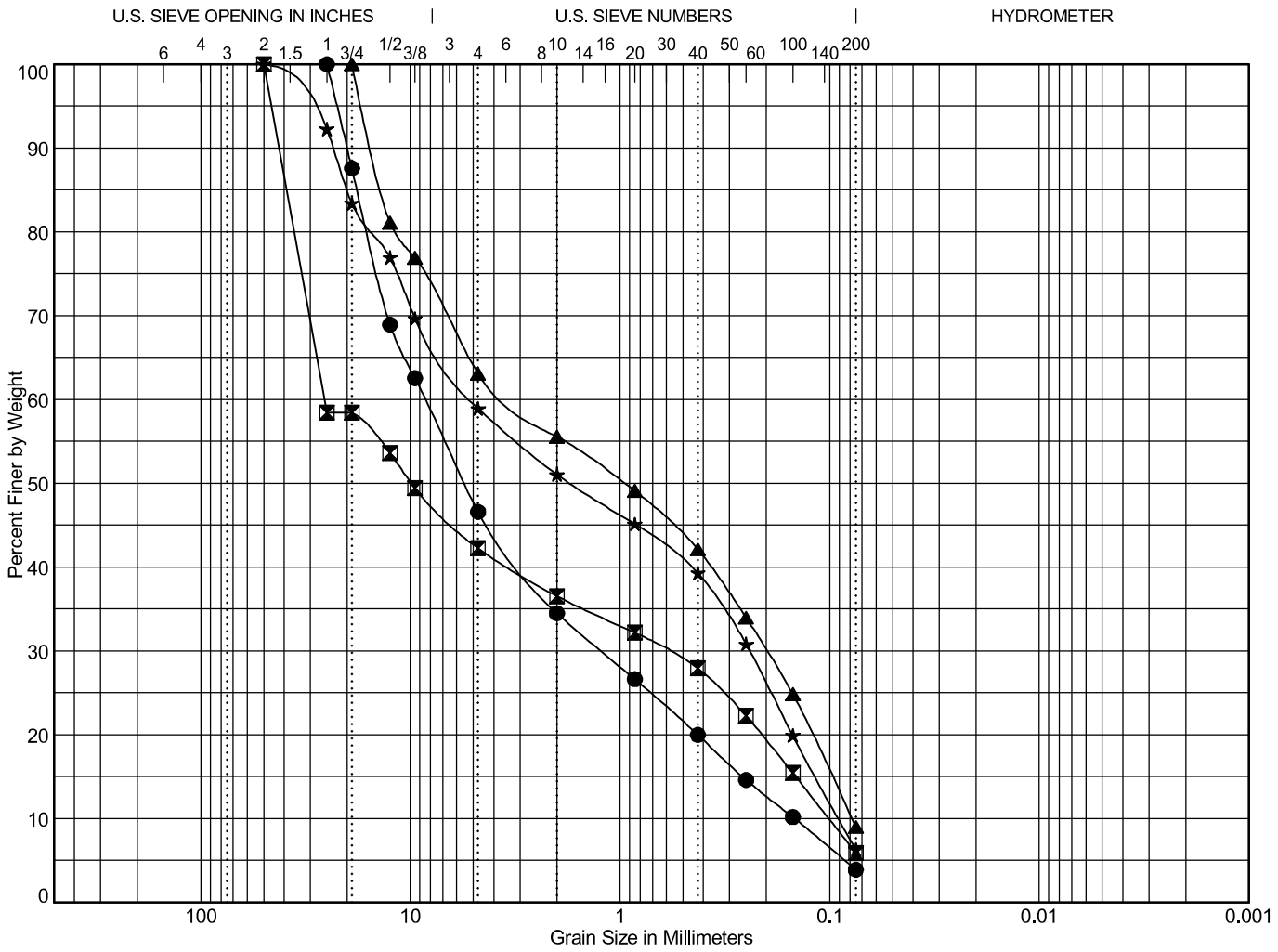
Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

GEOTEST	7C's Swim School Mill Creek, Washington	Log of Test Pits	Figure 6 (2 of 3)

TP-5

SAMPLE DATA			SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: Tracked Excavator Ground Elevation (ft): 428 Excavated By: Coast Construction Group/Erin Belsvik	
0					WD	Loose, dark brown, moist to wet, sandy, primarily organic material (Forest Duff).	Groundwater not encountered.
2					GW	Loose to medium dense, brown, moist, well-graded GRAVEL, with sand with organics (Possible Weathered Till).	
4	S16	d					
	S17	d			SP-SM	Very dense, grey, dry, poorly graded SAND with gravel and silt (Glacial Till).	
6	S18	d	W = 7 GS				
8	S19	d					
10						Test Pit Completed 11/15/18 Total Depth of Test Pit = 9.0 ft.	
12							

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Point		Depth	Classification	LL	PL	PI	C_c	C_u
●	TP-1	2.5	WELL-GRADED GRAVEL with SAND (GW)				1.20	57.78
⊠	TP-1	7.5	POORLY GRADED GRAVEL with SAND and SILT (GP-GM)				0.14	254.37
▲	TP-2	3.0	POORLY GRADED SAND with GRAVEL and SILT (SP-SM)				0.15	42.50
★	TP-2	8.0	POORLY GRADED SAND with GRAVEL and SILT (SP-SM)				0.13	56.28

Point		Depth	D_{100}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
●	TP-1	2.5	25	8.499	5.506	1.226	0.147	12.4	41.0	12.1	14.5	16.1	3.9
⊠	TP-1	7.5	50	25.667	9.856	0.596	0.101	41.6	16.2	5.7	8.6	22.0	5.9
▲	TP-2	3.0	19	3.329	0.958	0.2	0.078	0.0	36.9	7.5	13.4	33.1	9.0
★	TP-2	8.0	50	5.09	1.718	0.24	0.09	16.6	24.5	7.9	11.7	33.0	6.3

$C_c = D_{30}^2/(D_{60} * D_{10})$
$C_u = D_{60}/D_{10}$

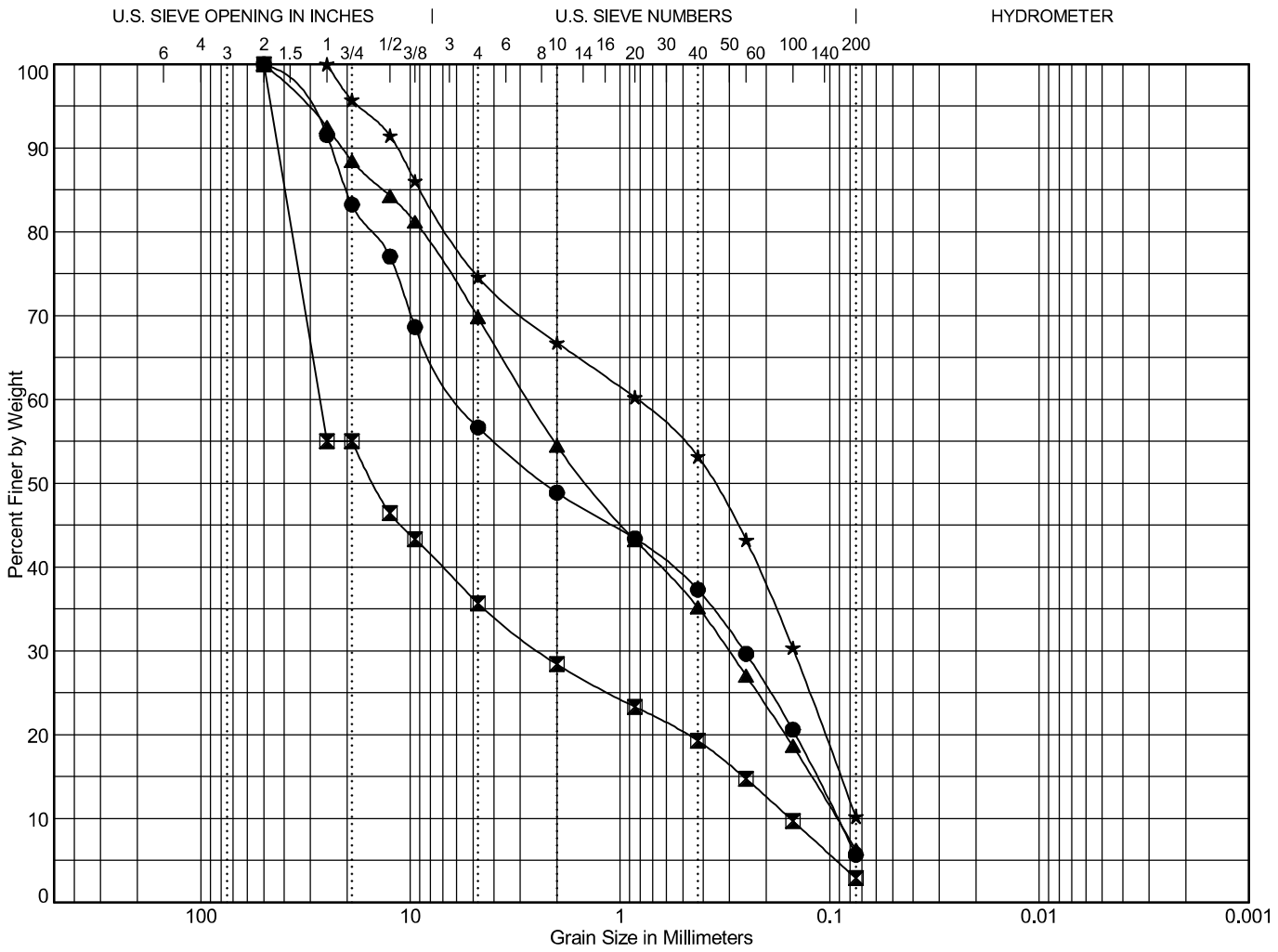
To be well graded: $1 < C_c < 3$ and $C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST

7C's Swim School
Mill Creek, Washington

Grain Size Test Data

Figure 8



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Point		Depth	Classification	LL	PL	PI	C_c	C_u
●	TP-3	6.5	POORLY-GRADED SAND with GRAVEL and SILT (SP-SM)				0.12	62.86
⊠	TP-4	2.0	WELL-GRADED GRAVEL with SAND (GW)				1.40	175.29
▲	TP-4	4.0	POORLY-GRADED SAND with GRAVEL and SILT (SP-SM)				0.36	29.61
★	TP-5	6.0	POORLY-GRADED SAND with GRAVEL and SILT (SP-SM)				0.36	11.12

Point		Depth	D_{100}	D_{60}	D_{50}	D_{30}	D_{10}	%Coarse Gravel	% Fine Gravel	% Coarse Sand	% Medium Sand	% Fine Sand	% Fines
●	TP-3	6.5	50	5.759	2.263	0.256	0.092	16.7	26.6	7.8	11.6	31.6	5.7
⊠	TP-4	2.0	50	27.001	14.883	2.415	0.154	45.0	19.3	7.3	9.1	16.4	2.9
▲	TP-4	4.0	50	2.731	1.422	0.303	0.092	11.5	18.7	15.3	19.3	28.9	6.3
★	TP-5	6.0	25	0.828	0.358	0.148		4.2	21.1	7.8	13.6	43.0	10.2

$C_c = D_{30}^2/(D_{60} * D_{10})$
$C_u = D_{60}/D_{10}$

To be well graded: $1 < C_c < 3$ and $C_u > 4$ for GW or $C_u > 6$ for SW

GEOTEST

7C's Swim School
Mill Creek, Washington

Grain Size Test Data

Figure 9

Northwest Agricultural Consultants

2545 W Falls Avenue
Kennewick, WA 99336
509.783.7450
www.nwag.com
lab@nwag.com

PAP-Accredited
NAPT

GeoTest Services Inc.
741 Marine Drive
Bellingham, WA 98225

Report: 46758-1
Date: November 19, 2018
Project No: 18-0787
Project Name: 7C's Swim School

Sample ID	pH	Organic Matter	Cation Exchange Capacity
TP-1 @ 1.0'	5.2	3.54%	9.0 meq/100g
TP-2 @ 1.5'	5.5	1.59%	4.2 meq/100g
TP-3 @ 0.5'	5.2	6.15%	13.3 meq/100g
TP-5 @ 3.0'	5.4	2.90%	7.9 meq/100g
Method	**SM 4500-H^+ B**	**ASTM D2974**	**EPA 9081**

REPORT LIMITATIONS AND GUIDELINES FOR ITS USE[1]

Subsurface issues may cause construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help:

Geotechnical Services are Performed for Specific Purposes, Persons, and Projects

At GeoTest our geotechnical engineers and geologists structure their services to meet specific needs of our clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of an owner, a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineer who prepared it. And no one – not even you – should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report is Based on a Unique Set of Project-Specific Factors

GeoTest's geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the clients goals, objectives, and risk management preferences; the general nature of the structure involved its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless GeoTest, who conducted the study specifically states otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed, for example, from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed construction,
- alterations in drainage designs; or
- composition of the design team; the passage of time; man-made alterations and construction whether on or adjacent to the site; or by natural alterations and events, such as floods, earthquakes or groundwater fluctuations; or project ownership.

Always inform GeoTest's geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

[1]Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. Do not rely on the findings and conclusions of this report, whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact GeoTest before applying the report to determine if it is still relevant. A minor amount of additional testing or analysis will help determine if the report remains applicable.

Most Geotechnical and Geologic Findings are Professional Opinions

Our site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoTest's engineers and geologists review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ – sometimes significantly – from those indicated in your report. Retaining GeoTest who developed this report to provide construction observation is the most effective method of managing the risks associated with anticipated or unanticipated conditions.

A Report's Recommendations are *Not* Final

Do not over-rely on the construction recommendations included in this report. Those recommendations are not final, because geotechnical engineers or geologists develop them principally from judgment and opinion. GeoTest's geotechnical engineers or geologists can finalize their recommendations only by observing actual subsurface conditions revealed during construction. GeoTest cannot assume responsibility or liability for the report's recommendations if our firm does not perform the construction observation.

A Geotechnical Engineering or Geologic Report may be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. Lower that risk by having GeoTest confer with appropriate members of the design team after submitting the report. Also, we suggest retaining GeoTest to review pertinent elements of the design teams plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having GeoTest participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do not Redraw the Exploration Logs

Our geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors of omissions, the logs included in this report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable; but recognizes that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In that letter, consider advising the contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the GeoTest and/or to conduct

[1]Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might you be in a position to give contractors the best information available, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. In addition, it is recommended that a contingency for unanticipated conditions be included in your project budget and schedule.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering or geology is far less exact than other engineering disciplines. This lack of understanding can create unrealistic expectations that can lead to disappointments, claims, and disputes. To help reduce risk, GeoTest includes an explanatory limitations section in our reports. Read these provisions closely. Ask questions and we encourage our clients or their representative to contact our office if you are unclear as to how these provisions apply to your project.

Environmental Concerns Are Not Covered in this Geotechnical or Geologic Report

The equipment, techniques, and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated containments, etc. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk management guidance. Do not rely on environmental report prepared for some one else.

Obtain Professional Assistance to Deal with Biological Pollutants

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts biological pollutants from growing on indoor surfaces. Biological pollutants includes but is not limited to molds, fungi, spores, bacteria and viruses. To be effective, all such strategies should be devised for the express purpose of prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional biological pollutant prevention consultant. Because just a small amount of water or moisture can lead to the development of severe biological infestations, a number of prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of this study, the geotechnical engineer or geologist in charge of this project is not a biological pollutant prevention consultant; none of the services preformed in connection with this geotechnical engineering or geological study were designed or conducted for the purpose of preventing biological infestations.

[1]Information in this document is based upon material developed by ASFE, Professional Firms Practicing in the Geosciences(asfe.org)

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www.geotest-inc.com

January 8, 2020
Project No. 18-0787

Coast Construction Group
328 N. Olympic Avenue
Arlington, WA 98223

Attn.: Mr. Trevor Gaskin

Re: Addendum to Geotechnical Engineering Report
Proposed 7C's Swim Facility
SW Corner of North Creek Drive and Dumas Road
Mill Creek, WA 98012
(Parcel No. 28053100203700)

Dear Trevor:

GeoTest Services, Inc. (GeoTest) previously prepared a *Geotechnical Engineering Report* for the above referenced project, dated December 13, 2018. Since this report was written, TerraVista NW (Civil Engineer) has begun the preliminary civil design for this project, including stormwater management plans. The City of Mill Creek is requesting clarification on hydrologic soil units for the native soils underlying the subject property. In addition, the Client (Coast Construction) has requested clarification regarding the proposed pavement sections to be used on this project.

HYDROLOGIC SOIL TYPES

Based on the USDA Natural Resources Conservation Service map for Snohomish County Area, Washington, the subject property is mapped as two soil types:

- Alderwood Gravelly Sandy Loam (0 to 8 percent slopes), Soil Group B; and
- Everett Very Gravelly Sandy Loam (0 to 8 percent slopes), Soil Group A.

It should be noted that the information given in the Web Soil Survey is only intended to describe near-surface soils for agricultural purposes.

Per Chapter 7 of the National Engineering Handbook, Group A soils have low runoff potential when thoroughly wet. These soils have typically less than 10 percent clay and more than 90 percent sand and gravel and have gravel or sand textures. Group B soils have moderately low runoff potential when thoroughly wet. These soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures.

The native, very dense, Glacial Till soils that were encountered in our subsurface explorations appear to contain about 90 percent sand based on the USDA textural classification. Thus, these

soils would typically be classified as Group A soils. Although these soils appear to have the material properties of a Group A soil, the native soils are still glacially consolidated. Preliminary infiltration rates that are calculated per the procedures given in the *Stormwater Management Manual for Western Washington* assume loose, unconsolidated soil and only take into account the material properties of the soil. Thus, it can reasonably be expected that loose soils would drain more efficiently than dense soils assuming the same sand and silt contents.

As the native soils were very dense and difficult to excavate in the field with a tracked excavator, GeoTest would typically apply a further reduction factor to calculated infiltration rates in these soils. GeoTest anticipates that perched groundwater seepage may be encountered atop very dense, glacially consolidated soils depending on the time of year. Furthermore, unweathered Glacial Till is typically classified as a Restriction Layer per the *Stormwater Manual.* Thus, it is GeoTest's opinion that the native Glacial Till soils encountered on this site are more indicative of a Group D soil based on the observed silt content, the dense to very dense, glacially consolidated nature of the soil, and the presence of wetlands to the north and east of the project area. Thus, the native soils do not appear to be suitable for conventional stormwater infiltration.

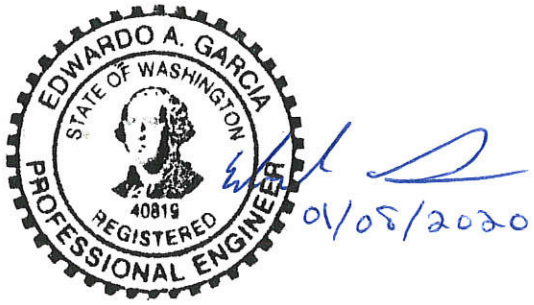
The drawings that GeoTest reviewed for this letter indicate that infiltration is not being considered for this project. However, if these plans change, GeoTest must be contacted to confirm the viability of our current recommendations.

PAVEMENT SECTION

GeoTest also understands that the Client is requesting clarification regarding the two recommended pavement sections given in the December 2018 geotechnical report. The Client and Civil Engineer have requested that GeoTest provide an opinion as to the suitability of using one uniform pavement section for the entire development. GeoTest understands that the Client is proposing to use one uniform pavement section consisting of 3 inches of asphalt overlying 8 inches of crushed stabilized base course (CSBC). Based on discussions with the Civil Engineer, GeoTest understands that the drive lanes would only receive sporadic heavy traffic (ex. garbage trucks once a week). It is GeoTest's opinion that this revised pavement section should be acceptable, provided that the Client can accept potentially increased maintenance due to the reduced pavement thickness along the drive lanes. However, it is still GeoTest's opinion that the minimum 8-inch thickness of CSBC be maintained, due to the low permeability of the underlying Glacial Till soils.

GeoTest appreciates the opportunity to provide geotechnical services for this project. Should you have any further questions regarding the information contained within the letter, or if we may be of service in other regards, please contact the undersigned.

Respectfully,
GeoTest Services, Inc.



Gerry D. Bautista, Jr., P.E.
Project Geotechnical Engineer

Edwardo Garcia, P.E.
Geotechnical Department Manager

REFERENCES

Gariepy, D., Graul, C., Heye, A., Howie, D., Labib, F., and Song, K. (n.d.), *2019 Stormwater Management Manual for Western Washington* (2019 SMMWW) (pp. 1-1108) (United States, Washington State Department of Ecology).

GeoTest Services, Inc., *Geotechnical Engineering Report, Proposed 7C's Swim Facility, SW Corner of North Creek Drive and Dumas Road, Mill Creek, WA.* Project No. 18-0787, December 13, 2018.

Part 630 National Engineering Handbook, Chapter 1 – Hydrologic Soil Groups. United States Department of Agriculture Natural Resources Conservation Service, May 2007.

Web Soil Survey for Snohomish County Area, Washington. United States Department of Agriculture Natural Resources Conservation Service. Retrieved on December 18, 2019.

Appendix C

Operation and Maintenance

The following maintenance standards are as described in Volume V, Section 4.6.6, Table 5.3 of the SWMMWW.

Table V-4.5.2(3) Maintenance Standards - Closed Detention Systems (Tanks/Vaults)			
Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and /or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications and is structurally sound.

		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance	Manhole is closed
	Locking mechanism not working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See "Catch Basins" (No. 5)	See "Catch Basins" (No. 5)	See "Catch Basins" (No. 5)

Table V-4.5.2(4) Maintenance Standards - Control Structure/Flow Restrictor			
Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes--other than designed holes--in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.

		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).	See "Closed Detention Systems" (No. 3).
Catch Basin	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).

Table V-4.5.2(5) Maintenance Standards - Catch Basins			
Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash and Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin

	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present
	Contamination and Pollution	See "Detention Ponds" (No. 1).	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.

	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Latter Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate Opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

Table V-4.5.2(15) Maintenance Standards - Manufactured Media Filters			
Maintenance Component	Defect	Condition When Maintenance Is Needed	Results Expected When Maintenance is Performed
Below Ground Vault	Sediment Accumulation on Media	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Cleanouts	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.

		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

Table V-4.5.2(18) Maintenance Standards - Catchbasin Inserts			
Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance is Performed
General	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.	No sediment cap on the insert media and its unit.
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.	Trash and debris removed from insert unit. Runoff freely flows into catch basin.
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.	Effluent water from media insert is free of oils and has no visible sheen.
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.	Remove and replace media insert.
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.	Remove and replace media insert.
	Media Insert Use Beyond Normal Product Life	Media has been used beyond the typical average life of media insert product.	Remove and replace media at regular intervals, depending on insert product.

Appendix D

Drainage Calculations

Appendix E

Water Quality Calculations

Appendix F

Sediment Trap Calculations

Appendix G

Off-Site Basin Map (Fig. 3) & Mill Creek Basin Map

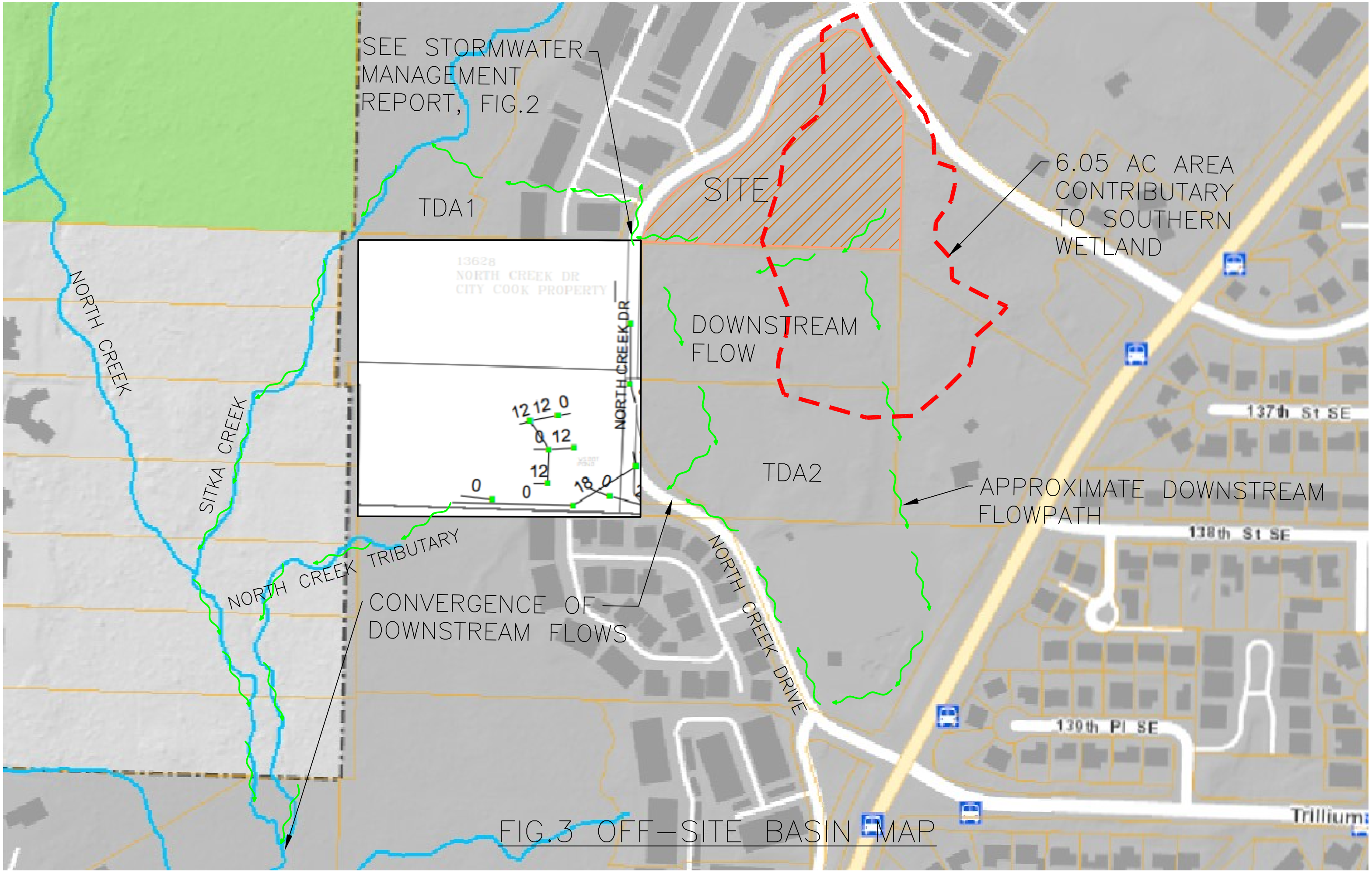
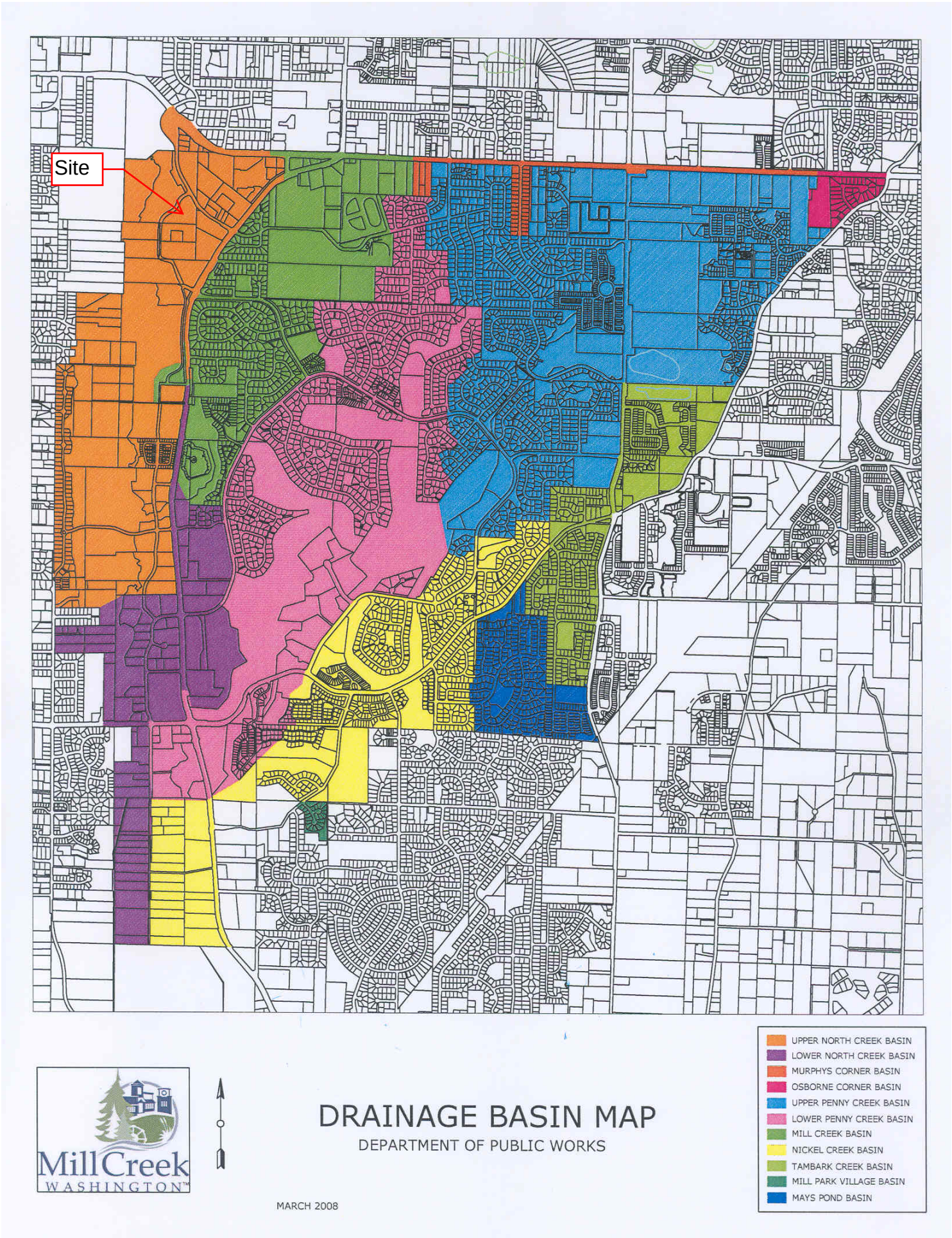
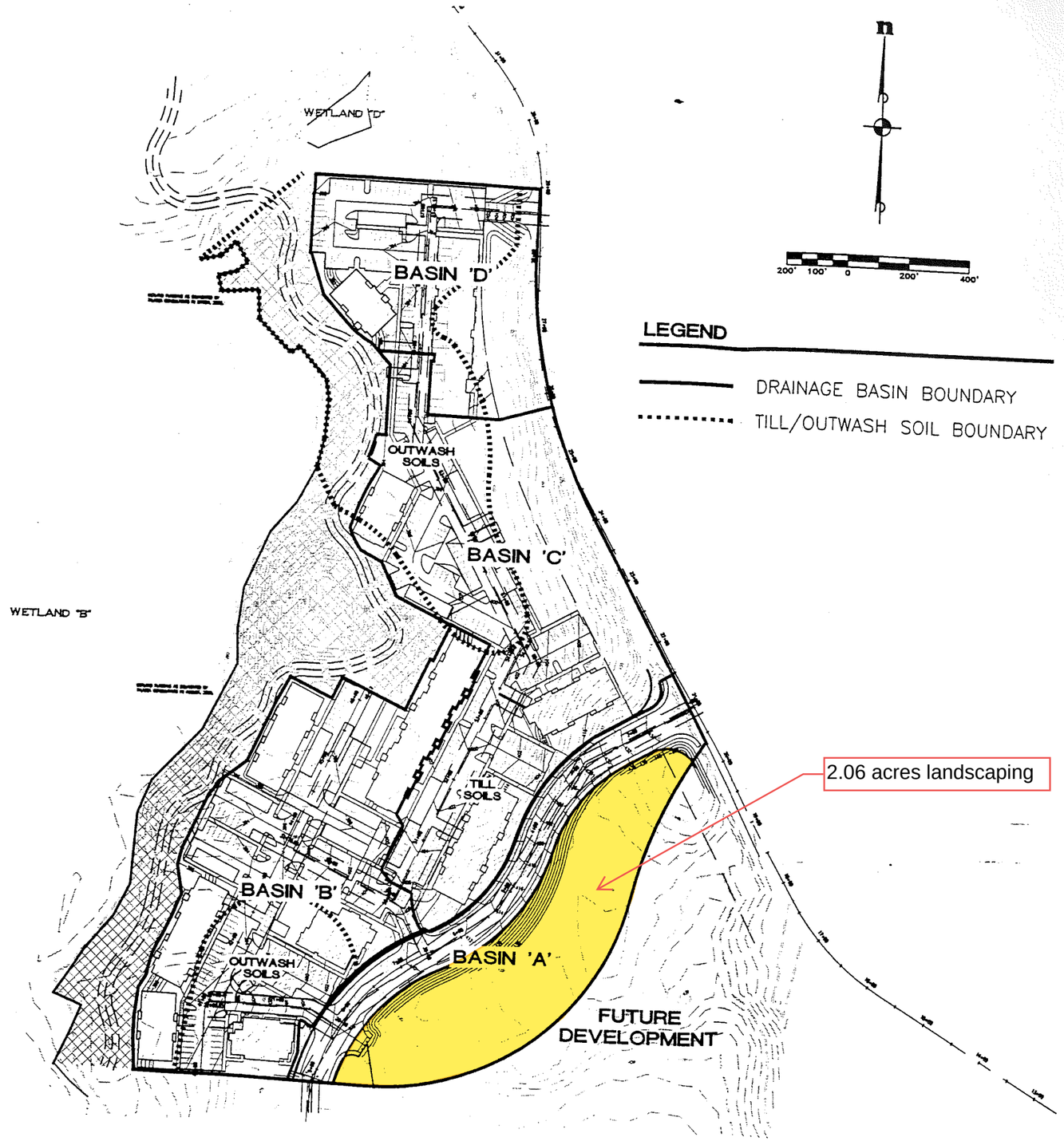


FIG.3 OFF-SITE BASIN MAP


Site
UPPER NORTH CREEK BASIN
LOWER NORTH CREEK BASIN
MURPHYS CORNER BASIN
OSBORNE CORNER BASIN
UPPER PENNY CREEK BASIN
LOWER PENNY CREEK BASIN
MILL CREEK BASIN
NICKEL CREEK BASIN
TAMBARK CREEK BASIN
MILL PARK VILLAGE BASIN
MAYS POND BASIN
Mill Creek
WASHINGTON
DRAINAGE BASIN MAP
DEPARTMENT OF PUBLIC WORKS
MARCH 2008

Appendix H

Heatherwood Apts Tributary Area Plan



LEGEND

DRAINAGE BASIN BOUNDARY

TILL/OUTWASH SOIL BOUNDARY

SITE CHARACTERISTICS

BASIN 'A':	TOTAL BASIN AREA =	3.22 AC.
	TOTAL OUTWASH AREA =	0.30 AC.
	OUTWASH PVMT/SW AREA =	0.22 AC.
	OUTWASH LANDSCAPED AREA =	0.08 AC.
	TOTAL TILL AREA =	2.92 AC.
	TILL PVMT/SIDEWALK AREA =	0.83 AC.
	TILL LANDSCAPED AREA =	2.09 AC.
BASIN 'B':	TOTAL BASIN AREA =	4.01 AC.
	TOTAL OUTWASH AREA =	1.20 AC.
	OUTWASH PVMT/SW AREA =	0.72 AC.
	OUTWASH ROOF AREA =	0.30 AC.
	OUTWASH LANDSCAPED AREA =	0.18 AC.
	TOTAL TILL AREA =	2.81 AC.
	TILL PVMT/SIDEWALK AREA =	1.16 AC.
	TILL ROOF AREA =	0.63 AC.
	TILL LANDSCAPED AREA =	0.50 AC.
	BYPASSED ROOF AREA =	0.52 AC.
BASIN 'C':	TOTAL BASIN AREA =	4.49 AC.
	TOTAL OUTWASH AREA =	1.36 AC.
	OUTWASH PVMT/SW AREA =	0.84 AC.
	OUTWASH ROOF AREA =	0.06 AC.
	OUTWASH LANDSCAPED AREA =	0.26 AC.
	OUTWASH UNDIST. FOREST =	0.07 AC.
	BYPASSED ROOF AREA =	0.13 AC.
	TOTAL TILL AREA =	3.13 AC.
	TILL PVMT/SW AREA =	0.90 AC.
	TILL ROOF AREA =	0.43 AC.
	TILL LANDSCAPED AREA =	0.76 AC.
	TILL UNDISTURBED FOREST =	1.04 AC.
BASIN 'D':	TOTAL BASIN AREA =	2.15 AC.
	TOTAL OUTWASH AREA =	1.47 AC.
	OUTWASH PVMT/SW AREA =	0.76 AC.
	OUTWASH ROOF AREA =	0.27 AC.
	OUTWASH LANDSCAPE AREA =	0.29 AC.
	OUTWASH UNDIST. FOREST =	0.04 AC.
	BYPASSED ROOF AREA =	0.11 AC.
	TOTAL TILL AREA =	0.68 AC.
	TILL PVMT/SW AREA =	0.12 AC.
	TILL ROOF AREA =	0.11 AC.
	TILL LANDSCAPED AREA =	0.09 AC.
	TILL UNDISTURBED FOREST =	0.36 AC.

FIGURE 5

HEATHERWOOD APTS

PROPOSED SITE HYDROLOGY

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JOB NO. 981-01-001 | DATE: 09-10-02
DRAWN: MS | SHEET 1 OF 1

DRAWING: